SieiDrive

Vector AC Drive

AVy

...Function description and parameters list

GEFRAN

Thank you for choosing this Gefran product.

We will be glad to receive any possible information which could help us improving this manual. The e-mail address is the following: techdoc@gefran.it.
Before using the product, read the safety instruction section carefully (see AVy Quick Start up manual).
Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period.
Gefran S.p.A has the right to modify products, data and dimensions without notice.
The data can only be used for the product description and they can not be understood as legally stated properties.

This manual is updated according the software version V1.X00.
Variation of the number replacing "X" have no influence on the functionality of the device.
The identification number of the software version can be read on the inverter nameplate or on the label on the FLASH memories mounted on the regulation card.

Table of Contents

1. DRIVE OPERATION

The figure 1.1. shows the parameters sets management in the Drive. The set of parameters which is used by the inverter during the operation, is called "Current set".

At each power up, the parameters contained in the not volatile memory, "Permanent set", are copied in the "Current set".

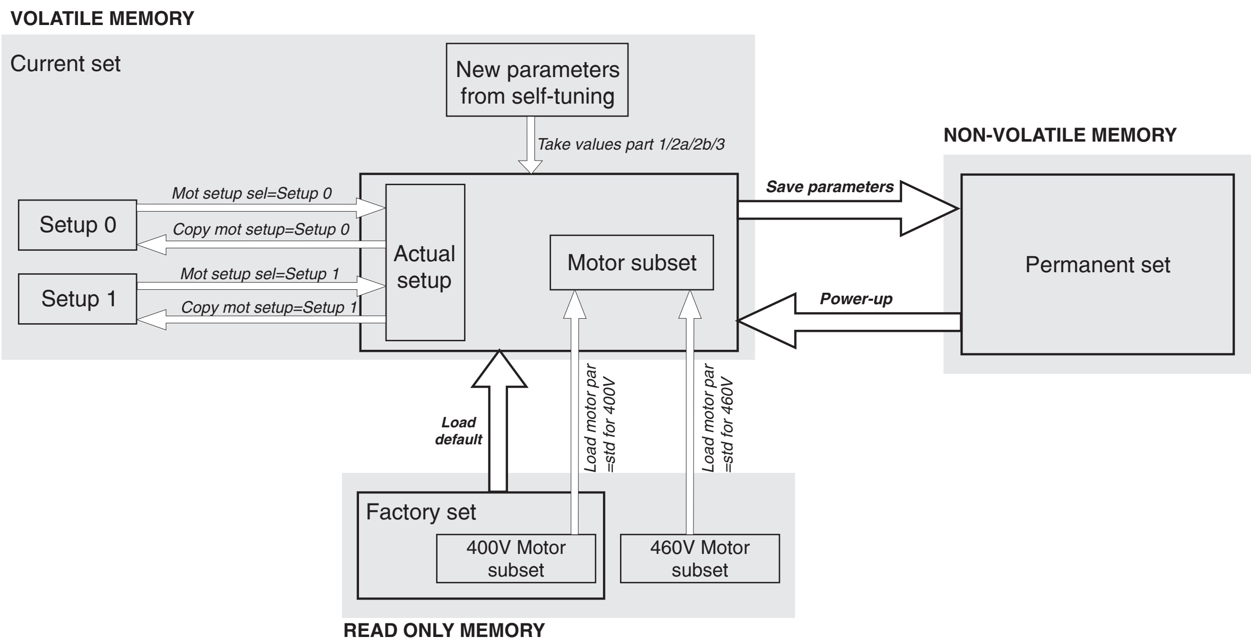
The device comes from the factory with the parameters of "Permanent set" preloaded with a set called "Factory set", whose values are indicated in the tables of section 3, column "Factory".

The user can change the parameter values of the "Current set" and subsequently store it in the "Permanent set" through the **Save parameters** command.

It is always possible to recall (in the "Current set") the factory parameters set "Factory set" by means of **Load default** command.

In addition the diagram shows some operations on subsets of parameters which are made possible by individual commands.

Figure 1.1: Parameters sets management

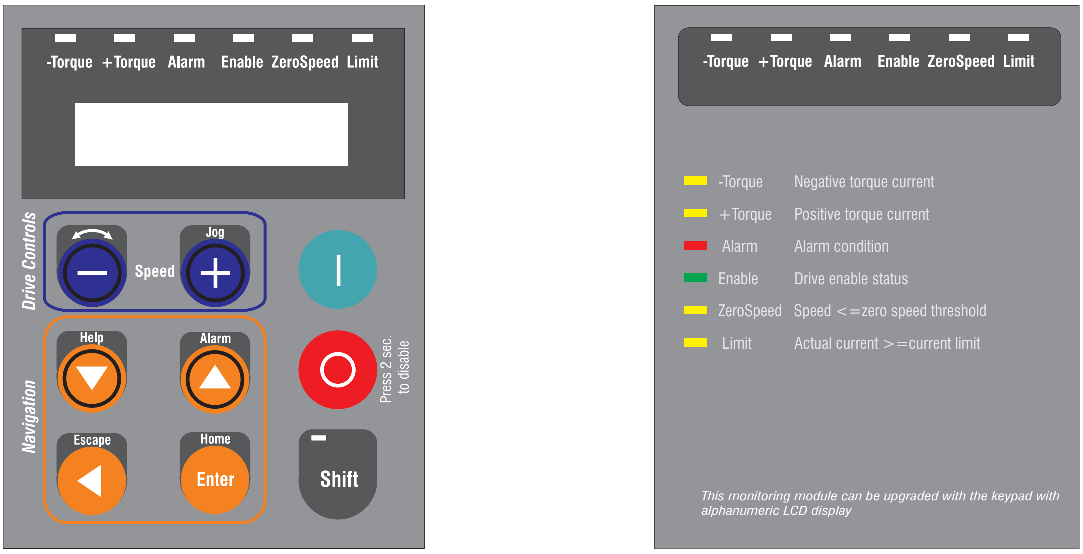


1.1. KEYPAD

The keypad is made of a LCD display with two 16-digit lines, seven LEDs and nine function keys. It is used

- to control the drive, when this kind of use has been programmed (Main commands=DIGITAL)
- to display the speed, voltage, diagnostics etc. during the operation
- to set the parameters

Figure 1.1.1: keypads (on right the standard Led module)



NOTE: keypad cable longer than 20 cm must be shielded.

1.1.1. LEDs & buttons

The LEDs present on the keypads are used to quickly diagnose the operating state of the drive.

Table 1.1.1.1: Keypad leds designation

Designation	Color	Function
-Torque	yellow	the LED is lit, when the drive operates with a negative torque
+Torque	yellow	the LED is lit, when the drive operates with a positive torque
ALARM	red	the LED is lit; it signals a trip
ENABLE	green	the LED is lit, when the drive is enabled
Zero speed	yellow	the LED is lit; it signals zero speed
Limit	yellow	the LED is lit, when the drive operates at a current limit
Shift	yellow	the LED is lit, when the second keypad functions are enabled

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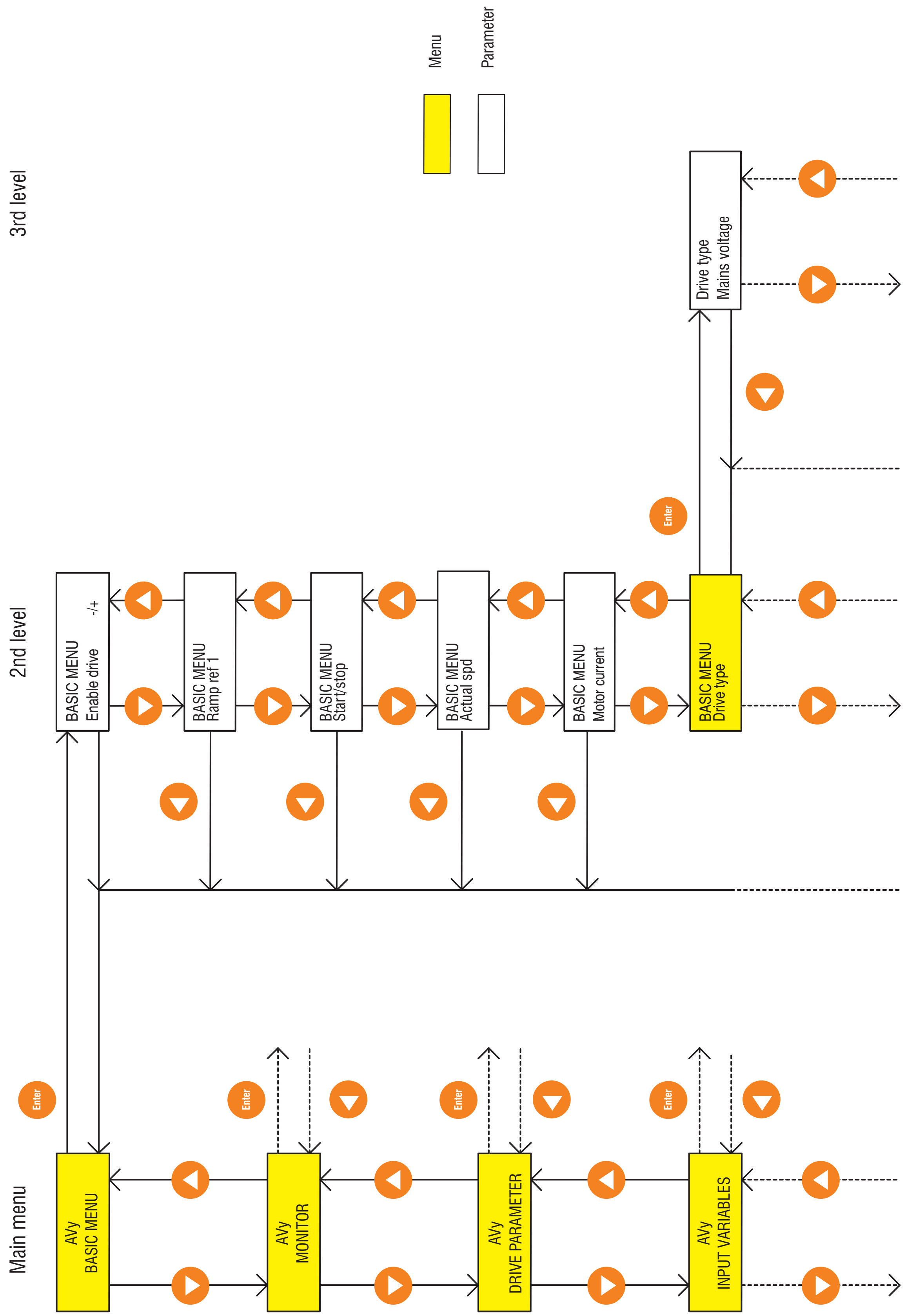
Control buttons	Text reference	Function
	[START]	START button commands the Drive to the Enable (Stop control function ON) and Run state (**Main commands** = DIGITAL) When **Main commands** is set as TERMINALS the button is not active
	[STOP]	STOP button commands to stop the Drive from the Run state when **Main commands** is set as DIGITAL (Pressing this button for 2 sec, the drive will be disabled). When **Main commands** is set as TERMINALS the button is not active.
	[Increase] / [Jog]	Plus button increases the speed reference for Motor pot function. JOG command, when shift button is selected.
	[Decrease] / [Rotation control]	Minus button decreases the speed reference for Motor pot function. Rotation control, it changes the rotation direction in Jog mode and Motor pot function when shift button is selected.
	[Down arrow] / [Help]	Down arrow - Used to change menu or parameter selection.In parameter and reference setting modes, it changes the value of the parameter or the reference. Help – Function Not available (“Help not found” displaying when pressed and when shift button is selected)
	[Up arrow] / [Alarm]	Up arrow - Used to change menu or parameter selection. In parameter and reference setting modes, it changes the value of the parameter or the reference. Alarm - Failure register displaying (shift selected). Use the UP/ DOWN Arrows to scroll through the last 10 alarms.
	[Left arrow] / [Escape]	Left arrow, when editing numeric parameters it selects the digit of the parameter to modify. In the other cases it is used to exit from setting mode. Escape - Used to exit from setting mode and Alarm displaying mode (when shift button is selected)
	[Enter] / [Home]	[Enter] - Used to [Enter] a new value for a parameter in the parameter setting mode. Home - Used to go directly to BASIC MENU (when shift button is selected)
	[Shift]	Shift button enables the second keypad functions (Rotation control, Jog, Help, Alarm, Escape, Home)

1.1.2. Moving Inside a Menu

Figure 1.1.2.1: Moving Inside the Navigation Menu



The BASIC MENU always appears when the inverter is switched on.

Use the ▲ and ▼ keys to select the individual points within the same menu level.

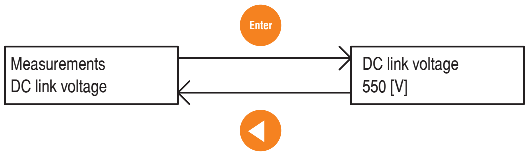
Press the **Enter** key to enter the next menu level.

Use the ◀ key to return to the next higher menu level, irrespective of which menu point was selected. The appropriate menu of the next higher level will appear once the return has been made.

Press **Home** (**Shift** and **Enter**) to go directly to BASIC MENU.

1.1.3. Displaying Parameters

(MONITOR \ Measurement)



Select the parameters within the menu.

Press **Enter**. The parameter will appear with the corresponding value.

Press ◀ key to return to the menu.

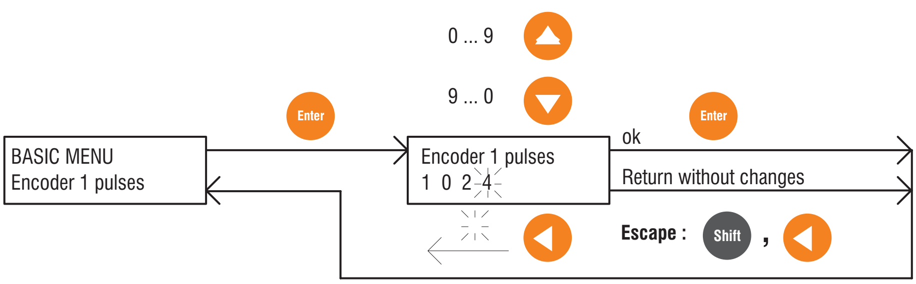
1.1.4. Changing / Saving Parameters / Password

The parameters with changeable values are divided into three groups:

- Parameters whose content is either selected as a number or as text within a defined range, e.g. ramp times and reference values
- Parameters whose contents are fixed values that can be selected, e.g. **Mains voltage** with the options 230V, 400V and 460V.
- Parameters that are automatically scaled by the keypad, e.g. **Auto tune inp XX**

Note! Only those parameters that are not assigned to a digital or analog input/output can be changed with the keypad. The changed parameters must be saved otherwise the previous values will be loaded the next time the device is switched on.

Changing numerical values and text (i.e.: BASIC MENU \ Encoder 1 pulses)



Select the parameter to be changed in the menu.

Press **Enter**. The value of the parameter will appear and the last digit will flash. The value of the flashing digit is always the one that can be changed.

Increase the value with **▲.** Reduce the value with ▼.

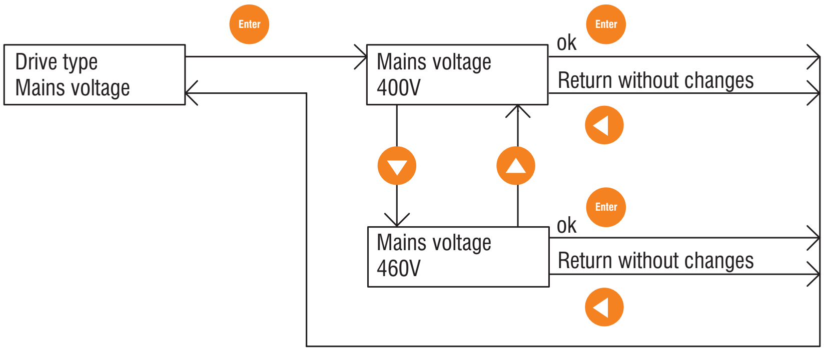
Select the next digit with ◀, .

Confirm the new value and return to the previous display by pressing **Enter**.

Press **Escap** (**Shift** and ◀) to return without changes.

NOTE! When setting the **Dim factor text** parameter, the following characters are also available in addition to the numbers: / % & + , - . : < = > ? A...Z [ ] a...z

Selection from predefined values (i.e.: BASIC MENU \ Drive type \ Mains voltage)

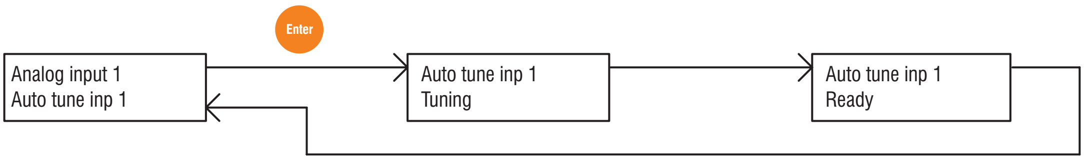


To change a value press **Enter**. The current value is shown in the display. This can be changed with the ▲ and ▼.

Confirm the new value and return to the previous display by pressing **Enter**.

Press ◀ key to return without changes.

Automatic Scaling (i.e.: I/O CONFIG \ Analog Inputs \ Analog input 1 \ Auto tune inp 1)



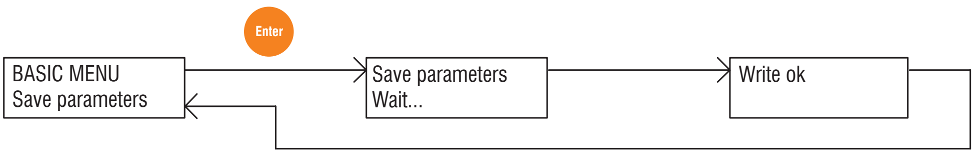
Select the appropriate **Auto tune input XX** parameter. Press **Enter.**

The scaling procedure will run automatically. The messages "Tuning" and "Ready" will appear in sequence before the original parameter is shown.

NOTE! The maximum signal possible must be present on the analog input concerned during the scaling procedure.

Saving (BASIC MENU \ Save parameters)

The parameters must be saved otherwise the previous values will be loaded the next time the device is switched on.

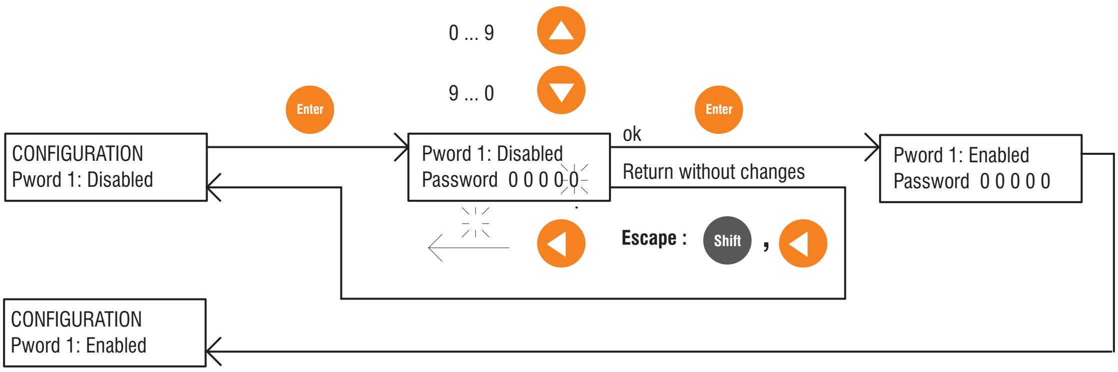


Select **Save parameters** in the BASIC MENU or in the SPEC FUNCTIONS menu. Press **Enter**.

The save operation is automatic. The messages "Wait ..." and "Write ok" will appear in sequence before the original parameter is shown.

Entering a password (CONFIGURATION \ Pword 1)

The operator can define a password consisting of a freely selectable five-digit number combination in order to protect the keypad from unauthorized access. This is carried out via the **Pword 1** parameter.



Select the **Pword1** (= Password 1) in the CONFIGURATION menu.

Press **Enter**. The value 00000 will appear with the last digit flashing. The value of the flashing digit is changed.

Increase the value with ▲. Reduce the value with ▼.

Select the next digit left with ◀ .

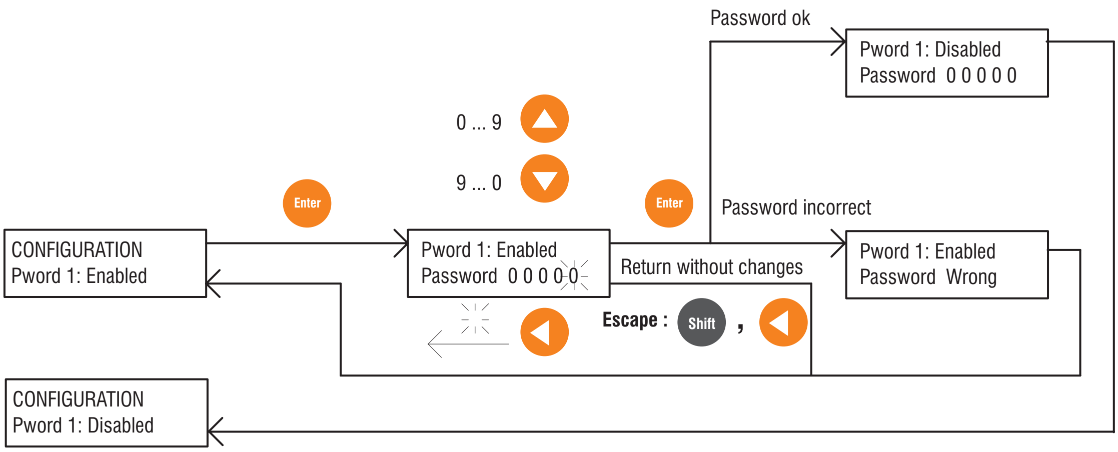
Confirm the password by pressing **Enter**. The message: "Pword1: Enabled" will then appear shortly with the currently valid password displayed.

The existing password is indicated in the CONFIGURATION menu via the "Pword 1: Enabled" message.

Press **Escape** (**Shift** and ◀) to return without changes.

Note! The password must be saved with **Save parameters** so that it is also active the next time the device is switched on.

General unlocking of the password (CONFIGURATION \ Pword 1)



Select the **Pword1** (= Password 1) parameter in the CONFIGURATION menu.

Press **Enter** to call up the value 00000 with the last digit flashing. Always the value of the flashing digit is changed. The valid password must be re-entered in order to unlock it.

Increase the value with ▲. Reduce the value with ▼.

Select the next digit left with ◀ .

Confirm by pressing **Enter**. The message: "Pword1: Disabled" will then appear for a short time.

The existing password is indicated in the CONFIGURATION menu via the "Pword 1: Disabled".

Press **Escape** (**Shift** and ◀) key to abort the entry of the password if required.

If the incorrect password is entered and then Enter pressed, the message "Password wrong" will appear and the keypad will return to the CONFIGURATION menu with the display "Pword1: Enabled"

NOTE! The **Save parameters** function must be used to save the password if the password itself must not only be disabled but completely unlocked.

1.1.5. Operating the Drive via the Keypad

In order to operate the drive via the keypad, the following settings must be made in the CONFIGURATION menu:

- **Main commands** = Digital
- **Control mode** = local

The hardware enable input on terminals 12 .. 15 are also active when the drive is operated via the keypad. This means, for example, that the signal at terminal 13 must also be present for starting the drive in addition to the command via the keypad.

If the drive is stopped via the keypad, it can be restarted simply by pressing the appropriate key.

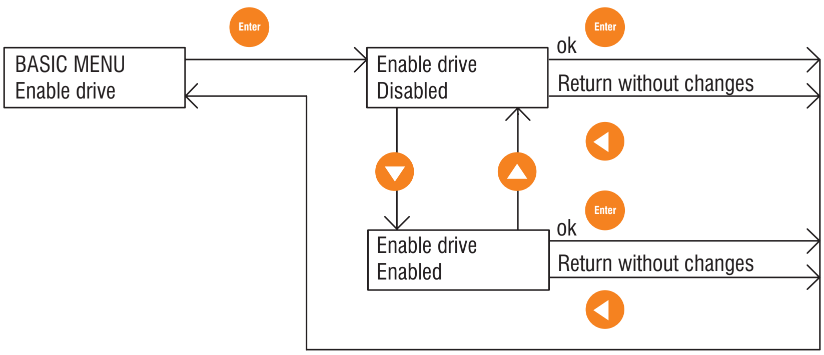
If the stop was caused by removing the voltage signal on terminal 13, both the signal at terminal 13 and the command via the keypad are necessary to restart the drive. The signal at the terminals must be present before giving the keypad command.

The same applies accordingly to the enabling of the drive via the **Enable drive** parameter.

1.1.5.1. Starting and Stopping the Drive with Keypad

NOTE: The keypad must be enabled (see section 2.12.1) before performing these actions. (**MAIN COMMANDS** parameter **= DIGITAL)**

Enabling / Disabling the Drive (BASIC MENU \ Enable drive)



Select the **Enable drive** parameter in the BASIC MENU or MONITOR Menu.

Press **Enter**.

Use the ▲ and ▼ keys to move from “Disabled” to “Enabled”.

Press **Enter** to confirm your entry.

Press **Escape** (**Shift** and ◀) to return without changes.

Start / Stop

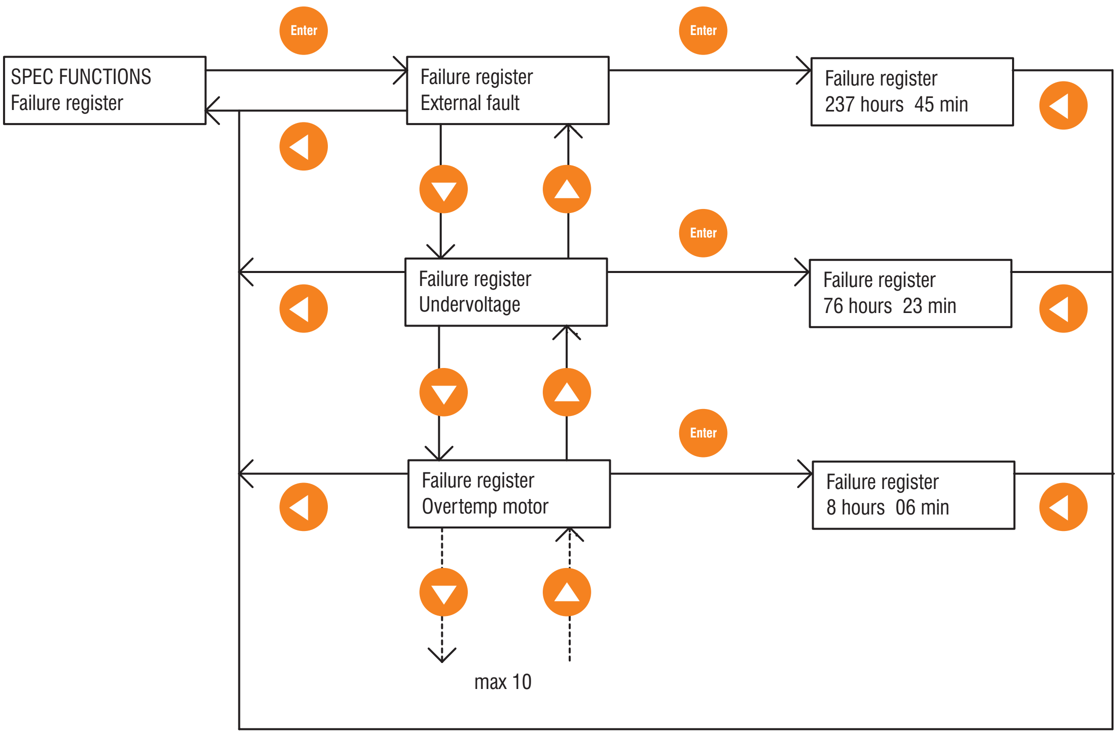
Start: Press the I key

Stop: Press the key.

WARNING: **The Keypad STOP key can be used only when MAIN COMMANDS parameter is set to digital.**

1.1.5.2. Failure register / acknowledge alarms

Displaying the failure register



Press **Alarm** (**Shift** and ◀) key to select the **Failure register** parameter (or select it in the SPEC FUNCTIONS menu).

Press **Enter**: the last error that has occurred will be displayed.

Use ▼ ey to display the previous error.

The failure register can take up to 10 values. If a new failure is reported, the oldest entry in the failure register is overwritten.

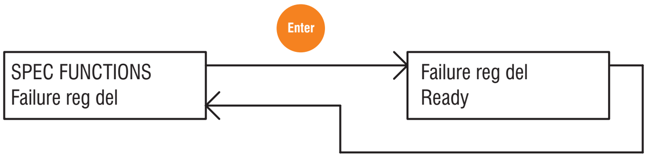
The entries in the failure register are retained until the register is cleared.

Press **Enter** to display the time at which the failure occurred. The time statement refers to the operating hours of the inverter (power supply unit connected to supply).

Press ▲ or ▼ o returns to the **Failure register** menu point.

If the ◀ ey is pressed when the failure is displayed, the display returns to the Failure register menu without showing the time.

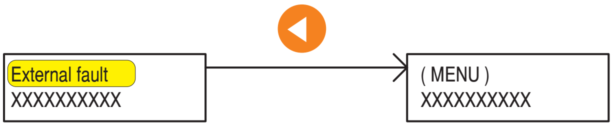
Clearing the failure register



Select the **Failure reg del** parameter in the SPEC FUNCTIONS menu.

Press **Enter**. The failure register is deleted.

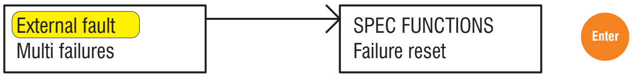
Acknowledging a failure alarm



If a failure occurs, the appropriate failure alarm will appear in the display and the display will flash, the failure message and the previous text alternately.

Acknowledge or reset the failure by pressing the ◀ key. The Drive must be disabled for this and a Start command must not be present.

Acknowledging when several failure alarms occur at the same time



If several alarms occur at the same time, the blinking message “Multi failures” will be shown in the display.

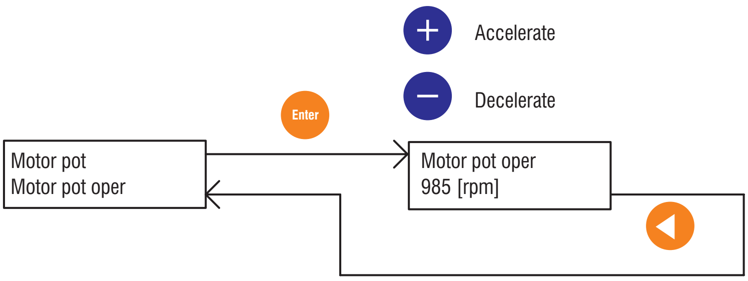
Select the **Failure reset** parameter in the SPEC FUNCTIONS menu.

Press the **Enter** key to acknowledge or reset the failure alarm. The Drive must be disabled for this and there should be no Start command present.

1.1.5.3. Motor Potentiometer function

Note! To use the motor potentiometer function, this must be enabled with the **Enable motor pot** parameter!

Acceleration, Deceleration (FUNCTION \ Motor pot)

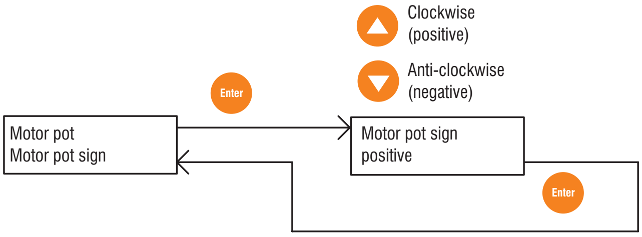


Select the **Motor pot oper** parameter in the “Motor pot” menu.

Press **Enter** to display the current reference value.

Press the + key to increase the reference value and accelerate the drive. Press the **-** key to decrease the reference value and decelerate the drive. This applies to both rotation directions.

Press **Escape** (**Shift** , ◀) to return to the "Motor pot" submenu.



Changing rotation direction

Select the **Motor pot sign** parameter in the "Motor pot" menu.

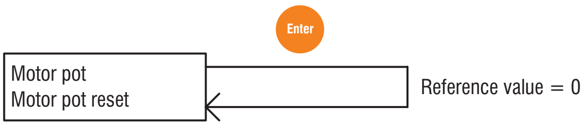
Press **Enter** to display the currently active rotation direction.

Press the ▲ key to select clockwise rotation and the ▼ key for counterclockwise rotation.

Confirm by pressing **Enter**.

Changing the **Motor pot sign** parameter during operation causes the drive to reverse rotation according to the ramp times set.

Resetting the speed reference value



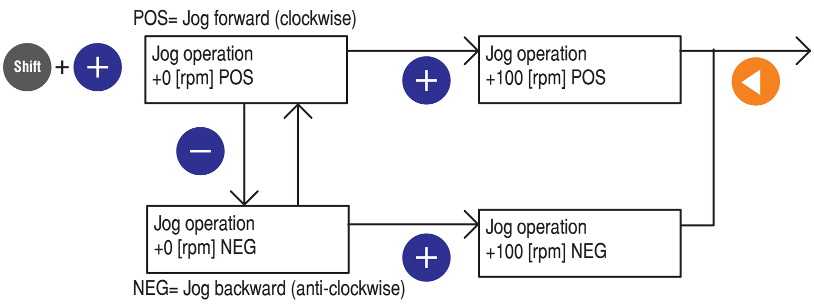
Select the **Motor pot reset** parameter in the "Motor pot" submenu.

Press **Enter**. The speed reference value will be set to zero.

NOTE! The speed reference value can only be reset when the drive is switched off.

1.1.5.4. Jog function

NOTE! The **Enable jog** parameter is standard setting enabled with a speed reference value = 100 rpm.



Press **Shift** and + keys to select the **Jog operation** function.

Press the - key to select the motor shaft rotation (POS = clockwise rotation , NEG = counterclockwise rotation).

Press Jog to run the motor (the selected jog speed will be displayed).

Press ◀ key to exit from jog operation.

1.2. MENU STRUCTURE

1.2.1 Main menu and Submenu

Main menu — *Submenu*

- **BASIC MENU**
  - Drive type
- **MONITOR**
  - Measurements
    - Speed
      - Speed in DRC []
      - Speed in rpm
      - Speed in %
  - I/O
- **DRIVE PARAMETER**
  - Mot plate data
  - Motor Parameter
    - Self-tuning
      - Self-tune 1
      - Self-tune 2a
      - Self-tune 2b
      - Self-tune 3
  - Sensorless V/f control
    - Voltage boost
    - Slip compens
    - V/f spd search
    - Energy save
- **INPUT VARIABLES**
  - Ramp ref
    - Ramp ref 1
    - Ramp ref 2
  - Speed ref
    - Speed ref 1
    - Speed ref 2
  - T current ref
- **LIMITS**
  - Speed limits
    - Speed amount
    - Speed min/max
  - Current limits
  - Flux limits
  - Voltage limits
- **RAMP**
  - Acceleration
  - Deceleration
  - Quick stop
- **SPEED REGULAT**
  - Spd zero logic
  - Speed up
  - Droop function
  - Inertia/loss cp
- **CURRENT REGULAT**
- **FLUX REGULATION**
- **REG PARAMETERS**
  - Percent values
    - Speed regulator
    - Current reg
      - Dead time comp
    - Flux regulator
    - Voltage reg
  - Base values
    - Speed regulator
    - Current reg
    - Flux regulator
    - Voltage reg
  - In use values
- **CONFIGURATION**
  - Motor spd fbk
  - Drive type
  - Dimension fact
  - Face value fact
  - Prog alarms
    - Undervoltage
    - Overvoltage
    - Heatsink sensor
    - Heatsink ot
    - Intake air ot
    - Regulation ot
    - Module overtemp
    - Overtemp motor
    - External fault
    - Overcurrent
    - Output stages
    - Opt2 failure
    - Bus loss
    - Hw opt1 failure
    - Enable seq err
    - BU overload

Main menu — *Submenu*

- **I/O CONFIG**
  - Analog outputs
    - Analog output 1
    - Analog output 2
    - Analog output 3
    - Analog output 4
  - Analog inputs
    - Analog input 1
    - Analog input 2
    - Analog input 3
  - Digital outputs
  - Digital inputs
  - Encoder inputs
- **ADD SPEED FUNCT**
  - Adap spd reg
  - Speed control
  - Speed zero
- **FUNCTIONS**
  - Motor pot
  - Jog function
  - Multi speed fct
  - Multi ramp fct
    - Ramp 0
      - Acceleration 0
      - Deceleration 0
    - Ramp 1
      - Acceleration 1
      - Deceleration 1
    - Ramp 2
      - Acceleration 2
      - Deceleration 2
    - Ramp 3
      - Acceleration 3
      - Deceleration 3
  - Stop control
  - Speed draw
  - Motor setup
  - Overload contr
    - Ovld mot contr
    - Ovld drv contr
  - Brake unit
  - Pwr loss stop f
- **SPEC FUNCTIONS**
  - Test generator
  - DC braking
  - Links
    - Link 1
    - Link 2
  - Pad Parameters
- **OPTIONS**
  - Option 1
    - PDC config
      - Pdc inputs
      - Pdc outputs
      - Virt dgt in
      - Virt dgt out
  - Option 2
  - PID
    - PID source
    - PID references
    - PI controls
    - PD controls
    - PID target
    - Diameter calc
- **DRIVECOM**
  - Speed amount
  - Speed min/max
  - Acceleration
  - Deceleration
  - Quick stop
  - Face value fact
  - Dimension fact
- **SERVICE**

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1.2.2 Main menu, Submenu and parameters

BASIC MENU

[314]	Enable drive
[44]	Ramp ref 1
[315]	Start/stop
[122]	Actual spd [rpm]
[231]	Motor current

Drive type

[333]	Mains voltage
[332]	Ambient temp
[802]	Continuous curr
[331]	Software version

[321]	Regulation mode
[21]	Acc delta speed
[22]	Acc delta time
[29]	Dec delta speed
[30]	Dec delta time
[8]	T current lim +
[9]	T current lim -
[415]	Encoder 1 type
[416]	Encoder 1 pulses
[45]	Speed base value
[256]	Save parameters

MONITOR

[314]	Enable drive
[315]	Start/stop

Measurements

Speed

Speed in DRC [ ]

[109]	Ramp ref (d)
[112]	Ramp output (d)
[115]	Speed ref (d)
[119]	Actual spd (d)
[925]	F act spd (d)
[923]	Act spd filter

Speed in rpm

[110]	Ramp ref (rpm)
[113]	Ramp outp (rpm)
[118]	Speed ref (rpm)
[122]	Actual spd (rpm)
[427]	Enc 1 speed (rpm)
[420]	Enc 2 speed (rpm)
[924]	F act spd (rpm)
[923]	Act spd filter

Speed in %

[111]	Ramp ref (%)
[114]	Ramp output (%)
[117]	Speed ref (%)
[121]	Actual spd (%)

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[227]	DC link voltage
[229]	Active power
[233]	Output voltage
[324]	Output frequency
[231]	Motor current
[230]	Torque
[41]	T current ref %
[927]	T curr (%)
[928]	F T curr (%)
[926]	T curr filter
[234]	Flux
[881]	Heatsink temp
[1147]	Regulation temp
[914]	Intake air temp

I/O

[-]	Digital I/Q
[582]	Virtual dig inp
[583]	Virtual dig out

DRIVE PARAMETER

Motor plate data

[161]	Nominal voltage
[162]	Nominal speed
[163]	Nom frequency
[164]	Nominal current
[371]	Cos phi
[167]	Base voltage
[168]	Base frequency
[694]	Take motor par

Motor parameter

[165]	Magnetizing curr
[726]	Magn working cur
[166]	Rotor resistance
[436]	Stator resist
[437]	Lkg inductance
[251]	Load motor par

Self-tuning

Self-tune 1

[676]	Start part 1
[436]	Stator resist
[683]	Stator resist Nw
[644]	Voltage comp lim
[685]	Volt comp lim Nw
[645]	Comp slope
[686]	Comp slope Nw
[437]	Lkg inductance
[684]	Lkg inductance Nw
[89]	Current P
[687]	Current P Nw

ai5020-b

[166]	Rotor resistance
[682]	Rotor resist Nw
[90]	Current I
[688]	Current I Nw
[677]	Take val part 1

Self-tune 2a

[678]	Start part 2a
[176]	P1 flux model
[689]	P1 flux model Nw
[692]	P2 flux model
[690]	P2 flux model Nw
[165]	Magnetizing curr
[691]	Magnetiz curr Nw
[91]	Flux P
[907]	Flux P Nw
[92]	Flux I
[908]	Flux I Nw
[1022]	Voltage P
[1024]	Voltage P Nw
[902]	Voltage I
[909]	Voltage I Nw
[679]	Take val part 2a

Self-tune 2b

[680]	Start part 2b
[176]	P1 flux model
[689]	P1 flux model Nw
[692]	P2 flux model
[690]	P2 flux model Nw
[165]	Magnetizing curr
[691]	Magnetiz curr Nw
[91]	Flux P
[907]	Flux P Nw
[92]	Flux I
[908]	Flux I Nw
[1022]	Voltage P
[1024]	Voltage P Nw
[902]	Voltage I
[909]	Voltage I Nw
[681]	Take val part 2b

Self-tune 3

[1029]	Fwd-Rev spd tune
[1048]	Test T curr lim
[1027]	Start part 3
[1014]	Inertia
[1030]	Inertia Nw
[1015]	Friction
[1031]	Friction Nw
[87]	Speed P
[1032]	Speed P Nw
[88]	Speed I
[1033]	Speed I Nw
[1028]	Take val part 3

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- **Sensorless**
  - [646] Low speed factor
  - [643] Sls speed filter
  - [647] Flux corr factor
- **V/f control**
  - [712] V/F shape
  - **Voltage boost**
    - [709] Vlt boost type
    - [710] Manual boost
    - [711] Actual boost
  - **Slip compensat**
    - [722] Slip comp type
    - [723] Manual slip comp
    - [724] Actual slip comp
    - [725] Slip comp filt
    - [727] Motor losses %
  - **V/f spd search**
    - [893] Spd srch time
    - [894] Flux srch time
    - [895] Spd autocapture
    - [896] Delay auto cap
    - [897] Delay retrying
  - **Energy save**
    - [898] Enable save eng
    - [899] Lock save eng
    - [900] V/f flux level
    - [901] Flux var time

INPUTS VARIABLES

- **Ramp ref**
  - **Ramp ref 1**
    - [44] Ramp ref 1
    - [47] Ramp ref 1(%)
  - **Ramp ref 2**
    - [48] Ramp ref 2
    - [49] Ramp ref 2 (%)
- **Speed ref**
  - **Speed ref 1**
    - [42] Speed ref 1
    - [378] Speed ref 1(%)
  - **Speed Ref 2**
    - [43] Speed ref 2
    - [379] Speed ref 2(%)
- **T current ref**
  - [39] T current ref 1
  - [40] T current ref 2

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LIMITS

- **Speed limits**
  - **Speed amount**

[1]	Speed min amount
[2]	Speed max amount

  - **Speed min/max**

[5]	Speed min pos
[3]	Speed max pos
[6]	Speed min neg
[4]	Speed max neg

- **Current limits**

[715]	T curr lim type
[7]	T current lim
[8]	T current lim +
[9]	T current lim -
[10]	In use Tcur lim+
[11]	In use Tcur lim-
[13]	Current lim red
[342]	Torque reduct

- **Flux limits**

[467]	Flux level

- **Voltage limits**

[889]	Dynam vlt margin

RAMP

- **Acceleration**

[21]	Acc delta speed
[22]	Acc delta time

- **Deceleration**

[29]	Dec delta speed
[30]	Dec delta time

- **Quick stop**

[37]	QStp delta speed
[38]	QStp delta time

[18]	Ramp shape
[19]	S shape t const
[663]	S acc t const
[664]	S dec t const
[20]	Ramp +/- delay
[673]	Fwd-Rev
[245]	Enable ramp
[344]	Ramp out = 0
[345]	Ramp in = 0
[373]	Freeze ramp

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SPEED REGULAT.

- [118] Speed ref
- [236] Speed reg output
- [322] Lock speed reg
- [242] Enable spd reg
- [348] Lock speed I
- [1016] Aux spd fun sel
- [444] Prop. filter
- **Spd zero logic**
  - [123] Enable spd=0 I
  - [124] Enable spd=0 R
  - [125] Enable spd=0 P
  - [422] Enable lck sls
  - [126] Spd=0 P gain
  - [106] Ref 0 level
  - [890] Enable zero pos
  - [891] Lock zero pos
  - [892] Zero pos gain
- **Speed up**
  - [445] Speed up gain
  - [446] Speed up base
  - [447] Speed up filter
- **Droop function**
  - [696] Droop gain
  - [697] Droop filter
  - [698] Load comp
  - [700] Droop limit
  - [699] Enable droop
- **Inertia/loss cp**
  - [1014] Inertia
  - [1015] Friction
  - [1013] Torque const
  - [1012] Inertia c filter

CURRENT REGULAT

- [353] Zero torque

FLUX REGULATION

- [469] Flux reg mode
- [500] Flux reference
- [234] Flux
- [921] Out vlt level

REG. PARAMETERS

- **Percent values**
  - **Speed regulator**
    - [87] Speed P
    - [88] Speed I

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- **Current reg**
  - [89] Current P
  - [90] Current I
  - **Dead time comp**
    - [644] Voltage comp lim
    - [645] Comp slope
- **Flux regulator**
  - [91] Flux P
  - [92] Flux I
- **Voltage reg**
  - [1022] Voltage P
  - [902] Voltage I

- **Base values**
  - **Speed regulator**
    - [93] Speed P base
    - [94] Speed I base
  - **Current reg**
    - [95] Current P base
    - [96] Current I base
  - **Flux regulator**
    - [97] Flux P base
    - [98] Flux I base
  - **Voltage reg**
    - [1023] Voltage P base
    - [903] Voltage I base
- **In use values**
  - [99] Speed P in use
  - [100] Speed I in use

CONFIGURATION

[252]	Main commands
[253]	Control mode
[45]	Speed base value
[321]	Regulation mode
[179]	Full load curr
[675]	Magn ramp time
[413]	Magn boost curr
[412]	Ok relay func
[240]	Switching freq
[713]	Qstp opt code
[1291]	Npar displayed
[85]	Pword1

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Motor spd fbk

[414]	Speed fbk sel
[415]	Encoder 1 type
[416]	Encoder 1 pulses
[1146]	Enc 1 supply vlt
[169]	Encoder 2 pulses
[1054]	Encoder repeat
[649]	Refresh enc 1
[652]	Refresh enc 2
[911]	Enable ind store

Drive type

[333]	Mains voltage
[332]	Ambient temp
[802]	Continuous curr
[331]	Software version

Dimension fact

[50]	Dim factor num
[51]	Dim factor den
[52]	Dim factor text

Face value fact

[54]	Face value num
[53]	Face value den

Prog alarms

Undervoltage

[357]	Latch
[358]	OK relay open
[359]	Restart time
[360]	N of attempts

Overvoltage

[361]	Latch
[362]	OK relay Open

Heatsink sensor

[368]	Activity
[369]	Latch
[370]	OK relay open
[1294]	Heatsink tmp thr [*C]

Heatsink ot

[1152]	OK relay open

Intake air ot

[1140]	Activity
[1141]	Latch
[1152]	OK relay open

Regulation ot

[1148]	Activity
[1149]	Latch
[1150]	OK relay open

Module overtemp

[1151]	OK relay open

Overtemp motor

[365]	Activity
[366]	Latch
[367]	OK relay open

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External Fault

[354]	Activity
[355]	Latch
[356]	OK relay open

Overcurrent

[363]	Latch
[364]	OK relay open

Output stages

[210]	Latch
[211]	OK relay open

Opt2 failure

[639]	Activity
[640]	OK relay open

Bus loss

[634]	Activity
[633]	Latch
[635]	OK relay open
[636]	Hold off time
[637]	Restart time

Hw opt 1 failure

[386]	Activity
[387]	OK relay open

Enable seq err

[728]	Activity
[729]	Latch
[730]	OK relay open

BU overload

[737]	Activity
[738]	OK relay open

[319]	Device address
[408]	Ser answer delay
[323]	Ser protocol sel
[326]	Ser baudrate sel
[1292]	MB swap float

I/O CONFIG.

Analog outputs

Analog output 1

[66]	Select output 1
[62]	Scale output 1

Analog output 2

[67]	Select output 2
[63]	Scale output 2

Analog output 3

[68]	Select output 3
[64]	Scale output 3

Analog output 4

[69]	Select output 4
[65]	Scale output 4

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Analog inputs

Analog input 1

[70]	Select input 1
[295]	An in 1 target
[71]	Input 1 type
[389]	Input 1 sign
[72]	Scale input 1
[73]	Tune value inp 1
[259]	Auto tune inp 1
[792]	Input 1 filter
[1042]	Input 1 compare
[1043]	Input 1 cp error
[1044]	Input 1 cp delay
[74]	Offset input 1

Analog input 2

[75]	Select input 2
[296]	An in 2 target
[76]	Input 2 type
[390]	Input 2 sign
[77]	Scale input 2
[78]	Tune value inp 2
[260]	Auto tune inp 2
[79]	Offset input 2

Analog input 3

[80]	Select input 3
[297]	An in 3 target
[81]	Input 3 type
[391]	Input 3 sign
[82]	Scale input 3
[83]	Tune value inp 3
[261]	Auto tune inp 3
[84]	Offset input 3

Digital outputs

[145]	Digital output 1
[146]	Digital output 2
[147]	Digital output 3
[148]	Digital output 4
[149]	Digital output 5
[150]	Digital output 6
[151]	Digital output 7
[152]	Digital output 8
[629]	Relay 2

Digital inputs

[137]	Digital input 1
[138]	Digital input 2
[139]	Digital input 3
[140]	Digital input 4
[141]	Digital input 5
[142]	Digital input 6
[143]	Digital input 7
[144]	Digital input 8

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Encoder inputs

[1020]	Select enc 1
[1021]	Select enc 2
[415]	Encoder 1 type
[416]	Encoder 1 pulses
[169]	Encoder 2 pulses
[649]	Refresh enc 1
[652]	Refresh enc 2

ADD SPEED FUNCT

[388]	Auto capture

Adap spd reg

[181]	Enable spd adap
[182]	Sel adap type
[183]	Adap reference
[184]	Adap speed 1
[185]	Adap speed 2
[186]	Adap joint 1
[187]	Adap joint 2
[188]	Adap P gain 1
[189]	Adap I gain 1
[190]	Adap P gain 2
[191]	Adap I gain 2
[192]	Adap P gain 3
[193]	Adap I gain 3

Speed control

[101]	Spd threshold +
[102]	Spd threshold -
[103]	Threshold delay
[104]	Set error
[105]	Set delay

Speed zero

[107]	Speed zero level
[108]	Speed zero delay

FUNCTIONS

Motor pot

[246]	Enab motor pot
[-]	Motor pot oper
[248]	Motor pot sign
[249]	Motor pot reset

Jog function

[244]	Enable jog
[-]	Jog operation
[375]	Jog selection
[266]	Jog reference

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Multi speed fct

[153]	Enab multi spd
[208]	Multi speed sel
[154]	Multi speed 1
[155]	Multi speed 2
[156]	Multi speed 3
[157]	Multi speed 4
[158]	Multi speed 5
[159]	Multi speed 6
[160]	Multi speed 7

Multi ramp fct

[243]	Enab multi rmp
[202]	Multi ramp sel

Ramp 0

Acceleration 0

[659]	Acc delta speed 0
[660]	Acc delta time 0
[665]	S acc t const 0

Deceleration 0

[661]	Dec delta speed 0
[662]	Dec delta time 0
[666]	S dec t const 0

Ramp 1

Acceleration 1

[23]	Acc delta speed 1
[24]	Acc delta time 1
[667]	S acc t const 1

Deceleration 1

[31]	Dec delta speed 1
[32]	Dec delta time 1
[668]	S dec t const 1

Ramp 2

Acceleration 2

[25]	Acc delta speed 2
[26]	Acc delta time 2
[669]	S acc t const 2

Deceleration 2

[33]	Dec delta speed 2
[34]	Dec delta time 2
[670]	S dec t const 2

Ramp 3

Acceleration 3

[27]	Acc delta speed 3
[28]	Acc delta time 3
[671]	S acc t const 3

Deceleration 3

[35]	Dec delta speed 3
[36]	Dec delta time 3
[672]	S dec t const 3

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SPEC FUNCTION

Stop control

[626]	Stop mode
[627]	Spd 0 trip delay
[630]	Jog stop control

Speed draw

[1017]	Speed ratio
[1018]	Spd draw out (d)
[1019]	Spd draw out (%)

Motor setup

[943]	Mot setup sel
[941]	Copy mot setup
[942]	Actual mot setup

Overload contr

Ovld mot control

[656]	Motor cont curr
[657]	Trip time 50%

Ovld drv control

[655]	I_sqrt_t_accum

Brake unit

[736]	Enable BU
[740]	BU ovld time
[741]	BU duty cycle
[801]	BU DC vlt

Pwr loss stop f

[1083]	PL stop enable
[1082]	PL stop t limit
[1080]	PL stop acc
[1081]	PL stop dec
[1084]	PL stop vdc ref
[1087]	PL time-out
[1085]	PL stop I Gain
[1086]	PL stop P Gain
[1088]	PL stop active
[1089]	PL active limit
[1090]	PL next active
[1091]	PL next factor
[1093]	PL time-out sig
[1094]	PL time-out ack
[1092]	PL mains status

VDC Control f

[1289]	VDC Ctrl P Gain
[1290]	VDC Ctrl I Gain

Test generator

[58]	Gen access
[59]	Gen frequency
[60]	Gen amplitude
[61]	Gen offset

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[435]	Enable rr adap
[256]	Save parameters
[258]	Load default
[235]	Life time
[-]	Failure register
[262]	Failure reset
[263]	Failure reg del

DC braking

[904]	DC braking mode
[905]	Brk time @ stop
[717]	DC braking curr
[716]	DC braking delay

Links

Link 1

[484]	Source
[485]	Destination
[486]	Mul Gain
[487]	Div Gain
[488]	Input max.
[489]	Input min.
[490]	Input offset
[491]	Output offset
[492]	Input absolute

Link 2

[553]	Source
[554]	Destination
[555]	Mul Gain
[556]	Div Gain
[557]	Input max
[558]	Input min
[559]	Input offset
[560]	Output offset
[561]	Input absolute

Pad parameters

[503]	Pad 0
[504]	Pad 1
[505]	Pad 2
[506]	Pad 3
[507]	Pad 4
[508]	Pad 5
[509]	Pad 6
[510]	Pad 7
[511]	Pad 8
[512]	Pad 9
[513]	Pad 10
[514]	Pad 11
[515]	Pad 12
[516]	Pad 13
[517]	Pad 14
[518]	Pad 15
[519]	Bitword Pad A
[536]	Bitword Pad B

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OPTIONS

Option1

[1293]	SBI enable
	Menu

PDC config

PDC inputs

[1095]	PDC in 0
[1096]	PDC in 1
[1097]	PDC in 2
[1098]	PDC in 3
[1099]	PDC in 4
[1100]	PDC in 5

PDC outputs

[1101]	PDC out 0
[1102]	PDC out 1
[1103]	PDC out 2
[1104]	PDC out 3
[1105]	PDC out 4
[1106]	PDC out 5

Virt dig in

[1107]	Virt dig in 0
[1108]	Virt dig in 1
[1109]	Virt dig in 2
[1110]	Virt dig in 3
[1111]	Virt dig in 4
[1112]	Virt dig in 5
[1113]	Virt dig in 6
[1114]	Virt dig in 7
[1115]	Virt dig in 8
[1116]	Virt dig in 9
[1117]	Virt dig in 10
[1118]	Virt dig in 11
[1119]	Virt dig in 12
[1120]	Virt dig in 13
[1121]	Virt dig in 14
[1122]	Virt dig in 15

Virt dig out

[1123]	Virt dig out 0
[1124]	Virt dig out 1
[1125]	Virt dig out 2
[1126]	Virt dig out 3
[1127]	Virt dig out 4
[1128]	Virt dig out 5
[1129]	Virt dig out 6
[1130]	Virt dig out 7
[1131]	Virt dig out 8
[1132]	Virt dig out 9
[1133]	Virt dig out 10
[1134]	Virt dig out 11
[1135]	Virt dig out 12
[1136]	Virt dig out 13
[1137]	Virt dig out 14
[1138]	Virt dig out 15

Option2

	Menu
[425]	Enable OPT2

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PID

[769]	Enable PI PID		
[770]	Enable PD PID		
PID source			
		[786]	PID source
		[787]	PID source gain
[758]	Feed-fwd PID		
PID references			
		[759]	PID error
		[763]	PID feed-back
		[762]	PID offs. sel
		[760]	PID offset 0
		[761]	PID offset 1
		[1046]	PID acc time
		[1047]	PID dec time
		[757]	PID clamp
PI controls			
		[765]	PI P gain PID %
		[764]	PI I gain PID %
		[695]	PI steady thr
		[731]	PI steady delay
		[793]	P init gain PID %
		[734]	I init gain PID %
		[779]	PI central v sel
		[776]	PI central v 1
		[777]	PI central v 2
		[778]	PI central v 3
		[784]	PI top lim
		[785]	PI bottom lim
		[783]	PI integr freeze
[771]	PI output PID		
[418]	Real FF PID		
PD controls			
		[768]	PD P gain 1 PID
		[766]	PD D gain 1 PID
		[788]	PD P gain 2 PID
		[789]	PD D gain 2 PID
		[790]	PD P gain 3 PID
		[791]	PD D gain 3 PID
		[767]	PD D filter PID
[421]	PID output PID		
[772]	PID out.sign PID		
[774]	PID output		
PID target			
		[782]	PID target
		[773]	PID out scale
Diameter calc			
		[794]	Diameter calc
		[795]	Positioning spd
		[796]	Max deviation
		[797]	Gear box ratio
		[798]	Dancer constant
		[799]	Minimum diameter

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DRIVECOM

[57]	Malfunction code
[55]	Control-Word
[56]	Status word
[44]	Speed input var
[115]	Speed ref var
[119]	Act speed value

Speed amount

[1]	Speed min amount
[2]	Speed max amount

Speed min/max

[5]	Speed min pos
[3]	Speed max pos
[6]	Speed min neg
[4]	Speed max neg

Acceleration

[21]	Acc delta speed
[22]	Acc delta time

Deceleration

[29]	Dec delta speed
[30]	Dec delta time

Quick stop

[713]	QStp opt code
[37]	QStp delta speed
[38]	QStp delta time

Face value fact

[54]	Face value num
[53]	Face value den

Dimension fact

[50]	Dim factor num
[51]	Dim factor den
[52]	Dim factor text

[45]	Speed base value
[46]	Speed input perc
[116]	Percent ref var
[120]	Act percentage

SERVICE

[86]	Password 2

ai5020-r

1.3. START UP

WARNING The safety instructions, danger warnings and technical data reporte in manual "AVy Quick Start Up guide" must be observed!

CONVENTIONS **Positive speed** is clockwise rotation seen from the motor shaft end.

Negative speed is counterclockwise rotation seen from the motor shaft end.

Positive torque is torque in clockwise direction seen from the motor shaft end.

Negative torque is torque in counterclockwise direction seen from the motor shaft end.

These conventions are listed for reference. Actual rotation directions depend on mechanical configuration.

The aim of this quick introductory guide is to introduce the user to the basic menu structure of the AVy Drive, how to operate the device and how to carry out an initial commissioning of the device via the BASIC MENU.

It is assumed that the device has the factory set default configuration and that the configuration has been carried out according to the diagrams in manual "AVy Quick Start Up guide", section 5.5 "Standard connection diagrams".

Possible parameter values and information about write/read authorization by the operator are described in the "List of all parameters" provided in the manual.

1.3.1 PRE POWER CHECKS

1.3.1.1 Setting Jumpers and Switches

Review all jumper and switch positions on Power board and Regulation board of the Drive (see manual "AVy Quick Start Up guide", table 5.3.1.3 on chapter 5.3,).

- **Analog inputs 1,2,3**
  Analog input (voltage type) 0...10V / -10...+10V   Jumper S8/S9/S10=OFF
  Analog Input (current type) 0...20mA / 4...20mA   Jumper S8/S9/S10=ON

- **RS485 Termination resistors**
  First and last drop of the net   Jumper S5/S6=ON
  Other drive of the net   Jumper S5/S6=OFF

When using the PCI-485 RS232/RS485 converter PC interface, refer to the "CTI" instruction book.

For initial tune up it is recommended to disconnect any DGF or SBI (LAN card).

1.3.1.2 Checking the Wiring and Auxiliary Voltages

The following should be checked before powering the drive:

- **Grounds/grounding** Verify an AC power ground wire from the incoming power / isolation transformer to the AVy input ground terminal.

  Verify the ground lead of the AVy output terminal is wired to the motor, or the motor is properly grounded .

  Verify the AC input leads, AC output leads, and control wiring to and from the drive terminals are not grounded.(Remember that the 0V terminal may be intentionally grounded).

- **Meggering** When meggering the power cables, they must be disconnected or isolated from the AVy drive to prevent drive damage.
- **Connections** Double check all connections to make sure they are tight. Verify each connection is wired per wiring diagrams, and are appropriate for the current and voltage levels specified.

Terminals	Description
U1, V1, W1, PE1 (ground)	3 phase AC input 400 or 480 VAC
U2, V2, W2, PE2 (ground)	3 phase AC output to motor, wire to the motor according to motor rotation.
C,D	internal DC power terminals, *DB units or external capacitors are wired to these terminals*
BR1	external braking resistor connection
26 & 27	command for external DB unit. (if used)
78 & 79	low voltage connection for motor thermistor (type DIN44081 or DIN 44082) when using a motor thermistor, remove the 1 KΩ resistor *if motor klixon is used for this protective function, it must be wired in series with a 1 KΩ resistor to these terminals*
80 & 82	OK relay, normally open dry contact, good for a maximum of 250 VAC, 1 A
83 & 85	relay 2, normally open dry contact, good for a maximum of 250 VAC, 1 A programmable functionality

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Table 1.3.1.2.1: Terminals description

Regulation terminals

1,2 = analog input 1;	3,4 = analog input 2;	5,6 = analog input 3
7 = + 10 V;	8 = -10V;	9 = common;
12 = enable;	13 = start;	14 = fast stop;
15 = external fault;	18 = common for 24 V power supply;	19 = + 24 VDC (internal)

16 = common point for terminals 12 through 15, terminals 36 through 39, terminal 41 and terminal 42.

XS = 9 pin serial port for PC tools, use PCI-485 (or equivalent) from PC to drive

XE (ENC1) 15 pin sinusoidal/digital encoder input

Amps/Volts ratio on Current Test point XY4 / XY5

Drive size	Hall CT ratio / (n. turns x burden resistor ohms x ampl.gain)				
1007	500 / (1 x 154 x 1)	= 3.24	**4300**	1000 / (1 x 13 x 1)	= 76.92
1015	500 / (1 x 95.3 x 1)	= 5.25	**4370**	1000 / (1 x 10 x 1)	= 100
1022	500 / (1 x 66.5 x 1)	= 7.5	**5450**	2000 / (1 x 15.8 x 1)	= 126.58
1030	500 / (1 x 49.9 x 1)	= 10.02	**5550**	2000 / (1 x 13 x 1)	= 153.85
2040	1000 / (1 x 78.7 x 1)	= 12.7	**6750**	2000 / (1 x 11 x 1)	= 181.82
2055	1000 / (1 x 59 x 1)	= 16.95	**6900**	2000 / (1 x 7.87 x 1)	= 254.13
2075	1000 / (1 x 42.2 x 1)	= 23.7	**6110**	2000 / (1 x 7.87 x 1)	= 254.13
3110	2000 / (1 x 60.4 x 1)	= 9.01	**71320**	2000 / (1 x 5.9 x 1)	= 338.98
3150	2000 / (1 x 45.3 x 1)	= 46.2	**81600**	4000 / (1 x 9.31 x 1)	= 429.65
4220	1000 / (1 x 15.8 x 1)	= 63.29			

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Example: AVy 1015 size, 1V = 5.25 A (peak current)

Table 1.3.1.2.2: Amps/Volts ratio

Amps rms = Amps peak x 2 ^ (1/2)

- Record motor nameplate data, encoder information, gearbox and mechanical data.

MOTOR DATA

HP (kW)		**Cos phi (power factor)**	
Amps		**Tach type**	
Volts		**Tach PPR**	
Hz		**Motor rotation for machine fwd direction [CW/CCW]**	
Rpm		**Gearbox ratio**	

avi54123

Caution! **The following is not permissible:**

- Operating a capacitive load on the Drive

- Connecting an external voltage source to the output side of the Drive

- Bridging the output side of the inverter directly to AC power (bypass). If the drive is to be bypassed, the motor must be disconnected from the Drive before the bypass contactor is closed.

1.3.2 POWER UP CHECKS

- **Check drive power supplies from the appropriate terminals:**
  Terminal 7 = + 10 V (0V to terminal 9)
  Terminal 8 = - 10 V (0V to terminal 9)
  Terminal 19 = + 24 ... 30 V (0V to terminal 18)

- **Verify hardwired stop and enable controls are operational**

- **Check DC link voltage (DC link** parameter in **Monitor/Measurement** menu**):**
  The value should be: 480 to 650 VDC for 400 VAC input
  550 to 715 VDC for 480 VAC input
  The DC link will read higher after the drive is enabled, and even higher if the drive is braking the motor.

  Refer to manual AVy Quick Start, troubleshooting section for different voltage levels

1.3.2.1 Basic Settings of the Drive for all the regulation modes

Note! These instructions assume the drive has the default configuration. The default setting can be loaded via the **Load default** command in the SPEC FUNCTIONS menu. Executing this command means that all modifications previously carried out by a user will be overwritten.

If the **Save parameters** command is executed after executing **Load default** command previous setting are lost. If **Save parameters** command is not entered, the original values stored by the user are loaded again after switching off and on the drive.

The defaults also assume that a four-pole motor with a rating that complies with the rated values of the AVy drive is used. Other motor can be used by entering their motor data via the "DRIVE PARAMETER / Motor plate data" menu. The rated values of the motor are entered here to ensure optimum regulation for the motor concerned.

- **Drive must be disabled to enter configuration data.**

See sections 7.1.1, "LEDs" and section 7.1.2, "Moving inside a menu" for information on operating the keypad.

- **Set AC Input voltage**

  This setting is carried out via the **Mains voltage** parameter in the "Drive type" submenu of the BASIC MENU. Select the AC Input voltage wired to the drive .

NOTE! If the "Undervoltage" alarm is activated when the device is switched on for the first time, this can be acknowledged by pressing the **Escape**.key

- **Regulation mode**

  This setting is carried out via the **Regulation mode** parameter in the BASIC MENU.

  Select "Field oriented", "Sensorless vect" or "V/f control" mode.

- **Base for speed related values**

  Setting **Speed base value** in the BASIC MENU

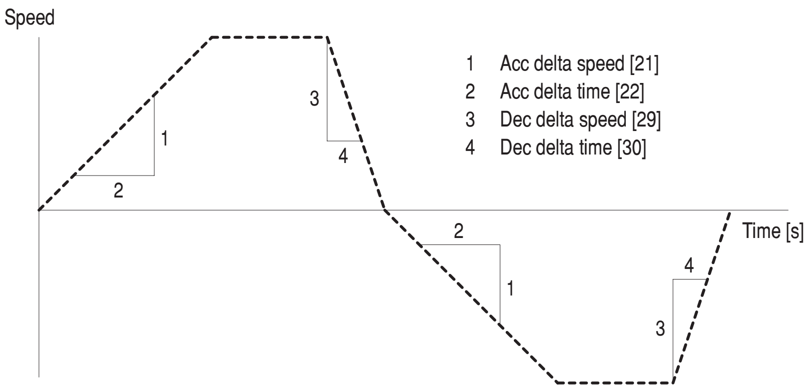
  This value determines the rpm speed ref with max. signal (e.g. 10 V) present at the analog input.

  This value also defines the basis for percentage values of speed related quantities (range is +/- 200%)

- **Ramp time**

  This setting is carried out via **Acc delta speed**, **Acc delta time**, **Dec delta speed** and **Dec delta time** parameters in the BASIC MENU.

  The interrelationship of these parameters is illustrated in the following diagram. If the maximum possible speed is entered for **Acc delta speed** and **Dec delta speed**, the times correspond to the ramp times from zero to maximum speed and vice versa.



- **Speed reference**

NOTE! In the standard drive configuration, **Ramp ref 1** reference value is set with an analog value via terminals 1 and 2. In this condition is not possible, and also not necessary, to set the reference value via the keypad or the PC software, **Ramp ref 1** is then setted from an analog input,

or:

Set parameter "**Select input 1** (2 or 3)" in OFF condition or in a different configuration of **Ramp ref 1**

Setting **Ramp ref 1** in the BASIC MENU

Select the reference value required. The sign determines the rotation direction of the drive. Entry via keypad: the reference value is not active until the entry is confirmed by pressing Enter.

- **Current limitation**

  Setting in the BASIC MENU with **T current lim +** and **T current lim -**

  T current lim + = positive limit (clockwise drive and counterclockwise braking)

T current lim - = negative limit (counterclockwise drive and clockwise braking)

The default maximum value corresponds to total current = 1.36 continuous current

- **Saving setting**

  Use **Save parameters** in BASIC MENU

  Parameters must be saved so that the entered values are read the next time the device is switched on.

  When using the keypad: press Enter.

1.3.2.2. Setting Motor parameters

The AVy drive is factory set for use with 4-pole standard motors, either for 400V or 460V, to be operated up to the nominal speed. Enter nameplate data recorded for the connected motor to ensure satisfactory performance.

Proper nameplate data is required for “**Field Oriented**” and “**Sensorless**” modes. For “**V/f control**” mode they are not. However, they are recommended for a better current limit control.

When using **V/f control** to operate multiple motors in parallel on the same drive, better result are obtained with motor similar or equal to each other.

• MOTOR NAMEPLATE SPECIFICATIONS (Mot plate data menu**)**

- Set the rated voltage of the motor via the **Nominal voltage** parameter. Ensure the voltage is specified according to the circuit connection (star or delta). (Location: **Drive parameters/Mot plate data/Nominal voltage**)
- Set the nominal speed (rated full load speed) in accordance with the nameplate specification via the **Nominal speed** parameter. (Location: **Drive parameters/Mot plate data/Nominal speed**)
- Set the nominal frequency of the motor in accordance with the nameplate specification of the motor via the **Nom frequency** parameter. (Location: **Drive parameters/Mot plate data/Nom frequency**)
- Set the nominal current (rated full load amps) of the motor via the **Nominal current** parameter. Ensure that the current is specificied according to the circuit connection (star or delta). (Location: **Drive parameters/Mot plate data/Nominal current**)

  In case of “**V/f control**” mode with multiple motors enter a value equal to the sum of **Nominal current** of all the motors.
- Set Cos phi (power factor) as per motor nameplate via the **Cos phi** parameter. (Location: **Drive parameters/Mot plate data/Cos phi**)

- VOLTAGE/FREQUENCY CHARACTERISTIC, “BASE” OPERATING POINT

The parameters **Base voltage** (location: **Drive parameters/Mot plate data/Base voltage**) and **Base frequency** (location: **Drive parameters/Mot plate data/Base frequency**) determine the degree of flux in the motor and the frequency where the field weakening range begins. The assignment of values to these parameters can be carried out according to the indications and the examples shown in the section “Motor plate data” .

NOTE! The operating level of the magnetic flux of the motor must not exceed the value corresponding to the nominal operating condition. This means that the ratio Base voltage to Base frequency must not exceed the ratio Nominal voltage to Nominal frequency.

When Base voltage is very close to or above to the Mains Voltage, in the field weakening range the dynamic behaviour of the drive is influenced by parameter “Dynamic vlt margin” (menu LIMITS\Voltage limits).

- Enter the basic frequency via the **Base frequency** parameter.
- Enter the base voltage via the **Base voltage** parameter.
- Finally enter **Take motor par** to enable computation of normalization factors and estimate values for parameters in the “Motor parameter” submenu.

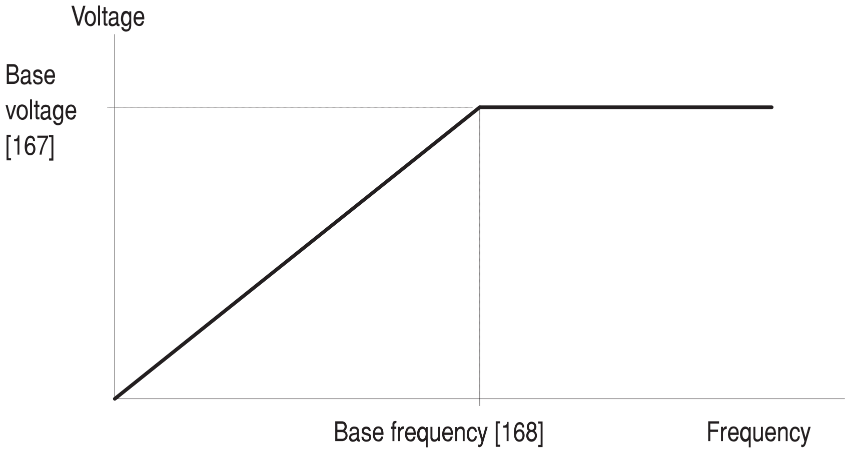


Figure 1.3.2.1.1: Voltage / frequency characteristics

In case of “**V/f control**”, it is possible to select the shape of V/f characteristic:

Charateristics	Type of drive
Type 0 ($V = K * f^{1.0}$)	Constant torque requirement across the whole speed range
Type 1 ($V = K * f^{1.5}$)	Mixed load between types 0 and 3
Type 2 ($V = K * f^{1.7}$)	Mixed load between types 0 and 3
Type 3 ($V = K * f^{2.0}$)	Load where the torque is proportional to the speed squared, e.g. fans and certain types of pump

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- **MAGNETIZING CURRENT, ROTOR RESISTANCE, STATOR RESISTANCE AND LEAKAGE INDUCTANCE**

These values are not normally stated on the nameplate of the motor, although they are very important for the behavior of the drive. If you have obtained detailed specifications from the manufacturer, enter them in place of estimates computed from the nameplate motor data (**Take motor par** command).

NOTE! In case the command **Take motor par** is reentered, these parameters will be overwritten.

- Save the setting using **Save parameters** in BASIC MENU.

1.3.2.3. Verify speed feedback setup and encoder polarity (field oriented mode)

A tachometer is required to run the drive in field oriented (vector) regulation.

First, note the tachometer rotation direction (for example: A leads B when tach is turned CCW with respect to the motor shaft), and the direction of the desired motor rotation.

Verify the tach wiring to the drive is correct, and the tach is fed the appropriate voltage from the drive or separate power supply.

15 pin female connector XE (for a sinusoidal or digital encoder)

Encoder type	Shielded cable	XE CONNECTOR PIN														
		1 B-	2	3 C+	4 C-	5 A+	6 A-	7 0V	8 B+	9 +5V	10 E+	11 E-	12 F+	13 F-	14 G+	15 G-
DE	8 pole	●		●	●	●	●	●	●	●						
SE	8 pole	●		●	●	●	●	●	●	●						
SESC	12 pole	●		●	●	●	●	●	●	●	●	●	●	●		
DEHS	14 pole	●		●	●	●	●	●	●	●	●	●	●	●	●	●
SEHS	14 pole	●		●	●	●	●	●	●	●	●	●	●	●	●	●

ai3160

Jumpers setting

Encoder / Jumpers setting	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23
DE	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	-	-	-	-	-	-
SE	ON	ON	ON	ON	ON	ON	-	-	-	-	-	-	-
SESC	ON	ON	ON	ON	ON	ON	-	A	A	A	A	A	A
DEHS	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	B	B	B	B	B	B
SEHS	ON	ON	ON	ON	ON	ON	-	B	B	B	B	B	B

ai3150

- **DE**: 5V digital incremental encoder with $A / \overline{A}$, $B / \overline{B}$, $C / \overline{C}$
- **SE**: 5V sinusoidal incremental encoder with $A / \overline{A}$, $B / \overline{B}$, $C / \overline{C}$
- **DEHS**: 5V digital incremental encoder with $A / \overline{A}$, $B / \overline{B}$, $C / \overline{C}$ and three Hall sensor digital position signals (for AC Brushless motors)
- **SESC**: 5V sinusoidal incremental encoder with $A / \overline{A}$, $B / \overline{B}$, $C / \overline{C}$ and and two sin/cos traces for absolute position (for AC Brushless motors or positioning)
- **SEHS**: 5V sinusoidal incremental encoder with $A / \overline{A}$, $B / \overline{B}$, $C / \overline{C}$ and three Hall sensor digital position signals (for AC Brushless motors)

(*) If the encoder is not provided with the zero channel S17=OFF

- The AVy must be disabled and not be in start.
- Enter parameters for tachometer setup:
  - CONFIGURATION\Motor speed feedback\Speed fbk sel\Encoder 1 or Encoder 2, **Enter**
  - CONFIGURATION\Motor speed feedback\Encoder 1 type\ sinusoidal or digital, **Enter**
  - CONFIGURATION\Motor speed feedback\Encoder 1 pulses\ PPR, **Enter**
- Set Regulation mode to **V/f control mode** (default).
- Enable and Run the Drive in forward direction with a positive speed reference.
- Select **Enc 1 speed parameter** (MONITOR/Measurement/Speed/Speed in rpm menu):
  - *Turn the motor shaft clockwise (view facing the shaft). The value indicated must be positive.*
  - *If the value does not change or if random values are shown, check the encoder power supply and the encoder connection.*
  - *If the displayed value is negative, reverse encoder terminals. Channel A+ and A- or B+ and B-*
- Set Regulation mode to **Field oriented** mode.
- Save the setting using Save parameters in BASIC MENU.

The drive is now setup and ready to continue with final commissioning and tune up.

1.3.3. SELF TUNING

NOTE! In order to execute any of the self-tuning procedure (1, 2a or 2b, 3), **Main commands** must be set as Digital (CONFIGURATION / Main command) and ENABLE input (terminal 12) must be driven high (+24V).

If this setting is omitted you will be prompted by the message “**Set main cmd = Dig**”.

It is not necessary to set parameters **Enable drive** = Enable neither **Regulation mode** = Self-tuning, because they will be automatically set by the drive and reset at the end of the self-tuning execution.

- **Self tuning procedure is divided in three parts:**

The first part, "**Self-tune 1**", identifies the voltage compensation parameters, stator and rotor resistances, and leakage inductance. Then it computes appropriate gains for current controllers, according to the "optimum module" algorithm.

"Self- tune 1" is executed without motor shaft rotation.

The second part identifies the magnetizing curve of the motor, that is parameters for the shape of saturation curve and the magnetizing current of the motor at nominal point.

The self tune computes appropriate gains for flux and voltage regulators. The second part is available in two versions, "**Self-tune 2a**" and "**Self-tune 2b**".

- "Self-tune 2a" requires free shaft rotation at 50% rated motor speed (the shaft must be uncoupled from the load).
- If free shaft rotation is not possible, "Self-tune 2b" can be used because it is executed with the motor at standstill.

"Self-tune 2a" provide results with a better accuracy, therefore it should be used whenever possible.

The third part, speed regulator tuning, identifies the total Inertia value at the motor shaft ($Kg*m^2$), the friction value (or Loss compensation) in N*m and computes the Proportional and Integral gains of the speed regulator.

For the motor chosen, it is necessary to take into account the following limits:

- **Nominal current [164] parameter can not be set to a value lower or equal to 0.3 x I_{2N} (I_{2N} = drive nominal current-class 1 at 400V)**
- **Magnetizing current [165] parameter must not result higher than I_{CONT} (drive continuative current).**

TO EXECUTE PART 1, enter DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune 1.

Start execution by entering "Start part 1", **Enter.**

The procedure takes a few minutes, and can be interrupted by either powering the AVy off or pressing the **Escape** button.

You may hear some buzzing noise from the motor during the execution.

The progress of the activity is reported with messages "Measuring xxx"

At the beginning of "Self-tune 1" a sudden, short rotation may occurr due to parasitic torque related to slot alignment between stator and rotor.

Results of the identification may be unreliable, or identification may fail with some "xxx range error" or "timeout" message. Repeat execution. Usually this problem disappears after the first trial. If shaft rotation is persistent, it is necessary to lock the rotor in order to get reliable results.

" xxx range error" or "Timeout" messages may also occur in some extreme parameter ranges (see section 2.4.2.1, "Self-tuning"). Repeat execution in this case. If error messages are persistent, manual tuning procedures (following section) should be used.

After self tuning is done, new identified parameter values ("Nw" suffix) can be compared with values prior to the identification by browsing the subsequent menu entries. New parameters can be accepted all together by entering "**Take val part 1**". In this case prior values are overwritten. "Self-tune 1" can be repeated, whether values from the previous trial have been accepted or not.

NOTE! "Take val part 1" does not store values in non-volatile memory, so values are lost if inverter power is cycled off and on. You need to enter **Save parameters** in the BASIC MENU or SPEC FUNCTIONS menu to permanently store values.

TO EXECUTE "Self-tune 2a", enter menu DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune2a. Start execution by entering "Start part 2a", **Enter.**

The procedure takes a few minutes, and can be interrupted by either powering the AV300i off or pressing the **Escape** buttom.

Progress of activity is indicated by the message "Measuring sat2a".

WARNING! **The motor shaft will rotate up to 50% rated speed in part 2a of the identification.**

NOTE! The shaft must be free to rotate uncoupled from the load, otherwise results may be completely unreliable.

In case of extreme parameter ranges, a timeout message may occurr. Repeat execution in this case. If an error message is persistent, keep default values for parameters **P1 flux model** and **P2 flux model**, and use the manual tuning procedure for Magnetizing current (see section "Checking and manual tuning of Magnetizing current").

After self tuning is done, new values can be compared with the previous ones like in part 1. New parameters supersede the previous ones if "**Take val part 2a**" is entered.

NOTE! "Take val part 2a" does not store values in non-volatile memory, so values are lost if inverter power is cycled off and on. You need to enter Save parameters in the BASIC MENU or SPEC FUNCTIONS menu to permanently store values from the procedure.

"Self-tune 2a" can be repeated, whether values from the previous trial have been accepted or not.

If free shaft rotation is not possible, "**Self-tune 2b**" provides an alternative identification technique that does not require shaft rotation. The menu is DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune 2b.

Operation and meaning of parameters are the same as "Self-tune 2a", replacing "2b" suffix for "2a".

Self tune 3

WARNING ! **This procedure requires free rotation of the motor shaft coupled to the load. Start/Stop command is disregarded, therefore it can not be used on drives with limited travel.**

- This procedure is not suitable for use with "hoist" or "elevator" drives.

- It is recommended that any hardwired stop control are operational.

CAUTION ! **The test is performed using the torque limit value set in Test T curr lim parameter. The torque is applied stepwise, with no ramp (profile), therefore the mechanical transmission must not have significant backlash, and it must be compatible with operation at the torque limit set in Test T curr lim parameter. The user can reduce the torque limit to a suitable value via theTest T curr lim parameter.**

NOTE ! **- Application where the system inertia coupled to the motor shaft is much higher than the motor inertia value , increase the Test T curr lim parameter to avoid "Time out" error.**

- Set **Regulation mode** parameter (BASIC MENU) to **Field oriented** or **Sensorless vect** mode (encoder feedback is required when Field oriented mode is selected).

- Set the current limit (BASIC MENU\ T Current lim +/-) to a value compatible with the motor size and load. (Example when motor is 1/3 of the Drive power, the limit should be reduced compared to the default value).

- Set the motor shaft direction: Forward or Reverse via the **Fwd-Rev spd tune** parameter
- Select the torque current value to be used during the test via the **Test T curr lim** parameter

TO EXECUTE PART 3, enter DRIVE PARAMETER\Motor parameter\Self tuning\Self tune 3.

Start execution by entering "**Start part 3**", **Enter.**

The procedure performs an acceleration test at torque limit value set in **Test T curr lim** parameter up to a speed threshold, then a deceleration test with no torque applied (coasting) down to zero speed.

The speed threshold is 33% of the lowest in the following:

- **Speed base value**
- **Motor nominal speed**
- **Base frequency** x 60 / pole pairs (crossover speed)
- **Speed max pos** or **Speed max neg** according to direction of rotation.

The procedure may take a few minutes, depending on inertia and friction values.

Based on inertia and friction values, the drive will calculate the speed loop gains (**Speed P** and **Speed I** parameters).

If self-tuning of speed regulator is not satisfactory, refer to manual tuning procedure in the next section.

After the completion of the **Speed self tune** by the drive, the new identified parameter values ("Nw" suffix) can be compared with values prior to the procedure, by browsing the subsequent menu entries. Parameters in this menu are read only. Editing of individual parameters must be done in their specific menus. New parameters can be accepted all togetheter by entering "**Take val part 3**" after disabling the drive. In this case, prior values are overwritten. "Self tune 3" can be repeated, whether values from the previous trial have been accepted or not.

NOTE! "Take val part 3" does not store values in non-volatile memory, so values are lost if drive power is cycled off and on. You need to enter **Save parameters** in the BASIC MENU or SPEC FUNCTIONS menu to permanently store values in non-volatile memory.

In case of extreme parameter ranges, error messages can occurr. Repeat execution in this case. If the error message is persistent, keep default values and use manual tuning of speed regulator in the following sections.

1.3.3.1 List of self tune error messages

Generic messages

Description	Note
"Drive disabled":	Provide enable input by setting terminal 12 high.
"Not ready":	"**Take values part 1**" or "**Take values part 2a**" or "**Take values part 2b**"or "**Take values part 3**" can not be executed because the measurement has not been completed correctly. Repeat self tune command.
"Time out":	Measurement has not been completed in the proper time.
"Start part…?":	Press **Enter** to confirm start of measurement.
"Tuning aborted":	Measurement aborted by user (**Escape** button has been pressed).
"Set Main cmd=Dig":	Go to CONFIGURATION menu and set **Main commands** = digital.
"Set Ctrl=Local":	Go to CONFIGURATION menu and set **Control mode** = Local.
"Reg mode NOK":	**Self tune part 3** can only be executed **Regulation mode = Field oriented** or **Regulation mode = Sensorless vect**. Go to BASIC MENU and set **Regulation mode** properly.

1.3.3.2 Measurement error messages

These messages may occour when extreme parameter values have to be identified. It can be useful to retry the self tune command when any of the following messages occours. If messages persist, alternative manual tuning procedures should be adopted.

Description	Note
"No break point"	**Self tune part1** failed. Check integrity of connections between inverter and motor prior to attempt repeating part 1.
"Over speed"	**Self tune part3** detected a a much higher speed than expected. Possible causes are: load causing a speed drift or bad tuning of inner loops when using Sensorless vector mode. Try repeating **Self tune 1** or the corresponding manual tune operations.
"Drive stalled":	Increase value of parameter **Test T curr lim** and repeat **Self tune 3**
"Load applied":	Nominal zero load torque at standstill was detected. **Self tune 3** is impossible for this type of load.
"T curr too high":	Reduce value of parameter **Test T curr lim** for **Self tune 3**
"Friction null":	Value of friction is zero or lower than the accuracy limit of the control system.

1.3.4 MANUAL TUNING

1.3.4.1 V/F CONTROL MODE

1.3.4.1.1 Magnetizing current in V/f control

NOTE! **You may skip this section if Self-tune 2 executed successfully.**

For an accurate current limitation in "**V/f control**" mode it is useful to check the accuracy of magnetizing current by the following procedure:

- Operate the motor between ½ **Nominal speed** and **Nominal speed**, making sure electromechanical resonance areas have been avoided.
- **Magnetizing curr** parameter should be adjusted until **Magn working curr** equals the value read in **Motor current** (see Motor current in the Basic menu).

For "**V/f Control**" mode the following sections are relevant:

- Voltage boost (Sect 2.4.2.3.1)
- Slip Compensation (If Used) (Sect 2.4.2.3.2)
- Current Limit setting (Sect 2.6.2)
- DC Braking current (If Used) (Sect 2.15.9)

1.3.4.1.2 Tuning of voltage compensation parameters

NOTE! **You may skip this section if Self-tune 1 executed successfully.**

The presence of current distortion is shown by an irregular rotation at low speeds (values lower than 2% of the motor rated speed).

- In order to compensate the distortion, monitor the "current U" variable on an analog output. Then operate the drive at a speed equal to 2% of the motor rated speed. The compensation is obtained through the two parameters **Voltage comp lim** and **Comp slope** in the "Dead time comp" menu.

The [Volt] value of **Voltage comp lim** represents the limit value of line voltage used for compensation. The [Volt/Ampere] value of **Comp slope** defines the relation between current and applied compensation voltage value.

1.3.4.2 SENSORLESS VECT MODE

1.3.4.2.1 Tuning of voltage compensation parameters

NOTE! **You may skip this section if Self-tune 1 executed successfully.**

The presence of current distortion is shown by an irregular rotation at low speeds (values lower than 2% of the motor rated speed).

- In order to compensate the distortion, monitor the "current U" variable on an analog output set. Then operate the drive at a speed equal to 2% of the motor rated speed. The compensation is obtained through the two parameters **Voltage comp lim** and **Comp slope** in the "Dead time comp" menu.

The [Volt] value of **Voltage comp lim** represents the limit value of line voltage used for compensation. The [Volt/Ampere] value of **Comp slope** defines the relation between current and applied compensation voltage value.

1.3.4.2.2 Checking and manual tuning of magnetizing current

NOTE! **You may skip this section if Self-tune 1 executed successfully.**

- Operate the drive without load at 50% of Base frequency by setting:

$$\text{Ramp ref 1 [rpm]} = \frac{60 \bullet \text{Base frequency} \bullet 0.5}{\text{N. of pole pairs}}$$

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The **Output voltage** parameter in the MONITOR\Measurements menu should indicate a value approximately equal to 50% of Base voltage.

If this is not the case, you should adjust **Magnetizing current** in DRIVE PARAMETER\Motor parameter menu until you obtain the required voltage value.

1.3.4.2.3 Checking and fine tuning of Sensorless parameters

In order to obtain the best setting, the measurement of the motor-shaft rpm is suggested using a hand held tachometer, so that a comparison between the real speed and the internal speed can be performed.

- **Calibration at no load**

- Set a speed reference equal to approx 2/3 of the rated motor speed.

- Check the accuracy of motor speed. This can be optimized by adjusting the value of **Leakage inductance**. If accuracy can not meet the specification, store the value of **Lkg inductance** that minimizes the error and then adjust **Flux curr factor**. With this parameter the error will be recovered.

- Set a speed value equal to approximately 3% of the rated speed. Then observe the error between real motor speed and reference set-point and adjust **Stator resistance** to minimize the error.

In “Stop” conditions, that is zero speed reference, the motor may tend to rotate or, given a “Start” command, the motor may not follow the reference. In either case the **Voltage comp lim** needs to be decreased.

- **Calibration with load applied**

During the normal operation of the drive with load applied, it is possible to calibrate the **Rotor resistance** value. The calibration of **Rotor resistance** will be carried out by observing the real motor speed with load applied. If **Rotor resistance** value is high, the real motor speed will be higher than the reference set-point, and vice-versa.

The **Low speed factor** parameter allows improving the torque to be obtained at a speed equal to approximately. 2% of the rated speed. By increasing the parameter value an increase of the available torque is obtained.

1.3.4.2.4 Manual tuning of regulator loops

The AVy drive contains the following closed loop regulators:

- Current regulators for active (Torque) current and reactive (Flux) current. The value of gains are the same for both these regulators.
- Flux regulator (normally requires manual tuning only for applications with field weakening range.
- Speed regulator (Sensorless vect and Field oriented mode)
- Voltage regulator (does not require tuning).

Using the Test generator function

For the tuning of regulators, an internal test generator is used in order to evaluate the step responce of the regulators. This operation requires using a digital scope.

The test generator provides a square-wave signal with an adjustable frequency and amplitude, and an offset. The **Gen access** parameter determines which regulator input the signal is assigned to. Further information on this is provided in section 2.16.1, “Test generator” .

The menu structure to access the regulator gains is REG.PARAMETERS \ Percent value. Base values may be changed to extend the numerical ranges of the gains (REG.PARAMETERS \ Base value).

1.3.4.2.4.1 Manual tuning of current regulator

NOTE! **You can skip this section if Self-tune 1 operated successfully.**

- **Drive disabled**
- Select the following settings for the test generator:
- **Gen access** = F current ref
- **Gen frequency** = 60 Hz
- **Gen amplitude** = 10 %
- **Gen offset** = 60 %
- Prepare current measuring as a direct measurement on regulation card (test point XY4 / XY5).
- Set **Current P** and **Current I** parameters in the REG PARAMETERS / .... menu to 0.00.

NOTE! Voltage saturation may occur during the optimization process (see Figure 1.3.4.1). In this case the value for Gen amplitude and also possibly for Generator offset should be reduced. Take extra care with this effect, especially with motors up to 7.5 kW.

- **Enable drive**
- Increase **Current P** until the reaction time is approximately 1 ms and the overshoot is less than 4 % of the applied step (see Figures 1.3.4.2 to 1.3.4.4)
- Increase **Current I** until the overshoot is greater than 4 %. Then reduce it until it is just smaller than 4% of the applied step (see Figure 1.3.4.5 and 1.3.4.6).
- Stop and disable drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command

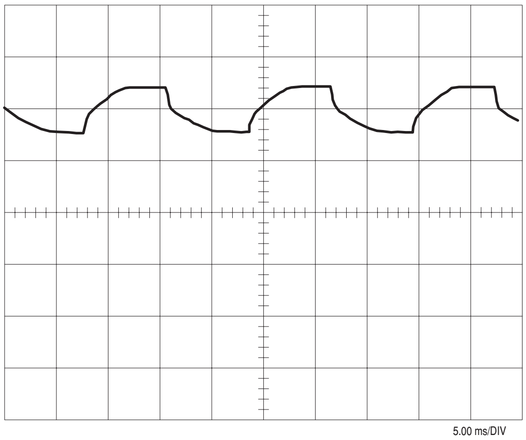

Figure 1.3.4.1: Current in phase U. Voltage reaches saturation: Gen amplitude and possibly Generator offset too high.

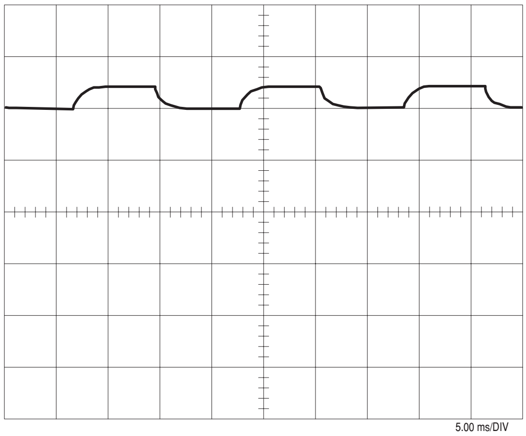

Figure 1.3.4.2: Current in phase U. Current P is too small.

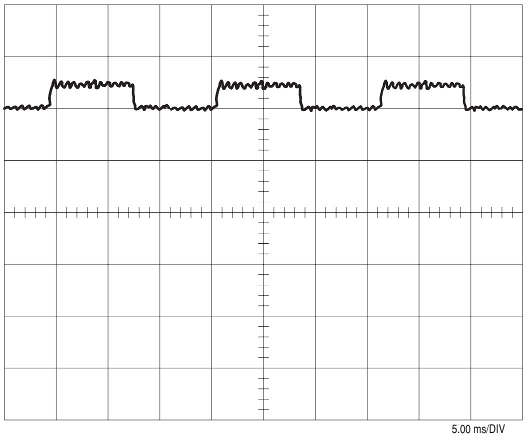

Figure 1.3.4.3: Current in phase U.Current P is too high.

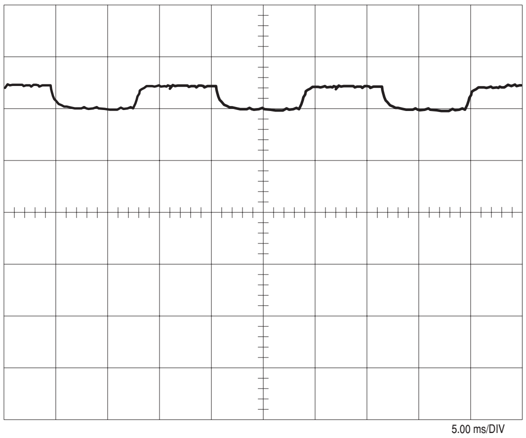

Figure 1.3.4.4: Current in phase U . Current P is set correctly.

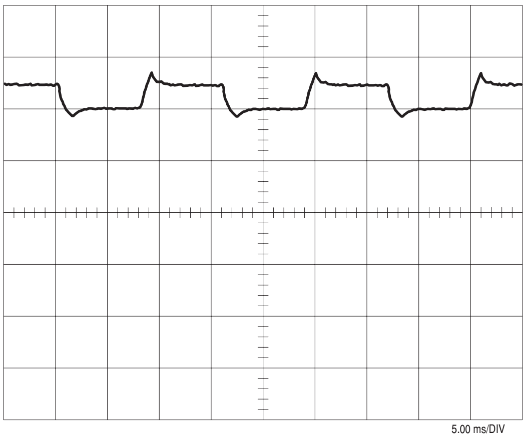

Figure 1.3.4.5: Current in phase U.Current I is too high.

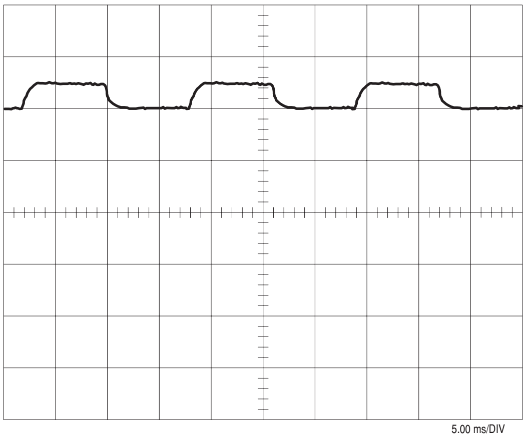

Figure 1.3.4.6: Current in phase U . Current P/I are set correctly.

1.3.4.2.4.2. Manual tuning of flux regulator

NOTE! **This section can be skipped if Self-tune 2a or 2b have been performed successfully.**

If self-tuning has failed or had not been correctly carried out, the manual tuning can be applied.

This operation is usually required only for application with field weakening range.

- **Drive disabled**
- Select the following setting for the test generator:
- Gen access = Flux ref
- Gen frequency = 2 Hz
- Gen amplitude = 10 %
- Gen offset = 20 %
- Measure the actual value via an analog output. Set "**Flux**" to an analog output and "**F current ref**" to a second analog output. (see section 2.13, "I/O Configuration).
- Set **Flux P** and **Flux I** parameters in the REG PARAMETERS / .... to 0.00.
- **Enable the drive** and **start**

  Increase Flux P until the reaction time is approx. 40 ... 60 ms and the overshoot is less than 4 %. Ensure that saturation does not occur to the variable **F current ref** (see Figure 1.3.4.7). If saturation does occur,
- Reduce **Gen amplitude** and/or **Gen frequency**.
- Increase **Flux I** until the overshoot is greater than 4%. Then reduce it until it is just less than 4 % (see Figures 1.3.4.10 and 1.3.4.11).
- Stop the drive and disable.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

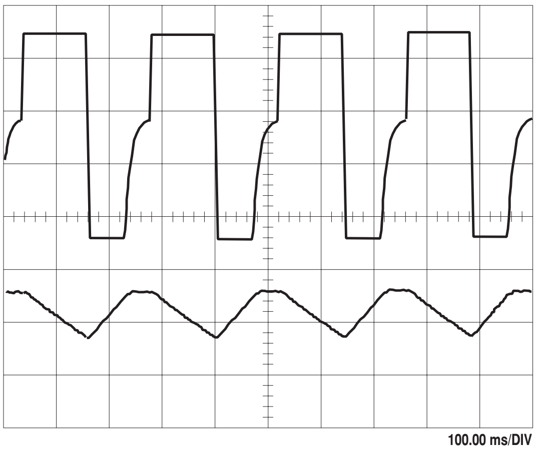

Figure 1.3.4.7: Above, F current ref; below, Flux. Too high amplitude and/or test generator frequency. Decrease both.

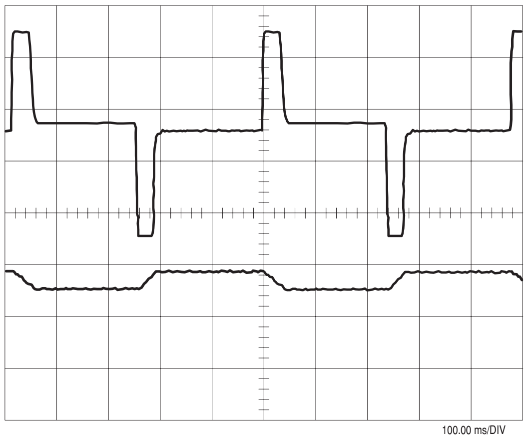

*Figure 1.3.4.8: Above, F current ref; below, Flux. **Flux P** is too high*

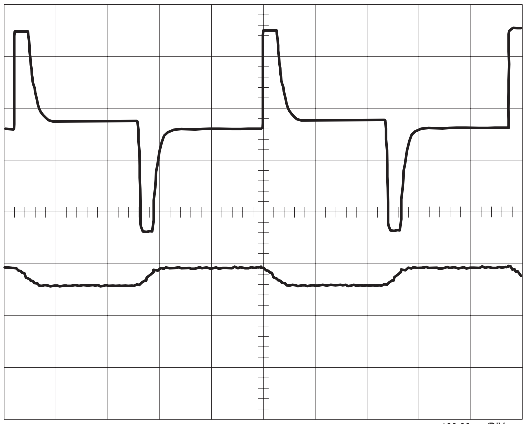

*Figure 1.3.4.9: Above; F current ref; below, Flux. **Flux P** set correctly.*

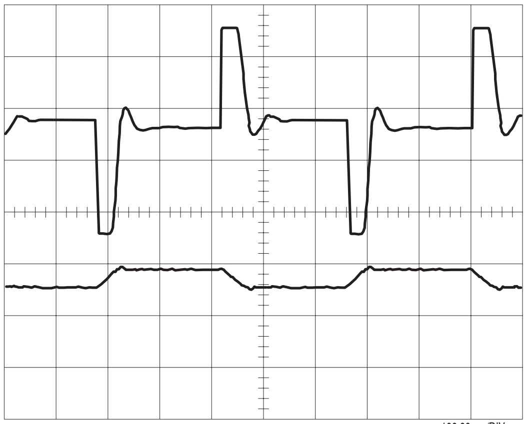

*Figure 1.3.4.10: Above, F current ref; below,Flux. **Flux I** is too high.*

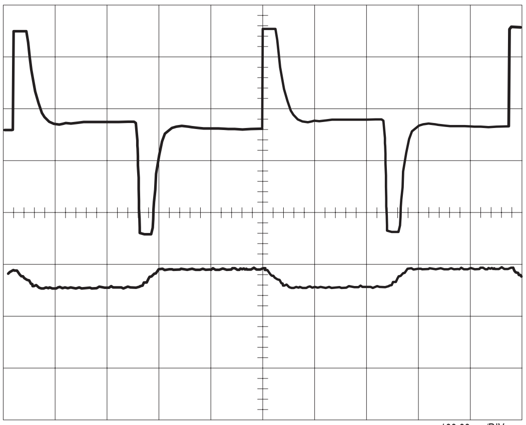

*Figure 1.3.4.11: Above, F current ref; below, Flux. **Flux P** are **Flux I** are set correctly.*

1.3.4.2.4.3. Manual tuning the Speed regulator

- **Drive disabled**
- Select the following settings for the test generator (high inertial loads may require different setting):

- **Gen access**	=	Ramp ref
- **Gen frequency**	=	0.2 Hz
- **Gen amplitude**	=	10 %
- **Gen offset**	=	10 %

- Measure the actual value via an analog output. For this the **Actual speed** variable must be assigned to an analog output and the **Torque current** variable to a second analog output (see section 2.13, “I/O Configuration).
- Set the **Acc delta speed** parameter in the BASIC MENU to the highest possible value and the **Acc delta time** parameter to 1 s.
- If possible set the deceleration via **Dec delta speed** and **Dec delta time** in the same way. This is normally only possible with loads with a very low intertia or when using a braking unit. Otherwise the values should be set so that there is no overvoltage alarm when the motor is regenerating.
- Set the **Speed P** and **Speed I** parameters in the REG PARAMETERS / .... menu to 0.00.
- **Enable the drive** and **start**

- Increase **Speed P** until the overshoot is less than 4 % with a short reaction time of the drive.
- Increase the **Speed I** parameter until the overshoot is greater than 4 %.
  Then reduce it until it is less than 4 %.
- Stop and disable the drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

NOTE! If the ripple level on the estimated speed is significant, it is possible to attenuate it by increasing the value of **Sls speed filter**. This parameter represents the time constant of the low-pass filter applied on the estimated speed. Increasing the value of **Sls speed filter** reduces the available bandwidth of the speed regulator.

