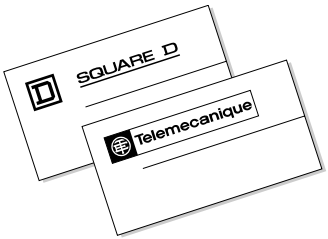
Guide de programmation
Programming manual

Altivar 66 Telemecanique

variateurs de vitesse pour moteurs asynchrones, contrôle vectoriel de flux avec capteur.

speed controllers for asynchronous motors, flux vector control with sensor.

2,2 à 220 kW, 400 V
3 à 350 HP, 460 V



GROUPE SCHNEIDER

Merlin Gerin ■ Modicon ■ Square D ■ Telemecanique

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CAUTION

This document concerns the use of the Ativar 66 terminal without options.

Some modes or menus may be modified if the speed controller has been fitted with one or more options.

Any such modifications are indicated in the accompanying documentation.

For instructions on how to install, connect and start the Altivar, refer to the User's Manual.

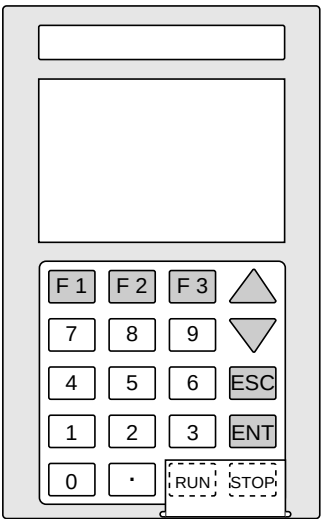
Contents

Introduction

Altivar 66 has a removable graphic terminal (keypad) on the front panel.

This graphic terminal is used to :

– Display (in plain language) the speed controller identification, operating parameters or faults.
– Modify the settings and configuration of the Altivar.



Front view

Liquid crystal graphic display (128 x 64 points, with 6 lines of 21 characters) which displays bargraphs during operation, with reverse video to highlight text or numerical value.

Keypad with 20 keys

1 ENT (enter) key
1 ESC (escape) key
2 direction keys ▲ ▼
11 numerical keys (0 to 9 and the decimal •)
3 function keys F1, F2, F3
2 RUN and STOP keys under a removable protective cover
(RUN not available)

Use

ENT key : – go to next menu,
– confirm a selection or setting.

ESC key : – return to previous menu,
– abandon current setting and return to its original value.

▲ ▼ keys : – scroll through and select from menus,
– set a value (in + – mode),
– select a function.

Numerical keys : enter or set a value.

F1, F2, F3 keys : F1 accesses the help menu, F2 returns to Display mode, and F3 provides direct access to a menu or a mode selected by its number.

The STOP key enables :
– a stopping of the motor according to the deceleration ramp in speed regulation mode,
– a freewheel stopping in torque regulation mode.

The RUN command from the terminal is not available.

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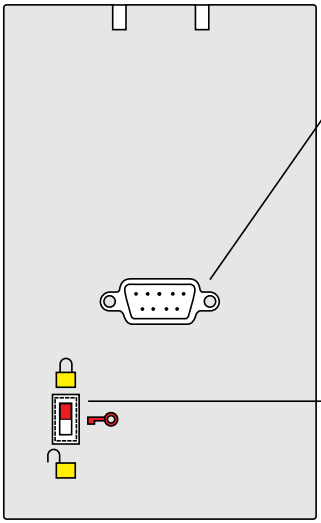

Rear view (with graphic terminal removed)

9-pin SUB-D connector for connection to the speed controller.

For remote operation, the graphic terminal can be connected by a cable, supplied separately :

– length 3 meters, reference **VW3-A66311**,
– length 2 meters, reference **VW3-A66312**.

Access switch to limit access to programming functions (modify settings and configuration).

Removing the graphic terminal

Unscrew

Remove

Access to RUN and STOP keys

For ease of access, it is advisable to remove the graphic terminal.

Recommendations for initial power-up

1. Follow the wiring and installation recommendations given in the user manual.

2. Select the mode for accessing the settings.
   Set the access switch behind the graphic terminal to unlock mode.

3. Power up the locked speed controller.
   – Select the working language.
   – Check the speed controller configuration.

4. Go to the general menu 7.11 :
   – Set the number of encoder points.
   – Set the motor rated speed.
   – Set the motor slip .
   – Set the motor flux.

5. The encoder direction can be defined with a non FVC control type.
   – Select the "Normal" or "High torque" control type [7.13].
   – Run the motor with a positive speed reference.
   – Display from menu [2.2] the encoder feedback sign [+ / - … %].
   The sign is + ⇒ Correct
   The sign is - ⇒ Stop and reverse the encoder direction from menu 7.11
   – Check that the encoder feedback sign has become +.

6. Select the control type, Menu 7.13.
   – "Normal" : without encoder feedback.
   – "High torque" : without encoder feedback.
   – "FVC" : with encoder feedback.
   Select "FVC".

7. Perform the following tests :
   – If the motor responds to commands, refine the settings in menu 1, and particularly the inertia, gain and stability settings.
   – If the motor does not respond :
   - Run command enabled
     (L1 Run + L2 Direction of operation) enabled.
   - The motor is turning the wrong way :
     – Forward 
     – Reverse 
     ⇒ Reverse the motor rotation direction ABC → CBA, Menu 7.11.
   - The motor does not turn or only turns erratically (current is flowing through the motor) :
     ⇒ Check the encoder signals.

   Contact your local sales office for more details.

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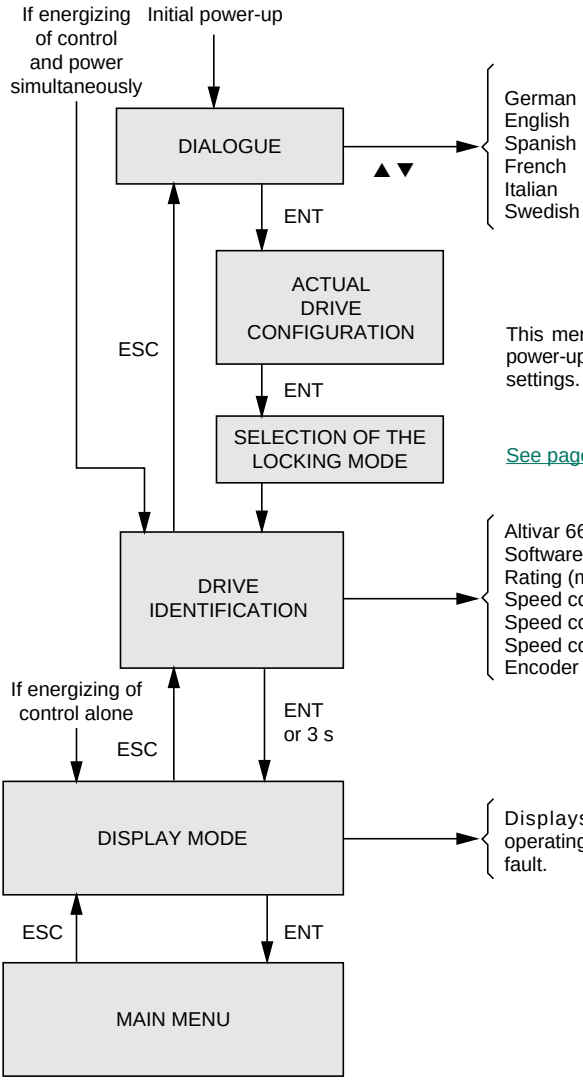
Principle of access to menus

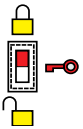
On initial power-up, or after a total return to factory settings (page 162), a message appears on the screen for selecting the dialogue language using the ▲ and ▼ keys.

The second message displayed enables the operator to confirm or change the factory configuration of the speed controller (see page 100).