In some cases it is necessary to have variable gains of the speed regulator above the Base speed range. For this purpose of the AVy series are provided with an adaptive speed regulator. For further information on this function see section 2.14.2, "Adaptive spd reg". See below for information on setting the auxiliary logic.

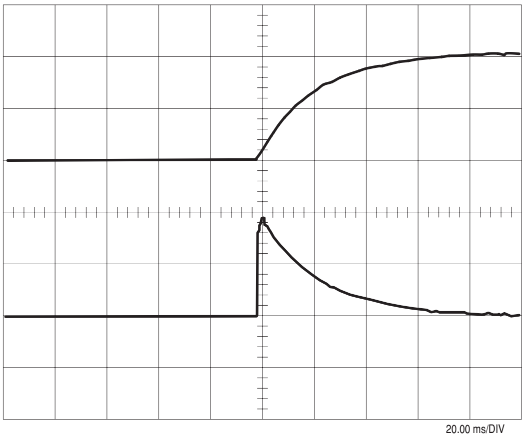

*Figure 1.3.4.12: Above, Motor speed; below, Torque current. **Speed P** is too small.*

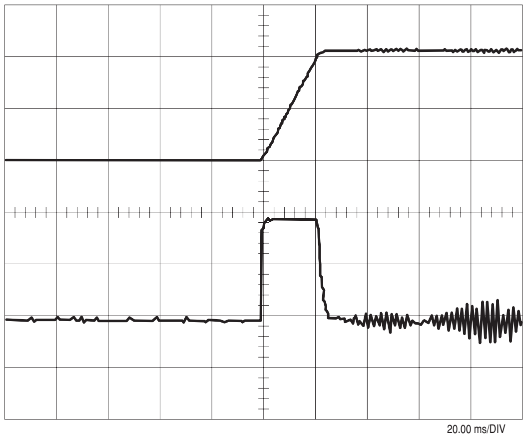

*Figure 1.3.4.13: Above, Motor speed; below, Torque current. **Speed P** is too high.*

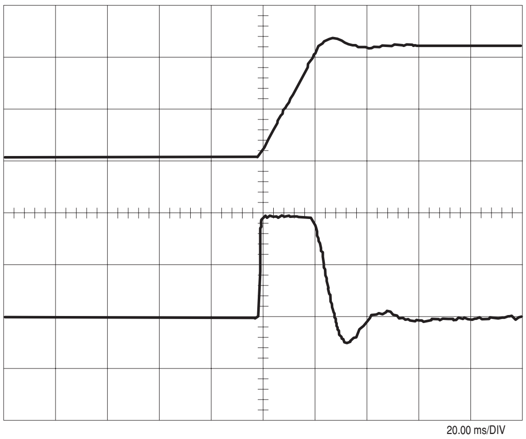

*Figure 1.3.4.14: Above, Motor speed; below, Torque current. **Speed I** is too high.*

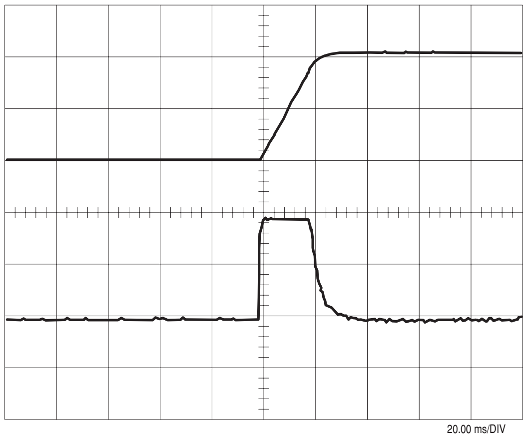

*Figure 1.3.4.15: Above, Motor speed; below, Torque current. **Speed P** and **Speed I** are set correctly.*

1.3.4.3 FIELD ORIENTED MODE

1.3.4.3.1 Checking and manual tuning of magnetizing current

NOTE! **You may skip this section if Self-tune 2 executed successfully.**

- Operate the drive without load at 50% of Base frequency by setting:

$$\text{Ramp ref 1 [rpm]} = \frac{60 \bullet \text{Base frequency} \bullet 0.5}{\text{N. of pole pairs}}$$

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The **Output voltage** parameter in the MONITOR\Measurements menu should indicate a value approximately equal to 50% of Base voltage.

If this is not the case, you should adjust **Magnetizing curt** in DRIVE PARAMETER\Motor parameter menu until you obtain the required voltage value.

1.3.4.3.2 Checking and manual tuning of Rotor resistance

NOTE! **You may skip this section if Self-tune 1 executed successfully.**

<u>There are three methods for this test:</u>

The **first method** is based on steady-state load test. It offers the best accuracy and should be used, if compatible with the mechanical system coupled to the drive.

- Operate the drive at 50% of Base frequency, as in section 1.3.4.3.1, “Checking and manual tuning of magnetizing current”, but with load applied.
- Check that the drive is not at current limit.
- Compare **Output voltage** with the reading at no load. The value should be approximately the same, possibly 2-3% higher. If a strong voltage deviation appears when load is applied, tune the value of **Rotor resistance** until **Output voltage** reaches the correct value.You will have to increase Rotor resistance if **Output voltage** is too high, and vice-versa.

If load test cannot be used, other methods based on dynamic response are available. However, the current regulator must be properly tuned in order to use these methods (for manual tuning of the current regulator, see section 1.3.4.3.3.1, “Manual tuning of current regulator”).

As an alternative to the steady-state load tests, the following two methods are based on dynamic response tests.

The **Rotor resistance** parameter in the DRIVE PARAMETER / Motor parameter menu can be adjusted in the two following ways:

Method 2: By means of a step change of the speed reference value and evaluation of the speed response

Method 3: By means of a step change of the torque reference value

<u>**Method 2**</u>

If the incorrect rotor resistance value is set, an unstable speed will occur on accelerations at the current limit. This effect can be used for calculating the correct value.

- **Drive disabled**

- Select the following settings for the test generator:
- **Gen access** = Ramp ref
- **Gen frequency** = 0.1 Hz
- **Gen amplitude** = 50 % of the required speed jump
- **Gen offset** = same value as for **Gen amplitude**

- Measure of the actual value via an analog output. For this the Actual spd variable must be assigned to an analog output and Torque current to a second analog output (see section 2.13, "I/O Configuration).
- Set the Acc delta speed and Acc delta time parameters in the BASIC menu so that the drive accelerates at the current limit (shortest possible acceleration time).
- Set the deceleration time via Dec delta speed and Dec delta time so that there is no overvoltage alarm when the drive decelerates.

NOTE! The current limit may not be reached with drives with low intertia, even with short acceleration times. In this case reduce the value for T current lim + in the BASIC MENU.

- **Enable drive and start**
- Ensure that the drive works at the current limit when accelerating. If not, shorten the acceleration time accordingly or reduce the current limit.
- Speed oscillations will occur if the **Rotor resistance** value is incorrect, as shown in Figure 1.3.4.16.
- Change the value until the behavior shown in Figure 1.3.4.17 is established.
- Stop and disable the drive.
- If the **T current lim +** parameter was reduced, this should be set to its original value.
- Set **Gen access** = Not connected
- Save settings via **Save parameters** command.

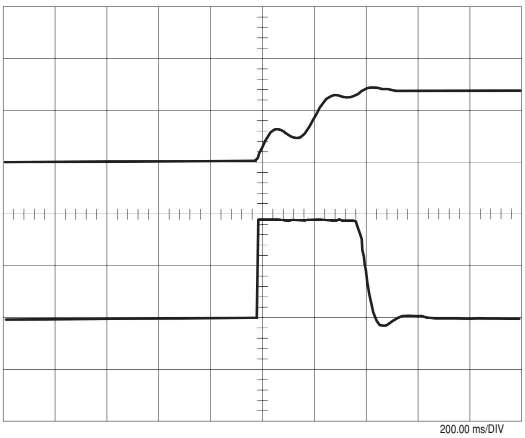


Figure 1.3.4.16: Above, Motor speed; below, Torque current. The rate for Rotor resistance is incorrect. Change this until the behavior corresponds to Figure 1.3.4.13.

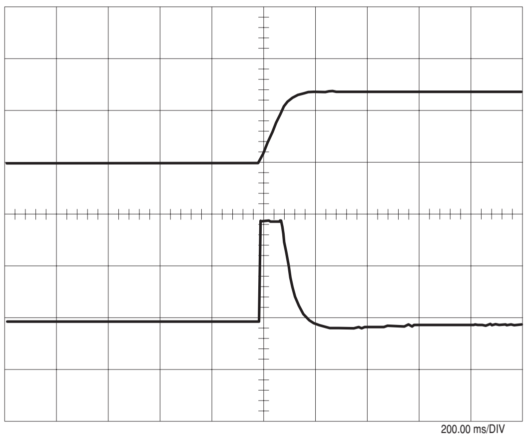


Figure 1.3.4.17: Above, Motor speed; below, Torque current. Correct setting for Rotor resistance.

Method 3

In order to check whether an incorrect value for Rotor resistance is present, a square wave torque reference value should be specified that has an average value of zero. Since the speed depends on the acceleration torque, it must have a sawtooth shape with sharp corners when the Rotor resistance has been set correctly. If the corners are rounded, the incorrect value has been entered.

NOTE! The motor must be operated without load applied with this method

- **Drive disabled**
- Preset the following settings for the test generator:

- **Gen access**	=	T current ref
- **Gen frequency**	=	20 Hz
- **Gen amplitude**	=	5 %
- **Gen offset**	=	0 %

- Measure the actual values via an analog output. Set the Actual speed variable to an analog output and Torque current variable to a second analog output (see secton 2.13, “I/O Configuration).
- **Enable drive** and **start**

The motor shaft should turn alternately in both directions. If the measured speed is too low, the value for **Gen amplitude** should be increased and/or the value for **Gen frequency** should be reduced (only change the values minimally, in order to avoid uncontrolled behaviour).

- Change the **Rotor resistance** value until the speed signal measured is sawtooth-shaped and has sharp corners.
- Stop the drive and disable.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

NOTE! For motors rated 30 Kw and higher, thermal drift of the **Rotor resistance** due to operating temperature rise in the rotor may cause sensitive alteration of the performance. In this case the on-line adaption for Rotor resistance should be enabled via the parameter **Enable rr adap** in the SPEC FUNCTION menu (see section 2.16.2).

1.3.4.3.3 Manual tuning of regulator loops

The AVy drive contains the following closed loop regulators:

- Current regulators for active (Torque) current and reactive (Flux) current. The value of gains are the same for both these regulators.
- Flux regulator (normally requires manual tuning only for applications with field weakening range.
- Speed regulator (Sensorless vect and Field oriented mode)
- Voltage regulator (does not require tuning).

Using the Test generator function

For the tuning of regulators, an internal test generator is used in order to evaluate the step responce of the regulators. This operation requires using a digital scope.

The test generator provides a square-wave signal with an adjustable frequency and amplitude, and an offset. The Gen access parameter determines which regulator input the signal is assigned to. Further information on this is provided in section 2.16.1, “Test generator” .

The menu structure to access the regulator gains is REG.PARAMETERS \ Percent value. Base values may be changed to extend the numerical ranges of the gains (REG.PARAMETERS \ Base value).

1.3.4.3.3.1 Manual tuning of current regulator

NOTE! **You can skip this section if Self-tune 1 operated successfully.**

- **Drive disabled**
- Select the following settings for the test generator:
  - **Gen access** = F current ref
  - **Gen frequency** = 60 Hz
  - **Gen amplitude** = 10 %
  - **Gen offset** = 60 %
- Prepare current measuring as a direct measurement on regulation card (test point XY4 / XY5).
- Set **Current P** and **Current I** parameters in the REG PARAMETERS / .... menu to 0.00.

NOTE! Voltage saturation may occur during the optimization process (see Figure 1.3.4.1). In this case the value for Gen amplitude and also possibly for Generator offset should be reduced. Take extra care with this effect, especially with motors up to 7.5 kW.

- **Enable drive**
- Increase **Current P** until the reaction time is approximately 1 ms and the overshoot is less than 4 % of the applied step (see figures 1.3.4.2 to 1.3.4.4)
- Increase **Current I** until the overshoot is greater than 4 %. Then reduce it until it is just smaller than 4% of the applied step (see figure 1.3.4.5 and 1.3.4.6).
- Stop and disable drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command

1.3.4.3.3.2. Manual tuning of flux regulator

NOTE! **This section can be skipped if Self-tune 2a or 2b have been performed successfully.**

If self-tuning has failed or had not been correctly carried out, the manual tuning can be applied.

This operation is usually required only for application with field weakening range.

- **Drive disabled**
- Select the following setting for the test generator:
  - Gen access = Flux ref
  - Gen frequency = 2 Hz
  - Gen amplitude = 10 %
  - Gen offset = 20 %

- Measure the actual value via an analog output. Set "**Flux**" to an analog output and "**F current ref**" to a second analog output. (see section 2.13, "I/O Configuration).
- Set **Flux P** and **Flux I** parameters in the REG PARAMETERS / .... to 0.00.
- **Enable the drive** and **start**

  Increase Flux P until the reaction time is approx. 40 ... 60 ms and the overshoot is less than 4 %. Ensure that saturation does not occur to the variable **F current ref** (see Figure 1.3.4.7). If saturation does occur,

- Reduce **Gen amplitude** and/or **Gen frequency**.
- Increase **Flux I** until the overshoot is greater than 4%. Then reduce it until it is just less than 4 % (see Figures 1.3.4.10 and 1.3.4.11).
- Stop the drive and disable.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

1.3.4.3.3.3 Manual tuning the Speed regulator

- **Drive disabled**
- Select the following settings for the test generator (high inertial loads may require different setting):

- **Gen access**	=	Ramp ref
- **Gen frequency**	=	0.2 Hz
- **Gen amplitude**	=	10 %
- **Gen offset**	=	10 %

- Measure the actual value via an analog output. For this the **Actual speed** variable must be assigned to an analog output and the **Torque current** variable to a second analog output (see section 2.13, "I/O Configuration).
- Set the **Acc delta speed** parameter in the BASIC MENU to the highest possible value and the **Acc delta time** parameter to 1 s.
- If possible set the deceleration via **Dec delta speed** and **Dec delta time** in the same way. This is normally only possible with loads with a very low intertia or when using a braking unit. Otherwise the values should be set so that there is no overvoltage alarm when the motor is regenerating.
- Set the **Speed P** and **Speed I** parameters in the REG PARAMETERS / .... menu to 0.00.
- **Enable the drive** and **start**
- Increase **Speed P** until the overshoot is less than 4 % with a short reaction time of the drive.
- Increase the **Speed I** parameter until the overshoot is greater than 4 %.
  Then reduce it until it is less than 4 %.
- Stop and disable the drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

Note! In some cases it is necessary to have variable gains of the speed regulator above the Base speed range. For this purpose the AVy series are provided with an adaptive speed regulator. For further information on this function see section 2.14.2, "Adaptive spd reg". See below for information on setting the auxiliary logic

1.3.5 ENHANCED REGULATOR FEATURES

1.3.5.1. Setting the Speed zero logic

The Drive is factory set with the speed zero logic disabled. A detailed description of the drive settings is in section 2.8.2., “Spd zero logic”.

Speed zero logic enables separate tuning settings when zero speed is detected

Ref 0 level is used to define the switch threshold for the speed zero logic. References below this threshold are considered zero.

Selecting the proportional gain at zero speed, hence when reference value and **Actual speed** are respectively below **Ref 0 level** and **Speed zero level**:

Speed P gain corresponds **Spd=0 P gain** at zero speed	**Enable spd=0 P** = Enabled
Speed P gain corresponds to the normal P gain	**Enable spd=0 P** = Disabled

Deactivate the P gain specified with **Spd=0 P gain** :

Deactivate if the reference value is over **Ref 0 level**	**Enable spd=0 R** = Enabled
Deactivate if reference value or **Actual speed** are out of thresholds	**Enable spd=0 R** = Disabled

Enable spd=0 R is only effective if **Enable spd=0 P** has been enabled

Disable the I component of the speed regulator with speed=0:

Integral component disabled	**Enable spd=0 I** = Enabled
Integral component enabled	**Enable spd=0 I** = Disabled

When the motor is stopped, it is possible to avoid the position overshoots by the speed I. When the motor is switched off, it can not accept any load and therefore this function is not suitable for all applications!

In Sensorless mode enabling **Enable lck sls** disables speed control and field rotation when the speed reaches the threshold of zero speed, in order to avoid motor shaft drift.

Direct current equal to the magnetizing current is injected and no significant torque reaction is possible at standstill.

1.3.5.2 Anti Drift function (only for field oriented control)

Enabling this function locks the rotor of the motor at zero speed without drift, using an internal position control.

It is activated via digital input or Bus, using the command **Lock zero pos**, and when the threshold of zero speed (**Speed zero level**) detection is reached.

Enable the Anti Drift function:

Anti Drift function enabled	**Enable zero pos** = Enabled
Anti Drift function disabled	**Enable zero pos** = Disabled

Lock zero pos	This command operates the Anti drift function the digital input, keypad or Bus
Zero pos gain [%]	Proportional gain of the position control

<u>Also refer to parameters ADD SPEED FUNCT / Speed zero / Speed zero level and Speed zero delay</u>

<u>**Anti Drift application example:**</u>

- Enable zero pos = Enabled
- Lock zero pos = Enabled

- Motor is running at 1000 rpm
- Speed zero level = 10 rpm
- Speed zero delay = 100 ms

When the STOP command is active and the motor reaches 10 rpm, the position control is automatically activated after 100 msec.

For restart, it is necessary to set the command Lock zero pos = Disabled before the START command.

1.3.5.3 Adaptive speed

NOTE! The adaptive speed regulation is used if the gain of the speed regulator has to be changed above the speed range or dependant of another value. The details of the different parameters are described in section 2.14.2, "Adaptive spd reg".

Enable adaptive speed regulation with the drive disabled. **Enable spd adap** = Enabled. This makes the settings of **Speed P** and **Speed I** invalid.

Specify according to the controlling variable by which the speed regulator gain is to be changed. Normally this is based on the speed (**Select adap type** = Speed).

If the gain is to be changed on the basis of a different variable, set **Select adap type** = Adap reference. The other variable is connected to the device via an analog input. It is also possible to set **Adap reference** via the serial interface or a bus.

The setting of **Adap speed 1** and **Adap speed 2** produces three ranges that can have different gains. Enter the value as a percentage of the **Speed base value** and the maximum value of **Adap reference**.

For **Select adap type** = Speed: The optimization is carried out as previously described for Speed regulator. Note the following:

- **Gen offset** is assigned a value that is in the lower section of the range to be optimized, however outside of the transition range specified by **Adap joint XX**.
- Use **Gen amplitude** to define the jump so that the speed stays within the range to be optimized.
- The optimization is specified for each range separately and the regulator parameters by range via **Adap P gain XX** and **Adap I gain XX**.
- Run through the entire speed range after the ranges have beeen optimized.
- Instabilities within the transitions from one range to the next can be reduced by changing the values for **Adap joint XX**. Increase the values for more gradual transitions.

For **Select adap type** = Adap reference: the optimization depends on the system so that no general setting instructions can be given here.

The gains of the speed regulator set via **Adap P gain 1** and **Adap I gain 1** are active when the zero speed logic(as factory set) and the drive is disabled. When the zero speed logic is enabled, the values set when the motor is switched off are valid.

1.3.5.4 Speed-up function

With loads having a high moment of inertia (large torque current to make a speed change) it is possible to "force" the speed regulator during speed changes using the function "Speed-up". The figures 1.3.5.4.1 and 1.3.5.4.2 show the influence of this function.

Parameters used in the example:

Speed up base	14 rpm/ms
Speed up gain	50 %
Speed up filter	20 ms

- See section 2.8.4 for other parameter details.

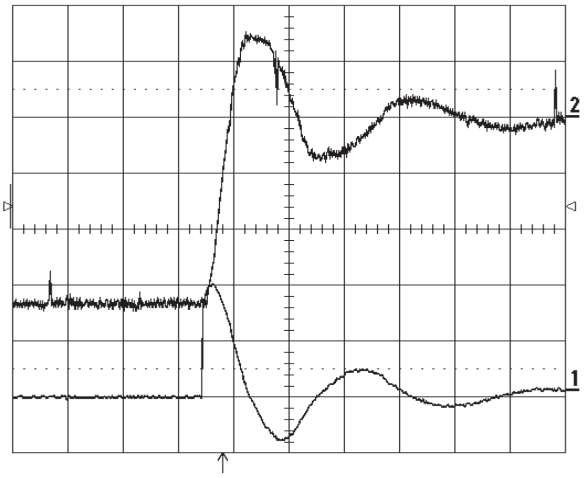


Figure 1.3.5.4.1: Above: Actual spd.Below: Motor current jumps with the speedchanges due to a high moment of inertia.The function Speed-up is not active.

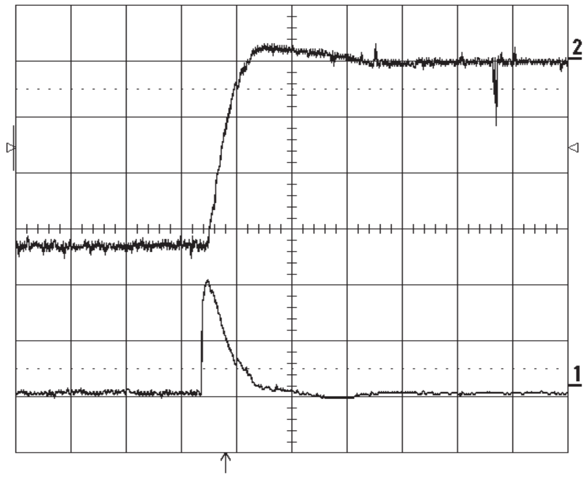


Figure 1.3.5.4.2: Above: Actual spd. Below: Motor current The same drive with Speed-up function active

1.3.6 TROUBLESHOOTING

See OVERFLOW LIST on chapter 2.4.1 and "Throubleshooting" (manual "AVy Quick Start up", section 1.12).

2. FUNCTION DESCRIPTION

Menu structure

BASIC MENU	Parameters required for the basic setup of the drive
MONITOR	Display of reference values, speed, voltage, current, frequency...
DRIVE PARAMETER	Entry of motor parameters, self-tuning, definition of the saturation curve for the field weakening range, sensorless parameters, V/f control parameters and functions
INPUT VARIABLES	Ramp reference value, speed reference value, torque reference value
LIMITS	Speed limitation, Current limitation, Flux limitation, Voltage limitation
RAMP	Acceleration, deceleration, quick stop, ramp shape
SPEED REGULAT	Configuration of the speed regulator, speed zero logic,Anti Drift, Speed up function, Droop function, Inertia Loss comp
CURRENT REGULAT	Configuration of the current regulator
FLUX REGULATION	Configuration of the flux regulator
REG PARAMETERS	Parameters for speed, current, flux regulation
CONFIGURATION	Operating mode, regulation mode, encoder type, factor function, programmable failure alarms, address, PWM frequency, password
I/O CONFIG	Configuration of programmable digital and analog inputs and outputs, Tach follower
ADD SPEED FUNCT	Auto capture, adaptive speed regulation, speed control, speed zero logic
FUNCTIONS	Motor potentiometer, jog function, internal multi-speed function, multi-ramps, overload control, Brake Unit control, Stop control, Power loss management
SPEC FUNCTION	Test generator, saving parameters, loading factory default settings, failure register, signal adjustments, PAD parameters, DC Braking functions
OPTIONS	Access to the Field Bus Card parameter (option 1), access to the APC optional Card (option 2), PID function
DRIVECOM	Parameter settings for the DRIVECOM profile
SERVICE	Service menu, only accessible to service personnel of the manufacturer

Ay4005g

2.1. ENABLE SIGNALS

The following hardware enable signals are always required, whether the device is to be controlled via the terminal strip, the keypad or the serial interface.

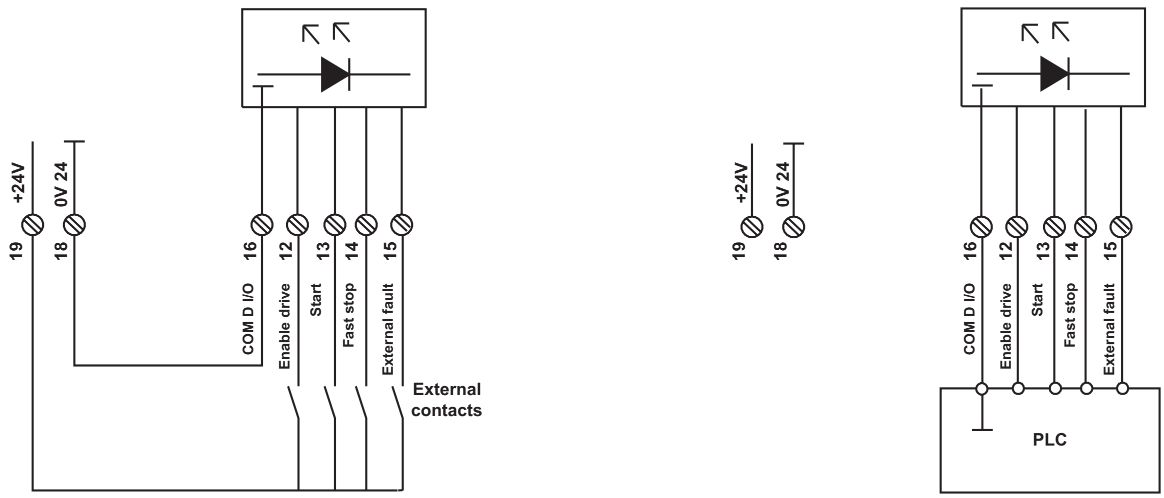


Figure 2.1.1 Enables via potential free contacts and PLC

Figure 2.1.1 show the connection principle

The enable signals are activated via a +15 ... 30 V voltage at the appropriate terminals.The inputs are protected against reverse polarity.

Negative voltage, 0 V and a missing signal are interpreted as disable signals.

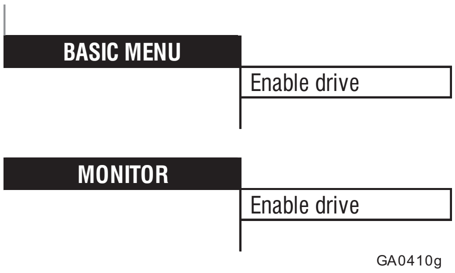
The reference point for the enable signals is terminal 16.

When using an operator keypad/serial interface, the signals on the appropriate terminals and the corresponding commands must be sent via the keypad/serial interface. If an enable is removed via a signal on the terminals, the appropriate command must be sent via the keypad/serial interface in addition to the signal on the terminal in order to restart the drive.

There are four types of enable signals that have a different effect on the behavior of the AVy Drive.

- **Enable drive** enables the inverter modulation
- **Start** enables the regulation
- **Fast stop** sets the speed reference value to zero with a fast ramp so that the drive is stopped as quickly as possible
- **External fault** incorporates external fault conditions into the enable logic

2.1.1. Enable drive



Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Enable drive	314	0	1	Disabled	Terminal 12
Enable					+ 15...30V
Disable				(0)	0V

GA6010g

The **Enable drive** command activates the AVy Drive.

An auxiliary contact on the AC Input contactor may be wired in the Drive enable (terminal 12). When the **Enable drive**=disable and terminal 12=0 V, no other control commands (e.g. **Jog +**, **Jog -** or **Start**) are accepted.

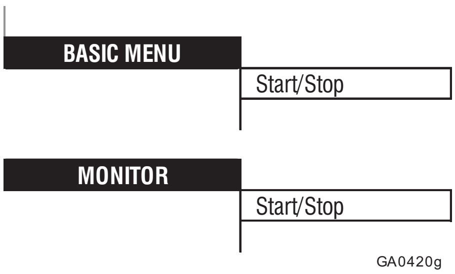
Removal of the **Enable drive** command (**Enable drive**=disable) while the drive is running causes the motor coasting to stop. Neither electrical braking nor controlled stopping of the motor within a prescribed time during the run down are possible. The actuation of the Drive is disabled.

When operated via the keypad the **Enable drive** command is provided in the BASIC MENU and in the MONITOR menu.

Using **Enable drive** command from keypad (**mains command**=Digital), active voltage level is also required on terminal 12.

Using **Enable drive** command from terminal 12 set "**Main command**=terminals". **Enable drive** in the menu is read only parameter.

2.1.2. Start



Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Start/Stop	315	0	1	Stop	Terminal 13
Start					+ 15...30V
Stop				(0)	0V

GA6015g

When "**Main commands**"is set to "Digital", **Start/Stop** parameters is used for starting the drive and the STOP button on the keypad is able to stop the drive (active voltage level is also required on terminal 13).

When "**Main commands**" is set to "Terminals", **Start/Stop** is read only parameters.

NOTE: The following signals (at High level) are required for operating the drive in addition to the **Start** command:
- **Enable drive**
- **Fast stop**
- **External fault**

The behavior of the drive after the **Start** command depends on the parameter setting at hand:
- When using the ramp (**Enable ramp** = Enabled and **Enable spd reg** = Enabled) the drive accelerates to the required speed according to the ramp specified. If the Start command is removed, the drive decelerates to zero according to the ramp defined. If the Start command is reapplied once more during the deceleration time, the drive accelerates once more to the required speed.
- If the **Speed ref 1** value reaches the input of the speed regulator directly without a ramp (**Enable ramp** = Disabled and **Enable spd reg** = Enabled), the drive accelerates to the required speed in the shortest possible time once the Start command has been applied. When the Start command is removed, the **Speed ref 1** value is set to zero immediately. The command has no effect on the correction value (**Speed ref 2**).
- When using torque current regulation (**Enable spd reg** = Disabled) the **Start** command enables the torque current reference value (**T current ref 1**) or disables it after the **Start** command is removed. The command has no effect on the correction value (**T current ref 2**).

The **Start** command is not required for Jog function mode.

If the **Start** command and **Jog +** or **Jog -** are applied at the same time, the **Start** command is given priority.

If the **Start** command is applied during Jog operation, the Jog operation is aborted.

2.1.3. Fast stop

Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Fast stop No fast stop Fast stop	316	0	1	No fast stop (1)	Terminal 14

GA6020g

Terminal 14: + 15 ... 30 V = no Fast stop, 0 V = Fast stop.

NOTE: **This function <u>cannot</u> be actuated via the keypad!**

Application: **Fast stop** is actuated in emergencies and hazardous situations, to stop the drive in the shortest possible time. This method of stopping employs the intermediate circuit and braking unit which absorb energy and thus bring the drive to a stop in a shorter time than when the drive coasts down.

The **Fast stop** input signal is <u>always</u> required to be high for operation of theDrive. A removal of the command when the drive is running initiates braking with the ramp specified by the parameters **Qstp delta speed** and **Qstp delta time**.

When the drive is brought to a stop, it is still enabled and has torque. The **Enable drive** command must be removed for it to be disconnected.

The drive behavior after the **Fast stop** command has been given depends on the type of operating mode selected:

1) Operation via the terminal strip (**Main commands** = Terminals):
- The drive keeps braking as long as there is low voltage on terminal 14. When voltage is restored, the drive automatically accelerates to the required reference value (provided the other enable commands are still active).

2) Operation via the terminal strip with the additional possibility of digital parameter entry (**Main commands** = Digital):
- The drive executes braking until it has come to a stop. When voltage is restored on terminal 14, there is no automatic start. This requires the entry of the **Start** command.
- If the **Fast stop** command is actuated via the serial interface while there is voltage present on terminal 14, the fast stop is executed until the drive is at a stop. The **Start** command must be entered for the drive to be restarted.

2.1.4. Quick stop

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Quick stop	343	0	1	No Quick stop	
Quick stop					
No Quick stop				(1)	

GA6025g

NOTE: **This function cannot be actuated via the keypad!**

Application: **Quick stop** is actuated in emergencies or hazardous situations to bring the drive to a stop in the shortest possible time. This method of stopping empoys the intermediate circuit and braking unit (when fitted) which can absorb energy and bring the drive to a stop in a shorter time than when the drive coasts to a stop.

- **Quick stop** function can be assigned to a programmable digital input.
- If select Qstp Opt code = Ramp stop, the drive is stopped with the ramp defined by Qstp delta speed and Qstp delta time.
- If select Qstp Opt code = DC braking curr, the drive is stopped by injection of DC current (section 2.16.7)
- **When the drive is at a stop, it is disabled and thus has no torque.** The **Start** command must be given again for the drive to re-enable and start.

2.1.5. External fault

Parameter	No.	Value			Standard
		min	max	Factory	Configuration
External fault	-	-	-	-	Terminal 15

GA6030g

Terminal 15: + 15...30 V = No ext. fault, 0 V = ext. fault

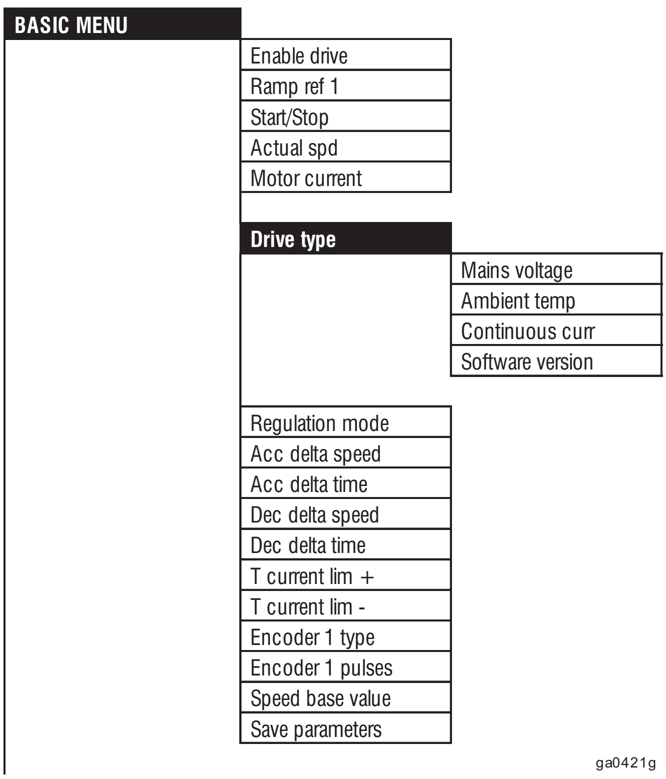
The **External fault** command enables an external signal to be incorporated in the failure alarms of the frequency inverter.

Application example

The Drive is being used for closed-loop control of a single drive without contactors. A temperature-dependent contact, which opens under excessive temperature is located within the motor. Connect this contact between +24 V and terminal 15. When the contact opens (= overtemperature) the Drive will be disabled.

- During operation a signal is always required on terminal 15, whether the commands are transmitted via the terminal strip or not.
- In the event of an external fault, the drive will behave according to the configuration set in the "Programmable alarms".

2.2. BASIC MENU



ga0421g

The BASIC MENU provides the parameters required for the initial commissioning of the drive. The data that is factory set for the default motor concerned refers to a four-pole machine for either 400V or 460V). The motor data in the DRIVE PARAMETER menu should be changed accordingly if different motors are used.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable drive	314	0	1	Disabled	Terminal 12
Enable				(0)	
Disable					
Start/Stop	315	0	1	Stop	Terminal 13
Start					
Stop				(0)	
Actual Spd [rpm]	122	-8192	+8192	—	Analog output 1*
Motor Current [A]	231	0.00	S		Analog output 4**
Mains voltage	333	0	2	460 V	
230V					
400V				(2)	
460V					
Ambient temp	332	0	1	40°C	—
50°C					
40°C				(1)	
Software version	331				
Continuous curr	802	S	S	S	
Regulation mode	321	0	3	V/f control	
Sensorless					
Field oriented				(3)	
V/f control					
Self-tuning					
Acc delta speed [FF]	21	0	2^{32}-1	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	2^{32}-1	100	
Dec delta time [s]	30	0	65535	1	
Ramp ref 1 [FF]	44	-2*P45	-2*P45	0	Terminals 1/2
T current lim + [%]	8	0	F	S	*
T current lim - [%]	9	0	F	S	*
Encoder 1 type	415	0	1	Digital	
Sinusoidal				(1)	
Digital					
Encoder 1 pulses	416	600	9999	1024	
Speed base value [FF]	45	0	16383	1500	
Save parameters	256	0	65535		

Ay6035

* This function can be assigned to a programmable analog input

** This function is assigned to programmable analog outputs (optional card required)

See index for further information on the individual parameters.

Enable drive When controlling the Drive via the keypad, the Drive is activated via the **Enable drive** parameter. Voltage is also required on terminal 12. The **Start** command is required for starting the drive.

Enable Drive enabled

Disable Drive disabled

Start/Stop If the menu point **Start** is selected via the keypad, the Start/Stop status is displayed. (dedicated keys are available to execute Start/stop, voltage is required on terminal 13).

Actual spd Display of speed actual value in rpm (revolutions per minute)

Motor current Display of motor line current in A_{RMS}

Mains voltage Rated value for the mains voltage present (e.g. 400 V). This value is used as a reference for the undervoltage monitoring. See manual AVy Quick Start Up, section 3.3.4 for more information on derating factor.

Ambient temp Adaption to Ambient temperature.Temperature characteristics specified on the nameplate of the inverter.

40°C (104°F) The Drive is able to take the current continosly I_{CONT} at an ambient temperature of up to 40°C (104°F).

50°C (122°F) The Drive is able to take the current continosly I_{CONT} at an ambient temperature of up to 50°C (122°F). (See manual AVy Quick Start Up, section 3.3.1, “Permissable environmental conditions”).

Software version Display of version number of the Drive operating system

Continuous current Indicates the continuous current of the drive in relation to different derating values. E.g. Mains voltage (K_V) - PWM frequency (K_T) - Ambient temperature (K_T).

This parameter is automatically set according to the formula: $\mathbf{I_{CONT} = I_{2N} \times K_V \times K_T \times K_F}$

For the derating factor values see manual AVy Quick Start Up, section 3.3.4.

Regulation Mode This parameter determines the type of regulation of the Drive

Sensorless The drive operates with a sensorless control mode. An encoder is not necessary to feedback the motor speed. In this case the speed and position of motor shaft are estimated by a control algorithm.

Self-tuning Automatic commissioning (see section 1.3.2, “Self-tuning”).

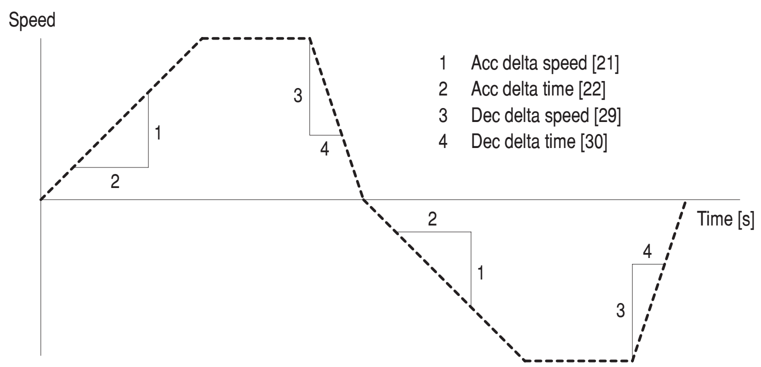
Field oriented The drive operates with a field-oriented vector control. Either a sinusoidal encoder or a digital encoder is needed in order to feed back the motor speed to the Drive. This setting provides the best regulation performance..

V/f control The motor is not vector controlled but according to a specified voltage/frequency characteristic curve. (See section 2.4.2.3, “Voltage/ Frequency control”).

The acceleration of the drive is specified as a ratio of the parameters **Acc delta speed** and **Acc delta time**, the deceleration as a ratio of the parameters **Dec delta speed** and **Dec delta time** (see figure below). They are the same for both rotation directions of the motor.

Acc delta speed Has the same dimension as the ramp reference value and depends on the factor function.

Acc delta time Is specified in seconds. When “0 s” is entered, the ramp output follows the reference value directly.



Dec delta speed Has the same dimension as the ramp reference value and depends on the factor function.

Dec delta time Is specified in seconds. Entering “0 s” causes the ramp output to follow the reference value directly.

Ramp ref 1 1st reference value for the ramp. The value to be entered depends on the factor function.

T current lim + Setting for the current limitation of the drive for the positive current direction (clockwise drive or counter-clockwise brake).

T current lim - Setting for the current limitation of the drive for the negative current direction (counter-clockwise drive or clockwise brake).

These values are specified as a percentage of Full load torque curr (see section 2.9, “Current regulation”).

Encoder 1 type Specifying the encoder type on the XE connector (standard connection)

Sinusoidal Encoder with sinusoidal outputs

Digital Encoder with digital outputs

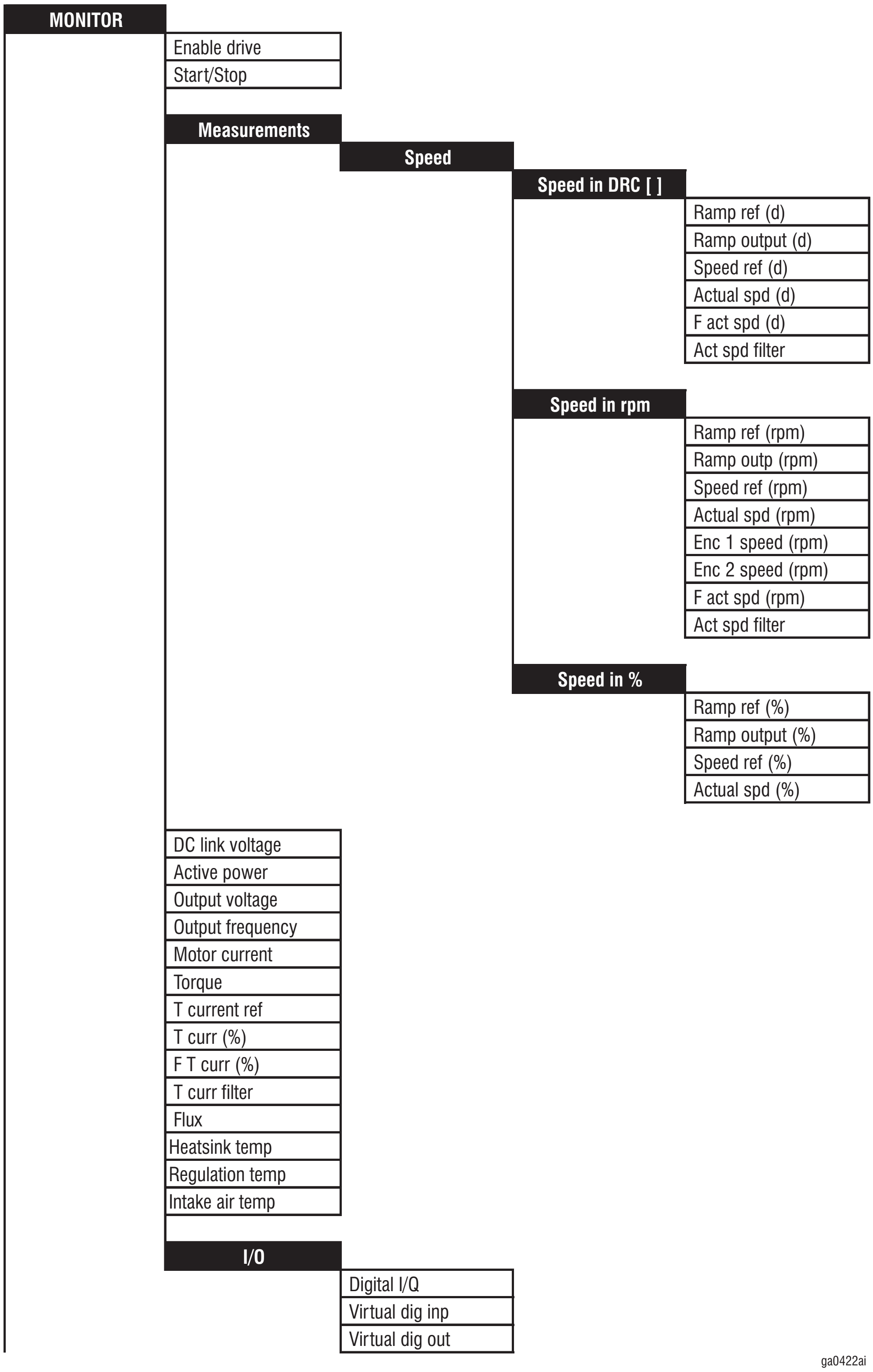
Encoder 1 pulses Number of pulses per revolution

Speed base value The **Speed base value** is defined in the unit specified by the factor function. It is the base value for all speed values (reference values, adaptive speed regulation..) given as a percentage, and corresponds to 100% of the speed. Changing this parameter is only possible whe the drive is disabled (**Enable drive** = Disabled). The **Speed base value** does not define the maximum possible speed. However, the maximum range for speed percentage is ±200% of **Speed base value**.

Save parameters Saving of customer-related parameters.

When the drive is switched on, the last saved parameters are read in. It is absolutely necessary to save parameters once they have been modified otherwise any changes made will be cancelled when power to the drive is applied.

2.3. MONITOR



The MONITOR menu shows all current reference and actual values. The values related to the speed are given in rpm (revolutions per minute), as a percentage (related to the **Speed base value**) and in the dimension specified by the factor function.

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Enable drive	314	0	1	Disabled	Terminal 12
Enable					
Disable				(0)	
Start/Stop	315	0	1	Stop	Terminal 13
Start					
Stop				(0)	
Ramp ref (d) [FF]	109	-32768	+32767	–	
Ramp ref (rpm)	110	-32768	+32767		*
Ramp ref (%)	111	-200.0	+200.0		
Ramp output (d) [FF]	112	-32768	+32767	–	
Ramp output (rpm)	113	-32768	+32767		*
Ramp output (%)	114	-200.0	+200.0		
Speed ref (d) [FF]	115	-32768	+32767	–	
Speed ref (rpm)	118	-32768	+32767		*
Speed ref (%)	117	-200.0	+200.0		
Actual spd (d) [FF]	119	-32768	+32767	–	
Actual spd (rpm)	122	-8192	+8192		Analog out. 1*
Actual spd (%)	121	-200.0	+200.0		
Act spd filter [s]	923	0.001	0.100	0.001	
F act spd (rpm)	924	-32768	32767	-	**
F act spd (d) [FF]	925	-32768	32767	-	
Enc1 speed (rpm)	427	-8192	+8192	-	*
Enc2 speed (rpm)	420	-8192	+8192	-	*
DC link voltage [V]	227	0	999	–	*
Active power [%]	229	-500	+500	–	*
Output voltage [V]	233	0	500	–	*
Output frequency [Hz}	324	0.0	500.0	–	–
Motor current [A]	231	0.00	S	–	Analog out. 4*
Torque [%]	230	-500	+500	–	*
T current ref [%]	41	-500	+500	–	*
T curr filter [s]	926	0.001	0.250	0.100	
T curr (%)	927	-500	500	-	**
F T curr (%)	928	-500	500	-	**
Flux [%]	234	0.00	100.00	–	*
Heatsink temp [°C]	881	-	-	-	–
Regulation temp [°C]	1147	-	-	-	–
Intake air temp [°C]	914	-	-	-	–
Dig input term	564	0	65535	–	–
Dig input term 1	565	0	1	–	–
Dig input term 2	566	0	1	–	–
Dig input term 3	567	0	1	–	–
Dig input term 4	568	0	1	–	–
Dig input term 5	569	0	1	–	–
Dig input term 6	570	0	1	–	–
Dig input term 7	571	0	1	–	–
Dig input term 8	572	0	1	–	–
Dig input term 9	573	0	1	–	–
Dig input term 10	574	0	1	–	–
Dig input term 11	575	0	1	–	–
Dig input term 12	576	0	1	–	–
Dig input term 13	577	0	1	–	–
Dig input term 14	578	0	1	–	–
Dig input term 15	579	0	1	–	–
Dig input term 16	580	0	1	–	–
Dig output term	581	0	65535	–	–
Virtual dig inp	582	0	65535	–	–
Virtual dig out	583	0	65535	–	–

Ga0044ai

* This function can be assigned to a programmable analog output.

Enable drive	When operating the Drive via the keypad, it is activated via the **Enable drive** parameter. A voltage is also required on terminal 12. The **Start** command is required for starting the drive. Enable Drive enabled Disabled Drive disabled
Start/Stop	If the menu point **Start** is selected via the keypad, the Start/Stop status is displayed.
Ramp ref (d)	Total reference value for the ramp using the unit specified by the factor function.
Ramp ref (rpm)	Total reference value for the ramp in rpm (revolutions per minute).
Ramp ref (%)	Total reference value for the ramp as a percentage of the **Speed base value**.
Ramp output (d)	Ramp output in the dimension specified by the factor function.
Ramp outp (rpm)	Ramp output in rpm (revolutions per minute)
Ramp output (%)	Ramp output as a percentage of the **Speed base value**
Speed ref (d)	Total speed reference value using the unit specified by the factor function.
Speed ref (rpm)	Total speed reference value in rpm (revolutions per minute).
Speed ref (%)	Total speed reference value as a percentage of the **Speed base value**
Actual spd (d)	Actual speed using the unit specified by the factor function.
Actual spd (rpm)	Actual speed in rpm (revolutions per minute).
Actual spd (%)	Actual speed as a percentage of the **Speed base value**
Act spd filter	1^{st} order Low pass filter time constant on Actual speed.
F act spd (rpm)	Filtered value of Actual speed in rpm.
F act spd (d)	Filtered value of Actual speed in the unit specified by the factor function.
Enc1 speed [rpm]	This parameter provides the value of speed measured from Encoder 1, regardless of the value of **Speed fbk sel**
Enc2 speed [rpm]	This parameter provides the value of speed measured from Encoder 2, regardless of the value of **Speed fbk sel**
DC link voltage	Intermediate circuit voltage in Volt
Active Power	[%]Active power of the drive as a percentage of the rated active power, if the **Full load curr** parameter corresponds to the rated motor current and the motor is operating with rated flux. Using SR-32 “Line regen converter” this parameter is also accessible via: - PDC (for BUS card) with full range: 32767 (7FFFH) = √3 x **Mains voltage** x **Full load current** - programmable analog output (code selection = 78) with full range = 10V: √3 x **Mains voltage** x **Full load current** These selection are possible only with **Regulation mode** = **Sensorless** or **Field oriented mode**
Output voltage	Line to line output voltage of the inverter in V_{RMS}
Output frequency	Output frequency in Hz
Motor current	Motor current in A_{RMS}
Torque	Torque of the drive as a percentage of the rated motor torque if the **Full load curr** parameter corresponds to the rated motor current and the motor is operating with rated flux.
T current ref	Total current reference value as a percentage of Full load torque curr (see section 2.9, “Current regulation”).
T curr filter	1^{st} order Low pass filter time constant on **Torque current**.
T curr (%)	**Torque current** value in percentage. It can be associated to an analog output (Select: **Torque [29]**)

F T curr (%) Filtered value of **Torque current** in percentage.

Flux Calculated flux in the motor as a percentage of the rated flux

Heatsink temp Reading of the heatsink temperature in °C

Regulation temp Reading of the regulation temperature in °C

Heatsink air temp Reading of the cooling air temperature in °C

Digital I/O Status of the digital input and output of the base device and the optional digital input card.

Display: I 1 2 3 4 5 6 7 8 E S F

Q 1 2 3 4 5 6 7 8

A I/O is displayed only if a voltage is present on the corresponding terminal. E.g., if the inputs 1 and 4 are displayed, that means that the digital inputs 1 and 4 on the Regulation card are at High level (Digital inputs 5 to 8 will be displayed only if an Expansion card is connected).
E = Enable drive (terminal 12)
S = Start (terminal 13)
F = Fast stop (terminal 14)
When a serial line or a Bus is used, the status of the digital I/O can be read by means of the **Dig input term** and **Dig output term** parameters.

Dig input term Status of the digital inputs on the drive and optional digital input card to be read by serial line or field bus. Format: decimal. The information is contained in a word, where each bit is 1 if voltage is present on the corresponding input terminal.

Bit n.	Input	Bit n.	Input
0	I/O, Terminal 36 (Digital Input 1)	6	I/O, Terminal 33 (Digital Input 7)
1	I/O, Terminal 37 (Digital Input 2)	7	I/O, Terminal 34 (Digital Input 8)
2	I/O, Terminal 38 (Digital Input 3)	8	AVy, Terminal 12 (Enable drive)
3	I/O, Terminal 39 (Digital Input 4)	9	AVy, Terminal 13 (Start/Stop)
4	I/O, Terminal 31 (Digital Input 5)	10	AVy, Terminal 14 (Fast stop)
5	I/O, Terminal 32 (Digital Input 6)		

ay6045

Dig input term 1* Status of the digital input 1 (terminal 36, on optional digital input card)

Dig input term 2* Status of the digital input 2 (terminal 37, on optional digital input card)

Dig input term 3* Status of the digital input 3 (terminal 38, on optional digital input card)

Dig input term 4* Status of the digital input 4 (terminal 39, on optional digital input card)

Dig input term 5* Status of the digital input 5 (terminal 31, on optional digital input card)

Dig input term 6* Status of the digital input 6 (terminal 32, on optional digital input card)

Dig input term 7* Status of the digital input 7 (terminal 33, on optional digital input card)

Dig input term 8* Status of the digital input 8 (terminal 34, on optional digital input card)

Dig input term 9* Status of the digital input on terminal 12 (Enable Drive)

Dig input term 10* Status of the digital input on terminal 13 (Start)

Dig input term 11* Status of the digital input on terminal 14 (Fast stop)

Dig input term 12*up to 16* Not used

Dig output term Status of the digital outputs on the device and optional I/O card to be accessed by serial line or field bus. Format: decimal. The information is contained in a word, where each bit is 1 if voltage is present on the corresponding input terminal.

Bit n.	Output	Bit n.	Output
0	Terminal 41, on Regulation card (Digital output 1)	4	Terminal 53, on Option card (Digital output 5)
1	Terminal 42, on Regulation card (Digital output 2)	5	Terminal 54, on Option card (Digital output 6)
2	Terminal 51, on Option card (Digital output 3)	6	Terminal 56, on Option card (Digital output 7)
3	Terminal 52, on Option card (Digital output 4)	7	Terminal 57, on Option card (Digital output 8)

ai6050

Virtual dig inp Status of the virtual digital inputs**

Virtual dig out Status of the virtual digital outputs**

* Available only via RS 485 interface line or via Field Bus.

** The virtual inputs and outputs are used only in connection with a Bus provide fast communication. For further details see the manual of the Bus.

2.4. DRIVE PARAMETER

2.4.1. Motor plate data

DRIVE PARAMETER

Mot plate data

- Nominal voltage
- Nominal speed
- Nom frequency
- Nominal current
- Cos phi
- Base voltage
- Base frequency
- Take motor par

GA0423g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Nominal voltage [V]	161	1	999	400	
Nominal speed [rpm]	162	1	99999	S	
Nom frequency [Hz]	163	1	999	50	
Nominal current [A]	164	0.1	999.0	S	
Cos phi	371	0.1	0.99	S	
Base voltage [V]	167	1	999	400	
Base frequency [Hz]	168	1	999	50	
Take motor par	694	0	1	-	

Ga6055y

S = depending on the drive size

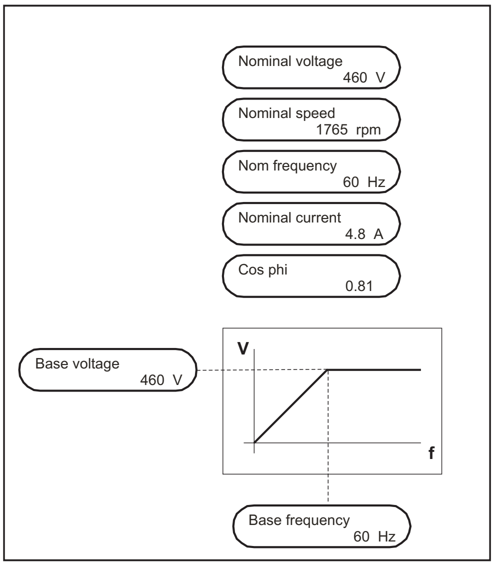
In the "Mot plate data" submenu, data from the motor nameplate and information on the desired "base" operating point must be entered. These are required in order to:

a) Compute appropriate normalization factors for the regulation
b) Compute estimated values for the motor parameters required by the regulation (see section "Motor parameter").

Nominal voltage	Nominal voltage of the motor (given on nameplate). Enter here the voltage that the inverter should supply at the nominal frequency of the motor.
Nominal speed	Nominal full load speed of the motor in rpm (revolutions per minute)
Nom frequency	Nominal frequency of the motor in Hz
Nominal current	Nominal current of the motor according to the given nominal voltage. In case of **"V/f control"** with multiple motors enter a value equal to the sum of Nominal current of all the motors.
Cos phi	Motor power factor.
Base voltage	Max. working voltage in field weakening condition.
Base frequency	Frequency at which the field weakening range begins.
Take motor par	This command must be entered after entering appropriate values for all parameters listed above. It causes computation of normalization factors (a) and motor parameter estimates (b).

Nominal voltage, Nominal speed, Nom frequency, Nominal current, Cos phi, Base voltage and **Base frequency** must be entered (default value of **Cos phi** can be used if value not available from the nameplate). After setting these parameters, **Take motor par** must be entered in order to compute items (a) and (b) above. The drive can not be operated until **Take motor par** is entered. If some values are inconsistent, or motor size is far too small compared to the inverter size, an error message indicating numerical overflow is given, and the previous set of parameters in the "Mot plate data" submenu is restored.

Figure 2.4.1.1: Motor plate data



OVERFLOW LIST

CODE	CAUSES
10 ; 54	The ratio between the Encoder 1 pulses[416] and the number of motor poles pair must be higher than 128
3 ; 4	The Stator resistance [436] value is too high. The motor is not compatible with the drive size used.
5 ; 8 ; 9 ; 15	The Leakage inductance [437] value is too high. The motor is not compatible with the drive size used.
16 ; 24	The Rotor resistance [166] value is too high. The motor is not compatible with the drive size used.
17	The Nominal voltage [161] and Nom frequency [163] values produce motor nominal flux (out of range) that is too high. - Verify these values: the Nominal voltage value is too high and/or the Nom Frequency value is too small.
18	The Base voltage [167] and Base frequency [168] values produce motor nominal flux (out of range) that is too high. - Verify these values: the Base voltage value is too high and/or the Base frequency value is too small
23	The ratio between nominal flux (Nominal voltage, Nom frequency) and working flux (Base voltage , base frequency) is too high. - Verify the above parameters value. The Magnetizing current [165] value is too high. - Verify that this value is lower than Full load curr.
27	The Base voltage value is too high. The maximum value is 500V.
28	The Base frequency value is too high. This value must be lower than 500Hz
59	The Magnetizing working curr [726] is too high. - Verify that the nominal flux value (Nominal voltage and Nom frequency) is lower than the working flux value (Base voltage and Base frequency). Check the parameters value. The Magnetizing current value is too high. - Verify that this value is lower than Full load curr.
64	The **Motor cont curr [656]** value, of the motor thermal protection function (menu **Ovld mot contr**), produces continuative current that is too low in comparison to the used inverter size. This error can also be due to a too low setting of the **Nominal current [164]** parameter ($\leq 0.3 \times I_{2N}$).
66	The Nominal speed [162] value is wrong. The set value produces too small (or too high) slip value.

- Parameters computed in (b) are an estimate, they can be overwritten if values are available from the motor manufacturer (see section “Motor parameter”). Alternatively, these values can be overwritten by the values identified by the Self-tuning procedure (see section “Self-tuning”).
- Manual assignment of values in the “Motor parameter” submenu, or Self-tuning procedure, must be executed only after entering **Take motor par** command. In case **Take motor par** is entered after manual assignment or Self-tuning procedure, values will be overwritten again.

SETTING OF THE BASE SETPOINT

The coordinated setting of **Base voltage** and **Base frequency** determines the working flux and the starting threshold of the flux weakening.

Setting them equal to the nominal value of the motor yields operation at nominal flux in the costant torque region and weakened flux at frequencies higher than **Base frequency**.

Different setting allows the working at a lower flux (Base Voltage/Base frequency < Nominal voltage/ Nominal Frequency).

The operation with a flux higher of the nominal one is not allowed.

The **Base voltage** and **Base frequency** setting at values higher than Nominal Voltage and Nominal Frequency will be prompted by an error message “Overflow”, when the **“Take motor par”** command is entered.

VOLTAGE AVAILABLE ON THE DRIVE OUTPUT

The **Base voltage** value is also the value of the output voltage in flux weakening condition.

The maximum available value is determined by the actual value of the main voltage reduced by the **dynamic regulation margin** (LIMITS\Voltage Limits\Dynam Vlt Margin).

Then the Base voltage setting must be done according to the application.

If the request of the application is the maximum static performances of the motor (torque and power) without any particular dynamic requirements or torque smoothness versus main voltage dips, the Base voltage must be

set equal to the nominal value of the motor.

On the contrary, if the application can not tollerate any torque fluctuation when a main dip occurs, Base voltage must be set to a value lower than the fluctuation range of the main voltage.

Here below are presented some examples with different V/f settings:

Example 1

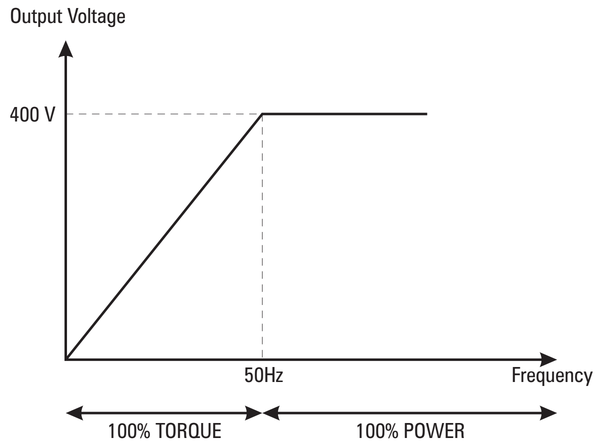
Use of a standard motor 400 V / 50 Hz

Base voltage 400 V

Base frequency 50 Hz (standard)

The motor works with nominal flux until around 50Hz, at full torque.

Over this frequency the voltage is regulated constant, the flux is weakened and the motor supplies a constant power equal to the nominal (rated) power.



Example 2

Use of a standard motor 400V / 50Hz

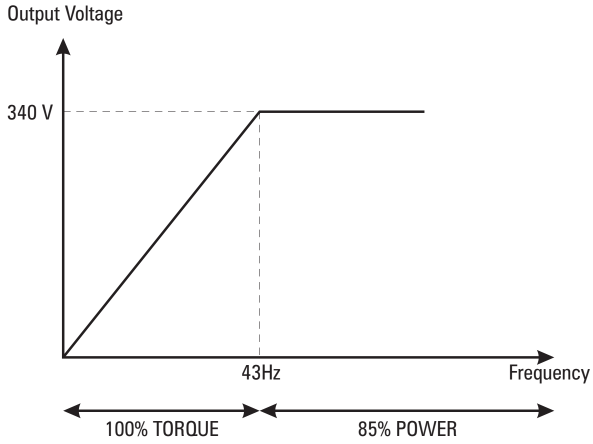
Application requiring total immunity from torque disturbances due to main voltage fluctuation.

Base voltage 400 V -15% = 340 V

Base frequency 50 Hz -15% = 43 Hz

The motor works at nominal flux until 43Hz (85% of the nominal speed), supplying full torque.

Over this frequency the voltage is regulated constant regulated, the flux is weakened and the motor supplies constant power equal to 85% of the nominal (rated) power.



Example 3

Use of a motor **qualified for inverter duty** (isolation,speed, losses, etc...) with star / delta connection winding.

Motor Plate Data:

Nominal voltage	230 V (delta) / 400 V (star)
Nominal current	100 A (delta) / 58 A (star)
Nominal frequency	50 Hz
Cos phi (power factor)	0.87
Nominal power	30 kW (40HP)
Nominal speed	1450 rpm
Maximum speed	3000 rpm

Case 3/a

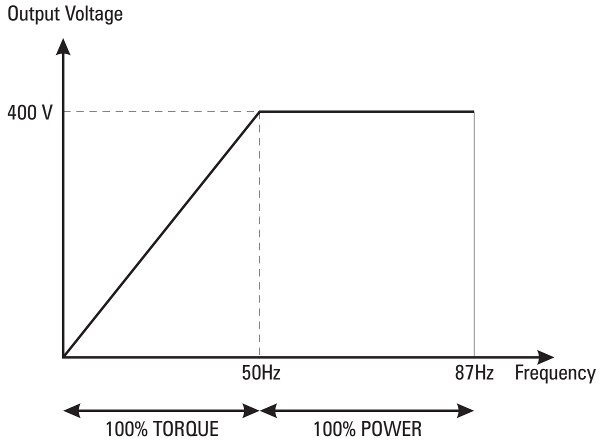
Application with constant torque until 1450 rpm and constant power until 2500 rpm.

Set the motor as star connection and select a drive AVy 4300 (nominal current 63 A).

Set the drive as follow:

Nominal voltage	400 V (star)
Nominal current	58 A (star)
Nominal frequency	50 Hz
Cos phi	0.87
Nominal speed	1450 rpm
Base voltage	400 V
Base frequency	50 Hz

The motor supplies full torque up to nominal speed and full power (30 kW / 40 HP) up to the maximum speed.



Case 3/b

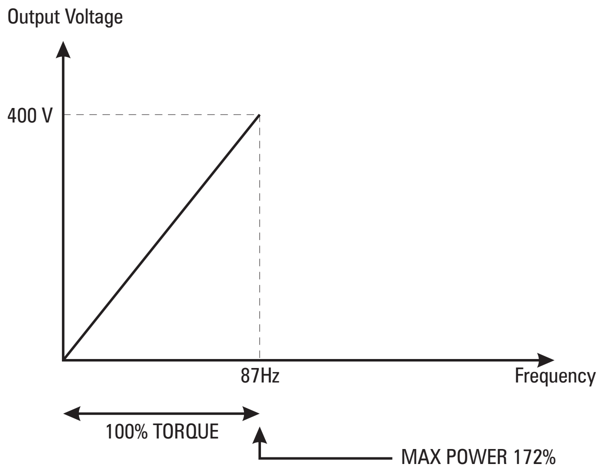
Application with constant torque until 2500 rpm.

Set the motor as delta connection and select a drive AVy 5550 (nominal current >100 A).

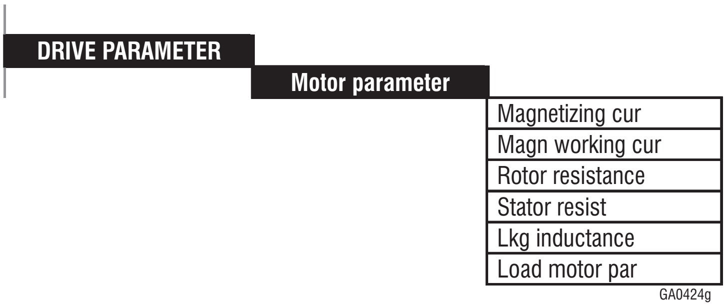
Set the drive as follow:

Nominal voltage	230 V (star)
Nominal current	100 A (star)
Nominal frequency	50 Hz
Cos phi	0.87
Nominal speed	1450 rpm
Base voltage	400 V
Base frequency	87 Hz (note! 50 Hz x 400 V / 230 V).

The motor supplies full torque until the maximum speed with a maximum power approximately equal to: 30 kW (40 HP) x 2500 rpm / 1450rpm 51 kW (69 HP).



2.4.2. Motor parameter



Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Magnetizing cur [A]	165	0.1	999.0	S	
Magn working cur [A]	726	0.1	999	S	
Rotor resistance [Ohm]	166	0.0001	S	S	
Stator resist [Ohm]	436	0.0001	S	S	
Lkg inductance [H]	437	0.00001	9.00000	S	
Load motor par Std for 400V Std for 460V	251	0	1	Std for 400V (0)	

GA6060g

S = depending on the drive size

The "Motor parameter" submenu contains parameters used inside the regulation (Flux model).

These parameters can be either:

- Estimated from plate data values using the **Take motor par** command (see section 1.3.2.2 "Setting Motor Parameters").
- Manually assigned, if values are available
- Identified by the Self-tuning procedure (see section 1.3.3 "Self-tuning").

Additionally, if using the standard recommended motor series for 400 V or 460 V, plate data, motor parameters and suitable controller gains can be loaded automatically.

Magnetizing curr Value of magnetizing current (approx. equal to no load current) at nominal voltage and frequency. The magnetizing transient when drive is enabled can be modified by making an appropriate setting of the Magn curr boost and Magn ramp time parameters in the CONFIGURATION menu.

Magn working curr Value of magnetizing current corresponding to the actual setting of **Base voltage** and **Base frequency.**

Rotor resistance Rotor resistance of the motor in Ohm.

Stator resistance Stator resistance of motor in Ohm.

Lkg inductance Leakage inductance in Henry.

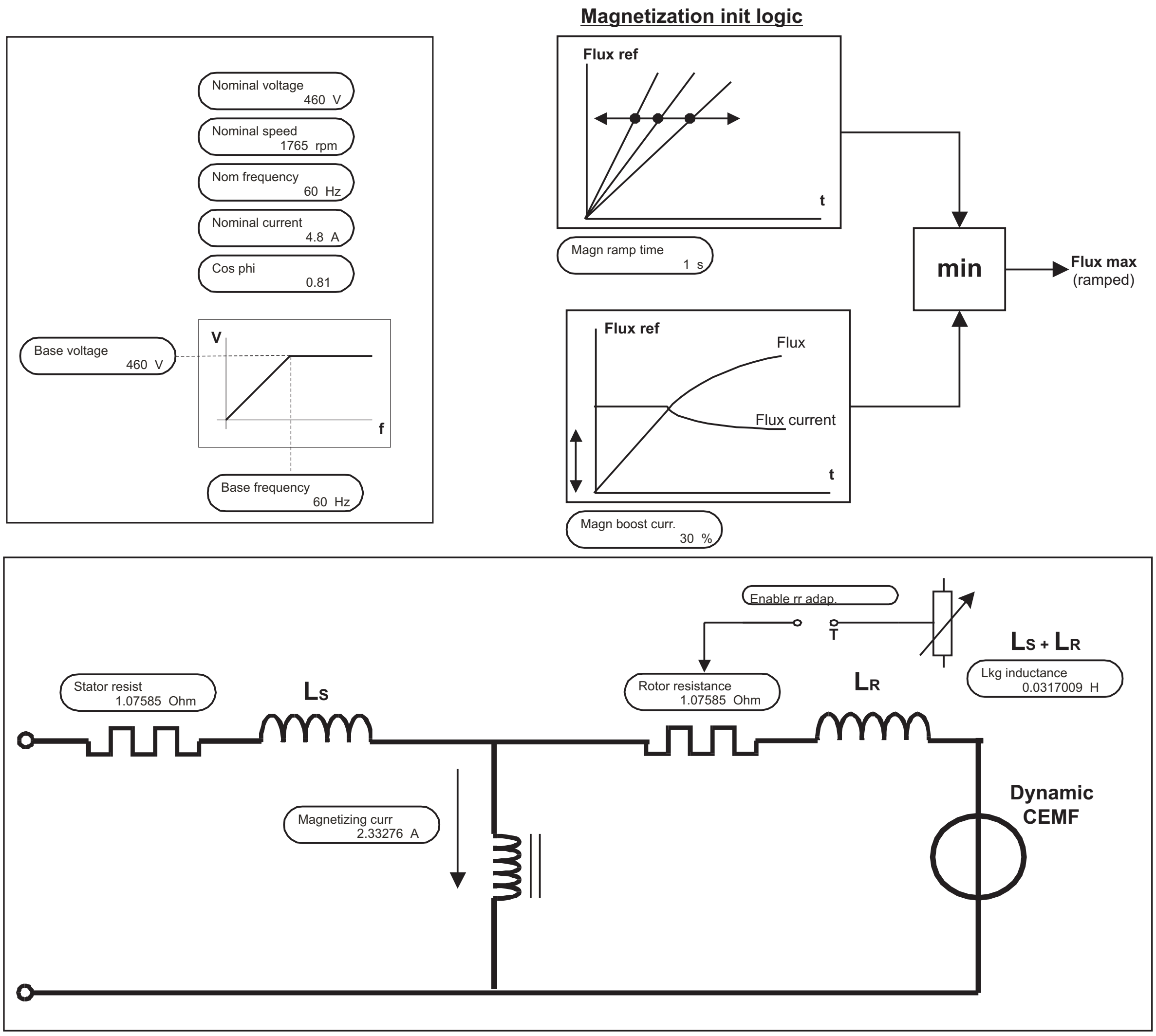
Load motor par It allows to automatically set motor plate data and parameters and regulator gains corresponding to the standard recommended motor, either for 400V or 460V.

If the value for **Magnetizing curr** is too low, the motor does not provide the nominal torque.

If the values for the **Rotor resistance** are incorrect, the motor may show speed instability, or it may be unable to deliver the nominal torque (Field oriented mode). The speed accuracy may get worse (Sensorless mode).

The procedures required for the fine adjustment are described in section 1.3, “Start up”.

Figure 2.4.2.1: Motor parameter



2.4.2.1. Self-tuning

- DRIVE PARAMETER
  - Motor parameter
    - Self-tuning
      - Self-tune 1
        - Start part 1
        - Stator resist
        - Stator resist Nw
        - Voltage comp limit
        - Volt comp lim Nw
        - Comp Slope
        - Comp slope Nw
        - Lkg inductance
        - Lkg inductance Nw
        - Current P
        - Current P Nw
        - Rotor resistance
        - Rotor resist Nw
        - Current I
        - Current I Nw
        - Take val part 1
      - Self-tune 2a
        - Start part 2a
        - P1 flux model
        - P1 flux model Nw
        - P2 flux model
        - P2 flux model Nw
        - Magnetizing curr
        - Magnetiz curr Nw
        - Flux P
        - Flux P Nw
        - Flux I
        - Flux I Nw
        - Voltage P
        - Voltage P Nw
        - Voltage I
        - Voltage I Nw
        - Take val part 2a
      - Self-tune 2b
        - Start part 2b
        - P1 flux model
        - P1 flux model Nw
        - P2 flux model
        - P2 flux model Nw
        - Magnetizing curr
        - Magnetiz curr Nw
        - Flux P
        - Flux P Nw
        - Flux I
        - Flux I Nw
        - Voltage P
        - Voltage P Nw
        - Voltage I
        - Voltage I Nw
        - Take val part 2b
      - Self-tune 3
        - Fwd-Rev spd tune
        - Test T curr lim
        - Start part 3
        - Inertia
        - Inertia Nw
        - Friction
        - Friction Nw
        - Speed P
        - Speed P Nw
        - Speed I
        - Speed I Nw
        - Take val part 3

ga0425g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Start part 1	676	0	65535	-	
Take val part 1	677	0	65535	-	
Stator resist [Ohm]	436	0.0001	9.0000	S	
Stator resist Nw [Ohm]	683	S	S	-	
Voltage comp lim [V]	644	0.1	30.0	6.0	
Volt comp lim Nw [V]	685	0.1	30.0	-	
Comp slope [V/A]	645	0.1	50.0	13.0	
Comp slope Nw [V/A]	686	0.1	50.0	-	
Lkg inductance [H]	437	0.00001	9.00000	S	
Lkg inductance Nw [H]	684	S	S	-	
Current P [%]	89	0.00	100.00	S	
Current P Nw [%]	687	S	S	-	
Rotor resistance [Ohm]	166	0.0001	9.0000	S	
Rotor resist Nw [Ohm]	682	S	S	-	
Current I [%]	90	0.00	100.00	S	
Current I Nw [%]	688	S	S	-	
Flux P [%]	91	0.00	100.00	S	
Flux P Nw [%]	907	0.00	100.00	S	
Flux I [%]	92	0.00	100.00	S	
Flux I Nw [%]	908	0.00	100.00	S	
Voltage P [%]	1022	0.00	100.00	15.00	
Voltage P Nw [%]	1024	0.00	100.00	S	
Voltage I [%]	902	0.00	100.00	4.00	
Voltage I Nw [%]	909	0.00	100.00	S	
Start part 2a	678	0	65535	-	
Take val part 2a	679	0	65535	-	
Start part 2b	680	0	65535	-	
Take val part 2b	681	0	65535	-	
P1 flux model	176	0.00	1.00	S	
P1 flux model Nw	689	S	S	S	
P2 flux model	692	1	20	S	
P2 flux model Nw	690	S	S	S	
Magnetizing curr [A]	165	0.1	999.0	S	
Magnetiz curr Nw [A]	690	S	S	S	
Fwd-Rev spd tune **Fwd direction** **Rev direction**	1029	1	2	Fwd direct. (1)	
Test T curr lim	1048	0	S	20	
Start part 3	1027	0	65535	-	
Inertia [Kg*m*m)	1014	0.001	999.999	S	
Inertia Nw [Kg*m*m)	1030	0.001	999.999	-	
Friction [N*m]	1015	0.000	99.999	S	
Friction Nw [N*m]	1031	0.000	99.999	-	
Speed P [%]	87	0.00	100.00	S	
Speed P Nw [%]	1032	0.00	100.00	-	
Speed I [%]	88	0.00	100.00	S	
Speed I Nw [%]	1033	0.00	100.00	-	
Take val part 3	1028	0	65535	-	

Ga6065g

S = Depending on the size of the device

Self-tuning	Automatic commissioning (See section 1.3.3, "Self-tuning")
Start part 1	Start-up first step of self commissioning
Take val part 1	Acquire the parameters after first step
Start part 2a	Start-up second step of self commissioning (with rotating motor)
Take val part 2a	Acquire the parameters after second step
Start part 2b	Start-up second step of self commissioning (with the motor at stand-still)
Take val part 2b	Acquire the parameters after second step
Start part 3	Start speed self tune.
Stator resistance	Stator resistance of motor in ohm.
Stator resistance Nw	New value of stator resistance of motor in ohm identified by Self-tuning.
Voltage comp lim	Value of the voltage compensation
Volt comp lim Nw	New value of the voltage compensation identified by Self-tuning
Comp slope	Compensation gradient value
Comp slope Nw	New value of Compensation gradient identified by Self-tuning
Lkg inductance	Leakage inductance in Henry
Lkg inductance Nw	New value of Leakage inductance in Henry identified by Self-tuning
Current P	Proportional coefficient of the current regulator in percentage
Current P Nw	New value of proportional coefficient of the current regulator in percentage identified by Self-tuning
Rotor resistance	Rotor resistance of the motor in ohm
Rotor resist Nw	New value of Rotor resistance of thes motor in ohms identified by Self-tuning
Current I	Integral coefficient of the current regulator in percentage
Current I Nw	New value of integral coefficient of the current regulator in percentage identified by Self-tuning
P1 flux model	First parameter to define the value of motor magnetizing curve
P1 flux model Nw	New value identified by self-tuning
P2 flux model	Second parameter to define the value of motor magnetizing curve
P2 flux model Nw	New value identified by self-tuning
Magnetizing curr	Magnetizing current value of the motor
Magnetiz curr Nw	New magnetizing current value of the motor identified by Self-tuning
Flux P	Proportional coefficient of the flux regulator in percent
Flux P Nw	New value of proportional coefficient of the flux regulator in percent identified by the Self tuning
Flux I	Integral coefficient of the flux regulator in percent
Flux I Nw	New value of integral coefficient of the flux regulator in percent identified by the Self tuning
Voltage I	Integral coefficient of the voltage regulator in percent
Voltage I Nw	New value of integral coefficient of the voltage regulator in percent identified by the Self tuning
Voltage P	Proportional coefficient of the voltage regulator in percentage
Voltage P Nw	New value of Proportional coefficient of the voltage regulator in percentage identified by the Self tuning
Fwd-Rev spd tune	Direction of rotation for the speed self tune test (Forward or Reverse; Forward is clockwise as seen from shaft drive end).
Test T curr lim	Torque current lim applied during **Speed Self tune** tests

Inertia Inertia value in Kg*m². (**1 Kg*m² = 23.76 lb*ft²**)

Inertia Nw New Inertia value in Kg*m² identified during the Speed self tune procedure.

Friction Friction value or Loss compensation in N*m. (**1 N*m = 0.738 lb*ft**)

Friction Nw New Friction value or Loss compensation in N*m identified during the speed self tune procedure.

Speed P Proportional gain of the speed regulator in percentage.

Speed P Nw New value of Proportional gain of the speed regulator in percentage computed during the speed self tune procedure.

Speed I Integral gain of the speed regulator in percentage.

Speed I Nw New value of Integral gain of the speed regulator in percentage computed during the speed self tune procedure.

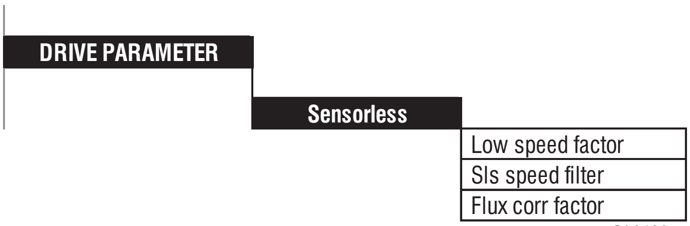
Take val part 3 Acquire the parameters after the self tune procedure (overwrite current values).

NOTE! This is not a permanent save. Go to “Save Parameters” in BASIC MENU or SPEC FUNCTIONS to save to non-volatile memory.

NOTE! A range control exists over the parameters identified by the self-tuning procedure in case of out of range occuring an error message like “parameter_name range error” is displayed. As follows the parameter list: Rs (stator resistance), DTL (Voltage comp lim), DTS (Comp slope), Ls (stator inductance), U (Voltage used during Rr tuning process), Rr (rotor resistance), PIS (stator current regulator proportional gain) and IIS (stator current regulator integralgain).

For commissioning and more informations on procedure in case of error message “parameter_name range error”see chapter 1.3.3 “Self tuning”.

2.4.2.2. Sensorless



GA0426g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Low speed factor	646	0	32000	5000	
Sls speed filter [s]	643	0.01	0.50	0.01	
Flux corr factor	647	0.50	1.00	0.90	

GA6070g

Low speed factor This parameter influences the performance of low speed control (2% of nominal speed). If the drive cannot provide the required torque value at low speed, the parameter will have to be increased. Too high values of this parameter can produce instability.

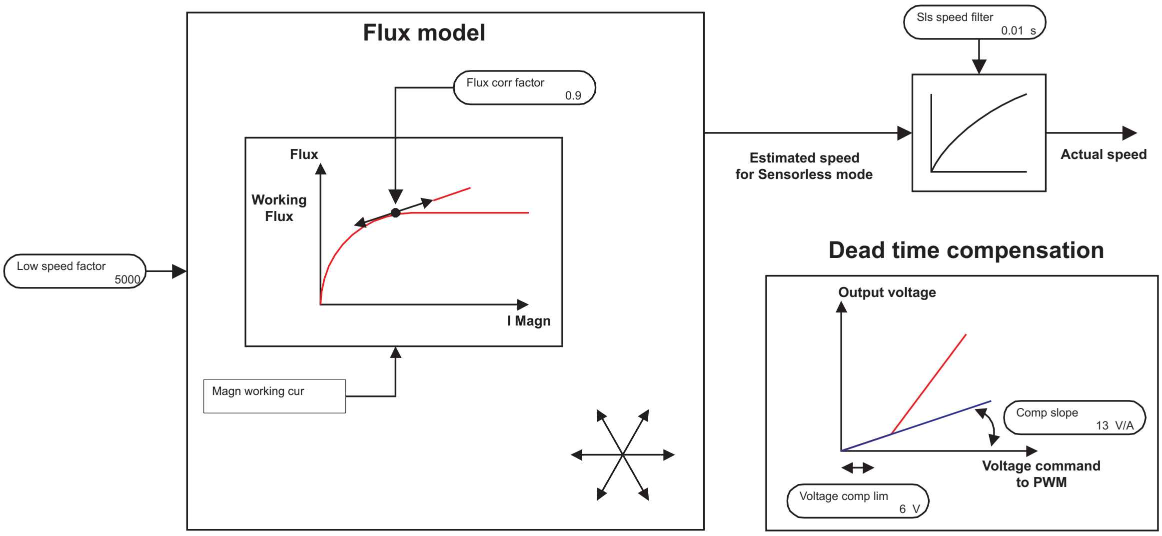
Sls speed filter This parameter represents the time constant of the low-pass filter on the estimated speed.

By increasing this parameter it is possible to reduce the noise level of the estimated speed; consequently lowering the speed control dynamics too.

Flux corr factor This parameter is a correction factor on estimated rotor flux.

In case of high inertia load or in regenerative operation, a speed instability might occur that can be avoided decreasing this factor.

Figure 2.4.2.2.1: Sensorless



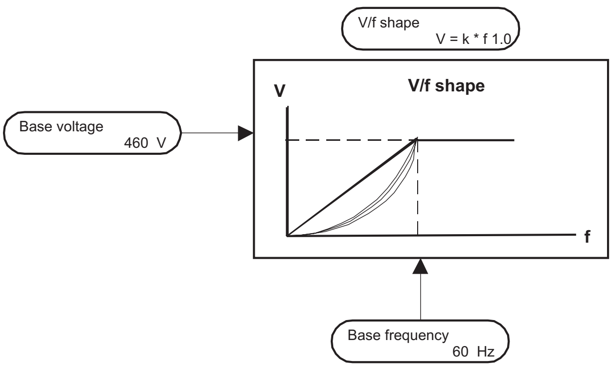
2.4.2.3. V/f control

DRIVE PARAMETER → **V/f control** → V/f shape

GA0427g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
V/f shape $V = K \cdot f^{1.0}$ $V = K \cdot f^{1.5}$ $V = K \cdot f^{1.7}$ $V = K \cdot f^{2.0}$	712	0	3	$V = K \cdot f^{1.0}$ (0)	

GA6075g



V/f shape There are essentially four different types of V/f characteristics, which are specified by this parameter. This parameter specifies the characteristics between zero and the knee of the characteristic curve.

Type 0 $V = K \cdot f^{1.0}$ (use this selection for constant torque loads)

Type 1 $V = K \cdot f^{1.5}$

Type 2 $V = K \cdot f^{1.7}$

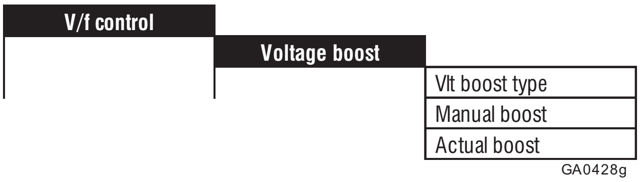
Type 3 $V = K \cdot f^{2.0}$

The basic selection criteria for the V/f characteristics (V/f shape) available can be taken from the next table.

Characteristics	Type of load
0	Constant torque requirement across the whole speed range
1	Mixed load between types 0 and 3
2	Mixed load between types 0 and 3
3	Load where the torque is proportional to the speed squared, e.g. fans and certain types of pump

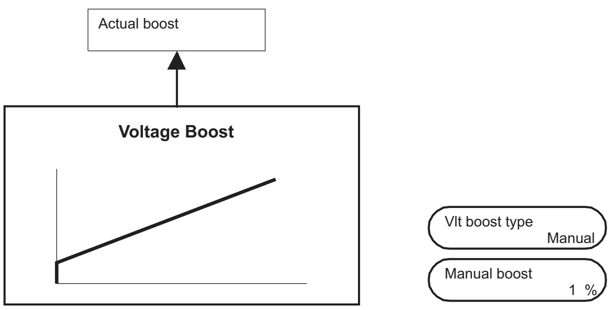
GA6080g

2.4.2.3.1. Voltage boost



Parameter	No.	Value min	Value max	Value Factory	Standard Configuration
Vlt boost type Manual Automatic	709	0	1	Manual (0)	
Manual boost [%]	710	0.0	10.0	0.0	
Actual boost [%]	711	0.0	100.0	—	

GA6085g



The resistive impedance of the stator windings causes a voltage drop within the motor, which results in a reduction in torque in the lower speed range. Compensation can be made for this effect by boosting the voltage. Compensation is carried out continuously across the whole speed range and according to the amount of Output current.

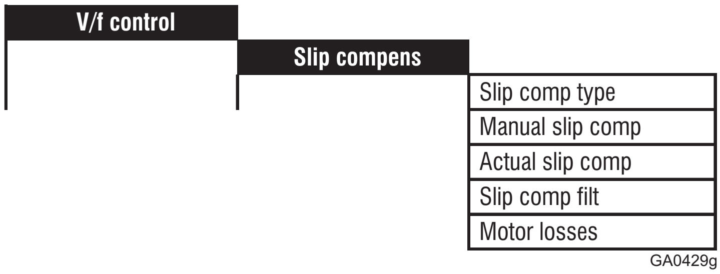
Vlt boost type Selection of the Boost type:

- Manual — Boost value can be set manually via **Manual boost**
- Automatic — Boost value is derived from Motor parameters

Manual boost Value in percentage of the **Nominal voltage** [161], the voltage boost specified is independent of the V/f characteristic selected (parameter 712).

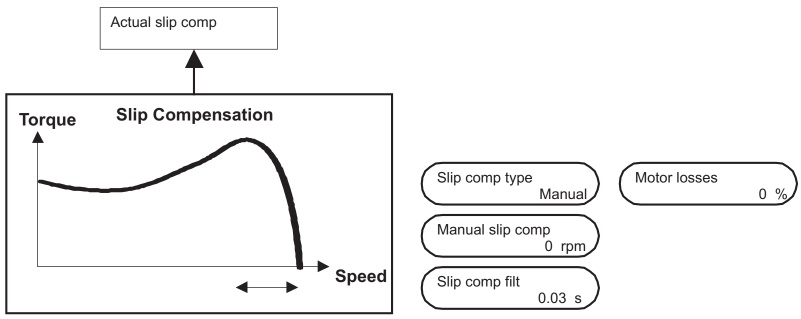
Actual boost Actual boost as a percentage of the **Nominal voltage**

2.4.2.3.2. Slip compens



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Slip comp type Manual Automatic	722	0	1	Manual (0)	
Manual slip comp [rpm]	723	0	200	0.0	
Actual slip comp [rpm]	724	-400	+400	0	
Slip comp filter [s]	725	0.003	0.300	0.030	
Motor losses %	727	0.0	20.0	0.0	

GA6090g



If the asynchronous motor is being loaded, due to the slip compensation, the mechanical speed will vary as long as the load varies. In order to adjust this speed error the slip compensation function can be used.

During the “Slip comp” calibration make sure that the drive is not in the Current limit condition; in that case it is not possible to make calibration.

Too high compensation values can cause instability because of over slip compensation.

Losses in the motor may cause **Actual slip comp** to be different from zero even if the Drive is not loaded. **Motor losses** parameter can be used to adjust compensation to zero at no load.

Slip comp type — **Selection of the Slip compensation type:**

Manual	Manual compensation
Automatic	Automatic compensation value in base of Motor parameters

Manual slip comp — Compensation value to be applied when the motor supplies the nominal torque

Actual slip comp — Actual slip compensation in rpm

Slip comp filt — Time constant of 1st order lowpass filter of the slip compensation. The value is specified in seconds. Increasing this value helps damping oscillations that may arise with load steps (especially negative ones).

Motor losses % — Total losses of the motor, as a percentage of rated output power this value is used to adjust slip compensation at no load.

2.4.2.3.3 V/f spd search

V/f control

- **V/f spd search**
  - Spd srch time
  - Flux srch time
  - Spd auto capture
  - Delay auto cap
  - Delay retrying

GA0430g

Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Spd srch time [s]	893	0.01	10.00	10.00	
Flux srch time [s]	894	0.01	20.00	1.00	
Spd auto capture [FF]	895	-32768	32767	1500	
Delay auto cap	896	0	10000	1000	
Delay retrying	897	0	10000	1000	

GA6091g

Enabling this function allows an automatic restart in case of momentary alarm (retrying).
The same parameters can also be used to engage a spinning motor (auto capture).

Retrying: the alarm which causes the momentary stop of the drive (for example Undervoltage), must be set as Latch = OFF (CONFIGURATION/Prog Alarms menu).

Autocapture: the engage of a spinning motor, for example in case of motor by-pass between the AC mains and the drive, is activated setting Autocapture = OFF (ADD SPD FUNCT menu)

Spd srch time — This parameter determines the speed variation of the drive output frequency.

It represents the time within which is executed a frequency variation from 0 to the motor nominal one, if the output current would be equal to the nominal of the motor.

Flux srch time — This parameter determines the speed variation of the drive flux.

It represents the time within which is executed a flux variation from 0 to the motor nominal flux, if the output current would be equal to the nominal of the motor.

Delay retrying — Delay time for motor demagnetization

Spd auto capture	It represents the starting speed of the synchronism research.
Delay auto cap	Delay time for motor demagnetization

Autorestart after a momentary alarm: Retrying

Before to start the autocapture procedure, it is necessary to consider the motor demagnetization, to avoid high current transient due to the e.m.f. (electromotive force) which cause Overcurrent alarm.

The demagnetization time can be set in milliseconds through the **Delay retrying** parameter. Generally as bigger is the motor power as higher must be the setting of this time; lower values of this parameter can cause high insertion current (Overcurrent alarm).Elapsed the demagnetization time, the autocapture procedure starts. This function is related to **Spd srch time** and **Flux srch time** parameters.

The procedure begins providing to the motor a frequency equal to the one at which the drive was working before the alarm. Then the motor flux will be increased towards the value corresponding to the one related at the output frequency (V/f ratio).

If during this procedure the output current is kept high respect to the nominal one of the motor, the output frequency is reduced and the speed of the flux insertion decreased.

Generally as faster is the motor deceleration at the switching off, as bigger must be the value of **Spd srch time**.

If during the syncronization procedure the Overcurrent alarm occurrs, it is necessary to increase the value of **Flux srch time**.

At the end of the autocapture process, the drive restarts in normal working condition.

Engage of a spinning motor: Autorestart

The procedure is similar to the one above mentioned. The demagnetization time is here set by mean of **Delay auto cap** parameter and the starting search speed of the syncronism by mean of **Spd auto capture**.

Example: 4 poles motor by-pass from the AC mains (50Hz) to inverter.

- Enable the **Autocapture** function (ADD SPD FUNCT)
- Set **Spd auto capture** = 1500
- Drive in STOP condition
- Disconnect the motor from the mains and by-pass it to the inverter

WARNING ! Never apply voltage to the inverter output (terminals U2, V2, W2). Pay particular attention to the commutation sequence contacts between AC mains and inverter.

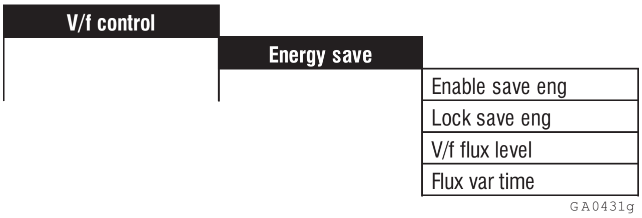
- Give the START command to the inverter

If necessary modify as above described the parameters **Spd srch time** and **Flux srch time**

WARNING ! When this function is selected, the drive will automatically restart once power is reconnected to the unit.

This function should only be used on applications where there is no danger to persons or machines during automatic restart. Anyway the valid safety regulations are to be considered.

2.4.2.3.4 Energy save function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable save eng Disable Enable	898	0	1	Disabled (0)	
Lock save eng OFF ON	899	0	1	OFF (0)	
V/f flux level [%]	900	0	100	100	
Flux var time [s]	901	1	100	10	

GA6092g

* This parameter can be assigned to one of the programmable digital input

** This parameter can be assigned to one of the programmable analog input

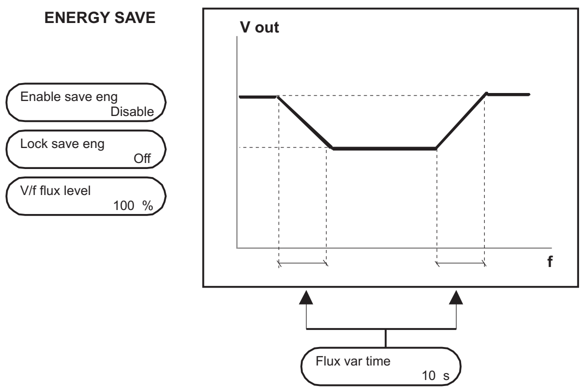
When a motor is found to use only partial levels during normal running conditions, enabling this function reduces the motor flux current to save energy costs.

Enable save eng Enable Energy save function enabled
Disable Energy save function not enabled

Lock save eng This command enables (ON) the Energy save function through the digital input, Keypad or Bus.

V/f flux level Percentage value of the motor flux

Flux var time Time to obtain the flux variation



This function can be activated via **"Enable save eng"** by using the serial interface or via keypad.

Using **V/f Flux level** parameter you can change the percentage value of the motor flux which is required. With **Flux var time** you can set the time to obtain the variation flux, from the rated value to the reduced one and back again.

2.5. INPUTS VARIABLES

The AVy Drives enable reference values for the ramp and the speed regulator to be specified in different units:

- as a percentage of the **Speed base value**
- in a unit that the user can define himself with the factor function, e.g. as a speed in m/s. The default factory setting is rpm (revolutions per minute).

When entering a value on one of the two parameters, the other is updated with the equivalent value.

Example:

A motor has a maximum speed of 1450 rpm. This corresponds to 100 % and at the same time the user-defined value for this speed is 10,000 bottles per hour.
Changing the reference value to 50 % will automatically result in a change of the other value to 5,000 bottles per hour.

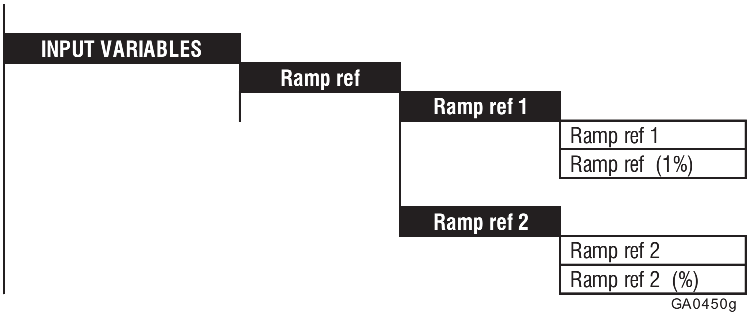
The table below shows the relationship among reference values. In the event of a change, the other parameters are overwritten automatically.

Parameters of the same value	No.	Dimension
Ramp ref 1	44	acc. factor function
Ramp ref 1 (%)	47	%
Speed input var*	44	acc. factor function
Speed input perc*	46	%
Ramp ref 2	48	acc. factor function
Ramp ref 2 (%)	49	%
Speed ref 1	42	acc. factor function
Speed ref 1 (%)	378	%
Speed ref var*	115	acc. factor function
Percent ref var*	116	%
Speed ref 2	43	acc. factor function
Speed ref 2 (%)	379	%

GA6095g

* Defined in the DRIVECOM menu

2.5.1. Ramp ref



The ramp reference value specifies the speed the drive should reach once the acceleration phase has been completed. Modifications to the ramp reference value are therefore transferred to the ramp accordingly. The amplitude of the ramp reference value determines the motor speed while the plus/minus sign determines the direction of rotation.

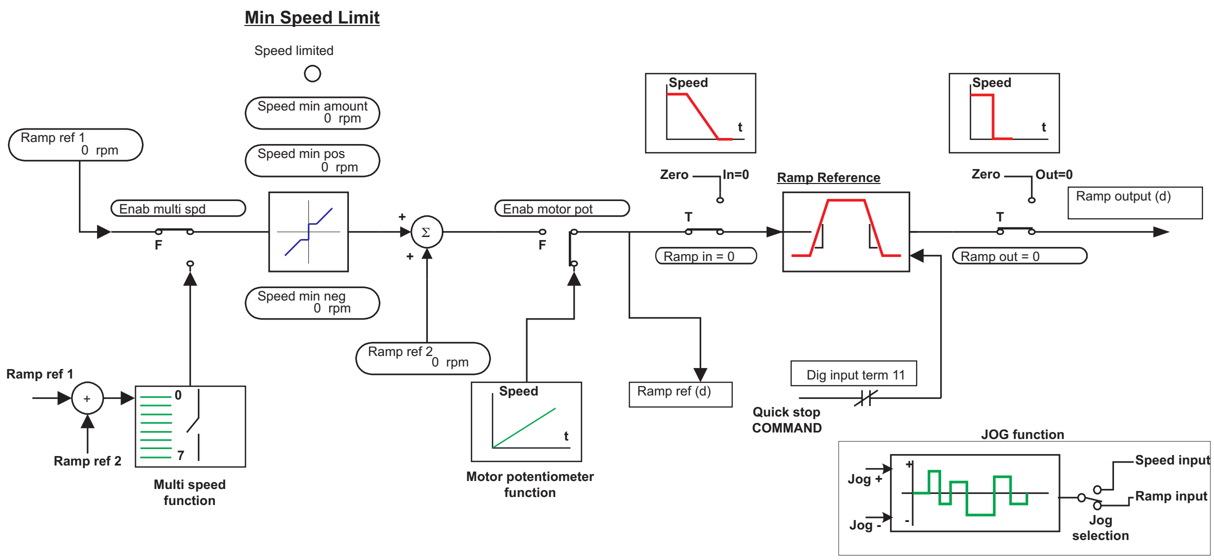


Figure 2.5.1.1: Ramp references

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ramp ref 1 [FF]	44	-2*P45	+2*P45	0	Analog input 1 (Terminals 1 + 2)*
Ramp ref 1 (%)	47	-200.0	+200.0	0.0	
Ramp ref 2 [FF]	48	-2*P45	+2*P45	0	*
Ramp ref 2 (%)	49	-200.0	+200.0	0.0	
Ramp ref (rpm)	110	-32768	+32767	-	**
Ramp ref (d) [FF]	109	-32768	+32767	-	
Ramp ref (%)	111	-200.0	+200.0	-	

GA6100g

* This parameter can be assigned to one of the programmable digital input. Terminals factory configuration can be changed for differente use.

** This parameter can be assigned to one of the programmable analog input

Ramp ref 1 1st reference value for the ramp. The value to be entered depends on the factor function.

Ramp ref 1 (%) 1st reference value as a percentage of the **Speed base value**

Ramp ref 2 2nd reference value for the ramp. The value to be entered depends on the factor function.

Ramp ref 2 (%) 2nd reference value as a percentage of the **Speed base value**

Ramp ref (rpm) Total reference value for the ramp in rpm (revolutions per minute)

Ramp ref (d) Total reference value for the ramp in the unit is specified by the factor function.

Ramp ref (%) Total reference value of the ramp as a percentage of the **Speed base value**

The entire Ramp reference value **Ramp ref** consists of the signed addition of **Ramp ref 1** and **Ramp ref 2** (see Figure 6.5.1.1).

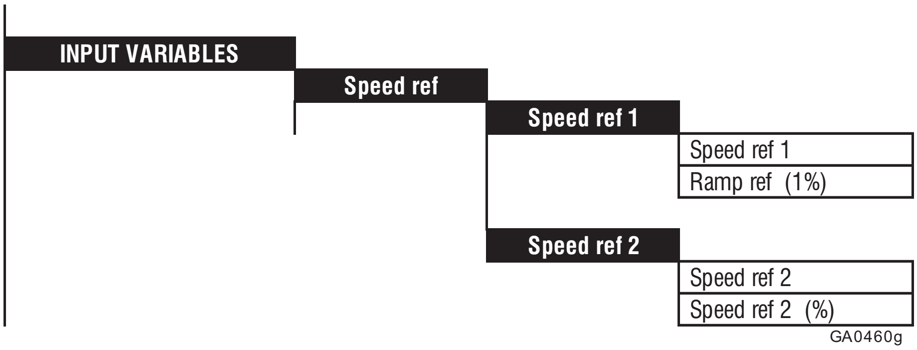
Example 1: **Ramp ref 1** = + 50 % **Ramp ref 2** = + 30 %
Ramp ref = 50 % + 30 % = 80 %

Example 2: **Ramp ref 1** = + 40 % **Ramp ref 2** = - 60 %
Ramp ref = 40 % - 60 %= - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals.

For the **Ramp ref (rpm)**, **Ramp ref (d)** and **Ramp ref (%)** parameters a minimum limit can be specified. When the “Motopotentiometer” or “Multi speed” functions are set, its references will be used .

2.5.2. Speed ref



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed ref 1 [FF]	42	-2*P45	+2*P45	0	Ramp output *
Speed ref 1 (%)	378	-200.0	+200.0	0.0	
Speed ref 2 [FF]	43	-2*P45	+2*P45	0	*
Speed ref 2 (%)	379	-200.0	+200.0	0.0	
Speed ref (rpm)	118	-32768	+32767		
Speed ref (d) [FF]	115	-32768	+32767		**
Speed ref (%)	117	-200.0	+200.0		

GA6105g

* This parameter can be assigned to one of the programmable digital input. Factory configuration can be changed for differente use.

** This parameter can be assigned to one of the programmable analog input

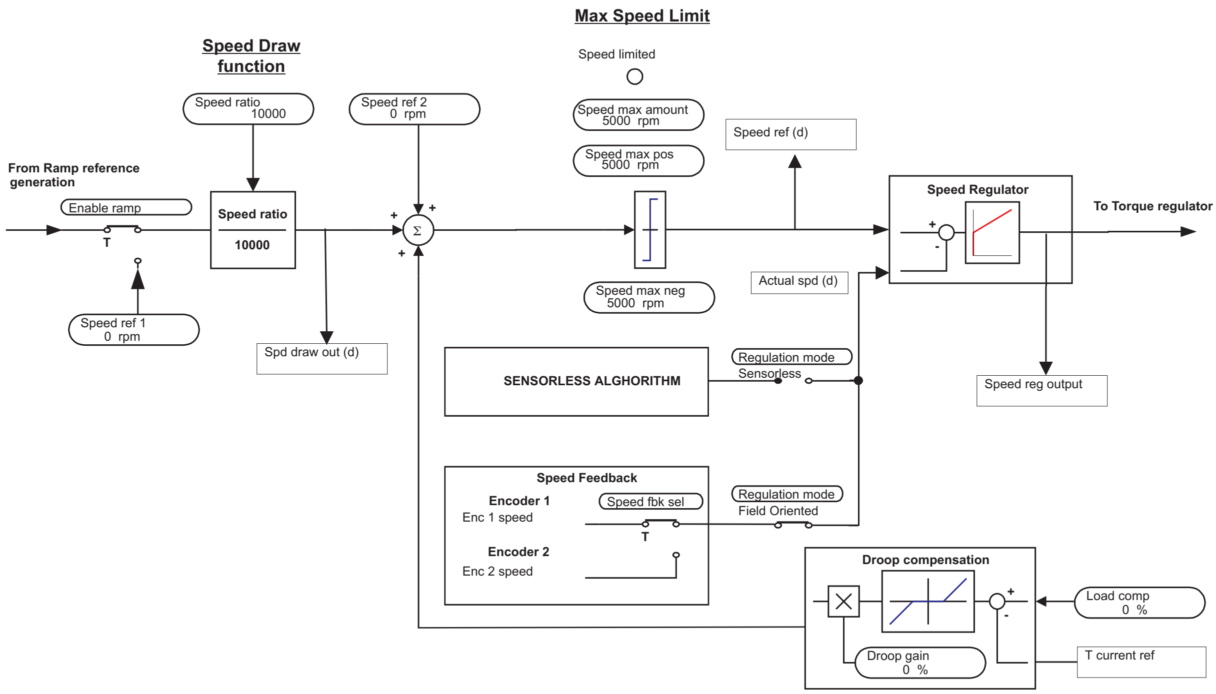


Figure 2.5.2.1 Speed references

The speed reference value specifies the required speed of the drive. The drive responds to the reference value progression directly, except in cases where the torque available is insufficient for this purpose. In this case, the drive operates at the current limit until the selected speed has been reached. The speed reference value determines the speed of the motor, while the plus/minus sign determines the directíon of rotation.

Speed ref 1	1st reference value for the speed. The value to be entered depends on the factor function.
Speed ref 1 (%)	1st speed reference value as a percentage of the **Speed base value**
Speed ref 2	2nd reference value for the speed. The value to be entered depends on the factor function.
Speed ref 2 (%)	2nd speed reference value as a percentage of the **Speed base value**
Speed ref (rpm)	Total speed reference value in rpm (revolutions per minute).
Speed ref (d)	Total speed reference value in the unit specified by the factor function.
Speed ref (%)	Total speed reference value as a percentage of the **Speed base value**

The total speed reference value consists of the signed addition of **Speed ref 1** and **Speed ref 2.**

Example 1: **Speed ref 1** = + 50 % **Speed ref 2** = + 30 %
Speed ref = 50 % + 30 % = 80 %

Example 2: **Speed ref 1** = + 40 % **Speed ref 2** = - 60 %
Speed ref = 40 % - 60 % = - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals.

The speed reference value has an upper and a lower limit.

If the ramp is selected, (**Enable ramp** parameter= Enabled), the reference value input **Speed ref 1** is automatically linked with the ramp output.

2.5.3. Torque current reference value (T current ref)

GA0470g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
T current ref 1 [%]	39	***	***	0	Speed reg output *
T current ref 2 [%]	40	***	***	0	*
T current ref [%]	41	-500	+500	-	**

GA6110g

This parameter can be assigned to one of the programmable digital input

** This parameter can be assigned to one of the programmable analog input

*** This value depends on Full load torque current **Flt 100mf** (see section 2.9).

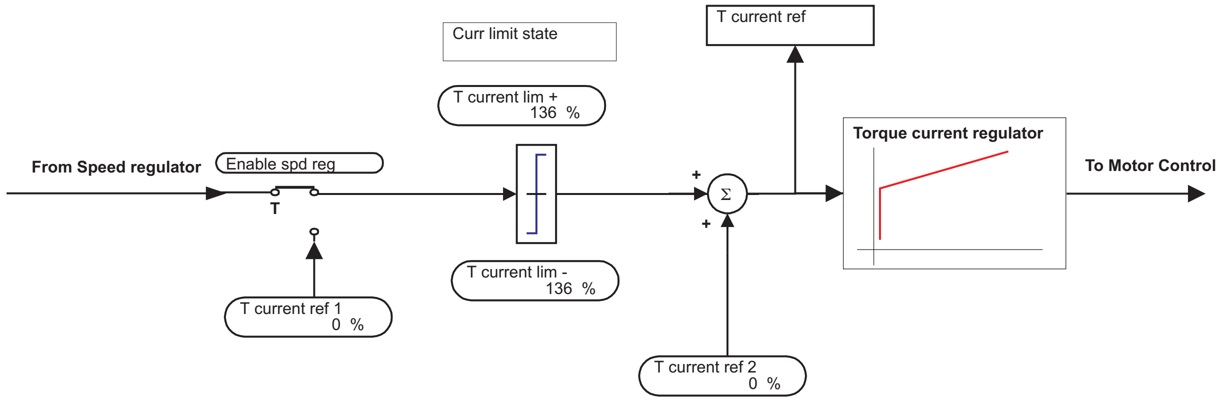


Figure 2.5.3.1: Torque references

The torque current reference value is proportional to the active current of the motor and determines the torque, the sign of the torque determines the direction. For most applications **T current Ref 1** comes from the speed regulator output. **T current ref 2** can also be used as a correction value.

T current ref 1	First current reference value.
T current ref 2	Second current reference value.
T current ref	Total current reference value.

T current ref, **T current ref 1**, **T current ref 2** are specified as a percentage of:
Full load torque current Flt 100mf (see section 6.9, “Current regulation”)

The total current reference value consists of the signed addition of **T current ref 1** and **T current ref 2.**

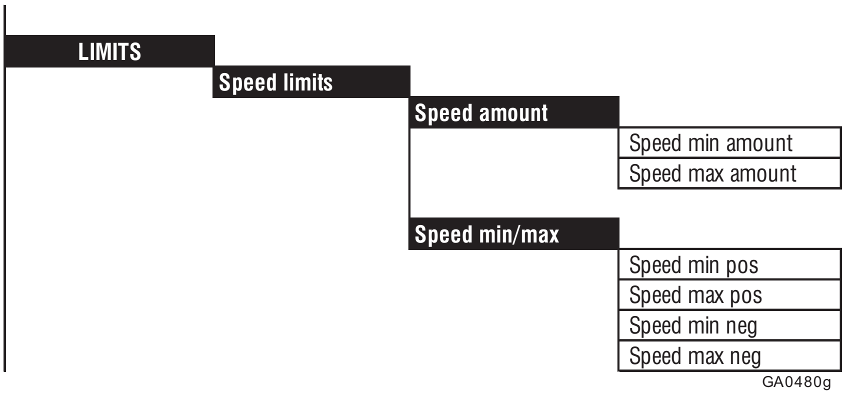
Example 1: **T current ref 1** = + 50 % **T current ref 2** = + 30 %
T current ref = 50 % + 30 % = 80 %

Example 2: **T current ref 1** = + 40 % **T current ref 2** = - 60 %
T current ref = 40 % - 60 % = - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals.
The torque current reference value has an upper limit.

2.6. LIMITS

2.6.1. Speed Limits



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed min amount [FF]	1	0	2^{32} -1	0	
Speed max amount [FF]	2	0	2^{32} -1	5000	
Speed min pos [FF]	5	0	2^{32} -1	0	
Speed max pos [FF]	3	0	2^{32} -1	5000	
Speed min neg [FF]	6	0	2^{32} -1	0	
Speed max neg [FF]	4	0	2^{32} -1	5000	
Speed limited	372	0	1		*

Ay6115

* This function can be assigned to a programmable digital output..

Speed min amount It defines the minimum speed for both directions. A value below the minimum value is not possible, regardless of the reference value selected. This parameter affects the ramp input. If the **Speed min amount** parameter is changed, the parameters **Speed min pos** and **Speed min neg** are set to the same value. If either of these parameters is subsequently changed, the last change is valid. The value to be entered is based on the factor function.

Speed max amount It defines the maximum speed for both directions. This parameter affects the input of the speed regulator and therefore it takes into account both the reference values that come from the ramp as well as the direction of rotation (see figure 2.5.2.1). If the **Speed max amount** parameter is changed, the **Speed max pos** and **Speed max neg** parameters are set to the same value. If either of these values is subsequently changed, the last change is valid. The value to be entered is based on the factor function.

Speed min pos It defines the minimum speed for the clockwise rotation of the motor. A value below the minimum is not possible, regardless of the reference value selected. This function effects the ramp input (see figure 2.5.1.1). The value of the parameter to be entered is based on the factor function.

Speed max pos It defines the maximum speed for the clockwise rotation of the motor. This function affects the input of the speed regulator and therefore takes into account both the reference values that come from the ramp as well as the directly entered values (see figure 2.5.1.1). The value of the parameter entered is based on the factor function.

Speed min neg It defines the minimum speed for the counter clockwise rotation of the motor. A value below the minimum is not possible, regardless of the reference value selected. This parameter affects the ramp input (see figure 2.5.1.1). The value of the parameter entered is based on the factor function.

Speed max neg It defines the maximum speed for the counter clockwise rotation of the motor. This parameter affects the input of the speed regulator and therefore it takes into account both the reference values that come from the ramp as well as the directly entered value (see figure 2.5.1.1). The value of the parameter entered is based on the factor function.

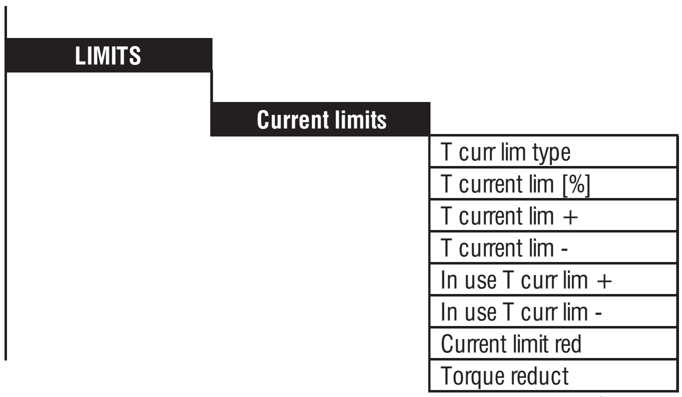
Speed limited Message that indicates that the reference value limited by the entered minimum and maximum limit values.

Speed limited Reference value limited since the value selected is out of range of the limit values defined.

Speed not limited Reference value within the defined limit values.

NOTE! The **Speed min amount**, **Speed min pos** and **Speed min neg** parameters have an effect on the **Ramp ref 1** reference value, the motor potentiometer function and the multi-speed function. They do not, however, have an effect on the **Ramp ref 2** parameter!

2.6.2. Current limits



GA0490g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
T curr lim type	715	0	1	T lim +/- (0)	
T lim + / -					
T lim mot gen					
T lim VDC Ctrl					
T current lim [%]	7	0	****	S	**
T current lim + [%]	8	0	****	S	**
T current lim - [%]	9	0	****	S	**
Curr limit state	349	0	1		Digital output5 ***
Curr. limit not reached					
Curr. limit reached					
In use Tcur lim+ [%]	10	0	****		
In use Tcur lim- [%]	11	0	****		
Current lim red [%]	13	0	****	100	
Torque reduct	342	0	1	Not act. (0)	*
Not actived					
actived					

GA6120

* This function can be assigned to one of the programmable digital inputs.

** This parameter can be assigned to a programmable analog input.

*** This function can be assigned to one of the programmable digital outputs.

**** This value depends on Full load torque curr Flt 100 mf (see chapter 2.9.)

The current limit parameters affect the input of the current regulator and only take into account the active current of the drive.

T curr lim type This parameter determines the behaviour of the drive in current limit condition.

T lim +/- The active positive torque limit is T current lim + and the active negative torque limit is T current lim -.

T lim mot gen With this selection 3 conditions are possible:

1 - If the motor speed > +1% of Motor nom speed the active positive torque limit is **T current lim+** and the active negative torque limit is **T current lim-**

2 - If the motor speed < -1% of Motor nom speed the active positive torque limit is **T current lim-** and the active negative torque limit is **T current lim+**.

3 - If -1% of Motor nom speed < motor speed < +1% of Motor nom speed both the active positive torque limit and the active negative torque limit are **T current lim+**.

T lim VDC Ctrl Enables the tension control function DC link (menu FUNCTIONS/VDC control f).

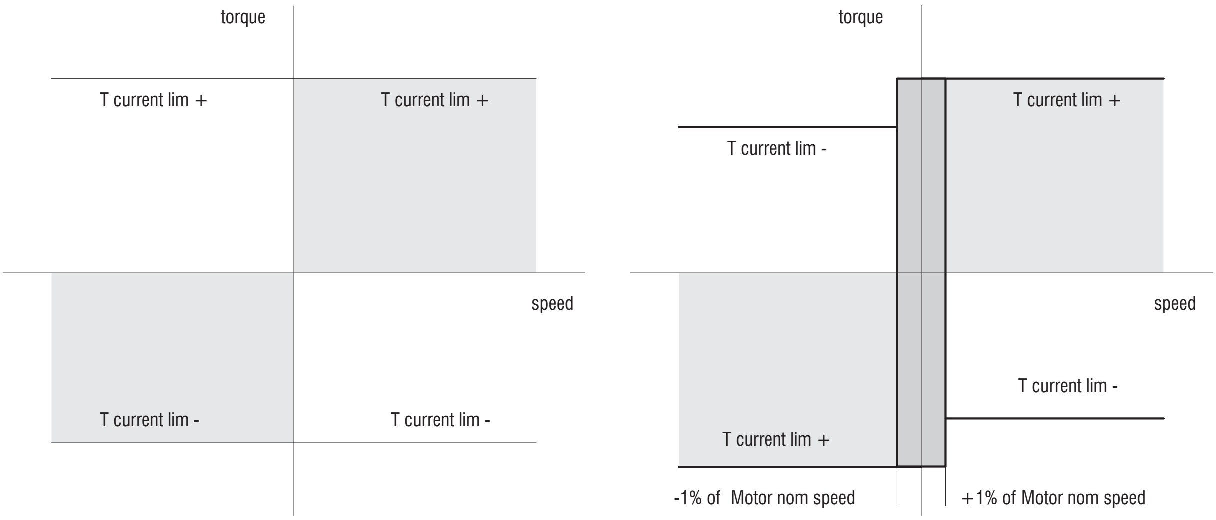


Figure 2.6.2.1 Tlim +/- , T lim not gen

In **Sensorless** mode there is also the following internal limitation :

NOTE! Parameter **Full load curr [179]** must be set equal to **Nominal Current [164]** of the motor.

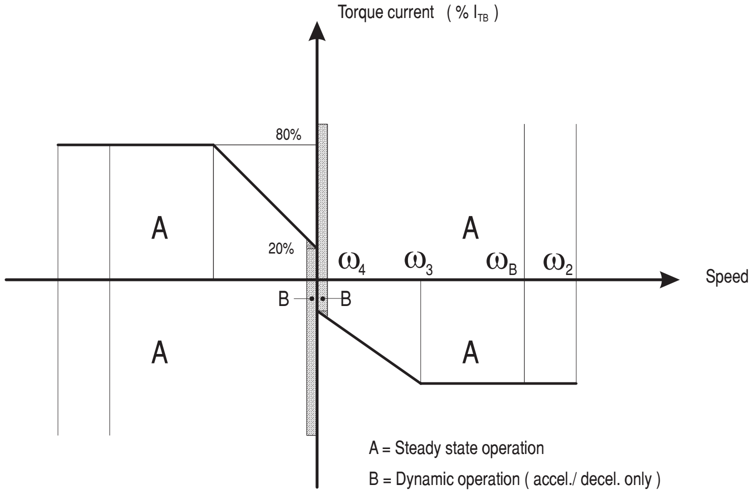


Figure 2.6.2.3 Current limits in sensorless mode

ω_B = Speed @ Base frequency $\omega_2 = 2{,}5 \times \omega_B$

$\omega_3 = 0{,}2 \times \omega_B$ $\omega_4 = 0{,}02 \times \omega_B$

I_{TB} = Torque current at **Base voltage** [167], **Base frequency** [168]

$$I_{TB} = \sqrt{(I_N)^2 - (I\mu_{work})^2}$$

f031

Where: I_N = **Nominal current** [164]

$I\mu_{WORK}$ = **Magn working curr** [726]

T current lim Symmetrical current limit for both current directions. If the **T current limit** parameter is changed, the Parameter **T current lim +** and **T current lim -** parameters are set to the same value. If any of these parameters is subsequently changed, the last change is valid.

T current lim + Setting of the drive current limit for the positive current direction (clockwise drive and counter-clockwise brake).

T current lim - Setting of the drive current limit for the negative current direction (counter-clockwise drive and clockwise brake).

T current lim, **T current lim+**,**T current lim -** are specified as a percentage of:

Full load torque curr Flt 100 mf (see section 2.9 “Current regulation”).

Curr limit state It indicates whether the drive is working at current limit or not.

Current limit reached Drive working at the current limit. “I limit” LED lights up.

Current limit not reached Drive not working at the current limit.

In use Tcur lim + Positive Current limit value in use

In use Tcur lim - Negative Current limit value in use

Current lim red Selection of **T current lim +/-** value, for use with **Torque reduct** (torque reduction) function.

Torque reduct Selection for torque reduction. This function can be assigned to a programmable digital input. When the torque reduction function is active, the current limit is reduced to the percentage defined with the **Current lim red** parameter.

Low Torque reduction not active

High Torque reduction active

Example of the function of the **Current lim red** and **Torque reduct** parameters.

T current limit (or **T current lim +/-**) = 80 %

Current lim red = 70 %

Torque reduct = Low (not active)   Current limit = 80 %

Torque reduct = High (active)   Current limit = 70 %

The value for **T current lim** can be set in the BASIC MENU.

2.6.3 Flux limits

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Flux level	467	0.00	100	100	*

GA6121g

* This parameter can be assigned to one of the programmable Analog output and Analog input

Flux Level Percentage limit of the working flux.

Working flux is internally computed according to choice of **Base Voltage** and **Base frequency** parameter.

See also chapter 2.10 Flux regulation

2.6.4 Voltage limits

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Dynamic vlt margin [%]	889	01.00	10.00	01.00	

GA6122g

Dynamic vlt margin It corresponds to the voltage regulation margin with respect to the nominal one available.

In case of a **Base voltage** setting close to or equal to the actual value of the main, **Dynamic vlt margin** represent the margin allowable by the voltage regulation to perform current variations when load steps are suddenly applied.

A 5% value allows a very fast response to load steps but at a loss of voltage (and maximum power).

The minimum value (1%) allows to obtain a maximum output voltage around the 98% of the main voltage but at a loss of quality of dynamic response.

2.7. RAMP

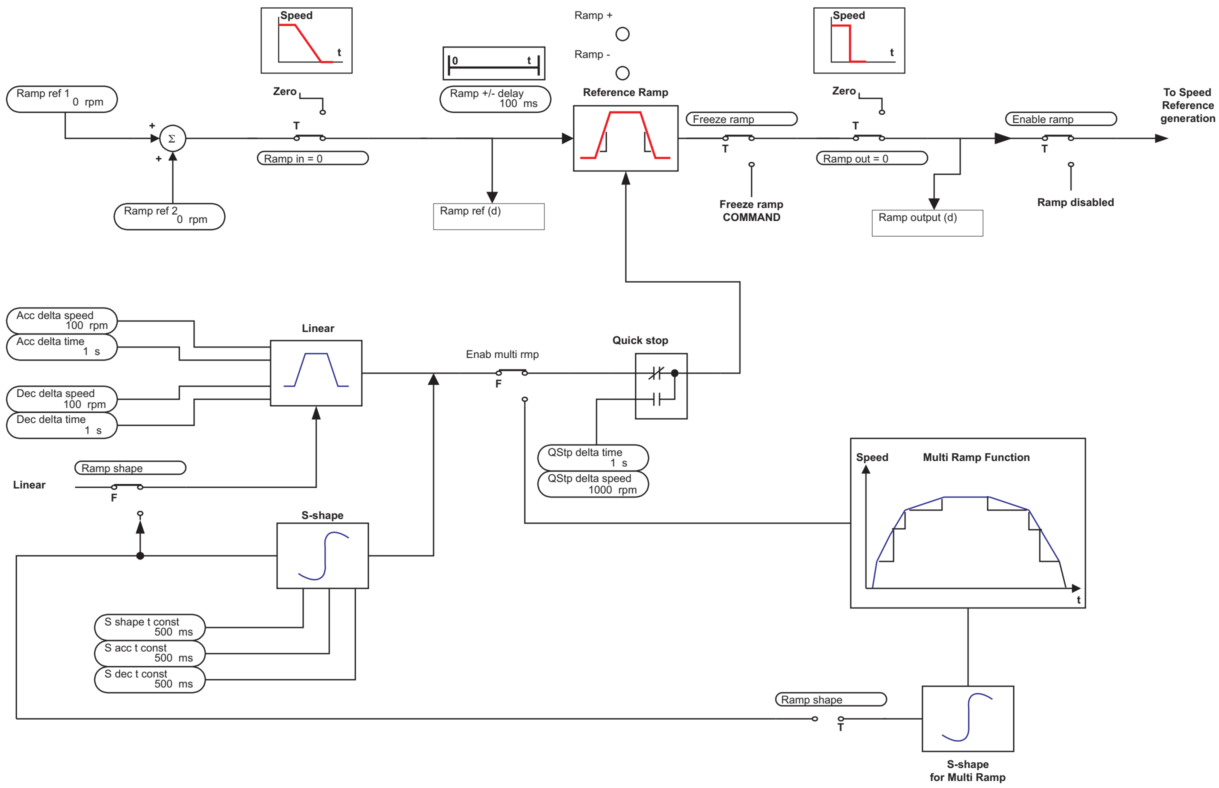


Figure 2.7.1: Ramp

The ramp (reference value integrator) determines the acceleration and deceleration times of the drive. These times can be set independently of each other. An additional ramp is provided for fast stop. This ramp can be activated via the serial interface or a bus or via terminal strip (Fast Stop).

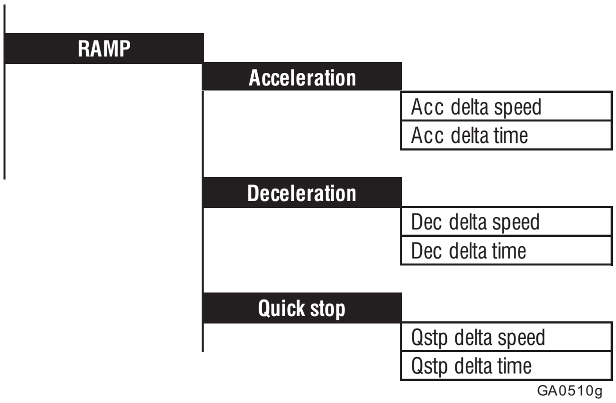
The ramp can either be linear or S-shaped.

The reference values can be defined in three ways

- with the **Ramp ref 1** and/or **Ramp ref 2** reference values
- with the multi-speed function
- with the motor potentiometer function

The Ramp generator can be used in a stand alone configuration. When the Ramp generator is disabled (**Enable Ramp** = disabled), the Enable drive, Start/Stop and Fast stop commands have no more influence on Ramp generator. In such a condition it is free to run and can be used separately.

2.7.1. Acceleration, Deceleration, Quick Stop



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Acc delta speed [FF]	21	0	2^{32} -1	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	2^{32} -1	100	
Dec delta time [s]	30	0	65535	1	
Qstp delta speed [FF]	37	0	2^{32} -1	1000	
Qstp delta time [s]	38	0	65535	1	

GA6125g

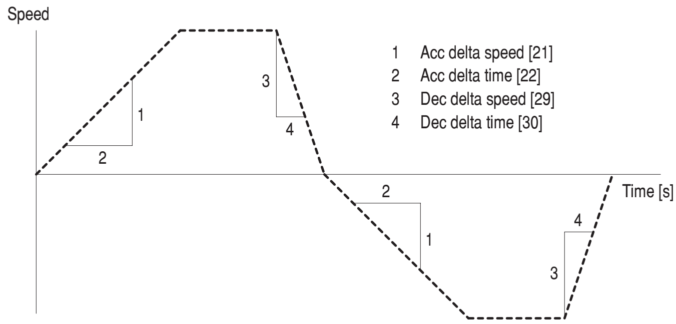


Figure 2.7.1.1: Accel, Decel, and Quick stop

Acc delta speed Has the same unit as the ramp reference value and is based on the factor function.

Acc delta time Is defined in seconds. If "0 s" is entered,the ramp output directly follows the reference value.

Dec delta speed Has the same unit as the ramp reference value and is based on the factor function.

Dec delta time Is defined in seconds. If "0s" is entered, the ramp output directly follows the reference value.

Qstp delta speed Has the same unit as the ramp reference value and is based on the factor function.

Qstp delta time Is defined in seconds. If "0 s" is entered,the ramp output directly follows the reference value.

Quick stop Activates the Quick stop ramp and disables the Drive when halted

Fast stop Activates the Quick stop ramp and holds the motor at zero speed under control

The acceleration of the drive is defined as a ratio of the **Acc delta speed** and **Acc delta time** parameters (see figure 2.7.1.1). It is the same for both directions of rotation.

The deceleration of the drive is defined as a quotient of the parameters **Dec delta speed** and **Dec delta time** (see figure 2.7.1.1). It is the same for both directions of rotation.

The Quick Stop and Fast stop functions provide the possibility of an indipendent deceleration ramp for the emergency braking of the drive. The ramp output in this case is not set to zero immediately but after a set time. The deceleration of the drive via the Quick Stop function is defined as the ratio of the **Qstp delta speed** and **Qstp delta time** parameters. It is the same for both directions of rotation. If the parameter **Qstp Opt code** = DC Braking curr, the Drive is stopped by injection of DC current.

2.7.2. Ramp shape and control commands

RAMP

- Ramp shape
- S shape t const
- S acc t const
- S dec t const
- Ramp +/- delay
- Fwd-rev
- Enable ramp
- Ramp out = 0
- Ramp in = 0
- Freeze ramp

GA0520g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ramp shape Linear S shaped	18	0	1	Linear (0)	
S shape t const [ms]	19	100	3000	500	
S acc t const [ms]	663	100	3000	500	
S dec t const [ms]	664	100	3000	500	
R amp+	346	0	1		Digital output 1 **
R amp-	347	0	1		Digital output 2 **
Ramp +/- Delay [ms]	20	0	65535	100	
Fwd-Rev No direction Fwd direction Rev direction No direction	673	0	3	Fwd (1)	
Forward sign	293	0	1	0	
Reverse sign	294	0	1	0	
Enable ramp (Enabled/Disabled)	245	0	1	Enabled (1)	
Ramp in = 0 Active Not Active	345	0	1	Not active (1)	*
Ramp out = 0 Active Not Active	344	0	1	Not active (1)	*
Freeze ramp Active Not Active	373	0	1	Not active (1)	*
Ramp outp (rpm)	113	-32768	+32767		
Ramp output (d)	112	-32768	+32767		***
Ramp output (%)	114	-200.0	+200.0		

GA6130g

* This function can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to a programmable digital output.
*** This parameter can be assigned to a programmable analog output.

The shape of the ramp is determined by the **Ramp shape** and **S shape t const** parameters.

Ramp shape	Linear	Linear ramp
	S shaped	S-shaped ramp
S shape t cons	Determines the curve for S-shaped ramps (see figure 2.7.2.1).	

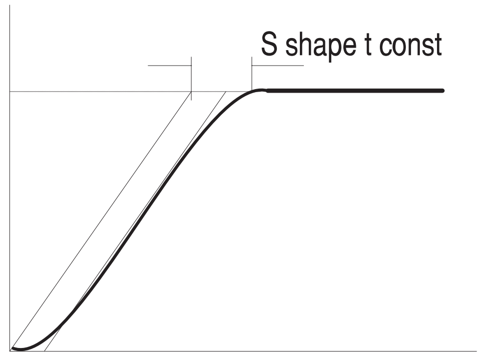


Figure 2.7.2.1: Ramp shape

The value of **S shape t const** is added to the ramp time of linear ramps. The ramp time is thus lengthened by the value defined by the **S shape t const** parameter. This is done regardless of the speed change involved!

S acc t const Determines the curve for S-shaped acceleration ramps

S dec t const Determines the curve for S-shaped deceleration ramps

Using very different **S acc t const** and **S dec t const** values it is possible to have a discontinuous behaviour during the changing of the motor direction.

Speed changes (= Ramp active) are indicated by the **Ramp + and Ramp - parameters.**

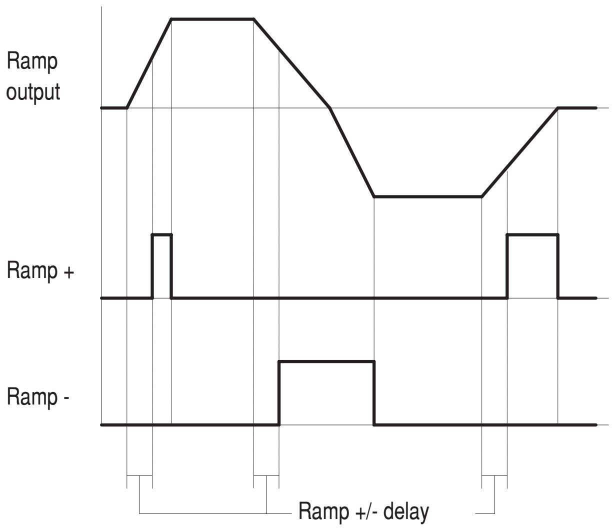


Figure 2.7.2.2: Ramp delay

Ramp + Active, if the drive has a positive torque (clockwise drive and counter clockwise brake)

Ramp - Active if the drive has a negative torque (counter clockwise drive and clock-wise brake).

Ramp +/- delay It defines a delay time for Ramp+ and Ramp- commutations.

Fwd-Rev Changes the sign of the Ramp reference. When Fwd direction is selected the Ramp reference is multiplied by +1. When Rev direction is selected the Ramp reference is multiplied by -1.

Forward sign Sets the Fwd direction of the Ramp reference. It can be programmed on a digital input.

Reverse sign Sets the Rev direction of the Ramp reference. It can be programmed on a digital input.

When both Fwd and Rev are 0 or 1, or Fwd-Rev is 0 or 1 the multiplier is 0.

The behavior of the ramp is defined by the **Enable Ramp**, **Ramp In = 0**, **Ramp Out = 0** and **Freeze ramp** parameters.

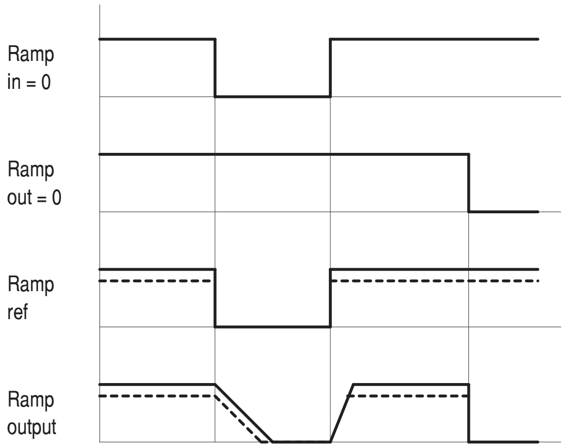


Figure 2.7.2.3 Ramp control

This parameter can be used only with a disabled drive.

Enable Ramp	Enabled	Ramp function enabled.
	Disabled	Ramp function disabled.
Ramp in = 0	Not Active	Ramp input is enabled. The **Ramp Ref** parameter corresponds to the reference value set.
	Active	The ramp input is disabled. **Ramp Ref** = 0
Ramp out = 0	Not Active	The ramp output is enabled.
	Active	The ramp output is set to zero immediately.
Freeze ramp	Not Active	The value at the ramp output is kept, regardless of any possible reference value changes at the ramp input
	Active	The ramp output follows the reference value changes at the ramp input according to the times set.

Ramp outp (rpm) Ramp output in rpm (revolutions per minute)

Ramp output (d) Ramp output in the dimension defined by the factor function

Ramp output (%) Ramp output as a percentage of the **Speed base value**

Drive operation is only possible with the ramp function enabled. **Enable ramp** = Enabled.

When the ramp input is enabled via **Ramp in = 0,** the acceleration time of the drive starts. If the input is disabled, the drive slows down according to the deceleration time set till a zero speed.

When the ramp output is set to zero via **Ramp out=0,** the drive brakes at current limit (maximum available torque). The ramp function (also **Quick Stop**) has no effect.

2.8. SPEED REGULATION

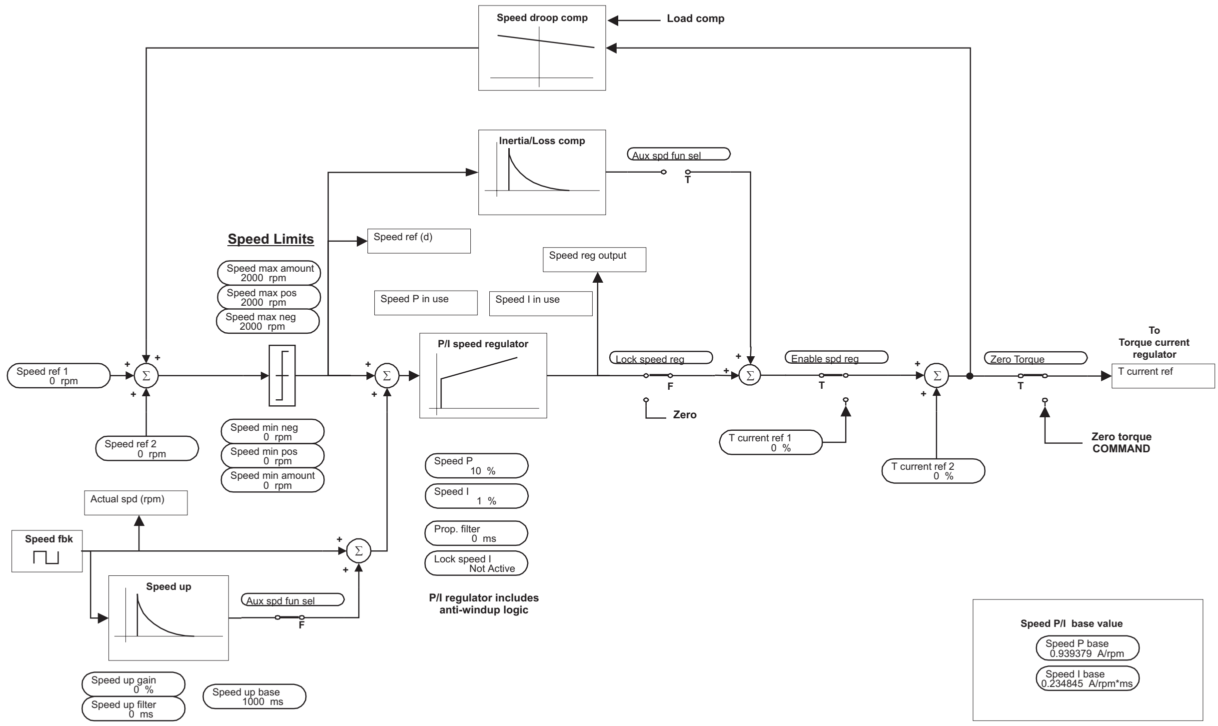


Figure 2.8.1: Speed regulator

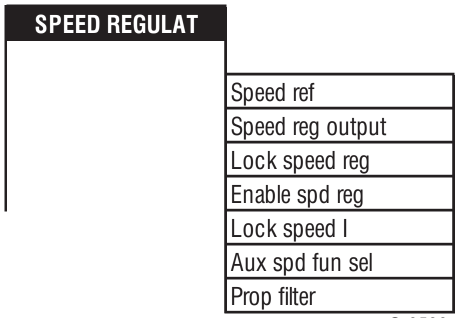
The AVy Drives are provided with a speed regulator circuit that can be adapted to the requirements of various applications. The device is factory set for PI behaviour with constant P and I gains.

The following functions are also provided:

- "Speed up" function in order to avoid oscillations in presence of loads with a high moment of inertia.
- Speed zero logic for regulator behaviour when the motor is stopped.
- Speed regulator adaption for optimizing the regulator according to the current speed or to an external reference (Adap Reference).
- Motor captive function for engaging the running motor
- Speed control logic
- Speed signals
- Droop function for current balancing

The internal structure of the speed regulator is shown on manual AVy Quick Start up, see chapter 7 "Speed regulator PI part" block diagram.

2.8.1. Speed regulator



Ga0530

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed ref [rpm]	118	-32768	+32767	-	**
Speed reg output	236	-	-	-	T current ref 1**
Lock speed reg	322	0	1	OFF	*
ON					
OFF				(0)	
Enable spd reg	242	0	1	Enabled	
Enabled				(1)	
Disabled					
Lock speed I	348	0	1	Not active	*
Active					
Not active				(1)	
Aux spd fun sel	1016	0	1	Speed up	
Speed up				(0)	
Inertia/loss cp					
Prop filter [ms]	444	0	1000	0	

Ga6135

* This function can be assigned to one of the programmable digital inputs.

** This parameters can be assigned to a programmable analog output.

Speed ref Total speed reference value in rpm (revolutions per minute)

Speed reg output Output value of the speed regulator, used as the reference value for the torque current regulator

NOTE! **Speed reg output [%]** contains valid information even if the speed regulator is disabled (Enable speed reg = Disabled). If Speed reg output is enabled, it contains the sum of actual speed regulator output and **T current ref 2.**

Lock speed reg This parameter is used in order to separate the speed regulator output from the torque current regulator during operation. When this happens, the torque current reference value is set to zero and the drive coasts to a halt. This coasting time then depends on the rotating mass and the friction within the system concerned. If the connection between the speed regulator and the current regulator is restored, the drive will restart in the shortest possible time.

ON Speed regulator / torque current regulator connection separated (= when using a digital input).

OFF Speed regulator / torque current regulator connection present (= 15...30 V when using a digital input).

Enable spd reg This parameter can only be changed when the drive is switched off.

Enabled — The speed regulator is enabled. The regulator output is connected to the input of the torque current regulator. **Speed reg output** = **T current ref 1**

Disabled — The speed regulator is disabled.

Lock speed I Not active — I component of the speed regulator is active

Active — I component of the speed regulator is set to zero

Aux spd fun sel Selection of the Speed up or Inertia/loss comp function (see chapter 1.3.5.4 & 2.8.4 for other details).

Prop filter Time constant of the filter belonging to the circuit of the speed feedback. Filtering og the high frequency components of speed feedback signal is useful in case of elastic coupling between motor and load (joint or belts)

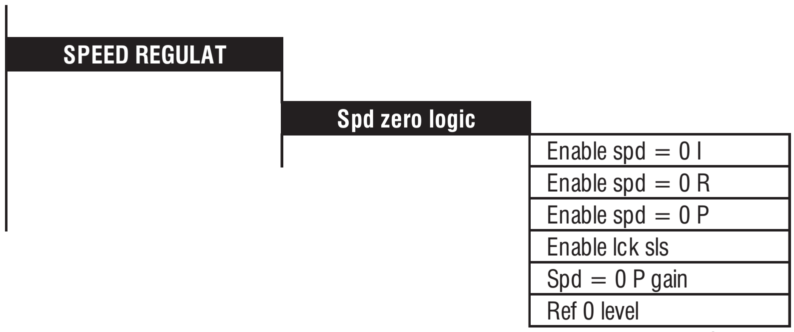
NOTE! The speed regulator must be enabled with the **Enable spd reg** parameter in order to use it. The reference value for the speed regulator consists of the signed addition of **Speed ref 1** and **Speed ref 2.**

For Field oriented mode the actual value is supplied by an encoder that is mounted to the motor shaft. The higher the resolution of the encoder, the better the control accuracy of the regulator. for Sensorless mode, the actual value is computed by the flux model block in the regulation scheme.

The regulator parameters can be set separately.

The internal structure of the speed regulator is shown on manual AVy Quick Start up, see chapter 7 “Speed regulator PI part” block diagram.

2.8.2. Spd zero logic



GA0541g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable spd=0I Enable Disable	123	0	1	Disabled (0)	
Enable spd=0R Enable Disable	124	0	1	Disabled (0)	
Enable sped=0P Enable Disable	125	0	1	Disabled (0)	
Spd=0P gain [%]	126	0.00	100.00	10.00	
Enable lck sls Enable Disable	422	0	1	Disabled (0)	
Ref 0 level [FF]	106	1	32767	10	

GA6140g

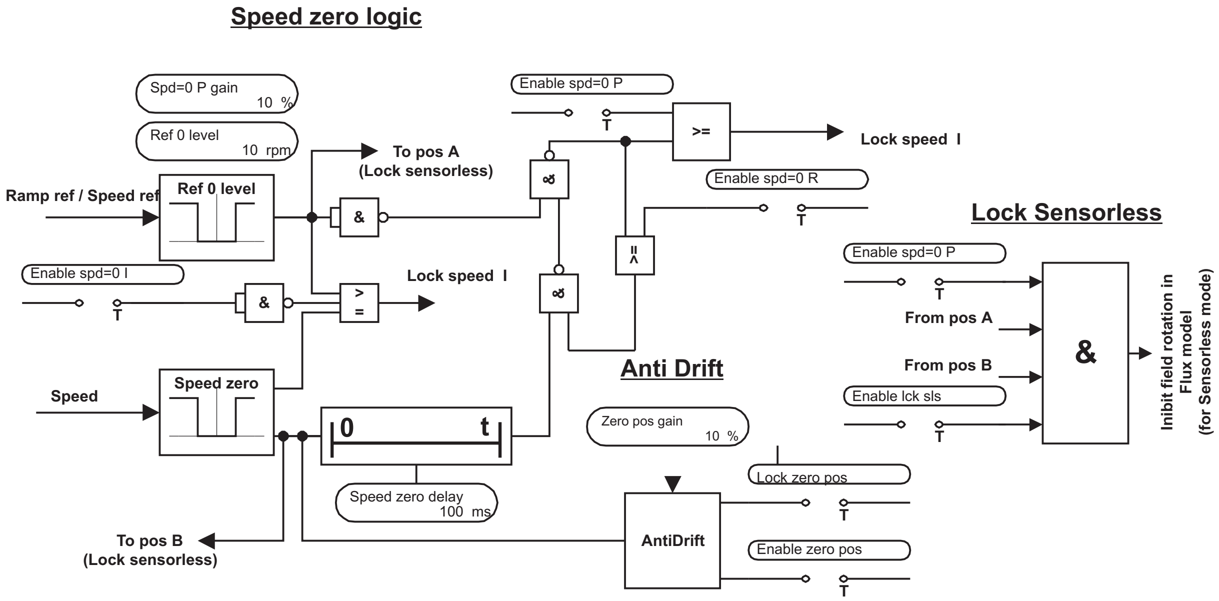


Figure 2.8.2.1: Speed adaptive and Speed zero logic

The speed zero logic defines the behavior of the drive when the motor is at a stop.

Enable spd=0 I

Enabled — The I component of the speed regulator is set to zero when the reference value and the actual value = 0. The drive control is then only proportional. The I component is enabled when a reference value is entered to restart acceleration.

Disabled — The I component of the speed regulator is effective also when the motor is at a stop.

Enable spd=0 R

Only effective if **Enable spd=0 P** is enabled.

Enabled — The proportional **Spd=0 P gain** used when the drive is at a halt is suspended when the speed reference value is above the value defined by **Ref 0 level**.

Disabled — The proportional **Spd=0 P gain** used when the drive is at a halt is suspended when the speed reference value or the speed actual value is above the value defined by **Ref 0 level**.

Enable spd=0 P

Enabled — When reference value and Actual speed are respectively below **Ref 0 level** and **Speed zero level** (“ADD SPEED FUNCT\Speed zero” menu), after the time delay defined by **Speed zero delay**, the proportional and integral gains of the speed regulator are set respectively to **Spd=0 P gain** and to zero. **Spd=0 P gain** deactivation is based on **Enable spd=0 R** parameter.

Disabled — The speed regulator keeps its normal proportional gain when the drive is at a halt.

For **Speed zero level** and **Speed zero** delay parameter, see section 2.14.4.

Spd=0 P gain — Proportional gain of the speed regulator, that is only active when the **Enable spd=0 P** function has been enabled.

Enable lck sls — This parameter is used for **Sensorless** control. This function (Enabled lck sls=Enabled) disables speed control and field rotation when the speed reaches the threshold of zero speed detection. This avoids the drift of the motor shaft. Direct current equal to magnetizing current is injected. No significant torque reaction is possible at standstill with this function enabled. This function is active when **Enable Spd = 0P** is enabled.

Ref 0 level — Switch threshold for speed zero logic for zero reference detection. Defined in the unit specified in the factor function. References below this threshold are defined as zero.

2.8.3 Anti Drift Function

GA0493g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable zero pos Disable Enable	890	0	1	Disabled (0)	
Lock zero pos OFF ON	891	0	1	OFF (0)	*
Zero pos gain [%]	892	0	100	10	

GA6123g

* This parameter can be assigned to one of the programmable digital input

Enabling this function locks the rotor of the motor at zero speed without drift, using an internal position control.

It is activated via digital input or Bus, using the command **Lock zero pos**, and when the threshold of zero speed (**speed zero level**) detection is reached.

Enable zero pos Enable Anti drift function enabled
Disable Anti drift function not enabled

Lock zero pos This command enables (ON) the Anti drift function through the digital input, keypad or Bus

Zero pos gain [%] Proportional gain of the position control

Also refer to parameters ADD SPEED FUNCT / Speed zero / **Speed zero level** and **Speed zero delay**

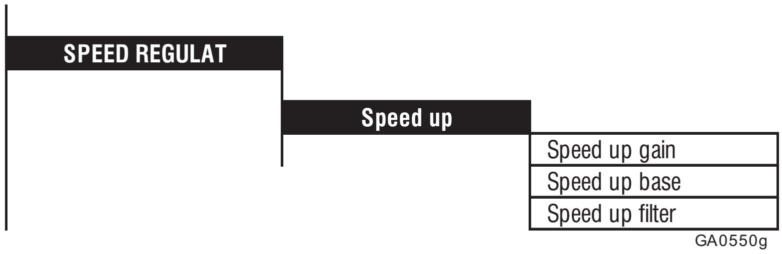
Application example:

- Enable zero pos = Enabled
- Lock zero pos = Enabled
- Motor is running at 1000 rpm
- Speed zero level = 10 rpm
- Speed zero delay = 100 ms

When the STOP command is active and the motor reaches 10 rpm, the position control is automatically activated after 100 msec.

For restart the motor, it is necessary to set the command Lock zero pos = Disabled before to give the START command.

2.8.4. Speed-up function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed up gain [%]	445	0.00	100.00	0.00	
Speed up base [ms]	446	0	16000	1000	
Speed up filter [%]	447	0	1000	0	

GA6150g

The Speed-up function is used in order to avoid oscillations in presence of loads with a high moment of inertia. It is made up of a D derivative part in the speed feedback circuit, which increases the integral gain of the speed regulator and limits the overshoot. It is also useful in case of cyclical non constant loads on the motor (ex. cams). The feedback applied to the speed regulator is made of two components:

- the motor speed
- the output signal from the Speed up function

This function is mutually exclusive to the **Inertia/loss comp** function, This selection must be done via the **Aux spd fun sel** [1016] parameter. (SPEED REGULAT menu). See section 2.8.1 Speed regulator.

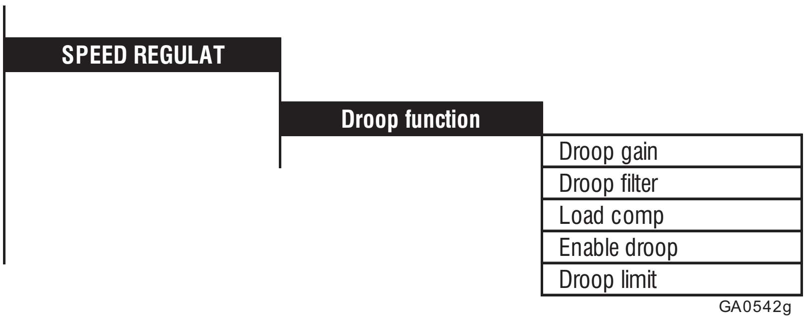
Speed up gain Speed up function gain as a percentage of **Speed up base**

Speed up base Speed up function max. gain. The defined value corresponds to 100% of the **Speed up gain** parameter.

Speed up filter Time constant of the filter belonging to the Derivative part of the Speed up function.

(see example figure 1.3.5.1 and 1.3.5.2)

2.8.5. Droop function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Droop gain [%]	696	0.00	100.00	0.00	
Droop filter [ms]	697	0	1000	0	
Load comp [%]	698	F	F	0	*
Enable droop (Enable / Disable)	699	0	1	Disabled (0)	**
Droop limit [FF]	700	0	2*P45	1500	

GA6145ai

* This parameter can be assigned to one of the programmable digital inputs.
** This parameter can be assigned to a programmable analog outputs.

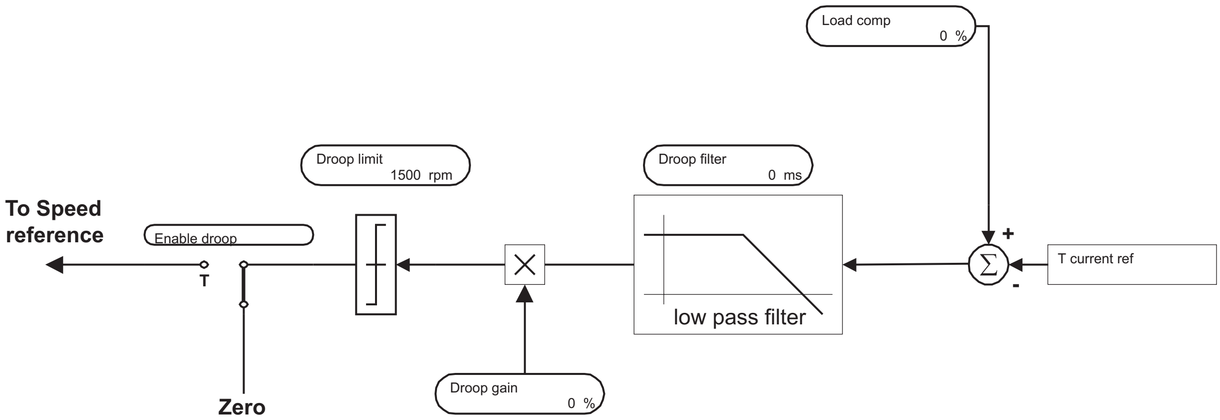


Figure 2.8.5.1: Droop compensation

The Droop function is used when current balancing between two drives is required. A typical situation is when two motors are mechanically coupled and have to run at the same speed. If, because of a different characteristic of the two speed regulators, one motor is driven to run at a higher speed, it will be overloaded and the second motor will work as a brake. The Droop function avoids this by adding a component in the speed reference of a drive, which is proportional to the actual load difference of the drives. The effect is the balacing of the two motor current.

Droop gain Droop function gain. It is defined as a percentage of the ratio between **Speed base value** and the difference **Load comp - T current ref.** That means that when the difference **Load comp - T current ref** is 100% and **Droop gain** = 100%, the speed reference correction signal is equal to **Speed base value**.

Droop filter Filter time constant.

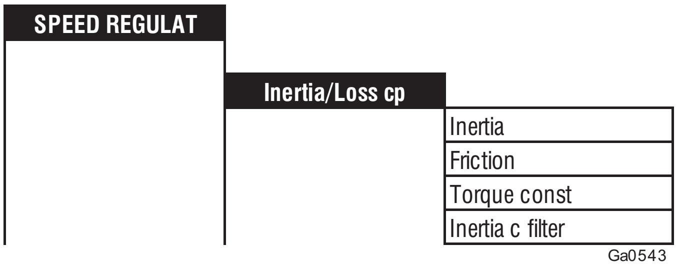
Load comp Load compensation signal. It is typically equal to the “master” drive current, but it can also be provided by an external control (PLC, etc). The parameter can be assigned to a programmable analog input. It is defined as a percentage of Idn.

Enable droop Enabled Droop function enabled.
Disabled Droop function disabled.

Droop limit It defines the speed range in which the droop function is active. The value to be entered is based on the factor function.

(For more detail see figure 2.8.1 Speed regulator)

2.8.6 Inertia/Loss comp



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Inertia [Kg*m*m]	1014	0.001	999.999	S	
Friction [N*m]	1015	0.000	99.999	S	
Torque const [N*m/A]	1013	0.01	99.99	S	
Inertia c filter [ms]	1012	0	1000	0	

Ga6146

S = depending on the Drive size

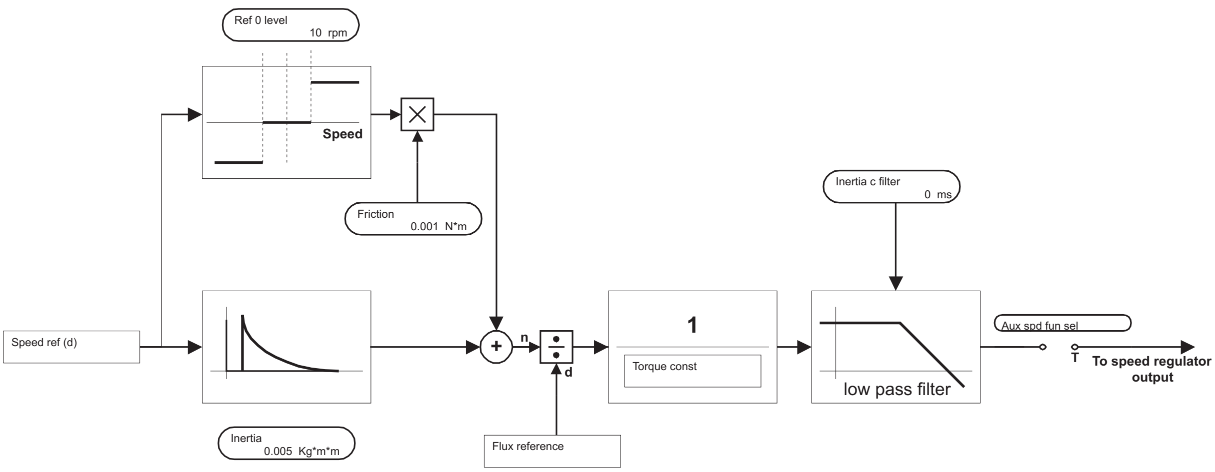


Figure 2.8.6.1: Inertia/Loss compensation

Speed regulator feedforward term that allows to increase the dynamic response to a speed reference variation. These parameters are identified from the Speed self tune function (DRIVE PARAMETER\Motor parameter\Self tuning\Self-tune 3) but they can also be set from the user.

This function is mutually exclusive to the Speed up function, This selection must be done via the **Aux spd fun sel [1016]** parameter. (SPEED REGULAT menu). See section 2.8.1, Speed regulator.

This function does not apply to “V/f control” regulation mode.

Inertia Total Inertia value at the motor shaft in Kg*m^2 identified during the speed self tune procedure. (**1 Kg*m^2 = 23.73 lb*ft^2**)

Friction Friction value (or Loss compensation) in N*m identified during the speed self tune procedure. (**1 N*m = 0.738 lb*ft**)

Torque const Total torque constant value internally computed that allows to obtain the Nm – Amps conversion when the motor operates within the specified **Base voltage** and **Base frequency** range. In order to take field weakening into account, this value must be scaled using the value of **Flux reference [500]**.

Inertia c filter 1st order low pass filter time constant. The filter reduces the noise value owed to the operation of the speed differentiation in the Inertia compensation block.

Inertia/Friction: default value

Drive size	Inertia [Kg*m*m]	Friction [N*m]
1007	0.0018	0.001
1015	0.0035	
1022	0.0048	
1030	0.005	
2040	0.011	
2055	0.023	
2075	0.028	
3110	0.05	
3150	0.07	
4220	0.15	
4300	0.24	
4370	0.44	
5450	0.52	
5550	0.79	
6750	1.4	
7900	1.6	
71100	2.2	
71320	2.7	
81600	3.2	

Gy6147

[1013] **Torque const** is an internal value which is computed as a function of motor plate data when **Take motor par** is asserted.

2.9. CURRENT REGULATION

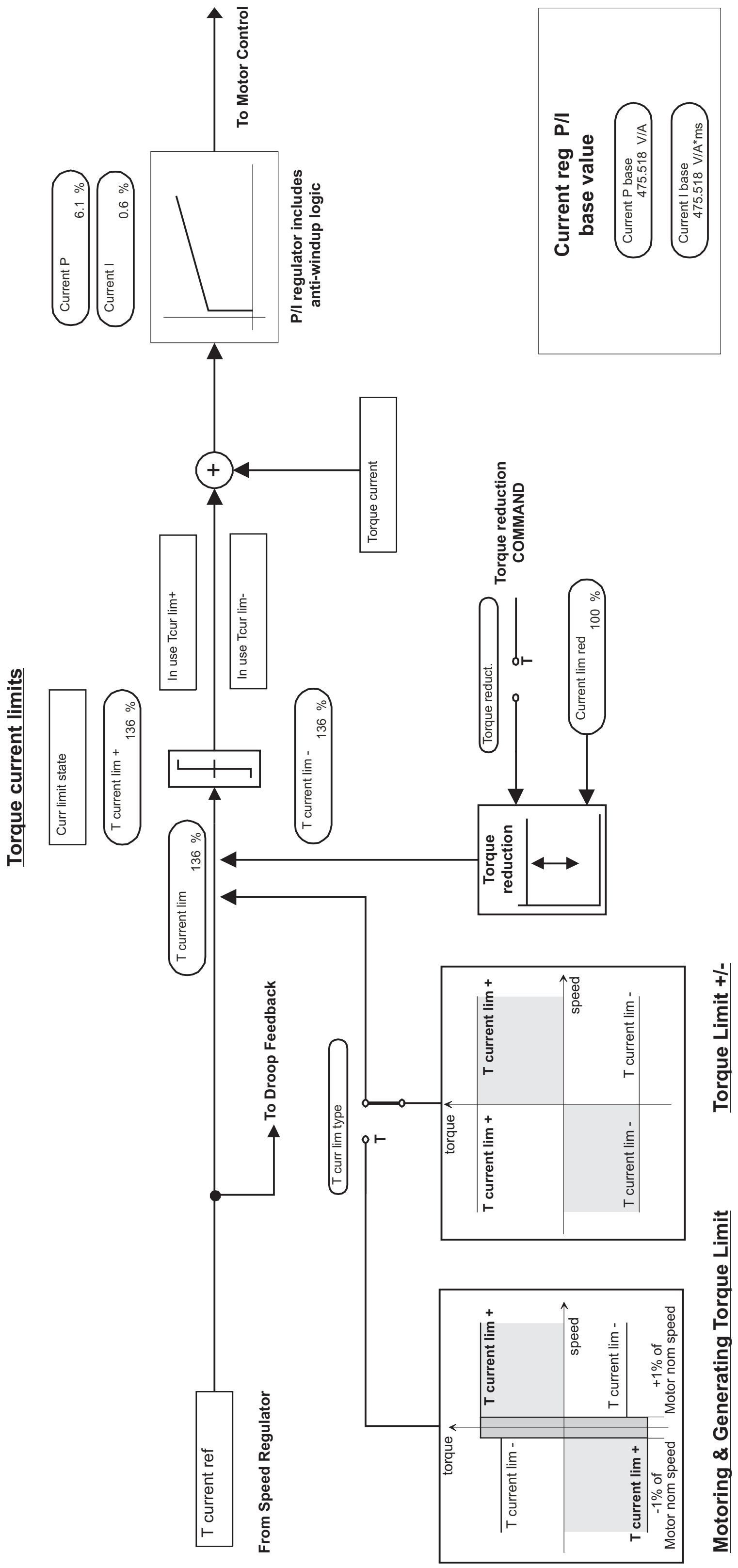


Figure 2.9.1: Torque current regulator

CURRENT REGULAT

Zero torque

ai691

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Torque current	350	S	S		**
Flux current	351	S	S		**
F current ref	352	S	S		**
Zero torque	353	0	1	Not Active	*
Active					
Not Active				(1)	

GA6155g

* This function can be assigned to one of the programmable digital inputs.

** This parameters can be assigned to a programmable analog output.

The user defines the full load current of the motor via the **Full load curr** (FLC) parameter in the CONFIGURATION menu. This is at the same time the output current of the drive when **T current ref** = 100 %. The drive calculates the value $I\mu_{WORK}$ of magnetizing current required according to **Base voltage** and **Base frequency** and the defined motor data for operation in the base speed range. **F current ref**, during steady state operation in the base speed range, approximately equals $I\mu_{WORK}$. The active motor current in this operating condition is called "Full load torque current" and it is computed as:

$$\text{Flt 100mF} = \sqrt{(FLC)^2 - (I\mu_{WORK})^2}$$

fA021

The **Torque current reference** and **Torque current limit** percentage values are based on **Flt 100mF**. Note that Flt 100mF is an external parameter and not aceessible to the user.

Therefore, percentage quantities based on **Flt 100mF** represent torque quantities in the base speed range (scaling by the flux percentage is required in the field weakening range).

Percentage quantities based on FLC refer to total inverter output current. Overload control typically deals with these quantities.

The current regulator consists of two control loops:

- a control loop for the active current "Torque current" (Abbr.: T current)
- a control loop for the reactive current "Flux current" (Abbr.: F current)

They use the same P and I gains. See the regulation block diagram, in section 7, "Block Diagrams" (AVy Quick Start Up manual).

Torque Current Active current of the motor (actual value). This value can be assigned to a programmable analog output.

Flux Current Reactive current of the motor (actual value). This value is only available via the serial interface.

F current ref Reference value for the flux current (generated internally). This value can be assigned to a programmable analog output.

Zero torque This parameter can be used to set the reference value for the reactive current **T current ref** to zero so that the drive has no torque.

Not Active (H) - **T current ref** not set to zero

Active (L) - **T current ref** set to zero. The drive has no torque.

2.10 FLUX REGULATION

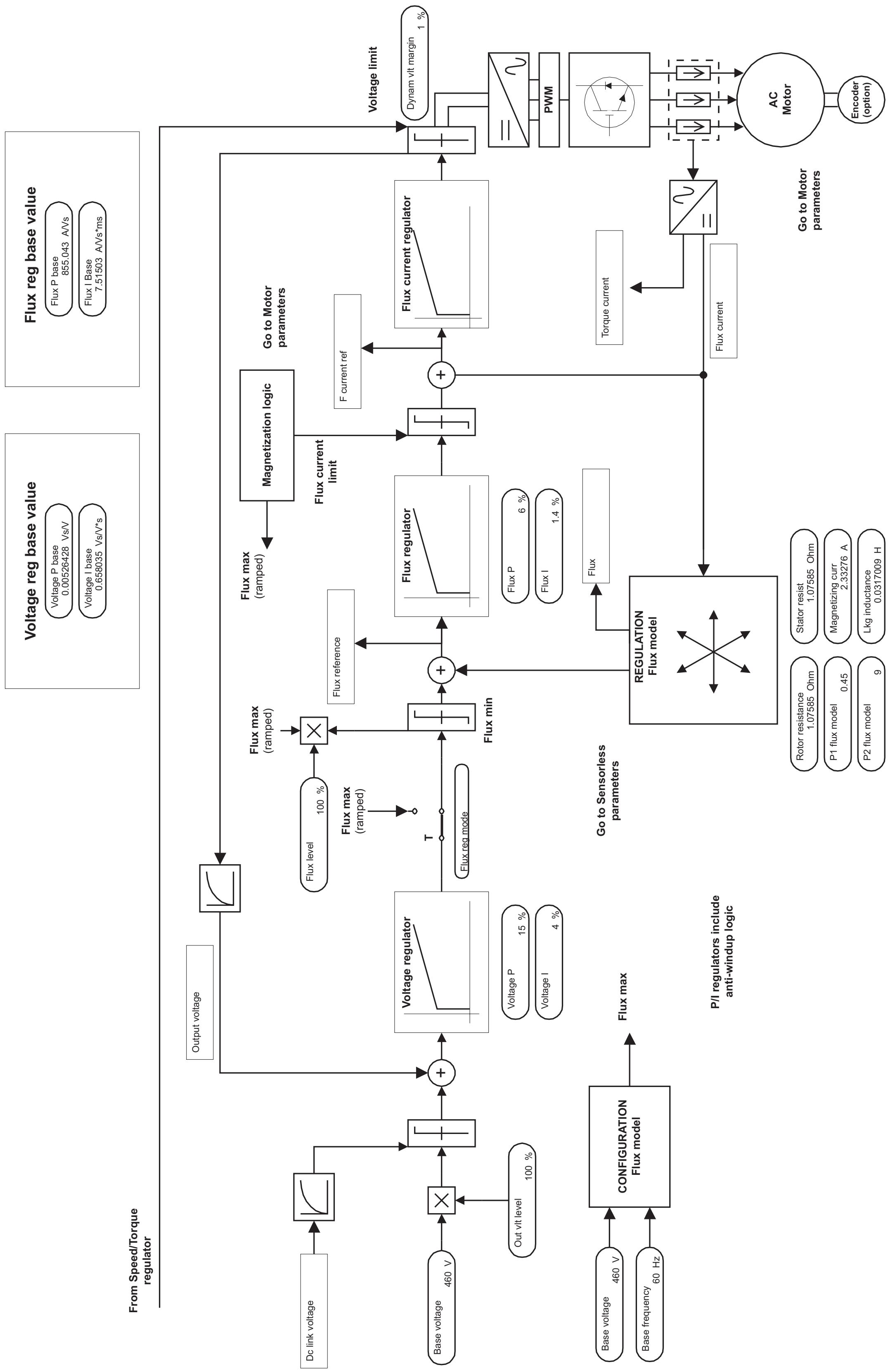


Figure 2.10.1: Motor control

FLUX REGULATION

- Flux reg mode
- Flux reference
- Flux
- Out vlt level

GA0551g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Flux reg mode	469	0	1	Volt. control	
Constant current					
Voltage control				(1)	
Flux reference	500	0.0	100.0	-	*
Flux	234	0.00	100.00	-	*
Out vlt level	921	0.0	100.0	100.0	**

GA6151g

* This parameter can be assigned to one of the programmable Analog output

** This parameter can be assigned to one of the programmable Analog output and Analog Input

The AVy Drive contains the "flux control" regulator (working flux) and the "Voltage control" regulator. The magnetization curve (P1 flux model [176] and P2 flux model [692] parameters) is automatically defined through the Self tuning procedure.

Via the **Flux level** [467] parameter (Limit\Flux Limit) it is possible to set the working flux value and via the Out vlt level [921] it is possible to set the motor output voltage.

Flux reg mode Operating mode selection of the Flux regulator

Constant current By this selection, the motor flux is automatically set and controlled according to the setting of **Base voltage** and **Base frequency**, by the voltage really available on the DC link and by the output frequency of the inverter.

This functionality must be used when it is necessary to perform an external control of the motor flux (for example through the DGF card or through an analog input).

Voltage control By this selection the regulator tends to mantain the flux value constant, for all the working range of the motor, independently from the value of the output frequency and from the voltage available on the DC link.

Flux reference Flux reference, indicated as a percentage of the working flux (defined by **Base voltage** [167] and **Base frequency** [168] values).

Flux Flux feedback, indicated as a percentage of the working flux (defined by **Base voltage** [167] and **Base frequency** [168] values).

Out vlt level By this selection, it is possible to modify the voltage value corresponding to the defluxing setpoint of the motor.

Out vlt level is defined as percentage of **Base voltage**.

Out vlt level is operative only in condition of **Flux reg mode** = **Voltage control**

Working on parameters **Out vlt level** and **Flux level** (LIMIT/Flux limit) it is possible to modify the flux characteristic, as described in the following examples:

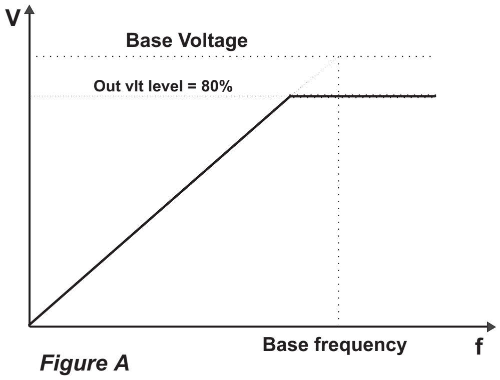


Figure A

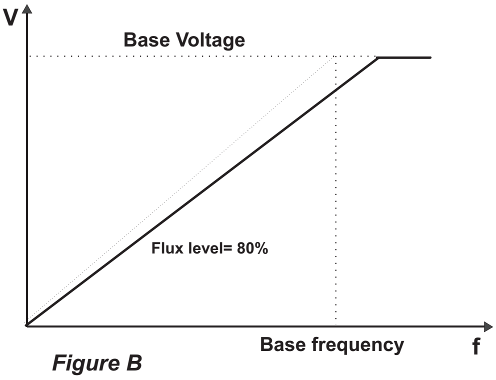


Figure B

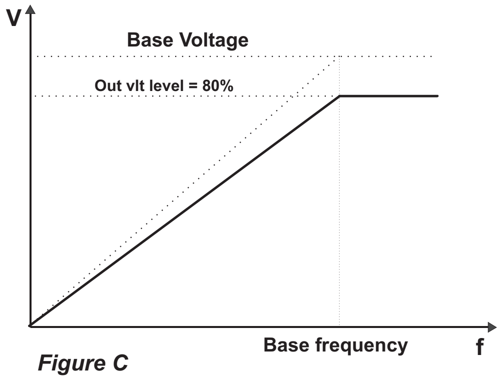


Figure C

Figure A: Out vlt level = 80%

The motor flux value follows the characteristic defined by **Base voltage** and **Base frequency** up to the 80% of the **Base voltage**, operating in costant flux. Over this setpoint the motor will be defluxed.

Figure B: Flux level = 80%

The motor voltage value is reduced at the 80% respect to the ratio defined by **Base voltage** and **Base frequency**. In this way the voltage value corresponding to the **Base voltage** setting, is reached at a frequency value higher than **Base frequency**.

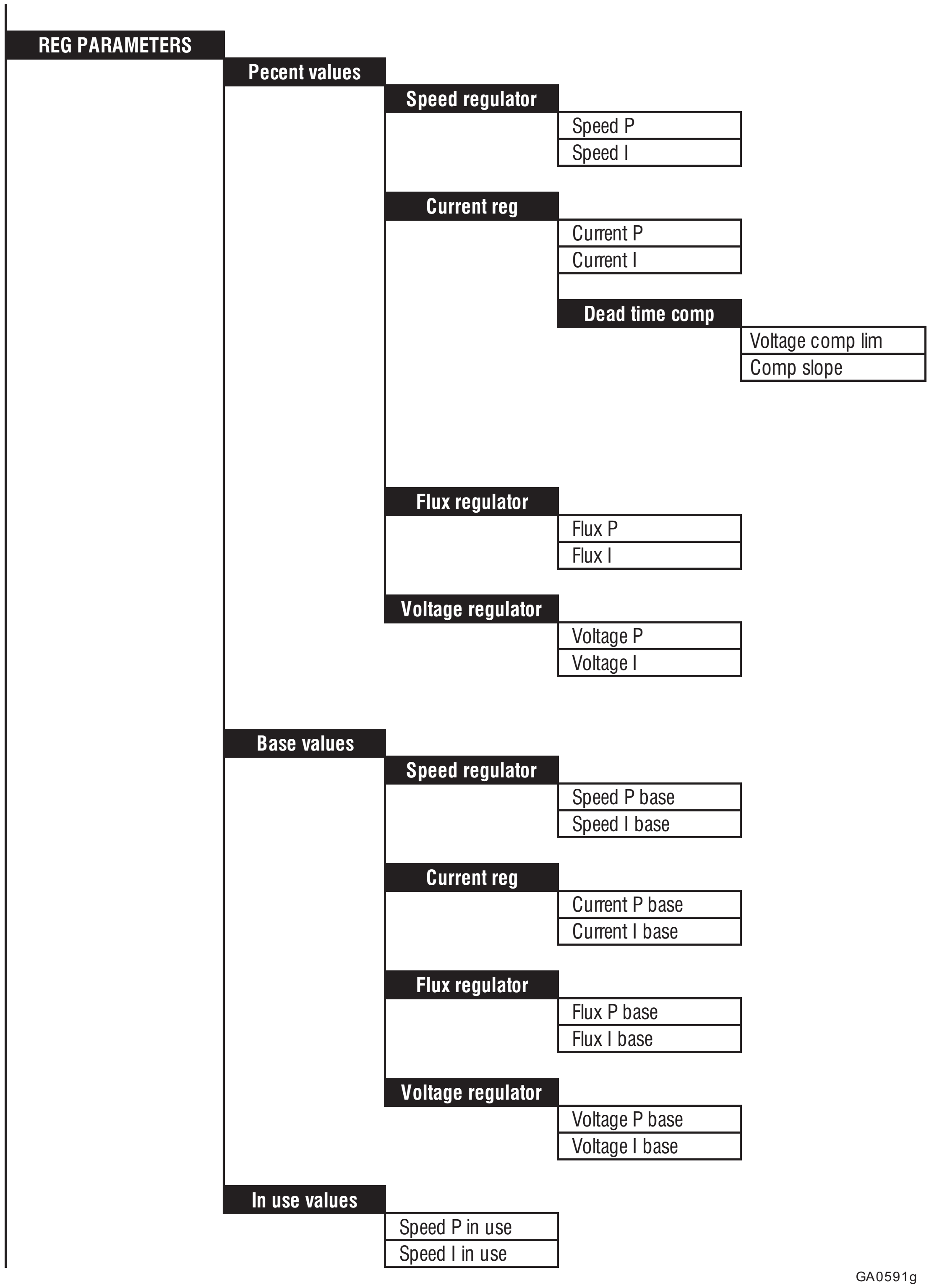
Figure C:

The motor voltage value follows the characteristic defined by the 80% of **Base voltage** and **Base frequency**.

The motor flux value will be constant but reduced at the 80% of the flux value, defined by the **Base voltage** and **Base frequency** ratio. It will be up to the frequency value identified by the intersection of the stright lines shown as **Out vlt level** = 80% and **Flux level** = 80%

Over this setpoint the flux will decrease in a way inversely proportional to the output frequency of the drive.

2.11. REG PARAMETERS



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed P [%]	87	0.00	100.00	S	
Speed I [%]	88	0.00	100.00	S	
Current P [%]	89	0.00	100.00	S	
Current I [%]	90	0.00	100.00	S	
Flux P [%]	91	0.00	100.00	S	
Flux I [%]	92	0.00	100.00	S	
Voltage P [%]	1022	0.00	100.00	15.00	
Voltage I [%]	902	0.00	100.00	4.00	
Speed P base [A/rpm]	93	0.001	99.999	S	
Speed I base [A/rpm•ms]	94	0.001	99.999	S	
Current P base [V/A]	95	0.1	99999.9	S	
Current I base [V/A•ms]	96	0.1	9999.9	S	
Flux P base [A/Vs]	97	0.1	9999.9	S	
Flux I base [A/Vs•ms]	98	0.01	999.99	S	
Voltage P base [Vs/V]	1023	0.00001	9.99999	S	
Voltage I base [Vs/V•s]	903	0.00001	9.99999	S	
Speed P in use [%]	99	0.00	100.00	S	
Speed I in use [%]	100	0.00	100.00	S	
Voltage comp lim [V]	644	0.1	30.0	6.0	
Comp slope [V/A]	645	0.1	50.0	13.0	

Ga6160

S = Depending on the size of the device

Speed P Proportional gain K_P* of the speed regulator expressed as a percentage of **Speed P base**.

Speed I Integral gain K_I* of the speed regulator expressed as a percentage of **Speed I base**.

Current P Proportional gain K_P* of the current regulator, expressed as a percentage of **Current P base**.

Current I Integral gain K_I* of the current regulator, expressed as a percentage of **Current I base**.

Flux P Proportional gain K_P* of the flux regulator expressed as percentage of **Flux P base**.

Flux I Integral gain K_I* of the flux regulator expressed as a percentage of **Flux I base**.

Voltage P Proportional gain K_P of the voltage regulator exspressed as a percentage Voltage P base

Voltage I Integral gain K_I of the voltage regulator exspressed as a percentage Voltage I base

Speed P base Base value for Proportional gain K_{P0} of the speed regulator in A/rpm (base value).

Speed I base Base value for Integral gain K_{I0} of the speed regulator in A/rpm·ms

Current P base Base value for Proportional gain K_{P0} of the current regulator in V/A

Current I base Base value for Integral gain K_{I0} of the current regulator in V/A·ms

Flux P base Base value for Proportional gain K_{P0} of the flux regulator in A/Vs

Flux I base Base value for Integral gain K_{I0} of the flux regulator in A/Vs·ms

Voltage P base Base value for Proportional gain K_{PO} of the voltage regulator in Vs / s

Voltage I base Base value for Integral gain K_{IO} of the voltage regulator in Vs / V x s

Speed P in use Indication of the current proportional gain of the speed regulator as a percentage of **Speed P base**

Speed I in use Indication of the current integral gain as a percentage of **Speed I base**

*These parameters are used for **Sensorless** control):*

Dead time comp	Distortion compensation of output voltage due to lock times
Voltage comp lim	Value of the voltage compensation
Comp slope	Compensation gradient value

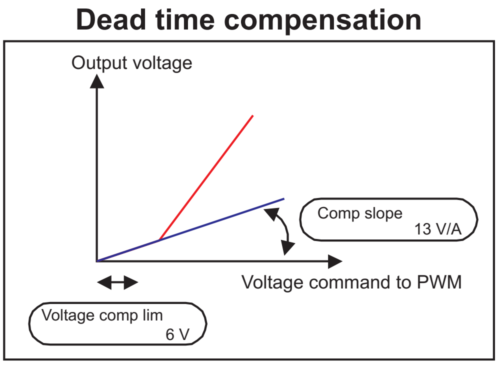


Figure 2.11.1: Regulator parameters for Sensorless

NOTE! Current, flux and voltage regulators can be tuned by the self tuning procedure (see section 5.4.3 Self tuning). If this fails, manual tuning procedures are possible for current and flux regulators (not for the voltage regulator, no changes by the user should be performed).

The speed regulator has to be manually tuned.

The maximum value for the regulator parameters is defined by the base values. The settings possible depend on the size of the device.

The user can optimize the function of the regulator by changing the percentage values (values marked with *).

The resulting gains for the regulator are calculated as follows:

$$\mathbf{K_P = K_{P0} \cdot K_P^* / 100\ \%} \qquad \mathbf{K_I = K_{I0} \cdot K_I^* / 100\ \%}$$

Example of the speed regulator gains:

Speed P base = 12 A/rpm (= K_{P0}) **Speed P** = 70 % (= K_P*)

Proportional gain K_P = 12 · 70 % / 100 % = 8.4 A/rpm

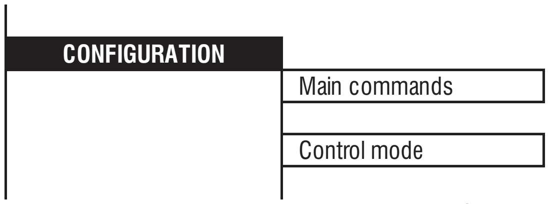
The base values **... base** are also the basis for setting the adaptive speed regulator.

When the adaptive speed regulator is enabled (**Enable spd adap** = Enabled), the **Speed P** and **Speed I** parameters have no effect. They still retain their value, however, and are effective again when the speed regulator adaption is disabled.

The **Speed P in use** and **Speed I in use** parameters indicate the current gains for the speed regulator. This also applies when the speed regulator adaption is active.

2.12. CONFIGURATION

2.12.1. Operating mode selection



GA0610g

Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Main commands	252	0	1	Terminals	
Terminals				(0)	
Digital					
Control mode	253	0	1	Local	
Local				(0)	
Bus					

GA6165

Main commands Defines the modality of use of **Enable drive** and **Start** drive commands.

Terminals: These commands are exclusively assigned by Terminal via terminals 12 (Enable) and 13 (Start), active voltage level is required.

Digital: With this configuration **Enable drive** and **Start/stop** drive commands are active through **Enable drive** and **Start/stop** parameters (BASIC MENU).

If the motor is stopped by removing the **Start** signal from terminal 13, to get again the **Start** is necessary to restore the active voltage level on terminal 13 and give the command using “Start” button (keypad) or through the **Start** parameter.

To restart a motor when active level is present on terminal 13, is enough to use “Start” button (keypad) or use the **Start/stop** parameter. This is also valid when drive enabled/disabled (**Enable drive** command) is used.

Changing the mode selection from Digital to Terminals with these terminals supplied, you will be prompted by the message **“Change input”**, indicating the wrong operation.

NOTE! In case of Main commands=Digital, the described commands can be assigned through:

- Terminal or RS485, when **Control mode** parameter = Local
- field Bus, when **Control mode** parameter = Bus

Control mode Defines whether the digital channel is the keypad/RS485 or a bus system (Option).

Local: The digital channel is the keypad or the RS485 serial interface

Bus: The digital channel is a bus system (Option)

The following tables show the operating modes possible.

Parameter		Actuation of: Enable drive Start Fast stop	Control mode selection	Failure reset	Save parameters
Input commands	**Control mode**				
Terminals	Local	Terminals	Keypad*/ RS485* or Bus	Terminals or Keypad	Keypad/ RS485
Digital	Local	Terminals and Keypad/RS485	Keypad*/ RS485* or Bus	Terminals or Keypad	Keypad/ RS485
Terminals	Bus	Terminals	Keypad*/ RS485* or Bus	Terminals or Keypad/RS485 or Bus	Keypad/ RS485 or Bus
Digital	Bus	Terminals and Bus	Keypad*/ RS485* or Bus	Terminals or Keypad/RS485 or Bus	Keypad/ RS485 or Bus

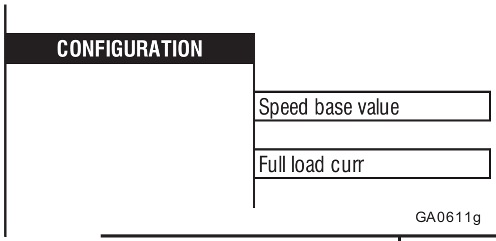
GA6170g

Parameter		Write Access Restrictions		
Input commands	**Control mode**	**Terminals**	**Keypad/RS485**	**Bus**
Terminals	Local	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Select control mode *
Digital	Local	Access to everything assigned to programmmable I/Os	Access to all parameters not assigned to programmable I/Os	Select control mode *
Terminals	Bus	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os
Digital	Bus	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os

GA6175g

* Access via the keypad or the RS485 serial interface is protected in this configuration by password level 1
Write access from Bus through process data channel is not affected by control mode description.

2.12.2. Speed base value, Full load current



GA0611g

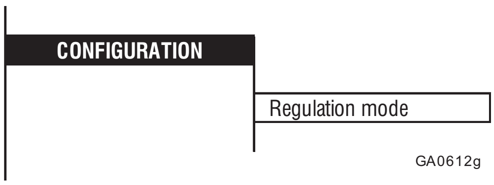
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed base value [FF]	45	1	16383	1500	
Full load curr [A]	179	0.1	999.0	S	

GA6180g

Speed base value The **Speed base value** is defined in the unit specified by the factor function. It is the base value for all speed values (reference values, adaptive speed regulation) given as a percentage, and corresponds to 100% of the speed. Changing this parameter is only possible whe the drive is disabled (**Enable drive** = Disabled). The **Speed base value** does not define the maximum possible speed. However, the maximum range for speed percentage is ±200% of speed base value.

Full load curr The **Full load curr** (FLC) parameter is defined in A_{RMS} and by default it is equal to I_{CONT}. It depends on Derating factor (see manual AVy Quick Start up, section 3.3.4, "Output"). The FLC is used to calculate the corresponding active current (see section 2.9, " Current regulation"), taking into account the motor parameters entered. 100mF corresponds to 100 % of the current limit. The settings for the current limit and the overload function are based on **Flt 100mF**.

2.12.3. Regulation mode



GA0612g

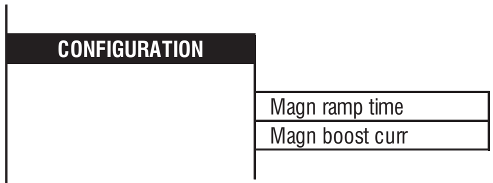
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Regulation mode (Sensorless\Self-tuning\ Field oriented\V/f control)	321	0	3	V/f control (3)	

GA6185ai

Regulation Mode This parameter defines the regulation mode of the Drive.

- **Sensorless** The drive operates with a sensorless control mode. An encoder is not necessary to feedback the motor speed. In this case the speed and position of motor shaft are estimated by a control algorithm.
- **Self-tuning** Automatic commissioning (see section 1.3.3, "Self-tuning")
- **Field oriented** The drive operates with a field oriented vector regulation. Either a sinusoidal encoder or a digital encoder are required to feedback the motor speed to the drive.
- **V/f control** The drive operates without vector control. A predefined voltage/frequency characteristic curve is used instead.

2.12.4. Magnetizing boost current, Magnetizing ramp time



GA0613g

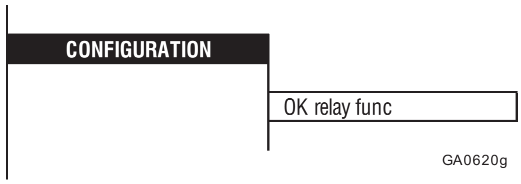
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Magn ramp time [s]	675	0.01	5.00	1.00	
Magn boost curr [%]	413	10	136	30	

GA6190g

Magn ramp time Ramp time for the F current ref at initial magnetization. It may be used to slow down the magnetization transient and avoid shaft rotation due to torque parasitic related to stator and rotor slot alignment.

Magn boost curr At the opposite to the purpose of **Magn ramp time**, in some applications it may be necessary to speed up the magnetizing of the motor. This option is provided by the **Magn boost curr** parameter. Higher values will thus lead to short magnetization times. The parameter is defined as a percentage of the **Full load curr** and represents a temporary value of the flux current limit for the initial magnetization. After magnetization the nominal limit $\pm 1.2 \cdot I_{\mu}$ is restored.

2.12.5. Configuration of the OK relay *(Terminals 80,82)*



GA0620g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ok relay func Drive Healthy Ready to start	412	0	1	Drive Healthy (0)	

GA6195g

Ok relay func This parameter defines the condition in which the relay contact will close.

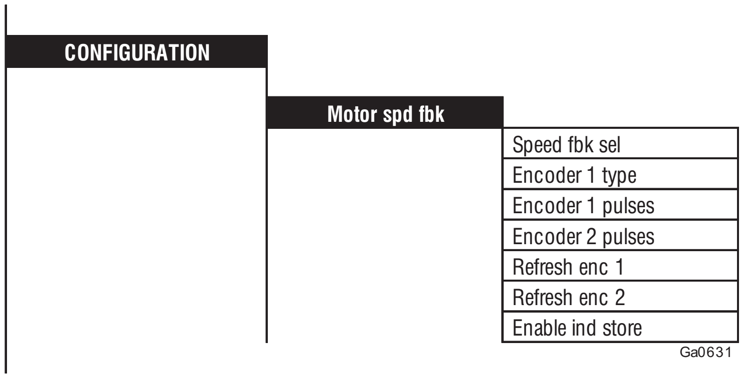
Drive Healthy — The contact closes when the drive is supplied with voltage and when there are no failure alarms.

Ready to start — The contact closes when the following conditions are fulfilled:

- The drive has a voltage supply
- There are no failure alarms present
- The drive is enabled with **Enable drive**
- The magnetizing procedure has been ompleted.

(Drive is ready to deliver torque)

2.12.6. Encoder type selection



Parameter	N.	Value min	Value max	Value Factory	Standard configuration
Speed fbk sel Encoder 1 Encoder 2	414	0	1	Encoder 1 (1)	*
Encoder 1 type Sinusoidal Digital	415	0	1	Digital (1)	
Encoder 1 pulses	416	600	9999	1024	
Enc 1 supply vlt 5.41V 5.68V 5.91V 6.18V	1146	0	3	5.41V	
Encoder 2 pulses	169	600	9999	1024	
Encoder repeat	1054	0	1	Encoder 1 (1)	
Refresh enc 1 Enabled Disabled	649	0	1	Disabled (0)	
Refresh enc 2 Enabled Disabled	652	0	1	Disabled (0)	
Encoder 1 state Encoder 1 OK Encoder 1 NOT OK	648	0	1	-	**
Encoder 2 state Encoder 2 OK Encoder 2 NOT OK	651	0	1	-	**
Enable ind store Disabled Enabled	911	0	1	Disabled (0)	
Ind store ctrl	912	0	65535	0	
Index storing	913	0	2^{32} -1	-	

Ga6200ai

* This function can be assigned to one of the programmable digital inputs.
** This function can be assigned to one of the programmable digital outputs.

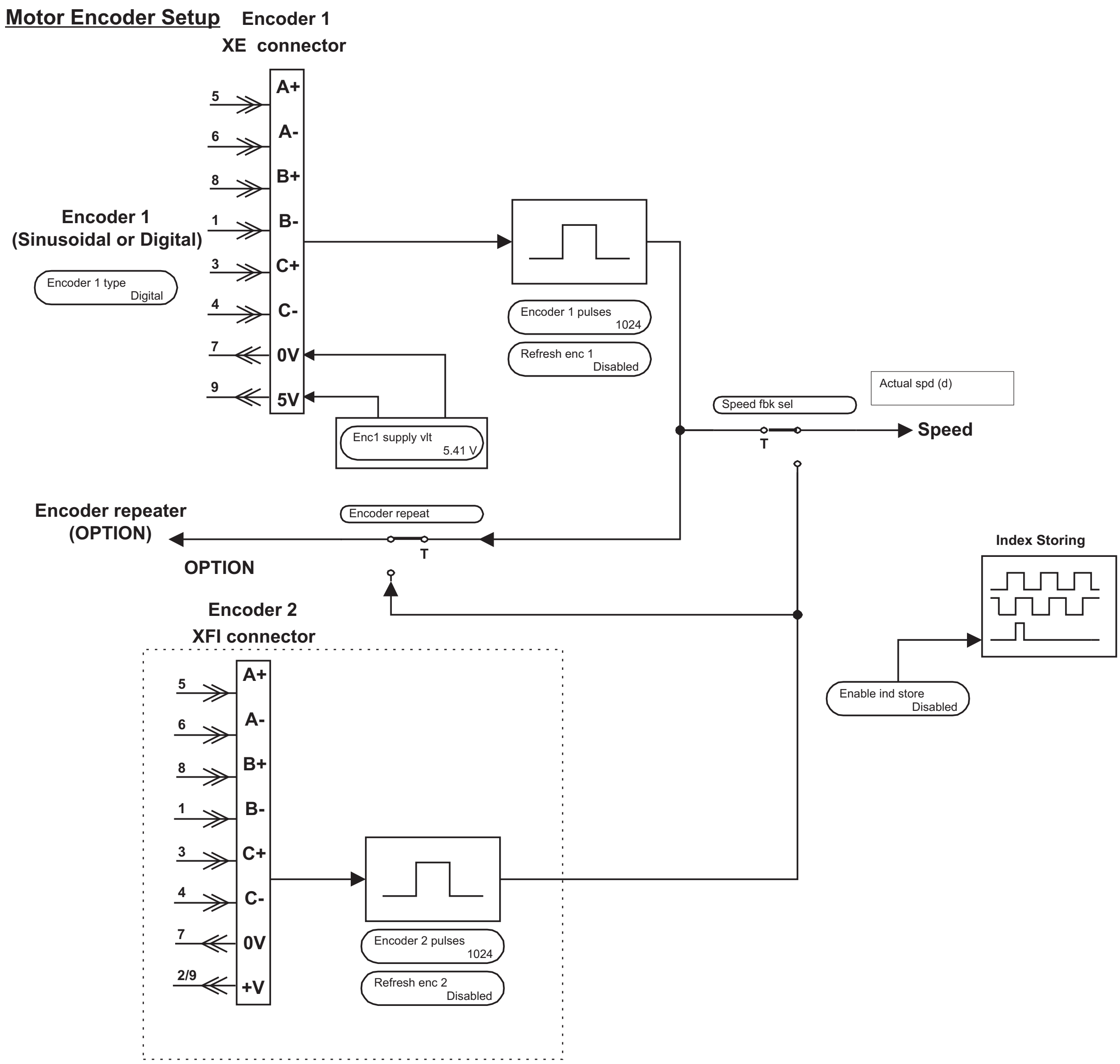


Figure 2.12.6.1: Speed Feedback

NOTE! Encoders are required in the "Field oriented" regulation mode , both for speed and torque current. The required encoder specifications are defined in manual AVy Quick Start up, section 4.4.2, "Encoders".

Speed fbk sel Selects which encoder input is to be used for feeding back the actual speed value.

Encoder 1	The encoder on connector XE is used (Default)
Encoder 2	The digital encoder on optional card EXP-F2E is used

Encoder 1 type Defines the encoder type on connector XE

Sinusoidal	Sinusoidal encoder
Digital	Digital encoder

Encoder 1 pulses Number of pulses per revolution for the encoder on connector XE

Encoder 2 pulses Number of pulses per revolution for the digital encoder on optional card EXP-F2E

Refresh enc 1	Enable the monitoring of the encoder 1 connection status, in order to detect a speed feedback loss alarm.
Encoder 1 state	Provides the indication of encoder 1 connection status. The parameter can be programmed on a digital output
Refresh enc 2	Enable the monitoring of the digital encoder 2 connection status, in order to detect a speed feedback loss alarm.
Encoder 2 state	Provides the indication of digital encoder 2 connection status. The parameter can be programmed on a digital output
Enc1 supply vlt	This parameter allows to supply the encoder 1 at different voltage levels, in order to avoid a possible voltage drop, due to the encoder wires resistance. Four available range of supply are selectable by means of the parameter Enc1 supply vlt and these are automatically generated by the internal supplier. The four range are: V0 = 5,41V, V1 = 5,68V, V2 = 5,91V, V3 = 6,18V
Encoder repeat	The external processing of the encoder data, can be carried out by using the optional card EXP-F2E. The selection of which encoder data have to be elaborated, is possible through the parameter Encoder repeat. Encoder 1 — Repetition of the encoder 1 pulses Encoder 2 — Repetition of the encoder 2 pulses

NOTE: Encoder 1: standard hardware
Encoder 2: optional hardware

For further information about the encoder signals management, please refer to the instruction manual of the optional card EXP-F2E

Following parameters allows to determine the machine absolute zero and perform a positioning control:

Enable ind store	This parameter enables the reading of the encoder index and qualifying signal that could be used in a system for implementation of position control. Enabled — This setting enables the reading of the encoder index. Disabled — This setting disables the reading of the encoder index
Ind store ctrl	Control register for the encoder index and qualifying signal.
Index storing	Status register and function data.

NOTE: **Programmable digital input 4 (terminal 39) can be used as first encoder index qualifier (in this case the corresponding configuration parameter must be set to “OFF”).**

Programmable digital input 3 (terminal 38) can be used as second encoder index qualifier (in this case the corresponding configuration parameter must be set to “OFF”).

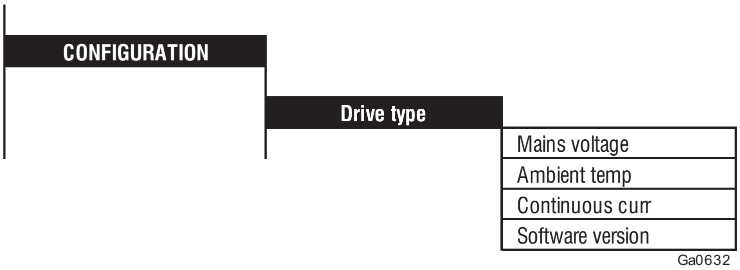
Ind store ctrl parameter [912]

No. bit	Name	Description	Access (Read/Write)	Default
0-1	-	Not used	-	-
2	POLNLT	It indicates the encoder index edge polarity: · 0=rising edge · 1=falling edgec	R/W	0
3	-	Not used	-	-
4-5	ENNQUAL	It indicates the qualifier level that activates the encoder index reading: · =0=Switched off · =1=Switched off · =2=Through signal = 0 · =3=Through signal = 1	W	0
6	Target Enc Num	It points out for which encoder the values of this parameter are reported. · =0, operations requested on the Encoder 1 · =1, operations requested on the Encoder 2	R/W	0
7	-	Not used	-	-
8-9	ENNLT	Control function of the encoder index reading · =0=Switched off, function disabled · =1=Once, enables the reading of the first index signal edge only. · =2=Continuous, enables the reading of the index signal.	R/W	0

Index storing parameter [913]

No. bit	Name	Description	Access (Read/Write)	Default
0	Source Enc Num	It indicates to which encoder the values in this register are referred to: · =0, register data are referred to the encoder 1 · =1, register data are referred to the encoder 2	R	0
1	MP_IN	Actual Qualifier level value: · =0, qualifier input level is low · =1, qualifier input level is high	R	0
2 3	STATNLT	Status of the acquisition function: · =0=Switched off · =1=Once, storing is not executed yet · =2=Once, storing is already executed · =3=Continuous	R	0
16-31	CNTNLT	Position counter value corresponding to the index. Value is only valid when STANLT is equal to 2 or 3	R	0

2.12.7. Mains voltage, Ambient temp, Continuous current, Software version



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Mains voltage (230V/400V/460V)	333	S	2	400V (1)	
Ambient temp 104°-122°F (40°C/50°C)	332	0	1	104°F (40°C) (1)	
Continuous curr	802	S	S	S	
Software version	331				

Ay6205

Mains voltage Rated value of the mains voltage present (e.g. 400 V). The undervoltage monitoring function is based on this value (see manual AVy Quick Start up, section 3.3.4 "Output " for detail on value of Derating factor).

NOTE! 230V Main voltage selection is disabled if **PL stop enable [1083]** parameter is set to active value (1 or 2).

230V Main voltage selection is not available on 1007 ... 3150 sizes.

When 230V Main voltage is set, **Pwr loss stop** function is disabled .

Ambient temp Adaption to Ambient temperature. Possible currents are specified on the name-plate of the inverter. See example.

40°C The drive is able to take the current continously at an ambient temperature of up to 40°C.

50°C The drive is able to take the current continously at an ambient temperature of up to 50°C

See manual AVy Quick Start up, section 3.3.1 "Permissable environmental conditions".

Continuous curr Drive continuative output current value considering the derating factor due to mains voltage, switching frequency and ambient temperature setting.

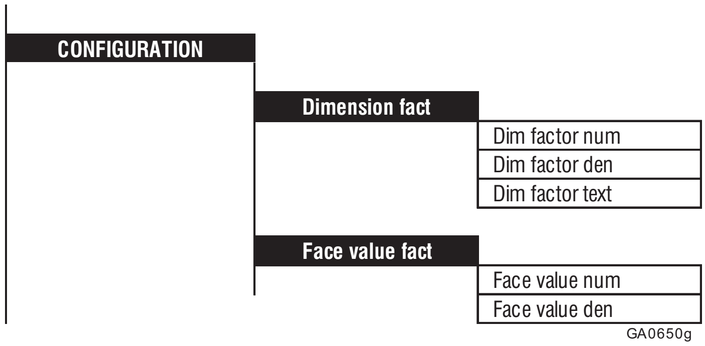
This parameter is automatically overwritten by the control system as $\mathbf{I_{CONT}} = \mathbf{I_{2N}}$ x $\mathbf{K_V}$ x $\mathbf{K_T}$ x $\mathbf{K_F}$

The "**K**" derating factors are shown on manual AVy Quick Start up, section 3.3.4 "Output ".

Full load Current parameter (CONFIGURATION menu) is automatically set by the system to the same **Continuous curr** value.

Software version Display of the version number of the drive operating system.

2.12.8. Dimension factor, face value factor



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Dim factor num	50	1	65535	1	
Dim factor den	51	1	$+2^{31-1}$	1	
Dim factor text	52			rpm	
Face value num	54	1	+32767	1	
Face value den	53	1	+32767	1	

Ga6210

The factor function consists of two functions: the dimension factor and the face value factor. Both factors are defined as fractions.

The dimension factor is used to specify the drive speed in a unit related to the machine concerned, e.g. kg/h or m/min.

The face value factor is used to increase the resolution.

See the calculation examples given below.

Dim factor num Numerator of the dimension factor

Dim factor den Denominator of the dimension factor

Dim factor text Unit of the dimension factor (5 characters). This text is shown in the keypad display for reference value entry.

Possible characters: / % & + , - . 0...9 : < = > ? A...Z [ ] a...z

Face value num Numerator of the face value factor

Face value den Denominator of the face value factor

The reference value given multiplied with the dimension factor and the face value factor defines the motor speed in rpm.

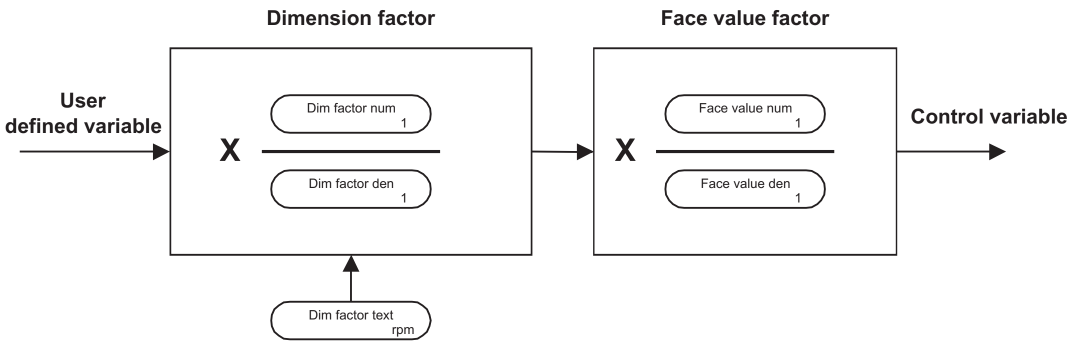


Figure 2.12.8.1: Calculation using dimension and face value factors

Example 1 of the calculation of the dimension factor

The drive speed is given in m/s. The conversion ratio is 0.01 m per revolution of the motor (Note: face value factor = 1)

The dimension factor is calculated from

$$\text{Dimension factor} = \frac{\text{Output (rpm)}}{\text{Entry (here: m/s)}}$$

f022

0.01 m corresponds to 1 revolution of the motor shaft

0.01 m/min corresponds to 1/min

0.01 m / 60 s corresponds to 1/min

$$\text{Dimension factor} = \frac{1}{\text{min}} \bullet \frac{60\text{s}}{0.01\text{m}} \bullet \frac{6000}{1} \bullet \frac{1}{\text{min}} \bullet \frac{\text{s}}{\text{m}}$$

f023

Dim factor num 6000

Dim factor den 1

Dim factor text ”m/s” (meters per second)

Example 2 of the calculation of the dimension factor

The reference values for a bottling plant are given in bottles per minute. One revolution of the drive corresponds to the filling of 0.75 bottles. This corresponds to a dimension factor of 4/3. The speed limitation and the ramp function are also given in bottles per minute.

$$\text{Dimension factor} = \frac{\text{Output (rpm)}}{\text{Entry (here: Bottles / min)}}$$

f024

3/4 di bottiglia corrisponde ad 1 giro dell’albero motore

3/4 di bottiglia / minuto = 1/min

$$\text{Dimension factor} = \frac{1}{\text{min}} \bullet \frac{4\text{ min}}{3\text{ Bottles}} = \frac{4}{3} \bullet \frac{1}{\text{min}} \bullet \frac{\text{min}}{\text{Bottles}}$$

f025

Dim factor dum 4

Dim factor den 3

Dim factor text ”B/min”(Bottles per minute)

Example of the face value factor

Normally the reference value has a resolution of 1 rpm. In order to fully exploit the available resolution, the face value factor is used. The maximum internal resolution is 0.25 rpm

The motor speed range required is, for example, 0 ... 1500 rpm. A more accurate resolution (i.e. 1/4 revolution) can be obtained by setting the face value factor to 1/4.

The value 4 000 is entered, for example, in order to select 1000 rpm This is then multiplied with the face value factor to give the value 1000 rpm.

Face value num 1

Face value den 4

2.12.9. Programmable alarms

- **CONFIGURATION**
  - **Prog alarms**
    - **Undervoltage**
      - Latch
      - OK relay open
      - Restart time
      - N of attempts
    - **Overvoltage**
      - Latch
      - OK relay Open
    - **Heatsink sensor**
      - Activity
      - Latch
      - OK relay open
      - Heatsink tmp thr
      - Heatsink tmp thr state
    - **Heatsink /Air ot**
      - OK relay open
    - **Regulation ot**
      - Activity
      - Latch
      - OK relay open
    - **Module overtemp**
      - OK relay open
    - **Overtemp motor**
      - Activity
      - Latch
      - OK relay open
    - **External Fault**
      - Activity
      - Latch
      - OK relay open
    - **Overcurrent**
      - Latch
      - OK relay open
    - **Output stages**
      - Latch
      - OK relay open
    - **Opt2 failure**
      - Activity
      - OK relay open
    - **Bus loss**
      - Activity
      - Latch
      - OK relay open
      - Hold off time
      - Restart time
    - **Hw opt 1 failure**
      - Activity
      - OK relay open
    - **Enable seq err**
      - Activity
      - Latch
      - OK relay open
    - **BU overload**
      - Activity
      - OK relay open

GA0661ai

Alarm	No.	Factory			Restart time, No. of attempts	Standard
		Activity	Latch	Open ok relay		
Overcurrent	2300h	Disable drive	ON	ON		Dig. outp. 8*
Overvoltage	3210h	Disable drive	ON	ON		Dig. outp. 6*
Undervoltage	3220h	Disable drive	ON	ON	1000 ms, 0	Dig. outp.7*
Heatsink sensor	4210h	Disable drive	ON	ON		*
Heatsink ot	4211h	Disable drive	ON	ON		*
Regulation ot	4212h	Disable drive	ON	ON		*
Module overtemp	4213h	Disable drive	ON	ON		*
Intake air ot	4214h	Disable drive	ON	ON		*
Overtemp motor	4310h	Disable drive	ON	ON		*
Failure supply**	5100h	Disable drive	ON	ON		
Curr Fbk Loss	5210h	Disable drive	ON	ON		*
Output stages	5410h	Disable drive	ON	ON		*
DSP error**	6110h	Disable drive	ON	ON		
Interrupt error**	6120h	Disable drive	ON	ON		
BU Overload	7110h	Disable drive	ON	ON		*
Speed fbk loss***	7301h	Disable drive	ON	ON		*
Opt2	7400h	Disable drive	ON	ON	8 ms	*
Hw Opt 1 failure	7510h	Disable drive	ON	ON		*
Bus loss	8110h	Disable drive	ON	ON		*
External fault	9000h	Disable drive	ON	ON		*
Enable seq err	9009h	Disable drive	ON	ON		*

GA6215ai

* This function can be assigned to one of the programmable digital outputs.

** The behavior of the drive cannot be configured for these alarms. The assignment of an alarm to a digital output is not possible.

*** This alarm can be disabled, but the behavior of the Drive can not be configured.

If the serial interface or bus system is used, the alarms can be evaluated via the **Malfunction Code** parameter.

The AVy Drives contain extensive monitoring functions. The effect of possible alarms (Drive faults) on the behaviour of the drive are defined in the PROG ALARMS submenu:

- Saving of alarm status
- How the drive is to react to the alarm
- Indication via the relay between terminal 80 and 82. The switch conditions for the relay can be defined with the Ok relay func parameter in the CONFIGURATION menu.
- Automatic restart
- Failure reset

For some alarms, the behavior of the drive can be configured separately. All alarms can also be assigned to a programmable digital output present as standard configuration.

Activity	Warning	The alarm does not cause the disconnection of the drive. A warning message can be output via a digital output. If LATCH = ON, the drive locks to the "stop" condition as soon as speed = zero is reached. To start the drive again the alarm must be reset.
	Disable drive	The alarm causes the immediate disabling of the Drive. The motor coasts to an uncontrolled stop.
	Quick stop	When the alarm occurs, the drive runs to a halt according to the ramp set in the RAMP / QUICK STOP menu. The Drive is then disabled.
	Normal stop	When the alarm occurs, the drive runs to a stop according to the ramp set. The Drives then disabled.

Curr lim stop — When the alarm occurs, the Drive brakes with the maximum possible current, until stopped, the Drive is then disabled when stopped.

Ignore — The alarm message is indicated on the keypad. No other reaction is present. Acknowledgment of the situation via RESET.

Not all alarms can initiate a controlled stop of the drive. The possibility of setting the particular "Activity" for individual alarms is described in the table below.

Allarme	Warning	Disable drive	Quick stop	Normal stop	Curr lim stop	Ignore
Overcurrent	-	X	-	-	-	-
Overvoltage	-	X	-	-	-	-
Undervoltage	-	X	-	-	-	-
Heatsink sensor	X	X	X	X	X	-
Heatsink ot	–	X	–	–	–	–
Regulation ot	X	-	-	-	-	X
Module overtemp	–	X	–	–	–	–
Intake air ot	X	X	X	X	X	-
Overtemp motor	X	X	X	X	X	-
Failure supply	-	X	-	-	-	-
Curr fbk Loss	-	X	-	-	-	-
Output stages	-	X	-	-	-	-
DSP error	-	X	-	-	-	-
Interrupt error	-	X	-	-	-	-
BU Overload	X	X	X	X	X	-
Speed fbk loss	-	X	-	-	-	-
Opt2	-	X	X	X	X	-
Hw Opt 1 failure	X	X	X	X	X	-
Bus loss	X	X	X	X	X	-
External fault	X	X	X	X	X	-
Enable seq err	-	X	-	-	-	X

ga6220ai

Latch — ON — The alarm is stored. The programmed actions (e.g. opening the OK relay) are enabled. This status is retained even if the fault condition is restored. A Reset command is required before a restart.

OFF — In case of alarm, the drive is disabled and the programmed functions are enabled. The alarm is not saved. When the failure is restored, the alarm is automatically reset and the Drive tries a restart

OK relay open — ON — An alarm causes the opening of the isolated potential contact between terminals 80 and 82.

OFF — In case of alarm, the contact between the terminals 80 and 82 does not open.

Hold off time — Delay time between the alarm condition detection and the alarm activation. If an alarm condition occurs the alarm keeps OFF for the Hold off time. When this time is elapsed, if the alarm is still present, it becomes ON.

Restart time — If Latch=OFF and the alarm condition persists even after the time defined via Restart time, the alarm is stored and no restart is possible.

In case the alarm condition is still present after the time setted on **Restart time**, the alarm condition is saved and cannot happen any restart.

No of attempts — Number of start attempts after an alarm. The number of start attempts are counted. When the defined number has been reached, the "No more attempts" message is displayed. The failure must then be reset and the drive restarted. If the number of attempts required for a restart is below the defined value, the counter for the start attempts is set to zero after 5 minutes and will start counting from the beginning if another alarms occurs.

NOTE! The occurrence of a failure is indicated in the display of the keypad. If "Latch" = ON is selected, a Reset command is necessary. This can be also done by pressing the CANCEL key on the keypad. If a second error occurs before the first one was reset, the text "Multiple failures" will appear in the display. In this case, a reset is possible via **Failure reset** parameter in the SPEC FUNCTIONS menu by pressing the Enter key with a disabled inverter, or through a digital input programmed as “Failure reset”.

LIST OF PROGRAMMABLE ALARMS

Undervoltage Undervoltage in the intermediate circuit (DC Link).

The Undervoltage alarm occurs in case of an undervoltage in the intermediate circuit if the Drive is enabled (Enable drive = Enabled). The power section is disabled immediately in order to prevent the intermediate circuit discharge.

If the alarm is not saved (Latch = OFF), the drive will try to restart automatically as soon as the voltage rises up to the undervoltage threshold. If this does not happen within the restart time, the alarm is latched anyway. The number of restart attempts is limited.

If the ramp is used, when the voltage is restored, if the function Auto capture is active, the ramp output is set to the value corresponding to the curent motor speed. This avoids speed steps.

In case of undervoltage the Drive is disabled and the precharge resistor is inserted so that the charging of the DC link can be controlled when voltage is restored.

Bypass of the precharge resistor occurs if conditions for restart are met.

Overvoltage Overvoltage in the intermediate circuit

If the failure is not saved (Latch = OFF), the drive will try a restart automatically once the overvoltage has been removed.

If the ramp is used, when the voltage is restored, if the function Auto capture is active, the ramp output is set to the value corresponding to the curent motor speed. This avoids speed steps.

Heatsink sensor Heatsink temperature of the Drive too high. This alarm always initiates the disconnection of the Drive 10 seconds after the failure has been detected.

If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected. It is possible to initiate a controlled stop of the drive within the 10 seconds described.

Heatsink tmp thr (No. 1294), min=0, max=255, def=50

Setting of the threshold value (°C) of the heatsink temperature. Signalling of the reached value can be set on a digital output

Heatsink tmp thr state (No. 1295), min=0, max=1, def=0

Status of the heatsink temperature threshold: 1=temperature value set is reached

Heatsink ot (For sizes from 22 kW... and higher).Heatsink temperature of the Drive too high (possible heatsink sensor malfunctioning). This always initiates the disabling of the Drive 1s after the failure has been detected (Activity=Disable drive). If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.

Regulation ot Temperature of the regulation card of the Drive too high. This always initiates the disabling of the Drive 10s after the failure has been detected. If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.

Module overtemp (For drives size from 0.75 kW up to 15 kW).Temperature of the IGBT module too high

This always initiates the disabling of the Drive immediately after the failure has been detected. If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.

Intake air ot (For sizes from 22 kW... and higher).Temperature of the cooling air too high. This always initiates the disabling of the Drive 10s after the failure has been detected.

If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.

Overtemp motor Motor temperature (connection for thermistor: terminals 78/79)

External Fault External fault (no voltage on terminal 15)

Overcurrent Overcurrent (short-circuit / ground fault)

The Drive is always disconnected (Activity = Disable drive) when an overcurrent is detected in order to protect the power section.

If the fault is not saved, the drive will automatically try to restart if no other overcurrent alarms occured within the last 30 seconds. If this, however, is the case, the alarm is saved and no automatic restarts are possible.

Output stages Alarm caused by a short-circuit on the inverter output bridge or on the brake unit (if enabled).

Opt2 failure Failure on the card "Option 2" (Optional)

Bus loss Failure in the connection on the field bus (only with an option bus interface card).

Hw opt 1 failure Failure on the card "Option 1" (Not included in the default equipment)

Enable seq err Wrong drive enabling sequence. The correct sequence is as follows:

Case a: **Main commands** = Terminal

1 - Regulation board power-up: Enable terminal (term.12) in any state.

2 - Drive initialization. Max duration time: 5 s.

3 - End of drive initialization. The Enable drive terminal (12) is L (0V).

4 - Delay time during which the Enable drive terminal must be L (0V): 1s.

5 - Drive enabling. Terminal 12 is H (+24V).

If at the end of the drive initialization (step 3) or during the 1s delay time the Enable drive terminal (term. 12) is High (+24V) a fault is detected.

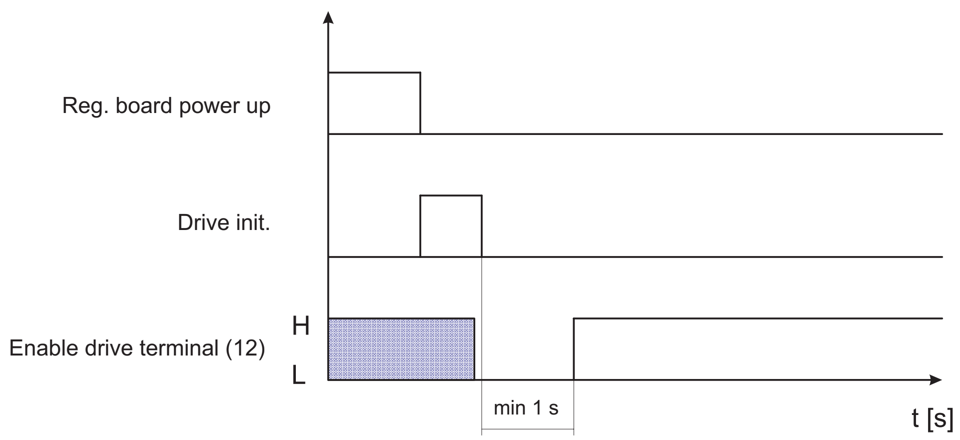


*Figure 2.12.9.1 Drive enabling sequence: **Main commands** = Terminals*

Case b: **Main command** = Digital

1 - Regulation board power-up: Enable terminal (term.12) in any state.

2 - Drive initialization. Max duration time: 5 s.

3 - End of drive initialization.

4 - Delay time during which the Enable drive terminal must be L (0V) and Enable drive [314] = Disable (0): 1s. During this time the Process data channels setup initialization occurs.

5 - Drive enabling. Terminal 12 is H (+24V) and **Enable drive** [314] = Enable (1).

If at the end of the drive initialization (step 3) or during the 1s delay time the Enable drive terminal (term. 12) is High (+24V) and **Enable drive** [314] = Disable (0) a fault is detected.

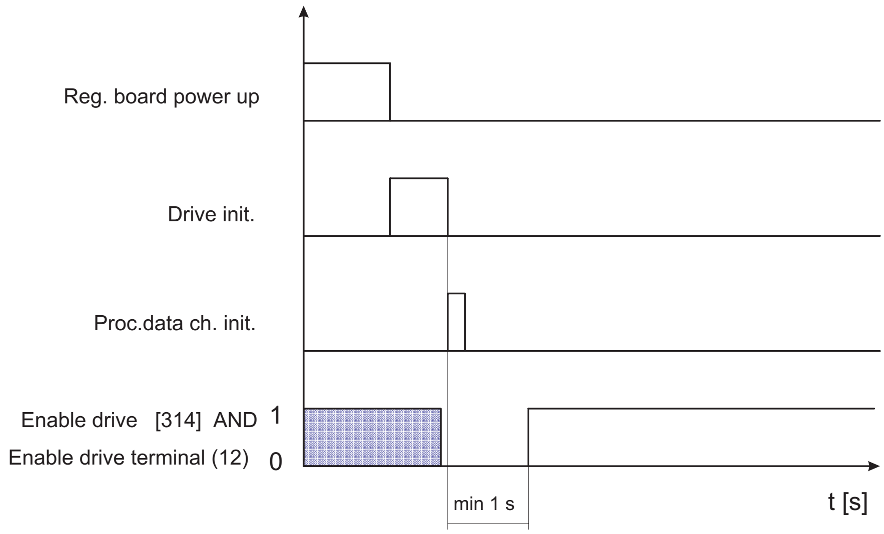


*Figure 2.12.9.2 Drive enabling sequence: **Main command** = Digital*

In case of fault the reset sequence is as follows:

Case a: **Latch** = ON

1 - Set Enable drive terminal (term. 12) = L (0V)

2 - Set **Enable drive** [314] = Disable (0)

3 - If **Main commands** = Terminals set Start/Stop terminal (term. 13) = L (0V)

4 - Failure reset command. The failure is reset and the drive can work normally.

Case b: **Latch** = OFF

1 - Set Enable drive terminal (term. 12) = L (0V) and **Enable drive** [314] = Disable (0) for at least 30 ms. The failure is automatically reset.

NOTE ! In case of alarm, the behavior of OK Relay can be affected only if **OK relay funct** = Drive Healthy. If Config OK relay funct = Ready to start, the contact will be open anyway.

NOTE: The connection diagram reported in manual AVy Quick Start up, figure 5.5.1.1 (Control sequencing) is valid only when the configuration of the sequency alarm **Enable seq err** is set as **Ignore**.

BU overload Protection for the internal or external braking resistance. The duty cycle exceeds thelimits specified (internal - user defined)

LIST OF NON-PROGRAMMABLE ALARMS

The operation of the Drive upon a non-programmable alarm is Disable drive, Latch the alarm condition, open Ok relay, N. restart

Failure supply Failure in the power supply.

DSP error Program error of the processor

Interrupt error Unused interrupt error has occurred

Speed fbk loss Failure on speed feedback:

In order to detect an alarm of the encoder 1 (connector XE) set **Refresh encoder 1** parameter (MENU CONFIGURATION\Drive type) to ENABLED.

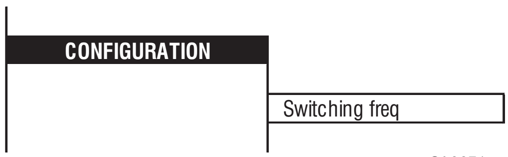
The jumper S17 selects the inhibition or the enabling of the channel C pulses reading. It has to be correctly selected in order to detect appropriately the encoder loss alarm.

S17 ON : channel C (index) reading=ON

S17 OFF: channel C (index) reading=OFF

Curr fbk loss Failure in the connection between regulation card and TA transformer (XTA Connector)

2.12.10 Switching frequency



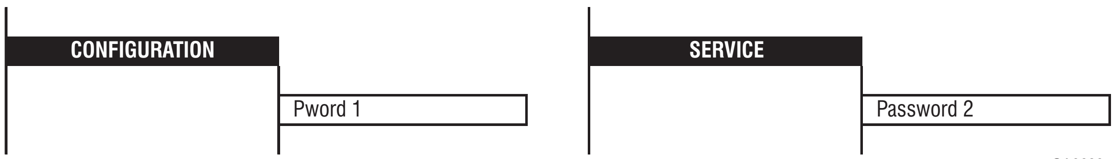
GA0671g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Switching freq (4-8-16 KHz)	240	S	S	S	

GA6230g

The switching frequency is constant in the speed set range and depends on the Drive size. (See manual AVy Quick Start up, section 3.3.4 “Output” for details of derating factor).

2.12.11. Password



GA0680g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Pword 1	85	00000	99999		
Password 2	86	-	-		

GA6235g

Passwords are used by the operator to protect the parameters from unauthorized access. The following two levels are available.

Pword 1 Protects the parameters entered by the user from unauthorized changes. The password can be freely defined by the user in the form of a 5-digit combination.

Password 2 Enables access to the Service menu. The password set by the manufacturer and consists of a 5-figure combination.

On delivery the Service menu of the drive is protected by **Password 2**. No **Pword 1** has been entered. The user has free access to all parameters except for those in the SERVICE menu which is reserved for manufacture's service personnel. **Password 2** cannot be deactivated. **Password 2** allows access to the Service menu until a different menu is selected.

Proceed as follows to activate **Pword 1**:

- Select **Pword 1** in the CONFIGURATION menu
- This indicates whether the Password is active (Enabled) or not (Disabled)
- If not, press Enter and enter the password (see section 1.1.4, "Changing/Saving Parameters/Password").
- Press Enter once more. The keypad indicates that the Password is active (Enabled).
- The password must be saved, so that it is valid when the power supply is switched off and on again, by means of the **Saving parameters** command.

Proceed as follows to unlock the **Pword 1**:

- Select **Pword 1** in the CONFIGURATION menu
- The display indicates whether the password is active (Enabled) or not (Disabled)
- If enabled, press Enter and enter the password (see Commissioning)
- Press Enter again. The display now indicates that the password is not active (Disabled).
- This configuration must be saved, in order to keep the password Disabled even after the power supply is turned off and switched back on again, by means of the **Saving parameters** command.
- The message **Wrong password** appears if an incorrect password is Entered.

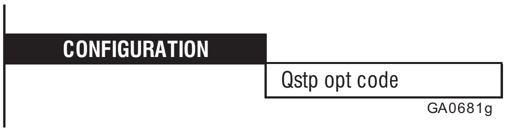
If the drive shows the message "**EEPROM Error**" the password is deactivated. This takes place the first time the drive is switched on and after a possible upgrade of the Firmware.

In case personal password has been forgotten, it is possible to deactivate it through the setting of the universal password.

The code of this password is: 51034.

The setting mode of this one remains unchanged compared to the personal password.

2.12.12. Qstp opt code



GA0681g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Qstp opt code Ramp stop DC braking curr	713	-2	-1	Ramp stop (-1)	

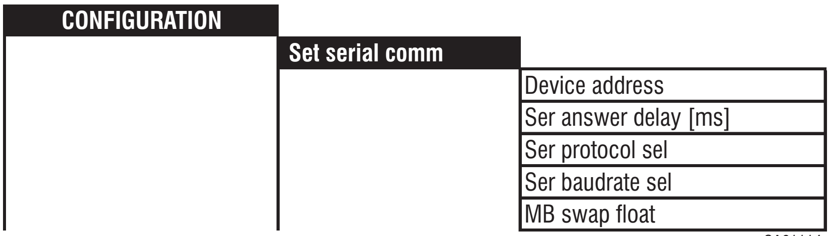
GA6240g

Qstp opt code Selection control for Operation of **Quick stop** command

Ramp stop (-1) Drive is stopped with the ramp defined by **Qstp delta speed, Ostp delta time**

DC braking curr (-2) Drive is stopped by an injection of DC current. See section 2.16.7 for more details.

2.12.13. Serial configuration



GA61114

Parameter	N.	Value			Standard configuration
		min	max	default	
Device address	319	0	127	0	
Ser answer delay [ms]	408	0	900	0	
Ser protocol sel Slink3 Modbus-RTU J Bus	323	0	2	0	
Ser baudrate sel 19200 19600 4800 2400 1200	326	0	4	1	
MB swap float Disabled Enabled	1292	0	1	0	

GA6231g

Device address Address under which the Drive can be accessed if it is networked via the RS485 interface (for connection see manual AVy Quick Start up, section 5.4, “Serial interface”)

Ser answer delay Setting of min. delay of drive between the reception of last byte and the start of its answer.

This delay avoid conflict on the serial line when the used RS485 interface is not presetted for an automatic Tx/Rx commutation.

The **Ser answer delay** parameter is specific for the standard serial line RS485.

E.g. : if on master the Tx/Rx delay commutation is 20ms max., the setting of **Ser answer delay** parameter have to be higher than 20ms: 22ms.

Set protocol sel Selection of the serial protocol: Slink3, Modbus-RTU, J BUS

Ser Baud Rate Sel Selection of the Baud Rate value

MB swap float This parameter enable the swap between High part of the word and Low part of the word for type float parameters using Modbus protocol

2.12.14. Selection of the parameter displayed at the power on

CONFIGURATION

Npar displayed

Ga61115

Parameter	N.	Value			Standard configuration
		min	max	default	
Npar displayed	1291	0.00	0.00	0	

GA6232g

Npar Displayed Selection of the parameter displayed at the power on of the drive. For parameter selection, Add 2000h (8192 Dec) offset to the parameter number

E.g. : Actual speed [Parameter No.122] : set 122 + 8192 = 8314

2.13. I/O CONFIG

Apart from the terminals which have fixed functions (e.g. for Enables), the AVy Drives provide the possibility of assigning programmable inputs/outputs to particular functions. This can either be carried out via the keypad, the serial interface or any bus connection present.

The freely programmable inputs/outputs are factory set for assignment to the most frequently required functions. However, these can be modified by the user to meet the requirements of the application at hand.

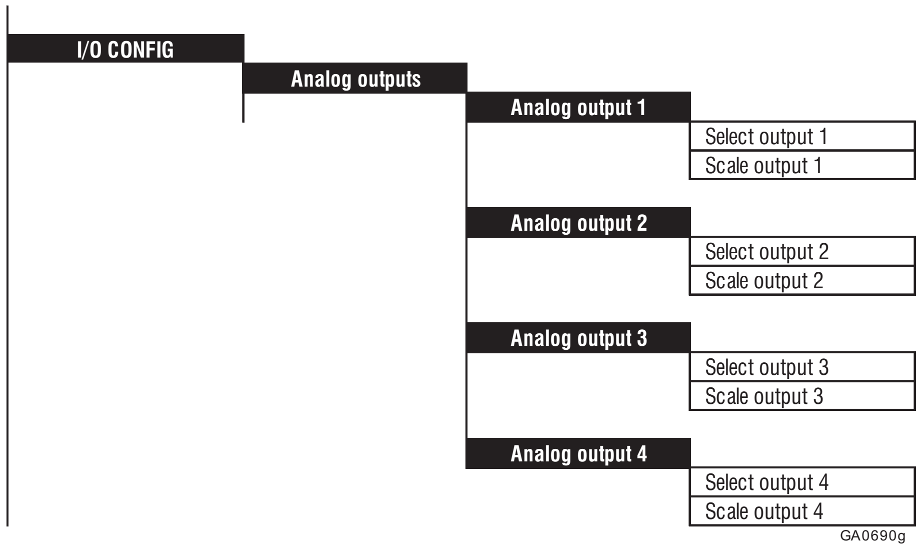
The basic device is provided with three analog inputs, that are designed as differential inputs. If more digital inputs/outputs and/or analog outputs are required, the I/O expansion cards are necessary. For more details about I/O expansion cards refer to relative instruction manual.

The following inputs / outputs are provided as standard configuration:

Basic device:	3	Analog differential inputs (1...3)
	2	Analog outputs (1 and 2) with common reference point
	2	Digital outputs (1...2) with common reference point, common voltage supply, galvanic isolation
	4	Digital inputs (1...4) with common reference point, galvanic isolation

NOTE! If parameters are assigned to particular terminals, the parameter value (e.g. speed reference value) can only be entered via this terminal and not via the keypad or bus.

2.13.1 Analog Outputs



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select output 1	66	0	84	Actual speed	
Scale output 1	62	-10.000	10.000	1.000	
Select output 2	67	0	84	T current	
Scale output 2	63	-10.000	10.000	1.000	
Select output 3	68	0	84	Current U	*
Scale output 3	64	-10.000	10.000	1.000	
Select output 4	69	0	84	Motor current	*
Scale output 4	65	-10.000	10.000	1.000	

Ga6245ai

* These outputs can be used only when optional expansion cards are mounted

Select output XX Selection of the parameter assigned as a variable to the corresponding analog output. The following assignments are possible (the value in square brackets are selection codes for RS485 or BUS):

OFF [0]
Speed ref 1 1) [1]
Speed ref 2 1) [2]
Ramp ref 1 1) [3]
Ramp ref 2 1) [4]
Ramp ref 1) [5]
Speed ref 1) [6]
Ramp output 1) [7]
Actual spd 1) [8]
T current ref 1 2) [9]
T current ref 2 2) [10]
T current ref 2) [11]
F current ref 8) [12]
Flux current 8) [13]
Torque current 2) [14]
Speed reg out 2) [15]
Motor current 12) [16]
Current U 3) [17]
Current V 3) [18]
Current W 3) [19]
Output voltage 4) [20]
Voltage U 5) [21]
Voltage V 5) [22]
DC link voltage 6) [23]
Analog input 1 7) [24]
Analog input 2 7) [25]
Analog input 3 7) [26]
Flux 9) [27]
Active power 11) [28]
Torque 10) [29]
Rr adap output 13) [30]
Pad 0 14) [31]
Pad 1 14) [32]
Pad 4 14) [33]
Pad 5 14) [34]
Flux reference 9) [35]
Pad 6 14) [38]
PID output 15) [39]
Feed fwd power 16) [78]
Out vlt level 19) [79]
Flux level 20) [80]
F act spd (rpm) 1) [81]
F T curr (%) 2) [82]
Spd draw out (d) 17) [84]
PL next factor 18) [87]
PL active limit 2) [88]

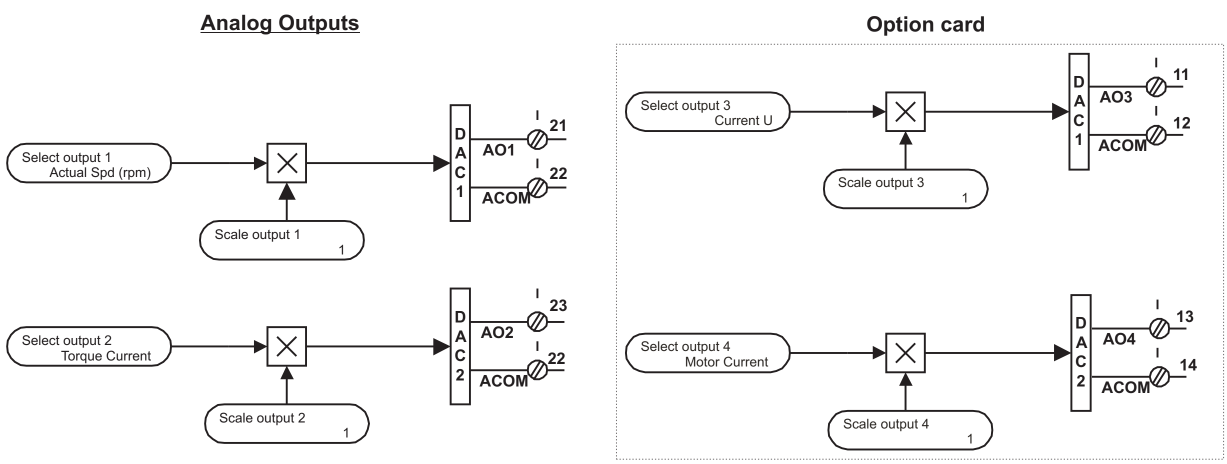


Figure 2.13.1.1: Standard Analog output and Option card blocks

Scale output XX Scaling of the analog output concerned

1) With a scaling factor of 1 the output is 10V when the reference value or speed equals to the value defined by **Speed base value.**
2) With a scaling factor of 1 the output is 10V when the quantity equals to Full load torque current **Flt 100mF**.
3) With a scaling factor of 1 the output is 10V when the current in A equals to √2 times **Full load curr.**
4) With a scaling factor of 1 the output is 10V when the RMS value of fondamental voltage (1st harmonic component) equals to **Mains voltage**
5) With a scaling factor of 1 the output is 10V when the voltage is 500 V. The output shows the voltage waveform over time. Sample time ≤ 1 ms.
6) With a scaling factor of 1 the output is 10V when the voltage is 1000 V.
7) With a scaling factor of 1 the output is 10V when the voltage at the corresponding analog input is 10 V (when scaling factor and Tune value of the equals input =1). See Figure 2.13.2.1.
8) With a scaling factor of 1 the output is 10V when the reference value equals to the **Magnetizing curr**
9) With a scaling factor of 1 the output is 10V when the flux is 2 Vs
10) With a scaling factor of 1 the output is 10V when the torque equals to the rated torque of the motor.
11) With a scaling factor of 1 the output is 10V when the active power equals to the rated power of the motor.
12) With a scaling factor of 1 the output is 10V when the current in ARMS equals to the **Full load curr.**
13) With a scaling factor of 1 the output is 10V when Rotor resistance correction corresponds to the original parameter value
14) With a scaling factor of 1 the output is 10V when a Pad value equals to 2047.
15) The range values are described in chapter 2.17.3 **PID Function**
16) With a scaling factor of 1 the output is 10V, when **Active power** = √3 x **Mains voltage** x **Full load current**.

    Using the drive with a SR32 line regenerative converter, either the PDC and the analog output are used only when **Regulation mode** = **Sensorless** or **Regulation mode** = **Field oriented**
17) With a scaling factor of 1, the output is 10V when the speed ratio = 20000
18) With a scaling factor of 1, the output is 10V when **PL next factor** = 10000 (ratio = 1)
19) With a scaling factor of 1, the output is 10V, when **Out Vlt level** (100%) is equals to **Base voltage** parameter**.**
20) With a scaling factor of 1, the output is 10V, when **Flux level** (100%) is equals to the nominal flux level**.**

<u>Calculation example for calculating the scaling factor **Scale output xx**</u>

Consider an analog display device to indicate the speed of the drive. The instrument has a measuring range of 0 ... 2 V.

This means that at maximum speed 2 V is required at the analog output of the frequency inverter. A scaling factor of 1 would supply 10 V. (Scaling factor = 2 V / 10 V = 0.200).

2.13.2. Analog Inputs

- **I/O CONFIG.**
  - **Analog inputs**
    - **Analog input 1**
      - Select input 1
      - An in 1 target
      - Input 1 type
      - Input 1 sign
      - Scale input 1
      - Tune value inp 1
      - Auto tune inp 1
      - Input 1 filter
      - Input 1 compare
      - Input 1 cp error
      - Input 1 cp delay
      - Offset input 1
    - **Analog input 2**
      - Select input 2
      - An in 2 target
      - Input 2 type
      - Input 2 sign
      - Scale input 2
      - Tune value inp 2
      - Auto tune inp 2
      - Offset input 2
    - **Analog input 3**
      - Select input 3
      - An in 3 target
      - Input 3 type
      - Input 3 sign
      - Scale input 3
      - Tune value inp 3
      - Auto tune inp 3
      - Offset input 3

GA0700

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select input 1	70	0	28	Ramp ref 1	Terminals1/2
An in 1 target	295	0	1	Assigned (0)	
Input 1 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	71	0	2	-10V...+10V (0)	
Input 1 sign Positive Negative	389	0	1	Positive (1)	
Input 1 sign+	-				*
Input 1 sign-	-				*
Scale input 1	72	-10.000	10.000	1.000	
Tune value inp 1	73	0.1	10.000	1.000	
Auto tune inp 1	259	0	65535		
Input 1 filter	792	0	1000	0	

Ga6250a

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Input 1 compare	1042	-10000	10000	0	
Input 1 cp error	1043	0	10000	0	
Input 1 cp delay [ms]	1044	0	65000	0	
Offset input 1	74	-32768	+32767	0	
Select input 2	75	0	28	OFF	Terminals 3/4
An in 2 target	296	0	1	Assigned (0)	
Input 2 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	76	0	2	-10V...+10V (0)	
Input 2 sign Positive Negative	390	0	1	Positive (1)	
Input 2 sign+	-			-	*
Input 2 sign-	-			-	*
Scale input 2	77	-10.000	10.000	1.000	
Tune value inp 2	78	0.1	10.000	1.000	
Auto tune inp 2	260	0	65535		
Offset input 2	79	-32768	+32767	0	
Select input 3	80	0	28	OFF	Terminals 5/6
An in 3 target	297	0	1	Assigned (0)	
Input 3 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	81	0	2	-10V...+10V (0)	
Input 3 sign Positive Negative	391	0	1	Positive (1)	
Input 3 sign+	-				*
Input 3 sign-	-				*
Scale input 3	82	-10.000	10.000	1.000	
Tune value inp 3	83	0.1	10.000	1.000	
Auto tune inp 3	261	0	65535		
Offset input 3	84	-32768	+32767	0	

Ga6250b

* These parameters can be assigned to programmable digital inputs. Both ...sign+ and ...sign- must be used for each channel, with a XOR logic

Select input XX Selection of the parameter to be assigned its value via an analog input. The following assignments are possible:

OFF [0]	**Adap reference**1) [8]	**Load comp** [19]
Jog reference1) [1]	**T current lim**2) [9]	**PID offset 0** 4) [21]
Speed ref 11) [2]	**T current lim +**2) [10]	**PI central V3** 4) [22]
Speed ref 21) [3]	**T current lim -**2) [11]	**PID feed-back** 4) [23]
Ramp ref 11) [4]	**Pad 0** 3) [12]	**V/f flux level** [24]
Ramp ref 21) [5]	**Pad 1** 3) [13]	**Flux level** [25]
T current ref 12) [6]	**Pad 2** 3) [14]	**Out vlt level** [26]
T current ref 22) [7]	**Pad 3** 3) [15]	**Speed ratio** 5) [28]

Input XX type Selection of input type (voltage or current input) Jumpers on the regulator card of the AVy should be fitted or removed according to the input signal used. The inputs of the device are factory set for voltage signals.

Analog input	Input signal	
	-10V...+10V 0-10 V	0-20 mA 4-20 mA
Analog input 1	S8 = OFF	S8 = ON
Analog input 2	S9 = OFF	S9 = ON
Analog input 3	S10 = OFF	S10 = ON

GA6255ai

ON Jumper fitted OFF Jumper not fitted

-10 V...+10 V — A voltage of max +10 V is connected to the analog input concerned. If the signal is used as a speed reference value, a polarity reversal can be used to reverse the rotation direction of the drive.

0-10V, 0-20mA — A voltage of max. +10 V or a current signal of 0...20 mA is connected to the analog input concerned. The signal must be positive. If the signal is used as a speed reference value, the drive rotation direction can be reversed via the **Input XX sign +** and **Input XX sign -** parameters.

4-20 mA — A current signal of 4...20 mA is connected to the analog input concerned. The signal must be positive. If the signal is used as a speed reference value, the drive rotation direction can be reversed via the **Input XX sign +** and **Input XX sign -** parameters.

An in XX target Assign the analog input xx sampling. If **assigned**, the sampled value is copied into the parameter programmed on the analog input.

If **not assigned**, the programmed parameter takes the value preset via keypad or RS485 or BUS, before to assign an analog input. Exception are the “PAD” parameters, where the last value on the analog input is stored when An in XX target = not assigned is executed.

Input XX sign Selection of rotation direction when operated via the serial interface or bus.

Input XX sign + Selection of “Clockwise”rotation when operated via the terminal strip, when the reference value is only given with one polarity.

High — Clockwise selected

Low — Clockwise not selected

Input XX sign - Selection of “Counter-clockwise” rotation when operated via the terminal strip, when the reference value is only given with one polarity.

High — Counter-clockwise selected

Low — Counter-clockwise not selected

Both Input xx sign+ and Input xx sign- should be used for each channel, with a XOR logic.

Scale input XX Scaling of the corresponding analog input

1) With a scaling factor of 1 and a **Tune value inp XX** = 1, 10 V or 20 mA on the input correspond to the **Speed base value.**

2) With a scaling factor of 1 and a **Tune value inp XX** = 1, 10 V or 20 mA on the input correspond to max possible Flt 100mF current.

3) With a scaling factor of 1, 10 V or 20 mA in the input correspond to the Pad value of 2047.

4) The range values are described in chapter: 6.17.3 **PID Function**

5) With a scaling factor of 1.0 and Tune value inp XX=1, 10V or 20 mA correspond to Speed ratio = 20000

Tune value inp XX Fine tuning of the input when the max. signal does not exactly match the full scale rated value. See below example.

Auto tune inp XX Automatic fine tuning of the input. If this command is given. **Tune value inp XX** is automatically selected so that the input signal present provides the full scale value, such as the **Speed base value**. Two conditions are necessary for automatic fine tuning:

- Input voltage greater than 1V or input current greater than 2 mA
- Positive polarity. The value found is used for both polarities.

Note: The automatically calculated value can, if necessary, be modified manually via **Tune value inp XX.**

Offset inp XX If the analog signal has an offset or if the variable assigned to the input shows a non-zero value although there is no input signal present, this can be compensated via the **Offset inp XX.**

The AVy Drive is factory set so that analog values defined as 0-10 V, 0-20 mA and 4-20 mA signals are always interpreted as positive values. In order to reverse the polarity, the parameters **Input XX sign +** and **Input XX sign -** must be configured on digital inputs. Both these inputs are used with a XOR logic. With field bus operation (Option), the Input XX sign parameter specifies the sign for the polarity of an analog input. If a parameter is already internally assigned (e.g. if Speed ref 1 is automatically connected with the ramp output when the ramp is enabled), it will no longer appear in the list of parameters that can be assigned to an analog input.

The **Input XX sign +** and **Input sign -** parameters cannot be addressed via the serial interface.

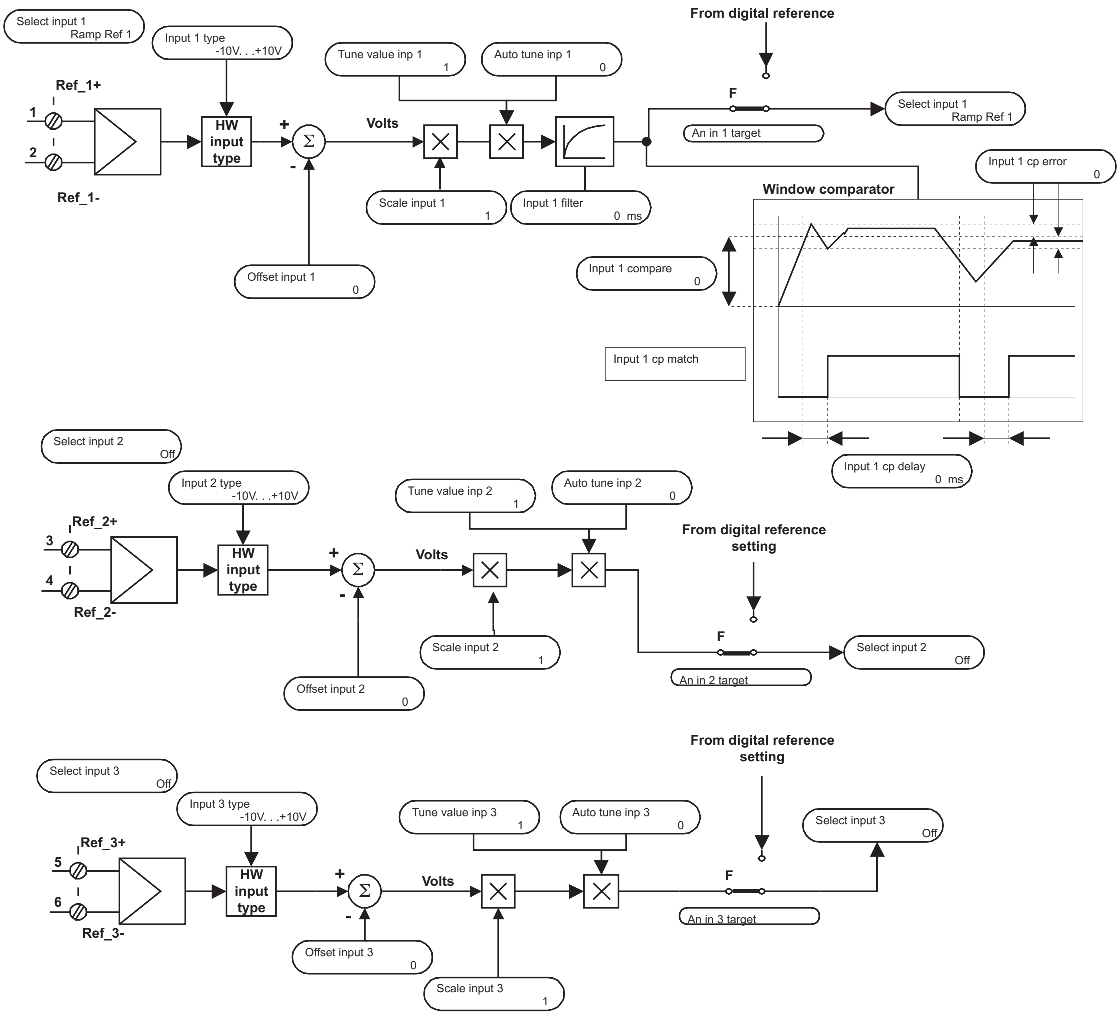


Figure 2.13.2.1: Analog input

Example 1:

The speed reference value of a drive is defined with an external voltage of max. 5 V. The value corresponds to the maximum possible speed of the drive (defined with Speed base value).

Scaling factor 2 is entered as the Scale input XX parameter (10V : 5V)

Example 2:

An external analog reference value is only max. 9.8 V instead of 10 V.

Set the Tune value inp XX parameter to 1.020 (10 V : 9.8 V).

The same result would have been obtained via the **Auto tune inp XX** function. The appropriate parameters would have to be entered in the menu of the keypad. The maximum possible analog value (in this case 9.8 V) would have to be present at the terminal with a positive polarity. The keypad will adjust the "Tune value" automatically if the Enter key is pressed.

Analog Input 1 window comparator

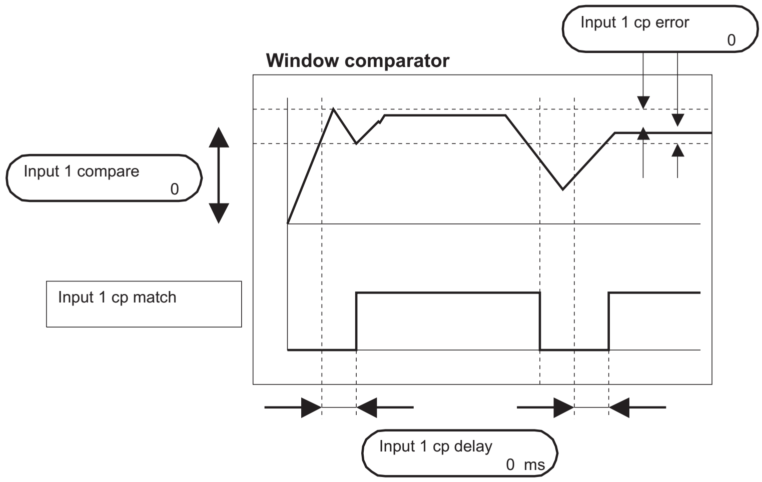


Figure 2.13.2.2: Window comparator

This function allows to signal the match of a programmable value on analog input 1.

Input 1 compare Sets the level for the comparator.

Input 1 cp error Defines a tolerance window around **Input 1 compare**.

Input 1 cp delay Delay time setting in milliseconds for the transition of **Input 1 cp match** from low to high.

Input 1 cp match Signalling output of the video comparator.
It can be read through a Field Bus LAN or digital output.

High	**Analog input 1** value is within the comparation window.
Low	**Analog input 1** value is out the comparation window.

NOTE! How to calculate **Input 1 compare** and **Input 1 cp error** parameters:

Input 1 compare = (Compare value) * 10000 / (Full range value)

Input 1 error = (Tolerance half window) 10000 / (Full range value)campo)

Example 1:

Select analog input 1 to **Ramp ref 1**

Speed base value equal to 1500 [RPM]

10Volt or 20 mA on analog input 1 (Ramp ref 1=Speed base value).

The application requires a signaling at 700 [RPM] via a digital output, with a tolerance window equal to 100 [RPM]

Input 1 cp match assigned to a programmable digital output.

Input 1 compare = 700 * 10000 / 1500 = 4667

Input 1 cp error = 100 * 10000 / 1500 = 666

Example 2:

Select analog input 1 to **Ramp ref 1**

Speed base value equal to 1500 [RPM]

10Volt or 20 mA on **Analog input 1** (**Ramp ref 1**=**Speed base value**).

The application requires a signaling at –700 [RPM] via LAN, with a tolerance window equal to ±100 [RPM]

Input 1 compare = -700 * 10000 / 1500 = -4667

Input 1 cp error = 100 * 10000 / 1500 = 666

Example 3:

Select analog input 1 to **Pad 0**

10Volt or 20 mA on **Analog input 1** corresponds to Pad 0=2047.

The application requires a signaling at 700 [count] via a digital output, with a tolerance window equal to ±50 [count]

Input 1 cp match assigned to a programmable digital output

Input 1 compare = 700 * 10000 / 2047 = 3420

Input 1 cp error = 50 * 10000 / 2047 = 244

Example 4:

Select analog input 1 to **PID feedback**

10Volt or 20 mA on **Analog input 1** corresponds to **PID feedback**=10000.

The application requires a signaling at 4000 [count] via a digital output, with a tolerance band equal to ±1000 [count]

Input 1 set thr assigned to a programmable digital output

Input 1 thr = 4000 * 10000 / 10000 = 4000

Input 1 cp error = 1000 * 10000 / 10000 = 1000

Example 5:

Select input 1 to **T current lim**

10Volt or 20 mA on **Analog input 1** corresponds to **T current lim** = 100 [%]

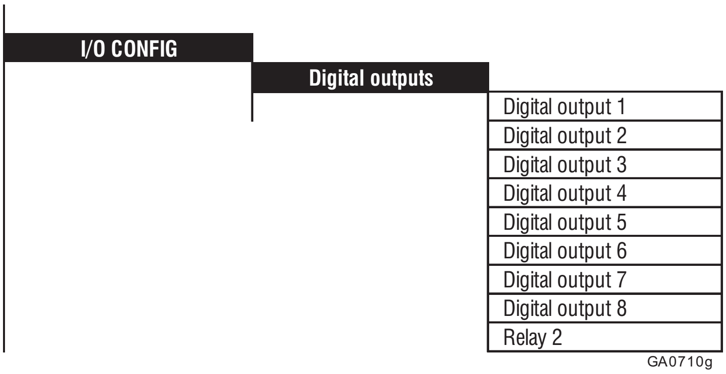
The application requires a signaling at 50 [%] via a digital output, with a tolerance band equal to ±2 [%]

Input 1 cp match assigned to a programmable digital output

Input 1 compare = 50 * 10000 / 100 = 5000

Input 1 cp error = 2 * 10000 / 100 = 200

2.13.3. Digital Outputs



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Digital output 1	145	0	49	Ramp+	
Digital output 2	146	0	49	Ramp-	
Digital output 3	147	0	49	Spd threshold	
Digital output 4	148	0	49	Overld available	
Digital output 5	149	0	49	Curr limit state	
Digital output 6	150	0	49	Overvoltage	
Digital output 7	151	0	49	Undervoltage	
Digital output 8	152	0	49	Overcurrent	
Relay 2	629	0	49	Speed zero thr	

Ga6260

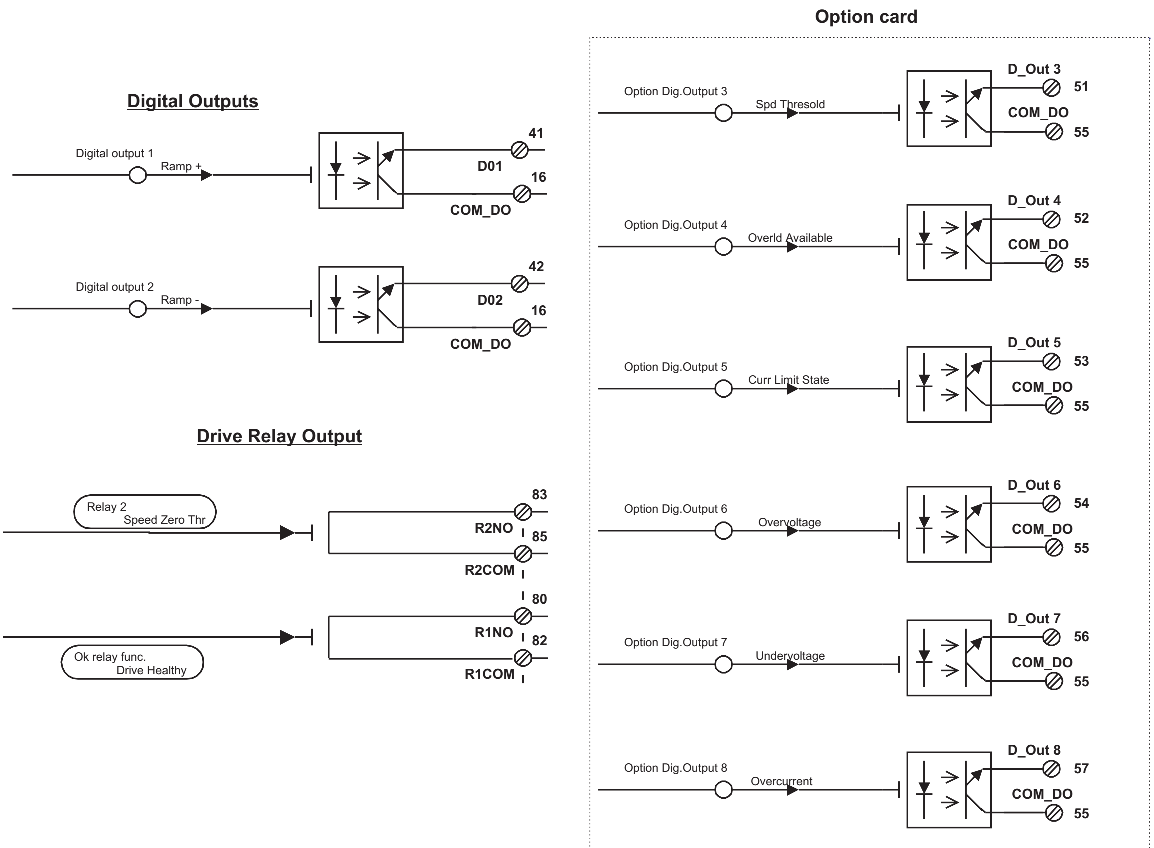


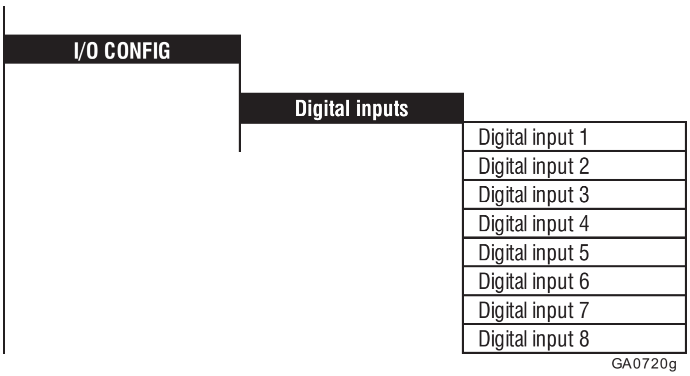
Figure 2.13.3.1: Digital Outputs and Option card

Digital output XX Selection of the parameter that is assigned to the digital output concerned. The following assignments are possible:

OFF [0]
Speed zero thr [1]
Spd threshold [2]
Set speed [3]
Curr limit state [4]
Drive ready [5]
Overld available [6]
Reserved [7]
Ramp + [8]
Ramp - [9]
Speed limited [10]
Undervoltage [11]
Overvoltage [12]
Heatsink sensor [13]
Overcurrent [14]
Overtemp motor [15]
External fault [16]
Failure supply [17]
Pad A bit [18]
Pad B bit [19]
Virt dig input [20]
Speed fbk loss [25]
Bus loss [26]
Output stages [27]
Hw opt 1 failure [28]
Opt 2 failure [29]
Encoder 1 state [30]
Encoder 2 state [31]
Ovld mot state [32]
Enable seq err [35]
Bu overload [36]
Diameter calc st [38]
Mot setup state [46]
Input 1 cp match [49]
Overload 200% [51]
PL stop active [52]
PL next active [53]
PL time-out sig [54]
Regulation ot [55]
Module overtemp [56]
Heatsink ot [57]
Intake air ot [62]

Relay 2 Selection of the parameters, that is assigned to the relay contact 83 and 85 has to trip (Open relay contact = Alarm, closed relay contact = No alarm).

2.13.4. Digital Inputs



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Digital input 1	137	0	62	OFF	
Digital input 2	138	0	62	OFF	
Digital input 3	139	0	62	OFF	
Digital input 4	140	0	62	OFF	
Digital input 5	141	0	62	OFF	
Digital input 6	142	0	62	OFF	
Digital input 7	143	0	62	OFF	
Digital input 8	144	0	62	OFF	

Ga6265

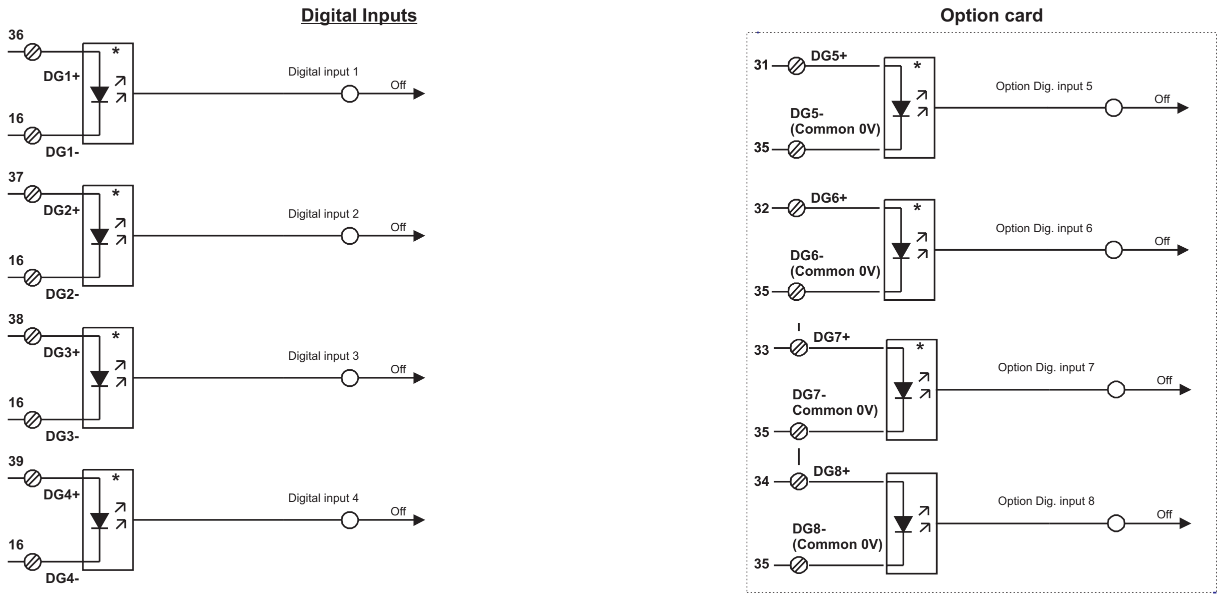


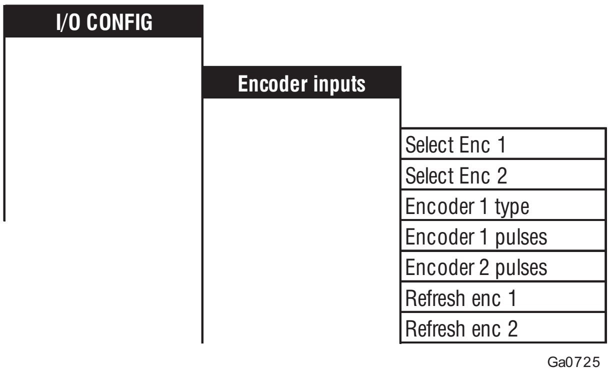
Figure 2.13.4.1: Digital Input and Option card

Digital input XX Selection of the parameter that is addressed by the digital input concerned. The following assignments are possible:

OFF [0]
Motor pot reset [1]
Motor pot up [2]
Motor pot down [3]
Motor pot sign + [4]
Motor pot sign - [5]
Jog + [6]
Jog - [7]
Failure reset [8]
Torque reduct [9]
Ramp out = 0 [10]
Ramp in = 0 [11]
Ramp freeze [12]
Lock speed reg [13]
Lock speed I [14]
Auto capture [15]
Input 1 sign +1) [16]
Input 1 sign -1) [17]
Input 2 sign +1) [18]
Input 2 sign - 1) [19]
Input 3 sign + 1) [20]
Input 3 sign -1) [21]
Zero torque [22]
Speed sel 02) [23]
Speed sel 12) [24]
Speed sel 22) [25]
Ramp sel 03) [26]
Ramp sel 13) [27]
Speed fbk sel [28]
Pad A bit 0 [32]
Pad A bit 1 [33]
Pad A bit 2 [34]
Pad A bit 3 [35]
Pad A bit 4 [36]
Pad A bit 5 [37]
Pad A bit 6 [38]
Pad A bit 7 [39]
Fwd sign [44]
Rev sign [45]
An in 1 target [46]
An in 2 target [47]
An in 3 target [48]
Droop enable [49]
Quick stop [51]
Enable PI PID 4) [52]
Enable PD PID 4) [53]
PI int freeze 4) [54]
PID offs. sel 4) [55]
PI central vs0 4) [56]
PI central vs1 4) [57]
Diameter calc 4) [58]
Lock zero pos [59]
Lock save eng [60]
Mot setup sel 05) [62]
PL mains status [66]
PL time-out ack [67]

1) The **Input xx sign +** and **Input XX sign -** parameters can only be used in conjunction with each other.
2) The **Speed sel 0**, **Speed sel 1** and **Speed sel 2** parameters can only be used together.
3) The **Ramp sel 0** and **Ramp sel 1** parameters can only be used together.
4) See **PID Function** (chapter 2.17.3)
5) See **Motor setup function** (chapter 2.15.6)

2.13.5 Speed reference from encoder input (Tach follower function)



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select enc 1	1020	0	5	OFF	
Select enc 2	1021	0.00	5	OFF	
Encoder 1 type Sinusoidal Digital	415	0	1	Digital (1)	
Encoder 1 pulses	416	600	9999	1024	
Encoder 2 pulses	169	600	9999	1024	
Refresh enc 1 Enabled Disabled	649	0	1	Disable (0)	
Refresh enc 2 Enabled Disabled	652	0	1	Disable (0)	

Ga6266ai

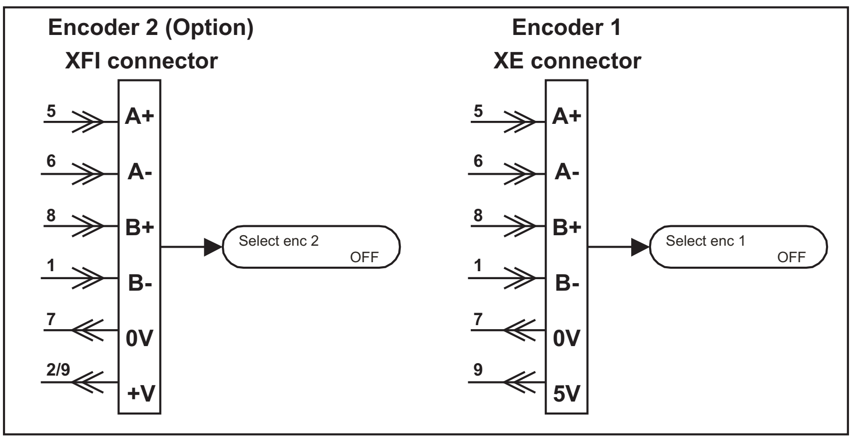


Figure 2.13.5.1: Tach follower

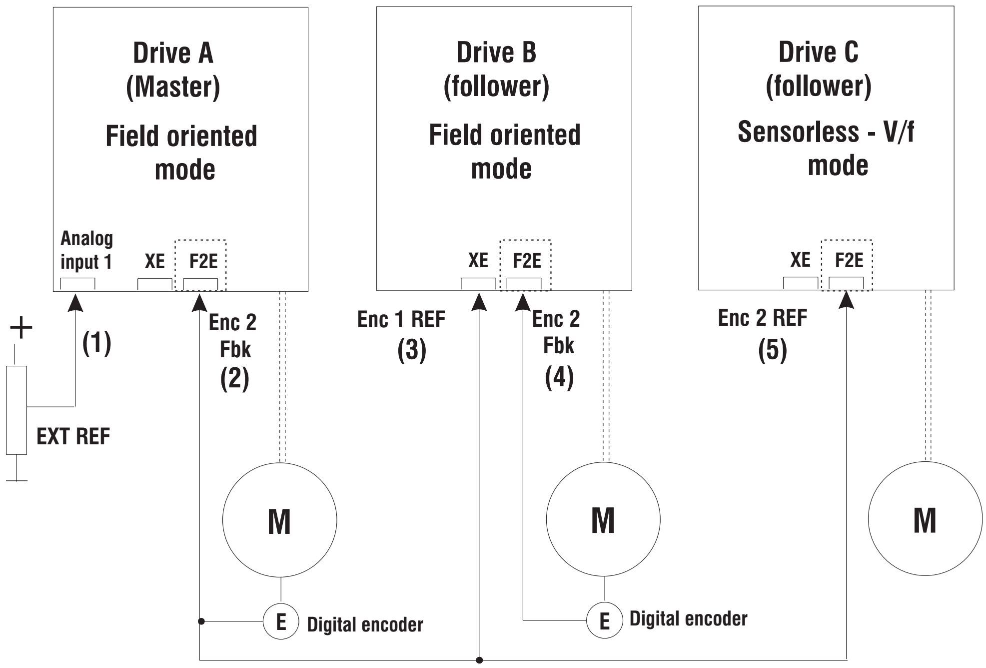
This configuration allows the use of the encoder inputs, as a speed reference. Compared to an analog input, these inputs have higher resolution and higher noise immunity.

Using for this purpouse the encoder input (XE connector), it is necessary to define the destination, selecting properly the type of speed reference on which it has to interact (**Ramp ref 1**, **Speed ref 1**, etc.)

When the encoder input is used as a speed reference source, using the same encoder input as speed feedback is disallowed. It is impossible to configure the same speed reference to the encoder input and an analog input.

Select enc 1	These parameters define which speed reference the encoder signal will reference to.
Select enc 2	The OFF condition indicates that the encoder connector is not used as speed reference and then it could be used as speed feedback. (CONFIGURATION/ Speed fbk sel menu). The speed reference destination choice must be done according to the speed regulator configuration (e.g. can not use **Speed ref 1** with the ramp active).
Encoder 1 type	It defines the encoder type to the XE connector connected. Sinusoidal Sinusoidal encoder Digital Digital encoder
Encoder 1 pulses	Pulse number of the encoder to the XE connector connected.
Encoder 2 pulses	Pulse number of the encoder to the optional card EXP-F2E connector connected.
Refresh enc 1	Enables the monitoring of the encoder 1 connection status, in order to detect a speed feedback loss alarm
Refresh enc 2	Enables the monitoring of the digital encoder 2 connection status, in order to detect a speed feedback loss alarm

The figure 2.13.5.2 describe a typical use of this function.



(1) Analog inputs/ Select input 1 = Ramp ref 1
(2) Speed fbk sel = Encoder 2
(3) Select enc 1 = Ramp ref 1/ Enc 1 Type = digital
(4) Speed fbk sel = Encoder 2
(5) Select enc 2 = Ramp ref 1

Figure 2.13.5.1:Example of application of the encoder reference

The Drive A speed reference is provided in this case by an external analog signal but it could be set from internal digital sources (e.g. APC optional card or field bus).

A configuration using the encoder signal as the line speed reference, is only possible when the speed reference source is provided by an additional encoder, independent from the motor shaft.

Use with different regulation mode setting:

The function “Tach follower” with **Regulation mode** = **Field oriented** can be used in accordance with the table below, if the “Motor setup” function (the parameters **Select enc 1** and **Select enc 2** must be set OFF) is used.

In the table below are reported the possible configurations of the Drive for the simultaneous use of the functions “Tach follower” and “Motor setup”.

Regulation mode	Motor setup		Tach follower	
	Speed fbk sel Setup 0	Speed fbk sel Setup 1	Select enc 1	Select enc 2
Field oriented mode	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1 (1)	Encoder 1 (1)	OFF	Reference assigned
	Encoder 2 (1)	Encoder 2 (1)	Reference assigned	OFF
Sensorless mode or V/f control (2)	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1	Encoder 1	OFF	Reference assigned
	Encoder 2	Encoder 2	Reference assigned	OFF

Ga6267

(1) It requires the electromechanical commutation of the encoder signals. It is not suggested for the correct continuity of the shieldings and low noise immunity.

(2) Encoder feedback is not used in these cases. The **Spd fbk sel** parameter is logically interblocked with **Select enc 1** and **Select enc 2** parameters and in both the setups it is necessary to assign it both channels.

2.14. ADDITIONAL SPEED FUNCTIONS

2.14.1. Auto capture

ADD SPEED FUNCT
Auto capture

GA0730g

This function can be assigned toone of the programmable digital inputs.

Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Auto capture	388	0	1	OFF	*
ON					
OFF				(0)	

GA6270g

* This function can be assigned toone of the programmable digital inputs.

Auto capture	ON	When the Drive is switched on, the speed of the motor is determined and the field orientation is initialized accordingly. The drive then runs to the set reference value.
	OFF	When the Drive is switched on, it starts at zero frequency.

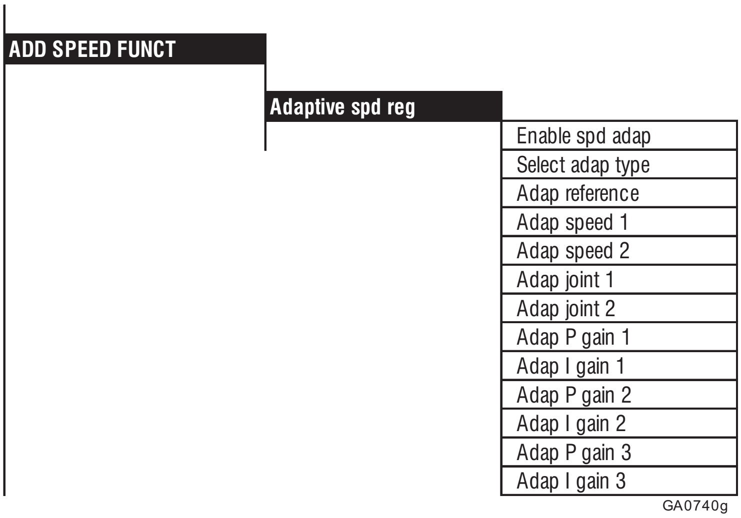
<u>This function can be used only with REGULATION MODE = Field oriented or REGULATION MODE= V/f control (see chapter 2.4.2.3.3).</u>

Main uses:

- Start of a motor that is already running due to its load (e.g. in the case of pumps, the flowing medium).
- Restart after a fault alarm.
- If the speed reference value is defined via the ramp, with **Auto capture** = ON this starts at a reference value corresponding to the motor speed.

NOTE! If the Auto capture function is switched off, ensure that the motor is not turning when the Drive is switched on. If this is not the case, this may cause the Drive to be switched off due to overvoltage or overcurrent.

2.14.2 Adaptive spd reg



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable spd adap	181	0	1	Disabled	
Enable					
Disable				(0)	
Select adap type	182	0	1	Speed	
Speed				(0)	
Adap reference					
Adap reference [FF]	183	-32768	+32767	1000	*
Adap speed 1 [%]	184	0.0	200.0	20.3	
Adap speed 2 [%]	185	0.0	200.0	40.7	
Adap joint 1 [%]	186	0.0	200.0	6.1	
Adap joint 2 [%]	187	0.0	200.0	6.1	
Adap P gain 1 [%]	188	0.00	100.00	10.00	
Adap I gain 1 [%]	189	0.00	100.00	1.00	
Adap P gain 2 [%]	190	0.00	100.00	10.00	
Adap I gain 2 [%]	191	0.00	100.00	1.00	
Adap P gain 3 [%]	192	0.00	100.00	10.00	
Adap I gain 3 [%]	193	0.00	100.00	1.00	

GA6275g

* This function can be assigned to one of the programmable analog inputs.

The adaptive speed regulator function enables different gains of the speed regulator depending on the speed or another variable (Adaptive Reference). This allows optimum adaption of the speed regulator to the application at hand.

Enable spd adap Enabled — Adaptive speed regulation enabled.

Disabled — Adaptive speed regulation is not enabled. The regulator operates with the parameters set in the REG PARAMETERS menu.

Select adap type Speed — The regulator parameters are modified according to the speed.

Adap reference — The regulator parameters are modified according to the **Adap reference** parameter.

Adap reference The variable according to which the speed regulator parameters are to be modified (only with **Select adap type** = Adap reference)

Adap speed 1 Parameter set 1 is valid below this point, and parameter set 2 above it. The transition behavior between the values is defined by the **Adap joint 1** parameter. The definition is a percentage of the **Speed base value**

Adap speed 2 Parameter set 2 is valid below this point, and parameter set 3 above it. The transition behaviour between the values is defined by **Adap joint 2**. The definition is a percentage of the **Speed base value**

Adap joint 1 Defines a range around **Adap speed 1** in which there is a linear change in gain from parameter set 1 to parameter set 2 in order to prevent jumps in the behavior of the regulator. The definition is a percentage of the **Speed base value**

Adap joint 2 Defines a range around **Adap Speed 2** in which there is a linear change in gain from parameter set 2 to parameter set 3 in order to prevent jumps in the behavior of the regulator. The definition is a percentage of the **Speed base value**

Adap P gain 1 Proportional gain for the range from zero to **Adap speed 1**. Defined as a percentage of **Speed P base**.

Adap I gain 1 Integral gain for the range from zero to Adap speed 1. Defined as a percentage of **Speed I base**.

Adap P gain 2 Proportional gain for the range from **Adap speed 1** to **Adap speed 2**. Defined as a percentage of **Speed P base**.

Adap I gain 2 Integral gain for the range from **Adap speed 1** to **Adap speed 2**. Defined as a percentage of **Speed I base**.

Adap P gain 3 Proportional gain for the range above **Adap speed 2**. Defined as a percentage of **Speed P base**.

Adap I gain 3 Integral gain for the range above **Adap speed 2**. Defined as a percentage of **Speed I base**.

In order to activate Adaptive speed regulation, the function must be enabled with the **Enable spd adap** parameter. Normally the gain depends on the speed of the drive. It can, however, also vary according to another variable, defined by the **Adap reference** parameter. This must be selected with the **Select adap type** parameter.

The **Adap speed 1** and **Adap speed 2** parameters are used to define the three ranges that may have different gains. A parameter set can be defined for each of these ranges, with each set containing an individually definable P and I component. The **Adap joint 1** and **Adap joint 2** parameters ensure a smooth transition between the different parameter sets. The ranges must be defined in such a way that **Adap joint 1** and **Adap joint 2** do not overlap.

When the Adaptive speed regulation is enabled (**Enable spd adap** = Enabled), the **Speed P** and **Speed I** parameters have no effect. They still retain, however, their value and are effective after disabling the Adaptive speed regulation. When the drive is not enabled, the gain of the speed regulator is determined by the speed zero logic. See section 2.14.4, "Speed zero logic".

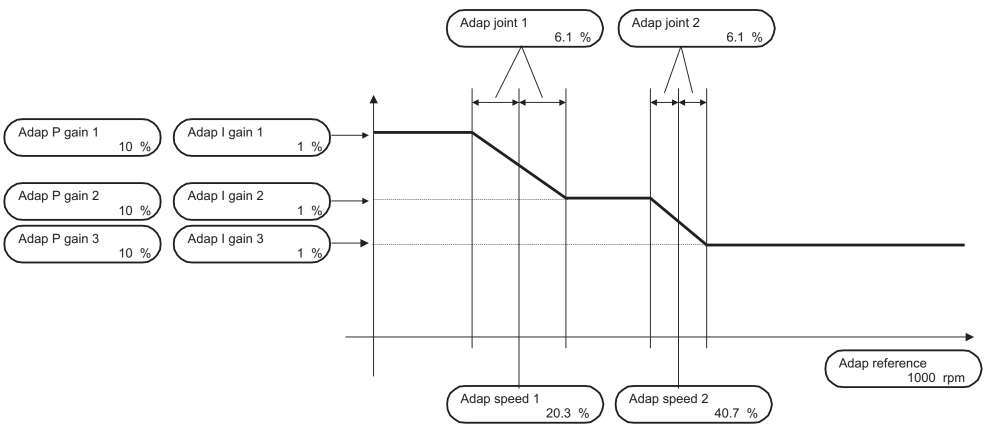
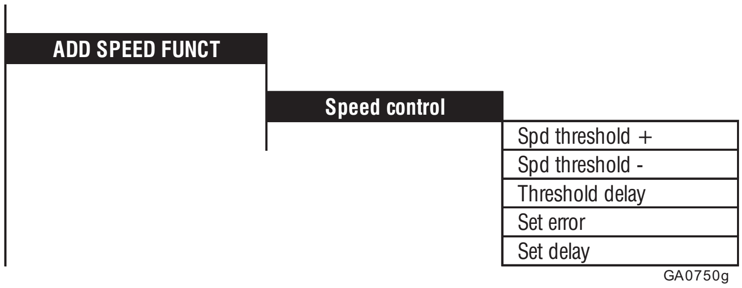


Figure 2.14.2.1: Adaptive speed regulation

2.14.3. Speed control



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Spd threshold + [FF]	101	1	32767	1000	
Spd threshold - [FF]	102	1	32767	1000	
Threshold delay [ms]	103	1	65535	100	
Spd threshold	393	0	1	-	Digital output 3 *
Set error [FF]	104	1	32767	100	
Set delay [ms]	105	0	65535	100	
Set speed	394	0	1	-	*

GA6280g

* This function can be assigned to a programmable digital output.

Two speed control messages are provided:
- when an adjustable speed threshold is exceeded
- when the speed equals the set reference value

Spd threshold + Switch point for "Spd threshold" for clockwise rotation of the drive in the unit defined by the factor function.

Spd threshold - Switch point for the "Spd threshold" for counter clockwise rotation of the drive in the unit defined by the factor function.

Threshold delay Setting of a delay time in milliseconds for the transition of **Spd threshold**

Spd threshold Message "Speed exceeded" (via a programmable digital output or RS485 or BUS)

High Speed not exceeded

Low Speed exceeded

Set error Defines a tolerance band around the speed reference in the unit specified by the factor function.

Set delay Setting of a delay time in milliseconds for the transition of set speed from low to high.

Set speed Message "The speed corresponds to the reference value" (via a programmable digital output or RS485 or BUS).

High Speed is in the range:reference ± Set error

Low Speed is outside the range said above

The message "Speed corresponds to the reference value" refers to the total reference value **Speed ref** or **Ramp Ref** ramp reference value when the ramp is selected.

With reference values below ± 1 % the signal is always Low!

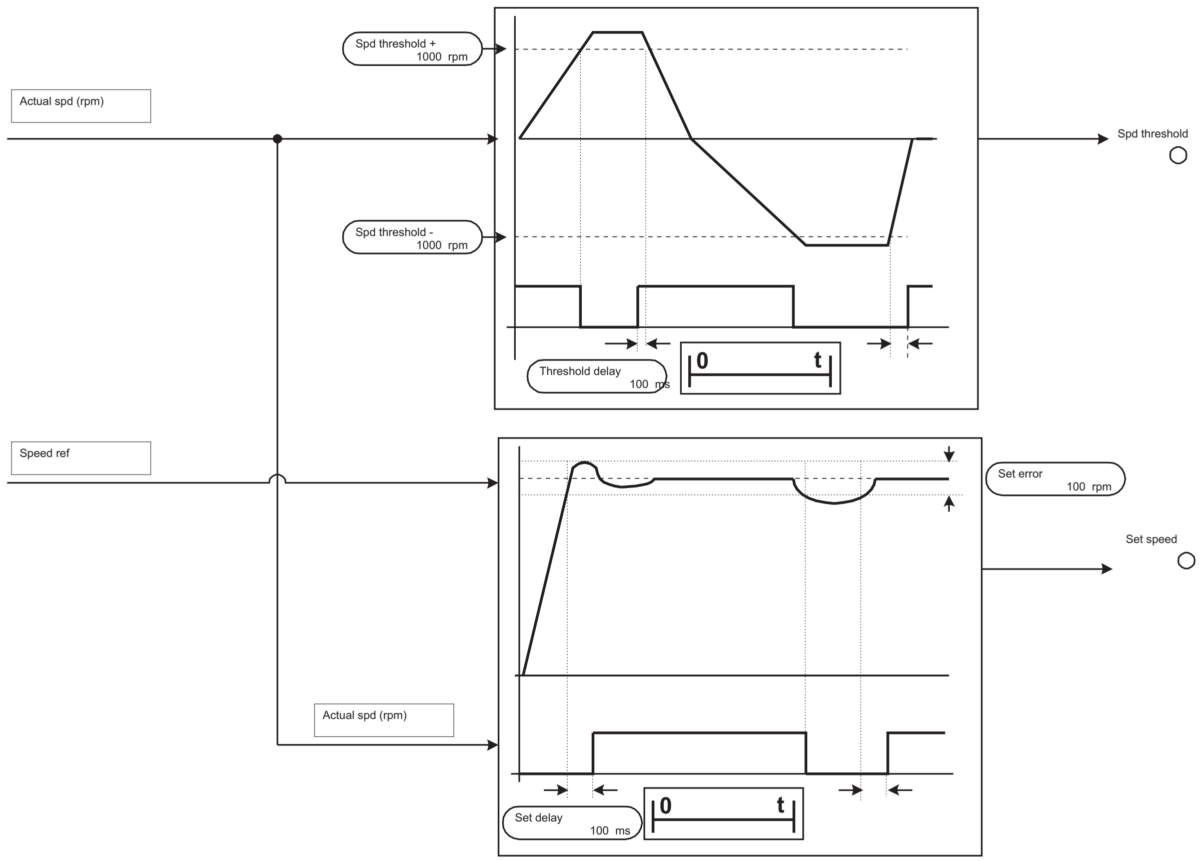
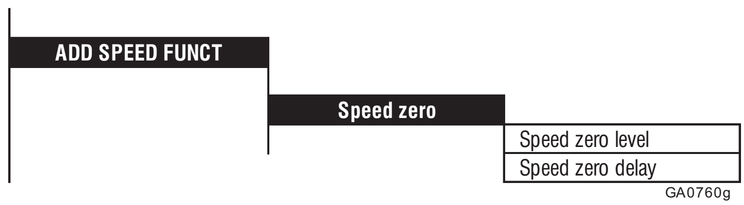


Figure 2.14.3.1: "Speed threshold" (up) and "Set speed" (down) messages

2.14.4. Speed zero



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed zero level [FF]	107	1	32767	10	-
Speed zero delay [ms]	108	0	65535	100	-
Speed zero thr	395	0	1	-	* Relay terminals 83/85

GA6285g

* This function can be assigned to a programmable digital output.

Speed zero level Switch threshold for Speed zero level. The value applies to both rotation directions. Defined in the unit specified by the factor function.

Speed zero delay	Definition of a delay time in milliseconds, for the transition of speed zero thr from High to low	
Speed zero thr	Message "Drive running" (via a programmable digital output or RS485 or BUS)	
	High	Drive running
	Low	Drive not running

The LED "Zero speed" is lit when the motor is not running.

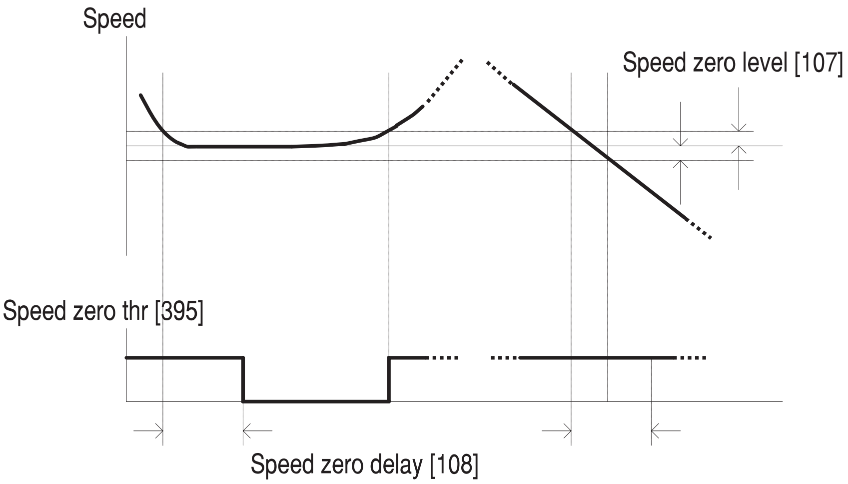
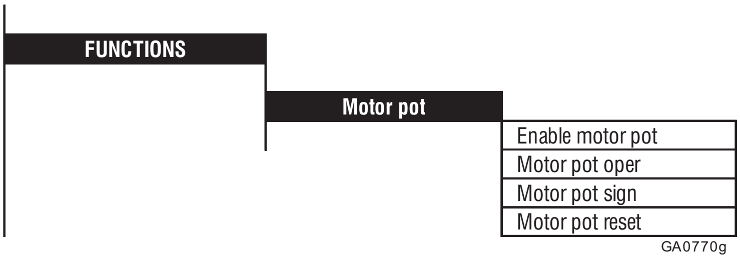


Figure 2.14.4.1: Speed zero

2.15. FUNCTIONS

2.15.1 Motor potentiometer



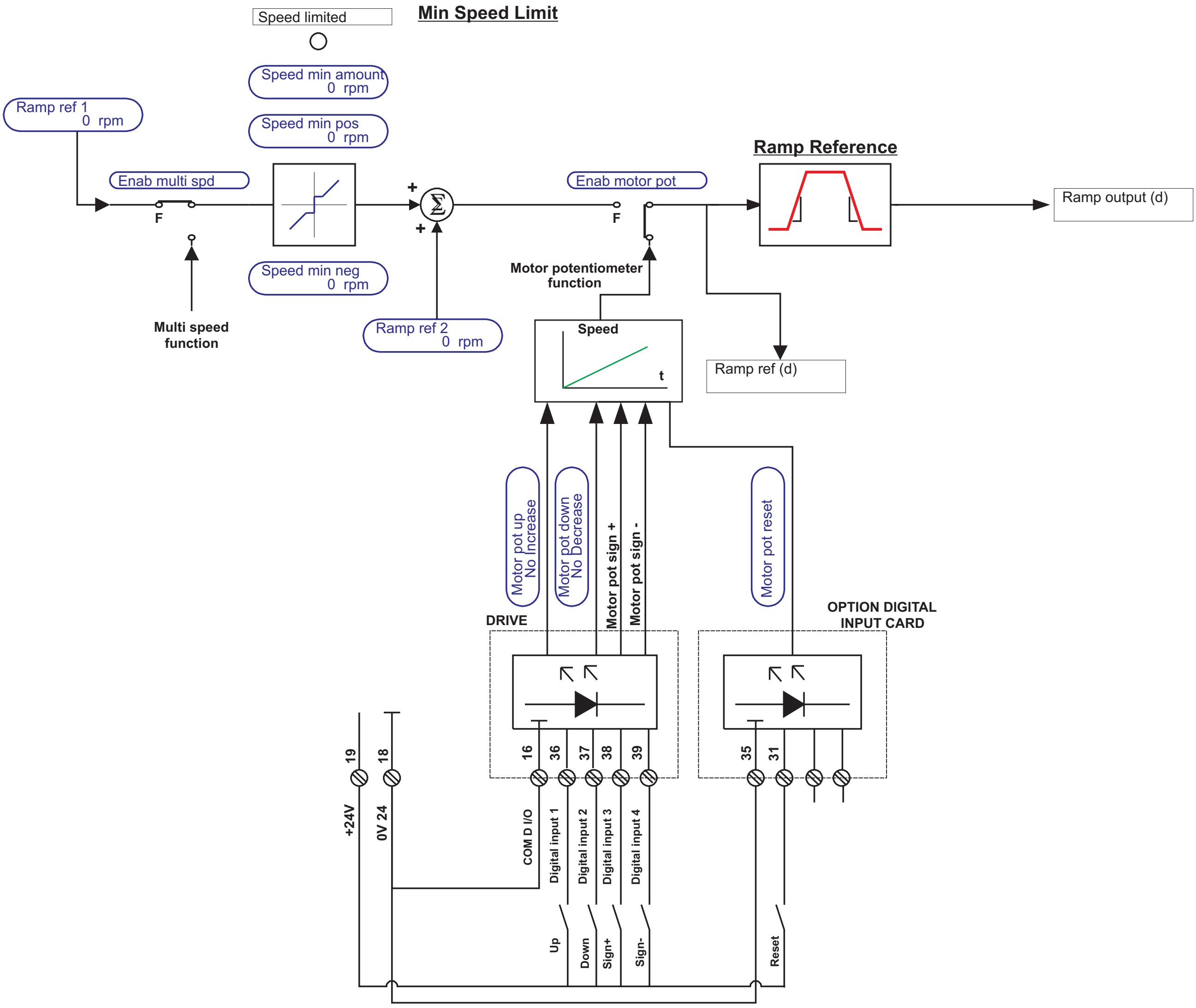


Figure 2.15.1.1 Example of the external activation of the motor potentiometer function.

The + and - sign signals can be omitted if only one rotation direction required.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable motor pot Enabled Disabled	246	0	1	Enabled (1)	
Motor pot oper	-				
Motor pot sign - / +	248	0	1	Positive (1)	
Motor pot sign +	-				**
Motor pot sign -	-				**
Motor pot reset	249	0	65535	-	*
Motor pot up	396	0	1	No acceleration (0)	
Motor pot down	397	0	1	No deceleration (0)	

GA6290ai

* This function can be assigned to one of the programmable digital inputs.
** These parameters can only be accessed via a programmable digital input.

The motor potentiometer function allows the speed of the drive to be adjusted by pressing a key. The speed is then adjusted according to the defined ramp time.

Enable motor pot Enabled — The motor potentiometer function is enabled. The ramp receives its reference value from the motor potentiometer function.

Disabled — The motor potentiometer function is disabled.

Motor pot oper After entering this menu item on the keypad pressing the "+" and "-" keys of the keypad the drive can be accelerated or decelerated.

+ Accelerate

- Decelerate

Motor pot sign This parameter is only accessible via the keypad and via the serial interface or bus. (When the drive is operated via the terminal strip, the parameters **Motor pot sign +** and **Motor pot sign -** must be used).

Positive — "Clockwise" rotation selected

Negative — "Counter-clockwise" rotation selected

Motor pot sign + Selection of the the "Clockwise" rotation direction when the selection is carried out via the terminal strip. The **Motor pot sign +** parameter is linked with the **Motor pot sign -** parameter via an XOR function. This means that the command (+24V) must be given only to one of the two terminals.

High — "Clockwise" rotation direction selected

Low — "Clockwise" rotation direction not selected

Motor pot sign - Selection of the "Counter-clockwise" rotation direction when the changeover is carried out via the terminal strip. The **Motor pot sign -** parameter is linked with the **Motor pot sign +** parameter via an XOR function: this means that the command (+24V) must be given only to one of the two terminals.

High — "Counter-clockwise" rotation direction selected.

Low — "Counter-clockwise" rotation direction not selected.

Motor pot reset After the Reset command is executed, if drive is switched off and on, and restarted,the reference is set at zero. The Motor pot up command is required in order to accelerate the drive. If the Reset command is not executed, the drive after being started will accelerate to the speed last selected (before being switched off).

The command is only possible with the drive disabled

Motor pot up The drive is accelerated with the preselected ramp. The setting is either carried out via the terminal, serial interface or bus.

Motor pot down The drive is decelerated with the preselected ramp. The setting is either carried out via the terminal, serial interface or bus.

When the motor potentiometer function is active (**Enable motor pot**), the current speed reference value is shown in the **Motor pot** submenu of the keypad.

When controlled via the keypad, the drive can be accelerated by pressing the "+" key and decelerated by pressing the "-" key. This corresponds to the commands **Motor pot u**p and **Motor pot down**. Select the menu point **Motor pot oper** for this purpose.

The speed of the drive can be adjusted between 0 and 100 % by setting the command **Motor pot up**.

The drive reduces the speed between 100 and 0 % by setting the command **Motor pot down**. If the command is given when the drive is already at a stop, this will not cause the drive to run reverse.

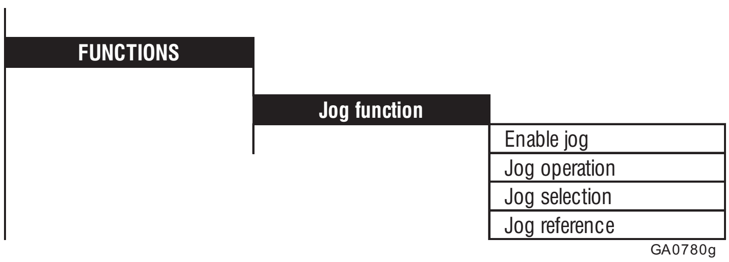
If the **Motor pot up** and **Motor pot down** commands are given at the same time, the speed reference value will not change. The last speed reference value is saved when the drive is disabled or if there is a fault. When the drive is restarted, it accelerates to this speed according to the ramp set.

If the command **Motor pot reset** is given with the drive switched off, the speed reference value is deleted, and the drive starts at zero speed.

If the status of the **Motor pot sign** command is changed while the drive is running, the drive will reverse according to the ramp times specified.

When using the motor potentiometer function, the ramp must be enabled and the **Start** command must be present.

2.15.2. Jog function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable jog (Enable/disable)	244	0	1	Enabled (1)	-
Jog operation	-				
Jog selection (Speed input/Ramp input)	375	0	1	Speed input (0)	
Jog reference [FF]	266	0	32767	100	**
Jog+	398	0	1	No jog+	*
Jog-	399	0	1	No jog-	*

GA6295ai

* This function can be assigned toone of the programmable digital inputs.

** This parameter can be assigned to a programmable analog input.

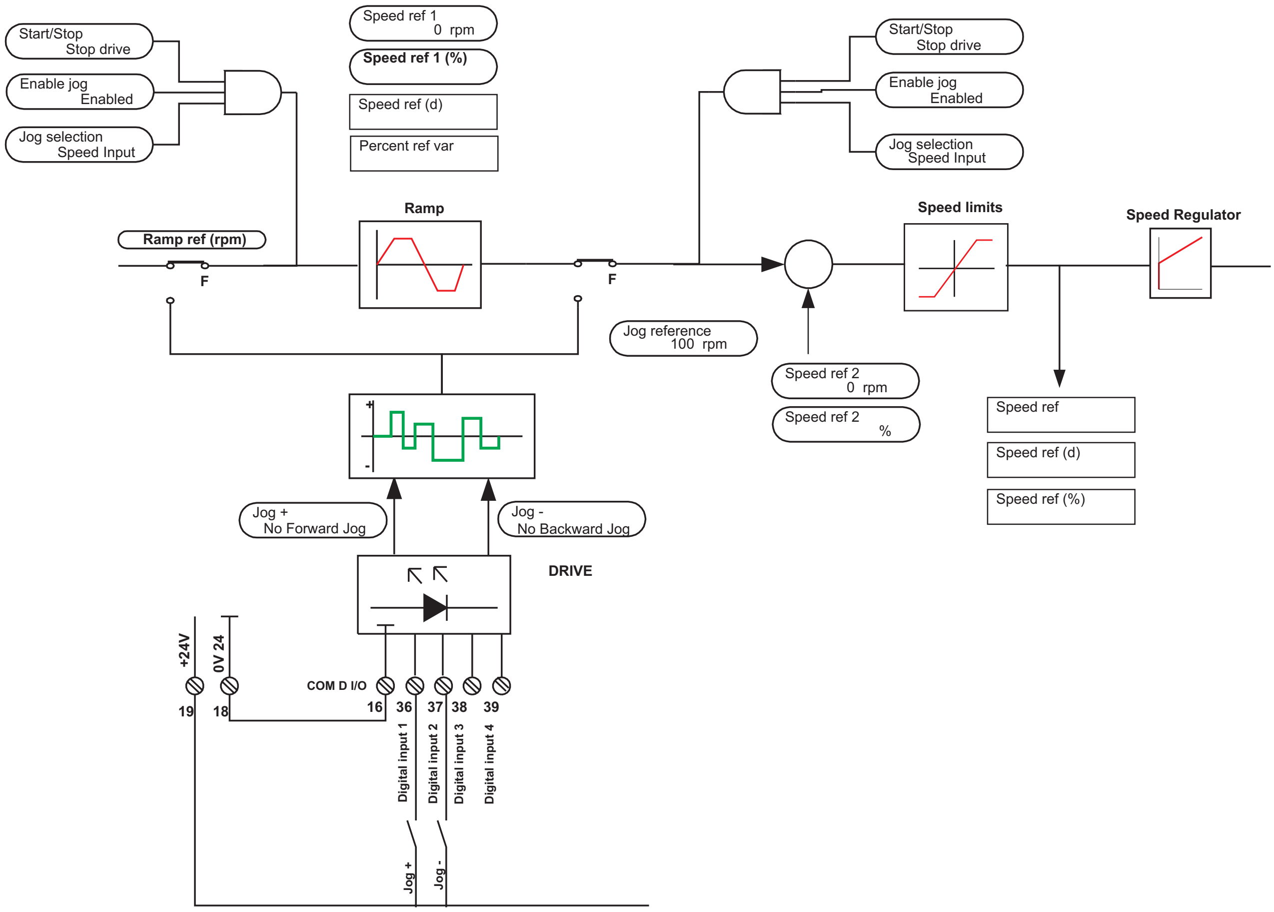


Figure 2.15.2.1: Example of external activation in Jog function

Enable jog	Enabled	Jog mode is enabled (Selection only possible if the drive is disabled)
	Disabled	Jog mode is disabled
Jog operation	Pressing the "+" and "-" keys (on keypad) enables the drive to be moved forward and backward.	
	+	Jog clockwise rotation
	-	Jog counter-clockwise rotation
Jog selection	This parameter determines if the jog function reference must go through the ramp or if it has to reach directly the speed regulator.	
	Speed input	The jog reference is directly fed to the speed regulator. The ramp is not active.
	Ramp input	The jog reference is fed to the ramp input block.
Jog reference	Reference value for jog mode. Defined by the dimension specified in the factor function.	
Jog +	High	Jog with clockwise motion of the drive when Jog mode enabled and no **Start** command present.
	Low	Disabled
Jog -	High	Jog with counter-clockwise rotation of the drive when Jog mode enabled and no **Start** command present.
	Low	Disabled

NOTE: The following signals are required to be high for Jog mode in addition to the commands **Jog +** and **Jog -:**

- **Enable drive**
- **Fast Stop**
- **External fault**

The jog speed corresponds to the value defined with the **Jog reference** parameter.

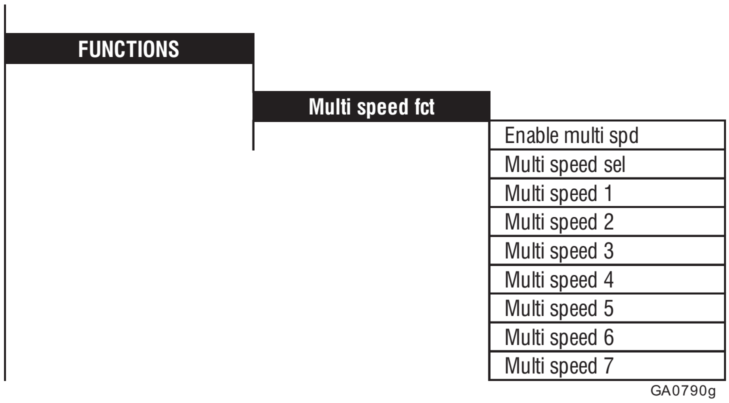
The jog reference value can only be activated by the **Jog +** or **Jog -** command if there is no **Start** command active and the actual speed of the drive is zero.

If the **Start** command is given in addition to the **Jog +** or **Jog -** command, Jog mode will be aborted and the drive will react according to the **Start** command.

When controlled via the keypad the “+” and “-” keys can be used in the **Jog function** menu. For this select the **Jog operation** menu point.

The correction value **Speed ref 2** for the speed regulator is still active during jog operation.

2.15.3. Multi speed fct



The Multi speed function allows up to seven internally preset reference values to be called up via a set of three digital signals

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable multi spd (Enable/Disable)	153	0	1	Disabled (0)	
Multi speed sel	208	0	7	0	
Multi speed 1	154	-32768	+32767	0	
Multi speed 2	155	-32768	+32767	0	
Multi speed 3	156	-32768	+32767	0	
Multi speed 4	157	-32768	+32767	0	
Multi speed 5	158	-32768	+32767	0	
Multi speed 6	159	-32768	+32767	0	
Multi speed 7	160	-32768	+32767	0	
Speed sel 0	400	0	1	Low	Digital input 5 *
Speed sel 1	401	0	1	Low	Digital input 6 *
Speed sel 2	402	0	1	Low	Digital input 7 *

GA6300g

* This function can be assigned to one of the programmable digital inputs

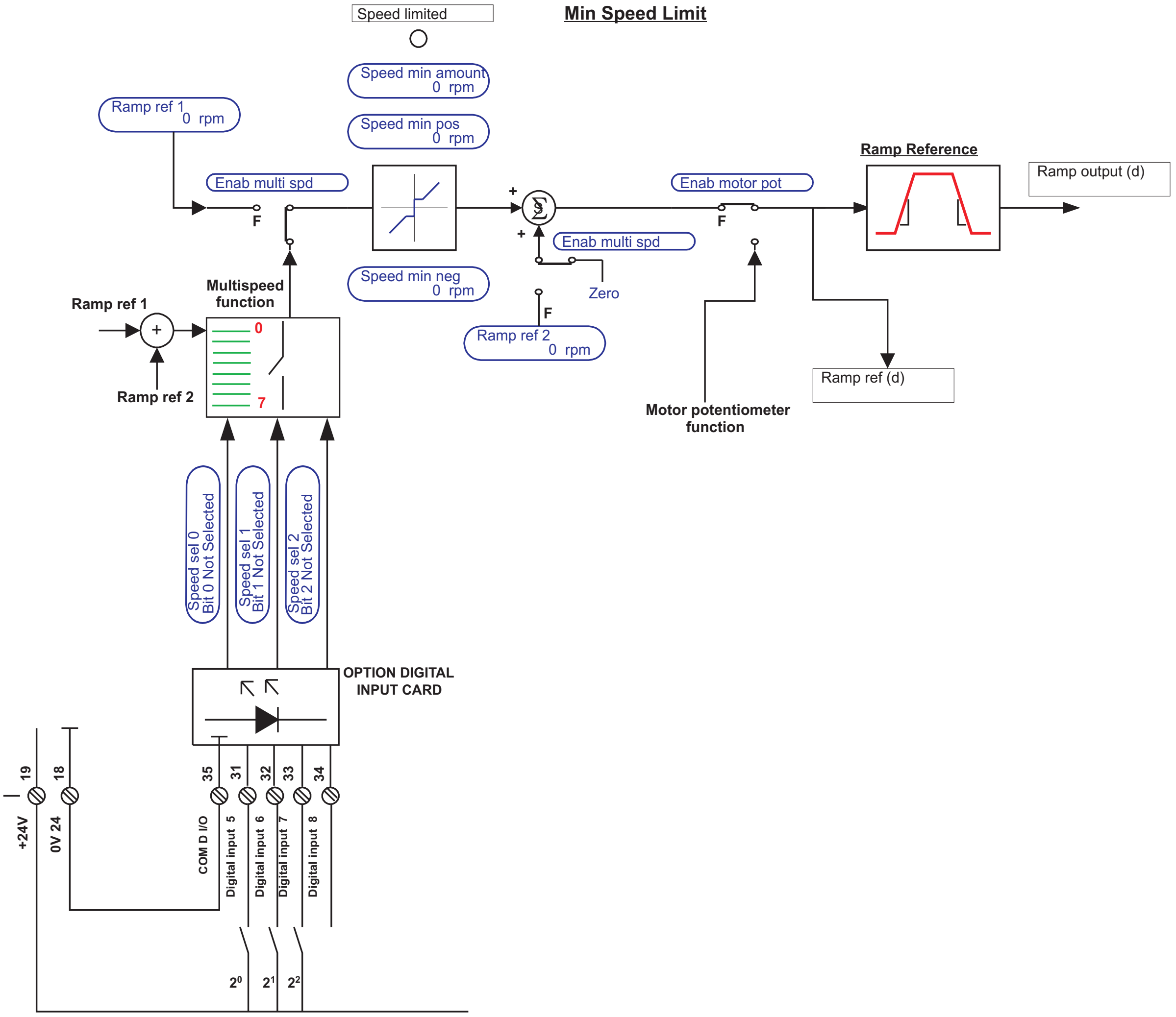


Figure 2.15.3.1: Selection of different reference values via terminal strip

Enab multi spd	Enabled - Multi speed function is enabled Disabled - Multi speed function is disabled
Multi speed 1	Reference value 1 for Multi speed function.Defined in the unit specified by the factor function.
Multi speed 2	Reference value 2 for Multi speed function.Defined in the unit specified by the factor function.
Multi speed 3	Reference value 3 for Multi speed function.Defined in the unit specified by the factor function.
Multi speed 4	Reference value 4 for Multi speed function.Defined in the unit specified by the factor function.
Multi speed 5	Reference value 5 for Multi speed function.Defined in the unit specified by the factor function.
Multi speed 6	Reference value 6 for Multi speed function.Defined in the unit specified by the factor function.
Multi speed 7	Reference value 7 for Multi speed function. Defined in the unit specified by the factor function.
Speed sel 0	Reference value selection with the significance 2^0 (=1) (bit 0). Parameter can only be used in conjunction with **Speed sel 1** and **Speed sel 2** High: Significance 2^0 selected Low: Significance 2^0 not selected

Speed sel 1 Reference value selection with the significance 2^1 (=2)(bit 1). Parameter can only be used in conjunction with **Speed sel 0** and **Speed sel 2**

High — Significance 2^1 selected

Low — Significance 2^1 not selected

Speed sel 2 Reference value selection with the significance 2^2 (=4) (bit 2). Parameter can only be used in conjunction with **Speed sel 0** and **Speed sel 1**.

High — Significance 2^2 selected

Low — Significance 2^2 not selected

Multi speed sel It is the word representation of the three parameters **Speed sel1** (bit 0), **Speed sel2** (bit1) and **Speed sel 2** (bit2). Used to change the speed selection by changing only one parameter instead of three. This allows to select different speeds via serial line or Bus instantaneously.

The table and graph below shows the interaction between the selection and the corresponding reference value.

Speed sel 0 bit 0 not selected	Speed sel 1 bit 1 not selected	Speed sel 2 bit 2 not selected	REFERENCE
0	0	0	Ramp ref 1 0 rpm + Ramp ref 2 0 rpm
1	0	0	Multi speed 1 0 rpm
0	1	0	Multi speed 2 0 rpm
1	1	0	Multi speed 3 0 rpm
0	0	1	Multi speed 4 0 rpm
1	0	1	Multi speed 5 0 rpm
0	1	1	Multi speed 6 0 rpm
1	1	1	Multi speed 7 0 rpm

Enab multi spd Disabled

Multi speed sel 0

Ramp ref (d)

Table 2.15.3.1: Multispeed selection

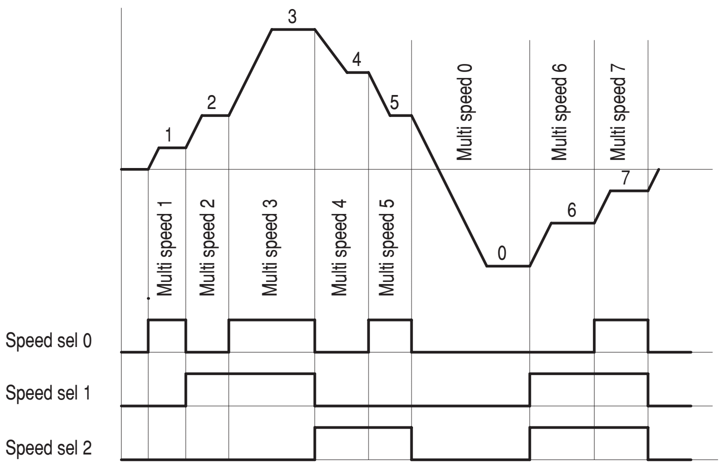


Figure 2.15.3.2: Multi speed function

The Multi speed function must be enabled by the **Enab multi spd** parameter.

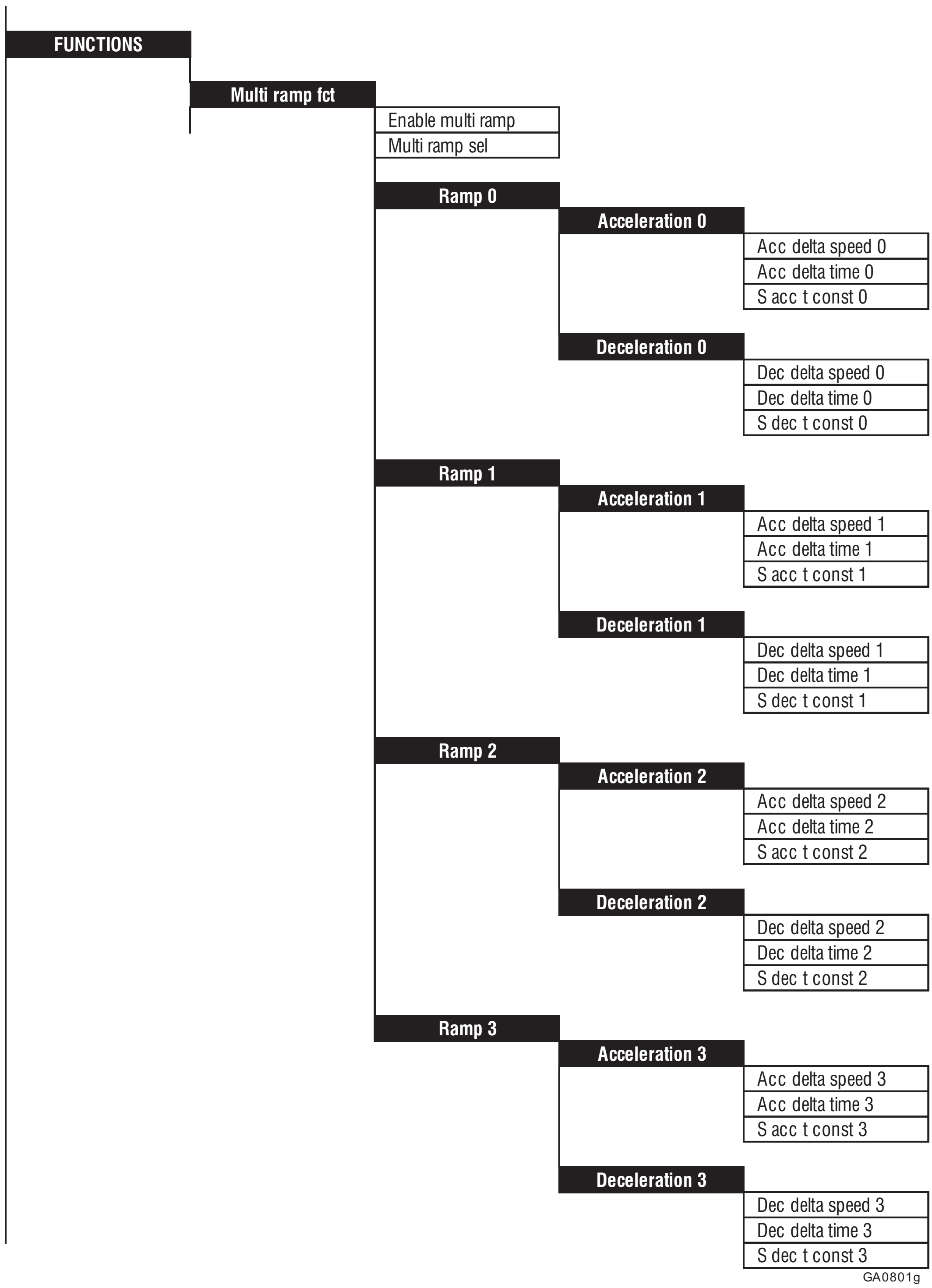
The reference value required is selected with the **Speed sel 0**, **Speed sel1** and **Speed sel 2** signals.

When the selection is carried out via the terminal strip, all three signals must always be assigned to digital inputs even if onlyreference values 1 and 2 are required.

The selection of the reference values is carried out via the keypad, serial interface, digital input, RS485 or BUS.The reference values are signed so that they can be defined for either direction of rotation.

When the **Multi speed** function is enabled, **Multi speed 0** is defined as the addition of the reference values **Rampref 1** and **Ramp ref 2**.

2.15.4. Multi ramp fct



The Multi ramp function enables up to four different ramps to be called up. The acceleration and deceleration times can also be defined here separately. The ramps are called up via digital signals.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enab multi rmp (Enable/Disable)	243	0	1	Disabled (0)	—
Multi ramp sel	202	0	3	0	—
Acc delta speed 0 [FF]	659	0	2^{32} -1	100	—
Acc delta time 0 [s]	660	0	65535	1	—
S acc t const 0 [ms]	665	100	3000	500	—
Dec delta speed 0 [FF]	661	0	2^{32} -1	100	—
Dec delta time 0 [s]	662	0	65535	1	—
S dec t const 0 [ms]	666	100	3000	500	—
Acc delta speed1 [FF]	23	0	2^{32} -1	100	—
Acc delta time 1 [s]	24	0	65535	1	—
S acc t const 1 [ms]	667	100	3000	500	—
Dec delta speed 1 [FF]	31	0	2^{32} -1	100	—
Dec delta time 1 [s]	32	0	65535	1	—
S dec t const 1 [ms]	668	100	3000	500	—
Acc delta speed 2 [FF]	25	0	2^{32} -1	100	—
Acc delta time 2 [s]	26	0	65535	1	—
S acc t const 2 [ms]	669	100	3000	500	—
Dec delta speed 2 [FF]	33	0	2^{32} -1	100	—
Dec delta time 2 [s]	34	0	65535	1	—
S dec t const 2 [ms]	670	100	3000	500	—
Acc delta speed 3 [FF]	27	0	2^{32} -1	100	—
Acc delta time 3 [s]	28	0	65535	1	—
S acc t const 3 [ms]	671	100	3000	500	—
Dec delta speed 3 [FF]	35	0	2^{32} -1	100	—
Dec delta time 3 [s]	36	0	65535	1	—
S dec t const 3 [ms]	672	100	3000	500	—
Ramp sel 0	403	—	—	Low	*
Ramp sel 1	404	—	—	Low	*

GA6310g

* This function can be assigned to one of the programmable digital inputs.

Enab multi rmp Enabled The Multi ramp function is enabled
Disabled The Multi ramp function is disabled

Multi ramp sel It is the word representaton of the two parameters Ramp sel 0 (bit0) and Ramp sel (bit1). Used to change the ramp selection by changing only one parameter instead of two. This allows to select different ramps via serial line or Bus instantaneously.

Acc delta speed 0 It defines together with **Acc delta time 0** the acceleration ramp 0. Defined by the units specified in the factor function.

Acc delta time 0 It defines together with **Acc delta speed 0** the acceleration ramp 0. Defined in seconds.

S acc t const 0 Defines the acceleration curve for S-shape ramp 0. Defined in ms.

Dec delta speed 0 It defines together with **Dec delta time 0** the deceleration ramp 0. Defined by the units specified in the factor function.

Dec delta time 0 It defines together with **Acc delta speed 0** the acceleration ramp 0. Defined in seconds.

S dec t const 0 Defines the deceleration curve for S-shape ramp 0. Defined in ms.

Acc delta speed1 It defines together with **Acc delta time 1** the acceleration ramp 1. Defined by the units specified in the factor function.

Acc delta time 1	It defines together with **Acc delta speed 1** the acceleration ramp 1. Defined in seconds.
S acc t const 1	Defines the acceleration curve for S-shape ramp 1. Defined in ms.
Dec delta speed1	It defines together with **Dec delta time 1** the deceleration ramp 1. Defined by the units specified in the factor function.
Dec delta time 1	It defines together with **Dec delta speed 1** the deceleration ramp 1. Defined in seconds.
S dec t const 1	Defines the deceleration curve for S-shape ramp 1. Defined in ms.
Acc delta speed2	It defines together with **Acc delta time 2** the acceleration ramp 2. Defined by the units specified in the factor function.
Acc delta time 2	It defines together with **Acc delta speed 2** the acceleration ramp 2. Defined in seconds.
S acc t const 2	Defines the acceleration curve for S-shape ramp 2. Defined in ms.
Dec delta speed2	It defines together with **Dec delta time 2** the deceleration ramp 2. Defined by the units specified in the factor function.
Dec delta time 2	It defines together with **Dec delta speed 2** the deceleration ramp 2. Defined in seconds.
S dec t const 2	Defines the deceleration curve for S-shape ramp 2. Defined in ms.
Acc delta speed3	It defines together with **Acc delta time 3** the acceleration ramp 3. Defined by the units specified in the factor function.
Acc delta time 3	It defines together with **Acc delta speed 3** the acceleration ramp 3. Defined in seconds.
S acc t const 3	Defines the acceleration curve for S-shape ramp 3. Defined in ms.Dec delta speed3It defines together with **Dec delta time 3** the deceleration ramp 3. Defined by the units specified in the factor function.
Dec delta time 3	It defines together with **Dec delta speed 3** the deceleration ramp 3. Defined in seconds.
S dec t const 3	Defines the deceleration curve for S-shape ramp 3. Defined in ms.
Ramp sel 0	Ramp selection with the significance 2^0 (bit 0). Parameter can only be used in conjunction with Ramp sel 1. High Significance 2^0 selected Low Significance 2^0 not selected
Ramp sel 1	Ramp selection with the significance 2^1(bit 1). Parameter can only be used in conjunction with Ramp sel 0. High Significance 2^1 selected Low Significance 2^1 not selected

The table and graph below shows the interaction between the selection and the corresponding reference value.

	Ramp sel 0	Ramp sel 1
Ramp 0	Low	Low
Ramp 1	High	Low
Ramp 2	Low	High
Ramp 3	High	High

GA6315g

Table 2.15.4.1: Ramp selection

In order to activate the **Multiramp function**, it must be enabled with the **Enab multi rmp** parameter. The ramp required is selected via the **Ramp sel 0** and **Ramp sel 1** signals. When the selection is made via the terminal strip, it is possible to select only one digital input. This configuration enables only the ramp time selected. Another ramp can be selected at any time. If this happens during an acceleration or deceleration phase, the reference value will then follow the new ramp.

The ramp parameters are defined via the keypad or the serial interface.

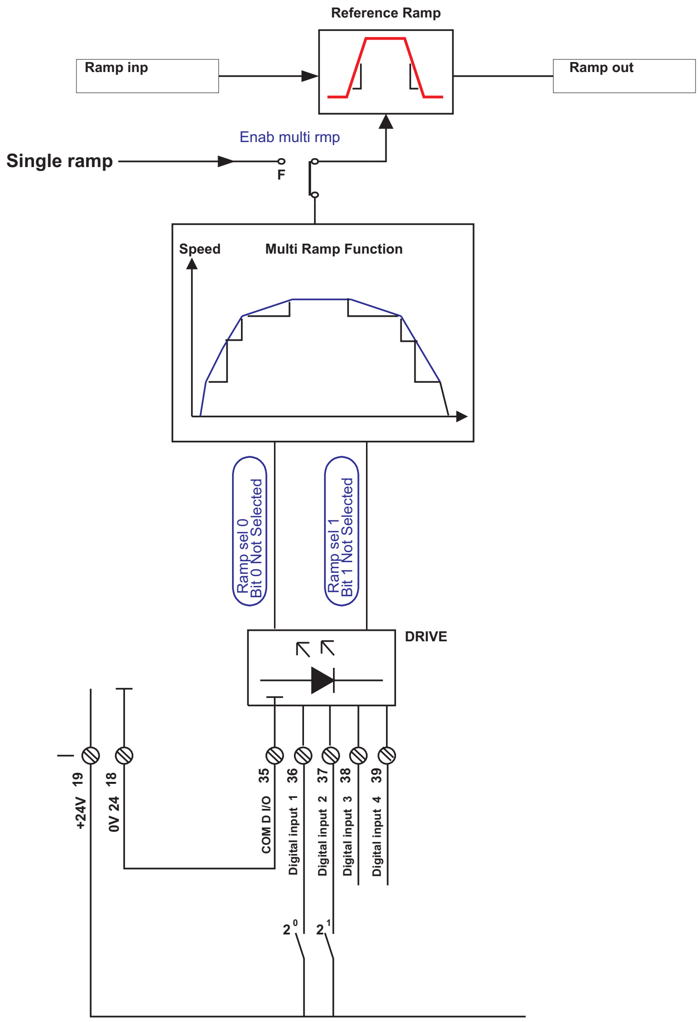


Figure 2.15.4.1: Selection of different ramps via the terminal strip

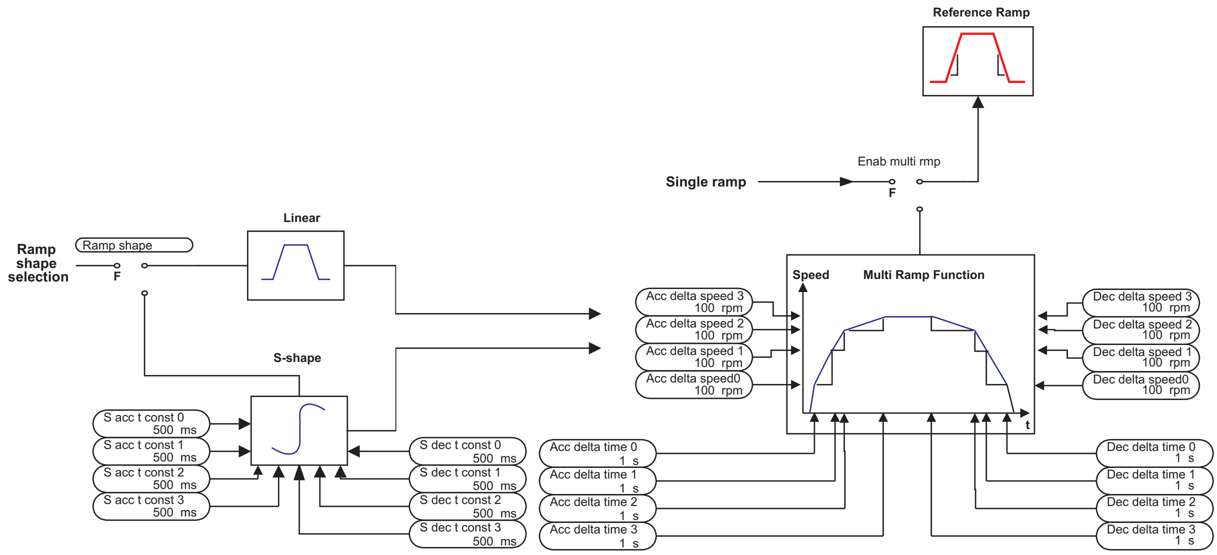
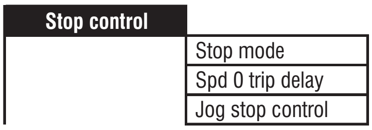


Figure 2.15.4.2: Multi ramp selection via signals

2.15.5. Stop control



ai6155

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Stop mode	626	0	3	1	
OFF					
Stop & speed					
Fast stp & spd					
Fs/stp & spd					
Spd 0 trip delay [ms]	627	0	40000	0	
Jog stop control	630	0	1	OFF (0)	
ON					
OFF					

ai61551

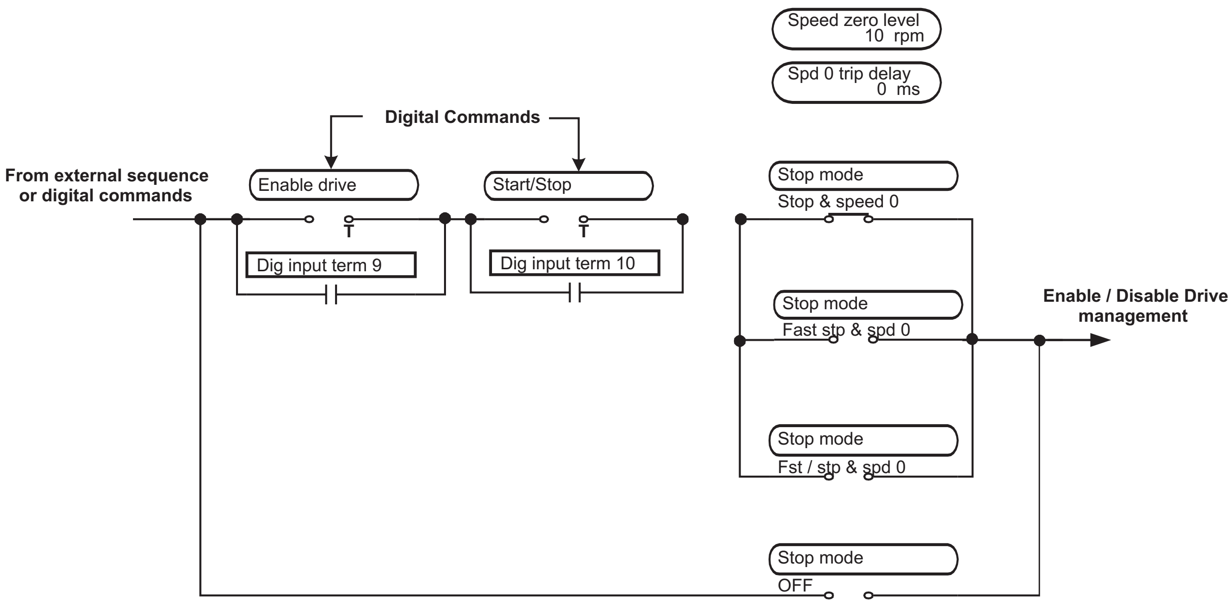


Figure 2.15.5.1: Start and stop management

This function is intended to help the system engineer to coordinate the output voltage of the inverter with the reference, in according to the management of the Start and Stop command.

Basically the Stop or Fast Stop command mode (**Stop mode** setting) define in which way the drive will stop and disables/enables the regulation and the reference.

In default condition (Main commands = Digital), when the drive receives the start command by pressing the START button (terminals 12 –13 HIGH) it runs the motor.

When the STOP button is pressed, the motor decelerates towards zero speed. When the zero speed is reached the drive is completely disabled once the **Spd 0 trip** delay is elapsed.

Different ways to manage the motor Stop are possible by the selection of the parameter **Stop mode**.

Stop mode

OFF The function is disabled

With Digital commands (terminals 12-13 HIGH):

Press START button:	Enables and Starts the drive and the motor runs
Press STOP button:	Stops the motor but the drive is enabled

With Terminal commands: Enable/Disable and Start/Stop commands indipendent

Stop&Speed The Start command determines the behaviour. If the Start command is not present (digital or via terminal strip) the inverter is blocked and stopped.

When the Start command is given the drive is enabled and ready to run.

Disabling the Start command and once reached zero speed (Speed 0 level), the drive is is blocked after a timespan set by **Spd 0 trip delay**.

Fast stp&Spd 0 The Fast Stop command determines the behaviour. If the Fast Stop command is present (digital or via terminal strip: i.e. with 0V on terminal 14) the inverter is blocked and stopped.

When the Fast Stop command is disabled (i.e. with +24V on terminal 14) the drive is enabled and ready to run.

Entering the Fast Stop command, when the zero speed (Speed 0 level) has been reached, the drive is is blocked after a timespan set by **Spd 0 trip delay**.

Fst / stp & Spd 0 The Fast Stop and Start commands determine the behaviour. When the Stop or Fast Stop command are present (digital or via terminal strip) the inverter is blocked and stopped.

When the Start command is given or the Fast Stop command is disabled (i.e. with +24V on terminal 14) the drive is enabled and ready to run.

When the Start command is disabled or when the Fast Stop command is entered, once reached the zero speed (Speed 0 level), the drive is blocked after a timespan set by **Spd 0 trip delay**.

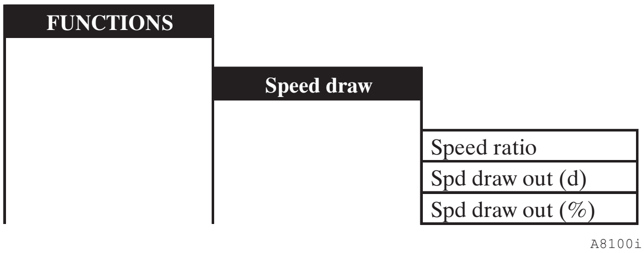
Spd 0 trip delay Delay time in ms between the reaching of the zero speed (Speed 0 level) and the disabling of the drive.

Jog stop control

OFF The behaviour selected by **Stop mode** has no influence on the Jog function

ON The behaviour selected by **Stop mode** is active also on the Jog function

2.15.6 Speed Draw function



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed ratio	1017	0	32767	10000	*
Spd draw out (d)	1018	-32768	32767	-	**
Spd draw out (%)	1019	-200	200	-	

Ga6316

* This parameter can be assigned to a programmable Analog Input.
** This parameter can be assigned to a programmable Analog Output.

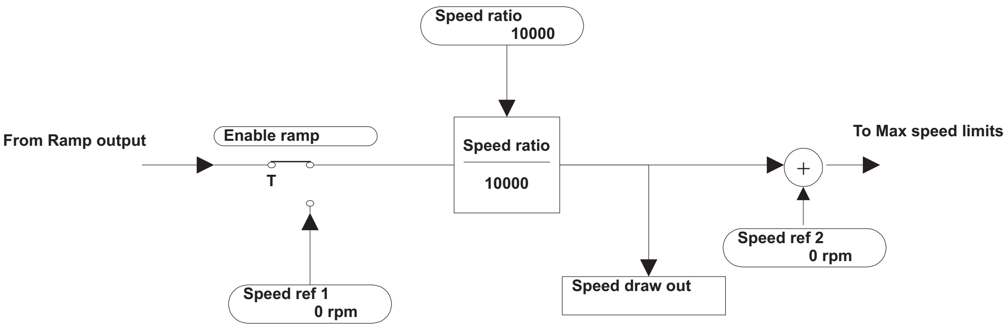


Figure 2.15.6.1: Speed draw block diagram

This function allows a configurable **Speed ratio** to be applied to the main reference **Speed ref 1**.

The Speed ratio range can be set between 0 and 32767 if written in digital form. It can be set from 0 to 20000 (0 to +10V) if assigned via an analog input.

This function is useful in a multidrive system where between the motors is required (see example in figure 2.15.6.2). The speed resulting value can be read through the **Spd draw out** parameter via an analog output.

Speed ratio This parameter determines the speed ratio value.This setting can be done in digital form, via field Bus or through an analog input.

Spd draw out (d) Speed value in the unit specified by the factor function.

Spd draw out (%) Speed value as a percentage of **Speed base value**.

EXAMPLE (RUBBER CALENDER)

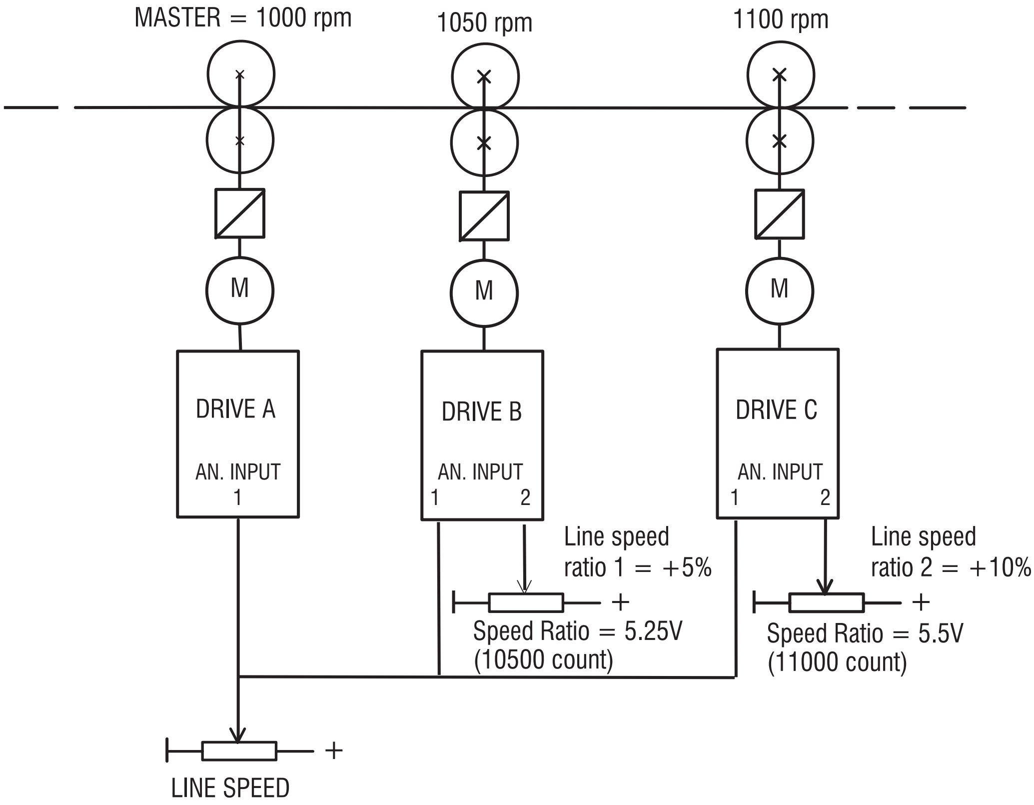


Figure 2.15.6.2: Rubber calender example

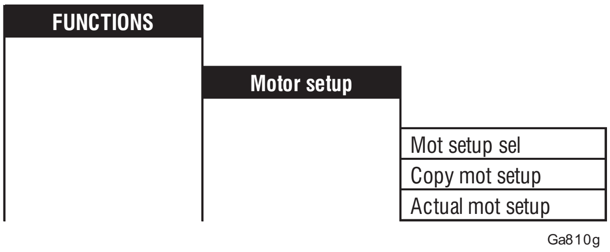
Example Setting:

DRIVE A (master)
Set **Analog input 1** = **Ramp ref 1**

DRIVE B
Line speed ratio 1 = Line speed + 5%
Set **Analog input 1** = **Ramp ref 1**
Set **Analog input 2** = **Speed ratio**
Set **Speed ratio** parameter = **10500**

DRIVE C
Line speed ratio 2 = **Line speed + 10%**
Set **Analog input 1** = **Ramp ref 1**
Set **Analog input 2** = **Speed ratio**
Set **Speed ratio** parameter = **11000**

2.15.7 Motor setup function



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Mot setup sel Setup 0 / Setup 1	943	0	1	0 (Setup 0)	
Copy mot setup Setup 0 / Setup 1	941	0	1	0 (Setup 0)	
Actual mot setup Setup 0 / Setup 1	942	0	1	0 (Setup 0)	

Ga6317

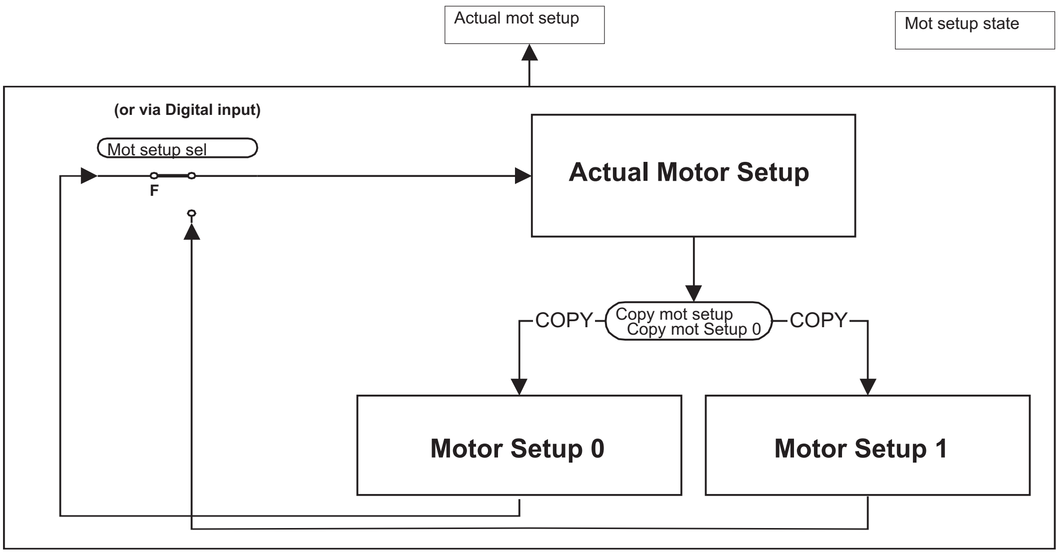


Figure 2.15.7.1: Dual motor setup

This configuration allows the selection of two motor parameter sets as listed in table 2.15.7.1 for using the Drive with two different motors.

For this purpose it is necessary to perform the parametrization of both the motors (motor parameters, self tune, speed regulation setting), determining in this way two “groups of parameters” (**Setup 0** and **Setup 1**) relative to each motor.

Selection of the parameter group concerning the motor which has to be used, is performed by the **Mot setup sel** parameter, or through a digital input configured as **Mot setup sel 0**.

The operation can be performed only with the Drive disabled (**Enable drive** parameter = Disable) and following the procedure described below.

Mot setup sel It selects the parameter group (**Setup 0** or **Setup 1**) concerning the motor which has to be used.

Mot setup sel 0 (Not shown on the keypad)

	Selection through digital input, of the "group of parameters" (**Setup 0** or **Setup 1**) concerning the motor to be used. LOW Selection **Setup 0** HIGH Selection **Setup 1**
Copy mot setup	This parameter defines in which "group of parameters", the first motor (setup 0) or the second motor (setup 1) the data will be stored.
Mot setup state	(Not shown on the keypad) It indicates the data computing status of the function. This parameter can be assigned to a programmable digital output. LOW Computing ended HIGH Computing in progress
Actual mot setup	It indicates which parameter group is actually in use(**Setup 0** or **Setup 1**)

- The "parameter set" loading and the commutation of the two AC motors, can be performed only with the drive disabled (**Enable drive** = Disable).
- The "parameter set" loading needs a data computing time whose duration is around 200 ms.
  The Enable command is not active until the end of this computing time.
- It is also necessary that the Enable command be supplied with a minimum delay of 24 ms, from the rising edge of the commutation input (Mot setupsel 0).
- The motor will be started with a minimum delay, which is the sum of the time intervals said above, plus magnetization time.
- The loading operation of the "parameter set" in **Setup 0** or **Setup 1** does not store them in permanent memory. It is necessary to execute a saving procedure via **Save parameters** (BASIC MENU or SPECIAL FUNCTION menu).
- At the Drive initialization, the "parameter set" corresponding to the value of Mot setup sel, will be loaded. If selection is defined via digital input (**Mot setup sel 0**), the active "parameter set" will be the one associated to the digital input status.

NOTE! This function can be performed independently by the regulation mode configuration (V/f – Sensorless vect –Field oriented mode).

Example of "parameters set" procedure

a) Motor 1 plate data setting
   - Nominal voltage
   - Nominal speed
   - Nom frequency
   - Nominal current
   - Cos phi
   - Base voltage
   - Base frequency
   - Take motor par
b) Speed feedback selection (if **Regulation mode** = Field oriented mode)
c) Self tuning (Self tune 1, 2a or 2b, 3) with motor 1
d) Speed regulator setting for motor 1 (if **Self tune 3** not performed)
e) Disable the drive (**Enable drive** = Disable)
f) Using **Copy mot setup** parameter, store the "parameter set" in **Setup 0**
g) Repeat steps a), b), c), d), e) for motor 2

h) Using **Copy mot setup** parameter, store the “parameter set” in **Setup 1**
i) Permanent storing via the **Save parameters** (BASIC MENU)

To execute the selection from **Setup 0** to **Setup 1** with:

- Manual sequence:
a) Disable the drive (**Enable drive** = Disable)
b) Set the **Mot setup sel** parameter = **Setup 0** or (**Setup 1**)
c) Enable the drive (**Enable drive** = Enable)

*- Selection from **Setup 0** to **Setup 1** through digital input:*
a) Disable the drive mantaining the terminal 12 = LOW (0V)
b) Set digital input **Mot setup sel 0** = HIGH (+24V)
c) Wait at least 24 ms
d) Enable the drive supplying the terminal 12= HIGH (+24V)

NOTE! Whatever modification of parameters relative to a “parameters set”, performed when it is active, it will be lost at the next commutation unless a **Copy mot setup** command is applied. For the permanent storing (with drive switched off), it is also necessary to execute **Save parameters** (BASIC MENU).

Below is a list of the parameters included in the “setup” of each motor.

Par. number	Parameter	Par. number	Parameter
161	Nominal voltage	645	Comp slope
162	Nominal speed	91	Flux P
163	Nom freq	92	Flux I
164	Nominal current	1022	Voltage P
748	Polepairs	902	Voltage I
371	Cos phi	646	Low speed factor
167	Base voltage	643	Sls speed filter
168	Base frequency	647	Flux corr factor
165	Magnetiz curr	712	V/f shape
166	Rotor resistance	709	Vlt boost type
436	Stator resist	710	Manual boost
437	Lkg inductance	722	Slip comp type
87	Speed P	723	Manual slip comp
88	Speed I	725	Slip comp filter
89	Current P	727	Motor losses
90	Current I	321	Regulation mode
644	Voltage comp lim	414	Speed fbk sel

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Table 2.15.7.1: Motor setup parameters list

NOTE: If after storing the “parameter sets” other parameters are assigned that do not belong to them, the compatibility of the new parameters must be verified with each of the two sets.

For setup, it is suggested that the following sequence be followed to allow individual motor setup to be done last:
1. The drive parametrization
2. Motor setup1 parametrization
3. Motor setup 2 parametrization

If **Speed reference** from encoder input (**Tach follower**) is used with **Motor setup** function, restrictions apply. See table below.

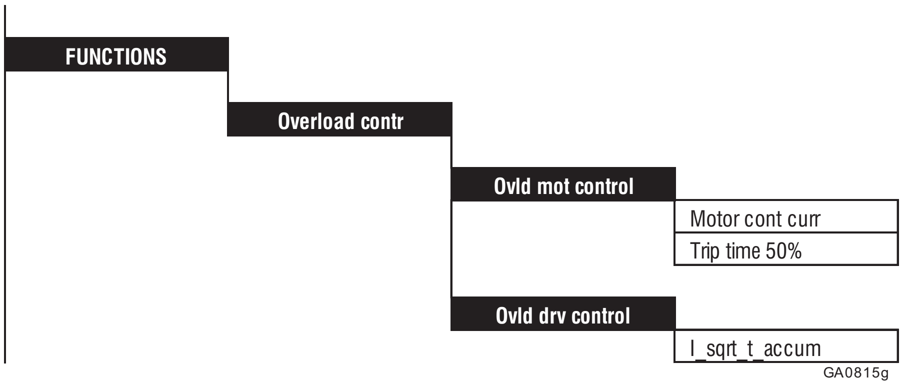
Regulation mode	Motor setup		Tach follower	
	Setup 0 Speed fbk sel	**Setup 1 Speed fbk sel**	**Select enc 1**	**Select enc 2**
Field oriented mode	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1 (1)	Encoder 1 (1)	OFF	Reference assigned
	Encoder 2 (1)	Encoder 2 (1)	Reference assigned	OFF
Sensorless mode or V/f control (2)	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1	Encoder 1	OFF	Reference assigned
	Encoder 2	Encoder 2	Reference assigned	OFF

Ga6318

(1) It requires the electromechanical commutation of the encoder signals. It is not suggested for continuity of the shieldings and low noise immunity.

(2) Encoder feedback is not used in these cases. The **Spd fbk** sel parameter is logically interlocked with **Select enc 1** and **Select enc 2** parameters and in both the setups it is necessary to assign it to both channels.

2.15.8 Overload control



The Overload control function provides integrator logic to protect the drive and the motor independently against thermal overload.

Parameter	No.	Value			Standard Configuration
		min	**max**	**Factory**	
Motor cont curr [%]	656	50	100	100	
Trip time 50% [s]	657	0	120	60	
Ovld mot state Overload Not Overload	658	0	1		*
I_sqrt_t_accum	655	0	65535	0	
Overld available	406	0	1	-	Digital output 4 *
Overload 200%	1139	0	1	-	*

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* This parameter can be assigned to a programmable digital output.

FUNCTIONS

I^2t protection on the drive overload

The I2t protection on the drive is calibrated in order to allow the IEC 146 class 2 service (see section 3.3.4, "AC Output").

The integrator builds according to the following formula:

I_sqrt_t_accum = ¾ $(I^2 - I_{CONT}^2)$ dt

Where I_{CONT} = continuous current to be delivered to the drive (considering derating factors)

A restriction applies for frequency range 0...3 Hz (see Note below) The threshold protection of the drive reduces the Torque current limit at I_{CONT} value when the integrator exceeds the safety threshold. It is possible to set the warning signal on a digital output (**Overld available**). The warning signal is activated 10s before the current limit reduction is activated. Current limit is automatically restored when the accumulator is reset to zero.

I_sqrt_t_accum gives a percentage definition of the integration of the Rms current.

100 % = trip level I^2t (Value in internal units is 4000hex)

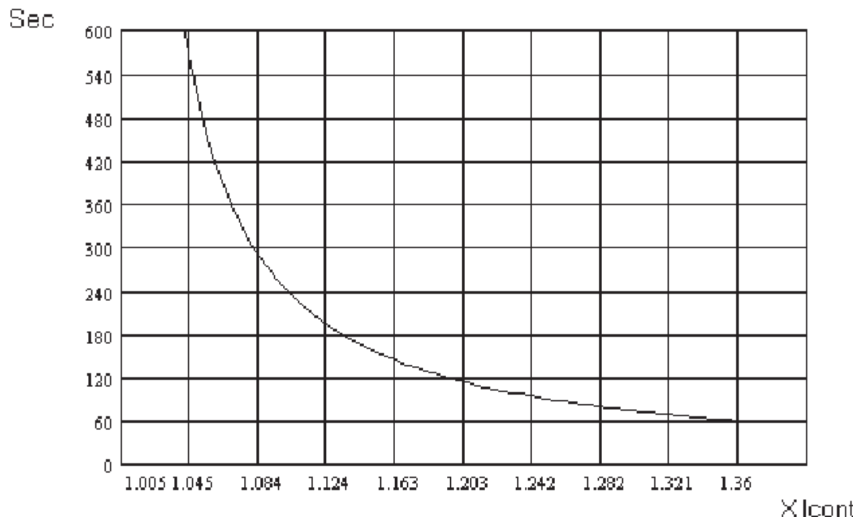
Overld available Indicates whether an overload is possible at the moment.

High	Overload possible
Low	Overload not possible (current limit reduction active)

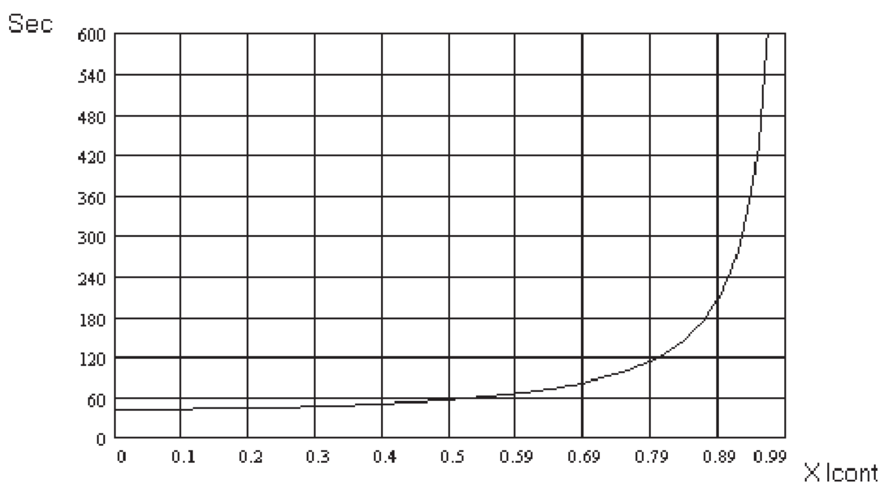
Oveload 200% A short term overload of 200% (I2N Rated output current as for IEC 146 Class 2) is available for 0,5s each 60s.

The 200% overload status can be monitored on a digital output.

Overload time



Pause time



NOTE! In the output frequency ranges 0...3 Hz a faster I^2t function operates. This is calibrated to reduce the Torque current limit to I_{CONT} if $1.36 \cdot I_{CONT}$ overload is applied for more than 2 seconds.

Current limit is restored either when the faster accumulator is reset to zero, or when the output frequency exceeds 3 Hz.

The activation of the protection will be reported by a keypad message, registered in the failure register and monitored on a digital output (**Overld available** parameter).

The current limits depend on the value I_{CONT} ($I_{2N} \cdot$ Derating factor) that it is automatically selected depending on Ambient temperature, Switching frequency and input voltage.

The ability of the drive to provide an overload is indicated by the status of the **Overld available** parameter.

Motor thermal protection

This function is an emulation of the protection thermal relay of the motor controlled by AVy drives. This protection presents the characteristic I^2t behavior.

For this purpose it is necessary to set the following characteristic parameters of the function:

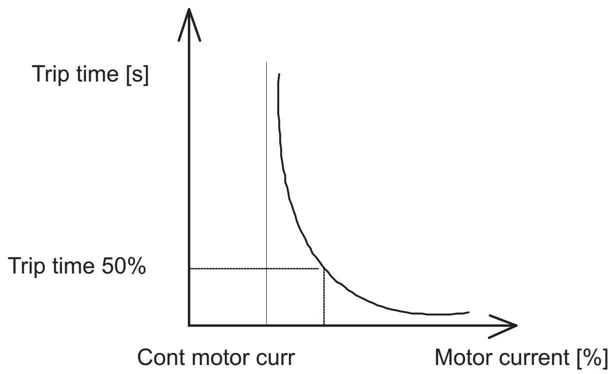
Cont motor curr value in percentage of “Nominal current” (motor rated current). It represents the current that can be delivered to the motor for continuous service.

Trip time 50% Value in seconds. It represents the time at which the protection (“Motor overload”) operates, if the motor current value is 50% more than “**Cont motor curr**”. It is possible to assign this alarm to a programmable digital output (**Ovld mot state**, low = Alarm)

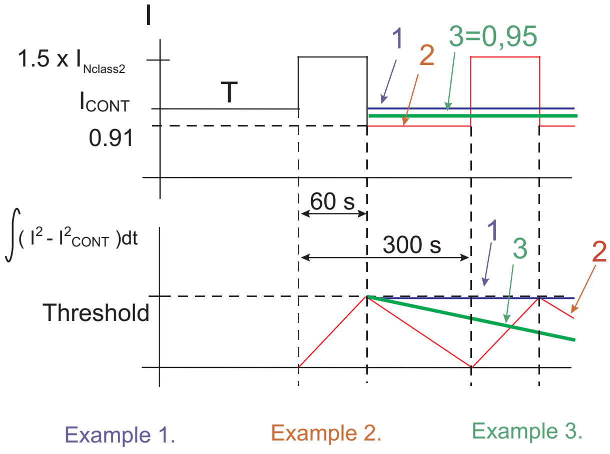
$$\text{Trip time [s]} = \frac{\text{Trip time 50\%} \bullet 1.25}{(\text{Motor current \%})^2 \div (\text{Cont motor curr \%})^2 - 1}$$

f026

According to the above definition, the tripping time as a function of current value to the motor will be the following (the mentioned values in percentage are referred to the motor rated current):



Examples



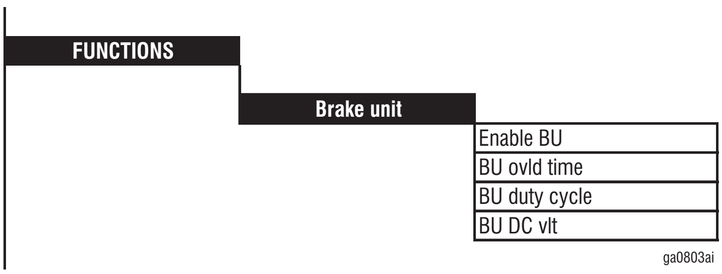
$\frac{\Delta I}{\Delta t} = 1 - 1 = 0$ $\frac{\Delta I}{\Delta t} = 1 - (0{,}91)^2$ $\frac{\Delta I}{\Delta t} = 1 - (0{,}95)^2$

2.15.9 Braking unit function

WARNING! The braking resistors can be subject to unforeseen overloads due to possible failures. The resistors have to be protected using thermal protection devices.

Such devices do not have to interrupt the circuit where the resistor is inserted but their auxiliary contact must interrupt the power supply of the drive power section.

In case the resistor foresees the precence of a protection contact, such contact has to be used together with the one belonging to the thermal protection device.



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Enable Bu Enable (0) Disable (1)	736	0	1	Disabled (1)	
BU ovld time [s]	740	0.10	50.00	S	
BU duty cycle [%]	741	1	75	S	
BU DC vlt [V] 0 (230V) 1 (400V) 2 (460V)	801	0	2	1	

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NOTE ! The command for both internal and external BU depends on drive enable status (terminal 12 and **Enable drive [314]** parameters). For multi drive applications with common DC BUS the drive that controls the BU must always be enabled when BU operations is required (net power regeneration flow).

NOTE ! The internal BU works in both case with Enable drive ON/OFF (**Enable BU** parameter, No.736, must be set Enabled [Default=Disabled]).

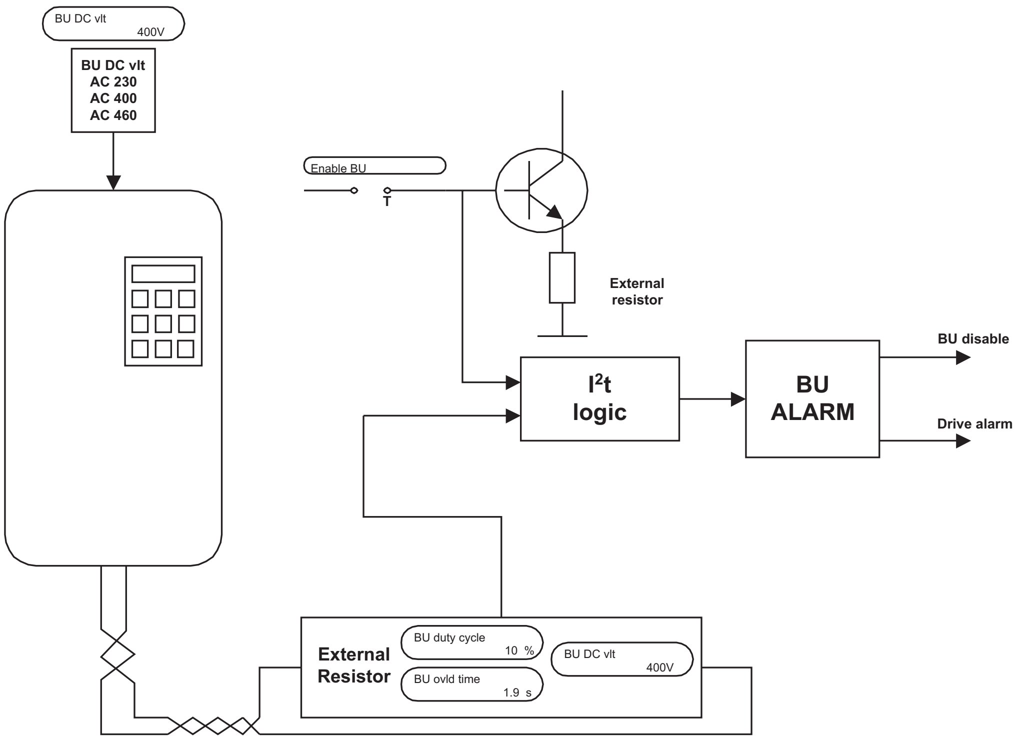


Figure 2.15.9.1: Brake unit function

Enable BU It enables the command for the internal brake unit and the protection for the braking resistance (internal or external). This parameter enables also the digital output MCMD for the command of the external braking units and the protection for the relative resistor.

BU ovld time Maximum time for which can be applied to the braking resistor the peak power P_{PBR}. **Bu ovld time** = E_{BR} / P_{PBR} (see manual AVy Quick Start up, section 5.8.1)

BU duty cycle Maximum chopping duty cycle of the resistor, defined as:

BU duty cycle = $(P_{NBR} / P_{PBR}) \cdot 100$

BU DC vlt Value of the mains voltage at which "**BU ovld time**" and "**BU duty cycle**" must be referred.

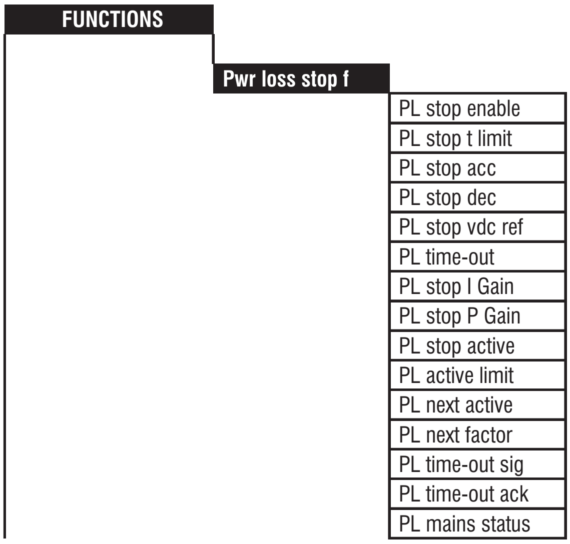
Once defined the values of **Bu duty cycle** and **BU ovld time** according to the resistor type chosen and to the **BU DC vlt** , in case the inverter is connected to a different mains voltage, it is not necessary to modify the three above mentioned parameters, because the software adapts automatically these values according to the mains voltage.

Besides **BU duty cycle** is automatically modified according to the istantaneous values of the DC link voltage.

The values recalculated are not displayed by the keypad or by the PC configurator.

For all the sizes it is possible the management of an external braking unit (through MCMD digital output on the power card) and of the I^2t protection.

2.15.10. Powerloss stop function



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Parameter	No.	Value			Standard Configuration
		min	max	Factory	
PL stop enable	1083	0	2	0	
Disabled					
Enabled as Mst					
Enabled as Slv					
PL stop t limit [%]	1082	0	F	100	
PL stop acc [rpm/s]	1080	0	99999999	100	
PL stop dec [rpm/s]	1081	0	99999999	10000	
PL stop vdc ref [V]	1084	0	800	646	
PL time-out [s]	1087	0	65535	10	
PL stop P Gain [%]	1086	0.00	100.00	5.00	
PL stop I Gain [%]	1085	0.00	100.00	0.30	
PL stop active	1088	0	1	Not active (0)	
Not active					
Active					
PL active limit [%]	1089	-	-	-	
PL next active	1090	0	1	Not active (0)	
Not active					
Active					
PL next factor	1091	0	32767	10000	
PL time-out sig	1093	0	1	Not active (0)	
Not active					
Active					
PL time-out ack	1094	0	1	Not acknowledged (0)	
Not acknowledged					
Acknowledged					
PL mains status	1092	0	1	Not ok (0)	
Not ok					
Ok					

ai61511

Note ! The **PL stop function** function is not available for 230VAC mains voltage.

This function allows the controlled stop of a single or multiple drive / motor configuration, in case of a.c. mains power loss.

Enabling the function, the DC link voltage is permanently monitored.

The function can be enabled as a master (**Pwr loss stop f** = **Enable as Mst**) or as a slave (**Pwr loss stop f** = **Enable as Slv**) in function of the application setup.

In single drive / motor application the function must be enabled always as a master.

In multiple drive / motor applications, only one of the drives must be enabled as master, normally it is the main motor of the line and all the other drives have to be enabled as slaves.

When the DC link voltage drops under the power loss detection threshold, the power loss stop function is actived. The power loss detection threshold is internally selected to be higher than the undervoltage level.

The drive then will automatically lead the motor to zero speed with a ramp defined by the parameter **PL stop dec**.

In this phase, the torque of the system is controlled by a dedicated PI regulator and with the limit set in the parameter **PL stop t limit** . The control action of the PI regulator can be adjusted through the parameters **PL stop P gain** and **PL stop I gain**.

The DC link voltage is regulated at the value set by the parameter **PL stop vdc ref**. Its default setting is a 5% less than the intervention threshold of the braking unit.

In applications where the braking unit is used, the parameter **PL stop vdc ref** can be manually changed to a level higher than the braking threshold.

The device will take the advantages of the braking unit intervention and in this way a stop in a specified time can be achieved. Of course, also the current limit defined by the parameter **PL stop t limit** must be properly set so that the stopping time specifications are met.

It is possible to monitor the power loss stop function activity on a digital output programmed as PL stop active.

If the a.c.mains is restored within the time set by the parameter **PL time out**, the motor after having reached the zero speed, will be automatically lead back by the drive to run at its original speed, with an acceleration ramp time defined by **PL stop acc**. In case the a.c.mains is restored but, the **PL time out** elapses before than the motor is arrived at zero speed, it is necessary to provide the drive with the digital command **PL time-out ack**, in order to restart and return to the original speed.

The elapsing of **PL time out** can be monitored on a digital output set as **PL time-out sig**.

During the power loss, it is possible to restart even before that the motor reached the zero speed, when the drive is provided with a signal indicating that the a.c.mains is restored. This signal must be programmed on a digital input as **PL mains status**.

Such signal can be provided for example from a SR-32 or SM-32 line converters.

In a multiple drive / motor configuration where a co-ordinated stop is required, in addition to the **Enable Mst** and **Enable Slv** programming, a master drive must have an analog output set as **PL next factor**.

The **PL next factor** range can be set between 0 and 32767 if written in digital form. It can be set from 0 to 20000 (0 to +10V) if assigned via analog output.

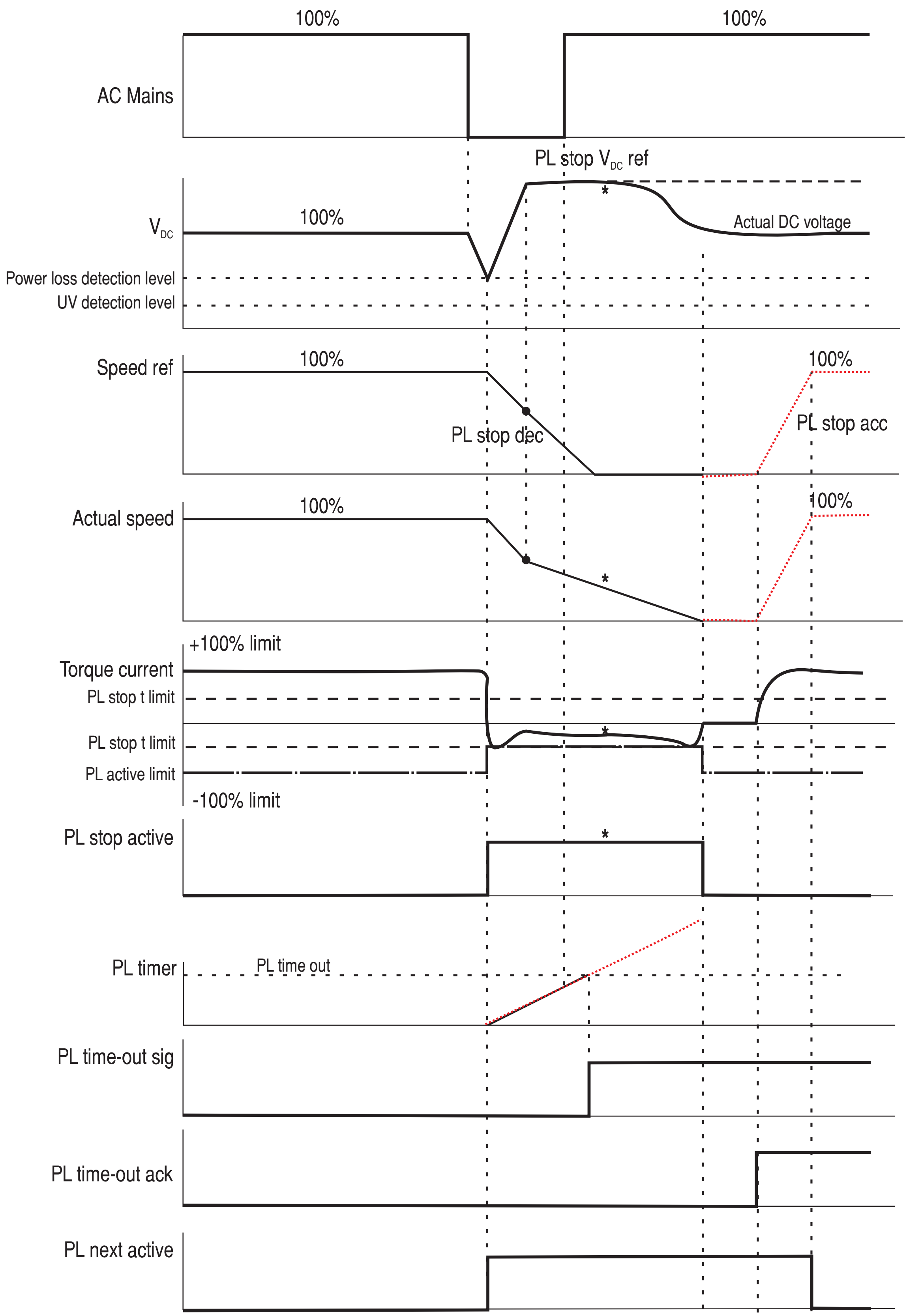
This analog output has to be connected to an analog input of each slave drive (**PL stop enable** = **Enable as Slv**) programmed as **Speed ratio** (see chapter 2.15.6 Speed Draw Function). When the power loss is detected, the speed of the master decreases according to a computed ratio between **Speed ref** and the

Actual speed.

This ratio determines the reference for the slaves, to decrease linearly the speed in accordance to the master drive speed. The fact that the motor is running at the speed controlled by the master can be monitored on a digital output of master drive programmed as **PL next active**.

The performance of this function in case of a multiple motor configuration, can be achieved only with drives connected on common DC bus.

PL stop enable	Enable as Mst	Setting of the drive as a master. This configuration is for single drive / motor or multiple drive / motor applications.
	Enable as Slv	Setting of the drive as a slave. This configuration is for multiple drive / motor applications.
PL stop acc	Acceleration and deceleration time when power loss stop function is active.	
PL stop dec	The smooth deceleration allows to avoid sudden variation of the torque when the power loss stop function is activated . However the ramp must be fast enough to allow the proper intervention of the function itself.	
PL stop vdc ref	Set point of the DC link voltage during the power loss stop activity. If the braking unit is used in order to achieve shorter stopping times, then the parameter has to be set higher than the value of the braking unit ON threshold. The value has not to be set higher than the Overvoltage alarm threshold.	
PL time-out	Time after which it is not possible to restart automatically.	
PL stop P gain	Proportional gain of the power loss stop function PI regulator.	
PL stop I gain	Integral gain of the power loss stop function PI regulator.	
PL stop active	Signalling of the power loss stop function activity. The parameter can be monitored on a programmable digital output.	
PL active limit	Reading of the drive torque current, during the Power loss stop function activity. This parameter can be monitored on a programmable analog output.	
PL next active	It indicates that the slave motor speed is the same of the master motor speed. The parameter can be monitored on a programmable digital output.	
PL next factor	Ratio between Ramp ref / Speed ref and Actual speed.It is the reference for the slaves, to decrease linearly the speed in accordance with the master drive speed.The parameter can be set on a programmable analog output.	
PL time-out sig	It indicates that **PL time-out** is elapsed. The parameter can be monitored on a programmable digital output.	
PL stop t limit	Setting of the torque current limit in use, during the power loss stop function activity. The parameter has the priority on the T curr lim when the function is active.	
PL time-out ack	Command of the motor restart, in case the a.c. mains is restored after the time set in **PL time-out**. The command can be provided via keypad, programmable digital input, serial line or Bus.	
PL mains status	Indication for the drive of the a.c. mains restoring, in order to restart the motor before it reached the zero speed. The command can be provided via keypad, programmable digital input, serial line or Bus.	



* = depending on the load inertia

Figure 2.15.10.1: PL stop function

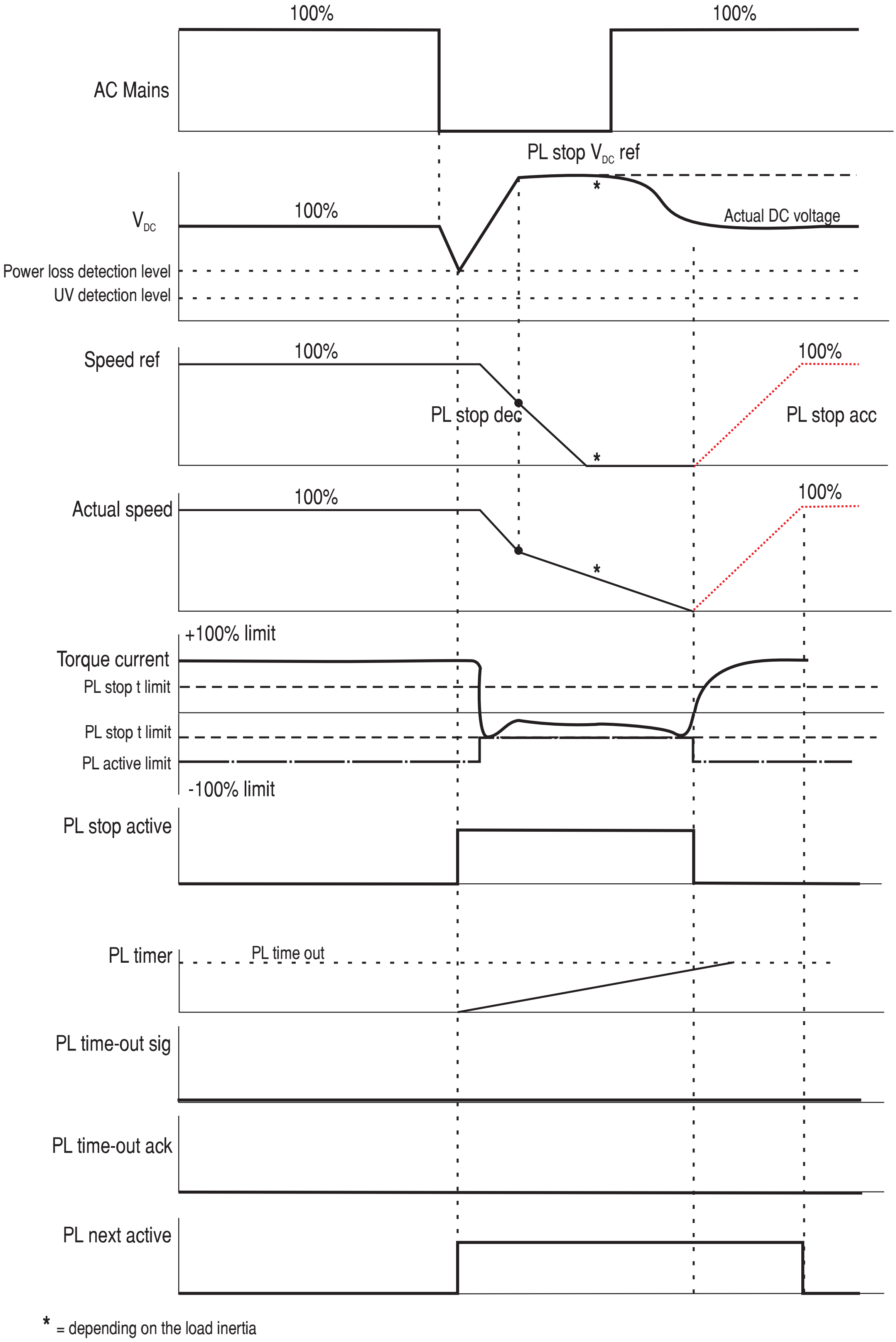


*Figure 2.15.10.2: Power loss stop function. AC mains restored and drive stopped before **PL time-out***

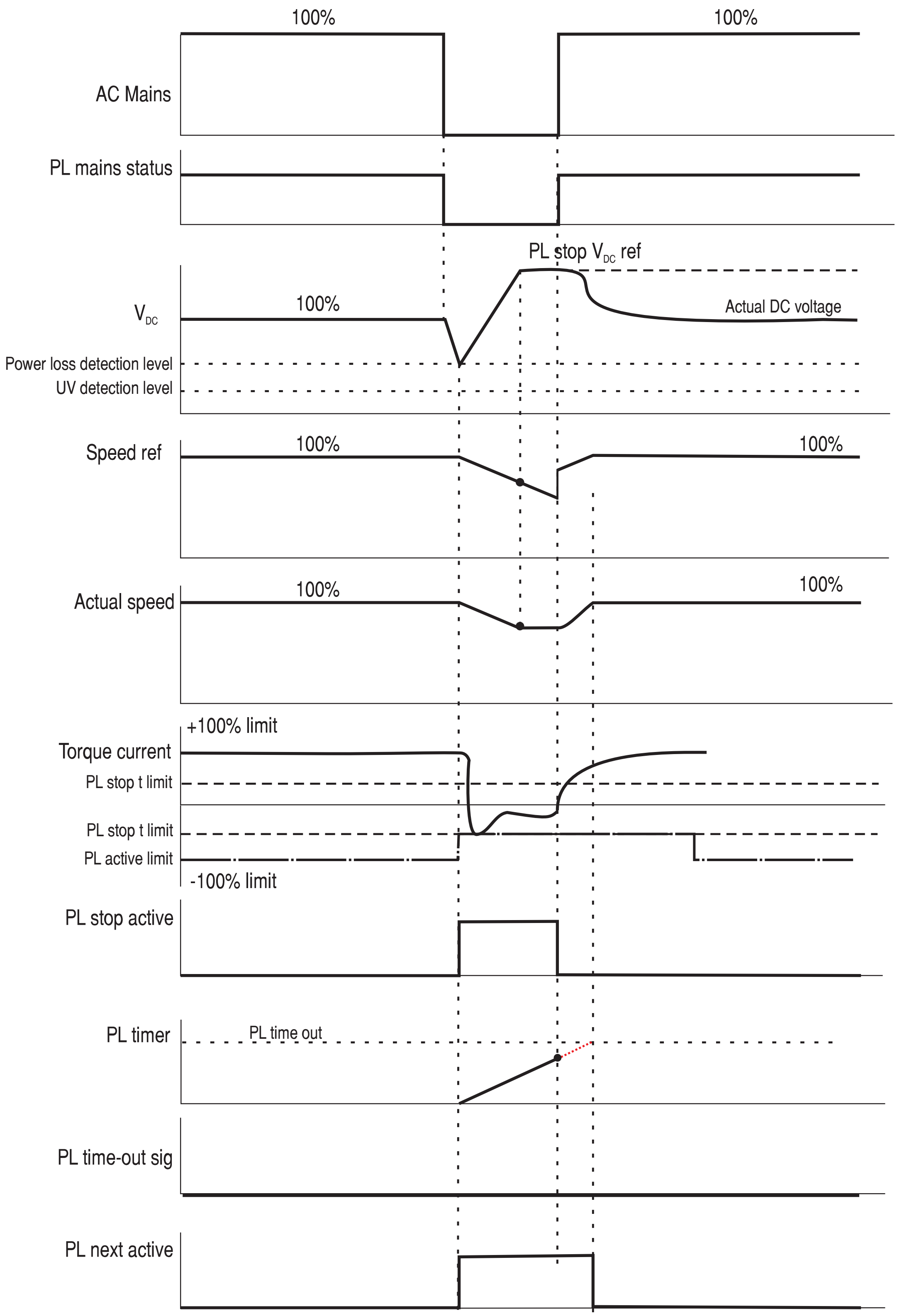


Figure 2.15.10.3: Power loss stop function. Operation with SR-32 / SM-32 sources

2.15.11 Tension Control Function DC Link

Parameter	No.	Value			Standard configuration
		min	max	Factory	
VDC Ctrl P Gain [%]	1289	0.00	100	10	
VDC Ctrl I Gain [%]	1290	0.00	100	10	

ai61513

This function, only available in modalities Sensorless and Field Oriented, allow you to control the DC link tension during regeneration (e.g. deceleration), to avoid the intervention of the Overvoltage alarm.

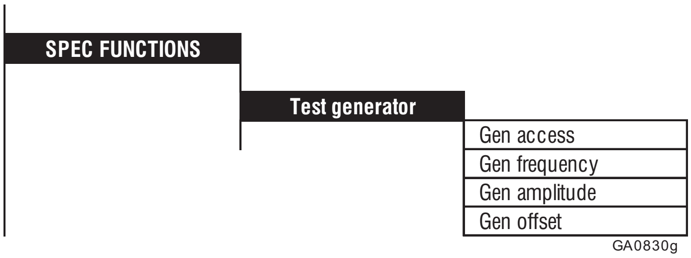
This function gets enabled by introducing the **T curr lim type = T lim VDC ctrl** parameter in the LIMIT / Current limits menu.

VDC Ctrl P Gain Proportional gains of the DC link voltage function control.

VDC Ctrl I Gain Integral gains of the DC link voltage function control.

2.16. SPEC FUNCTIONS

2.16.1. Test Generator



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Gen access	58	0	4	Not connected (0)	*
Not connected					
F current ref					
T current ref					
Flux ref					
Ramp ref					
Gen frequency [Hz]	59	0.1	62.5	1.0	
Gen amplitude [%]	60	0.00	200.00	0.00	
Gen offset [%]	61	-200.00	+200.00	0.00	

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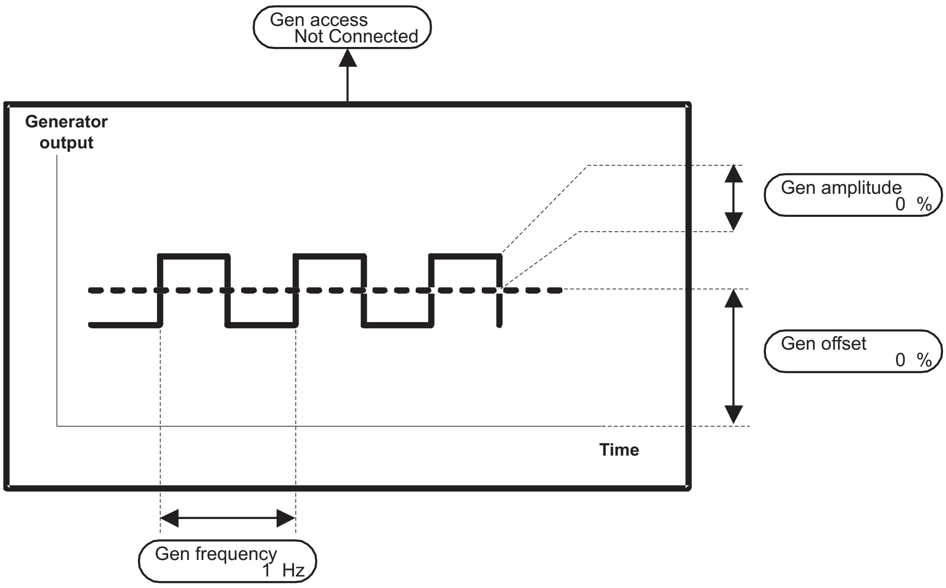


Figure 2.16.1.1: Test generator output

The test generator of the AVy Drive is used to manually tune the regulators. It consists of a square wave generator whose frequency, offset and amplitude can be set.

Gen access Different parameters can be simulated by the test generator. The parameter concerned then has the value of the generator output.

Not connected No internal parameters defined by the generator

F current ref	The generator output defines the reference value of the flux current. 100 % corresponds to the **Magnetizing current** parameter.
T current ref	The output of the generator defines the reference value of torque current. 100 % corresponds to Flt 100mF current (see section 2.9, “Current Regulation”).
Flux ref	The output of the generator defines the flux reference value. 100 % corresponds to the rated flux based on the motor parameters.
Ramp ref	The output of the generator defines the ramp reference value. 100 % corresponds to the **Speed base value**.

Gen frequency Output frequency of the generator in Hz.

Gen amplitude Amplitude of the square-wave signal produced by the generator in percent.

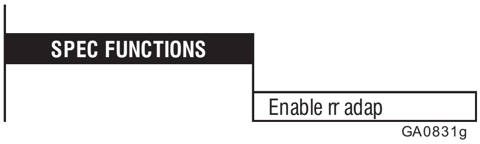
Generator offset Offset of the generator in percent.

The generator output consists of the addition of **Gen amplitude** and **Generator offset**. The signal is limited internally to the maximum possible values.

Current: limited to the max. permissible current for the drive

Speed: limited to the value set with **Speed max amount**

2.16.2. Temperature compensation of the rotor resistance



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable rr adap	435	0	1	Disabled	
Enable					
Disable				(0)	

GA6330g

Enable rr adap Enabled The temperature compensation is enabled

Disabled The temperature compensation is disabled

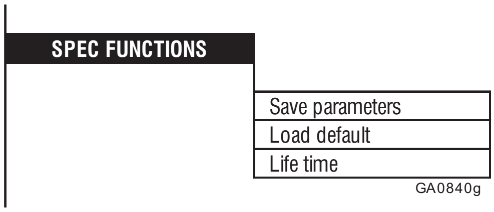
The motor temperature changes in time, because of the motor losses. This condition causes a variation of the rotor resistance from cold to warm.

A torque or motor power reduction can be caused by the deviation of rotor resistance from the value set in the “Motor parameter” menu. This effect is more sensitive for high power, high efficency motors.

An automatic adaptation function for the rotor resistance value is available via the **Enable rr adap** parameter. If necessary, this parameter must be enabled. On the basis of tests, the time constant and the limit value for the compensation are factory set. If these values are not suitable for your particular case, refer to your customer service center.

For calibration purpose, the compensation internal value can be set on an analog output by selecting the “Rr adap output” code. See section 1.3, “ Start up”.

2.16.3. Saving parameters. loading default factory settings, life time



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Save parameters	256	0	65535		
Load default	258	0	65535		
Life time [h.min]	235	0.00	65535.00		

GA6335g

Save parameters Saving of parameters that are currently set.

Load default Loading of the default settings (“Factory” column in the parameter lists, section 3).

Life time Shows the operating time of the drive. This parameter counts the time in which the drive is powered on (even if disabled).

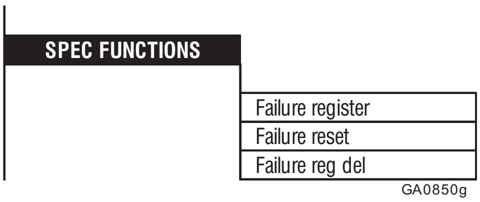
Default values for individual parameters are factory set in the device. These values are shown in the “Factory” column of the individual parameter tables. (Motor parameter and regulator defaults, that depend on drive size, are listed in section 3, “Parameter lists”).

In order to retrieve the values specific to your application when the device is switched on, they must be saved via the **Save parameters** command after being set.

The factory default values can be re-loaded by selecting **Load default**. If these are not saved, the application specific drive settings will still be available the next time the drive is switched on .

When the device is switched on the saved parameter set is loaded.

2.16.4. Failure register



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Failure register	320	-	-	-	-
Failure reset	262	0	65535	-	*
Failure reg del	263	0	65535	-	-

GA6340g

* This function can be assigned to one of the programmable digital inputs.

Failure register The Failure register contains the last 10 failures that have occurred. It also contains information about the time the failure occurred, based on the operating hours (Life time), as well as information on the type of failure. This information can be accessed by pressing the **Enter** key on the keypad when a failure is indicated. If several failures occur in sequence, all the failures are stored in the failure register until a failure occurs that causes the disconnection of the drive (Latch = ON, see Programmable alarms).The content of the failure register can also be read out via the bus or the serial interface.

Failure reset Acknowledgement of a failure. The failure reset can be initiated by pressing the **Escape** key when the failure is shown in the display of the keypad. If, however, several failures occur in sequence, these can only be reset by selecting **Failure reset** command through the **Enter** key.

Failure reg del Clearing the failure register.

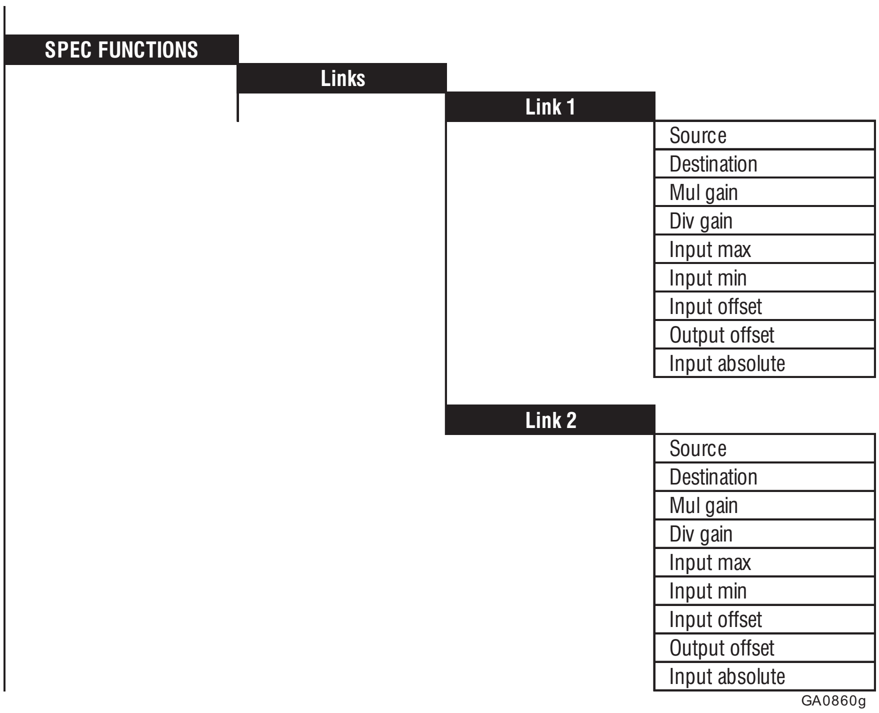
The informations about the last 10 failures that have occorred are available thru serial line in the following way:

- Set the parameter POINTER [330], it indicates the position number of the failure occurred: Example, if set to 10 it will be the last failure.
- Read: FAILURE TEXT [327], FAILURE HOUR [328], FAILURE MIN [329], they indicate the type and when the alarm is occurred

2.16.5. Signal adaptation (Links function)

The Link1 and Link 2 functions are two control sections operating independently from each other for the signal adaptation. With the Links, parameters can be:

- rectified
- limited
- multiplied by a factor
- divided by a factor
- provided with an offset.



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Source *link 1*	484	0	65535	0	—
Destination *link 1*	485	0	65535	0	—
Mul gain *link 1*	486	-10000	+10000	1	—
Div gain *link 1*	487	-10000	+10000	1	—
Input max *link 1*	488	-2^{31}	$+2^{31}-1$	0	—
Input min *link 1*	489	-2^{31}	$+2^{31}-1$	0	—
Input offset *link 1*	490	-2^{31}	$+2^{31}-1$	0	—
Output offset *link 1*	491	-2^{31}	$+2^{31}-1$	0	—
Inp absolute *link 1* **(ON/OFF)**	492	0	1	OFF	—
Source *link 2*	553	0	65535	0	—
Destination *link 2*	554	0	65535	0	—
Mul gain *link 2*	555	-10000	+10000	1	—
Div gain *link 2*	556	-10000	+10000	1	—
Input max *link 2*	557	-2^{31}	$+2^{31}-1$	0	—
Input min *link 2*	558	-2^{31}	$+2^{31}-1$	0	—
Input offset *link 2*	559	-2^{31}	$+2^{31}-1$	0	—
Output offset *link 2*	560	-2^{31}	$+2^{31}-1$	0	—
Inp absolute *link 2* **(ON/OFF)**	561	0	1	OFF	—

GA6345g

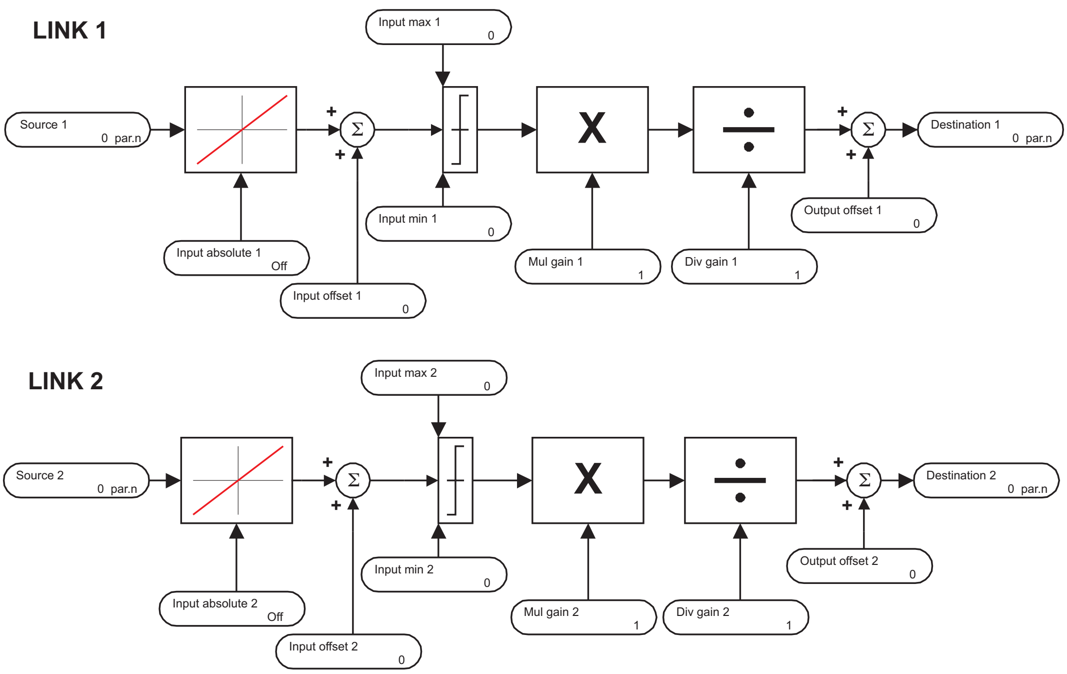


Figure 2.16.5.1: Structure of the signal adaptation

Source Parameter number used as an input quantity. For example “8236” for the **Ramp ref 1** parameter (44+8192 offset). Select the parameter number in the individual descriptions or in the list of all parameters in section 3, “Parameter list”.

Destination Parameter number, which determines the output quantity. Select the parameter number (+8192 offset) in the individual description column or in the list of all parameters in section 3, “Parameter lists”.

Mul gain Multiplicative factor of the input quantity (after a possible limitation). Resolution: 5 digits.

Div gain	Divisor, through which it is possible to divide the input quantity already multiplied and limited. Resolution: 5 digits.
Input max	Max. limit of the input quantity. Resolution: 5 digits.
Input min	Min. limit of the input quantity. Resolution: 5 digits.
Input offset	Offset to be added to the input quantity. Resolution: 5 digits.
Output offset	Offset to be added to the output quantity. Resolution: 5 digits.
Inp absolute	The input behavior can be determined with this parameter. OFF The input quantity is processed with its sign. ON The input quantity is processed with a positive sign (absolute value). It is possible to have a polarity change with the signs of **Mul gain** or **Div gain**.

In order to write SOURCE LINK (1/2) parameter or DESTINATION LINK (1/2) parameter it is necessary to add to the parameter number the offset "8192"

Eg. **RAMP REF 1 "44"**

SOURCE LINK (1/2) = 44+8192 = 8236

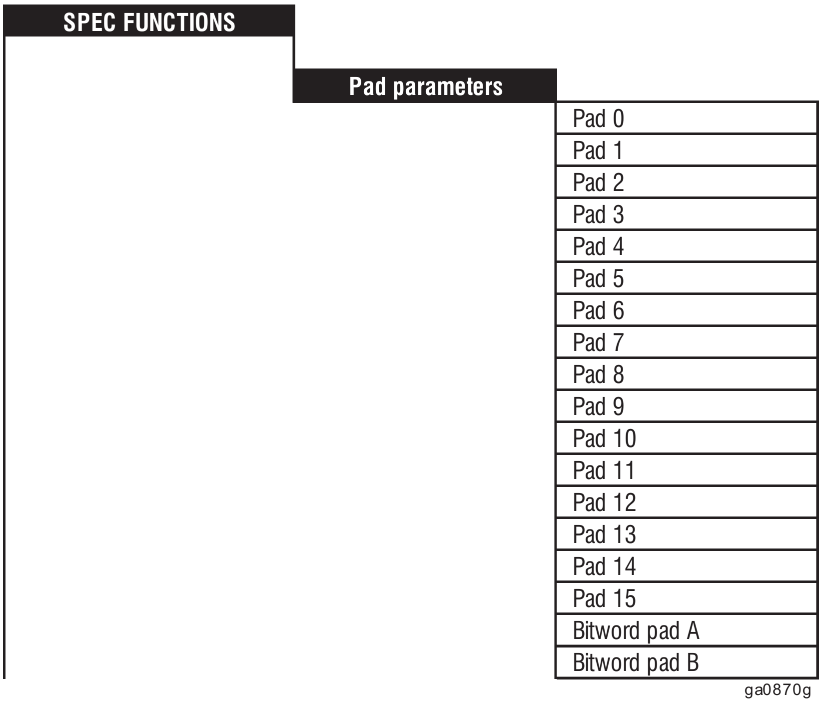
NOTE! The links are executed with an approximate cycle time of 20 ms. They are not mainly intended to be used for regulation but to access or connect parameters otherwise not accessible. The use of Links according to the parameter as a destination involves a CPU overhead that can slow down the keypad/display operation. Check that the functionality corresponds to the needs before plant-wide implementation.

NOTE! The following parameters cannot be used as a destination of a Link:
- All parameters with only "R" access code
- All parameters with "Z" access code
- All parameters with "C" access code
- All the following:

19	S shape t const	553	Link2 Source	726	Motor losses %
55	Control-Word	554	Link2 Destination	776	PI central v1
72	Scale input 1	636	Bus loss - Hold off time	777	PI central v2
73	Tune value inp 1	637	Bus loss - Restart time	778	PI central v3
77	Scale input 2	644	Voltage comp lim	784	PI bottom lim
78	Tune value inp 2	645	Comp slope	785	PI bottom lim85
85	Pword1	647	Flux corr factor	786	PID source
83	Tune value inp 3	649	Refresh enc 1	792	Input 1 filter [mS]
86	Pword2	652	Refresh enc 2	889	Dynamic vlt margin
165	Magnetizing curr	656	Motor cont curr	891	Lock zero pos
166	Rotor resistance	657	Trip time 50%	892	Zero pos gain
167	Base voltage	663	S acc t const	893	Spd src time
168	Base frequency	664	S dec t const	1012	Inertia c filter
176	P1 flux model	665	S acc t const 0	1013	Torque const
359	Undervoltage - Restart time	665	S dec t const 0	1014	Inertia
360	Undervoltage - N of attempts	666	S acc t const 1	1015	Friction
408	Ser answer del	668	S dec t const 1	1042	Input 1 compare
425	Enable OPT2	669	S acc t const 2	1043	Input 1 cp error
436	Stator resist	670	S dec t const 2	1044	Input 1 cp delay
437	Lkg inductance	672	S dec t const 3	1095 up to 1100	PDC in xx
444	Prop. filter	692	P2 flux model	1101 up to 1106	PDC out xx
467	Flux level	710	Manual boost	1107 up to 1122	Virt dig in xx
484	Link1 Source	717	DC braking curr	1123 up to 1138	Virt dig out xx
485	Link1 Destination	725	Slip comp filt		

2.16.6. Pads

The pads are used for the data exchange among the several components of a Bus system. They can be compared to the variables of a PLC. The figure 2.16.6.1 shows the overall structure of the system. With the help of pads it is possible for example to send information from a field Bus to an option card. All the pads can be written and read. See the several access possibilities in section 3, "Parameter lists".



Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Pad 0	503	-32768	+32767	0	*,**
Pad 1	504	-32768	+32767	0	*,**
Pad 2	505	-32768	+32767	0	*
Pad 3	506	-32768	+32767	0	*
Pad 4	507	-32768	+32767	0	**
Pad 5	508	-32768	+32767	0	**
Pad 6	509	-32768	+32767	0	**
Pad 7	510	-32768	+32767	0	-
Pad 8	511	-32768	+32767	0	-
Pad 9	512	-32768	+32767	0	-
Pad 10	513	-32768	+32767	0	-
Pad 11	514	-32768	+32767	0	-
Pad 12	515	-32768	+32767	0	-
Pad 13	516	-32768	+32767	0	-
Pad 14	517	-32768	+32767	0	-
Pad 15	518	-32768	+32767	0	-

GA6350a+F55

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Bitword pad A	519	0	65535	0	***,****
Pad A bit 0	520	0	1	0	***,****
Pad A bit 1	521	0	1	0	***,****
Pad A bit 2	522	0	1	0	***,****
Pad A bit 3	523	0	1	0	***,****
Pad A bit 4	524	0	1	0	***,****
Pad A bit 5	525	0	1	0	***,****
Pad A bit 6	526	0	1	0	***,****
Pad A bit 7	527	0	1	0	***,****
Pad A bit 8	528	0	1	0	****
Pad A bit 9	529	0	1	0	****
Pad A bit 10	530	0	1	0	****
Pad A bit 11	531	0	1	0	****
Pad A bit 12	532	0	1	0	****
Pad A bit 13	533	0	1	0	****
Pad A bit 14	534	0	1	0	****
Pad A bit 15	535	0	1	0	****
Bitword pad B	536	0	65535	0	****
Pad B bit 0	537	0	1	0	****
Pad B bit 1	538	0	1	0	****
Pad B bit 2	539	0	1	0	****
Pad B bit 3	540	0	1	0	****
Pad B bit 4	541	0	1	0	****
Pad B bit 5	542	0	1	0	****
Pad B bit 6	543	0	1	0	****
Pad B bit 7	544	0	1	0	****
Pad B bit 8	545	0	1	0	****
Pad B bit 9	546	0	1	0	****
Pad B bit 10	547	0	1	0	****
Pad B bit 11	548	0	1	0	****
Pad B bit 12	549	0	1	0	****
Pad B bit 13	550	0	1	0	****
Pad B bit 14	551	0	1	0	****
Pad B bit 15	552	0	1	0	****

GA6350b

* These parameters can be set on a programmable analog input.
** These parameters can be set on a programmable analog output.
*** These parameters can be set on a programmable digital input.
**** These parameters can be set on a programmable digital output.

Pad 0...15 General variables, 16 Bit. The Pads 0...3 can be set via analog inputs. The values of the Pads 0, 1, 4 , 5 and 6 can be set on analog outputs.

Bitword pad A (B) Bitmap of the parameters Pad A (B) bit 0 up to Pad A (B) bit 15. With a parameter it is possible to read or write all the Bits inside a Word..

Esempio:	**Pad A bit 0**	0		
	Pad A bit 1	1	$= 2^1$	= 2
	Pad A bit 2	0		
	Pad A bit 3	0		
	Pad A bit 4	0		
	Pad A bit 5	1	$= 2^5$	= 32
	Pad A bit 6	1	$= 2^6$	= 64
	Pad A bit 7	0		
	Pad A bit 8	0		
	Pad A bit 9	0		
	Pad A bit 10	1	$= 2^{10}$	= 1024
	Pad A bit 11	0		
	Pad A bit 12	1	$= 2^{12}$	= 4096
	Pad A bit 13	0		
	Pad A bit 14	0		
	Pad A bit 15	0		

Bitword pad A = 2 + 32 + 64 + 1024 + 4096 = 5218

Pad A (B) bit 0...15 Bit variables. The single Bits can be read or written. With the **Bitword pad A (B)** it is possible to process a Word. See the example. From the Pad A it is possible to read the Bits 0.....7 of a digital input. On a digital output it is possible to write all the Bits.

NOTE! When setting the PADs bit to digital I/O, the following rules apply:

1- Assigning PAD A/B bit to Digital Output will cause the state of the digital output (n) coming from PAD A/B bit (n-1)

2- Relay 2 (terminals 83,85) can be driven by means of PAD A/B bit 14

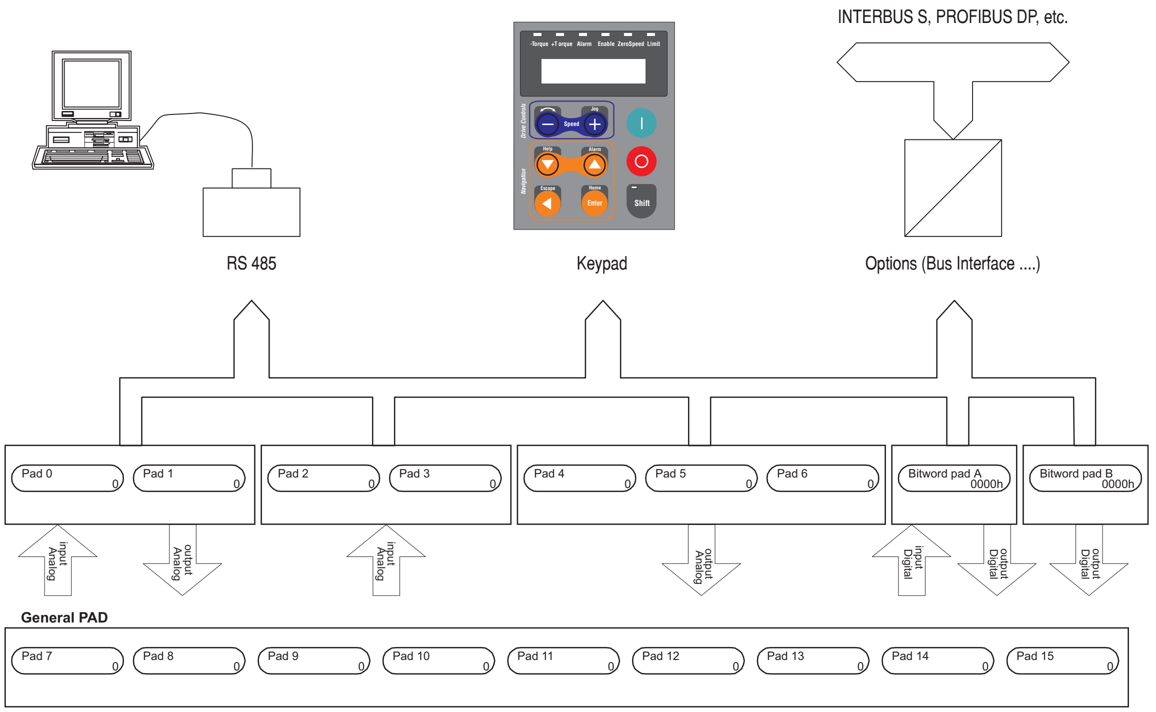


Figure 2.16.6.1: Bus pads

2.16.7. DC braking

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
DC Braking mode (Disabled) 0 (Enabled) 1	904	0	1	0 (OFF)	
Brk time @ stop [ms]	905	0	30000	1000	
DC braking curr [%]	717	0	100	50	
DC braking delay [ms]	716	0	65535	500	

GA6355g

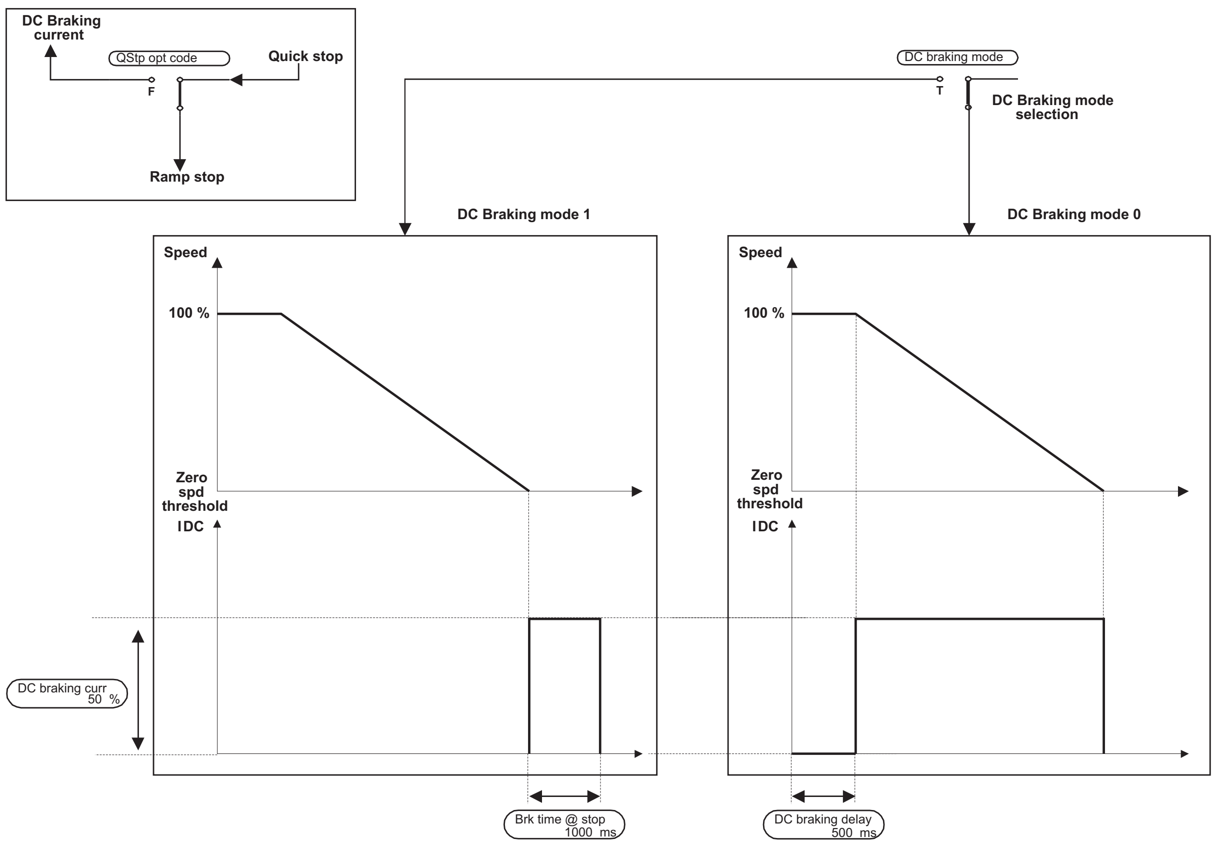


Figure 2.16.7.1: DC Braking function

The Drive offers the facility of D.C. braking as a standard. With this operation, the Inverter injects D.C. current into motor phases, thereby generating braking torque. The level of braking current (=braking torque) can be set between 0 and 100% of the **Full load curr** .

The kinetic energy of the machine is dissipated as heat in the motor.

To enable this function it is necessary select the parameter **Qstp Option code** = DC braking curr (in the Configuration menu).

To activate DC braking curr set "**Quick stop**" on a Digital input

DC braking mode = **0** — DC Braking function is activated for braking the drive in the shortest possible time using the "**Quick stop**" command.

DC braking mode = **1** — When the "**Stop**" command is activated the motor decelerates with the ramp time selected.

When the threshold of zero speed (**speed zero level**) detection is reached, D.C. braking is activated and the motor is braked to a standstill. The level of the current is determined by **DC braking curr** parameter and the braking time is determined by **Brk time @ stop** parameter.

Brk time @ stop — Braking time of the DC braking (msec).

DC braking curr — Level of current for DC operation. It is specified as a percentage of **Full load curr**.

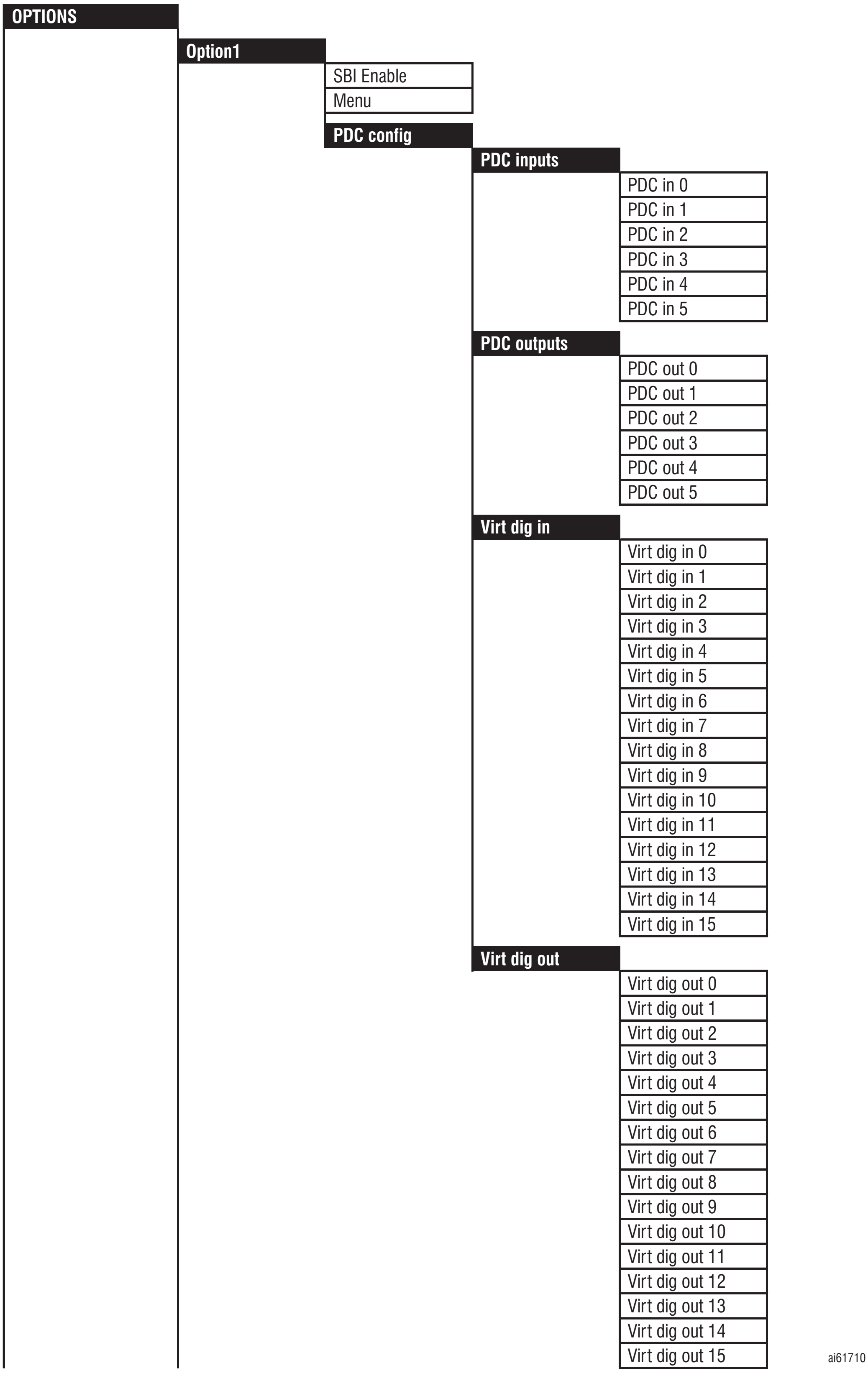
DC braking delay — Delay from the assertion of the command to the actuation of the DC braking.

This delay allow the motor to demagnetize, thus avoiding Overcurrent trip due to electro motive force (e.m.f.) In the motor.

NOTE: The Enable command is required during braking. If this command is not present or is removed during the braking process, the drive coasts to a halt without braking. Once braking has been initiated, the drive ignores a Start or Jog command.

2.17. OPTIONS

2.17.1. Option 1



Through this Menu, the setting of Drive parameters to the virtual digital I/O (menu MONITOR\Virtual digital Inp-Out) and the data channels (PDC) of the field Bus can be carried out.

If the OPT1 board is not present you will be prompted (inside the menu) by the message **OPT1 not present**. If the used OPT1 card does not support the configuration from this menu you will be prompted (inside the menu) by the message **OPT1 old version**. For further and detailed information see the instruction book of the optional board.

SBI Enable This parameter enable the reading of the SBI card. When enabled, if the card is not present, an Hw opt1 alarm is showed.

When the parameter is changed, power off and on of the drive is needed.

2.17.1.1 Process Data Channel

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Pdc in 0	1095	0	65535	0	
Pdc in 1	1096	0	65535	0	
Pdc in 2	1097	0	65535	0	
Pdc in 3	1098	0	65535	0	
Pdc in 4	1099	0	65535	0	
Pdc in 5	1100	0	65535	0	
Pdc out 0	1101	0	65535	0	
Pdc out 1	1102	0	65535	0	
Pdc out 2	1103	0	65535	0	
Pdc out 3	1104	0	65535	0	
Pdc out 4	1105	0	65535	0	
Pdc out 5	1106	0	65535	0	
Virt dig in 0	1107	0	65535	0	
Virt dig in 1	1108	0	65535	0	
Virt dig in 2	1109	0	65535	0	
Virt dig in 3	1110	0	65535	0	
Virt dig in 4	1111	0	65535	0	
Virt dig in 5	1112	0	65535	0	
Virt dig in 6	1113	0	65535	0	
Virt dig in 7	1114	0	65535	0	
Virt dig in 8	1115	0	65535	0	
Virt dig in 9	1116	0	65535	0	
Virt dig in 10	1117	0	65535	0	
Virt dig in 11	1118	0	65535	0	
Virt dig in 12	1119	0	65535	0	
Virt dig in 13	1120	0	65535	0	
Virt dig in 14	1121	0	65535	0	
Virt dig in 15	1122	0	65535	0	
Virt dig out 0	1123	0	65535	0	
Virt dig out 1	1124	0	65535	0	
Virt dig out 2	1125	0	65535	0	
Virt dig out 3	1126	0	65535	0	
Virt dig out 4	1127	0	65535	0	
Virt dig out 5	1128	0	65535	0	
Virt dig out 6	1129	0	65535	0	
Virt dig out 7	1130	0	65535	0	
Virt dig out 8	1131	0	65535	0	
Virt dig out 9	1132	0	65535	0	
Virt dig out 10	1133	0	65535	0	
Virt dig out 11	1134	0	65535	0	
Virt dig out 12	1135	0	65535	0	
Virt dig out 13	1136	0	65535	0	
Virt dig out 14	1137	0	65535	0	
Virt dig out 15	1138	0	65535	0	

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Through the parameters of this menu, it is possible to manage the process data channel coming from a field bus interface card. The exchange of high priority parameters (see list at chapter 3.4) with the bus interface, can be performed by programming the **Pdc input** and **Pdc output**. The exchange of the high priority parameters is executed in automatic synchronous communication with the task of the speed regulation.

For this purpose, the regulation card of the drive, provides 6 dedicated word, while the number of the word used by the bus interface cards, is dependant on the type of the bus connected (for further information see the instruction manual of the relative interface cards).

Pdc input is referred to the data transfer from master to slave (Input for the drive). **Pdc output** is referred to the data transfer from slave to master (Output for the drive)

Assigning a drive parameter to a Pdc I/O, it necessary to add at the number of the parameter itself an offset equal to decimal number 8192.

E.g.: Reading of **Actual speed** on **Pdc out 2** [1103]
Actual speed [122]
Pdc out 2 = 122+8192 = 8314
Writing of **Ramp ref 1** on **Pdc in 1** [1096]
Ramp ref 1 [44]
Pdc in 1 = 44+8192 = 8236

A virtual terminal is available as 16 bits format for input and output. The bit terminal functionality is programmable by assigning drive parameter number to the **Virt dig in** and **Virt dig out** parameters.

Virt dig in is referred to the data transfer from master to slave (Input for the drive)

Virt dig out is referred to the data transfer from slave to master (Output for the drive)

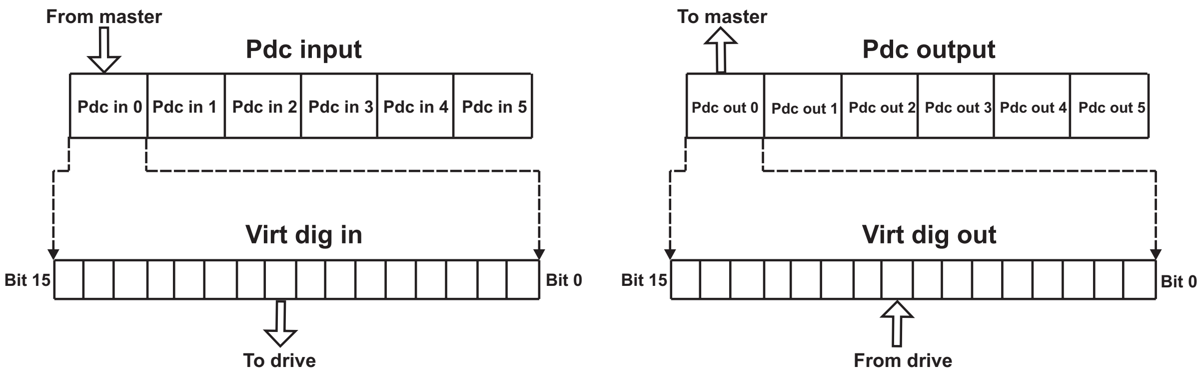
Assigning a parameter to a Virtual I/O, it necessary to add at the number of the parameter itself an offset equal to 8192.

E.g.: Setting of **Enable/Disable** on **Virt dig in 1** [1108]
Enable/Disable [314]
Virt dig in 1 = 314+8192 = 8506
Setting of **Drive ready** status on **Virt dig out 2** [1125]
Drive ready [380]
Virt dig out 2 = 380+8192 = 8572

To connect the **Pdc Input** to the **Virt dig in**, the parameter index 582 is involved.

This index must be assigned to the configuration parameter of the selected **Pdc input** word.

Eg: **Virt dig in** has to be assigned to the **Pdc in** word no. 0.
This can be performed by assigning parameter number [582+8192] to the configuration parameter 1095 of the **Pdc input.**



To connect the **Pdc Output** to the **Virt dig out**, the parameter index 583 is involved.

This index must be assigned to the configuration parameter of the selected **Pdc output** word.

Eg: Virt dig out has to be assigned to the Pdc out word no.1.
This can be performed by assigning parameter number (583+8192) to the configuration parameter 1102 of the **Pdc output**.

The following table shows the different error codes that may occur during the execution of a service.

RESULT	VALUE	RESULT	VALUE
OK no error	0000H	Reserved	0017H
Parameter not exist	0001H	Unknown Command	0018H
Reserved	0002H	Read only Parameter	0019H
Control Access denied	0003H	Write not allowed	001AH
Reserved	0004H	Value out of constant limits	001BH
Attribute Access denied	0005H	State not correct	001CH
Type value error	0006H	Password	001DH
Reserved	0007H-000FH	Type Unknown	001EH
Destination option not exist	0010H	Hardware Fail	0030H
Parameter Access Conflict	0011H	Checksum Fail	0031H
Value out of the maximun range	0012H	Reserved	001FH-007CH
Value out of the minimun range	0013H	Reserved	0082H-00FCH
Value not supported	0014H	NOK generic	00FFH
Parameter Configuration Conflict	0015H	User defined	0100H-FFFFH
Command Submitted	0016H		

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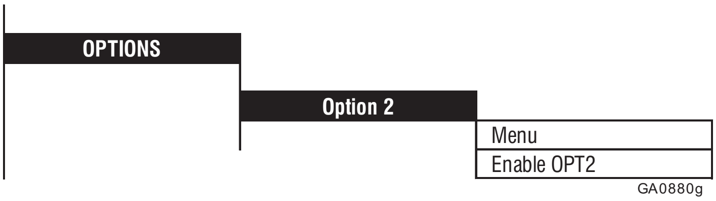
Explanation:

Parameter not exist	The specified parameter does not exist
Control Access denied	The access is denied because of the control status
Attribute Access denied	The parameter attributes do not allow the access
Type value error	The specified type value is incorrect
Destination option not exist	The destination option does not exist at node
Parameter Access Conflict	The addressed parameter can not be accessed (for example if the command is write and parameter is connected to an external input)
Value out of the max range	Value is out of the maximum range
Value out of the min range	Value is out of the minimum range
Value not supported	Value is in range but not allowed
Parameter Configuration Conflict	The addressed parameter can not be accessed for sistem configuration conflict (for example try to connect an input source to a parameter that is already connected to an input source)
Command Submitted	Command has been submitted but is not possible to know if it has been executed
Unknown Command	The command is not known
Read only Parameter	The parameter has read only attribute
Write not allowed	Write operation is not allowed for the slave conditions
Value out of constant limits	Value is out of constant fixed limits
State not correct	The control state doesn’t allow the command execution
Password	The command is not executed because the password is active
Type Unknown	The parameter type is not known
Hardware Fail	The access is denied because of an hardware failure
Checksum Fail	The access is aborted because of an error in cheksum control
NOK generic	The access is aborted because of an indeterminated error

2.17.2. Option 2



This menu allows the user access to the parameter set of the OPT2 option card.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Menu					
Enable OPT2	425	0	1	Disabled	

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Menu The menu is active only if the OPT2 card is present (e.g. a APC card). If the user tries to enter in the Option 2 menu and the card is not mounted on the device the message "Not present" is displayed.

For further and detailed information see the instruction book of the optional board.

Enable OPT2 Default configuration = Disabled.

To change the configuration:

1 - set the new value of **Enable OPT2** parameter

2 - store via the **Save parameters** (BASIC MENU)

3 - switch-off and switch-on the drive

If Enabled and the APC card is not present, will be generated the error:

OPT2 failure code 100-98 or OPT2 failure code 100-96.

NOTE When using the APC card (Option 2), all parameters listed in the "Opt2-A/PDC" column of Parameter List (section 3.1 and 3.2) can be accessed through the automatic asynchronous communication. Parameters listed in the High Priority Parameter List (section 3.4) can be accessed by means of the automatic synchronous communication. (See APC manual for more details.)

If the software has detected the presence of the APC the parameter set of the optional card is accessible. In this case see the APC user manual for detailed information.

2.17.3. PID function

- **OPTIONS**
  - **PID**
    - Enable PI PID
    - Enable PD PID
    - **PID source**
      - PID source
      - PID source gain
    - Feed-fwd PID
    - **PID references**
      - PID error
      - PID feed-back
      - PID offs. sel
      - PID offset 0
      - PID offset 1
      - PID acc time
      - PID dec time
      - PID clamp
    - **PI controls**
      - PI P gain PID %
      - PI I gain PID &
      - PI steady thr
      - PI steady delay
      - P init gain PID %
      - I init gain PID %
      - PI central v sel
      - PI central v 1
      - PI central v 2
      - PI central v 3
      - PI top lim
      - PI bottom lim
      - PI integr freeze
    - PI output PID
    - Real FF PID
    - **PD controls**
      - PD P gain 1 PID
      - PD D gain 1 PID
      - PD P gain 2 PID
      - PD D gain 2 PID
      - PD P gain 3 PID
      - PD D gain 3 PID
      - PD D filter PID
    - PID output PID
    - PID out.sign PID
    - PID output
    - **PID target**
      - PID target
      - PID out scale
    - **Diameter calc**
      - Diameter calc
      - Positioning spd
      - Max deviation
      - Gear box ratio
      - Dancer constant
      - Minimum diameter

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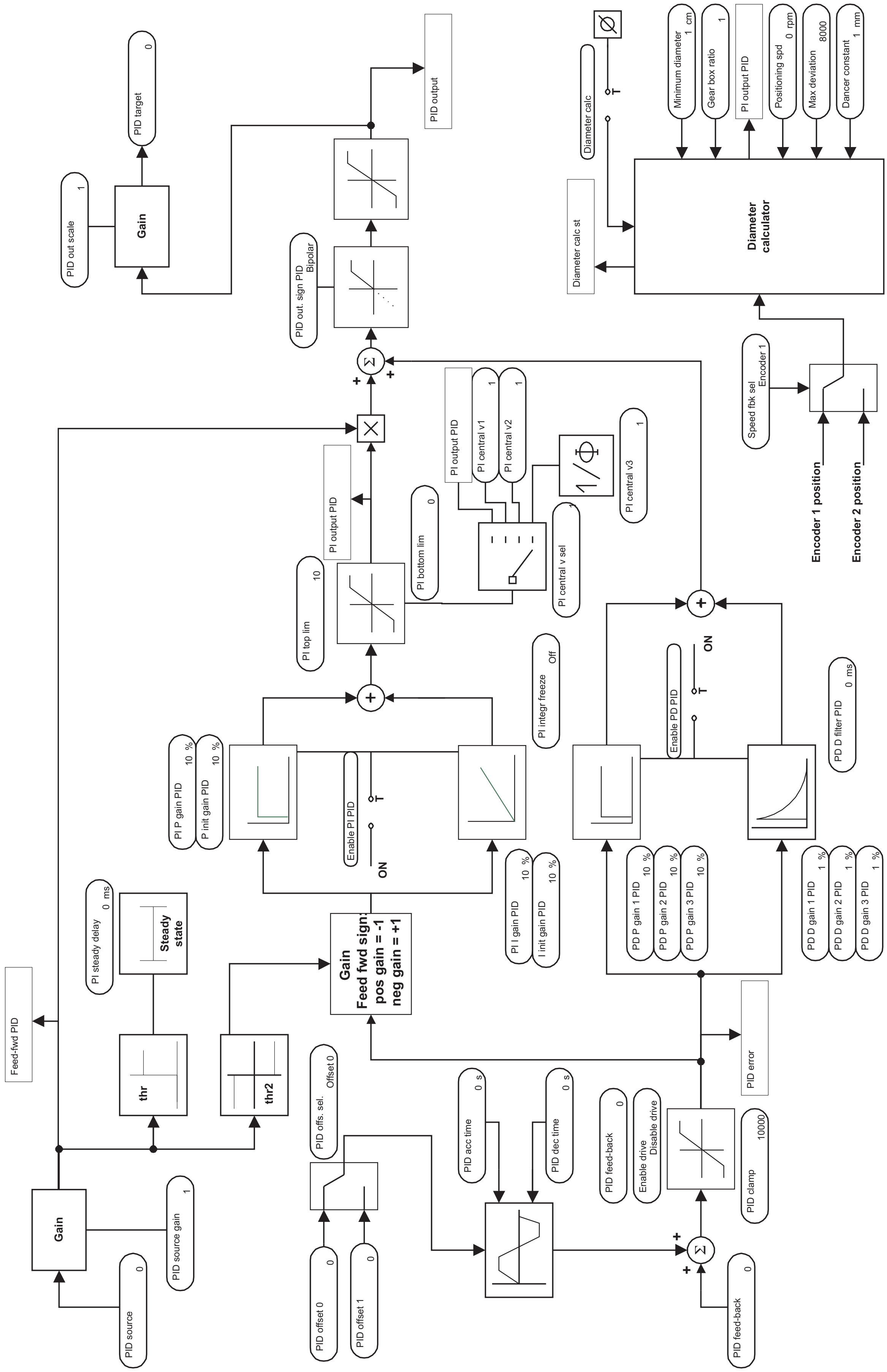


Figure 2.17.3.1: PID function

2.17.3.1 General

The PID function has been developed for general uses which can include nip-roll, winders, unwinders, pressure control of pumps and extruders.

A dancer or a load cell can be used as position/tension transducer.

The inputs (with the exception of those concerning the transducers) and the outputs can be configured. They can be associated to various converter parameters, E.g. the PID output can be sent to the speed or to current regulator.

The analog inputs/outputs will be sampled/updated to 2ms.

The digital inputs/outputs will be sampled/updated to 8ms.

NOTE! PID function in the firmware and the APC card are mutually exclusive.

2.17.3.2 Inputs / Outputs

Regulation Inputs/outputs

PID source Sample parameter of Feed-forward normally programmed on analog input.

PID feed-back Analog input of position / tension transducer (dancer/load cell).

PID feed-back must be programmed on the analog input 1 (terminals 1-2) because of the input filter provided.

PID offset 0 Offset analog input added to **PID feed-back.** Used for the adjustement of the dancer position.

PID target Parameter associated with the regulator output. Normally, it will be programmed on the speed reference of the drive.

PID output Analog output of the regulator. Used to carry on a reference cascade in multidrives systems.

PI central v3 PID Initial value setting of the integral component of the regulator (correspondent to initial diameter). It can be programmed on an analog input. E.g. to an ultrasonic transducer used for the diameter measure of a winder/unwinder.

Input Command (programmable on digital inputs)

Enable PI PID Enable of the PI (proportional - integral) of the regulator.

Enable PD PID Enable of the PD (proportional - derivative) of the regulator.

PI integral freeze Freezing of the actual value of the integral component of the regulator.

PID offset sel Offset selection, in addition to **PID feed-back**: L = **PID offset 0**, H = **PID offset 1**.

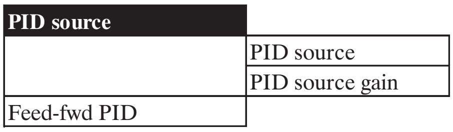
PI central v S0 Output selector of initial block PI. With **PI central v S1** determined, through binary selection, 4 possible settings of the integral initial level (correspondent to initial diameter) can be used.

PI central v S1 Output selector of initial block PI. With **PI central v S0** determined, through binary selection, 4 possible settings of the integral initial level (correspondent to initial diameter) can be used.

Diameter calc Enable of the calculation.

Diameter calc st Calculation of the ended initial diameter (digital output).

2.17.3.3 Feed - Forward



GA0882g

Parameter	N.	Value			Standard configuration
		min	max	default	
PID source	786	0	65535	0	
PID source gain	787	-100.000	100.000	0	
Feed-fw PID	758	-10000	+10000	0	*

ga6390i

* This parameter can be set on an analog programmable input.

When used , the feed-forward signal represents the main reference of the regulator. Inside the regulator it will be attenuated or amplified by the PID function and sent to the output as reference signal for the drive.

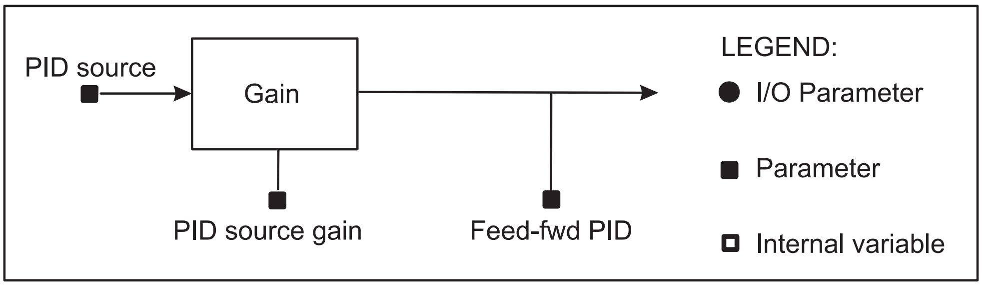


Figure 2.17.3.1: Feed-forward block description

PID source Address of the parameter (Feed-forward value) containing the value which will be used as PID source.
Number +2000H (8192 decimal) must be added to the parameter.

PID source gain Multiplier factor of the input value to PID source.

Feed-fwd PID Value of feed-forward

Through the parameter **PID source,** it is possible to select which point in the drive the feed-forward signal may be sent. The selectable parameters are those indicated in the paragraph 10.4. “List of the high-priority parameters”. The measure units are those indicated in the notes at the end of this paragraph.

1. Programming example of the ramp output block (Parameter Ramp out) on PID source:

Menu’ OPTION

————> PID

————> PID source

————> PID source = 8305

The **PID source** must be set to the parameter number to which it will be associated, choosing it from paragraph 3.4. “List of high-priority parameters’ (**Ramp out** has the decimal number 113).

To obtain the value, it must be added to the decimal value 8192 (fixed offset): 8192 + 113 = 8305.

If you need to set the feed-forward on analog input, given that they are not directly inserted in the 'high-priority parameters', it is necessary to pass through a **PAD 0.....PAD 15** parameters.

2. Programming example of the analog input 2 on PID source:

a) Input programming on a PAD parameter

Menu' I/O CONFIG

————> Analog input

————> Analog input 2

————> Select input 2 = PAD 0

b) Setting of the **PAD 0** as feed-forward input:

Menu' OPTION

————> PID

————> PID source

————> PID source = 8695

The **PID source** must be set to the parameter number to which it will be associated, choosing it from paragraph 3.4 "List of high-priority parameters' (**PAD 0** has the decimal number 503).

To obtain the value must be added the decimal value 8192 (fixed offset):

8192 + 503 = 8695.

The full-scale of the feed-forward is limited to the value +/- 10000, which depends on the parameter set on **PID source**. It will be necessary the calibration through the **PID gain source**.

The measure units are those indicated in the notes at the end of the paragraph 10.4. "List of the high-priority parameters'.

The feed-forward value can be read through the parameter **Feed-fwd PID** via keypad or serial line.

Referring to the above examples:

1. Programming example of the ramp output block (**Parameter Ramp out**) on **PID source**:
   Speeds will be converted inside the drive into RPM x 4.
   The ramp input references take as maximum set value what set in **Speed base value**.
   Feed - fwd PID = Speed base value x 4 x PID source gain

   If, with max. ramp reference and **Speed base value** = 3000rpm, to have
   Feed - fwd PID = 10000, it is necessary to set:
   PID source gain = 10000 / (3000 x 4) = 0.833

2. Programming for example analog input 2 on **PID source**:
   When an analog input will be set on a **PAD** parameter, this will have a max. value of + / - 2047.
   With max. analog reference, for having **Feed - fwd PID** = 10000, it is necessary to set:
   PID source gain = 10000 / 2047 = 4.885.

NOTE! Using the regulator as "generic PID" without the feed -forward function, **Feed - fwd PID** must be at its max. value.

To do this, it is necessary to set **PID source** on a **PAD** parameter and program it = 10000

2.17.3.4 PID function

The PID function is divided in three blocks:

- Feed-back input "**PID reference**"
- Proportional-integral control block "**PI controls**"
- Proportional-derivative control block "**PD controls**"

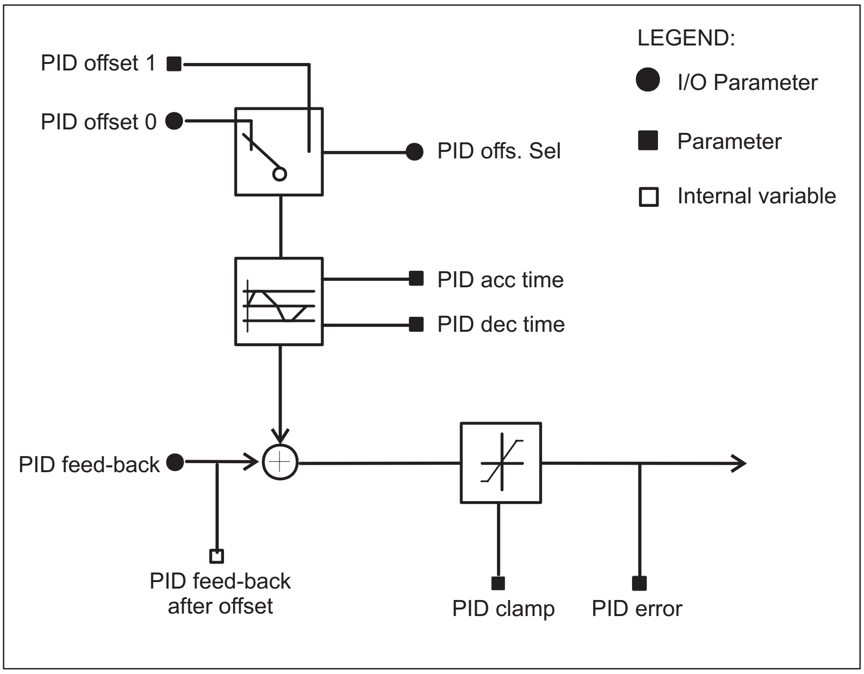
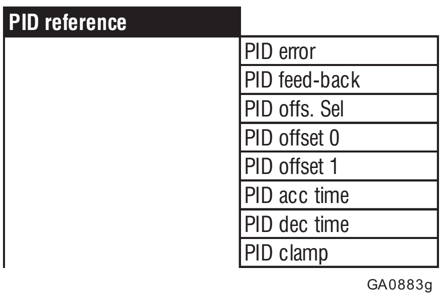


Figure 2.17.3.2: Feedback block description



Parameter	N.	Value			Standard configuration
		min	max	default	
PID error	759	-10000	+10000	0	
PID feed back	763	-10000	+10000	0	**
PID offs. Sel	762	0	1	0	*
PID offset 0	760	-10000	+10000	0	**
PID offset 1	761	-10000	+10000	0	
PID acc time [s]	1046	0.0	900.0	0.0	
PID dec time [s]	1047	0.0	900.0	0.0	
PID clamp	757	0	+10000	10000	

GA6391g

* This function can be set on a digital programmable input

** This parameter can be set on an analog programmable input

PID error	Error reading the input of the function PID (**PID clamp** block output).
PID feed-back	Reading of feed-back value from the transducer position (dancer) or tension (load cell).
PID offs. sel	Offset selector added to **PID feed-back**. This parameter can be set on a digital programmable input. 0 = **PID offset 0** 1 = **PID offset 1**
PID offset 0	Offset 0 added to **PID feed-back**. This parameter can be set on analog input , E.g. for the tension setting when a load cell has to be used as feed-back.
PID offset 1	Offset 1 added to **PID feed-back**.
PID acc time	Acceleration ramp time value in seconds after the PID offset block.
PID dec time	Deceleration ramp time value in seconds after the PID offset block.
PID clamp	The clamper allows a smooth tension setting of a controlled system winder/ unwinder, when cannot be used the "Function for the calculation of the initial diameter". When enabling the drive, the dancer is at its lower full scale, being **PID error** at its maximum value, the motor could have a too fast acceleration for setting the dancer in its central position of work. Setting **PID clamp** at a value sufficiently low e.g = 1000, enabling the drive and at the enabling the **Enable PD PID**, the value of **PID error** is limited at 1000 till when the signal coming from the dancer (**PID feed-back**) does not go down this value. Now **PID clamp** is automatically take back at its maximum value corresponding to 10000. The clamper is kept at 10000 till the next disabling of the drive or of **Enable PD PID**.

The feed - back input is provided for the analog transducers connection like dancer, with relative potentiometer or load cell. Nevertheless, it is possible to use this input block as comparison point between two different analog signals + / - 10V.

Connection to a dancer with potentiometer connected between - 10 and + 10V.

The cursor of the potentiometer can be connected to one of the analog inputs of the drive. Normally it should be used the analog input 1 (terminals 1 and 2) because it is provided with filter.

The input choosen for that connection must be programmed in the menu I/O CONFIG as **PID feed - back.** Its value can be read in the **PID feed - back** parameter in the **PID REFERENCE** submenu.

Through **PID offset 1** (or PID offset 0), it is possible to carry on the adjustement of the dancer position.

Connection to a load cell with full range + 10V.

The output of the load cell can be connected to one of the drive analog inputs. Normally the analog input 1 (terminals 1 and 2) should be used because its provided with filter.

The input chosen for the connection must be programmed in the menu I/O CONFIG as **PID feed - back.** Its value can be read in the **PID feed - back** parameter of the **PID REFERENCE** submenu.

The tension setting can be sent, with value 0...-10V, to one of the remaining programmable analog inputs in the **I/O CONFIG** menu as **PID offset 0**.

2.17.3.5 Proportional - integral block

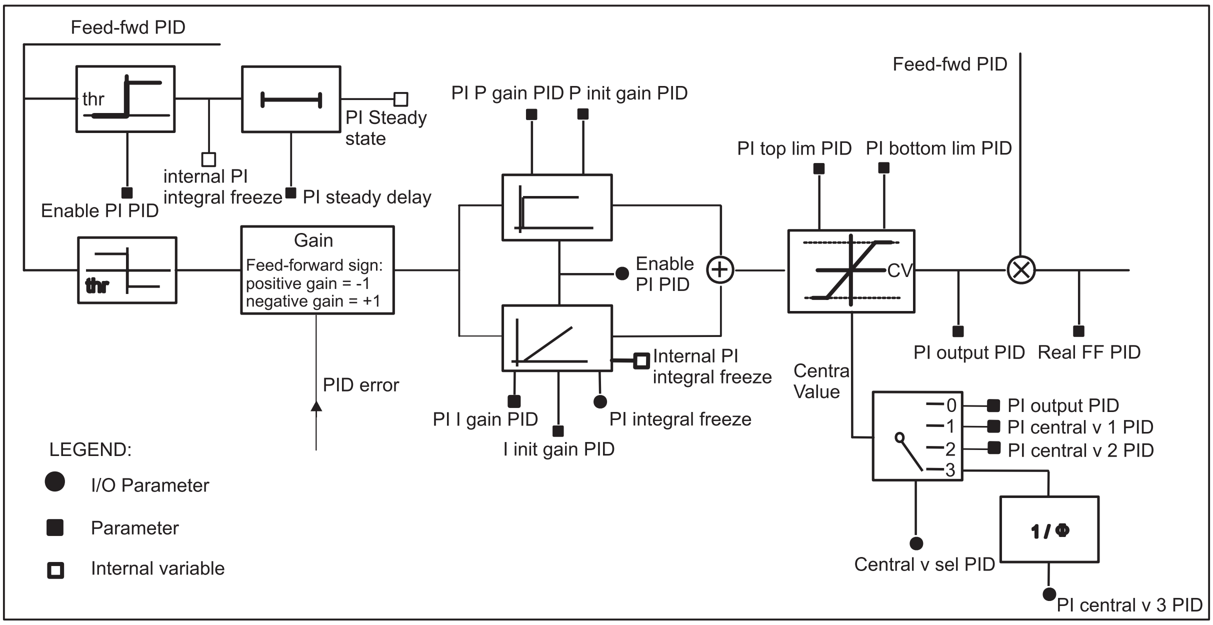


Figure 2.17.3.3: PI block description

The PI block receives its input from the **PID error** parameter, which represents the error that must be corrected by the regulator. The PI block carries on a proportional-integral regulation. Its output, **PI output PID,** after having been appropriately adapted, according to the system which has to control, will be used as multiplier factor of the feed-forward (**Feed-fwd PID**) obtaining the correct value of the speed reference for the drive (**Real FF PID**).

The PI block will be enabled by setting **Enable PI PID** = Enable. If **Enable PI PID** has been programmed on a digital input, this must be set to a high logic level (+24V).

PID

Enable PI PID

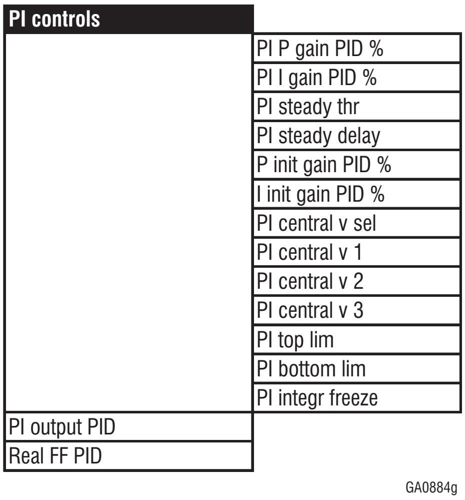
GA0931g

Parameter	N.	Value			Standard configuration
		min	max	default	
Menu					
Enable PI PID	769	0	1	Disabled	*

GA6392g

* This function can be set on a digital programmable input

Enable PI PID	Enabled	Enable of the proportional-integral block
	Disabled	Disabling of the proportional-integral block.



Parameter	N.	Value			Standard configuration
		min	max	default	
PI P gain PID	765	0.00	100.00	10.00	
PI I gain PID	764	0.00	100.00	10.00	
PI steady thr	695	0	10000	0	
PI steady delay	731	0	60000	0	
P init gain PID	793	0.00	100.00	10.00	
I init gain PID	734	0.00	100.00	10.00	
PI central v sel	779	0	3	1	*
PI central v 1	776	PI bottom lim	PI top lim	1.00	
PI central v 2	777	PI bottom lim	PI top lim	1.00	
PI central v 3	778	PI bottom lim	PI top lim	1.00	**
PI top limit	784	PI bottom lim	10.00	10.00	
PI bottom limit	785	-10.00	PI top lim	0.00	
PI integral freeze	783	0	1	0	*
PI output PID	771	0	1000 x PI top lim	1000	
Real FF PID	418	-10000	+10000	0	

GA6393g

* This function can be set on a digital programmable input

**This parameter can be set on an analog programmable input

PI P gain PID Proportional gain of PI block

PI I gain PID Integral gain of PI block

PI steady thr Threshold feed-forward survey. If **Feed-fwd PID** is less than **PI steady thr** the integral regulation will be frozen, the proportional gain assumes the value set in **P init gain PID**.

When **Feed-fwd PID** overcomes the threshold, the integral regulation with the gain set in **I init gain PID** will be enabled. The PI block will mantain the gains **P init gain PID** and **I init gain PID** for the time preset through **PI steady delay**. Once this delay is over, they will be brought automatically to **PI P gain PID** and **PI I gain PID**.

PI steady delay Time for which the gains **P init gain PID** and **I init gain PID** have been kept operative after overcoming the feed-forward **PI steady thr** threshold.

The delay time **PI steady delay** and the resulting function of initial gains changing also, operate on the transition L to H of the **Enable PI PID** parameter.

P init gain PID Initial proportional gain. **P init gain PID** operates when feed-forward is less than **PI steady thr** and at its overcoming, for the time set in **PI steady delay** or on the transition L to H of **Enable PI PID** for the same time.

I init gain PID Initial integral gain. **I init gain PID** operates after the threshold **PI steady thr** has been overcome or on the transition L to H of **Enable PI PID** for the time set in **PI steady delay**.

PI central v sel Output selector of the starting PI block. **PI central v sel** (0...3) selects between the 4 possible settings of the initial value of the regulator integral component (corresponding to initial diameter).

PI central v sel can be set directly from keypad, serial line or through two digital inputs set respectively as **PI central v S0** and **PI central v S1**.

Selecting **PI central v sel = 0**, when PI block is disabled (**Enable PI PID** = Disable), the last value of the integral component calculated (corresponding to roll diameter) is stored. This value is displayed in **PI output PID**. When enabled again, the regulation restarts again from that value. The same functionality is used when switching off the drive. This kind of operation can be used when controlling a winder and it is necessary to stop the machine and disable the drives or even remove AC incoming power from the electrical cabinet.

Selecting **PI central v sel** = 1-2-3, when PI block has been disabled, the value of **PI output PID** will be set at what is programmed in the correspondent parameter (x1000). When the drive is restarted after a power off, the precalculated value will be automatically set only if, when powering up the drive, the digital input programmed as **Enable PI PID** is already set at a high level.

PI central v 1 Setting of the first initial value of the regulator's integral component (corresponding to initial diameter 1). The **PI central v 1** value must be included in the limits set in **PI top lim PID** and **PI bottom lim PID**.

PI central v 1 will be selected by setting **PI central v sel** = 1.

PI central v 2 Setting of the second initial value of the regulator's integral component (corresponding to initial diameter 2). The **PI central v 2** value must be included in the limits set in

PI top lim PID and **PI bottom lim PID**.

PI central v 2 will be selected by setting **PI central v sel** = 2.

PI central v 3 Setting of the third initial value of the regulator's integral component (correspondent to initial diameter 3). The **PI central v 1** value must be included in the limits given by **PI top lim PID** and **PI bottom lim PID**.

PI central v 3 will be selected by setting **PI central v sel** = 3.

PI top lim It defines the higher limit of the adapting block of the PI correction.

PI bottom lim It defines the lower limit of the adapting block of the PI correction.

The output of the PI block represents the multiplier factor of feed-forward, whose value must be adapted from the regulator in the max. limits included between +10000 and -10000 and defined by **PI top lim** and **PI bottom lim**. The value of these parameters will be defined according to the system that has to be controlled. For a better understanding, please refer to the paragraph "Examples of application".

PI output PID Output of PI block, adapted to the values included between **PI top limit** and **PI bottom limit**. At the power up of the drive, **PI output PID** acquires automatically the selected value with **PI central v sel** multiplied by 1000.

Example: If **PI central v 2** = 0.5 is selected, at the start **PI output PID** acquires value = 500.

When **Enable PI PID** has been enabled, the output **PI output PID** is, dependent on the input error able to integrate its value up to the limits set with **PI top limit** or **PI bottom limit** multiplied by 1000.

Example: **PI top limit** = 2, **PI output PID** max = 2000.

The PI block output will be further limited from the parameter saturation **Real FF PID** (see corresponding parameter).

As previously described, **PI output PID** is used as a multiplier factor of the feed-forward in order to obtain the angular speed reference of the motor. If the PID function is used to control a winder/ unwinder system, its value is inversely proportional to the roll diameter. When winding with a constant peripheral speed, the following is valid:

$$\omega_0\Phi_1=\omega_1\Phi_1$$

where:

ω_0 = angular speed at minimum diameter

Φ_0 = minimum diameter

ω_1 = angular speed at actual diameter

Φ_0 = actual diameter

$\omega_1 = \omega_0 \text{ x } (\Phi_0/\Phi_1)$

If the drive is set correctly, and ω0 is equivalent to the maximum value of the feed-forward, then **PI output PID** depends on (Φ_0/Φ_1).

Taking into consideration the internal coefficients of the firmware, it can be written:

PI output PID = (Φ_0/Φ_1) x 1000

This formula can be used to verify the accuracy of the setting when the system is on working or during the procedure for the calculation of the initial diameter.

Real FF PID Represents the feed-forward value which has been recalculated according to the PI correction. It will be calculated with the following formula:

Real FF PID = (**Feed-fwd PID** / 1000) x **PI output PID**

The max. value of **Real FF PID** is +/- 10.000.If this limit had been reached during operation, in order to avoid dangerous levels of regulator saturation, further increases of **PI output PID** will be blocked.

Example: Feed-fwd = + 8000, the positive limit of PI output PID will be automatically set at
10000 / (8000 / 1000) = 1250.

2.17.3.6 Proportional - Derivative control block

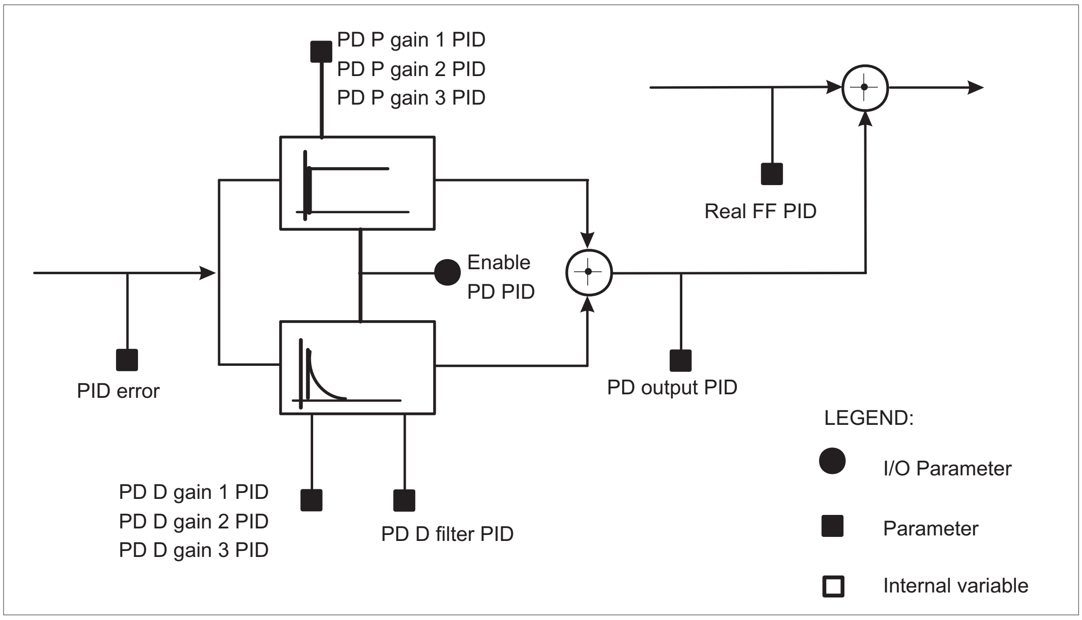


Figure 2.17.3.4: PD block description

The PD block receives the values **PID error** at its input, which represents the error that must be corrected by the regulator. The PD block carries out proportional-derivative regulation and its output **PD output PID** will be added to **Real FF PID**.

The PD block is enabled by setting **Enable PD PID** = Enable. If **Enable PD PID** has been programmed on a digital input, this must be set to a high logic level.

PID

Enable PD PID

GA0932g

Parameter	N.	Value			Standard configuration
		min	max	default	
Menu					
Enable PD PID	770	0	1	Disabled	*

GA6394g

Enable PD PID Enabled Enabling of the block proportional-derivative
Disabled Disabling of the block proportional-derivative

PD controls

PD P gain 1 PID
PD D gain 1 PID
PD P gain 2 PID
PD D gain 2 PID
PD P gain 3 PID
PD D gain 3 PID
PD D filter PID
PD output PID

GA0885g

Parameter	N.	Value			Standard configuration
		min	max	default	
PD P gain 1 PID	768	0.00	100.00	10.00	
PD D gain 1 PID	766	0.00	100.00	1.00	
PD P gain 2 PID	788	0.00	100.00	10.00	
PD D gain 2 PID	789	0.00	100.00	1.00	
PD P gain 3 PID	790	0.00	100.00	10.00	
PD D gain 3 PID	791	0.00	100.00	1.00	
PD D filter PID	767	0	1000	0	
PD output PID	421	-10000	+10000	0	

GA6395g

The gains of the block can remain fixed and programmed in this case through the parameters **PD P gain 1 PID** and **PD I gain 1 PID**, or changed depending on machine parameters, through the function **Adap spd reg**. In this case the gains come from **PD P gain 1-2-3 PID** and **PD I gain 1-2-3 PID**.

For example, it is possible to modify, dynamically, the gains of PD block according to the speed, to a regulation parameter internal to the drive, or to an analog input proportional to the unit related to the machine. The behaviour of the regulator can be so configured to meet the needs of the machine.

NOTE: When **Adap Spd reg** has been enabled (paragraph 2.14.2. of the manual), it operates both on the PID function and on the gains of the speed regulator. So it is necessary to appropriately program all relative parameters. If one wishes to modify only the gains of the speed regulator and keep fixed the gains of the PID function, it is necessary set the three proportional gains and integral gains of the PD block at the same value. The same is valid in case the PID gains have to be modified and the speed regulator gains must remain fixed.

PD P gain 1 Proportional gain 1 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD D gain 1 Derivative gain 1 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD P gain 2 Proportional gain 2 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD D gain 2 Derivative gain 2 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD P gain 3 Proportional gain 3 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD D gain 3 Derivative gain 3 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD D filter PID Time constant of the filter from the derivative side.

PD output PID PD block output.

2.17.3.7 Output reference

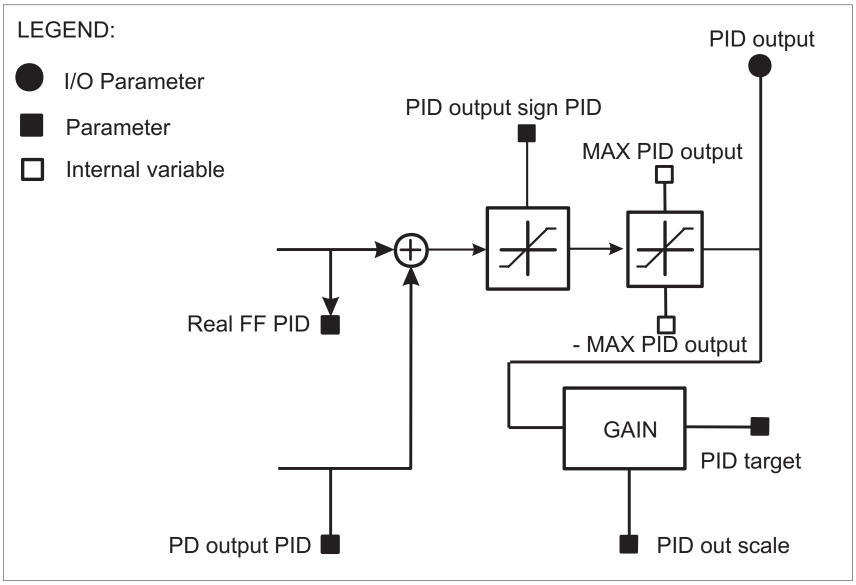


Figure 2.17.3.5: Output reference block description

PID
PID out. sign PID
PID output
GA0886g

Parameter	N.	Value			Standard configuration
		min	max	default	
PID output sign PID	772	0	1	1	
PID output	774	-10000	+10000	0	*

GA6396g

* This parameter can be set on an analog programmable output

PID out. sign PID Through this parameter it is possible to set the output of the regulator to be either bipolar or simply positive (clamp of negative side).

PID output Display of regulator output. It is possible to program this parameter to an analog output in order to perform a reference cascade in multidrive systems.

PID target
PID target
PID out scale
GA0887g

Parameter	N.	Value			Standard configuration
		min	max	default	
PID target	782	0	65535	1	
PID out scale	773	-100.00	+100.00	1.000	

GA6397g

PID target Address of the parameter which contains the value to be used as PID target. To obtain the real settable value, it is necessary to add +2000H (8192 decimal) to the parameter number.

PID out scale Matching factor of **PID output**. Its value depends on the parameter to which the regulator output is addressed.

Through the parameter **PID target** it is possible to select which point of the drive will be addressed as the output signal of the regulation. The selectable parameters are those assigned as writing parameters (W or R/W) indicated in the paraghraph 3.4. "*List of high-priority parameters*'". The units are those indicated in the notes at the end of the paragraph.

Programming example of the speed reference 1 (parameter **Speed ref 1**) on **PID target**:

Menu' OPTION

————> PID

————> PID target

————> PID target = 8234

PID target must be set according to the number of the parameter to which it will be associated, choosing it from the paragraph 3.4. "List of high-priority parameters'" (**Speed ref 1** has the decimal number 42). To obtain the value it must be added the decimal number 8192 (fixed offset):

8192 + 42 = 8234.

NOTE: When the ramp function has been enabled, **Speed ref 1** will be automatically programmed on its output. To have it available it is necessary to set parameter **Enable ramp** = disable.

Speed ref 1 will be set in RPM x 4, considering that **PID output** assumes values included between 0....10000, it is necessary to set appropriately the calibration through **PID out scale**.

Calculation of PID out scale

If it is necessary that **PID output**, at its max. value = 10000, corresponds at speed reference = 2000rpm it is necessary to set:

PID out scale = (2000 x 4) / 10000 = 0.8

It is possible to read the set value of **Speed ref 1** in the appropriate parameter of the menu **INPUT VARIABLES / Speed ref**.

NOTE: The value of **PID out scale** will be defined according to the system which is being controlled. For a better understanding, please refer to the paragraph "Application examples".

2.17.3.8 Function of calculation for Initial diameter

This function performs a preliminary calculation of the diameter of an unwinder/winder before starting the line. This allows better control of the system avoiding unwanted balancing of the dancer.

The calculation is based on the measure of the movement of the dancer from the position of lower fullrange to its central position of work, and on the measure of angular movement of the roll during the initial phase.

NOTE: The function of initial diameter calculation can be carried out only when the winder/unwinder are controlled through dancer (no load cell) and the speed feed-back is carried out through encoder.

The result of the calculation is assigned to the parameter **PI output PID**, and so it represents the multiplier factor of the feed-forward, in order to obtain the angular speed reference of the motor.

Its value is universely proportional to the roll diameter.

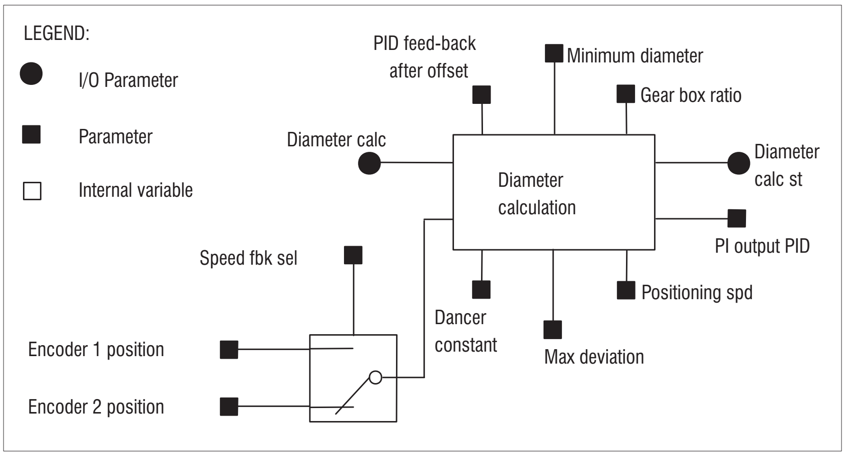


Figure 2.17.3.6: Diameter calculation block description

Diameter calc

- Diameter calc
- Positioning spd
- Max deviation
- Gear box ratio
- Dancer constant
- Minimum diameter

GA0888g

Parameter	N.	Value			Standard configuration
		min	max	default	
Diameter calc	794	0	1	0	*
Positioning spd	795	-100	+100	0	
Max deviation	796	-10000	+10000	8000	
Gear box ratio	797	0.001	1.000	1.000	
Dancer constant	798	1	10000	1	
Minimum diameter	799	1	2000	1	

GA6398g

* This function can be set on a digital programmable input.

Diameter calc Enabling of the initial function of diameter calculation.

The calculation will be enabled by setting **Diameter calc** = Enable.

If **Diameter calc** has been programmed on a digital input, this must be brought to a high logic level.

Positioning spd Motor speed at which the dancer is at its central working position, during the calculation phase of the initial diameter.

Max deviation Value expressed in count of D/A which corresponds to the maximum shift allowed by the dancer. This value will be associated with the starting measurement of the dancer movement during the calculation of the initial diameter.

During the preliminary phase of the commissioning, it is necessary to carry out the self-calibration of the analog inputs, so at the fullrange position of the dancer they will correspond, whatever was the value of the analog input, at 10000 counts. The parameter **Max deviation**, in order to guarantee a precise calculation of the movement , must be set at a value slightly lower. (standard **Max deviation** = 8000).

Gear box ratio Ratio reduction between the motor and the winder (< = 1).

Dancer constant It expresses the measure in mm, the total bunching of material in the dancer.

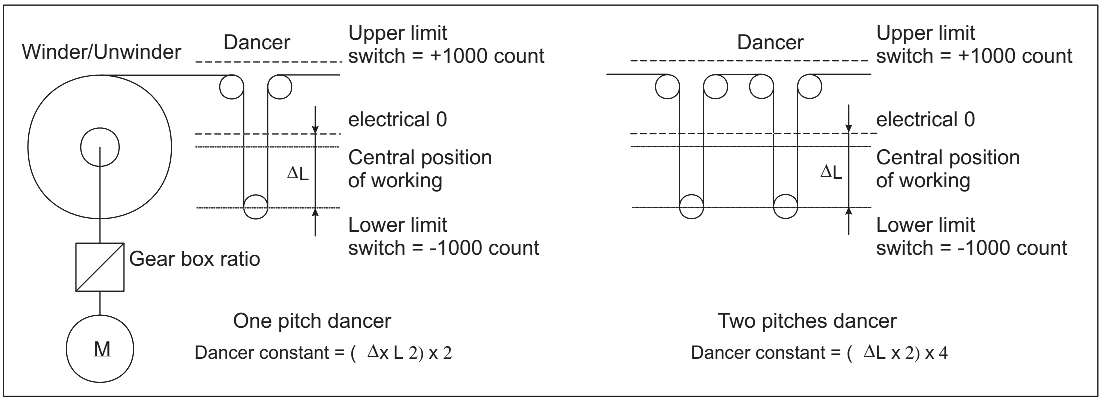


Figure 2.17.3.7: Diameter calculation

Measurement of Dancer constant

With dancer in lower fullrange position, perform the self-calibration of the analog input programmed as **PID feed-back**.

Set the keypad of the drive on the parameter **PID feed-back**.

Measure and multiply by 2, the distance in mm between the lower mechanical fullrange and the position of the dancer that, on the parameter **PID feed-back,** will display 0 (position of electrical 0).

Multiply the above calculated value by 2 if the dancer has only one pitch, by 4 if the dancer has two pitches and so on, as per the figure above.

Minimum diameter Min. value of core diameter expressed in cm.

2.17.3.9 Procedure of calculation for initial diameter

The calculation is based on the measurement of the dancer movement from the lower fullrange position to its central working position, and on the measurent of the angular movement of the swift during the drawing phase. For that reason, during this period, make sure that the gear mantaining the material blocked. For this reason it is necessary to enable the regulation of the nip-roll drive with speed reference = 0.

If line nip-rolls are controlled by dancers or load cells, it is necessary to carry out the diameter calculation of the winders/unwinders first, then the gear.

The parameter **PI central v sel** must be set at 0 to avoid **PI output PID** being set automatically at a predefined value.

Bringing the digital input programmed as **Diameter calc** to a high logic level (+24V) , if the drive is enabled, will start the procedures. During this phase, the parameters **Enable PI PID** and **Enable PD PID** are automatically disabled.

The regulation verifies the signal coming from the dancer potentiometer. If this is higher than what is already set in **Max deviation**, the motor begins following the speed reference set in **Positioning speed** in order to wind the material and bring the dancer to its central position of working.

The polarity of the reference assigned to **Positioning speed** will be winder / unwinder equal to the one working as a winder.

If the initial regulation verifies that the signal coming from the potentiometer of the dancer is lower than what already set in **Max deviation**, the motor starts running with speed reference set in **Positioning speed** in order to unwind the material and bring the dancer on the point identified by **Max deviation**, at this point the reference will be inverted to bring the dancer to its central position.

When the dancer has reached the central position, the parameter **PI output PID** will be set at a value inversely proportional to the diameter and the digital output **Diameter calc st**, that indicates the end of diameter calculation, will be brought to high logical level .

At this point, if **Enable PI PID** and/or **Enable PD PID** are enabled, the system passes automatically in regulation. For this reason generally the digital inputs programmed as **Diameter calc** and **Enable PI PID** and/or **Enable PD PID** will be brought to high logic level at the same time.

The output signal **Diameter calc st** can be used to reset the command **Diameter calc** (this command will be activated on the sliding edge of the digital input). For that reason, it must be brought to high logical level after the supply of the regulation part of the drive and reset once the initial calculation phase has finished.

The value of **PI output PID** will be calculated with the following formula:

PI output PID = (**Min diameter x PI top lim**) / Value of the calculated diameter

The parameters **PI top limit** and **PI bottom limit** in the menu **PI controls** have to be set according to the max. and min. diameter of the roll. For better explanation, please refer to paragraph 2.17.3.10 “Application examples”.

2.17.3.10 Examples of application

Nip-roll control with dancer

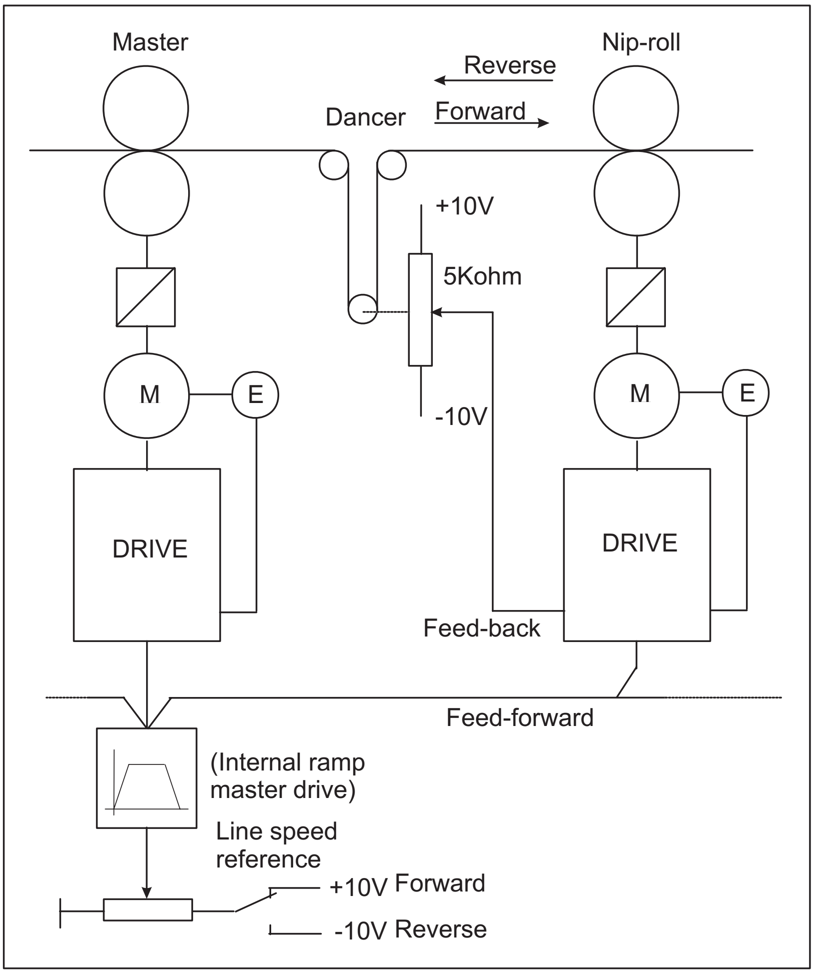


Figure 2.17.3.8: Nip-roll control with dancer

<u>Machine data:</u>

Rated speed of slave motor Vn = 3000rpm
Slave motors speed correspondent to the max. line speed = 85% Vn = 2550rpm
Max. correction of the dancer = +/- 15% of the line speed = +/- 382.5rpm

The slave drive must be sent the analog signals regarding line speed and the position of the dancer (whose potentiometer will be supplied between terminals -10V... +10V) and the digital commands regarding the enabling of the PID control.
The regulator output will be sent to speed reference 1.

Drive setting: (below parameters regarding only the PID function)

Input/output.

Set **Analog input 1** as input for the cursor of the dancer.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

To set the feed-forward on analog input, seeing that this one is not directly accessible in the list of high-priority parameters, it is necessary to pass through a supporting parameter **PAD 0.....PAD 15**.

Analog input 2 / Select input 2 = PAD 0

Set **Digital input 1** as enabling input of PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** as enabling input of PD block of the PID

Digital input 2 = Enable PD PID

Parameters.

Set **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Set **PID source** as **PAD 0**.

(**PAD 0** has been used as supporting parameter for the feed-forward reading on **Analog input 2**)

For **PID source**, set the parameter number to which it will be associated, choosing it from the list of paragraph 3.4. "*List of high-priority parameters*' (**PAD 0** has the decimal number 503).

To obtain the correct value it must be added to the decimal number 8192 (fixed offset):

PID source = (8192 + 503) = 8695

Set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on Analog input 2, 85% of its max. value = 10000 x 85%.

When an analog input is set on a PAD parameter, this will have a max. value +/- 2047.

So: **PID source Gain** = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

Set **PID target** as **Speed ref 1**.

NOTE: When the ramp function is enabled, **Speed ref 1** is not available. In order to keep it available, it is necessary to set the parameter **Enable ramp** = Disable.

PID target must be set to the parameter number to which it will be associated, choosing it from the list of paragraph 3.4, "*List of high-priority parameters*" (**Speed ref 1** has the decimal number 42).

To obtain the correct value it must be added the decimal number 8192 (fixed offset)

PID target = 8192 + 42 = 8234

Set **PID out scale** so that , the max. analog value on **Analog input 2** (**Feed-fwd PID** = 8500) and **Enable PI PID** and **Enable PD PID** = Disable, **Speed ref 1** is the same at 2550rpm.

The parameter **Speed ref 1** will set in RPM x 4, so:

PID out scale = (2550 x 4) / 8500 = 1.2

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In absence of a correction performed by the PI block of the regulator, the line speed reference (Feed-forward) must be multiplied by 1 and sent directly to the speed regulator of the drive.

In this application, the regulator carries out a mono type proportional control. The correction will be indicated in percentage, according to the line speed, from 0 to the maximum.

Set **PI top limit** and **PI bottom limit** so that, with max. of the dancer (max.value of the analog input 1 = **PID Feed-back**) and setting the proportional gain of the PI block at 15%, it will correspond to an equal proportional correction of feed-forward. For this reason set:

PI top limit = 10

PI bottom limit = 0.1

Set **PI P gain PID** = 15%

Set **PI I gain PID** = 0%

With this configuration, having a correction proportional to the line speed, the PI block is not able to position the dancer at speed = 0. In order to do the drawing in stop conditions, it is necessary to use the PD block.

Set **PD P gain PID** to a value that allows positioning of the dancer without large dynamic variations.

For example:

PD P gain PID = 1%

If necessary, use the derivative component as damping component of the system, setting for example:

PD D gain PID = 5%

PD D filter PID = 20ms

If not necessary, keep these parameters = 0.

If it is necessary to carry out a reference cascade for another drive, set **PID output** on an analog output, for example:

Analog output 1 / Select output 1= PID output

(with **Real FF PID** = 10000 count, **Analog output 1** = 10V).

Nip-rolls control with load cell

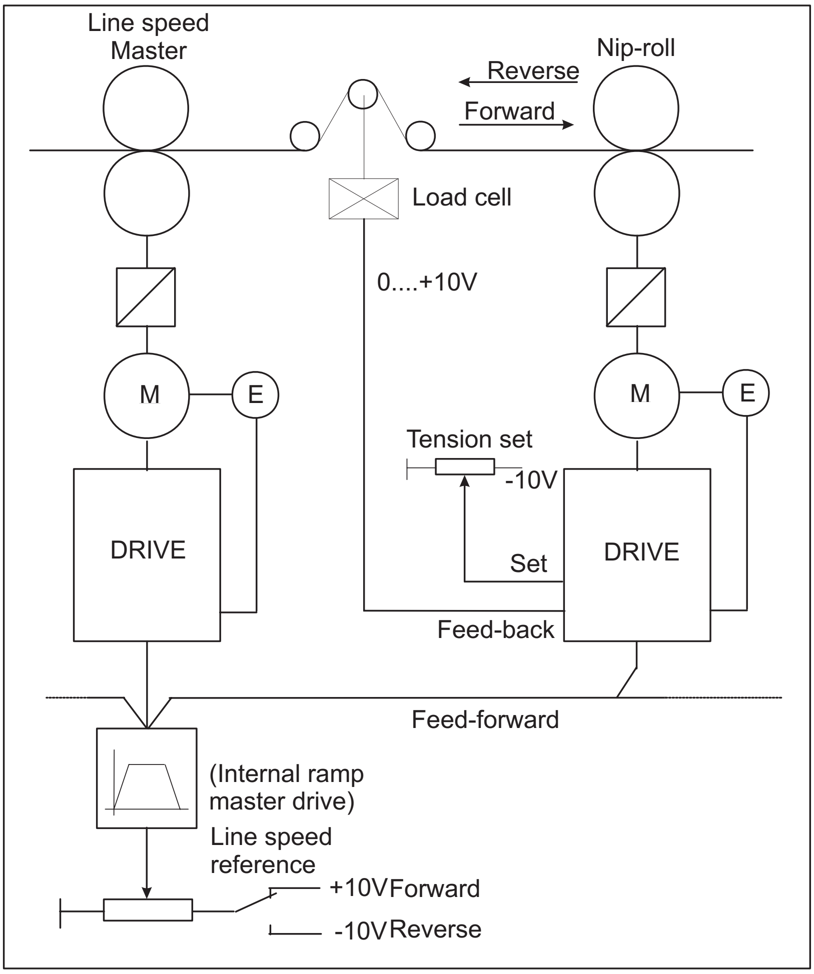


Figure 2.17.3.9: Nip-rolls control with load cell

<u>Machine data:</u>

Rated speed of slave motor Vn = 3000rpm

Slave motors speed corresponding to the max. line speed = 85% Vn = 2550rpm

Max. correction of the dancer = +/- 20% of the line speed = +/-510rpm

To the slave drive must be sent the analog signals regarding the line speed and the position of the load cell signal (0... +10V) and the tension set (0... +10V), and the digital commands regarding the enabling of the PID control.

The regulator output will be sent to the speed reference 1.

Drive setting: (below are parameters regarding only the PID function)

Input/output.

Set **Analog input 1** as input for the load cell signal.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

Setting the feed-forward on analog input, seeing that it is not directly inserted in the list of high-priority parameters, it is necessary to pass through a supporting parameter **PAD 0.....PAD 15**.

Analog input 2 / Select input 2 = PAD 0

Set **Analog input 3** as input for the tension set (**PID offset 0**).

Analog input 3 / Select input 3 / PID offset 0

Set **Digital input 1** as enabling input of the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** as enabling input of the PD block of the PID

Digital input 2 = Enable PD PID

Parameters

Program **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Program **PID source** as **PAD 0**.

(**PAD 0** has been used as supporting parameter of the feed-forward reading on **Analog input 2**)

For **PID source** set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. "*List of high-priority parameters*' (**PAD 0** has the decimal number 503).

To obtain the correct value it must be added the decimal number 8192 (fixed offset):

PID source = (8192 + 503) = 8695

Set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on **Analog input 2**, 85% of its max. value = 10000 x 85%.

When an analog input is set on a PAD parameter , this will have a max. value +/- 2047.

So:

PID source Gain = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

Set **PID target** as **Speed ref 1**.

NOTE: When the ramp function is enabled, **Speed ref 1** is not available. In order to have it available, it is necessary to set the parameter **Enable ramp** = Disable.

For **PID target** set the parameter number to which it will be associated, choosing it from the list of paragraph 3.4 "*List of high-priority parameters*' (**Speed ref 1** has the decimal number 42).

To obtain the correct value it must be added the decimal number 8192 (fixed offset)

PID target = 8192 + 42 = 8234

Set **PID out scale** so that, along with the max. analog value on **Analog input 2** (**Feed-fwd PID** = 8500) and with **Enable PI PID** e **Enable PD PID** = disable, **Speed ref 1** is the same at 2550rpm.

Speed ref 1 will be set in *RPM* x 4, so:

PID out scale = (2550 x 4) / 8500 = 1.2

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In the absence of a correction carried out from the PI block of the regulator, the line speed reference (Feed-forward) must be multiplied by 1 and sent directly to the speed regulator of the drive.

This application operates by using proportional control. The correction will be indicated in percentage according to the line speed, from 0 to the maximum.

Set **PI top limit** and **PI bottom limit** so that the max. correction of PI block corresponds at 20% of line speed.

PI top limit and **PI bottom limit** parameters are the maximum and minimum multiplier factor of Feed forward value.

At the max. line speed it will correspond 2550rpm of the motor (max. feed-forward).

Max. correction = 2550 x 20% = 510rpm

2550 + 510 = 3060rpm ——> **PI top limit** = 3060 / 2550 = 1.2

2550 - 510 = 2040rpm ——> **PI bottom limit** = 2040 / 2550 = 0.80

which will multiply the setting of **PI central v 1** (= 1) by + 20% (1.2) and - 20% (0.80).

With this configuration, having a correction proportional to the line speed, the PI block is not able to apply tension at speed = 0. In order to apply tension in stop conditions, it is necessary to use on the PD block.

The gains of the single components have to be set with loaded machine; it is possible to start tests with values below indicated (default values):

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 10%

Set **PD P gain PID** = 10%

In case use the derivative component for forcing the regulator output during velocity changes of the system, programming for example:

PD D gain PID = 5%

PD D filter PID = 20ms

If not necessary, keep these parameters = 0.

In case it is necessary to carry out a references cascade for another drive, set **PID output** on an analog output, for example:

Analog output 1 / Select output 1= PID output

(with **Real FF PID** = 10000 count, **Analog output 1** = 10V).

NOTE: If it is necessary, a system with the integral regulation enabled, with feed-forward = 0, and the need to apply tension of the system with null error also when the machine is stopped, please refer to the paragraph “Generic PID”.

Winder/Unwinder control with dancer

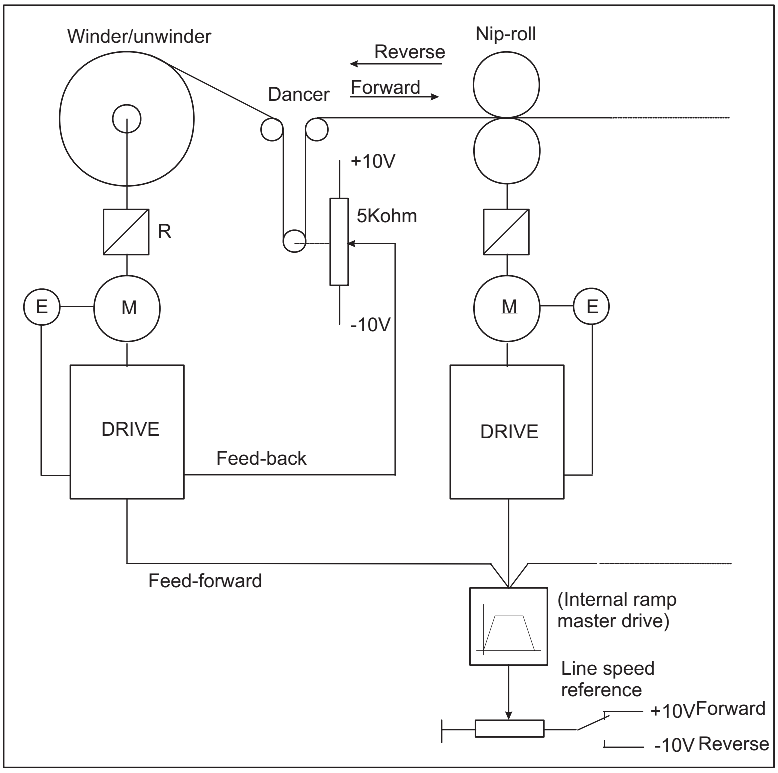


Figure 2.17.3.10: Winder/Unwinder control with dancer

Machine data:

Max. line speed =400m/min

Rated speed of the motor winder/unwinder Vn = 3000rpm

Max. diameter of the winder/unwinder = 700mm

Min. diameter of the winder/unwinder = 100mm

Reduction ratio motor-swift = 0.5

One pitch dancer

Dancer stroke from the lower limit switch to the position of electric 0 = 160mm

The drive of the winder/unwinder must be sent the analog signals regarding line speed and the position of the dancer (whose potentiometer will be supplied between the terminals -10V... +10V) and the digital commands regarding the enabling of the PID control.

The regulator output will be sent to the speed reference 1.

Drive setting: (below are only the parameters regarding the PID function)

Input/output.

Set **Analog input 1** as input for the cursor of the dancer.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

To set the feed-forward on an analog input, seeing that this one is not directly accesible in the list of high-priority parameters, it is necessary to pass through a supporting parameter **PAD 0.....PAD 15**.

Analog input 2 / Select input 2 = PAD 0

Set **Digital input 1** as enabling input of the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** as enabling input of the PI block of the PID

Digital input 2 = Enable PD PID

Set **Digital input 3** as enabling input of the calculation function of initial diameter.

Digital input 3 = Diameter calc

Set **Digital output 1** as signalling “ phase of calculation of starting diameter “.

Digital output 1 = Diameter calc st

Parameters

Set **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Set **PID source** as **PAD 0**.

(**PAD 0** has been used as supporting parameter of the feed-forward reading on **Analog input 2**)

For **PID source** set the parameter number to which it will be associated, choosing it from the list of the paragraph 3.4. “*List of high-priority parameters*’ (**PAD 0** had the decimal number 503). To obtain the correct value it must be added the decimal number 8192 (fixed offset):

PID source = (8192 + 503) = 8695

Set **Gain source** and **PID out scale** so that, the max. analog value on **Analog input 2** and without the PID correction (**Enable PI PID** e **Enable PD PID** = Disable), the peripheral speed of the swift in conditions of minimum diameter (soul) is the same of the max. line speed.

Calculation of the motor speed in the condition above mentionned:

$Vp = \pi \times \Phi min \times \omega \times R$

where:

Vp = peripheral speed of the swift = line speed

Φmin = min. diameter of the swift [m]

ω = angular speed of the motor [rpm]

R = reduction ratio motor-swift

$\omega = Vp / p \times \Phi min \times R = 400 / (\pi \times 0.1 \times 0.5) = 2546rpm$ = about 2550rpm

Mantaining a 15% margin as to the saturation limit of the regulator (10000 count), it is necessary to set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on **Analog input 2**, 85% of its max. value.

When an analog input is set on a PAD parameter , this will have a max. value +/- 2047.

So:

PID source Gain = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

The speed reference of the motor is set in *RPM* x 4, so program as follows:

PID out scale = (2550 x 4) / (10000 x 0.85) = 1.2

Set **PID target** as 1 **Speed ref 1**.

NOTE: When the ramp function has been enabled, **Speed ref 1** is not available. To keep it available it is necessary to set the parameter **Enable ramp** = Disable.

For **PID target** set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. "*List of high-priority parameters*' (**Speed ref 1** has the decimal number 42).

To obtain the correct value it must be added the decimal number 8192 (fixed offset):

PID source = (8192 + 42) = 8234

Set **PI central v sel** = 0.

Using this procedure it is possible to calculate the initial diameter and store in memory its value automatically in case of drive switch off.

As previously stated, the procedure determines the theorical multiplier factor (**PI output PID**) of feed-forward as relation of the diameter calculated. In order to send to the drive the correct speed angular value.

NOTE: When **PI central v sel** = 0 has been selected and the the PI block has been disabled, the system keeps in memory, or reset automatically in case of switching off, the last value calculated for **PI output PID**. If it would be necessary to set the value in order to have at the output an incorrect reference and so equal to the feed-forward, it is possible to configure a digital input as correction reset.

So configure:

Digital input 4 = PI central v S0

PI central v 1 = 1.00

Bringing the digital input to logical high level, the **PI output PID** will be reset.

Set **PI top lim** and **PI bottom lim** according to the ratio diameters swift.

Parameters **PI top lim** and **PI bottom lim** can be considered as multiplier factors, respectively max. and min. of the feed-forward.

Considering that the angular speed of the motor and the corresponding reference, change inversely to the unwinder/winder diameter;

Set:

PI top lim = 1

PI bottom lim = $\Phi min / \Phi max = 100 / 700 = 0.14$

Below is an explanation of above settings.

Calculation of the angular speed of the motor:

ω max. = Vl / (π x Φmin x R)

and

ω min = Vl / (π x Φmax. x R)

where:

ω max. = angular speed of the motor in conditions of min. diameter [rpm]

ω min = angular speed of the motor in conditions of max. diameter [rpm]

Vl = line speed

Φmin = min. diameter of the core[m]

Φmax. = max. diameter of the core[m]

R = gear reduction ratio motor-winder/unwinder

So: ω max. / ω min = Φmax. / Φmin

from which

ω min = (Φmin / Φmax) x ω max.

Considering that the **PI top lim** and **PI bottom lim** parameters can be considered as multiplier factors max. and min. of the feed-forward.

Multiplying the feed-forward by **PI top lim** = 1, gives the max. speed reference concerning the minimum diameter.

Multiplying the feed-forward by **PI bottom lim** = 0.14, gives the min. speed reference concerning the max. diameter.

This application operates by using the proportional-integral regulation.

The gains of a single component will be experimentally set with a loaded machine. It is possible to begin the tests with the values below:

Set **PI P gain PID** = 15%

Set **PI I gain PID** = 8%

Set **PD P gain PID** = 5%

In this case, use the derivative component for forcing the regulator output during velocity changes of the system. Programming for example:

PD D gain PID = 20%

PD D filter PID = 20ms

In case it is necessaryto carry out a reference cascade for another drive, program **PID output** on an analog output, for example:

Analog output 1 / Select output 1= PID output

(with **Real FF PID** = 10000 count, **Analog output 1** = 10V).

Parameters regarding the calculation function of the initial diameter

This function is always necessary when one has to control an unwinder or when the starting diameter is unknown.

Set **Positioning spd** at the value, in rpm, with which the initial positioning of the dancer has to be done. For example:

Positioning spd = 15rpm

The polarity of the reference assigned to **Positioning speed** will be (winder/unwinder) equal to the one functioning as a winder.

If for example one has to control an unwinder and the speed reference in standard functioning is positive, assign to **Positioning spd** a negative value.

Set **Max deviation** at a value slightly lower than the one correspondent to the position of max. mechanical sealing allowed by the dancer.

<u>During commissioning, it is always necessary to carry out the self calibration of the analog inputs of the drive. In particular the one regarding analog input 1, with dancer in its position of lower fullrange,</u> This position is automatically assigned to the value 10000. So in order to guarantee a precise calculation it might be assigned:

Max deviation = 8000 (Default value)

Set **Gear box ratio** equal to the reduction ratio between the motor and the winder/unwinder:

Gear box ratio = 0.5

Set **Dancer constant** to the value in mm correspondent to the total accumulation of material in the dancer:

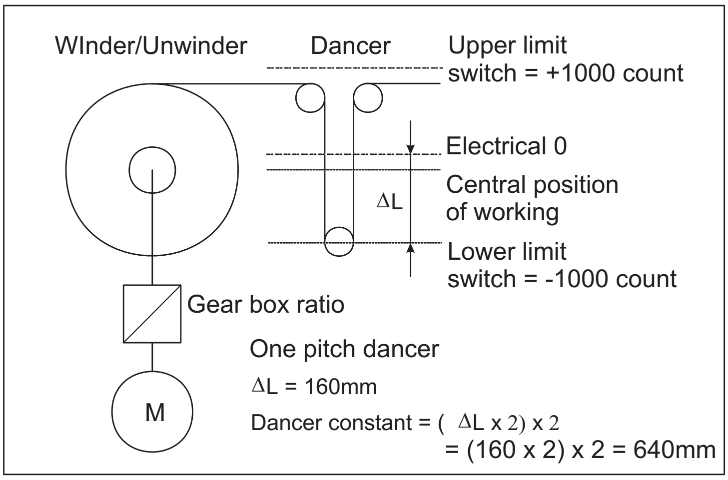


Figure 2.17.3.11: Diameter calculation

Measure of **Dancer constant**:

Set the keypad of the drive on the parameter **PID feed-back**.

Measure and multiply by 2, the distance between the lower mechanical fullrange and the position of the dancer so that in the parameter **PID feed-back** will display 0 (position of 0 electric).

As the dancer has only one pitch, multiply the above calculated value by 2.

In this case set:
Dancer constant = 640mm

Programm **Minimum diameter** equal to the minimum value of the core diameter [cm]:
Minimum diameter = 10cm

Use of the diameter sensor

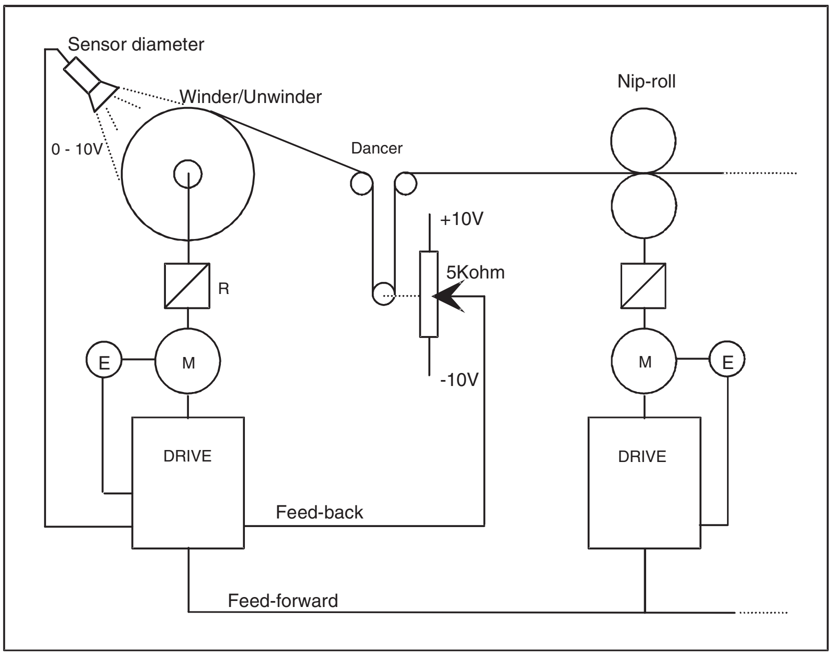


Figure 2.17.3.12: Winder/unwinder control with diameter sensor

The diameter sensor can be used in case of unwinder system with automatic gear.
In these cases, it is necessary to know the value of the starting diameter, in order to calculate the reference of the angular speed of the motor, before the insertion of the new core.
The transducer must set in order to supply a voltage signal proportional to the roll diameter.

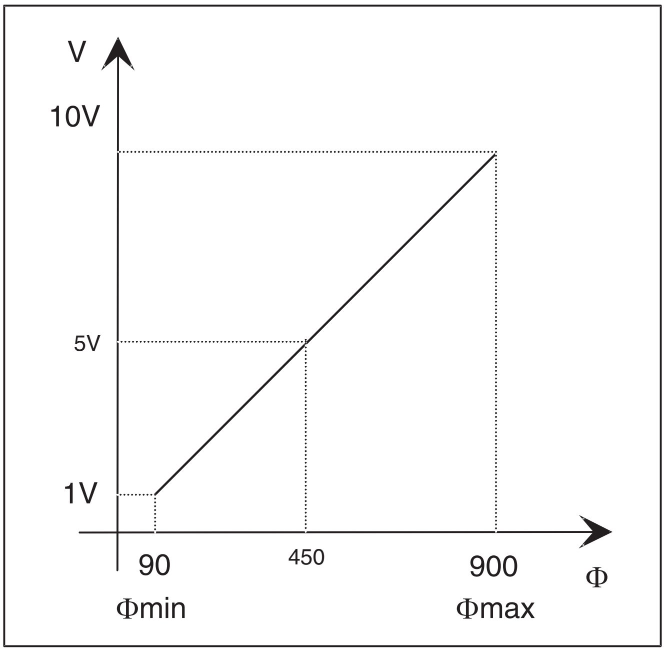


Figure 2.17.3.13: Relation between transducer signal and winder/unwinder diameter

Example:

Φmin	= 90 mm	transducer output = 1V
Φmax	= 900 mm	transducer output = 10V
Φ	= 450 mm	transducer output = 5V

The analog input to which the sensor is connected, must be programmed as **PI central V3**.
The parameter **PI central v sel**, must be set = 3.
When **Enable PI PID** = disable, the value of **PI central V3** is written in **PI output PID** and used as multiplier factor of the feed-forward.

As previously described in the instruction book, the setting of PI output PID depends on the diameters ratio, so the voltage signal proportional to the diameter will be automatically recalculated with the formula:

PI central V3 = (Φ_0 / Φ_1)

Where: Φ_0 = minimum winder diameter
Φ_1 = actual diameter

Setting resolution = 3 digits after the comma (also if in **PI central V3** are displayed only 2 digits after the comma).

NOTE ! During commissioning, it is necessary to verify that the signal coming from the sensor as proportional to the diameter and that its maximum value is corresponding to 10V (carry out the autotune of the analog input).

It is necessary to verify that **PI top lim** and **PI bottom lim** had been programmed

Pressure control for pumps and extruders

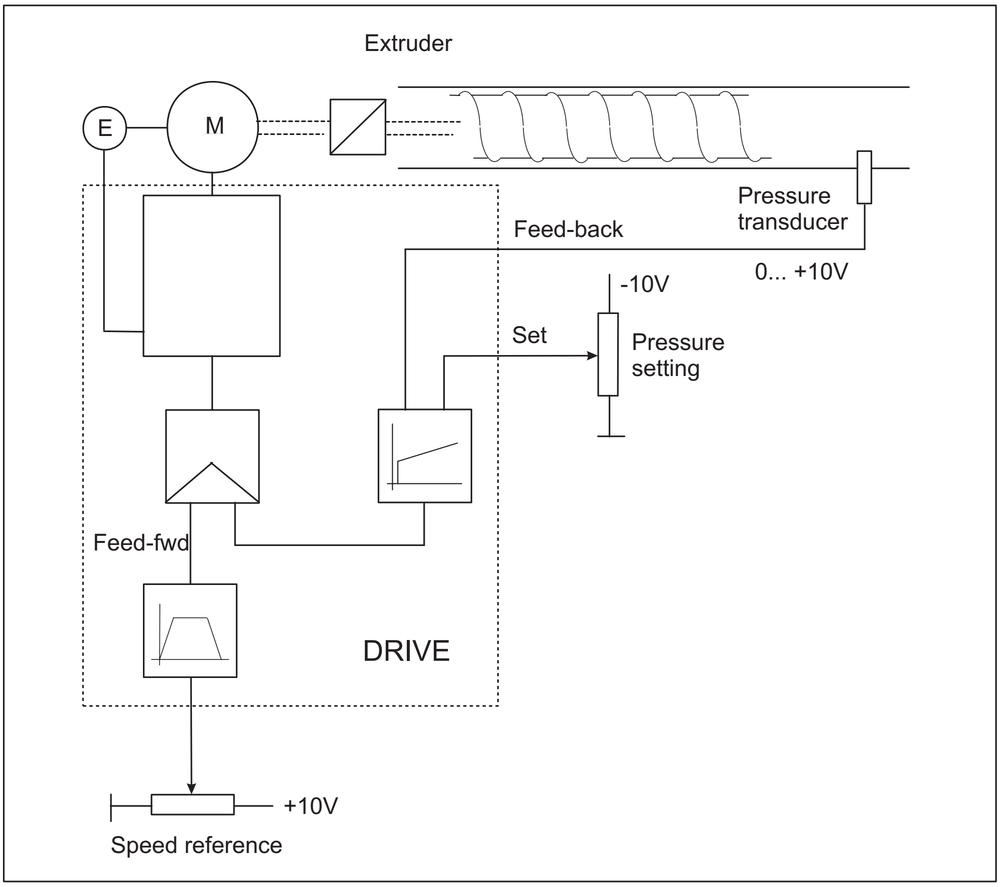


Figure 2.17.3.14: Pressure control for pumps and extruder

Machine Data:

Nominal speed of the extruder motor Vn = 3000rpm
Pressure transducer 0... +10V

The extruder slave drive must be sent analog signals concerning speed reference, the pressure transducer, the setting of potentiometer for pressure (supplied between 0V... -10V) and the digital commands concerning the enabling of the PID control.

The regulator output must be sent to the speed reference 1.

Setting of the drive: (below are only the parameters regarding the PID function)

Input/output.

Set **Analog input 1** as input for the pressure transducer.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as input for the ramp block. The output of the ramp block must be used as speed reference. (feed- forward).

Analog input 2 / Select input 2 = Ramp ref 1

Set **Analog input 3** as input for the pressure setting (**PID offset 0**).
Analog input 3 / Select input 3 / PID offset 0

Set **Digital input 1** as enabling input for the PI block of the PID
Digital input 1 = Enable PI PID

Set **Digital input 2** as enabling input for the PD block of the PID
Digital input 2 = Enable PD PID

Parameters.

Set **Speed base value** equal to the motor nominal speed .
Speed base value = 3000rpm

Set **PID source** as **Ramp output**.
For **PID source** set the parameter number to which it will be associated, choosing it from the list of section 3.4. "*List of high priority parameters*' (**Ramp output** has the decimal number 113).
To obtain the correct value it must be added the decimal value 8192 (fixed offset):
PID source = (8192 + 113) = 8305

Set **PID source Gain** so that **Feed-fwd PID,** along with the maximum value of **Ramp output** (corresponding to the maximum value of the analog input 2), reaches 100% of its value = 10000.

The ramp reference and its output automatically acquire their maximum value from the setting of **Speed base value**. Therefore it must be taken into consideration that each writing or reading of any parameter concerning the speed is defined as *RPM* x 4.
So:
PID source Gain = max **Feed-fwd PID** / (**Speed base value** x 4) = 10000 / (3000 x 4) = 0.833

Set **PID target** as **Speed ref 1**.

NOTE: When the ramp function is enabled, **Speed ref 1** is not available. In order to make it available it is necessary to set the parameter **Enable ramp** = Disable. (This setting allows the working of the ramp block, but disconnects its output from the speed reference 1).

For **PID target,** set the parameter number to which it will be associated, choosing it from the list of the section 3.4. "*List of high priority parameters*'" (**Speed ref 1** has the decimal number 42). To obtain the correct value it must be added the decimal value 8192 (fixed offset):
PID target = 8192 + 42 = 8234

Set **PID out scale** so that the maximum analog value on **Analog input 2** (**Feed-fwd PID** = 10000) and with **Enable PI PID** and **Enable PD PID** = Disable, **Speed ref 1** were equal to 3000rpm.
The **Speed ref 1** must be set as RPM x 4, then:
PID out scale = (3000 x 4) / 10000 = 1.2

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In absence of correction performed by the PI block of the regulator, the line reference speed (Feed-forward) must be multiplied x 1 and sent directly to the speed regulator of the drive.

In this application, the regulator makes a proportional-integral control.

Set **PI top limit** and **PI bottom limit** in order to obtain maximum correction of the PI block equal to the 100% of the speed reference.

The parameters, **PI top limit** and **PI bottom limit** could be considered as the multiplier factor respectively maximum and minimum of the feed-forward.

PI top limit = 1

PI bottom limit = 0

In this application the regulator uses a proportional-integral type of control.

The gains of the various components must be set with the load on the machine. A reference, it is possible to start the test with the values below (default values):

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 20%

Set **PD P gain PID** = 10%

If necessary, use the derivative component for forcing the regulator output during velocity changes of the system, setting for example:

PD D gain PID = 5%

PD D filter PID = 20ms

If not necessary, keep these parameters = 0.

2.17.3.11 Generic PID

Drive settings: (below are parameters regarding only the PID function)

Input/output.

Set **Analog input 1** as input of the variable which has to be regulated (Feed-back).
Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as input of the offset signal (**PID offset 0**).
Analog input 2 / Select input 2 / PID offset 0

Set **Digital input 1** as input for the enabling of the PI block of the PID
Digital input 1 = Enable PI PID
Set **Digital input 2** as input for the enabling of the PD block of the PID
Digital input 2 = Enable PD PID

Parameters

If it necessary to use the regulator as a "Generic PID", independent from the feed-forward function, the parameter **Feed-fwd PID** must be set at its maximum value. In order to do this it is necessary to go through a PAD parameter.

Set **PID source** to **PAD 0**.
For **PID source** set the parameter number to which it will be associated, choosing it from the list of the section 3.4. "*List of high priority parameters*" (**PAD 0** has the decimal number 503).
To obtain the correct value, it must be added the decimal value 8192 (fixed offset):
PID source = (8192 + 503) = 8695

Set **PAD 0** = 10000 (The parameter **PAD 0** is found in the "Special Function" menu').

NOTE: Setting PAD 0 = -10000, the output regulator polarity will be overwritten.

Set **PID source Gain** = 1

Set **PID target** with the parameter number that will be addressed to the output regulator.

To obtain the correct value it must be added to the decimal value 8192.
The parameters that can be addressed are described in "List of high priority parameters" in section 3.4.

Set **PID out scale** according to the parameter on which the regulator output has been addressed..
From the section 3.4. "List of high priority parameters ":
The parameters concerning the speed are expressed as [*SPD*].
The parameters concerning the current are expressed as [*CURR*].

Calculation of **PID out scale** when **PID target** is addressed on a parameter relative to the speed:

[*SPD*] = *RPM x 4*, so:

PID out scale = (max. speed x 4) / max. output PID = (max. speed x 4) / 10000

Calculation of **PID out scale** when **PID target** is addressed on a parameter relative to the current (active current):

1[CURR] = [**Current norm** / (2^{15} x √2)] A_{RMS}

Current norm depends on the inverter size, it can be choosen from the following table:

Drive Size	Rated drive curr [334]	Curr norm AMPS [267]
1007	2.4	10.8
1015	4	17.5
1022	5.6	25.1
1030	7.5	33.4
2040	9.6	42.4
2055	12.6	56.5
2075	17.7	79
3110	24.8	110.4
3150	33	147.2
4220	47	211
4300	63	256.4
4370	79	33.3
5450	93	421.9
5550	114	512.8
6750	142	606.1
7900	185	847.1
71100	210	847.1
71320	250	1129.9
81600	324	1432.2

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Through the parameter **Full load curr** (FLC) in the menu CONFIGURATION the user must define the motor current at full load.

The inverter calculates the magnetizing current value **Magn working curr** based on parameters **Base voltage**, **Base frequency** and on the motor plate data.

The active current of the motor is defined by the internal parameter (not accessible via keypad) “Full load torque current” (Flt 100mf), and calculated through the formula:

$$Flt\ 100mf = \sqrt{FLC^2 - I\mu_{work}{}^2}$$

The percentage values of **Torque current ref** and **Torque current limit** are based on **Flt 100mf**.

The maximum value of the torque current can be defined as “Full load torque current”and it is calculated as:

$$Full\ scale\ torque\ current = \sqrt{FLC^2 - I\mu_{work}{}^2}\ \ /\ CURR\ [count]$$

PID out scale = Full scale torque current / max. output PID = Full scale torque current / 10000

Example:

Mains voltage	=	400V	Ambient temperature	=	40°C (104°F)
Motor:					
Nominal Voltage	=	400V	Nominal frequency	=	50Hz
Nominal current	=	6.8A	Nominal speed	=	1415rpm

Inverter type: AVy1030

Switching frequency = standard

The output of the PID function is sent to the parametr **T current ref 2**.

After having carried out the base setting and the selftuning of the drive, from menu MOTOR PARAMETER comes out that **Magn working curr** = 3.2A.

(With an approximation it is possible to refer also to **Magnetizing current**).

Set in the menu CONFIGURATION:

Full load current = 6.8A

From the table above reported for AVy1030 **Current norm** = 33.4A

CURR = [**Current norm** / (2^{15} x √2)] = 33.4 / 46340.95 = 0.0007207 = 7.207^{e-4} A_{rms}

$$\textit{Full scale torque current} = \sqrt{FLC^2 - I\mu_{work}{}^2} \;/\; CURR = \sqrt{6.8^2 - 3.2^2} \;/\; 7.207^{\,e\text{-}4} = 8325 \text{ [count]}$$

PID out scale = Full scale torque current / max. output PID = 8325 / 10000 = 0.832

With this configuration, when the PID output reaches its maximum value, the reference of the active current **T current ref 2** receives a value equal to the active nominal current of the motor.

It must be said that, in this way, the drive is not driven at its maximum. Increasing the value of **PID out scale** it is possible to control the motor in overload condition.

If the application requires working in these conditions, it is necessary to calculate the maximum admissible overload of the drive

Inverter continuative current I_{cont} = 7.5A

$$\textit{Full scale inverter torque current} = \sqrt{(I_{cont} x1.36)^2 - I\mu_{work}{}^2} \;/\; CURR =$$

$$\sqrt{(7.5x1.36)^2 - 3.2^2} \;/\; 7.207^{\,e\text{-}4} = 13320 \text{ [count]}$$

PID out scale = Full scale inverter torque current / max. uscita PID = 13320 / 10000 = 1.332

With this configuration, when the PID output receives its maximum value, the active current reference **T current ref 2** gets the value corresponding to the 160% of the active current of the motor (1.332/ 0.832 = 1.60)

Furthermore it is necessary to set **T current lim+** and **T current lim-** = 160%

NOTE: The firmware of the drive does not perform a control on the polarity of the value sent. For this reason, if it is not necessary to address the regulator output on parameters "Unsigned", then set the PID output so that it can only be positive.

PID out. sign PID = Only positive

The parameters “Unsigned”, for example the current limits **T current lim +** and **T current lim -**, are indicated in the “List of high priority parameters “ with the symbol “U16”.

Set **PI central v sel** = 1.

Set **PI central v 1** = 0

In this configuration, when the transition Off / On of the parameters for the enabling of the PID function, is executed the regulator output starts from 0.

If it is necessary to retain the last value calculated when the machine is disabled, it necassary to use a digital input programmed as:

Digital input xx = PI central v S0

PI central v 1 = 0

When the digital input is at a low logic level (L), the last value calculated is stored. Applying a high logic level (H) will reset the value.

Set **PI top lim** and **PI bottom lim** in order to obtain a correction of the PID block equal to 100% of its maximum value.

PI top lim = 1

PI bottom lim = -1

In this configuration the PID block output will be either positive and negative.

Setting **PI top lim** = 0, the positive part is blocked.

Setting **PI bottom lim** = 0, the negative part is blocked.

The gains of the various components must be set experimentally with the machine loaded.

It is possible to start the test with the following values:

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 4%

Set **PD P gain PID** = 10%

In necessary, use the derivative component for forcing the regulator output during velocity changes of the system, setting for example:

PD D gain PID = 5%

PD D filter PID = 20ms

If not necessary, keep these parameters = 0.

2.17.3.12 Application note

Dynamic modification of the integral gain of the PI block

In standard dancer applications, where there is not a build up of material, the PI gains are set to a constant value. Where dancers are used in conjuction with material winding, the gains are compromise between low gain setting at large diameter, and high gain settings at a small diameter. Using the drawing as an example, it can be seen that with a large diameter roll, the amount of material to move the dancer requires only a fraction of a turn. At a small diameter, or empty roll, the center of the roll must rotate a whole turn to move the same amount of material. Since the PI regulator is used to provide the correction in rpm to maintain the dancer position, having the gain set by a single value is inadequate when used with a winder

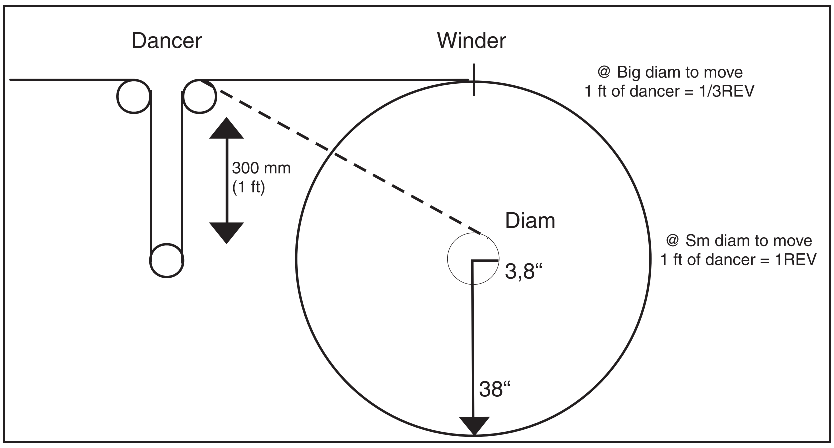


Figure 2.17.3.15: Example with small and large diameter

Better dancer control is realized if the gain of the PI is modified dynamically based on diameter.

This can be accomplished using LINKS function.

In case of higher ratio diameters, **PI I gain PID** could be dynamically changed according to the actual diameter. At the moment this functionality has not been implemented as specific function.

For example to control a winder having a diameters ratio of 1/10. The function LINK 1 is used to get a connection between the diameter and the value of the integral component of the PI block.

The integral component of the regulator must have a behavior inversely proportional to the diameter.

The value of the parameter **PI output PID** already follows this behavior, infact it changes according to the relation Φ_0 / Φ_{act}.

Where: Φ_0 = minimum swift diameter
Φ_{act} = actual swift diameter

The operation to carry out through the LINK parameter is:

PI output PID x KI **= PI I gain PID**

Where KI corresponds to the value of the integral component on minimum diameter condition.

Supposing that by functioning tests comes out that the system, on condition of minimum diameter is able to work till the maximum speed with steady dancer in electric zero position with **PI I gain PID** = 40%.

The LINK source must be associated to **PI output PID** [n^0 771]:

Source *link 1* = 8192 + 771 = 8963

The LINK destination must be associated to the value of the integral component= parameter PI I gain PID [n^0 764]:

Destination *link 1* = 8192 + 764 = 8956

The multiplier factor must be set to the value defined by the functioning tests above mentioned.

Mul gain *link 1* = 40

It will be necessary to set:

Div gain *link 1* = 1000 *

Input max *link 1* = 1000 *

Input min *link 1* = 100 **

Input offset *link 1* = 0

Output offset *link 1* = 0

Input absolute *link 1* = OFF

* The value 1000 is defined by **PI top lim** which will be in this case = 1 (correspondent to a maximum value of **PI output PID** = 1000).

** The value 100 is defined by **PI bottom lim** which will be in this case = 0.1 (correspondent to a minimum value of **PI output PID** = 100).

With this configuration at minimum diameter it will correspond an integral gain = 40% and at maximum diameter it will correspond an integral gain = 4%, between the two setpoints the gain will change with a hyperbolic characteristic.

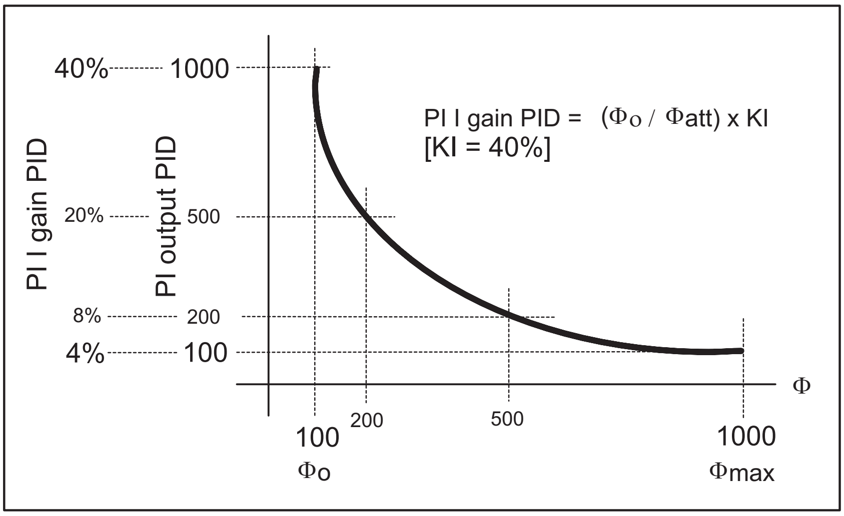


Figure 2.17.3.16: Relation between PI I gain PID and PI I output PID

The value of **PI I gain PID** will be displayed in the relative parameter of the submenu **PI controls**.

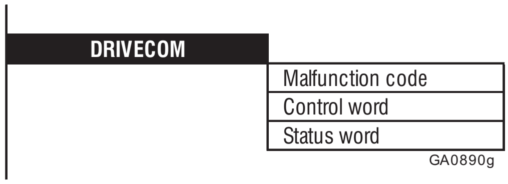
If necessary, using the LINK 2, it is possible to modify dynamically also the proportional gain **P gain PID.**

2.18. DRIVECOM

The DRIVECOM profile #21, “Power transission” defines the behavior of the drive if this is operated via the INTERBUS-S field bus. The DRIVECOM menu of the AVy Drive provides functions that were defined in the above standard and which are required to operate a motor with the drive.

The AVy Drives, however, have a considerably greater range of functions than is defined here. Apart from a few exceptions the parameters provided in this menu are described elsewhere in more detail. We will therefore restrict this description to the Parameters function. See section 3, “ Parameter lists”, for further information on the parameters concerned. When operating from a Bus, the parameters in the Drivecom group can also be accessed using the format and index specified in the above standard.

2.18.1. Control word, status word, malfunction code



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Malfunction code	57	0	65535		
Control word	55	0	65535	0	
Status word	56	0	65535		

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Malfunction code Malfunction code according to DRIVECOM specification (Mandatory functions)

The code displayed indicates a particular failure. The meaning of the individual failures concerned is described in section 2.12.9, “Programmable Alarms”.

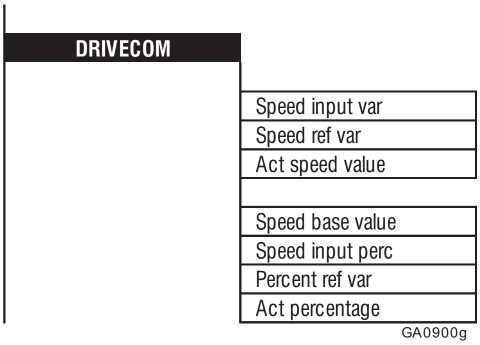
0000h **No failure**
2300h **Overcurrent**
3210h **Overvoltage**
3220h **Undervoltage**
4210h **Heatsink sensor**
4211h **Heatsink ot**
4212h **Regulation ot**
4310h **Overtemp motor**
4313h **Module overtemp**
4314h **Intake air ot**
5100h **Failure supply**
5210h **Curr fbk loss**
5410h **Output strages**
6110h **DSP error**
6120h **Interrupt error**
7110h **BU overload**
7301h **Speed fbk loss**
7400h **Opt2**
7510h **Hw Opt 1 failure**
8110h **Bus loss**
9000h **External fault**
9009h **Enable seq err**

The code and the alarm are displayed in plain text in the event of a failure. The code is given in hexadecimal format.

Control word Control word according to DRIVECOM specification (Mandatory functions)

Status word Status word according to DRIVECOM specification (Mandatory functions).

2.18.2. Speed



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed input var [FF]	44	-2*P45	+2*P45	0	*
Speed ref var [FF]	115	-32768	+32767		**
Act speed value [FF]	119	-32768	+32767		***
Speed base value [FF]	45	1	16383	1500	
Speed input perc [%]	46	-32768	+32767	0	*
Percent ref var [%]	116	-32768	+32767		**
Act percentage [%]	120	-32768	+32767		***

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* Factory set as Ramp ref 1 and connected to analog input 1 (terminal 1 and 2). See reference values

** Factory set as Speed ref 1 and connected to the ramp output. See reference values.

*** Factory set as Motor Speed and connected to analog output 1. See BASIC MENU

Speed input var 1st ramp reference value. The value to be entered is based on the factor function

Speed ref var 1st speed reference value. The value to be entered is based on the factor function

Act speed value Speed actual value in the unit specified in the factor function.

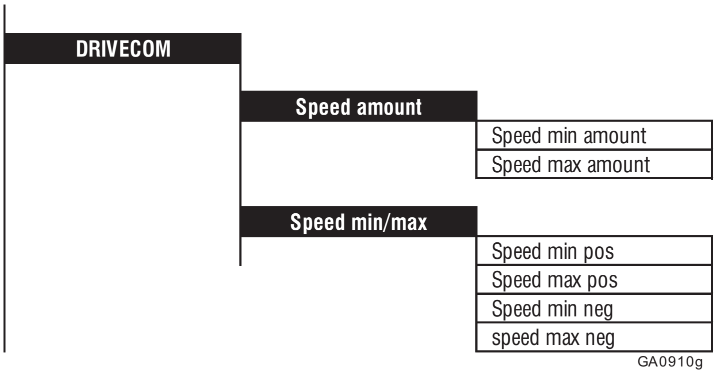
Speed base value The **Speed base value** is given in the unit specified in the factor function. It is the base value for all speed values given as a percentage (reference values, adaptive speed regulation ...). It is possible to modify the parameter drive only when the drive is disabled. (**Enable drive** = Disabled).

Speed input perc 1st ramp reference value. Defined as a percentage of the **Speed base value**

Percent ref var 1st speed reference value. Defined as a percentage of the **Speed base value**

Act percentage Speed actual value as a percentage of the **Speed base value**.

2.18.3. Speed limitation



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed min amount [FF]	1	0	2^{32} -1	0	
Speed max amount [FF]	2	0	2^{32} -1	2000	
Speed min pos [FF]	5	0	2^{32} -1	0	
Speed max pos [FF]	3	0	2^{32} -1	2000	
Speed min neg [FF]	6	0	2^{32} -1	0	
Speed max neg [FF]	4	0	2^{32} -1	2000	

GA6370ai

Speed min amount Defines the minimum speed for both rotation directions. A lower value than the defined value is not possible, regardless of the reference value set. It has an effect on the input of the ramp. If the Speed min amount parameter is changed, the Speed min pos and Speed min neg parameters are set to the same value. If one of these two parameters is changed later, the last change is valid. The current value for positive rotation (clockwise) is shown in the display of the keypad. The value to be entered is based on the factor function.

Speed max amount Defines the maximum speed for both rotation directions. The function has an effect on the input of the speed regulator and therefore takes into account the reference value that comes from the ramp as well as the directly defined values (see figure 2.5.2.1). If the Speed max amount is changed, the Speed max pos and Speed max neg parameters are set to the same value. If one of these two parameters is changed later, the last change is valid. The current value for positive rotation (clockwise) is shown in the display of the keypad. The value to be entered is based on the factor function.

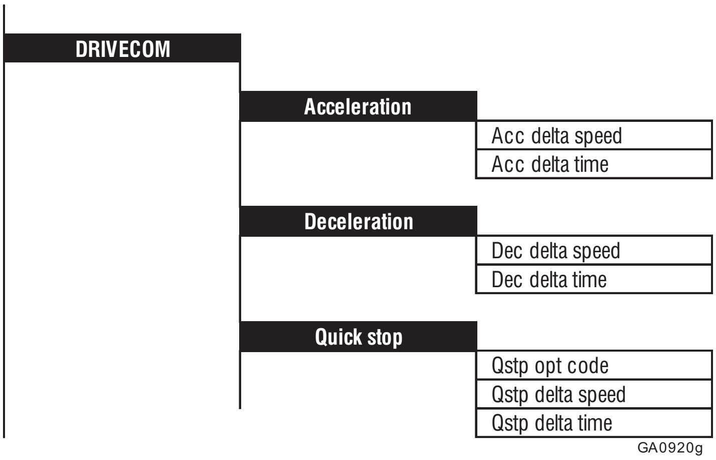
Speed min pos Defines the minimum speed for the clockwise rotation of the motor. A lower value than the defined value is not possible, regardless of the reference value. The function has an effect on the input of the ramp (see figure 2.5.1.1). The value to be entered is based on the factor function.

Speed max pos Defines the maximum speed for the clockwise rotation of the motor. The function has an effect on the input of the speed regulator, and therefore takes intoconsideration the reference value that comes from the ramp as well as those that are entered directly (see figure 2.5.2.1). The value to be entered is based on the factor function.

Speed min neg Defines the minimum speed for the counter clockwise rotation of the motor. A lower value than the defined value is not possible, regardless of the reference value. The function has an effect on the input of the ramp (see figure 2.5.1.1). The value to be entered is based on the factor function.

Speed max neg Defines the maximum speed for the counter clockwise rotation of the motor. The function has an effect on the input of the speed regulator, and therefore takes into consideration the reference value that comes from the ramp as well as the those that are entered directly (see figure 2.5.2.1). The value to be entered is based on the factor function.

2.18.4. Acceleration / Deceleration



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Acc delta speed [FF]	21	0	2^{32} -1	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	2^{32} -1	100	
Dec delta time [s]	30	0	65535	1	
Qstp delta speed [FF]	37	0	2^{32} -1	100	
Qstp delta time [s]	38	0	65535	1	
Quick stop Quick stop No Quick stop	343	0	1	No Quick stop (1)	
Quick opt code Ramp stop DC Braking curr	713	-2	-1	Ramp stop (-1)	

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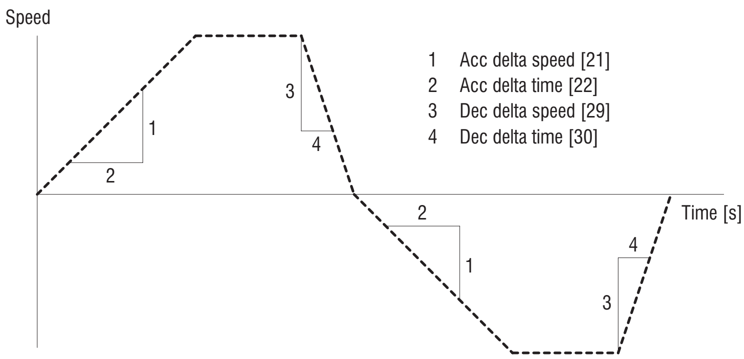


Figure 2.18.4.1: Accel and Decel

Acc delta speed Has the same unit as the ramp reference value and is based on the factor function.

Acc delta time Is defined in seconds. The ramp output follows the reference value directly if “0 s” is entered.

Dec delta speed Has the same unit as the ramp reference value and is based on the factor function.

Dec delta time Is defined in seconds. If “0 s” is entered, the ramp output follows the reference value directly.

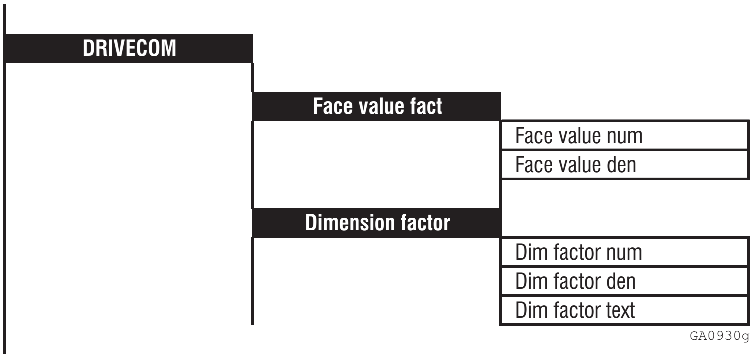
Qstp delta speed Has the same unit as the ramp reference value and is based on the factor function.

Qstp delta time is defined in seconds. If “0 s” is entered, the ramp output follows the reference value directly.

Quick stop Activates the Quick stop ramp to stop the Drive. If SELECT Qstp Opt code = Ramp stop, the drive is stopped with the ramp defined by Qstp Delta speed and Qstp delta time. If SELECT Qstp Opt Code = DC braking curr, the drive is stopped by injection of DC current (section 2.16.7)

The acceleration of the drive is defined as a quotient of the **Acc delta speed** and **Acc delta time** parameters. It is the same for both rotation directions of the motor. The deceleration of the drive is defined as a quotient of the **Dec delta speed** and **Dec delta time** parameters. It is the same for both rotation directions of the motor.

2.18.5. Factor function



The factor function contains two functions, the Dimension factor and Face value factor. They are both expressed as fraction numbers.

The dimension factor enables the drive speed to be defined in a machine-related dimension, e.g. kg/h or m/min.

Further information and examples are given in section 2.12, “ Configuration”.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Dim factor num	50	1	65535	1	
Dim factor den	51	1	$+2^{31}-1$	1	
Dim factor text	52			rpm	
Face value num	54	1	+32767	1	
Face value den	53	1	+32767	1	

GA6380g

Dim factor num Numerator of the dimension factor

Dim factor den Denominator of the dimension factor

Dim factor text Unit of the dimension factor. This text is shown in the display of the keypad when the reference value is shown.

Possible characters: / % & + , - . 0...9 : < = > ? A...Z [ ] a...z

Face value num Numerator of the reference value factor.

Face value den Denominator of the reference value factor.

See example in section 2.12.8, “Dimension Factor, Face Value Factor on how to make the calculation.

2.19. SERVICE

The SERVICE menu is reserved for the manufacturer's service personnel.

3. PARAMETERS LISTS

3.1. LIST OF ALL PARAMETERS

Explanation of tables:

White text on black background	Menu/submenu
White text on black background in brackets	Menu does not exist in the keypad
Fields with gray background	Function not accessible via keypad. The status of the corresponding parameter is only displayed.
[FF] in the Parameter column	Dimension based on the factor function
"No." column	**Parameter number (decimal). The value 2000H (= decimal 8192) must be added to the number given in the "No." column in order to obtain the index to access the parameter via Bus , serial line or Opt2 (APC card). The parameters in the Drivecom group can be accessed using the format and index specified in the DRIVECOM power transmission profile (#21).**
"Format" column	Internal parameter format: I= Integer (Example: I16 = Integer 16 bit) U = Unsigned (Example: U32 = unsigned 32 bit) Float = Floating point
"Value" column	Minimum, maximum and factory parameter values. S = set value depending on the size of the device. F = set value depending on the **Flt 100 mF** [303] parameter
"Keypad" column	√ = Parameter available via keypad
"RS485/BUS/Opt2-M" column (Low priority)	Parameter available via RS485, field Bus or via the APC Card manual communication (see the APC Card user manual) The numbers indicate what has to be sent via interface line in order to set the single parameters.
"Term." column	Parameter addressable to one of the analog or digital input/output terminals.

"Opt2-A" (Low Priority)	
"PDC" (High Priority)	Parameter available via the APC Card asynchronous communication (see the APC Card user manual) and/or the Process Data Channel (PDC) of the Field bus. **NOTE: When field Bus interface parameters whose range is [min=0; max=1] can be assigned to either virtual digital inputs (if "w" access code exists) and/or virtual digital outputs (if "R" access code exists).**
IA, QA, ID, QD in the "Term." column	The function can be accessed via a freely programmable analog or digital input or output. IA = analog input QA = analog output ID = digital input QD = digital output. The possibly present number is the one by which the terminal is identified.
H, L in the "Term." column	Level of the terminal signals (H=high, L=low) which enables the single function.
R/W/Z/C	Access possibilities via the serial interface, Bus or Opt2 manual or asynchronous communication : R = Read, W = Write, Z = Write only when drive disabled, C=Command parameter (the writing of any value causes the execution of a command).
X · Pyy	The value of this parameter can correspond to min/max X times the value of the yy parameter.

NOTE ! The parameter number shown in the following table is a base number. The value 2000H (=8192 decimal) must be added to the number given in the "No." column in order to obtain the index to access the parametr via Bus, serial line or Opt2 (APC card). The parameters in the Drivecom group can be accessed using the format and index specified in the DRIVECOM power transmission profile (#21).

* When the parameter is accessed by Opt2-A/PDC the format is U16

** When the parameter is accessed by Opt2-A/PDC the format is I16

*** When the parameter is accessed by Opt2-A/PDC the lower word of the parameter is considered

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Drive ready	380	U16	0	1	-	-	R	QD	R
Drive ready							1	H	
Drive not ready							0	L	
Quick stop	343	U16	0	1	No quick stop (1)	-	R/W	ID	R/W
Quick stop							0	L	
No Quick stop							1	H	
Fast stop	316	U16	0	1	No fast stop (1)	-	R/W	14	R/W
Fast Stop							0	L	
No Fast Stop							1	H	
BASIC MENU									
Enable drive	314	U16	0	1	Disabled (0)	√	R/W	12	R/W
Enabled							1	H	
Disabled							0	L	
Ramp ref 1 [FF] (Speed input var)	44	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Start/Stop	315	U16	0	1	Stop (0)	√	R/W	13	R/W
Start							1	H	
Stop							0	L	
Actual spd (rpm)	122	I16	-8192	8192	-	√	R	QA	R
Motor current [A]	231	Float	0	S	-	√	R	QA	-
BASIC MENU \ Drive type									
Mains voltage	333	U16	0	2	400 V (1)	√	R/Z	-	-
230 V							0		
400 V							1		
460 V							2		
Ambient temp [°C]	332	U16	0	1	40°C (1)	√	R/Z	-	-
50°C (122°F)							0		
40°C (104°F)							1		
Rated drive curr	334	U16	0	16	S	-	R	-	R
7.5							0		
12.6							1		
17.7							2		
24.8							3		
33							4		
47							5		
63							6		
79							7		
93							8		
114							9		
142							10		
185							11		
210							12		
250							13		
324							14		
485							15		
580							16		
2.4							17		
4							18		
5.6							19		
9.6							20		
Continuous curr [A]	802	Float	S	S	S	√	R	-	-
Software version	331	Text	-	-	-	√	R	-	-
Drive type (AVy)	300	U16	-	-	18	-	R	-	R
BASIC MENU									
Regulation mode	321	U16	0	3	V/f control (3)	√	R/Z	-	-
Sensorless vect							0		
Self-tuning							1		
Field oriented							2		
V/f control							3		
Acc delta speed [FF]	21	U32	0	$2^{32}-1$	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
Dec delta speed [FF]	29	U32	0	$2^{32}-1$	100	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
Encoder 1 type Sinusoidal Digital	415	I16	0	1	Digital (1)	√	R/Z 0 1	-	-
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Save parameters	256	U16	0	65535	-	√	C	-	-
MONITOR									
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)	√	R/W 1 0	12 H L	R/W
Start/Stop Start Stop	315	U16	0	1	Stop (0)	√	R/W 1 0	13 H L	R/W
MONITOR \ Measurements \ Speed \ Speed in DRC []									
Ramp ref (d) [FF]	109	I16	-32768	32767	-	√	R	-	R
Ramp output (d) [FF]	112	I16	-32768	32767	-	√	R	-	R
Speed ref (d) [FF] (Speed ref var)	115	I16	-32768	32767	-	√	R	-	R
Actual spd (d) [FF] (Act spd value)	119	I16	-32768	32767	-	√	R	-	R
F act spd (d) [FF]	925	I16	-32768	32767	-	√	R	-	R
Act spd filter [s]	923	Float	0.001	0.100	0.001	√	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in rpm									
Ramp ref (rpm)	110	I16	-32768	32767	-	√	R	QA	R
Ramp outp (rpm)	113	I16	-32768	32767	-	√	R	QA	R
Speed ref (rpm)	118	I16	-32768	32767	-	√	R	QA	R
Actual spd (rpm)	122	I16	-8192	8192	-	√	R	QA	R
Enc1 speed [rpm]	427	I16	-8192	8192	-	√	R	-	R
Enc2 speed [rpm]	420	I16	-8192	8192	-	√	R	-	R
F act spd (rpm)	924	I16	-32768	32767	-	√	R	QA	R
Act spd filter [rpm]	923	Float	0.001	0.100	0.001	√	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in %									
Ramp ref (%)	111	Float	-200.0	+ 200.0	-	√	R	-	-
Ramp output (%)	114	Float	-200.0	+ 200.0	-	√	R	-	-
Speed ref (%)	117	Float	-200.0	+ 200.0	-	√	R	-	-
Actual spd (%)	121	Float	-200.0	+ 200.0	-	√	R	-	-
MONITOR \ Measurements									
DC link voltage [V]	227	U16	0	999	-	√	R	QA	-
Active power [%]	229	Float**	-500	500	-	√	R	QA	R
Output voltage [V]	233	Float**	0	500	-	√	R	QA	R
Output frequency [Hz]	324	Float	0.0	500.0	-	√	R	-	-
Motor current [A]	231	Float	0.00	S	-	√	R	QA	-
Torque [%]	230	Float	-500	500	-	√	R	QA	-
T current ref [%]	41	I16	-500	500	-	√	R	QA	R
T curr (%)	927	I16	-500	500	-	√	R	QA	R
F T curr (%)	928	I16	-500	500	-	√	R	QA	R
T curr filter [s]	926	Float	0.001	0.250	0.100	√	R/W	-	-
Flux [%]	234	Float*	0.00	100.00	-	√	R	QA	R
Heatsink temp [°C]	881	I16	-	-	-	√	R	-	-
Regulation temp [°C]	1147	I16	-	-	-	√	R	-	-
Intake air temp [°C]	914	U16	-	-	-	√	R	QA	-
MONITOR \ I/O									
Digital I/Q	-				-	√	R	-	-
Dig input term	564	U16	0	65535	-	-	R	-	R
Dig input term 1	565	U16	0	1	-	-	R	-	R
Dig input term 2	566	U16	0	1	-	-	R	-	R
Dig input term 3	567	U16	0	1	-	-	R	-	R
Dig input term 4	568	U16	0	1	-	-	R	-	R
Dig input term 5	569	U16	0	1	-	-	R	-	R
Dig input term 6	570	U16	0	1	-	-	R	-	R
Dig input term 7	571	U16	0	1	-	-	R	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Dig input term 8	572	U16	0	1	-	-	R	-	R
Dig input term 9	573	U16	0	1	-	-	R	-	R
Dig input term 10	574	U16	0	1	-	-	R	-	R
Dig input term 11	575	U16	0	1	-	-	R	-	R
Dig input term 12	576	U16	0	1	-	-	R	-	R
Dig input term 13	577	U16	0	1	-	-	R	-	R
Dig input term 14	578	U16	0	1	-	-	R	-	R
Dig input term 15	579	U16	0	1	-	-	R	-	R
Dig input term 16	580	U16	0	1	-	-	R	-	R
Dig output term	581	U16	0	65535	-	-	R	-	R
Virtual dig inp	582	U16	0	65535	-	√	R/W	-	R/W
Virtual dig out	583	U16	0	65535	-	√	R	-	R
DRIVE PARAMETER \ Mot plate data									
Nominal voltage [V]	161	Float	1	999	400	√	R/Z	-	-
Nominal speed [rpm]	162	Float**	1	99999	S	√	R/Z	-	-
Nom frequency [Hz]	163	Float	1	999	50	√	R/Z	-	-
Nominal current [A]	164	Float	0.10	999.00	S	√	R/Z	-	-
Cos phi	371	Float	0.1	0.99	S	√	R/Z	-	-
Base voltage [V]	167	Float	1	999	400	√	R/Z	-	-
Base frequency [Hz]	168	Float	1	999	50	√	R/Z	-	-
Take motor par	694	U16	0	1	-	√	C	-	-
DRIVE PARAMETER \ Motor Parameter									
Magnetizing cur [A]	165	Float	0.10	999.00	S	√	R/W	-	-
Magn working cur [A]	726	Float	0.10	999.00	S	√	R	-	-
Rotor resistance [Ohm]	166	Float	0.0001	S	S	√	R/W	-	-
Stator resist [Ohm]	436	Float	0.0001	S	S	√	R/W	-	-
Lkg inductance [H]	437	Float	0.00001	9.00000	S	√	R/W	-	-
Load motor par	251	U16	0	1	Std400V (0)	√	Z	-	-
Std for 400V							0		
Std for 460V							1		
DRIVE PARAMETER \ Motor Parameter \ Self-tuning									
Self tune state	705	U16	0	65535	-	-	R	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1									
Start part 1	676	U16	0	65535	-	√	C	-	-
Stator resist [Ohm]	436	Float	0.0001	S	S	√	R/W	-	-
Stator resist Nw [Ohm]	683	Float	S	S	-	√	R	-	-
Voltage comp lim [V]	644	Float	0.1	30.0	6.0	√	R/W	-	-
Volt comp lim Nw [V]	685	Float	0.1	30.0	-	√	R	-	-
Comp slope [V/A]	645	Float	0.1	50.0	13.0	√	R/W	-	-
Comp slope Nw [V/A]	686	Float	0.1	50.0	-	√	R	-	-
Lkg inductance [H]	437	Float	0.00001	9.00000	S	√	R/W	-	-
Lkg indutance Nw [H]	684	Float	S	S	-	√	R	-	-
Current P [%]	89	Float	0.00	100.00	S	√	R/W	-	-
Current P Nw [%]	687	Float	S	S	-	√	R	-	-
Rotor resistance [Ohm]	166	Float	0.0001	S	S	√	R/W	-	-
Rotor resist Nw [Ohm]	682	Float	S	S	-	√	R	-	-
Current I [%]	90	Float	0.00	100.00	S	√	R/W	-	-
Current I Nw [%]	688	Float	S	S	-	√	R	-	-
Take val part 1	677	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a									
Start part 2a	678	U16	0	65535	-	√	C	-	-
P1 flux model	176	Float	0.00	1.00	S	√	R/W	-	-
P1 flux model Nw	689	Float	S	S	S	√	R	-	-
P2 flux model	692	U16	1	20	S	√	R/W	-	-
P2 flux model Nw	690	U16	S	S	S	√	R	-	-
Magnetizing curr [A]	165	Float	0.1	999.0	S	√	R/W	-	-
Magnetiz curr Nw [A]	691	Float	S	S	S	√	R	-	-
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux P Nw [%]	907	Float	0.00	100.00	S	√	R	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
Flux I Nw [%]	908	Float	0.00	100.00	S	√	R	-	-
Voltage P [%]	1022	Float	0	100.00	15.00	√	RW	RW	-
Voltage P Nw [%]	1024	Float	100.00	0.00	S	√	R	R	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Take val part 2a	679	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b									
Start part 2b	680	U16	0	65535	-	√	C	-	-
P1 flux model	176	Float	0.00	1.00	S	√	R/W	-	-
P1 flux model Nw	689	Float	S	S	S	√	R	-	-
P2 flux model	692	U16	1	20	S	√	R/W	-	-
P2 flux model Nw	690	U16	S	S	S	√	R	-	-
Magnetizing curr [A]	165	Float	0.1	999.0	S	√	R/W	-	-
Magnetiz curr Nw [A]	691	Float	S	S	S	√	R	-	-
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux P Nw [%]	907	Float	0.00	100.00	S	√	R	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
Flux I Nw [%]	908	Float	0.00	100.00	S	√	R	-	-
Voltage P [%]	1022	Float	0.00	100.00	15.00	√	RW	RW	-
Voltage P Nw [%]	1024	Float	100.00	0.00	S	√	R	R	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Take val part 2b	681	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3									
Fwd-Rev spd tune Fwd direction Rev direction	1029	U16	1	2	Fwd direction (1)	√	R/Z 1 2	-	-
Test T curr lim [%]	1048	U16	0	S	20	√	R/Z	-	-
Start part 3	1027	U16	0	65535	-	√	C	-	-
Inertia [kg*m*m*]	1014	Float	0.0010	999.9990	S	√	R/W	-	-
Inertia Nw [kg*m*m*]	1030	Float	0.0010	999.9990	-	√	R	-	-
Friction [N*m]	1015	Float	0.000	99.99	S	√	R/W	-	-
Friction Nw [N*m]	1031	Float	0.000	99.99	-	√	R	-	-
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-
Speed P Nw [%]	1032	Float	0.00	100.00	-	√	R	-	-
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-
Speed I Nw [%]	1033	Float	0.00	100.00	-	√	R	-	-
Take val part 3	1028	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Sensorless									
Low speed factor	646	I16	0	32000	5000	√	R/W	-	-
Sls speed filter [s]	643	Float	0.01	0.50	0.01	√	R/W	-	-
Flux corr factor	647	Float	0.50	1.0	0.90	√	R/W	-	-
DRIVE PARAMETER \ V/f control									
V/f shape $V = k \cdot f^{1.0}$ $V = k \cdot f^{1.5}$ $V = k \cdot f^{1.7}$ $V = k \cdot f^{2.0}$	712	U16	0	3	$V = k \cdot f^{1.0}$ (0)	√	R/Z 0 1 2 3	-	-
DRIVE PARAMETER \ V/f control \ Voltage boost									
Vlt boost type Manual Automatic	709	U16	0	1	Manual (0)	√	R/Z 0 1	-	-
Manual boost [%]	710	Float	0.0	10.0	1.0	√	R/W	-	-
Actual boost [%]	711	Float	0.0	100.0	-	√	R	-	-
DRIVE PARAMETER \ V/f control \ Slip compens									
Slip comp type Manual Automatic	722	U16	0	1	Manual (0)	√	R/Z 0 1	-	-
Manual slip comp [rpm]	723	I16	0	200	0	√	R/W	-	-
Actual slip comp [rpm]	724	I16	-400	400	0	√	R	-	-
Slip comp filt [s]	725	Float	0.003	0.300	0.030	√	R/W	-	-
Motor losses %	727	Float	0.0	20.0	0	√	R/W	-	-
DRIVE PARAMETER \ V/f control \ V/f spd search									
Spd srch time [s]	893	Float	0.01	10.00	10.00	√	R/W	-	-
Flux srch time [s]	894	Float	0.01	20.00	1.00	√	R/W	-	-
Spd autocapture [FF]	895	I16	-32768	32767	1500	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Delay auto cap [ms]	896	U16	0	10000	1000	√	R/W	-	-
Delay retrying [ms]	897	U16	0	10000	1000	√	R/W	-	-
DRIVE PARAMETER \ V/f control \ Energy save									
Enable save eng	898	U16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Lock save eng	899	U16	0	1	OFF (0)	√	R/W	ID	R/W
OFF							0	L	
ON							1	H	
V/f flux level [%]	900	U16	0	100	100	√	R/W	IA	R/W
Flux var time [s]	901	U16	1	100	10	√	R/W	-	-
INPUT VARIABLES \ Ramp ref \ Ramp ref 1									
Ramp ref 1 [FF] (Speed input var)	44	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Ramp ref 1 (%)	47	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Ramp ref \ Ramp ref 2									
Ramp ref 2 [FF]	48	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Ramp ref 2 (%)	49	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Speed ref \ Speed ref 1									
Speed ref 1 [FF]	42	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Speed ref 1 (%)	378	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Speed ref \ Speed ref 2									
Speed ref 2 [FF]	43	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Speed Ref 2 (%)	379	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ T current ref									
T current ref 1 [%]	39	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref 2 [%]	40	I16	F	F	0	√	R/W	IA, QA	R/W
LIMITS \ Speed limits \ Speed amount									
Speed min amount [FF]	1	U32	0	2^{32}-1	0	√	R/Z	-	-
Speed max amount [FF]	2	U32	0	2^{32}-1	5000	√	R/Z	-	-
LIMITS \ Speed limits \ Speed min/max									
Speed min pos [FF]	5	U32	0	2^{32}-1	0	√	R/Z	-	-
Speed max pos [FF]	3	U32	0	2^{32}-1	5000	√	R/Z	-	-
Speed min neg [FF]	6	U32	0	2^{32}-1	0	√	R/Z	-	-
Speed max neg [FF]	4	U32	0	2^{32}-1	5000	√	R/Z	-	-
Speed limited	372	U16	0	1		-	R	QD	R
Speed not limited							0	L	
Speed limited							1	H	
LIMITS \ Current limits									
T curr lim type	715	U16	0	1	T lim +/- (0)	√	R/Z	-	-
T lim + / -							0		
T lim mot gen							1		
T lim VDC Ctrl							3		
T current lim [%]	7	U16	0	F	S	√	R/W	IA	R/W
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
Curr limit state	349	U16	0	1		-	R	QD	R
Curr. limit not reached							0	L	
Curr. limit reached							1	H	
In use Tcur lim+ [%]	10	U16	0	F		√	R	-	R
In use Tcur lim- [%]	11	U16	0	F		√	R	-	R
Current lim red [%]	13	U16	0	F	100	√	R/W	-	R/W
Torque reduct	342	U16	0	1	Not act. (0)	√	R/W	ID	R/W
Not actived							0	L	
actived							1	H	
LIMITS \ Flux limits									
Flux level [%]	467	U16	10	100	100	√	R/W	IA QA	R/W
LIMITS \ Voltage limits									
Dynam vlt margin [%]	889	Float	10.00	10.00	1.00	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
RAMP \ Acceleration									
Acc delta speed [FF]	21	U32	0	2^{32} -1	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
RAMP \ Deceleration									
Dec delta speed [FF]	29	U32	0	2^{32} -1	100	√	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
RAMP \ Quick stop									
QStp delta speed [FF]	37	U32	0	2^{32} -1	1000	√	R/W	-	-
QStp delta time [s]	38	U16	0	65535	1	√	R/W	-	-
RAMP									
Ramp shape	18	U16	0	1	Linear (0)	√	R/Z	-	-
Linear							0		
S-Shaped							1		
S shape t const [ms]	19	Float	100	3000	500	√	R/W	-	-
S acc t const [ms]	663	Float	100	3000	500	√	R/W	-	-
S dec t const [ms]	664	Float	100	3000	500	√	R/W	-	-
Ramp +/- delay [ms]	20	U16	0	65535	100	√	R/W		-
Fwd-Rev	673	U16	0	3	Fwd (1)	√	R/W	-	R/W
No direction							0		
Fwd direction							1		
Rev direction							2		
No direction							3		
Forward sign	293	U16	0	1	not sel (0)	-	R/W	ID	R/W
FWD selected							1	H	
FWD not selected							0	L	
Reverse sign	294	U16	0	1	not sel (0)	-	R/W	ID	R/W
REV selected							1	H	
REV not selected							0	L	
Enable ramp	245	I16	0	1	Enabled (1)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Ramp out = 0	344	U16	0	1	Not act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
Ramp in = 0	345	U16	0	1	Not act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
Freeze ramp	373	U16	0	1	Not act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
Ramp +	346	U16	0	1	-	-	R	QD	R
Acc. clockwise +							1	H	
Dec. counter-clockwise									
Other states							0	L	
Ramp -	347	U16	0	1	-	-	R	QD	R
Acc. counter-clockwise +							1	H	
Dec. clockwise									
Other states							0	L	
SPEED REGULAT.									
Speed ref [rpm]	118	I16	-32768	32767	-	√	R	QA	R
Speed reg output [%]	236	I16	-	-	-	√	R	QA	R
Lock speed reg	322	U16	0	1	OFF (0)	√	R/W	ID	R/W
ON							1	L	
OFF							0	H	
Enable spd reg	242	I16	0	1	Enabled (1)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Lock speed I	348	U16	0	1	Not act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
Aux spd fun sel	1016	U16	0	1	Speed up (0)	√	R/Z	-	-
Speed up							0		
Inertia-loss cp							1		
Prop. filter [ms]	444	U16	0	1000	0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
SPEED REGULAT \ Spd zero logic									
Enable spd=0 I	123	U16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Enable spd=0 R	124	U16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Enable spd=0 P	125	U16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Enable lck sls	422	U16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Spd=0 P gain [%]	126	Float	0.00	100.00	10.00	√	R/W	-	-
Ref 0 level [FF]	106	U16	1	32767	10	√	R/W	-	-
Enable zero pos	890	U16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Lock zero pos	891	U16	0	1	OFF (0)	√	R/W	ID	R/W
ON							1	L	
OFF							0	H	
Zero pos gain [%]	892	U16	0	100	10	√	R/W	-	-
SPEED REGULAT \ Speed up									
Speed up gain [%]	445	Float	0.00	100.00	0.00	√	R/W	-	-
Speed up base [ms]	446	Float	0	16000	1000	√	R/W	-	-
Speed up filter [ms]	447	U16	0	1000	0	√	R/W	-	-
SPEED REGULAT \ Droop function									
Droop gain [%]	696	Float	0.00	100.00	0.00	√	R/W	-	-
Droop filter [ms]	697	U16	0	1000	0	√	R/W	-	-
Load comp [%]	698	I16	F	F	0	√	R/W	IA	R/W
Droop limit [FF]	700	U16	0	2 × P45	1500	√	R/W	-	-
Enable droop	699	U16	0	1	Disabled (0)	√	R/W	ID	R/W
Enabled							1	H	
Disabled							0	L	
SPEED REGULAT \ Inertia/loss cp									
Inertia [kg*m*m]	1014	Float	0.001	999.999	S	√	R/W	-	-
Friction [N*m]	1015	Float	0.000	99.999	S	√	R/W	-	-
Torque const [N*m/A]	1013	Float	0.01	99.99	S	√	R	-	-
Inertia c filter [ms]	1012	U16	0	1000	0	√	R/W	-	-
CURRENT REGULAT									
Current norm	267	Float	0.00	9999.99	S	-	R	-	-
Torque current	350	Float	S	S		-	R	QA	-
Flux current	351	Float	S	S		-	R	QA	-
F current ref	352	Float	S	S		-	R	QA	-
Zero torque	353	U16	0	1	Not Act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
FLUX REGULATION									
Flux reg mode	469	U16	0	1	Volt.control (1)	√	R/Z		-
Constant current							0	-	
Voltage control							1		
Flux reference	500	Float*	0.0	100.0	-	√	R	QA	R
Flux	234	Float*	0.00	100.00	-	√	R	QA	R
Out vlt level [%]	921	Float*	0.0	100.0	100.0	√	R/W	IA,QA	R/W
REG PARAMETERS \ Percent values \ Speed regulator									
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-
REG PARAMETERS \ Percent values \ Current reg									
Current P [%]	89	Float	0.00	100.00	S	√	R/W	-	-
Current I [%]	90	Float	0.00	100.00	S	√	R/W	-	-
REG PARAMETERS \ Percent values \ Current reg\Dead time comp									
Voltage comp lim [V]	644	Float	0.1	30.0	6.0	√	R/W	-	-
Comp slope [V/A]	645	Float	0.1	50.0	13.0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
REG PARAMETERS \ Percent values \ Flux regulator									
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
REG PARAMETERS \ Percent values \ Voltage reg									
Voltage P [%]	1022	Float	0.00	100.00	15.00	√	R/W	-	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
REG PARAMETERS \ Base values \ Speed regulator									
Speed P base [A/rpm]	93	Float	0.001	99.999	S	√	R/Z	-	-
Speed I base[A/rpm×ms]	94	Float	0.001	99.999	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Current reg									
Current P base [V/A]	95	Float	0.1	99999.9	S	√	R/Z	-	-
Current I base [V/A×ms]	96	Float	0.1	9999.9	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Flux regulator									
Flux P base [A/Vs]	97	Float	0.1	9999.9	S	√	R/Z	-	-
Flux I base [A/Vs×ms]	98	Float	0.01	999.99	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Voltage reg									
Voltage P base [Vs/V]	1023	Float	0.00001	9.99999	S	√	R/W	-	-
Voltage I base [Vs/V x s]	903	Float	0.00001	9.99999	S	√	R/W	-	-
REG PARAMETERS \ In use values									
Speed P in use [%]	99	Float	0.00	100.00	S	√	R	-	-
Speed I in use [%]	100	Float	0.00	100.00	S	√	R	-	-
CONFIGURATION									
Main commands	252	U16	0	1	Terminals (0)	√	R/Z	-	-
Terminals							0		
Digital							1		
Control mode	253	U16	0	1	Local (0)	√	R/Z	-	-
Local							0		
Bus							1		
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Regulation mode	321	U16	0	3	V/f control (3)	√	R/Z	-	-
Sensorless vect							0		
Self-tuning							1		
Field oriented							2		
V/f control							3		
Full load curr [A]	179	Float	0.10	999.00	S	√	R/Z	-	-
Flt_100_mf	303	I16	0	32767	S	-	R	-	R
Magn ramp time [s]	675	Float	0.01	5.00	1.00	√	R/Z	-	-
Magn boost curr [%]	413	U16	10	136	30	√	R/Z	-	-
Ok relay funct	412	I16	0	1	Drive healthy (0)	√	R/Z	-	-
Drive healthy							0		
Ready to start							1		
Switching freq	240	U16	S	S	S	√	R/Z	-	-
4 KHz							0		
8 KHz							1		
16 KHz							2		
2 KHz							3		
Qstp opt code	713	I16	-2	-1	Ramp stop (1)	√	R/Z	-	-
Ramp stop							1		
DC braking							2		
Npar displayed	1291	U16	0	65535	0	√	R/W	-	-
Pword 1 :	85	I32	00000	99999	Disabled (0)	√	W	-	-
Enabled							1		
Disabled							0		
CONFIGURATION \ Motor spd fbk									
Speed fbk sel	414	U16	0	1	Enc.1 (1)	√	R/Z	ID	R/W
Encoder 1							1	H	
Encoder 2							0	L	
Encoder 1 type	415	I16	0	1	Digital (1)	√	R/Z	-	-
Sinusoidal							0		
Digital							1		
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Enc1 supply vlt	1146	U16	0	3	5.41 V (0)	√	R/Z		
5.41 V							0		
5.68 V							1		
5.91 V							2		
6.18 V							3		
Encoder 2 pulses	169	Float*	600	9999	1024	√	R/Z	-	R
Encoder repeat	1054	U16	0	1	Encoder 1 (1)	√	R/Z	-	-
Encoder 2							0		
Encoder 1							1		
Encoder 1 state	648	U16	0	1	-	-	R	QD	R
Encoder 1 OK							1	H	
Encoder 1 NOT OK							0	L	
Encoder 2 state	651	U16	0	1	-	-	R	QD	R
Encoder 2 OK							1	H	
Encoder 2 NOT OK							0	L	
Refresh enc 1	649	U16	0	1	Disabled (0)	√	R/W	-	-
Enabled							1		
Disabled							0		
Refresh enc 2	652	U16	0	1	Disabled (0)	√	R/W	-	-
Enabled							1		
Disabled							0		
Enable ind store	911	U16	0	1	Disabled (0)	√	R/W	-	R/W
Enabled							1		
Disabled							0		
Ind store ctrl	912	U16	0	65535	0	-	R/W	-	R/W
Index storing	913	U32	0	$2^{32}-1$	-	-	R	-	R
CONFIGURATION \ Drive type									
Mains voltage	333	U16	S	2	400 V (1)	√	R/Z	-	-
230 V							0		
400 V							1		
460 V							2		
Ambient temp [°C]	332	U16	0	1	40°C (1)	√	R/Z	-	-
50°C (122°F)							0		
40°C (104°F)							1		
Rated drive curr	334	U16	0	16	S	-	R	-	R
7.5							0		
12.6							1		
17.7							2		
24.8							3		
33							4		
47							5		
63							6		
79							7		
93							8		
114							9		
142							10		
185							11		
210							12		
250							13		
324							14		
485							15		
580							16		
2.4							17		
4							18		
5.6							19		
9.6							20		
Continuous curr [A]	802	Float	S	S	S	√	R	-	-
Software version	331	Text				√	R	-	-
Drive type (AVy)	300	U16	-	-	18	-	R	-	R
CONFIGURATION \ Dimension fact									
Dim factor num	50	I32***	1	65535	1	√	R/Z	-	R
Dim factor den	51	I32***	1	$2^{32}-1$	1	√	R/Z	-	R
Dim factor text	52	Text			rpm	√	R/Z	-	-
CONFIGURATION \ Face value fact									
Face value num	54	I16	1	32767	1	√	R/Z	-	R
Face value den	53	I16	1	32767	1	√	R/Z	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
CONFIGURATION \ Prog alarms \ Undervoltage									
Latch	357	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	358	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
Restart time [ms]	359	U16	0	65535	1000	√	R/W	-	-
N of attempts	360	U16	0	100	1	√	R/W	-	-
CONFIGURATION \ Prog alarms \ Overvoltage									
Latch	361	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	362	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Heatsink sensor									
Activity	368	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	369	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	370	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
Heatsink tmp thr [*C]	1294	U16	0	255	50	√	R/W	-	-
HS tmp thr state	1295	U16	0	1	0	-	-	-	R
CONFIGURATION \ Prog alarms \ Heatsink ot									
Ok relay open	1152	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Intake air ot									
Activity	1140	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	1141	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	1142	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Regulation ot									
Activity	1148	U16	0	1	Warning (1)	√	R/Z	-	-
Ignore							0		
Warning							1		
Latch	1149	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	1150	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Module overtemp									
Ok relay open	1151	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Overtemp motor									
Activity	365	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	366	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	367	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ External fault									
Activity	354	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	355	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	356	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Overcurrent									
Latch	363	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	364	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Output stages									
Latch	210	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	211	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Opt2 failure									
Activity	639	U16	2	5	Disabled drive (2)	√	R/Z	-	-
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	640	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Bus loss									
Activity	634	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	633	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	635	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
Hold off time [ms]	636	U16	0	10000	0	√	R/W	-	-
Restart time [ms]	637	U16	0	10000	0	√	R/W	-	-
CONFIGURATION \ Prog alarms \ Hw opt1 failure									
Activity	386	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	387	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Enable seq err									
Activity	728	U16	0	2	Disabled drive (2)	√	R/Z	-	-
Ignore							0		
Disable drive							2		
Latch	729	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	730	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ BU overload									
Activity	737	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	738	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Set serial comm									
Device address	319	U16	0	127	0	√	R/Z	-	-
Ser answer delay [ms]	408	U16	0	900	0	√	R/W	-	-
Ser protocol sel	323	U16	0	2	0	√	R/W	-	-
Slink3							0		
Modbus-RTU							1		
J Bus							2		
Ser baudrate sel	326	U16	0	4	1	√	R/W	-	-
19200							0		
19600							1		
4800							2		
2400							3		
1200							4		
MB swap float	1292	U16	0	1	0	√	R/W	-	-
Disabled							0		
Enabled							1		
I/O CONFIG \ Analog outputs \ Analog output 1									
Select output 1	66	U16	0	88	Actual speed (8)	√	R/Z	-	-
OFF							0		
Speed ref 1							1		
Speed ref 2							2		
Ramp ref 1							3		
Ramp ref 2							4		
Ramp ref							5		
Speed ref							6		
Ramp output							7		
Actual spd (rpm)							8		
T current ref 1							9		
T current ref 2							10		
T current ref							11		
F current ref							12		
Flux current							13		
Torque current							14		
Speed reg out							15		
Motor current							16		
Current U							17		
Current V							18		
Current W							19		

Parameter	No	Format	Value min	Value max	Value Factory	Access via Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Output voltage							20		
Voltage U							21		
Voltage V							22		
DC link voltage							23		
Analog input 1							24		
Analog input 2							25		
Analog input 3							26		
Flux							27		
Active power							28		
Torque							29		
Rr adap output							30		
Pad 0							31		
Pad 1							32		
Pad 4							33		
Pad 5							34		
Flux reference							35		
Pad 6							38		
PID output							39		
Feed fwd power							78		
Out vlt level							79		
Flux level							80		
F act spd (rpm)							81		
F T curr (%)							82		
Spd draw out							84		
PL next factor							87		
PL active limit							88		
Scale output 1	62	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 2									
Select output 2 (Select like output 1)	67	U16	0	88	T current (14)	√	R/Z	-	-
Scale output 2	63	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 3									
Select output 3 (Select like output 1)	68	U16	0	88	Current U (17)	√	R/Z	-	-
Scale output 3	64	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 4									
Select output 4 (Select like output 1)	69	U16	0	88	Motor current (16)	√	R/Z	-	-
Scale output 4	65	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 1									
Select input 1	70	U16	0	28	Ramp ref 1 (4)	√	R/Z	-	-
OFF							0		
Jog reference							1		
Speed ref 1							2		
Speed ref 2							3		
Ramp ref 1							4		
Ramp ref 2							5		
T current ref 1							6		
T current ref 2							7		
Adap reference							8		
T current lim							9		
T current lim +							10		
T current lim -							11		
Pad 0							12		
Pad 1							13		
Pad 2							14		
Pad 3							15		
Load comp							19		
PID offset 0							21		
PI central v3							22		
PID feed-back							23		
V/f flux level							24		
Flux level							25		
Out vlt level							26		
Speed ratio							28		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
An in 1 target Assigned Not assigned	295	U16	0	1	Assign. (0)	√	R/W 0 1	ID L H	R/W
Input 1 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	71	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 1 sign Positive Negative	389	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 1	72	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 1	73	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 1 Auto tune	259	U16	0	65535	-	√	C 1	-	-
Input 1 filter [ms]	792	U16	0	1000	0	√	R/W	-	-
Input 1 compare	1042	I16	-10000	10000	0	√	R/W	-	-
Input 1 cp error	1043	U16	0	10000	0	√	R/W	-	-
Input 1 cp delay	1044	U16	0	65000	0	√	R/W	-	-
Input 1 cp match Input 1 not thr.val. Input 1=thr.val	1045	U16	0	1	-	-	R 0 1	QD L H	R
Offset input 1	74	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 2									
Select input 2 (Select like Input 1)	75	U16	0	28	OFF (0)	√	R/Z	-	-
An in 2 target Assigned Not assigned	296	U16	0	1	Assign.(0)	√	R/W 0 1	ID L H	R/W
Input 2 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	76	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 2 sign Positive Negative	390	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 2	77	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 2	78	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 2 Auto tune	260	U16	0	65535	-	√	C 1	-	-
Offset input 2	79	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 3									
Select input 3 (Select like Input 1)	80	U16	0	28	OFF (0)	√	R/Z	-	-
An in 3 target Assigned Not assigned	297	U16	0	1	Assign. (0)	√	R/W 0 1	ID L H	R/W
Input 3 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	81	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 3 sign Positive Negative	391	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 3	82	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 3	83	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 3 Auto tune	261	U16	0	65535	-	√	C 1	-	-
Offset input 3	84	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Digital outputs									
Digital output 1 OFF Speed zero thr Spd threshold Set speed Curr limit state	145	U16	0	63	Ramp + (8)	√	R/Z 0 1 2 3 4	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Drive ready							5		
Overld available							6		
Ramp +							8		
Ramp -							9		
Speed limited							10		
Undervoltage							11		
Overvoltage							12		
Heatsink sensor							13		
Overcurrent							14		
Overtemp motor							15		
External fault							16		
Failure supply							17		
Pad A bit							18		
Pad B bit							19		
Virt dig input							20		
Speed fbk loss							25		
Bus loss							26		
Output stages							27		
Hw opt 1 failure							28		
Opt 2 failure							29		
Encoder 1 state							30		
Encoder 2 state							31		
Ovld mot state							32		
Enable seq err							35		
BU overload							36		
Diameter calc st							38		
Mot setup state							46		
Input 1 cp match							49		
Overload 200%							51		
PL stop active							52		
PL next active							53		
PL time-out sig							54		
Regulation ot							55		
Module overtemp.							56		
Heatsink ot							57		
Intake air ot							62		
Heatsink tmp thr							63		
Digital output 2	146	U16	0	63	Ramp - (9)	√	R/Z	-	
(Select like output 1)									
Digital output 3	147	U16	0	63	Spd threshold (2)	√	R/Z	-	
(Select like output 1)									
Digital output 4	148	U16	0	63	Overld available (6)	√	R/Z	-	-
(Select like output 1)									
Digital output 5	149	U16	0	63	Curr limit state (4)	√	R/Z	-	-
(Select like output 1)									
Digital output 6	150	U16	0	63	Over-voltage (12)	√	R/Z	-	-
(Select like output 1)									
Digital output 7	151	U16	0	63	Under-voltage (11)	√	R/Z	-	-
(Select like output 1)									
Digital output 8	152	U16	0	63	Over-current (14)	√	R/Z	-	-
(Select like output 1)									
Relay 2	629	U16	0	63	Speed zero thr (1)	√	R/Z	83-85	-
(Select like output 1)									
I/O CONFIG \ Digital inputs									
Digital input 1	137	U16	0	67	OFF (0)	√	R/Z	-	-
OFF							0		
Motor pot reset							1		
Motor pot up							2		
Motor pot down							3		
Motor pot sign +							4		
Motor pot sign -							5		
Jog +							6		
Jog -							7		
Failure reset							8		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Torque reduct							9		
Ramp out = 0							10		
Ramp in = 0							11		
Freeze ramp							12		
Lock speed reg							13		
Lock speed I							14		
Auto capture							15		
Input 1 sign +							16		
Input 1 sign -							17		
Input 2 sign +							18		
Input 2 sign -							19		
Input 3 sign +							20		
Input 3 sign –							21		
Zero torque							22		
Speed sel 0							23		
Speed sel 1							24		
Speed sel 2							25		
Ramp sel 0							26		
Ramp sel 1							27		
Speed fbk sel							28		
PAD A bit 0							32		
PAD A bit 1							33		
PAD A bit 2							34		
PAD A bit 3							35		
PAD A bit 4							36		
PAD A bit 5							37		
PAD A bit 6							38		
PAD A bit 7							39		
Fwd sign							44		
Rev sign							45		
An in 1 target							46		
An in 2 target							47		
An in 3 target							48		
Enable droop							49		
Quick stop							51		
Enable PI PID							52		
Enable PD PID							53		
PI int freeze PID							54		
PID offs. sel							55		
PI central v s0							56		
PI central v s1							57		
Diameter calc							58		
Lock zero pos							59		
Lock save eng							60		
Mot setup sel 0							62		
PL mains status							66		
PL time-out ack							67		
Digital input 2 (Select like input 1)	138	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 3 (Select like input 1)	139	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 4 (Select like input 1)	140	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 5 (Select like input 1)	141	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 6 (Select like input 1)	142	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 7 (Select like input 1)	143	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 8 (Select like input 1)	144	U16	0	67	OFF (0)	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
I/O CONFIG \ Encoder inputs									
Select enc 1	1020	U16	0	5	OFF (0)	√	R/Z	-	-
OFF							0		
Speed ref 1							2		
Speed ref 2							3		
Ramp ref 1							4		
Ramp ref 2							5		
Select enc 2	1021	U16	0	5	OFF (0)	√	R/Z	-	-
OFF							0		
Speed ref 1							2		
Speed ref 2							3		
Ramp ref 1							4		
Ramp ref 2							5		
Encoder 1 type	415	I16	0	1	Digital (1)	√	R/Z	-	-
Sinusoidal							0		
Digital							1		
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Encoder 2 pulses	169	Float*	600	9999	1024	√	R/Z	-	R
Refresh enc 1	649	U16	0	1	Disabled (0)	√	R/W	-	-
Enabled							1		
Disabled							0		
Refresh enc 2	652	U16	0	1	Disabled (0)	√	R/W	-	-
Enabled							1		
Disabled							0		
ADD SPEED FUNCT									
Auto capture	388	U16	0	1	OFF (0)	√	R/W	ID	-
ON							1	H	
OFF							0	L	
ADD SPEED FUNCT \ Adap spd reg									
Enable spd adap	181	U16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Sel adap type	182	U16	0	1	Speed (0)	√	R/Z	-	-
Speed							0		
Adap reference							1		
Adap reference [FF]	183	I16	-32768	32767	1000	√	R/W	IA	R/W
Adap speed 1 [%]	184	Float	0.0	200.0	20.3	√	R/W	-	-
Adap speed 2 [%]	185	Float	0.0	200.0	40.7	√	R/W	-	-
Adap joint 1 [%]	186	Float	0.0	200.0	6.1	√	R/W	-	-
Adap joint 2 [%]	187	Float	0.0	200.0	6.1	√	R/W	-	-
Adap P gain 1 [%]	188	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 1 [%]	189	Float	0.00	100.00	1.00	√	R/W	-	-
Adap P gain 2 [%]	190	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 2 [%]	191	Float	0.00	100.00	1.00	√	R/W	-	-
Adap P gain 3 [%]	192	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 3 [%]	193	Float	0.00	100.00	1.00	√	R/W	-	-
ADD SPEED FUNCT \ Speed control									
Spd threshold + [FF]	101	U16	1	32767	1000	√	R/W	-	-
Spd threshold - [FF]	102	U16	1	32767	1000	√	R/W	-	-
Threshold delay [ms]	103	U16	0	65535	100	√	R/W	-	-
Spd threshold	393	U16	0	1		-	R	QD	R
Speed exceeded							0	L	
Speed not exceeded							1	H	
Set error [FF]	104	U16	1	32767	100	√	R/W	-	-
Set delay [ms]	105	U16	0	65535	100	√	R/W	-	-
Set speed	394	U16	0	1		-	R	QD	R
Speed not ref. val.							0	L	
Speed = ref. val.							1	H	
ADD SPEED FUNCT \ Speed zero									
Speed zero level [FF]	107	U16	1	32767	10	√	R/W	-	-
Speed zero delay [ms]	108	U16	0	65535	100	√	R/W	-	-
Spd zero thr	395	U16	0	1		-	R	QD	R
Drive not rotating							0	L	
Drive rotating							1	H	

Parameter	No	Format	Value min	Value max	Value Factory	Access via Keyp.	Access via RS485/ BUS/ Opt2-M	Access via Terminal	Access via Opt2-A /PDC
FUNCTIONS \ Motor pot									
Enab motor pot	246	I16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Motor pot oper	-					√	-	-	-
Motor pot sign	248	I16	0	1	Positive (1)		R/W	ID	-
Positive							1		
Negative							0		
Motor pot reset	249	U16	0	65535		√	Z/C	ID H=reset	-
Motor pot up	396	U16	0	1	No acc. (0)	-	R/W	ID	R/W
No acceleration							0	L	
Acceleration							1	H	
Motor pot down	397	U16	0	1	No dec. (0)	-	R/W	ID	R/W
No deceleration							0	L	
Deceleration							1	H	
FUNCTIONS \ Jog function									
Enable jog	244	I16	0	1	Enabled (1)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Jog operation	-					√	-	-	-
Jog selection	375	U16	0	1	Spd inp. (0)	√	R/Z	-	-
Speed input							0		
Ramp input							1		
Jog reference [FF]	266	I16	0	32767	100	√	R/W	IA	-
Jog +	398	U16	0	1	No jog+ (0)	-	R/W	ID	R/W
No jog forward							0	L	
Forward jog							1	H	
Jog -	399	U16	0	1	No jog- (0)	-	R/W	ID	R/W
No backward jog							0	L	
Backward jog							1	H	
FUNCTIONS \ Multi speed fct									
Enab multi spd	153	I16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Multi speed sel	208	U16	0	7	0	√	R/W	-	R/W
Multi speed 1 [FF]	154	I16	-32768	32767	0	√	R/W	-	-
Multi speed 2 [FF]	155	I16	-32768	32767	0	√	R/W	-	-
Multi speed 3 [FF]	156	I16	-32768	32767	0	√	R/W	-	-
Multi speed 4 [FF]	157	I16	-32768	32767	0	√	R/W	-	-
Multi speed 5 [FF]	158	I16	-32768	32767	0	√	R/W	-	-
Multi speed 6 [FF]	159	I16	-32768	32767	0	√	R/W	-	-
Multi speed 7 [FF]	160	I16	-32768	32767	0	√	R/W	-	-
Speed sel 0	400	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^0 not selected							0	L	
Value 2^0 selected							1	H	
Speed sel 1	401	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^1 not selected							0	L	
Value 2^1 selected							1	H	
Speed sel 2	402	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^2 not selected							0	L	
Value 2^2 selected							1	H	
FUNCTIONS \ Multi ramp fct									
Enab multi rmp	243	I16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Multi ramp sel	202	U16	0	3	0	√	R/W	-	R/W
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0									
Acc delta speed0 [FF]	659	U32	0	$2^{32}-1$	100	√	R/W	-	-
Acc delta time 0 [s]	660	U16	0	65535	1	√	R/W	-	-
S acc t const 0 [ms]	665	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0									
Dec delta speed0 [FF]	661	U32	0	$2^{32}-1$	100	√	R/W	-	-
Dec delta time 0 [s]	662	U16	0	65535	1	√	R/W	-	-
S dec t const 0 [ms]	666	Float	100	3000	500	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1									
Acc delta speed1 [FF]	23	U32	0	$2^{32}-1$	100	√	R/W	-	-
Acc delta time 1 [s]	24	U16	0	65535	1	√	R/W	-	-
S acc t const 1 [ms]	667	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1									
Dec delta speed1 [FF]	31	U32	0	$2^{32}-1$	100	√	R/W	-	-
Dec delta time 1 [s]	32	U16	0	65535	1	√	R/W	-	-
S dec t const 1 [ms]	668	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2									
Acc delta speed2 [FF]	25	U32	0	$2^{32}-1$	100	√	R/W	-	-
Acc delta time 2 [s]	26	U16	0	65535	1	√	R/W	-	-
S acc t const 2 [ms]	669	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2									
Dec delta speed2 [FF]	33	U32	0	$2^{32}-1$	100	√	R/W	-	-
Dec delta time 2 [s]	34	U16	0	65535	1	√	R/W	-	-
S dec t const 2 [ms]	670	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3									
Acc delta speed3 [FF]	27	U32	0	$2^{32}-1$	100	√	R/W	-	-
Acc delta time 3 [s]	28	U16	0	65535	1	√	R/W	-	-
S acc t const 3 [ms]	671	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3									
Dec delta speed3 [FF]	35	U32	0	$2^{32}-1$	100	√	R/W	-	-
Dec delta time 3 [s]	36	U16	0	65535	1	√	R/W	-	-
S dec t const 3 [ms]	672	Float	100	3000	500	√	R/W	-	-
Ramp sel 0	403	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^0 not selected							0	L	
Value 2^0 selected							1	H	
Ramp sel 1	404	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^1 not selected							0	L	
Value 2^1 selected							1	H	
FUNCTIONS \ Stop control									
Stop mode	626	U16	0	3	1	√	R/Z	-	-
OFF							0		
Stop & Speed 0							1		
Fast stp & Spd 0							2		
Fst / stp & spd 0							3		
Spd 0 trip delay [ms]	627	U16	0	40000	0	√	R/W	-	-
Jog stop control	630	U16	0	1	OFF (0)	√	R/Z	-	-
ON							1		
OFF							0		
FUNCTIONS \ Speed draw									
Speed ratio	1017	I16	0	32767	10000	√	R/W	IA	R/W
Spd draw out (d)	1018	I16	-32767	32767	-	√	R	QA	R
Spd draw out (%)	1019	Float	-200.0	+200.0	-	√	R	-	-
FUNCTIONS \ Motor setup									
Mot setup sel	943	U16	0	1	Setup 0 (0)	√	R/Z	-	R/W
Setup 0							0		
Setup 1							1		
Mot setup sel 0	940	U16	0	1	Not sel (0)	-	R/Z	ID	R/W
Value 2° not sel							0	L	
Value 2° sel							1	H	
Copy mot setup	941	U16	0	1	Setup 0 (0)	√	R/Z	-	-
Setup 0							0		
Setup 1							1		
Mot setup state	944	U16	0	1	0	-	R	QD	R
Not running							0	L	
Running							1	H	
Actual mot setup	942	U16	0	1	Setup 0 (0)	√	R	-	R
Setup 0							0		
Setup 1							1		
FUNCTIONS \ Overload contr \ Ovld mot contr									
Motor cont curr [%]	656	U16	50	100	100	√	R/W	-	-
Trip time 50% [s]	657	U16	0	120	60	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Ovld mot state Overload Not overload	658	U16	0	1	Not ovrl (1)	-	R 0 1	QD L H	R
FUNCTIONS \ Overload contr \ Ovld drv contr									
I_sqrt_t_accum [%]	655	U16	0	100	0	√	R	-	R
Ovld Available Overload not possible Overload possible	406	U16	0	1	-	-	R 0 1	QD L H	R
Overload 200% Overload not possible Overload possible	1139	U16	0	1	-	-	R 0 1	QD L H	R
FUNCTIONS \ Brake unit									
Enable BU Enabled Disabled	736	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
BU ovld time [s]	740	Float	0.10	50.00	S	√	R/W		
BU duty cycle [%]	741	U16	1	75	S	√	R/W	-	-
BU DC vlt [V] 230 400 460	801	U16	0	2	1	√	R/W 0 1 2	-	-
FUNCTIONS \ Pwr loss stop f									
PL stop enable Disabled Enabled as Mst Enabled as Slv	1083	U16	0	2	0	√	R/W 0 1 2	-	-
PL stop t limit [%]	1082	U16	0	F	100	√	R/W	-	-
PL stop acc [rpm/s]	1080	U32	0	99999999	100	√	R/W	-	-
PL stop dec [rpm/s]	1081	U32	0	10000	10000	√	R/W	-	-
PL stop vdc ref [V]	1084	U16	0	800	646	√	R/W	-	-
PL time-out [s]	1087	U16	0	65535	10	√	R/W	-	-
PL stop P Gain [%]	1086	Float	0.00	100.00	5.00	√	R/W	-	-
PL stop I Gain [%]	1085	Float	0.00	100.00	0.30	√	R/W	-	-
PL stop active Not active Active	1088	U16	0	1	Not active (0)	√	R 0 1	-	R
PL active limit [%]	1089	U16	-	-	-	√	R	-	-
PL next active Not active Active	1090	U16	0	1	Not active (0)	√	R 0 1	-	R
PL next factor	1091	I16	0	32767	10000	√	R	-	R
PL time-out sig Not active Active	1093	U16	0	1	Not active (0)	√	R 0 1	-	R
PL time-out ack Not acknowledged Acknowledged	1094	U16	0	1	Not acknowledged (0)	√	R/W 0 1	-	R/W
PL mains status Not ok Ok	1092	U16	0	1	Not ok (0)	√	R/W 0 1	-	R/W
FUNCTIONS \ VDC control f									
VDC Ctrl P Gain [%]	1289	Float	0.00	100	10	√	R/W	-	-
VDC Ctrl I Gain [%]	1290	Float	0.00	100	10	√	R/W	-	-
SPEC FUNCTIONS \ Test generator									
Gen access Not connected F current ref T current ref Flux ref Ramp ref	58	U16	0	4	Not conn. (0)	√	R/Z 0 1 2 3 4	-	-
Gen frequency [Hz]	59	Float	0.1	62.5	1.0	√	R/W	-	-
Gen amplitude [%]	60	Float	0.00	200.00	0.00	√	R/W	-	-
Gen offset [%]	61	Float	-200.00	200.00	0.00	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
SPEC FUNCTIONS									
Enable rr adap	435	U16	0	1	Disabled (0)	√	R/W	-	-
Enabled							1		
Disabled							0		
Save parameters	256	U16	0	65535		√	C	-	-
Load default	258	U16	0	65535		√	Z/C	-	-
Life time [h.min]	235	Float	0.00	65535.00		√	R	-	-
Failure register	-					√	R	-	-
Failure text	327	Text				-	R	-	-
Failure hour	328	U16	0	65535		-	R	-	-
Failure min	329	U16	0	59		-	R	-	-
Failure code	417	U16	0	65535		-	R	-	-
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt2							7400h		
Hw Opt 1failure							7510h		
Bus loss							8110h		
External fault							9000h		
Enable seq err							9009h		
Pointer	330	U16	1	10	10	-	R/W	-	-
Failure reset	262	U16	0	65535		√	Z/C	ID H=reset	W
Failure reg del	263	U16	0	65535		√	C	-	-
SPEC FUNCTIONS \ DC braking									
DC braking mode	904	U16	0	1	0	√	R/Z	-	-
Enabled							1		
Disabled							0		
Brk time @ stop [ms]	905	U16	0	30000	1000	√	R/W	-	-
DC braking curr [%]	717	U16	0	100	50	√	R/W	-	-
DC braking delay [ms]	716	U16	0	65535	500	√	R/W	-	-
SPEC FUNCTIONS \ Links \ Link 1									
Source	484	U16	0	65535	0	√	R/W	-	-
Destination	485	U16	0	65535	0	√	R/W	-	-
Mul.Gain	486	Float	-10000	10000	1	√	R/W	-	-
Div.Gain	487	Float	-10000	10000	1	√	R/W	-	-
Input max	488	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input min	489	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input offset	490	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Output offset	491	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input absolute	492	U16	0	1	OFF (0)	√	R/W	-	-
ON							1		
OFF							0		
SPEC FUNCTIONS \ Links \ Link 2									
Source	553	U16	0	65535	0	√	R/W	-	-
Destination	554	U16	0	65535	0	√	R/W	-	-
Mul.Gain	555	Float	-10000	10000	1	√	R/W	-	-
Div.Gain	556	Float	-10000	10000	1	√	R/W	-	-
Input max	557	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input min	558	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-

Parameter	No	Format	Value min	Value max	Value Factory	Access via Keyp.	Access via RS485/BUS/Opt2-M	Access via Terminal	Access via Opt2-A/PDC
Input offset	559	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Output offset	560	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input absolute ON OFF	561	U16	0	1	OFF (0)	√	R/W 1 0	-	-
SPEC FUNCTIONS \ Pad Parameters									
Pad 0	503	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 1	504	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 2	505	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 3	506	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 4	507	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 5	508	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 6	509	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 7	510	I16	-32768	32767	0	√	R/W	-	R/W
Pad 8	511	I16	-32768	32767	0	√	R/W	-	R/W
Pad 9	512	I16	-32768	32767	0	√	R/W	-	R/W
Pad 10	513	I16	-32768	32767	0	√	R/W	-	R/W
Pad 11	514	I16	-32768	32767	0	√	R/W	-	R/W
Pad 12	515	I16	-32768	32767	0	√	R/W	-	R/W
Pad 13	516	I16	-32768	32767	0	√	R/W	-	R/W
Pad 14	517	I16	-32768	32767	0	√	R/W	-	R/W
Pad 15	518	I16	-32768	32767	0	√	R/W	-	R/W
Bitword Pad A	519	U16	0	65535	0	√	R/W	ID*, QD*	R/W
Pad A Bit 0	520	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 1	521	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 2	522	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 3	523	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 4	524	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 5	525	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 6	526	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 7	527	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 8	528	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 9	529	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 10	530	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 11	531	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 12	532	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 13	533	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 14	534	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 15	535	U16	0	1	0	-	R/W	QD*	-
Bitword Pad B	536	U16	0	65535	0	√	R/W	QD*	R/W
Pad B Bit 0	537	U16	0	1	0	-	R/W	QD	R
Pad B Bit 1	538	U16	0	1	0	-	R/W	QD	R
Pad B Bit 2	539	U16	0	1	0	-	R/W	QD	R
Pad B Bit 3	540	U16	0	1	0	-	R/W	QD	R
Pad B Bit 4	541	U16	0	1	0	-	R/W	QD	R
Pad B Bit 5	542	U16	0	1	0	-	R/W	QD	R
Pad B Bit 6	543	U16	0	1	0	-	R/W	QD	R
Pad B Bit 7	544	U16	0	1	0	-	R/W	QD	R
Pad B Bit 8	545	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 9	546	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 10	547	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 11	548	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 12	549	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 13	550	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 14	551	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 15	552	U16	0	1	0	-	R/W	QD*	-
OPTIONS \ Option 1									
SBI enable Disabled Enabled	1293	U16	0	1	0	√	R/W 0 1	-	-
Menu	Accessible only with optional Field bus card								
OPTIONS \ Option 1\ PDC config \ PDC inputs									
Pdc in 0	1095	U16	0	65535	0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Pdc in 1	1096	U16	0	65535	0	√	R/W	-	-
Pdc in 2	1097	U16	0	65535	0	√	R/W	-	-
Pdc in 3	1098	U16	0	65535	0	√	R/W	-	-
Pdc in 4	1099	U16	0	65535	0	√	R/W	-	-
Pdc in 5	1100	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1\ PDC config \ PDC outputs									
Pdc out 0	1101	U16	0	65535	0	√	R/W	-	-
Pdc out 1	1102	U16	0	65535	0	√	R/W	-	-
Pdc out 2	1103	U16	0	65535	0	√	R/W	-	-
Pdc out 3	1104	U16	0	65535	0	√	R/W	-	-
Pdc out 4	1105	U16	0	65535	0	√	R/W	-	-
Pdc out 5	1106	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1\ PDC config \ Virt dig in									
Virt dig in 0	1107	U16	0	65535	0	√	R/W	-	-
Virt dig in 1	1108	U16	0	65535	0	√	R/W	-	-
Virt dig in 2	1109	U16	0	65535	0	√	R/W	-	-
Virt dig in 3	1110	U16	0	65535	0	√	R/W	-	-
Virt dig in 4	1111	U16	0	65535	0	√	R/W	-	-
Virt dig in 5	1112	U16	0	65535	0	√	R/W	-	-
Virt dig in 6	1113	U16	0	65535	0	√	R/W	-	-
Virt dig in 7	1114	U16	0	65535	0	√	R/W	-	-
Virt dig in 8	1115	U16	0	65535	0	√	R/W	-	-
Virt dig in 9	1116	U16	0	65535	0	√	R/W	-	-
Virt dig in 10	1117	U16	0	65535	0	√	R/W	-	-
Virt dig in 11	1118	U16	0	65535	0	√	R/W	-	-
Virt dig in 12	1119	U16	0	65535	0	√	R/W	-	-
Virt dig in 13	1120	U16	0	65535	0	√	R/W	-	-
Virt dig in 14	1121	U16	0	65535	0	√	R/W	-	-
Virt dig in 15	1122	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1\ PDC config \ Virt dig out									
Virt dig out 0	1123	U16	0	65535	0	√	R/W	-	-
Virt dig out 1	1124	U16	0	65535	0	√	R/W	-	-
Virt dig out 2	1125	U16	0	65535	0	√	R/W	-	-
Virt dig out 3	1126	U16	0	65535	0	√	R/W	-	-
Virt dig out 4	1127	U16	0	65535	0	√	R/W	-	-
Virt dig out 5	1128	U16	0	65535	0	√	R/W	-	-
Virt dig out 6	1129	U16	0	65535	0	√	R/W	-	-
Virt dig out 7	1130	U16	0	65535	0	√	R/W	-	-
Virt dig out 8	1131	U16	0	65535	0	√	R/W	-	-
Virt dig out 9	1132	U16	0	65535	0	√	R/W	-	-
Virt dig out 10	1133	U16	0	65535	0	√	R/W	-	-
Virt dig out 11	1134	U16	0	65535	0	√	R/W	-	-
Virt dig out 12	1135	U16	0	65535	0	√	R/W	-	-
Virt dig out 13	1136	U16	0	65535	0	√	R/W	-	-
Virt dig out 14	1137	U16	0	65535	0	√	R/W	-	-
Virt dig out 15	1138	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 2									
Menu	Accessible only with optional DGF card (See DGF card user manual)								
Enable OPT2 Enabled Disabled	425	U16	0	1	Disabled (0)	√	R/Z 1 0		
OPTIONS \ PID									
Enable PI PID Enabled Disabled	769	U16	0	1	Disabled (0)	√	R/W 1 0	ID	R/W
Enable PD PID Enabled Disabled	770	U16	0	1	Disabled (0)	√	R/W 1 0	ID	R/W
OPTIONS \ PID \ PID source									
PID source	786	U16	0	65535	0	√	R/W	-	-
PID source gain	787	Float	-100.000	100.000	1.000	√	R/W	-	-
OPTIONS \ PID									
Feed-fwd PID	758	I16	-10000	10000	0	√	R	IA	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
OPTIONS \ PID \ PID references									
PID error	759	I16	-10000	10000	0	√	R	-	R
PID feed-back	763	I16	-10000	10000	0	√	R/W	IA	R/W
PID offs. Sel	762	U16	0	1	Offset 0 (0)	√	R/W	ID	R/W
Offest 0							0		
Offset 1							1		
PID offset 0	760	I16	-10000	10000	0	√	R/W	IA	R/W
PID offset 1	761	I16	-10000	10000	0	√	R/W	-	-
PID acc time [s]	1046	Float	0.0	900.0	0.0	√	R/W	-	-
PID dec time [s]	1047	Float	0.0	900.0	0.0	√	R/W	-	-
PID clamp	757	I16	0	10000	10000	√	R/W	-	-
OPTIONS \ PID \ PI controls									
PI P gain PID %	765	Float	0.00	100.00	10.00	√	R/W	-	-
PI I gain PID %	764	Float	0.00	100.00	10.00	√	R/W	-	-
PI steady thr	695	I16	0	10000	0	√	R/W	-	-
PI steady delay [ms]	731	U16	0	60000	0	√	R/W	-	-
P init gain PID %	793	Float	0.00	100.00	10.00	√	R/W	-	-
I init gain PID %	734	Float	0.00	100.00	10.00	√	R/W	-	-
PI central v sel	779	U16	0	3	1	√	R/W	ID	R/W
PI central v1	776	Float	P785	P784	1.00	√	R/W	-	-
PI central v2	777	Float	P785	P784	1.00	√	R/W	-	-
PI central v3	778	Float	P785	P784	1.00	√	R/W	IA	-
PI top lim	784	Float	P785	10.00	10.00	√	R/W	-	-
PI bottom lim	785	Float	-10.00	P784	0	√	R/W	-	-
PI integr freeze	783	U16	0	1	0	√	R/W	ID	R/W
ON							1		
OFF							0		
OPTIONS \ PID									
PI output PID	771	I16	0	1000 x P784	1000	√	R	-	R
Real FF PID	418	I16	-10000	10000	0	√	R	-	R
OPTIONS \ PID \ PD controls									
PD P gain 1 PID [%]	768	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 1 PID [%]	766	Float	0.00	100.00	1.00	√	R/W	-	-
PD P gain 2 PID [%]	788	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 2 PID [%]	789	Float	0.00	100.00	1.00	√	R/W	-	-
PD P gain 3 PID [%]	790	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 3 PID[%]	791	Float	0.00	100.00	1.00	√	R/W	-	-
PD D filter PID [ms]	767	U16	0	1000	0	√	R/W	-	-
OPTIONS \ PID									
PD output PID	421	I16	-10000	10000	0	√	R	-	R
PID out sign PID	772	U16	0	1	1	√	R/W	-	-
Positive							0		
Bipolar							1		
PID output	774	I16	-10000	10000	0	√	R	QA	R
OPTIONS \ PID \ PID target									
PID target	782	U16	0	65535	0	√	R/W	-	-
PID out scale	773	Float	-100.000	100.000	1.000	√	R/W	-	-
OPTIONS \ PID \ Diameter calc									
Diameter calc	794	U16	0	1	0	√	Z/R	ID	R/W
Enabled							1		
Disabled							0		
Positioning spd [rpm]	795	I16	-100	100	0	√	R/W	-	-
Max deviation	796	I16	-10000	10000	8000	√	R/W	-	-
Gear box ratio	797	Float	0.001	1.000	1.000	√	R/W	-	-
Dancer constant [mm]	798	U16	1	10000	1	√	R/W	-	-
Minimum diameter [cm]	799	U16	1	2000	1	√	R/W	-	-
OPTIONS \ PID									
PI central vs0	780	U16	0	1	1	-	R/W	ID	R/W
PI central vs1	781	U16	0	1	0	-	R/W	ID	R/W
Diameter calc st	800	U16	0	1	0	-	R	QD	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
DRIVECOM									
Malfunction code	57	U16	0	65535		√	R	-	R
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt2							7400h		
Hw opt 1 failure							7510h		
Bus loss							8110h		
External fault							9000h		
Enable seq err							9009h		
Control Word	55	U16	0	65535	0	√	R/W	-	R/W
Status word	56	U16	0	65535	-	√	R	-	R
Speed input var [FF] (Ramp ref 1)	44	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	
Speed ref var [FF] (Speed ref)	115	I16	-32768	32767		√	R	-	R
Act speed value [FF] (Actual spd)	119	I16	-32768	32767		√	R	-	R
DRIVECOM \ Speed amount									
Speed min amount [FF]	1	U32	0	$2^{32}-1$	0	√	R/Z	-	
Speed max amount [FF]	2	U32	0	$2^{32}-1$	5000	√	R/Z	-	-
DRIVECOM \ Speed min/max									
Speed min pos [FF]	5	U32	0	$2^{32}-1$	0	√	R/Z	-	-
Speed max pos [FF]	3	U32	0	$2^{32}-1$	5000	√	R/Z	-	-
Speed min neg [FF]	6	U32	0	$2^{32}-1$	0	√	R/Z	-	-
Speed max neg [FF]	4	U32	0	$2^{32}-1$	5000	√	R/Z	-	-
DRIVECOM \ Acceleration									
Acc delta speed [FF]	21	U32	0	$2^{32}-1$	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Deceleration									
Dec delta speed [FF]	29	U32	0	$2^{32}-1$	100	√	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Quick stop									
QStp opt code	713	I16	-2	-1	Ramp stop (1)	√	R/Z		-
Ramp stop							1		
DC braking curr							2		
QStp delta speed [FF]	37	U32	0	$2^{32}-1$	1000	√	R/W	-	-
QStp delta time [s]	38	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Face value fact									
Face value num	54	I16	1	32767	1	√	R/Z	-	R
Face value den	53	I16	1	32767	1	√	R/Z	-	R
DRIVECOM \ Dimension fact									
Dim factor num	50	I32***	1	65535	1	√	R/Z	-	R
Dim factor den	51	I32***	1	$2^{32}-1$	1	√	R/Z	-	R
Dim factor text	52	Text			rpm	√	R/Z	-	-
DRIVECOM									
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Speed input perc [%]	46	I16	-32768	32767	0	√	R/W	-	R/W
Percent ref var [%]	116	I16	-32768	32767	0	√	R	-	R
Act percentage [%]	120	I16	-32768	32767	0	√	R	-	R
SERVICE									
Password 2	86			Service		√	W	-	-

3.2. LIST OF ALL PARAMETERS IN NUMERIC ORDER

Parameter	No	Format	Value min	Value max	Value Factory	Access via Keyp.	Access via RS485/BUS/Opt2-M	Access via Terminal	Access via Opt2-A/PDC
Speed min amount [FF]	1	U32	0	2^{32}-1	0	√	R/Z	-	
Speed max amount [FF]	2	U32	0	2^{32}-1	5000	√	R/Z	-	-
Speed max pos [FF]	3	U32	0	2^{32}-1	5000	√	R/Z	-	-
Speed max neg [FF]	4	U32	0	2^{32}-1	5000	√	R/Z	-	-
Speed min pos [FF]	5	U32	0	2^{32}-1	0	√	R/Z	-	-
Speed min neg [FF]	6	U32	0	2^{32}-1	0	√	R/Z	-	-
T current lim [%]	7	U16	0	F	S	√	R/W	IA	R/W
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
In use Tcur lim+ [%]	10	U16	0	F		√	R	-	R
In use Tcur lim- [%]	11	U16	0	F		√	R	-	R
Current lim red [%]	13	U16	0	F	100	√	R/W	-	R/W
S shape t const [ms]	19	Float	100	3000	500	√	R/W	-	-
Ramp shape	18	U16	0	1	Linear (0)	√	R/Z	-	-
Linear							0		
S-Shaped							1		
Ramp +/- delay [ms]	20	U16	0	65535	100	√	R/W		-
Acc delta speed [FF]	21	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
Acc delta speed1 [FF]	23	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time 1 [s]	24	U16	0	65535	1	√	R/W	-	-
Acc delta speed2 [FF]	25	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time 2 [s]	26	U16	0	65535	1	√	R/W	-	-
Acc delta speed3 [FF]	27	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time 3 [s]	28	U16	0	65535	1	√	R/W	-	-
Dec delta speed [FF]	29	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
Dec delta speed1 [FF]	31	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time 1 [s]	32	U16	0	65535	1	√	R/W	-	-
Dec delta speed2 [FF]	33	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time 2 [s]	34	U16	0	65535	1	√	R/W	-	-
Dec delta speed3 [FF]	35	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time 3 [s]	36	U16	0	65535	1	√	R/W	-	-
QStp delta speed [FF]	37	U32	0	2^{32}-1	1000	√	R/W	-	-
QStp delta time [s]	38	U16	0	65535	1	√	R/W	-	-
T current ref 1 [%]	39	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref 2 [%]	40	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref [%]	41	I16	-500	500	-	√	R	QA	R
Speed ref 1 [FF]	42	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Speed ref 2 [FF]	43	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Ramp ref 1 [FF] (Speed input var)	44	I16	-2 x P45	+2 x P45	0	√	R/W	IA, QA	R/W
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Speed input perc [%]	46	I16	-32768	32767	0	√	R/W	-	R/W
Ramp ref 1 (%)	47	Float	-200.0	+200.0	0.0	√	R/W	-	-
Ramp ref 2 [FF]	48	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Ramp ref 2 (%)	49	Float	-200.0	+200.0	0.0	√	R/W	-	-
Dim factor num	50	I32***	1	65535	1	√	R/Z	-	R
Dim factor den	51	I32***	1	2^{32}-1	1	√	R/Z	-	R
Dim factor text	52	Text			rpm	√	R/Z	-	-
Face value den	53	I16	1	32767	1	√	R/Z	-	R
Face value num	54	I16	1	32767	1	√	R/Z	-	R
Control Word	55	U16	0	65535	0	√	R/W	-	R/W
Status word	56	U16	0	65535	-	√	R	-	R
Malfunction code	57	U16	0	65535		√	R	-	-
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt2							7400h		
Hw opt 1 failure							7510h		
Bus loss							8110h		
External fault							9000h		
Enable seq err							9009h		
Gen access	58	U16	0	4	Not conn. (0)	√	R/Z	-	-
Not connected							0		
F current ref							1		
T current ref							2		
Flux ref							3		
Ramp ref							4		
Gen frequency [Hz]	59	Float	0.1	62.5	1.0	√	R/W	-	-
Gen amplitude [%]	60	Float	0.00	200.00	0.00	√	R/W	-	-
Gen offset [%]	61	Float	-200.00	200.00	0.00	√	R/W	-	-
Scale output 1	62	Float	-10.000	10.000	1.000	√	R/W	-	-
Scale output 2	63	Float	-10.000	10.000	1.000	√	R/W	-	-
Scale output 3	64	Float	-10.000	10.000	1.000	√	R/W	-	-
Scale output 4	65	Float	-10.000	10.000	1.000	√	R/W	-	-
Select output 1	66	U16	0	88	Actual speed (8)	√	R/Z	-	-
OFF							0		
Speed ref 1							1		
Speed ref 2							2		
Ramp ref 1							3		
Ramp ref 2							4		
Ramp ref							5		
Speed ref							6		
Ramp output							7		
Actual spd (rpm)							8		
T current ref 1							9		
T current ref 2							10		
T current ref							11		
F current ref							12		
Flux current							13		
Torque current							14		
Speed reg out							15		
Motor current							16		
Current U							17		
Current V							18		
Current W							19		
Output voltage							20		
Voltage U							21		
Voltage V							22		
DC link voltage							23		
Analog input 1							24		
Analog input 2							25		
Analog input 3							26		
Flux							27		
Active power							28		
Torque							29		
Rr adap output							30		
Pad 0							31		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Pad 1							32		
Pad 4							33		
Pad 5							34		
Flux reference							35		
Pad 6							38		
PID output							39		
Feed fwd power							78		
Out vlt level							79		
Flux level							80		
F act spd (rpm)							81		
F T curr (%)							82		
Spd draw out							84		
PL next factor							87		
PL active limit							88		
Select output 2	67	U16	0	88	T current (14)	√	R/Z	-	-
(Select like output 1)									
Select output 3	68	U16	0	88	Current U (17)	√	R/Z	-	-
(Select like output 1)									
Select output 4	69	U16	0	88	Motor current (16)	√	R/Z	-	-
(Select like output 1)									
Select input 1	70	U16	0	28	Ramp ref 1 (4)	√	R/Z	-	-
OFF							0		
Jog reference							1		
Speed ref 1							2		
Speed ref 2							3		
Ramp ref 1							4		
Ramp ref 2							5		
T current ref 1							6		
T current ref 2							7		
Adap reference							8		
T current lim							9		
T current lim +							10		
T current lim -							11		
Pad 0							12		
Pad 1							13		
Pad 2							14		
Pad 3							15		
Load comp							19		
PID offset 0							21		
PI central v3							22		
PID feed-back							23		
V/f flux level							24		
Flux level							25		
Out vlt level							26		
Speed ratio							28		
Input 1 type	71	U16	0	2	± 10 V (0)	√	R/Z	-	-
-10V ... + 10 V							0		
0...20 mA, 0...10 V							1		
4...20 mA							2		
Scale input 1	72	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 1	73	Float	0.1	10.000	1.000	√	R/W	-	-
Offset input 1	74	I16	-32768	32767	0	√	R/W	-	-
Select input 2	75	U16	0	28	OFF (0)	√	R/Z	-	-
(Select like Input 1)									
Input 2 type	76	U16	0	2	± 10 V (0)	√	R/Z	-	-
-10V ... + 10 V							0		
0...20 mA, 0...10 V							1		
4...20 mA							2		
Scale input 2	77	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 2	78	Float	0.1	10.000	1.000	√	R/W	-	-
Offset input 2	79	I16	-32768	32767	0	√	R/W	-	-
Select input 3	80	U16	0	28	OFF (0)	√	R/Z	-	-
(Select like Input 1)									

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Input 3 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	81	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Scale input 3	82	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 3	83	Float	0.1	10.000	1.000	√	R/W	-	-
Offset input 3	84	I16	-32768	32767	0	√	R/W	-	-
Pword 1 : Enabled Disabled	85	I32	00000	99999	Disabled (0)	√	W 1 0	-	-
Password 2	86	Service				√	W	-	-
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-
Current P [%]	89	Float	0.00	100.00	S	√	R/W	-	-
Current I [%]	90	Float	0.00	100.00	S	√	R/W	-	-
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
Speed P base [A/rpm]	93	Float	0.001	99.999	S	√	R/Z	-	-
Speed I base[A/rpm×ms]	94	Float	0.001	99.999	S	√	R/Z	-	-
Current P base [V/A]	95	Float	0.1	99999.9	S	√	R/Z	-	-
Current I base [V/A×ms]	96	Float	0.1	9999.9	S	√	R/Z	-	-
Flux P base [A/Vs]	97	Float	0.1	9999.9	S	√	R/Z	-	-
Flux I base [A/Vs×ms]	98	Float	0.01	999.99	S	√	R/Z	-	-
Speed P in use [%]	99	Float	0.00	100.00	S	√	R	-	-
Speed I in use [%]	100	Float	0.00	100.00	S	√	R	-	-
Spd threshold + [FF]	101	U16	1	32767	1000	√	R/W	-	-
Spd threshold - [FF]	102	U16	1	32767	1000	√	R/W	-	-
Threshold delay [ms]	103	U16	0	65535	100	√	R/W	-	-
Set error [FF]	104	U16	1	32767	100	√	R/W	-	-
Set delay [ms]	105	U16	0	65535	100	√	R/W	-	-
Ref 0 level [FF]	106	U16	1	32767	10	√	R/W	-	-
Speed zero level [FF]	107	U16	1	32767	10	√	R/W	-	-
Speed zero delay [ms]	108	U16	0	65535	100	√	R/W	-	-
Ramp ref (d) [FF]	109	I16	-32768	32767	-	√	R	-	R
Ramp ref (rpm)	110	I16	-32768	32767	-	√	R	QA	R
Ramp ref (%)	111	Float	-200.0	+ 200.0	-	√	R	-	-
Ramp output (d) [FF]	112	I16	-32768	32767	-	√	R	-	R
Ramp outp (rpm)	113	I16	-32768	32767	-	√	R	QA	R
Ramp output (%)	114	Float	-200.0	+ 200.0	-	√	R	-	-
Speed ref (d) [FF] (Speed ref var)	115	I16	-32768	32767	-	√	R	-	R
Percent ref var [%]	116	I16	-32768	32767	0	√	R	-	R
Speed ref (%)	117	Float	-200.0	+ 200.0	-	√	R	-	-
Speed ref [rpm]	118	I16	-32768	32767	-	√	R	QA	R
Actual spd (d) [FF] (Act spd value)	119	I16	-32768	32767	-	√	R	-	R
Act percentage [%]	120	I16	-32768	32767	0	√	R	-	R
Actual spd (%)	121	Float	-200.0	+ 200.0	-	√	R	-	-
Actual spd (rpm)	122	I16	-8192	8192	-	√	R	QA	R
Enable spd=0 I Enabled Disabled	123	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Enable spd=0 R Enabled Disabled	124	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Enable spd=0 P Enabled Disabled	125	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Spd=0 P gain [%]	126	Float	0.00	100.00	10.00	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital input 1	137	U16	0	67	OFF (0)	√	R/Z	-	-
OFF							0		
Motor pot reset							1		
Motor pot up							2		
Motor pot down							3		
Motor pot sign +							4		
Motor pot sign -							5		
Jog +							6		
Jog -							7		
Failure reset							8		
Torque reduct							9		
Ramp out = 0							10		
Ramp in = 0							11		
Freeze ramp							12		
Lock speed reg							13		
Lock speed I							14		
Auto capture							15		
Input 1 sign +							16		
Input 1 sign -							17		
Input 2 sign +							18		
Input 2 sign -							19		
Input 3 sign +							20		
Input 3 sign –							21		
Zero torque							22		
Speed sel 0							23		
Speed sel 1							24		
Speed sel 2							25		
Ramp sel 0							26		
Ramp sel 1							27		
Speed fbk sel							28		
PAD A bit 0							32		
PAD A bit 1							33		
PAD A bit 2							34		
PAD A bit 3							35		
PAD A bit 4							36		
PAD A bit 5							37		
PAD A bit 6							38		
PAD A bit 7							39		
Fwd sign							44		
Rev sign							45		
An in 1 target							46		
An in 2 target							47		
An in 3 target							48		
Enable droop							49		
Quick stop							51		
Enable PI PID							52		
Enable PD PID							53		
PI int freeze PID							54		
PID offs. sel							55		
PI central v s0							56		
PI central v s1							57		
Diameter calc							58		
Lock zero pos							59		
Lock save eng							60		
Mot setup sel 0							62		
PL mains status							66		
PL time-out ack							67		
Digital input 2 (Select like input 1)	138	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 3 (Select like input 1)	139	U16	0	67	OFF (0)	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital input 4 (Select like input 1)	140	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 5 (Select like input 1)	141	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 6 (Select like input 1)	142	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 7 (Select like input 1)	143	U16	0	67	OFF (0)	√	R/Z	-	-
Digital input 8 (Select like input 1)	144	U16	0	67	OFF (0)	√	R/Z	-	-
Digital output 1	145	U16	0	63	Ramp + (8)	√	R/Z	-	-
OFF							0		
Speed zero thr							1		
Spd threshold							2		
Set speed							3		
Curr limit state							4		
Drive ready							5		
Overld available							6		
Ramp +							8		
Ramp -							9		
Speed limited							10		
Undervoltage							11		
Overvoltage							12		
Heatsink sensor							13		
Overcurrent							14		
Overtemp motor							15		
External fault							16		
Failure supply							17		
Pad A bit							18		
Pad B bit							19		
Virt dig input							20		
Speed fbk loss							25		
Bus loss							26		
Output stages							27		
Hw opt 1 failure							28		
Opt 2 failure							29		
Encoder 1 state							30		
Encoder 2 state							31		
Ovld mot state							32		
Enable seq err							35		
BU overload							36		
Diameter calc st							38		
Mot setup state							46		
Input 1 cp match							49		
Overload 200%							51		
PL stop active							52		
PL next active							53		
PL time-out sig							54		
Regulation ot							55		
Module overtemp.							56		
Heatsink ot							57		
Intake air ot							62		
Heatsink tmp thr							63		
Digital output 2 (Select like output 1)	146	U16	0	63	Ramp - (9)	√	R/Z	-	
Digital output 3 (Select like output 1)	147	U16	0	63	Spd threshold (2)	√	R/Z	-	
Digital output 4 (Select like output 1)	148	U16	0	63	Overld available (6)	√	R/Z	-	-
Digital output 5 (Select like output 1)	149	U16	0	63	Curr limit state (4)	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital output 6 (Select like output 1)	150	U16	0	63	Over-voltage (12)	√	R/Z	-	-
Digital output 7 (Select like output 1)	151	U16	0	63	Under-voltage (11)	√	R/Z	-	-
Digital output 8 (Select like output 1)	152	U16	0	63	Over-current (14)	√	R/Z	-	-
Enab multi spd Enabled Disabled	153	I16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Multi speed 1 [FF]	154	I16	-32768	32767	0	√	R/W	-	-
Multi speed 2 [FF]	155	I16	-32768	32767	0	√	R/W	-	-
Multi speed 3 [FF]	156	I16	-32768	32767	0	√	R/W	-	-
Multi speed 4 [FF]	157	I16	-32768	32767	0	√	R/W	-	-
Multi speed 5 [FF]	158	I16	-32768	32767	0	√	R/W	-	-
Multi speed 6 [FF]	159	I16	-32768	32767	0	√	R/W	-	-
Multi speed 7 [FF]	160	I16	-32768	32767	0	√	R/W	-	-
Nominal voltage [V]	161	Float	1	999	400	√	R/Z	-	-
Nominal speed [rpm]	162	Float**	1	99999	S	√	R/Z	-	-
Nom frequency [Hz]	163	Float	1	999	50	√	R/Z	-	-
Nominal current [A]	164	Float	0.10	999.00	S	√	R/Z	-	-
Magnetizing cur [A]	165	Float	0.10	999.00	S	√	R/W	-	-
Rotor resistance [Ohm]	166	Float	0.0001	S	S	√	R/W	-	-
Base voltage [V]	167	Float	1	999	400	√	R/Z	-	-
Base frequency [Hz]	168	Float	1	999	50	√	R/Z	-	-
Encoder 2 pulses	169	Float*	600	9999	1024	√	R/Z	-	R
P1 flux model	176	Float	0.00	1.00	S	√	R/W	-	-
Full load curr [A]	179	Float	0.10	999.00	S	√	R/Z	-	-
Enable spd adap Enabled Disabled	181	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Sel adap type Speed Adap reference	182	U16	0	1	Speed (0)	√	R/Z 0 1	-	-
Adap reference [FF]	183	I16	-32768	32767	1000	√	R/W	IA	R/W
Adap speed 1 [%]	184	Float	0.0	200.0	20.3	√	R/W	-	-
Adap speed 2 [%]	185	Float	0.0	200.0	40.7	√	R/W	-	-
Adap joint 1 [%]	186	Float	0.0	200.0	6.1	√	R/W	-	-
Adap joint 2 [%]	187	Float	0.0	200.0	6.1	√	R/W	-	-
Adap P gain 1 [%]	188	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 1 [%]	189	Float	0.00	100.00	1.00	√	R/W	-	-
Adap P gain 2 [%]	190	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 2 [%]	191	Float	0.00	100.00	1.00	√	R/W	-	-
Adap P gain 3 [%]	192	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 3 [%]	193	Float	0.00	100.00	1.00	√	R/W	-	-
Multi ramp sel	202	U16	0	3	0	√	R/W	-	R/W
Multi speed sel	208	U16	0	7	0	√	R/W	-	R/W
Latch ON OFF	210	U16	0	1	ON (1)	√	R/Z 1 0	-	-
OK relay open ON OFF	211	I16	0	1	ON (1)	√	R/W 1 0	-	-
DC link voltage [V]	227	U16	0	999	-	√	R	QA	-
Active power [%]	229	Float**	-500	500	-	√	R	QA	R
Torque [%]	230	Float	-500	500	-	√	R	QA	-
Motor current [A]	231	Float	0.00	S	-	√	R	QA	-
Output voltage [V]	233	Float**	0	500	-	√	R	QA	R
Flux [%]	234	Float*	0.00	100.00	-	√	R	QA	R
Flux	234	Float*	0.00	100.00	-	√	R	QA	R
Life time [h.min]	235	Float	0.00	65535.00		√	R	-	-
Speed reg output [%]	236	I16	-	-	-	√	R	QA	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Switching freq	240	U16	S	S	S	√	R/Z	-	-
4 KHz							0		
8 KHz							1		
16 KHz							2		
2 KHz							3		
Enable spd reg	242	I16	0	1	Enabled (1)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Enab multi rmp	243	I16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Enable jog	244	I16	0	1	Enabled (1)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Enable ramp	245	I16	0	1	Enabled (1)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Enab motor pot	246	I16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Motor pot sign	248	I16	0	1	Positive (1)		R/W	ID	-
Positive							1		
Negative							0		
Motor pot reset	249	U16	0	65535		√	Z/C	ID H=reset	-
Load motor par	251	U16	0	1	Std400V (0)	√	Z	-	-
Std for 400V							0		
Std for 460V							1		
Main commands	252	U16	0	1	Terminals (0)	√	R/Z	-	-
Terminals							0		
Digital							1		
Control mode	253	U16	0	1	Local (0)	√	R/Z	-	-
Local							0		
Bus							1		
Save parameters	256	U16	0	65535		√	C	-	-
Load default	258	U16	0	65535		√	Z/C	-	-
Auto tune inp 1	259	U16	0	65535	-	√	C	-	-
Auto tune							1		
Auto tune inp 2	260	U16	0	65535	-	√	C	-	-
Auto tune							1		
Auto tune inp 3	261	U16	0	65535	-	√	C	-	-
Auto tune							1		
Failure reset	262	U16	0	65535		√	Z/C	ID H=reset	W
Failure reg del	263	U16	0	65535		√	C	-	-
Jog reference [FF]	266	I16	0	32767	100	√	R/W	IA	-
Current norm	267	Float	0.00	9999.99	S	-	R	-	-
Forward sign	293	U16	0	1	not sel (0)	-	R/W	ID	R/W
FWD selected							1	H	
FWD not selected							0	L	
Reverse sign	294	U16	0	1	not sel (0)	-	R/W	ID	R/W
REV selected							1	H	
REV not selected							0	L	
An in 1 target	295	U16	0	1	Assign. (0)	√	R/W	ID	R/W
Assigned							0	L	
Not assigned							1	H	
An in 2 target	296	U16	0	1	Assign.(0)	√	R/W	ID	R/W
Assigned							0	L	
Not assigned							1	H	
An in 3 target	297	U16	0	1	Assign. (0)	√	R/W	ID	R/W
Assigned							0	L	
Not assigned							1	H	

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Drive type (AVy)	300	U16	-	-	18	-	R	-	R
Flt_100_mf	303	I16	0	32767	S	-	R	-	R
Enable drive	314	U16	0	1	Disabled (0)	√	R/W	12	R/W
Enabled							1	H	
Disabled							0	L	
Start/Stop	315	U16	0	1	Stop (0)	√	R/W	13	R/W
Start							1	H	
Stop							0	L	
Fast stop	316	U16	0	1	No fast stop (1)	-	R/W	14	R/W
Fast Stop							0	L	
No Fast Stop							1	H	
Device address	319	U16	0	127	0	√	R/Z	-	-
Regulation mode	321	U16	0	3	V/f control (3)	√	R/Z	-	-
Sensorless vect							0		
Self-tuning							1		
Field oriented							2		
V/f control							3		
Lock speed reg	322	U16	0	1	OFF (0)	√	R/W	ID	R/W
ON							1	L	
OFF							0	H	
Ser protocol sel	323	U16	0	2	0	√	R/W	-	-
Slink3							0		
Modbus-RTU							1		
J Bus							2		
Output frequency [Hz]	324	Float	0.0	500.0	-	√	R	-	-
Ser baudrate sel	326	U16	0	4	1	√	R/W	-	-
19200							0		
19600							1		
4800							2		
2400							3		
1200							4		
Failure text	327	Text				-	R	-	-
Failure hour	328	U16	0	65535		-	R	-	-
Failure min	329	U16	0	59		-	R	-	-
Pointer	330	U16	1	10	10	-	R/W	-	-
Software version	331	Text	-	-	-	√	R	-	-
Ambient temp [°C]	332	U16	0	1	40°C (1)	√	R/Z	-	-
50°C (122°F)							0		
40°C (104°F)							1		
Mains voltage	333	U16	0	2	400 V (1)	√	R/Z	-	-
230 V							0		
400 V							1		
460 V							2		
Rated drive curr	334	U16	0	16	S	-	R	-	R
7.5							0		
12.6							1		
17.7							2		
24.8							3		
33							4		
47							5		
63							6		
79							7		
93							8		
114							9		
142							10		
185							11		
210							12		
250							13		
324							14		
485							15		
580							16		
2.4							17		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
4							18		
5.6							19		
9.6							20		
Quick stop	343	U16	0	1	No quick stop (1)	-	R/W	ID	R/W
Quick stop							0	L	
No Quick stop							1	H	
Rated drive curr	334	U16	0	16	S	-	R	-	R
7.5							0		
12.6							1		
17.7							2		
24.8							3		
33							4		
47							5		
63							6		
79							7		
93							8		
114							9		
142							10		
185							11		
210							12		
250							13		
324							14		
485							15		
580							16		
2.4							17		
4							18		
5.6							19		
9.6							20		
Torque reduct	342	U16	0	1	Not act. (0)	√	R/W	ID	R/W
Not actived							0	L	
actived							1	H	
Ramp out = 0	344	U16	0	1	Not act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
Ramp in = 0	345	U16	0	1	Not act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
Ramp +	346	U16	0	1	-	-	R	QD	R
Acc. clockwise +							1	H	
Dec. counter-clockwise									
Other states							0	L	
Ramp -	347	U16	0	1	-	-	R	QD	R
Acc. counter-clockwise +									
Dec. clockwise							1	H	
Other states							0	L	
Lock speed I	348	U16	0	1	Not act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
Curr limit state	349	U16	0	1		-	R	QD	R
Curr. limit not reached							0	L	
Curr. limit reached							1	H	
Torque current	350	Float	S	S		-	R	QA	-
Flux current	351	Float	S	S		-	R	QA	-
F current ref	352	Float	S	S		-	R	QA	-
Zero torque	353	U16	0	1	Not Act. (1)	√	R/W	ID	R/W
Actived							0	L	
Not Actived							1	H	
Activity	354	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		

Parameter	No	Format	Value min	Value max	Value Factory	Access via Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Curr lim stop							5		
Latch ON OFF	355	U16	0	1	ON (1)	√	R/Z 1 0	-	-
OK relay open ON OFF	356	I16	0	1	ON (1)	√	R/W 1 0	-	-
Latch ON OFF	357	U16	0	1	ON (1)	√	R/Z 1 0	-	-
OK relay open ON OFF	358	I16	0	1	ON (1)	√	R/W 1 0	-	-
Restart time [ms]	359	U16	0	65535	1000	√	R/W	-	-
N of attempts	360	U16	0	100	1	√	R/W	-	-
Latch ON OFF	361	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	362	I16	0	1	ON (1)	√	R/W 1 0	-	-
Latch ON OFF	363	U16	0	1	ON (1)	√	R/Z 1 0	-	-
OK relay open ON OFF	364	I16	0	1	ON (1)	√	R/W 1 0	-	-
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	365	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	366	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	367	I16	0	1	ON (1)	√	R/W 1 0	-	-
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	368	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	369	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	370	I16	0	1	ON (1)	√	R/W 1 0	-	-
Cos phi	371	Float	0.1	0.99	S	√	R/Z	-	-
Speed limited Speed not limited Speed limited	372	U16	0	1		-	R 0 1	QD L H	R
Freeze ramp Actived Not Actived	373	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Jog selection Speed input Ramp input	375	U16	0	1	Spd inp. (0)	√	R/Z 0 1	-	-
Speed ref 1 (%)	378	Float	-200.0	+200.0	0.0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Speed Ref 2 (%)	379	Float	-200.0	+200.0	0.0	√	R/W	-	-
Drive ready Drive ready Drive not ready	380	U16	0	1	-	-	R 1 0	QD H L	R
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	386	U16	1	5	Disabled drive (2)	√	R/Z 1 2 3 4 5	-	-
OK relay open ON OFF	387	I16	0	1	ON (1)	√	R/W 1 0	-	-
Auto capture ON OFF	388	U16	0	1	OFF (0)	√	R/W 1 0	ID H L	-
Input 1 sign Positive Negative	389	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Input 2 sign Positive Negative	390	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Input 3 sign Positive Negative	391	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Spd threshold Speed exceeded Speed not exceeded	393	U16	0	1		-	R 0 1	QD L H	R
Set speed Speed not ref. val. Speed = ref. val.	394	U16	0	1		-	R 0 1	QD L H	R
Spd zero thr Drive not rotating Drive rotating	395	U16	0	1		-	R 0 1	QD L H	R
Motor pot up No acceleration Acceleration	396	U16	0	1	No acc. (0)	-	R/W 0 1	ID L H	R/W
Motor pot down No deceleration Deceleration	397	U16	0	1	No dec. (0)	-	R/W 0 1	ID L H	R/W
Jog + No jog forward Forward jog	398	U16	0	1	No jog+ (0)	-	R/W 0 1	ID L H	R/W
Jog - No backward jog Backward jog	399	U16	0	1	No jog- (0)	-	R/W 0 1	ID L H	R/W
Speed sel 0 Value 2^0 not selected Value 2^0 selected	400	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Speed sel 1 Value 2^1 not selected Value 2^1 selected	401	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Speed sel 2 Value 2^2 not selected Value 2^2 selected	402	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Ramp sel 0 Value 2^0 not selected Value 2^0 selected	403	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Ramp sel 1 Value 2^1 not selected Value 2^1 selected	404	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Ovld Available	406	U16	0	1	-	-	R	QD	R
Overload not possible							0	L	
Overload possible							1	H	
Ser answer delay [ms]	408	U16	0	900	0	√	R/W	-	-
Ok relay funct	412	I16	0	1	Drive healthy (0)	√	R/Z	-	-
Drive healthy							0		
Ready to start							1		
Magn boost curr [%]	413	U16	10	136	30	√	R/Z	-	-
Speed fbk sel	414	U16	0	1	Enc.1 (1)	√	R/Z	ID	R/W
Encoder 1							1	H	
Encoder 2							0	L	
Encoder 1 type	415	I16	0	1	Digital (1)	√	R/Z	-	-
Sinusoidal							0		
Digital							1		
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Failure code	417	U16	0	65535		-	R	-	-
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt2							7400h		
Hw Opt 1failure							7510h		
Bus loss							8110h		
External fault							9000h		
Enable seq err							9009h		
Real FF PID	418	I16	-10000	10000	0	√	R	-	R
Enc2 speed [rpm]	420	I16	-8192	8192	-	√	R	-	R
PD output PID	421	I16	-10000	10000	0	√	R	-	R
Enable lck sls	422	U16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Enable OPT2	425	U16	0	1	Disabled (0)	√	R/Z		
Enabled							1		
Disabled							0		
Enc1 speed [rpm]	427	I16	-8192	8192	-	√	R	-	R
Enable rr adap	435	U16	0	1	Disabled (0)	√	R/W	-	-
Enabled							1		
Disabled							0		
Stator resist [Ohm]	436	Float	0.0001	S	S	√	R/W	-	-
Stator resist [Ohm]	436	Float	0.0001	S	S	√	R/W	-	-
Lkg inductance [H]	437	Float	0.00001	9.00000	S	√	R/W	-	-
Prop. filter [ms]	444	U16	0	1000	0	√	R/W	-	-
Speed up gain [%]	445	Float	0.00	100.00	0.00	√	R/W	-	-
Speed up base [ms]	446	Float	0	16000	1000	√	R/W	-	-
Speed up filter [ms]	447	U16	0	1000	0	√	R/W	-	-
Flux level [%]	467	U16	10	100	100	√	R/W	IA QA	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Flux reg mode	469	U16	0	1	Volt.control (1)	√	R/Z		-
Constant current							0	-	
Voltage control							1		
Source	484	U16	0	65535	0	√	R/W	-	-
Destination	485	U16	0	65535	0	√	R/W	-	-
Mul.Gain	486	Float	-10000	10000	1	√	R/W	-	-
Div.Gain	487	Float	-10000	10000	1	√	R/W	-	-
Input max	488	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input min	489	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input offset	490	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Output offset	491	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input absolute	492	U16	0	1	OFF (0)	√	R/W	-	-
ON							1		
OFF							0		
Flux reference	500	Float*	0.0	100.0	-	√	R	QA	R
Pad 0	503	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 1	504	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 2	505	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 3	506	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 4	507	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 5	508	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 6	509	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 7	510	I16	-32768	32767	0	√	R/W	-	R/W
Pad 8	511	I16	-32768	32767	0	√	R/W	-	R/W
Pad 9	512	I16	-32768	32767	0	√	R/W	-	R/W
Pad 10	513	I16	-32768	32767	0	√	R/W	-	R/W
Pad 11	514	I16	-32768	32767	0	√	R/W	-	R/W
Pad 12	515	I16	-32768	32767	0	√	R/W	-	R/W
Pad 13	516	I16	-32768	32767	0	√	R/W	-	R/W
Pad 14	517	I16	-32768	32767	0	√	R/W	-	R/W
Pad 15	518	I16	-32768	32767	0	√	R/W	-	R/W
Bitword Pad A	519	U16	0	65535	0	√	R/W	ID*, QD*	R/W
Pad A Bit 0	520	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 1	521	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 2	522	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 3	523	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 4	524	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 5	525	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 6	526	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 7	527	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 8	528	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 9	529	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 10	530	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 11	531	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 12	532	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 13	533	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 14	534	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 15	535	U16	0	1	0	-	R/W	QD*	-
Bitword Pad B	536	U16	0	65535	0	√	R/W	QD*	R/W
Pad B Bit 0	537	U16	0	1	0	-	R/W	QD	R
Pad B Bit 1	538	U16	0	1	0	-	R/W	QD	R
Pad B Bit 2	539	U16	0	1	0	-	R/W	QD	R
Pad B Bit 3	540	U16	0	1	0	-	R/W	QD	R
Pad B Bit 4	541	U16	0	1	0	-	R/W	QD	R
Pad B Bit 5	542	U16	0	1	0	-	R/W	QD	R
Pad B Bit 6	543	U16	0	1	0	-	R/W	QD	R
Pad B Bit 7	544	U16	0	1	0	-	R/W	QD	R
Pad B Bit 8	545	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 9	546	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 10	547	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 11	548	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 12	549	U16	0	1	0	-	R/W	QD*	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Pad B Bit 13	550	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 14	551	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 15	552	U16	0	1	0	-	R/W	QD*	-
Source	553	U16	0	65535	0	√	R/W	-	-
Destination	554	U16	0	65535	0	√	R/W	-	-
Mul.Gain	555	Float	-10000	10000	1	√	R/W	-	-
Div.Gain	556	Float	-10000	10000	1	√	R/W	-	-
Input max	557	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input min	558	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input offset	559	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Output offset	560	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input absolute ON OFF	561	U16	0	1	OFF (0)	√	R/W 1 0	-	-
Dig input term	564	U16	0	65535	-	-	R	-	R
Dig input term 1	565	U16	0	1	-	-	R	-	R
Dig input term 2	566	U16	0	1	-	-	R	-	R
Dig input term 3	567	U16	0	1	-	-	R	-	R
Dig input term 4	568	U16	0	1	-	-	R	-	R
Dig input term 5	569	U16	0	1	-	-	R	-	R
Dig input term 6	570	U16	0	1	-	-	R	-	R
Dig input term 7	571	U16	0	1	-	-	R	-	R
Dig input term 8	572	U16	0	1	-	-	R	-	R
Dig input term 9	573	U16	0	1	-	-	R	-	R
Dig input term 10	574	U16	0	1	-	-	R	-	R
Dig input term 11	575	U16	0	1	-	-	R	-	R
Dig input term 12	576	U16	0	1	-	-	R	-	R
Dig input term 13	577	U16	0	1	-	-	R	-	R
Dig input term 14	578	U16	0	1	-	-	R	-	R
Dig input term 15	579	U16	0	1	-	-	R	-	R
Dig input term 16	580	U16	0	1	-	-	R	-	R
Dig output term	581	U16	0	65535	-	-	R	-	R
Virtual dig inp	582	U16	0	65535	-	√	R/W	-	R/W
Virtual dig out	583	U16	0	65535	-	√	R	-	R
Stop mode OFF Stop & Speed 0 Fast stp & Spd 0 Fst / stp & spd 0	626	U16	0	3	1	√	R/Z 0 1 2 3	-	-
Spd 0 trip delay [ms]	627	U16	0	40000	0	√	R/W	-	-
Relay 2 (Select like output 1)	629	U16	0	63	Speed zero thr (1)	√	R/Z	83-85	-
Jog stop control ON OFF	630	U16	0	1	OFF (0)	√	R/Z 1 0	-	-
Latch ON OFF	633	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	634	U16	1	5	Disabled drive (2)	√	R/Z 1 2 3 4 5	-	-
OK relay open ON OFF	635	I16	0	1	ON (1)	√	R/W 1 0	-	-
Hold off time [ms]	636	U16	0	10000	0	√	R/W	-	-
Restart time [ms]	637	U16	0	10000	0	√	R/W	-	-
Activity Disable drive Quick stop	639	U16	2	5	Disabled drive (2)	√	R/Z 2 3	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Normal stop Curr lim stop							4 5		
OK relay open ON OFF	640	I16	0	1	ON (1)	√	R/W 1 0	-	-
Sls speed filter [s]	643	Float	0.01	0.50	0.01	√	R/W	-	-
Voltage comp lim [V]	644	Float	0.1	30.0	6.0	√	R/W	-	-
Comp slope [V/A]	645	Float	0.1	50.0	13.0	√	R/W	-	-
Low speed factor	646	I16	0	32000	5000	√	R/W	-	-
Flux corr factor	647	Float	0.50	1.0	0.90	√	R/W	-	-
Encoder 1 state Encoder 1 OK Encoder 1 NOT OK	648	U16	0	1	-	-	R 1 0	QD H L	R
Refresh enc 1 Enabled Disabled	649	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
Encoder 2 state Encoder 2 OK Encoder 2 NOT OK	651	U16	0	1	-	-	R 1 0	QD H L	R
Refresh enc 2 Enabled Disabled	652	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
I_sqrt_t_accum [%]	655	U16	0	100	0	√	R	-	R
Motor cont curr [%]	656	U16	50	100	100	√	R/W	-	-
Trip time 50% [s]	657	U16	0	120	60	√	R/W	-	-
Ovld mot state Overload Not overload	658	U16	0	1	Not ovrl (1)	-	R 0 1	QD L H	R
Acc delta speed0 [FF]	659	U32	0	$2^{32}-1$	100	√	R/W	-	-
Acc delta time 0 [s]	660	U16	0	65535	1	√	R/W	-	-
Dec delta speed0 [FF]	661	U32	0	$2^{32}-1$	100	√	R/W	-	-
Dec delta time 0 [s]	662	U16	0	65535	1	√	R/W	-	-
S acc t const [ms]	663	Float	100	3000	500	√	R/W	-	-
S dec t const [ms]	664	Float	100	3000	500	√	R/W	-	-
S acc t const 0 [ms]	665	Float	100	3000	500	√	R/W	-	-
S dec t const 0 [ms]	666	Float	100	3000	500	√	R/W	-	-
S acc t const 1 [ms]	667	Float	100	3000	500	√	R/W	-	-
S dec t const 1 [ms]	668	Float	100	3000	500	√	R/W	-	-
S acc t const 2 [ms]	669	Float	100	3000	500	√	R/W	-	-
S dec t const 2 [ms]	670	Float	100	3000	500	√	R/W	-	-
S acc t const 3 [ms]	671	Float	100	3000	500	√	R/W	-	-
S dec t const 3 [ms]	672	Float	100	3000	500	√	R/W	-	-
Fwd-Rev No direction Fwd direction Rev direction No direction	673	U16	0	3	Fwd (1)	√	R/W 0 1 2 3	-	R/W
Magn ramp time [s]	675	Float	0.01	5.00	1.00	√	R/Z	-	-
Start part 1	676	U16	0	65535	-	√	C	-	-
Take val part 1	677	U16	0	65535	-	√	Z/C	-	-
Start part 2a	678	U16	0	65535	-	√	C	-	-
Take val part 2a	679	U16	0	65535	-	√	Z/C	-	-
Start part 2b	680	U16	0	65535	-	√	C	-	-
Take val part 2b	681	U16	0	65535	-	√	Z/C	-	-
Rotor resist Nw [Ohm]	682	Float	S	S	-	√	R	-	-
Stator resist Nw [Ohm]	683	Float	S	S	-	√	R	-	-
Lkg indutance Nw [H]	684	Float	S	S	-	√	R	-	-
Volt comp lim Nw [V]	685	Float	0.1	30.0	-	√	R	-	-
Comp slope Nw [V/A]	686	Float	0.1	50.0	-	√	R	-	-
Current P Nw [%]	687	Float	S	S	-	√	R	-	-
Current I Nw [%]	688	Float	S	S	-	√	R	-	-
P1 flux model Nw	689	Float	S	S	S	√	R	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
P2 flux model Nw	690	U16	S	S	S	√	R	-	-
Magnetiz curr Nw [A]	691	Float	S	S	S	√	R	-	-
P2 flux model	692	U16	1	20	S	√	R/W	-	-
Take motor par	694	U16	0	1	-	√	C	-	-
PI steady thr	695	I16	0	10000	0	√	R/W	-	-
Droop gain [%]	696	Float	0.00	100.00	0.00	√	R/W	-	-
Droop filter [ms]	697	U16	0	1000	0	√	R/W	-	-
Load comp [%]	698	I16	F	F	0	√	R/W	IA	R/W
Enable droop	699	U16	0	1	Disabled (0)	√	R/W	ID	R/W
Enabled							1	H	
Disabled							0	L	
Droop limit [FF]	700	U16	0	2 × P45	1500	√	R/W	-	-
Self tune state	705	U16	0	65535	-	-	R	-	-
Vlt boost type	709	U16	0	1	Manual (0)	√	R/Z	-	-
Manual							0		
Automatic							1		
Manual boost [%]	710	Float	0.0	10.0	1.0	√	R/W	-	-
Actual boost [%]	711	Float	0.0	100.0	-	√	R	-	-
V/f shape	712	U16	0	3	$V = k \cdot f^{1.0}$ (0)	√	R/Z	-	-
$V = k \cdot f^{1.0}$							0		
$V = k \cdot f^{1.5}$							1		
$V = k \cdot f^{1.7}$							2		
$V = k \cdot f^{2.0}$							3		
Qstp opt code	713	I16	-2	-1	Ramp stop (1)	√	R/Z	-	-
Ramp stop							1		
DC braking							2		
T curr lim type	715	U16	0	1	T lim +/- (0)	√	R/Z	-	-
T lim + / -							0		
T lim mot gen							1		
T lim VDC Ctrl							3		
DC braking delay [ms]	716	U16	0	65535	500	√	R/W	-	-
DC braking curr [%]	717	U16	0	100	50	√	R/W	-	-
Slip comp type	722	U16	0	1	Manual (0)	√	R/Z	-	-
Manual							0		
Automatic							1		
Manual slip comp [rpm]	723	I16	0	200	0	√	R/W	-	-
Actual slip comp [rpm]	724	I16	-400	400	0	√	R	-	-
Slip comp filt [s]	725	Float	0.003	0.300	0.030	√	R/W	-	-
Magn working cur [A]	726	Float	0.10	999.00	S	√	R	-	-
Motor losses %	727	Float	0.0	20.0	0	√	R/W	-	-
Activity	728	U16	0	2	Disabled drive (2)	√	R/Z	-	-
Ignore							0		
Disable drive							2		
Latch	729	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	730	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
PI steady delay [ms]	731	U16	0	60000	0	√	R/W	-	-
I init gain PID %	734	Float	0.00	100.00	10.00	√	R/W	-	-
Enable BU	736	U16	0	1	Disabled (0)	√	R/W	-	-
Enabled							1		
Disabled							0		
Activity	737	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
OK relay open ON OFF	738	I16	0	1	ON (1)	√	R/W 1 0	-	-
BU ovld time [s]	740	Float	0.10	50.00	S	√	R/W		
BU duty cycle [%]	741	U16	1	75	S	√	R/W	-	-
PID clamp	757	I16	0	10000	10000	√	R/W	-	-
Feed-fwd PID	758	I16	-10000	10000	0	√	R	IA	R
PID error	759	I16	-10000	10000	0	√	R	-	R
PID offset 0	760	I16	-10000	10000	0	√	R/W	IA	R/W
PID offset 1	761	I16	-10000	10000	0	√	R/W	-	-
PID offs. Sel Offest 0 Offset 1	762	U16	0	1	Offset 0 (0)	√	R/W 0 1	ID	R/W
PID feed-back	763	I16	-10000	10000	0	√	R/W	IA	R/W
PI I gain PID %	764	Float	0.00	100.00	10.00	√	R/W	-	-
PI P gain PID %	765	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 1 PID [%]	766	Float	0.00	100.00	1.00	√	R/W	-	-
PD D filter PID [ms]	767	U16	0	1000	0	√	R/W	-	-
PD P gain 1 PID [%]	768	Float	0.00	100.00	10.00	√	R/W	-	-
Enable PI PID Enabled Disabled	769	U16	0	1	Disabled (0)	√	R/W 1 0	ID	R/W
Enable PD PID Enabled Disabled	770	U16	0	1	Disabled (0)	√	R/W 1 0	ID	R/W
PI output PID	771	I16	0	1000 x P784	1000	√	R	-	R
PID out sign PID Positive Bipolar	772	U16	0	1	1	√	R/W 0 1	-	-
PID out scale	773	Float	-100.000	100.000	1.000	√	R/W	-	-
PID output	774	I16	-10000	10000	0	√	R	QA	R
PI central v1	776	Float	P785	P784	1.00	√	R/W	-	-
PI central v2	777	Float	P785	P784	1.00	√	R/W	-	-
PI central v3	778	Float	P785	P784	1.00	√	R/W	IA	-
PI central v sel	779	U16	0	3	1	√	R/W	ID	R/W
PI central vs0	780	U16	0	1	1	-	R/W	ID	R/W
PI central vs1	781	U16	0	1	0	-	R/W	ID	R/W
PID target	782	U16	0	65535	0	√	R/W	-	-
PI integr freeze ON OFF	783	U16	0	1	0	√	R/W 1 0	ID	R/W
PI top lim	784	Float	P785	10.00	10.00	√	R/W	-	-
PI bottom lim	785	Float	-10.00	P784	0	√	R/W	-	-
PID source	786	U16	0	65535	0	√	R/W	-	-
PID source gain	787	Float	-100.000	100.000	1.000	√	R/W	-	-
PD P gain 2 PID [%]	788	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 2 PID [%]	789	Float	0.00	100.00	1.00	√	R/W	-	-
PD P gain 3 PID [%]	790	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 3 PID[%]	791	Float	0.00	100.00	1.00	√	R/W	-	-
Input 1 filter [ms]	792	U16	0	1000	0	√	R/W	-	-
P init gain PID %	793	Float	0.00	100.00	10.00	√	R/W	-	-
Diameter calc Enabled Disabled	794	U16	0	1	0	√	Z/R 1 0	ID	R/W
Positioning spd [rpm]	795	I16	-100	100	0	√	R/W	-	-
Max deviation	796	I16	-10000	10000	8000	√	R/W	-	-
Gear box ratio	797	Float	0.001	1.000	1.000	√	R/W	-	-
Dancer constant [mm]	798	U16	1	10000	1	√	R/W	-	-
Minimum diameter [cm]	799	U16	1	2000	1	√	R/W	-	-
Diameter calc st	800	U16	0	1	0	-	R	QD	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
BU DC vlt [V] 230 400 460	801	U16	0	2	1	√	R/W 0 1 2	-	-
Continuous curr [A]	802	Float	S	S	S	√	R	-	-
Continuous curr [A]	802	Float	S	S	S	√	R	-	-
Heatsink temp [°C]	881	I16	-	-	-	√	R	-	-
Dynam vlt margin [%]	889	Float	10.00	10.00	1.00	√	R/W	-	-
Enable zero pos Enabled Disabled	890	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Lock zero pos ON OFF	891	U16	0	1	OFF (0)	√	R/W 1 0	ID L H	R/W
Zero pos gain [%]	892	U16	0	100	10	√	R/W	-	-
Spd srch time [s]	893	Float	0.01	10.00	10.00	√	R/W	-	-
Flux srch time [s]	894	Float	0.01	20.00	1.00	√	R/W	-	-
Spd autocapture [FF]	895	I16	-32768	32767	1500	√	R/W	-	-
Delay auto cap [ms]	896	U16	0	10000	1000	√	R/W	-	-
Delay retrying [ms]	897	U16	0	10000	1000	√	R/W	-	-
Enable save eng Enabled Disabled	898	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Lock save eng OFF ON	899	U16	0	1	OFF (0)	√	R/W 0 1	ID L H	R/W
V/f flux level [%]	900	U16	0	100	100	√	R/W	IA	R/W
Flux var time [s]	901	U16	1	100	10	√	R/W	-	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I base [Vs/V x s]	903	Float	0.00001	9.99999	S	√	R/W	-	-
DC braking mode Enabled Disabled	904	U16	0	1	0	√	R/Z 1 0	-	-
Brk time @ stop [ms]	905	U16	0	30000	1000	√	R/W	-	-
Flux P Nw [%]	907	Float	0.00	100.00	S	√	R	-	-
Flux I Nw [%]	908	Float	0.00	100.00	S	√	R	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Enable ind store Enabled Disabled	911	U16	0	1	Disabled (0)	√	R/W 1 0	-	R/W
Ind store ctrl	912	U16	0	65535	0	-	R/W	-	R/W
Index storing	913	U32	0	$2^{32}-1$	-	-	R	-	R
Intake air temp [°C]	914	U16	-	-	-	√	R	QA	-
Out vlt level [%]	921	Float*	0.0	100.0	100.0	√	R/W	IA,QA	R/W
Act spd filter [s]	923	Float	0.001	0.100	0.001	√	R/W	-	-
Act spd filter [rpm]	923	Float	0.001	0.100	0.001	√	R/W	-	-
F act spd (rpm)	924	I16	-32768	32767	-	√	R	QA	R
F act spd (d) [FF]	925	I16	-32768	32767	-	√	R	-	R
T curr filter [s]	926	Float	0.001	0.250	0.100	√	R/W	-	-
T curr (%)	927	I16	-500	500	-	√	R	QA	R
F T curr (%)	928	I16	-500	500	-	√	R	QA	R
Mot setup sel 0 Value 2° not sel Value 2° sel	940	U16	0	1	Not sel (0)	-	R/Z 0 1	ID L H	R/W
Copy mot setup Setup 0 Setup 1	941	U16	0	1	Setup 0 (0)	√	R/Z 0 1	-	-

Parameter	No	Format	Value: min	Value: max	Value: Factory	Access via: Keyp.	Access via: RS485/ BUS/ Opt2-M	Access via: Terminal	Access via: Opt2-A /PDC
Actual mot setup	942	U16	0	1	Setup 0 (0)	√	R	-	R
Setup 0							0		
Setup 1							1		
Mot setup sel	943	U16	0	1	Setup 0 (0)	√	R/Z	-	R/W
Setup 0							0		
Setup 1							1		
Mot setup state	944	U16	0	1	0	-	R	QD	R
Not running							0	L	
Running							1	H	
Inertia c filter [ms]	1012	U16	0	1000	0	√	R/W	-	-
Torque const [N*m/A]	1013	Float	0.01	99.99	S	√	R	-	-
Inertia [kg*m*m*]	1014	Float	0.0010	999.9990	S	√	R/W	-	-
Friction [N*m]	1015	Float	0.000	99.999	S	√	R/W	-	-
Aux spd fun sel	1016	U16	0	1	Speed up (0)	√	R/Z	-	-
Speed up							0		
Inertia-loss cp							1		
Speed ratio	1017	I16	0	32767	10000	√	R/W	IA	R/W
Spd draw out (d)	1018	I16	-32767	32767	-	√	R	QA	R
Spd draw out (%)	1019	Float	-200.0	+200.0	-	√	R	-	-
Select enc 1	1020	U16	0	5	OFF (0)	√	R/Z	-	-
OFF							0		
Speed ref 1							2		
Speed ref 2							3		
Ramp ref 1							4		
Ramp ref 2							5		
Select enc 2	1021	U16	0	5	OFF (0)	√	R/Z	-	-
OFF							0		
Speed ref 1							2		
Speed ref 2							3		
Ramp ref 1							4		
Ramp ref 2							5		
Voltage P [%]	1022	Float	0	100.00	15.00	√	RW	RW	-
Voltage P base [Vs/V]	1023	Float	0.00001	9.99999	S	√	R/W	-	-
Voltage P Nw [%]	1024	Float	100.00	0.00	S	√	R	R	-
Start part 3	1027	U16	0	65535	-	√	C	-	-
Take val part 3	1028	U16	0	65535	-	√	Z/C	-	-
Fwd-Rev spd tune	1029	U16	1	2	Fwd direction (1)	√	R/Z	-	-
Fwd direction							1		
Rev direction							2		
Inertia Nw [kg*m*m*]	1030	Float	0.0010	999.9990	-	√	R	-	-
Friction Nw [N*m]	1031	Float	0.000	99.99	-	√	R	-	-
Speed P Nw [%]	1032	Float	0.00	100.00	-	√	R	-	-
Speed I Nw [%]	1033	Float	0.00	100.00	-	√	R	-	-
Input 1 compare	1042	I16	-10000	10000	0	√	R/W	-	-
Input 1 cp error	1043	U16	0	10000	0	√	R/W	-	-
Input 1 cp delay	1044	U16	0	65000	0	√	R/W	-	-
Input 1 cp match	1045	U16	0	1	-	-	R	QD	R
Input 1 not thr.val.							0	L	
Input 1=thr.val							1	H	
PID acc time [s]	1046	Float	0.0	900.0	0.0	√	R/W	-	-
PID dec time [s]	1047	Float	0.0	900.0	0.0	√	R/W	-	-
Test T curr lim [%]	1048	U16	0	S	20	√	R/Z	-	-
Encoder repeat	1054	U16	0	1	Encoder 1 (1)	√	R/Z	-	-
Encoder 2							0		
Encoder 1							1		
PL stop acc [rpm/s]	1080	U32	0	99999999	100	√	R/W	-	-
PL stop dec [rpm/s]	1081	U32	0	10000	10000	√	R/W	-	-
PL stop t limit [%]	1082	U16	0	F	100	√	R/W	-	-
PL stop enable	1083	U16	0	2	0	√	R/W	-	-
Disabled							0		
Enabled as Mst							1		
Enabled as Slv							2		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
PL stop vdc ref [V]	1084	U16	0	800	646	√	R/W	-	-
PL stop I Gain [%]	1085	Float	0.00	100.00	0.30	√	R/W	-	-
PL stop P Gain [%]	1086	Float	0.00	100.00	5.00	√	R/W	-	-
PL time-out [s]	1087	U16	0	65535	10	√	R/W	-	-
PL stop active	1088	U16	0	1	Not active (0)	√	R	-	R
Not active							0		
Active							1		
PL active limit [%]	1089	U16	-	-	-	√	R	-	-
PL next active	1090	U16	0	1	Not active (0)	√	R	-	R
Not active							0		
Active							1		
PL next factor	1091	I16	0	32767	10000	√	R	-	R
PL mains status	1092	U16	0	1	Not ok (0)	√	R/W	-	R/W
Not ok							0		
Ok							1		
PL time-out sig	1093	U16	0	1	Not active (0)	√	R	-	R
Not active							0		
Active							1		
PL time-out ack	1094	U16	0	1	Not acknowledged (0)	√	R/W	-	R/W
Not acknowledged							0		
Acknowledged							1		
Pdc in 0	1095	U16	0	65535	0	√	R/W	-	-
Pdc in 1	1096	U16	0	65535	0	√	R/W	-	-
Pdc in 2	1097	U16	0	65535	0	√	R/W	-	-
Pdc in 3	1098	U16	0	65535	0	√	R/W	-	-
Pdc in 4	1099	U16	0	65535	0	√	R/W	-	-
Pdc in 5	1100	U16	0	65535	0	√	R/W	-	-
Pdc out 0	1101	U16	0	65535	0	√	R/W	-	-
Pdc out 1	1102	U16	0	65535	0	√	R/W	-	-
Pdc out 2	1103	U16	0	65535	0	√	R/W	-	-
Pdc out 3	1104	U16	0	65535	0	√	R/W	-	-
Pdc out 4	1105	U16	0	65535	0	√	R/W	-	-
Pdc out 5	1106	U16	0	65535	0	√	R/W	-	-
Virt dig in 0	1107	U16	0	65535	0	√	R/W	-	-
Virt dig in 1	1108	U16	0	65535	0	√	R/W	-	-
Virt dig in 2	1109	U16	0	65535	0	√	R/W	-	-
Virt dig in 3	1110	U16	0	65535	0	√	R/W	-	-
Virt dig in 4	1111	U16	0	65535	0	√	R/W	-	-
Virt dig in 5	1112	U16	0	65535	0	√	R/W	-	-
Virt dig in 6	1113	U16	0	65535	0	√	R/W	-	-
Virt dig in 7	1114	U16	0	65535	0	√	R/W	-	-
Virt dig in 8	1115	U16	0	65535	0	√	R/W	-	-
Virt dig in 9	1116	U16	0	65535	0	√	R/W	-	-
Virt dig in 10	1117	U16	0	65535	0	√	R/W	-	-
Virt dig in 11	1118	U16	0	65535	0	√	R/W	-	-
Virt dig in 12	1119	U16	0	65535	0	√	R/W	-	-
Virt dig in 13	1120	U16	0	65535	0	√	R/W	-	-
Virt dig in 14	1121	U16	0	65535	0	√	R/W	-	-
Virt dig in 15	1122	U16	0	65535	0	√	R/W	-	-
Virt dig out 0	1123	U16	0	65535	0	√	R/W	-	-
Virt dig out 1	1124	U16	0	65535	0	√	R/W	-	-
Virt dig out 2	1125	U16	0	65535	0	√	R/W	-	-
Virt dig out 3	1126	U16	0	65535	0	√	R/W	-	-
Virt dig out 4	1127	U16	0	65535	0	√	R/W	-	-
Virt dig out 5	1128	U16	0	65535	0	√	R/W	-	-
Virt dig out 6	1129	U16	0	65535	0	√	R/W	-	-
Virt dig out 7	1130	U16	0	65535	0	√	R/W	-	-
Virt dig out 8	1131	U16	0	65535	0	√	R/W	-	-
Virt dig out 9	1132	U16	0	65535	0	√	R/W	-	-
Virt dig out 10	1133	U16	0	65535	0	√	R/W	-	-
Virt dig out 11	1134	U16	0	65535	0	√	R/W	-	-
Virt dig out 12	1135	U16	0	65535	0	√	R/W	-	-
Virt dig out 13	1136	U16	0	65535	0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Virt dig out 14	1137	U16	0	65535	0	√	R/W	-	-
Virt dig out 15	1138	U16	0	65535	0	√	R/W	-	-
Overload 200% Overload not possible Overload possible	1139	U16	0	1	-	-	R 0 1	QD L H	R
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	1140	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	1141	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	1142	I16	0	1	ON (1)	√	R/W 1 0	-	-
Enc1 supply vlt 5.41 V 5.68 V 5.91 V 6.18 V	1146	U16	0	3	5.41 V (0)	√	R/Z 0 1 2 3		
Regulation temp [°C]	1147	I16	-	-	-	√	R	-	-
Activity Ignore Warning	1148	U16	0	1	Warning (1)	√	R/Z 0 1	-	-
Latch ON OFF	1149	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	1150	I16	0	1	ON (1)	√	R/W 1 0	-	-
Ok relay open ON OFF	1151	I16	0	1	ON (1)	√	R/W 1 0	-	-
Ok relay open ON OFF	1152	I16	0	1	ON (1)	√	R/W 1 0	-	-
VDC Ctrl P Gain [%]	1289	Float	0.00	100	10	√	R/W	-	-
VDC Ctrl I Gain [%]	1290	Float	0.00	100	10	√	R/W	-	-
Npar displayed	1291	U16	0	65535	0	√	R/W	-	-
MB swap float Disabled Enabled	1292	U16	0	1	0	√	R/W 0 1	-	-
SBI enable Disabled Enabled	1293	U16	0	1	0	√	R/W 0 1	-	-
Heatsink tmp thr [*C]	1294	U16	0	255	50	√	R/W	-	-
HS tmp thr state	1295	U16	0	1	0	-	-	-	R
Digital I/Q	-				-	√	R	-	-
Motor pot oper	-					√	-	-	-
Jog operation	-					√	-	-	-
Failure register	-					√	R	-	-

3.3. PARAMETERS IN ALPHABETICAL ORDER

Parameter	N.	Position
Acc delta speed [FF]	21	BASIC MENU
Acc delta speed [FF]	21	RAMP \ Acceleration
Acc delta speed [FF]	21	DRIVECOM \ Acceleration
Acc delta speed0 [FF]	659	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
Acc delta speed1 [FF]	23	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
Acc delta speed2 [FF]	25	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
Acc delta speed3 [FF]	27	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
Acc delta time [s]	22	BASIC MENU
Acc delta time [s]	22	RAMP \ Acceleration
Acc delta time [s]	22	DRIVECOM \ Acceleration
Acc delta time 0 [s]	660	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
Acc delta time 1 [s]	24	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
Acc delta time 2 [s]	26	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
Acc delta time 3 [s]	28	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
Act percentage [%]	120	DRIVECOM
Act spd filter [rpm]	923	MONITOR \ Measurements \ Speed \ Speed in rpm
Act spd filter [s]	923	MONITOR \ Measurements \ Speed \ Speed in DRC []
Act speed value [FF]	119	DRIVECOM
Active power [%]	229	MONITOR \ Measurements
Activity	368	CONFIGURATION \ Prog alarms \ Heatsink sensor
Activity	1140	CONFIGURATION \ Prog alarms \ Intake air ot
Activity	1148	CONFIGURATION \ Prog alarms \ Regulation ot
Activity	365	CONFIGURATION \ Prog alarms \ Overtemp motor
Activity	354	CONFIGURATION \ Prog alarms \ External fault
Activity	639	CONFIGURATION \ Prog alarms \ Opt2 failure
Activity	634	CONFIGURATION \ Prog alarms \ Bus loss
Activity	386	CONFIGURATION \ Prog alarms \ Hw opt1 failure
Activity	728	CONFIGURATION \ Prog alarms \ Enable seq err
Activity	737	CONFIGURATION \ Prog alarms \ BU overload
Actual boost [%]	711	DRIVE PARAMETER \ V/f control \ Voltage boost
Actual mot setup	942	FUNCTIONS \ Motor setup
Actual slip comp [rpm]	724	DRIVE PARAMETER \ V/f control \ Slip compens
Actual spd (%)	121	
Actual spd (d) [FF]	119	MONITOR \ Measurements \ Speed \ Speed in DRC []
Actual spd (rpm)	122	BASIC MENU
Actual spd (rpm)	122	MONITOR \ Measurements \ Speed \ Speed in rpm
Adap I gain 1 [%]	189	ADD SPEED FUNCT \ Adap spd reg
Adap I gain 2 [%]	191	ADD SPEED FUNCT \ Adap spd reg
Adap I gain 3 [%]	193	ADD SPEED FUNCT \ Adap spd reg
Adap joint 1 [%]	186	ADD SPEED FUNCT \ Adap spd reg
Adap joint 2 [%]	187	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 1 [%]	188	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 2 [%]	190	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 3 [%]	192	ADD SPEED FUNCT \ Adap spd reg
Adap reference [FF]	183	ADD SPEED FUNCT \ Adap spd reg
Adap speed 1 [%]	184	ADD SPEED FUNCT \ Adap spd reg
Adap speed 2 [%]	185	ADD SPEED FUNCT \ Adap spd reg
Ambient temp [°C]	332	BASIC MENU \ Drive type
Ambient temp [°C]	332	CONFIGURATION \ Drive type
An in 1 target	295	I/O CONFIG \ Analog inputs \ Analog input 1
An in 2 target	296	I/O CONFIG \ Analog inputs \ Analog input 2
An in 3 target	297	I/O CONFIG \ Analog inputs \ Analog input 3
Auto capture	388	ADD SPEED FUNCT
Auto tune inp 1	259	I/O CONFIG \ Analog inputs \ Analog input 1
Auto tune inp 2	260	I/O CONFIG \ Analog inputs \ Analog input 2
Auto tune inp 3	261	I/O CONFIG \ Analog inputs \ Analog input 3
Aux spd fun sel	1016	SPEED REGULAT.
Base frequency [Hz]	168	DRIVE PARAMETER \ Mot plate data
Base voltage [V]	167	DRIVE PARAMETER \ Mot plate data
Bitword Pad A	519	SPEC FUNCTIONS \ Pad Parameters
Bitword Pad B	536	SPEC FUNCTIONS \ Pad Parameters
Brk time @ stop [ms]	905	SPEC FUNCTIONS \ DC braking
BU DC vlt [V]	801	FUNCTIONS \ Brake unit
BU duty cycle [%]	741	FUNCTIONS \ Brake unit
BU ovld time [s]	740	FUNCTIONS \ Brake unit
Comp slope [V/A]	645	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1

Parameter	N.	Position
Comp slope [V/A]	645	REG PARAMETERS \ Percent values \ Current reg\Dead time comp
Comp slope Nw [V/A]	686	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Continuous curr [A]	802	BASIC MENU \ Drive type
Continuous curr [A]	802	CONFIGURATION \ Drive type
Control mode	253	CONFIGURATION
Control Word	55	DRIVECOM
Copy mot setup	941	FUNCTIONS \ Motor setup
Cos phi	371	DRIVE PARAMETER \ Mot plate data
Curr limit state	349	LIMITS \ Current limits
Current I [%]	90	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current I [%]	90	REG PARAMETERS \ Percent values \ Current reg
Current I base [V/A×ms]	96	REG PARAMETERS \ Base values \ Current reg
Current I Nw [%]	688	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current lim red [%]	13	LIMITS \ Current limits
Current norm	267	CURRENT REGULAT
Current P [%]	89	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current P [%]	89	REG PARAMETERS \ Percent values \ Current reg
Current P base [V/A]	95	REG PARAMETERS \ Base values \ Current reg
Current P Nw [%]	687	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Dancer constant [mm]	798	OPTIONS \ PID \ Diameter calc
DC braking curr [%]	717	SPEC FUNCTIONS \ DC braking
DC braking delay [ms]	716	
DC braking mode	904	SPEC FUNCTIONS \ DC braking
DC link voltage [V]	227	MONITOR \ Measurements
Dec delta speed [FF]	29	BASIC MENU
Dec delta speed [FF]	29	RAMP \ Deceleration
Dec delta speed [FF]	29	DRIVECOM \ Deceleration
Dec delta speed0 [FF]	661	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
Dec delta speed1 [FF]	31	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
Dec delta speed2 [FF]	33	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
Dec delta speed3 [FF]	35	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Dec delta time [s]	30	BASIC MENU
Dec delta time [s]	30	RAMP \ Deceleration
Dec delta time [s]	30	DRIVECOM \ Deceleration
Dec delta time 0 [s]	662	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
Dec delta time 1 [s]	32	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
Dec delta time 2 [s]	34	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
Dec delta time 3 [s]	36	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Delay auto cap [ms]	896	DRIVE PARAMETER \ V/f control \ V/f spd search
Delay retrying [ms]	897	DRIVE PARAMETER \ V/f control \ V/f spd search
Destination	485	SPEC FUNCTIONS \ Links \ Link 1
Destination	554	SPEC FUNCTIONS \ Links \ Link 2
Device address	319	CONFIGURATION
Diameter calc	794	OPTIONS \ PID \ Diameter calc
Diameter calc st	800	OPTIONS \ PID
Dig input term	564	MONITOR \ I/O
Dig input term 1	565	MONITOR \ I/O
Dig input term 10	574	MONITOR \ I/O
Dig input term 11	575	MONITOR \ I/O
Dig input term 12	576	MONITOR \ I/O
Dig input term 13	577	MONITOR \ I/O
Dig input term 14	578	MONITOR \ I/O
Dig input term 15	579	MONITOR \ I/O
Dig input term 16	580	MONITOR \ I/O
Dig input term 2	566	MONITOR \ I/O
Dig input term 3	567	MONITOR \ I/O
Dig input term 4	568	MONITOR \ I/O
Dig input term 5	569	MONITOR \ I/O
Dig input term 6	570	MONITOR \ I/O
Dig input term 7	571	MONITOR \ I/O
Dig input term 8	572	MONITOR \ I/O
Dig input term 9	573	MONITOR \ I/O
Dig output term	581	MONITOR \ I/O
Digital I/Q	-	MONITOR \ I/O
Digital input 1	137	I/O CONFIG \ Digital inputs
Digital input 2	138	I/O CONFIG \ Digital inputs

Parameter	N.	Position
Digital input 3	139	I/O CONFIG \ Digital inputs
Digital input 4	140	I/O CONFIG \ Digital inputs
Digital input 5	141	I/O CONFIG \ Digital inputs
Digital input 6	142	I/O CONFIG \ Digital inputs
Digital input 7	143	I/O CONFIG \ Digital inputs
Digital input 8	144	I/O CONFIG \ Digital inputs
Digital output 1	145	I/O CONFIG \ Digital outputs
Digital output 2	146	I/O CONFIG \ Digital outputs
Digital output 3	147	I/O CONFIG \ Digital outputs
Digital output 4	148	I/O CONFIG \ Digital outputs
Digital output 5	149	I/O CONFIG \ Digital outputs
Digital output 6	150	I/O CONFIG \ Digital outputs
Digital output 7	151	I/O CONFIG \ Digital outputs
Digital output 8	152	I/O CONFIG \ Digital outputs
Dim factor den	51	CONFIGURATION \ Dimension fact
Dim factor den	51	DRIVECOM \ Dimension fact
Dim factor num	50	CONFIGURATION \ Dimension fact
Dim factor num	50	DRIVECOM \ Dimension fact
Dim factor text	52	CONFIGURATION \ Dimension fact
Dim factor text	52	DRIVECOM \ Dimension fact
Div.Gain	487	SPEC FUNCTIONS \ Links \ Link 1
Div.Gain	556	SPEC FUNCTIONS \ Links \ Link 2
Drive ready	380	
Drive type (AVy)	300	BASIC MENU \ Drive type
Drive type (AVy)	300	CONFIGURATION \ Drive type
Droop filter [ms]	697	SPEED REGULAT \ Droop function
Droop gain [%]	696	SPEED REGULAT \ Droop function
Droop limit [FF]	700	SPEED REGULAT \ Droop function
Dynam vlt margin [%]	889	LIMITS \ Voltage limits
Enab motor pot	246	FUNCTIONS \ Motor pot
Enab multi rmp	243	FUNCTIONS \ Multi ramp fct
Enab multi spd	153	FUNCTIONS \ Multi speed fct
Enable BU	736	FUNCTIONS \ Brake unit
Enable drive	314	BASIC MENU
Enable drive	314	MONITOR
Enable droop	699	SPEED REGULAT \ Droop function
Enable ind store	911	CONFIGURATION \ Motor spd fbk
Enable jog	244	FUNCTIONS \ Jog function
Enable lck sls	422	SPEED REGULAT \ Spd zero logic
Enable OPT2	425	OPTIONS \ Option 2
Enable PD PID	770	OPTIONS \ PID
Enable PI PID	769	OPTIONS \ PID
Enable ramp	245	RAMP
Enable rr adap	435	SPEC FUNCTIONS
Enable save eng	898	DRIVE PARAMETER \ V/f control \ Energy save
Enable spd adap	181	ADD SPEED FUNCT \ Adap spd reg
Enable spd reg	242	SPEED REGULAT.
Enable spd=0 I	123	SPEED REGULAT \ Spd zero logic
Enable spd=0 P	125	SPEED REGULAT \ Spd zero logic
Enable spd=0 R	124	SPEED REGULAT \ Spd zero logic
Enable zero pos	890	SPEED REGULAT \ Spd zero logic
Enc1 speed [rpm]	427	MONITOR \ Measurements \ Speed \ Speed in rpm
Enc1 supply vlt	1146	CONFIGURATION \ Motor spd fbk
Enc2 speed [rpm]	420	MONITOR \ Measurements \ Speed \ Speed in rpm
Encoder 1 pulses	416	BASIC MENU
Encoder 1 pulses	416	CONFIGURATION \ Motor spd fbk
Encoder 1 pulses	416	I/O CONFIG \ Encoder inputs
Encoder 1 state	648	CONFIGURATION \ Motor spd fbk
Encoder 1 type	415	BASIC MENU
Encoder 1 type	415	CONFIGURATION \ Motor spd fbk
Encoder 1 type	415	I/O CONFIG \ Encoder inputs
Encoder 2 pulses	169	CONFIGURATION \ Motor spd fbk
Encoder 2 pulses	169	I/O CONFIG \ Encoder inputs
Encoder 2 state	651	CONFIGURATION \ Motor spd fbk
Encoder repeat	1054	CONFIGURATION \ Motor spd fbk
F act spd (d) [FF]	925	MONITOR \ Measurements \ Speed \ Speed in DRC []

Parameter	N.	Position
F act spd (rpm)	924	MONITOR \ Measurements \ Speed \ Speed in rpm
F current ref	352	CURRENT REGULAT
F T curr (%)	928	MONITOR \ Measurements
Face value den	53	CONFIGURATION \ Face value fact
Face value den	53	DRIVECOM \ Face value fact
Face value num	54	CONFIGURATION \ Face value fact
Face value num	54	DRIVECOM \ Face value fact
Failure code	417	SPEC FUNCTIONS
Failure hour	328	SPEC FUNCTIONS
Failure min	329	SPEC FUNCTIONS
Failure reg del	263	SPEC FUNCTIONS
Failure register	-	SPEC FUNCTIONS
Failure reset	262	SPEC FUNCTIONS
Failure text	327	SPEC FUNCTIONS
Fast stop	316	
Feed-fwd PID	758	OPTIONS \ PID
Flt 100 mf	303	CONFIGURATION
Flux	234	FLUX REGULATION
Flux [%]	234	MONITOR \ Measurements
Flux corr factor	647	DRIVE PARAMETER \ Sensorless
Flux current	351	CURRENT REGULAT
Flux I [%]	92	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux I [%]	92	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux I [%]	92	REG PARAMETERS \ Percent values \ Flux regulator
Flux I base [A/Vs×ms]	98	REG PARAMETERS \ Base values \ Flux regulator
Flux I Nw [%]	908	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux I Nw [%]	908	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux level [%]	467	LIMITS \ Flux limits
Flux P [%]	91	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux P [%]	91	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux P [%]	91	REG PARAMETERS \ Percent values \ Flux regulator
Flux P base [A/Vs]	97	REG PARAMETERS \ Base values \ Flux regulator
Flux P Nw [%]	907	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux P Nw [%]	907	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux reference	500	FLUX REGULATION
Flux reg mode	469	FLUX REGULATION
Flux srch time [s]	894	DRIVE PARAMETER \ V/f control \ V/f spd search
Flux var time [s]	901	DRIVE PARAMETER \ V/f control \ Energy save
Forward sign	293	RAMP
Freeze ramp	373	RAMP
Friction [N*m]	1015	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Friction [N*m]	1015	SPEED REGULAT \ Inertia/loss cp
Friction Nw [N*m]	1031	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Full load curr [A]	179	CONFIGURATION
Fwd-Rev	673	RAMP
Fwd-Rev spd tune	1029	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Gear box ratio	797	OPTIONS \ PID \ Diameter calc
Gen access	58	SPEC FUNCTIONS \ Test generator
Gen amplitude [%]	60	SPEC FUNCTIONS \ Test generator
Gen frequency [Hz]	59	SPEC FUNCTIONS \ Test generator
Gen offset [%]	61	SPEC FUNCTIONS \ Test generator
Heatsink temp [°C]	881	MONITOR \ Measurements
Heatsink tmp thr [*C]	1294	CONFIGURATION \ Prog alarms \ Heatsink sensor
Hold off time [ms]	636	CONFIGURATION \ Prog alarms \ Bus loss
HS tmp thr state	1295	CONFIGURATION \ Prog alarms \ Heatsink sensor
I init gain PID %	734	OPTIONS \ PID \ PI controls
I_sqrt_t_accum [%]	655	FUNCTIONS \ Overload contr \ Ovld drv contr
In use Tcur lim- [%]	11	LIMITS \ Current limits
In use Tcur lim+ [%]	10	LIMITS \ Current limits
Ind store ctrl	912	CONFIGURATION \ Motor spd fbk
Index storing	913	CONFIGURATION \ Motor spd fbk
Inertia [kg*m*m*]	1014	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Inertia [kg*m*m]	1014	SPEED REGULAT \ Inertia/loss cp
Inertia c filter [ms]	1012	SPEED REGULAT \ Inertia/loss cp
Inertia Nw [kg*m*m*]	1030	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Input 1 compare	1042	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 cp delay	1044	I/O CONFIG \ Analog inputs \ Analog input 1

Parameter	N.	Position
Input 1 cp error	1043	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 cp match	1045	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 filter [ms]	792	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 sign	389	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 type	71	I/O CONFIG \ Analog inputs \ Analog input 1
Input 2 sign	390	I/O CONFIG \ Analog inputs \ Analog input 2
Input 2 type	76	I/O CONFIG \ Analog inputs \ Analog input 2
Input 3 sign	391	I/O CONFIG \ Analog inputs \ Analog input 3
Input 3 type	81	I/O CONFIG \ Analog inputs \ Analog input 3
Input absolute	492	SPEC FUNCTIONS \ Links \ Link 1
Input absolute	561	SPEC FUNCTIONS \ Links \ Link 2
Input max	488	SPEC FUNCTIONS \ Links \ Link 1
Input max	557	SPEC FUNCTIONS \ Links \ Link 2
Input min	489	SPEC FUNCTIONS \ Links \ Link 1
Input min	558	SPEC FUNCTIONS \ Links \ Link 2
Input offset	490	SPEC FUNCTIONS \ Links \ Link 1
Input offset	559	SPEC FUNCTIONS \ Links \ Link 2
Intake air temp	914	MONITOR \ Measurements
Jog -	399	FUNCTIONS \ Jog function
Jog +	398	FUNCTIONS \ Jog function
Jog operation	-	FUNCTIONS \ Jog function
Jog reference [FF]	266	FUNCTIONS \ Jog function
Jog selection	375	FUNCTIONS \ Jog function
Jog stop control	630	FUNCTIONS \ Stop control
Latch	357	CONFIGURATION \ Prog alarms \ Undervoltage
Latch	361	CONFIGURATION \ Prog alarms \ Overvoltage
Latch	369	CONFIGURATION \ Prog alarms \ Heatsink sensor
Latch	1141	CONFIGURATION \ Prog alarms \ Intake air ot
Latch	1149	CONFIGURATION \ Prog alarms \ Regulation ot
Latch	366	CONFIGURATION \ Prog alarms \ Overtemp motor
Latch	355	CONFIGURATION \ Prog alarms \ External fault
Latch	363	CONFIGURATION \ Prog alarms \ Overcurrent
Latch	210	CONFIGURATION \ Prog alarms \ Output stages
Latch	633	CONFIGURATION \ Prog alarms \ Bus loss
Latch	729	CONFIGURATION \ Prog alarms \ Enable seq err
Life time [h.min]	235	SPEC FUNCTIONS
Lkg inductance [H]	437	DRIVE PARAMETER \ Motor Parameter
Lkg inductance [H]	437	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Lkg indutance Nw [H]	684	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Load comp [%]	698	SPEED REGULAT \ Droop function
Load default	258	SPEC FUNCTIONS
Load motor par	251	DRIVE PARAMETER \ Motor Parameter
Lock save eng	899	DRIVE PARAMETER \ V/f control \ Energy save
Lock speed I	348	SPEED REGULAT.
Lock speed reg	322	SPEED REGULAT.
Lock zero pos	891	SPEED REGULAT \ Spd zero logic
Low speed factor	646	DRIVE PARAMETER \ Sensorless
Magn boost curr [%]	413	CONFIGURATION
Magn ramp time [s]	675	CONFIGURATION
Magn working cur [A]	726	DRIVE PARAMETER \ Motor Parameter
Magnetiz curr Nw [A]	691	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Magnetiz curr Nw [A]	691	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Magnetizing cur [A]	165	DRIVE PARAMETER \ Motor Parameter
Magnetizing curr [A]	165	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Magnetizing curr [A]	165	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Main commands	252	CONFIGURATION
Mains voltage	333	BASIC MENU \ Drive type
Mains voltage	333	CONFIGURATION \ Drive type
Malfunction code	57	DRIVECOM
Manual boost [%]	710	DRIVE PARAMETER \ V/f control \ Voltage boost
Manual slip comp [rpm]	723	DRIVE PARAMETER \ V/f control \ Slip compens
Max deviation	796	OPTIONS \ PID \ Diameter calc
MB swap float	1292	CONFIGURATION \ Set serial comm
Menu		OPTIONS \ Option 1
Menu		OPTIONS \ Option 2

Parameter	N.	Position
Minimum diameter [cm]	799	OPTIONS \ PID \ Diameter calc
Mot setup sel	943	FUNCTIONS \ Motor setup
Mot setup sel 0	940	FUNCTIONS \ Motor setup
Mot setup state	944	FUNCTIONS \ Motor setup
Motor cont curr [%]	656	FUNCTIONS \ Overload contr \ Ovld mot contr
Motor current [A]	231	BASIC MENU
Motor current [A]	231	MONITOR \ Measurements
Motor losses %	727	DRIVE PARAMETER \ V/f control \ Slip compens
Motor pot down	397	FUNCTIONS \ Motor pot
Motor pot oper	-	FUNCTIONS \ Motor pot
Motor pot reset	249	FUNCTIONS \ Motor pot
Motor pot sign	248	FUNCTIONS \ Motor pot
Motor pot up	396	FUNCTIONS \ Motor pot
Mul.Gain	486	SPEC FUNCTIONS \ Links \ Link 1
Mul.Gain	555	SPEC FUNCTIONS \ Links \ Link 2
Multi ramp sel	202	FUNCTIONS \ Multi ramp fct
Multi speed 1 [FF]	154	FUNCTIONS \ Multi speed fct
Multi speed 2 [FF]	155	FUNCTIONS \ Multi speed fct
Multi speed 3 [FF]	156	FUNCTIONS \ Multi speed fct
Multi speed 4 [FF]	157	FUNCTIONS \ Multi speed fct
Multi speed 5 [FF]	158	FUNCTIONS \ Multi speed fct
Multi speed 6 [FF]	159	FUNCTIONS \ Multi speed fct
Multi speed 7 [FF]	160	FUNCTIONS \ Multi speed fct
Multi speed sel	208	FUNCTIONS \ Multi speed fct
N of attempts	360	CONFIGURATION \ Prog alarms \ Undervoltage
Nom frequency [Hz]	163	DRIVE PARAMETER \ Mot plate data
Nominal current [A]	164	DRIVE PARAMETER \ Mot plate data
Nominal speed [rpm]	162	DRIVE PARAMETER \ Mot plate data
Nominal voltage [V]	161	DRIVE PARAMETER \ Mot plate data
Npar displayed	1291	CONFIGURATION
Offset input 1	74	I/O CONFIG \ Analog inputs \ Analog input 1
Offset input 2	79	I/O CONFIG \ Analog inputs \ Analog input 2
Offset input 3	84	I/O CONFIG \ Analog inputs \ Analog input 3
Ok relay funct	412	CONFIGURATION
OK relay open	358	CONFIGURATION \ Prog alarms \ Undervoltage
Ok relay open	362	CONFIGURATION \ Prog alarms \ Overvoltage
Ok relay open	370	CONFIGURATION \ Prog alarms \ Heatsink sensor
Ok relay open	1142	CONFIGURATION \ Prog alarms \ Heatsink ot
Ok relay open	1152	CONFIGURATION \ Prog alarms \ Heatsink ot
Ok relay open	1150	CONFIGURATION \ Prog alarms \ Regulation ot
Ok relay open	1151	CONFIGURATION \ Prog alarms \ Module overtemp
Ok relay open	367	CONFIGURATION \ Prog alarms \ Overtemp motor
OK relay open	356	CONFIGURATION \ Prog alarms \ External fault
OK relay open	364	CONFIGURATION \ Prog alarms \ Overcurrent
OK relay open	211	CONFIGURATION \ Prog alarms \ Output stages
OK relay open	640	CONFIGURATION \ Prog alarms \ Opt2 failure
OK relay open	635	CONFIGURATION \ Prog alarms \ Bus loss
OK relay open	387	CONFIGURATION \ Prog alarms \ Hw opt1 failure
OK relay open	730	CONFIGURATION \ Prog alarms \ Enable seq err
OK relay open	738	CONFIGURATION \ Prog alarms \ BU overload
Out vlt level [%]	921	FLUX REGULATION
Output frequency [Hz]	324	MONITOR \ Measurements
Output offset	491	SPEC FUNCTIONS \ Links \ Link 1
Output offset	560	SPEC FUNCTIONS \ Links \ Link 2
Output voltage [V]	233	MONITOR \ Measurements
Overload 200%	1139	FUNCTIONS \ Overload contr \ Ovld drv contr
Ovld Available	406	FUNCTIONS \ Overload contr \ Ovld drv contr
Ovld mot state	658	FUNCTIONS \ Overload contr \ Ovld mot contr
P init gain PID %	793	OPTIONS \ PID \ PI controls
P1 flux model	176	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P1 flux model	176	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P1 flux model Nw	689	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P1 flux model Nw	689	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P2 flux model	692	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P2 flux model	692	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P2 flux model Nw	690	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P2 flux model Nw	690	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b

Parameter	N.	Position
Pad 0	503	SPEC FUNCTIONS \ Pad Parameters
Pad 1	504	SPEC FUNCTIONS \ Pad Parameters
Pad 10	513	SPEC FUNCTIONS \ Pad Parameters
Pad 11	514	SPEC FUNCTIONS \ Pad Parameters
Pad 12	515	SPEC FUNCTIONS \ Pad Parameters
Pad 13	516	SPEC FUNCTIONS \ Pad Parameters
Pad 14	517	SPEC FUNCTIONS \ Pad Parameters
Pad 15	518	SPEC FUNCTIONS \ Pad Parameters
Pad 2	505	SPEC FUNCTIONS \ Pad Parameters
Pad 3	506	SPEC FUNCTIONS \ Pad Parameters
Pad 4	507	SPEC FUNCTIONS \ Pad Parameters
Pad 5	508	SPEC FUNCTIONS \ Pad Parameters
Pad 6	509	SPEC FUNCTIONS \ Pad Parameters
Pad 7	510	SPEC FUNCTIONS \ Pad Parameters
Pad 8	511	SPEC FUNCTIONS \ Pad Parameters
Pad 9	512	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 0	520	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 1	521	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 10	530	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 11	531	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 12	532	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 13	533	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 14	534	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 15	535	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 2	522	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 3	523	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 4	524	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 5	525	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 6	526	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 7	527	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 8	528	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 9	529	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 0	537	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 1	538	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 10	547	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 11	548	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 12	549	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 13	550	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 14	551	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 15	552	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 2	539	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 3	540	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 4	541	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 5	542	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 6	543	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 7	544	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 8	545	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 9	546	SPEC FUNCTIONS \ Pad Parameters
Password 2	86	SERVICE
PD D filter PID [ms]	767	OPTIONS \ PID \ PD controls
PD D gain 1 PID [%]	766	OPTIONS \ PID \ PD controls
PD D gain 2 PID [%]	789	OPTIONS \ PID \ PD controls
PD D gain 3 PID[%]	791	OPTIONS \ PID \ PD controls
PD output PID	421	OPTIONS \ PID
PD P gain 1 PID [%]	768	OPTIONS \ PID \ PD controls
PD P gain 2 PID [%]	788	OPTIONS \ PID \ PD controls
PD P gain 3 PID [%]	790	OPTIONS \ PID \ PD controls
Pdc in 0	1095	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 1	1096	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 2	1097	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 3	1098	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 4	1099	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 5	1100	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc out 0	1101	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 1	1102	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 2	1103	OPTIONS \ Option 1\ PDC config \ PDC outputs

Parameter	N.	Position
Pdc out 3	1104	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 4	1105	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 5	1106	OPTIONS \ Option 1\ PDC config \ PDC outputs
Percent ref var [%]	116	DRIVECOM
PI bottom lim	785	OPTIONS \ PID \ PI controls
PI central v sel	779	OPTIONS \ PID \ PI controls
PI central v1	776	OPTIONS \ PID \ PI controls
PI central v2	777	OPTIONS \ PID \ PI controls
PI central v3	778	OPTIONS \ PID \ PI controls
PI central vs0	780	OPTIONS \ PID
PI central vs1	781	OPTIONS \ PID
PI I gain PID %	764	OPTIONS \ PID \ PI controls
PI integr freeze	783	OPTIONS \ PID \ PI controls
PI output PID	771	OPTIONS \ PID
PI P gain PID %	765	OPTIONS \ PID \ PI controls
PI steady delay [ms]	731	OPTIONS \ PID \ PI controls
PI steady thr	695	OPTIONS \ PID \ PI controls
PI top lim	784	OPTIONS \ PID \ PI controls
PID acc time [s]	1046	OPTIONS \ PID \ PID references
PID clamp	757	OPTIONS \ PID \ PID references
PID dec time [s]	1047	OPTIONS \ PID \ PID references
PID error	759	OPTIONS \ PID \ PID references
PID feed-back	763	OPTIONS \ PID \ PID references
PID offs. Sel	762	OPTIONS \ PID \ PID references
PID offset 0	760	OPTIONS \ PID \ PID references
PID offset 1	761	OPTIONS \ PID \ PID references
PID out scale	773	OPTIONS \ PID \ PID target
PID out sign PID	772	OPTIONS \ PID
PID output	774	OPTIONS \ PID
PID source	786	OPTIONS \ PID \ PID source
PID source gain	787	OPTIONS \ PID \ PID source
PID target	782	OPTIONS \ PID \ PID target
PL active limit [%]	1089	FUNCTIONS \ Pwr loss stop f
PL mains status	1092	FUNCTIONS \ Pwr loss stop f
PL next active	1090	FUNCTIONS \ Pwr loss stop f
PL next factor	1091	FUNCTIONS \ Pwr loss stop f
PL stop acc [rpm/s]	1080	FUNCTIONS \ Pwr loss stop f
PL stop active	1088	FUNCTIONS \ Pwr loss stop f
PL stop dec [rpm/s]	1081	FUNCTIONS \ Pwr loss stop f
PL stop enable	1083	FUNCTIONS \ Pwr loss stop f
PL stop I Gain [%]	1085	FUNCTIONS \ Pwr loss stop f
PL stop P Gain [%]	1086	FUNCTIONS \ Pwr loss stop f
PL stop t limit [%]	1082	FUNCTIONS \ Pwr loss stop f
PL stop vdc ref [V]	1084	FUNCTIONS \ Pwr loss stop f
PL time-out [s]	1087	FUNCTIONS \ Pwr loss stop f
PL time-out ack	1094	FUNCTIONS \ Pwr loss stop f
PL time-out sig	1093	FUNCTIONS \ Pwr loss stop f
Pointer	330	SPEC FUNCTIONS
Positioning spd [rpm]	795	OPTIONS \ PID \ Diameter calc
Prop. filter [ms]	444	SPEED REGULAT.
Pword 1 :	85	CONFIGURATION
QStp delta speed [FF]	37	RAMP \ Quick stop
QStp delta speed [FF]	37	DRIVECOM \ Quick stop
QStp delta time [s]	38	RAMP \ Quick stop
QStp delta time [s]	38	DRIVECOM \ Quick stop
Qstp opt code	713	CONFIGURATION
QStp opt code	713	DRIVECOM \ Quick stop
Quick stop	343	
Ramp -	347	RAMP
Ramp +	346	RAMP
Ramp +/- delay [ms]	20	RAMP
Ramp in = 0	345	RAMP
Ramp out = 0	344	RAMP
Ramp outp (rpm)	113	MONITOR \ Measurements \ Speed \ Speed in rpm
Ramp output (%)	114	MONITOR \ Measurements \ Speed \ Speed in %

Parameter	N.	Position
Ramp output (d) [FF]	112	MONITOR \ Measurements \ Speed \ Speed in DRC []
Ramp ref (%)	111	MONITOR \ Measurements \ Speed \ Speed in %
Ramp ref (d) [FF]	109	MONITOR \ Measurements \ Speed \ Speed in DRC []
Ramp ref (rpm)	110	MONITOR \ Measurements \ Speed \ Speed in rpm
Ramp ref 1 (%)	47	INPUT VARIABLES \ Ramp ref \ Ramp ref 1
Ramp ref 1 [FF]	44	BASIC MENU
Ramp ref 1 [FF]	44	INPUT VARIABLES \ Ramp ref \ Ramp ref 1
Ramp ref 2 (%)	49	INPUT VARIABLES \ Ramp ref \ Ramp ref 2
Ramp ref 2 [FF]	48	INPUT VARIABLES \ Ramp ref \ Ramp ref 2
Ramp sel 0	403	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Ramp sel 1	404	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Ramp shape	18	RAMP
Rated drive curr	334	BASIC MENU \ Drive type
Rated drive curr	334	CONFIGURATION \ Drive type
Real FF PID	418	OPTIONS \ PID
Ref 0 level [FF]	106	SPEED REGULAT \ Spd zero logic
Refresh enc 1	649	CONFIGURATION \ Motor spd fbk
Refresh enc 1	649	I/O CONFIG \ Encoder inputs
Refresh enc 2	652	CONFIGURATION \ Motor spd fbk
Refresh enc 2	652	I/O CONFIG \ Encoder inputs
Regulation mode	321	BASIC MENU
Regulation mode	321	CONFIGURATION
Regulation temp [°C]	1147	MONITOR \ Measurements
Relay 2	629	I/O CONFIG \ Digital outputs
Restart time [ms]	359	CONFIGURATION \ Prog alarms \ Undervoltage
Restart time [ms]	637	CONFIGURATION \ Prog alarms \ Bus loss
Reverse sign	294	RAMP
Rotor resist Nw [Ohm]	682	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Rotor resistance [Ohm]	166	DRIVE PARAMETER \ Motor Parameter
Rotor resistance [Ohm]	166	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
S acc t const [ms]	663	RAMP
S acc t const 0 [ms]	665	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
S acc t const 1 [ms]	667	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
S acc t const 2 [ms]	669	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
S acc t const 3 [ms]	671	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
S dec t const [ms]	664	RAMP
S dec t const 0 [ms]	666	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
S dec t const 1 [ms]	668	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
S dec t const 2 [ms]	670	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
S dec t const 3 [ms]	672	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
S shape t const [ms]	19	RAMP
Save parameters	256	BASIC MENU
Save parameters	256	SPEC FUNCTIONS
SBI enable	1293	OPTIONS \ Option 1
Scale input 1	72	I/O CONFIG \ Analog inputs \ Analog input 1
Scale input 2	77	I/O CONFIG \ Analog inputs \ Analog input 2
Scale input 3	82	I/O CONFIG \ Analog inputs \ Analog input 3
Scale output 1	62	I/O CONFIG \ Analog outputs \ Analog output 1
Scale output 2	63	I/O CONFIG \ Analog outputs \ Analog output 2
Scale output 3	64	I/O CONFIG \ Analog outputs \ Analog output 3
Scale output 4	65	I/O CONFIG \ Analog outputs \ Analog output 4
Sel adap type	182	ADD SPEED FUNCT \ Adap spd reg
Select enc 1	1020	I/O CONFIG \ Encoder inputs
Select enc 2	1021	I/O CONFIG \ Encoder inputs
Select input 1	70	I/O CONFIG \ Analog inputs \ Analog input 1
Select input 2	75	I/O CONFIG \ Analog inputs \ Analog input 2
Select input 3	80	I/O CONFIG \ Analog inputs \ Analog input 3
Select output 1	66	I/O CONFIG \ Analog outputs \ Analog output 1
Select output 2	67	I/O CONFIG \ Analog outputs \ Analog output 2
Select output 3	68	I/O CONFIG \ Analog outputs \ Analog output 3
Select output 4	69	I/O CONFIG \ Analog outputs \ Analog output 4
Self tune state	705	DRIVE PARAMETER \ Motor Parameter \ Self-tuning
Ser answer delay [ms]	408	CONFIGURATION
Ser baudrate sel	326	CONFIGURATION \ Set serial comm
Ser protocol sel	323	CONFIGURATION \ Set serial comm
Set delay [ms]	105	ADD SPEED FUNCT \ Speed control

Parameter	N.	Position
Set error [FF]	104	ADD SPEED FUNCT \ Speed control
Set speed	394	ADD SPEED FUNCT \ Speed control
Slip comp filt [s]	725	DRIVE PARAMETER \ V/f control \ Slip compens
Slip comp type	722	DRIVE PARAMETER \ V/f control \ Slip compens
Sls speed filter [s]	643	DRIVE PARAMETER \ Sensorless
Software version	331	BASIC MENU \ Drive type
Software version	331	CONFIGURATION \ Drive type
Source	484	SPEC FUNCTIONS \ Links \ Link 1
Source	553	SPEC FUNCTIONS \ Links \ Link 2
Spd 0 trip delay [ms]	627	FUNCTIONS \ Stop control
Spd autocapture [FF]	895	DRIVE PARAMETER \ V/f control \ V/f spd search
Spd draw out (%)	1019	FUNCTIONS \ Speed draw
Spd draw out (d)	1018	FUNCTIONS \ Speed draw
Spd srch time [s]	893	DRIVE PARAMETER \ V/f control \ V/f spd search
Spd threshold	393	ADD SPEED FUNCT \ Speed control
Spd threshold - [FF]	102	ADD SPEED FUNCT \ Speed control
Spd threshold + [FF]	101	ADD SPEED FUNCT \ Speed control
Spd zero thr	395	ADD SPEED FUNCT \ Speed zero
Spd=0 P gain [%]	126	SPEED REGULAT \ Spd zero logic
Speed base value [FF]	45	BASIC MENU
Speed base value [FF]	45	CONFIGURATION
Speed base value [FF]	45	DRIVECOM
Speed fbk sel	414	CONFIGURATION \ Motor spd fbk
Speed I [%]	88	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed I [%]	88	REG PARAMETERS \ Percent values \ Speed regulator
Speed I base[A/rpm×ms]	94	REG PARAMETERS \ Base values \ Speed regulator
Speed I in use [%]	100	REG PARAMETERS \ In use values
Speed I Nw [%]	1033	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed input perc [%]	46	DRIVECOM
Speed input var [FF]	44	DRIVECOM
Speed limited	372	LIMITS \ Speed limits \ Speed min/max
Speed max amount [FF]	2	LIMITS \ Speed limits \ Speed amount
Speed max amount [FF]	2	DRIVECOM \ Speed amount
Speed max neg [FF]	4	LIMITS \ Speed limits \ Speed min/max
Speed max neg [FF]	4	DRIVECOM \ Speed min/max
Speed max pos [FF]	3	LIMITS \ Speed limits \ Speed min/max
Speed max pos [FF]	3	DRIVECOM \ Speed min/max
Speed min amount [FF]	1	LIMITS \ Speed limits \ Speed amount
Speed min amount [FF]	1	DRIVECOM \ Speed amount
Speed min neg [FF]	6	LIMITS \ Speed limits \ Speed min/max
Speed min neg [FF]	6	DRIVECOM \ Speed min/max
Speed min pos [FF]	5	LIMITS \ Speed limits \ Speed min/max
Speed min pos [FF]	5	DRIVECOM \ Speed min/max
Speed P [%]	87	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed P [%]	87	REG PARAMETERS \ Percent values \ Speed regulator
Speed P base [A/rpm]	93	REG PARAMETERS \ Base values \ Speed regulator
Speed P in use [%]	99	REG PARAMETERS \ In use values
Speed P Nw [%]	1032	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed ratio	1017	FUNCTIONS \ Speed draw
Speed ref (%)	117	MONITOR \ Measurements \ Speed \ Speed in %
Speed ref (d) [FF]	115	MONITOR \ Measurements \ Speed \ Speed in DRC []
Speed ref (rpm)	118	MONITOR \ Measurements \ Speed \ Speed in rpm
Speed ref [rpm]	118	SPEED REGULAT.
Speed ref 1 (%)	378	INPUT VARIABLES \ Speed ref \ Speed ref 1
Speed ref 1 [FF]	42	INPUT VARIABLES \ Speed ref \ Speed ref 1
Speed Ref 2 (%)	379	INPUT VARIABLES \ Speed ref \ Speed ref 2
Speed ref 2 [FF]	43	INPUT VARIABLES \ Speed ref \ Speed ref 2
Speed ref var [FF]	115	DRIVECOM
Speed reg output [%]	236	SPEED REGULAT.
Speed sel 0	400	FUNCTIONS \ Multi speed fct
Speed sel 1	401	FUNCTIONS \ Multi speed fct
Speed sel 2	402	FUNCTIONS \ Multi speed fct
Speed up base [ms]	446	SPEED REGULAT \ Speed up
Speed up filter [ms]	447	SPEED REGULAT \ Speed up
Speed up gain [%]	445	SPEED REGULAT \ Speed up

Parameter	N.	Position
Speed zero delay [ms]	108	ADD SPEED FUNCT \ Speed zero
Speed zero level [FF]	107	ADD SPEED FUNCT \ Speed zero
Start part 1	676	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Start part 2a	678	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Start part 2b	680	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Start part 3	1027	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Start/Stop	315	BASIC MENU
Start/Stop	315	MONITOR
Stator resist [Ohm]	436	DRIVE PARAMETER \ Motor Parameter
Stator resist [Ohm]	436	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Stator resist Nw [Ohm]	683	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Status word	56	DRIVECOM
Stop mode	626	FUNCTIONS \ Stop control
Switching freq	240	CONFIGURATION
T curr (%)	927	MONITOR \ Measurements
T curr filter [s]	926	MONITOR \ Measurements
T curr lim type	715	LIMITS \ Current limits
T current lim - [%]	9	BASIC MENU
T current lim - [%]	9	LIMITS \ Current limits
T current lim [%]	7	LIMITS \ Current limits
T current lim + [%]	8	BASIC MENU
T current lim + [%]	8	LIMITS \ Current limits
T current ref [%]	41	MONITOR \ Measurements
T current ref 1 [%]	39	INPUT VARIABLES \ T current ref
T current ref 2 [%]	40	INPUT VARIABLES \ T current ref
Take motor par	694	DRIVE PARAMETER \ Mot plate data
Take val part 1	677	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Take val part 2a	679	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Take val part 2b	681	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Take val part 3	1028	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Test T curr lim [%]	1048	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Threshold delay [ms]	103	ADD SPEED FUNCT \ Speed control
Torque [%]	230	MONITOR \ Measurements
Torque const [N*m/A]	1013	SPEED REGULAT \ Inertia/loss cp
Torque current	350	CURRENT REGULAT
Torque reduct	342	LIMITS \ Current limits
Trip time 50% [s]	657	FUNCTIONS \ Overload contr \ Ovld mot contr
Tune value inp 1	73	I/O CONFIG \ Analog inputs \ Analog input 1
Tune value inp 2	78	I/O CONFIG \ Analog inputs \ Analog input 2
Tune value inp 3	83	I/O CONFIG \ Analog inputs \ Analog input 3
V/f flux level [%]	900	DRIVE PARAMETER \ V/f control \ Energy save
V/f shape	712	DRIVE PARAMETER \ V/f control
VDC Ctrl I Gain [%]	1290	FUNCTIONS \ VDC control f
VDC Ctrl P Gain [%]	1289	FUNCTIONS \ VDC control f
Virt dig in 0	1107	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 1	1108	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 10	1117	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 11	1118	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 12	1119	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 13	1120	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 14	1121	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 15	1122	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 2	1109	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 3	1110	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 4	1111	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 5	1112	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 6	1113	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 7	1114	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 8	1115	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 9	1116	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig out 0	1123	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 1	1124	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 10	1133	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 11	1134	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 12	1135	OPTIONS \ Option 1\ PDC config \ Virt dig out

Parameter	N.	Position
Virt dig out 13	1136	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 14	1137	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 15	1138	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 2	1125	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 3	1126	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 4	1127	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 5	1128	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 6	1129	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 7	1130	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 8	1131	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 9	1132	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virtual dig inp	582	MONITOR \ I/O
Virtual dig out	583	MONITOR \ I/O
Vlt boost type	709	DRIVE PARAMETER \ V/f control \ Voltage boost
Volt comp lim Nw [V]	685	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Voltage comp lim [V]	644	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Voltage comp lim [V]	644	REG PARAMETERS \ Percent values \ Current reg\Dead time comp
Voltage I [%]	902	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage I [%]	902	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage I [%]	902	REG PARAMETERS \ Percent values \ Voltage reg
Voltage I base [Vs/V x s]	903	REG PARAMETERS \ Base values \ Voltage reg
Voltage I Nw [%]	909	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage I Nw [%]	909	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage P [%]	1022	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage P [%]	1022	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage P [%]	1022	REG PARAMETERS \ Percent values \ Voltage reg
Voltage P base [Vs/V]	1023	REG PARAMETERS \ Base values \ Voltage reg
Voltage P Nw [%]	1024	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage P Nw [%]	1024	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Zero pos gain [%]	892	SPEED REGULAT \ Spd zero logic
Zero torque	353	CURRENT REGULAT

3.4. LIST OF HIGH PRIORITY PARAMETERS

When an APC (Digital General Function Card) is used a subset of the AVy parameters can be exchanged with the optional card through the automatic synchronous communication. For more details see the APC Technical documentation.

Parameter	N.	Format	Value			Read/ Write
			min	max	Default	
T current lim + [CURR]	8	U16	0	F	S	R/W
T current lim - [CURR]	9	U16	0	F	S	R/W
In use Tcur lim+ [CURR]	10	U16	0	F	-	R
In use Tcur lim- [CURR]	11	U16	0	F	-	R
current lim red [CURR]	13	U16	0	F	F	R/W
T current ref 1 [CURR]	39	I16	F	F	0	R/W
T current ref 2 [CURR]	40	I16	F	F	0	R/W
T current ref [CUR+A11R]	41	I16	F	F	-	R
Speed ref 1 [spd]	42	I16	-32768	32767	0	R/W
Speed ref 2 [spd]	43	I16	-32768	32767	0	R/W
Ramp ref 1 [spd]	44	I16	-32768	32767	0	R/W
Ramp ref 2 [spd]	48	I16	-32768	32767	0	R/W
Control word	55	U16	0	65535	0	R/W
Status word	56	U16	0	65535	-	R
Ramp ref [spd]	110	I16	-32768	32767	-	R
Ramp outp [spd]	113	I16	-32768	32767	-	R
Speed ref [spd]	118	I16	-32768	32767	-	R
Actual spd [[spd]	122	I16	-8192	8192	-	R
Adap reference [spd]	183	I16	-32768	32767	4000	R/W
Enc 1 position [enc_pls]	197	I16	-32768	32767	-	R
Enc 2 position [enc_pls]	198	I16	-32768	32767	-	R
Enc 1 last time [enc_tim]	204	U32	0	232-1	-	R
Enc 1 last time high [enc_tim]	205	U16	0	65535	-	R
Enc 2 last time [enc_tim]	206	U32	0	232-1	-	R
Enc 2 last time high [enc_tim]	207	U16	0	65535	-	R
Speed reg output	236	I16	—	—	-	R
Lock speed reg	322	U16	0	1	0	R/W
Enc 2 speed [spd]	420	I16	-32768	32767	-	R
Enc 1 speed [spd]	427	I16	-32768	32767	-	R
Flux level	467	U16	1638	16384	16384	R/W
Flux reference	500	Float	0	16384	16384	R
Pad 0	503	I16	-32768	32767	0	R/W
Pad 1	504	I16	-32768	32767	0	R/W
Pad 2	505	I16	-32768	32767	0	R/W
Pad 3	506	I16	-32768	32767	0	R/W
Pad 4	507	I16	-32768	32767	0	R/W
Pad 5	508	I16	-32768	32767	0	R/W
Pad 6	509	I16	-32768	32767	0	R/W
Pad 7	510	I16	-32768	32767	0	R/W
Pad 8	511	I16	-32768	32767	0	R/W
Pad 9	512	I16	-32768	32767	0	R/W
Pad 10	513	I16	-32768	32767	0	R/W

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Parameter	N.	Format	Value			Read/ Write
			min	max	Default	
Pad 11	514	I16	-32768	32767	0	R/W
Pad 12	515	I16	-32768	32767	0	R/W
Pad 13	516	I16	-32768	32767	0	R/W
Pad 14	517	I16	-32768	32767	0	R/W
Pad 15	518	I16	-32768	32767	0	R/W
Bitword pad A	519	U16	0	65535	0	R/W
Bitword pad B	536	U16	0	65535	0	R/W
Dig input term	564	U16	0	65535	-	R
Dig output term	581	U16	0	65535	-	R
Load comp [CURR]	698	I16	F	F	-	R
V/f flux level	900	U16	0	16384	16384	R/W
Ind store ctrl	912	U16	0	65535	0	R/W
Index storing	913	U16	0	$+2^{32}-1$	-	R
Out vlt level	921	Float	0	16384	16384	R/W
F act speed (rpm) [spd]	924	I16	-32768	32767	-	R
F act speed (d) [spd]	925	I16	-32768	32767	-	R
T curr % [CURR]	927	I16	F	F	-	R
F T curr % [CURR]	928	I16	F	F	-	R
Speed ratio	1017	I16	0	+32767	10000	R/W
Spd draw out (d)	1018	I16	-32767	+32767	-	R
PL next factor	1091	I16	0	+32768	10000	R

a1004Bi

Notes!

1) Speed settings are expressed in **[SPD]**: 1 SPD = 0.25 rpm
2) Current settings are expressed in **[CURR]** : 1 CURR = **[Current norm** / ($2^{15}\cdot\sqrt{2}$)] ARMS

   - **Current norm**: (parameter no 267, format: floating, access code R (read only), not available via key pad), depends on drive sizes

   - **Flt 100 mf** (parameter no. 303, format: integer 16 bits, access code R (read only), not available via keypad): expressed in [CURR]. Setting **T current lim...** [CURR] equal to **Flt 100mf** implies the setting **Motor current** [ARMS] =FLC
3) Encoder positions are expressed in **[ENC_PLS]**: 1 ENC_PLS = 0.25 pulses
4) Encoders last time[s] are expressed in 50 ns units (1 = 50 ns) **[ENC_TIM]**.
5) Speed reg Output [%] contains valid information even if the speed regulator is disabled **(Enable Speed reg** = Disabled). If Speed Output is enabled, it contains the sum of actual speed regulator output and **T current ref 2**.

Drive Size	Rated drive curr [334]	Curr norm AMPS [267]
1007	2.4	10.8
1015	4	17.5
1022	5.6	25.1
1030	7.5	33.4
2040	9.6	42.4
2055	12.6	56.5
2075	17.7	79
3110	24.8	110.4
3150	33	147.2
4220	47	211
4300	63	256.4
4370	79	33.3
5450	93	421.9
5550	114	512.8
6750	142	606.1
7900	185	847.1
71100	210	847.1
71320	250	1129.9
81600	324	1432.2

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3.5. LOAD MOTOR PARAMETER

Standard for 400V								
Description	**No.**	**1007**	**1015**	**1022**	**1030**	**2040**	**2055**	**2075**
Nominal Voltage	**161**	400	400	400	400	400	400	400
Nominal speed	**162**	1400	1405	1415	1415	1435	1450	1450
Nom. frequency	**163**	50	50	50	50	50	50	50
Nominal current	**164**	1.95	3.70	5.20	6.80	9.20	11.80	15.60
Magn. current	**165**	0.97	1.74	2.45	3.30	4.60	5.04	6.66
Rotor resistance	**166**	7.8956	3.9531	2.5167	1.9246	1.0878	0.6524	0.4935
Cos phi	**371**	0.80	0.82	0.82	0.81	0.80	0.85	0.85
Stator resist	**436**	7.8956	3.9531	2.5167	1.9246	1.0878	0.6524	0.4935
Lkg inductance	**437**	0.08380	0.04170	0.02960	0.02340	0.01780	0.01180	0.00890
Speed P	**87**	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Speed I	**88**	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current P	**89**	6.03	4.84	4.94	5.19	5.00	4.44	4.70
Current I	**90**	1.70	1.38	1.26	1.28	0.92	0.74	0.78
Flux P	**91**	2.54	3.14	3.44	3.38	4.71	5.89	5.57
Flux I	**92**	1.97	2.17	2.12	2.15	2.37	1.92	2.13
Base voltage	**167**	400	400	400	400	400	400	400
Base frequency	**168**	50	50	50	50	50	50	50
Description	**No.**	**3110**	**3150**	**4220**	**4300**	**4370**	**5450**	**5550**
Nominal Voltage	**161**	400	400	400	400	400	400	400
Nominal speed	**162**	1460	1460	1455	1465	1470	1470	1475
Nom. frequency	**163**	50	50	50	50	50	50	50
Nominal current	**164**	22.50	30.00	43.00	58.00	71.00	85.00	93.50
Magn. current	**165**	6.63	8.54	12.24	15.91	19.48	22.41	24.65
Rotor resistance	**166**	0.2737	0.2053	0.1611	0.0929	0.0651	0.0543	0.0412
Cos phi	**371**	0.84	0.85	0.85	0.86	0.86	0.87	0.87
Stator resist	**436**	0.2737	0.2053	0.1611	0.0929	0.0651	0.0543	0.0412
Lkg inductance	**437**	0.00960	0.00700	0.00490	0.00350	0.00280	0.00230	0.00210
Speed P	**87**	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Speed I	**88**	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current P	**89**	7.07	6.83	6.83	5.93	6.30	6.40	7.07
Current I	**90**	0.60	0.60	0.68	0.48	0.43	0.46	0.42
Flux P	**91**	7.18	7.18	6.38	9.11	10.01	9.46	10.28
Flux I	**92**	1.52	1.36	1.46	1.56	1.47	1.23	1.12
Base voltage	**167**	400	400	400	400	400	400	400
Base frequency	**168**	50	50	50	50	50	50	50
Description	**No.**	**6750**	**7900**	**71100**	**71320**	**81600**		
Nominal Voltage	**161**	400	400	400	400	400		
Nominal speed	**162**	1480	1480	1485	1485	1485		
Nom. frequency	**163**	50	50	50	50	50		
Nominal current	**164**	140.00	170.00	205.00	240.00	295.00		
Magn. current	**165**	38.41	46.64	56.24	63.28	77.78		
Rotor resistance	**166**	0.0220	0.0181	0.0113	0.0096	0.0078		
Cos phi	**371**	0.86	0.86	0.86	0.87	0.87		
Stator resist	**436**	0.0220	0.0181	0.0113	0.0096	0.0078		
Lkg inductance	**437**	0.00140	0.00120	0.00100	0.00080	0.00070		
Speed P	**87**	10.00	10.00	10.00	10.00	10.00		
Speed I	**88**	1.00	1.00	1.00	1.00	1.00		
Current P	**89**	5.81	6.68	5.54	6.07	6.26		
Current I	**90**	0.27	0.31	0.19	0.22	0.22		
Flux P	**91**	16.28	14.14	22.74	19.96	19.36		
Flux I	**92**	1.48	1.28	1.55	1.30	1.26		
Base voltage	**167**	400	400	400	400	400		
Base frequency	**168**	50	50	50	50	50		avy105B

Standard for 400V

Description	No.	1007	1015	1022	1030	2040	2055	2075
Nominal Voltage	161	400	400	400	400	400	400	400
Nominal speed	162	1400	1405	1415	1415	1435	1450	1450
Nom. frequency	163	50	50	50	50	50	50	50
Nominal current	164	1.95	3.70	5.20	6.80	9.20	11.80	15.60
Magn. current	165	0.97	1.74	2.45	3.30	4.60	5.04	6.66
Rotor resistance	166	7.8956	3.9531	2.5167	1.9246	1.0878	0.6524	0.4935
Cos phi	371	0.80	0.82	0.82	0.81	0.80	0.85	0.85
Stator resist	436	7.8956	3.9531	2.5167	1.9246	1.0878	0.6524	0.4935
Lkg inductance	437	0.08380	0.04170	0.02960	0.02340	0.01780	0.01180	0.00890
Speed P	87	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Speed I	88	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current P	89	6.03	4.84	4.94	5.19	5.00	4.44	4.70
Current I	90	1.70	1.38	1.26	1.28	0.92	0.74	0.78
Flux P	91	2.54	3.14	3.44	3.38	4.71	5.89	5.57
Flux I	92	1.97	2.17	2.12	2.15	2.37	1.92	2.13
Base voltage	167	400	400	400	400	400	400	400
Base frequency	168	50	50	50	50	50	50	50

Description	No.	3110	3150	4220	4300	4370	5450	5550
Nominal Voltage	161	400	400	400	400	400	400	400
Nominal speed	162	1460	1460	1455	1465	1470	1470	1475
Nom. frequency	163	50	50	50	50	50	50	50
Nominal current	164	22.50	30.00	43.00	58.00	71.00	85.00	93.50
Magn. current	165	6.63	8.54	12.24	15.91	19.48	22.41	24.65
Rotor resistance	166	0.2737	0.2053	0.1611	0.0929	0.0651	0.0543	0.0412
Cos phi	371	0.84	0.85	0.85	0.86	0.86	0.87	0.87
Stator resist	436	0.2737	0.2053	0.1611	0.0929	0.0651	0.0543	0.0412
Lkg inductance	437	0.00960	0.00700	0.00490	0.00350	0.00280	0.00230	0.00210
Speed P	87	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Speed I	88	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current P	89	7.07	6.83	6.83	5.93	6.30	6.40	7.07
Current I	90	0.60	0.60	0.68	0.48	0.43	0.46	0.42
Flux P	91	7.18	7.18	6.38	9.11	10.01	9.46	10.28
Flux I	92	1.52	1.36	1.46	1.56	1.47	1.23	1.12
Base voltage	167	400	400	400	400	400	400	400
Base frequency	168	50	50	50	50	50	50	50

Description	No.	6750	7900	71100	71320	81600
Nominal Voltage	161	400	400	400	400	400
Nominal speed	162	1480	1480	1485	1485	1485
Nom. frequency	163	50	50	50	50	50
Nominal current	164	140.00	170.00	205.00	240.00	295.00
Magn. current	165	38.41	46.64	56.24	63.28	77.78
Rotor resistance	166	0.0220	0.0181	0.0113	0.0096	0.0078
Cos phi	371	0.86	0.86	0.86	0.87	0.87
Stator resist	436	0.0220	0.0181	0.0113	0.0096	0.0078
Lkg inductance	437	0.00140	0.00120	0.00100	0.00080	0.00070
Speed P	87	10.00	10.00	10.00	10.00	10.00
Speed I	88	1.00	1.00	1.00	1.00	1.00
Current P	89	5.81	6.68	5.54	6.07	6.26
Current I	90	0.27	0.31	0.19	0.22	0.22
Flux P	91	16.28	14.14	22.74	19.96	19.36
Flux I	92	1.48	1.28	1.55	1.30	1.26
Base voltage	167	400	400	400	400	400
Base frequency	168	50	50	50	50	50

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