If it is not the initial power-up, the Display mode message appears in the language which has previously been selected. To change the language, return to the Dialogue menu using the ESC key.



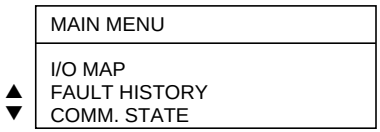
Principle of access in the Main menu

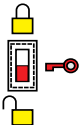


Depending on the position of the access switch at the back of the graphic terminal, the Main menu contains 3 or 6 or 12 modes which can be accessed.

Switch in locked position (factory setting)

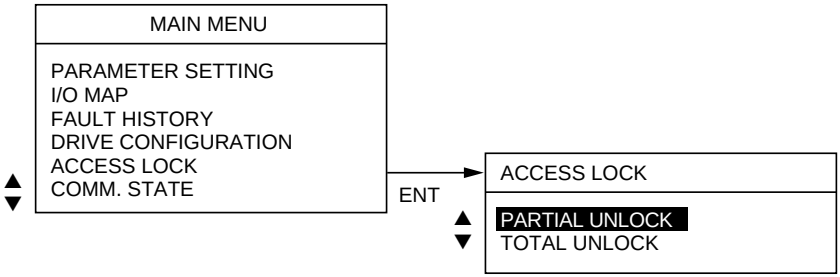
Speed controller programming is locked, and the graphic terminal is used for display only (and in local control mode using the keypad if this has previously been selected and programmed).



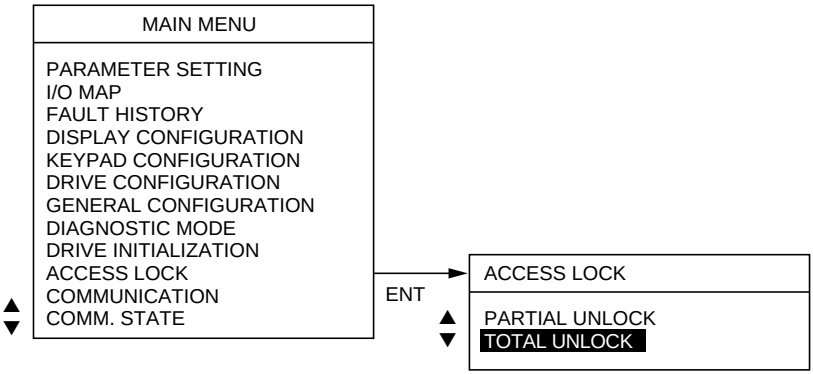


Switch in unlocked position

Speed controller programming using the keypad is partially unlocked.



When total unlock is selected in the Main menu, five additional programming modes can be accessed.



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Contents of the Main menu

1 PARAMETER SETTING	
LOW SPEED	
HIGH SPEED	
ACCELERATION	
DECELERATION	
MOTOR SLIP	(5)
IR COMPENSATION	(1) (2)
INERTIA	(3)
DAMPING	
BANDWIDTH	(2) (3)
VOLTAGE BOOST	(2)
TORQUE GAIN	(2)
NO-LOAD CURRENT	(3)
MOTOR OVERLOAD	
TORQUE COEFFECIENT	(4)
POS DEAD BAND	(4)
NEG DEAD BAND	(4)
SET POINT GAIN	(6)
OFFSET	(6)
KP	(6)
KI	(6)
PI FAULT RATIO	(6)
REF PI DISPLAY	(6)
REF MANUAL DISPLAY	(6)

Display and modification of the main settings, with the speed controller stopped or running.

Adjustment of motor thermal protection by thermal current selection (presetting to motor rated current).

Setting the drive parameters according to the control type selected, which determines the motor power characteristics : IR compensation, voltage boost, bandwidth, profile, damping, etc (see page 110).

(1) "Normal“ mode
(2) "High Torque" mode
(3) "FVC“ mode
(4) For torque reference and "FVC“ mode
(5) Motor slip in normal mode
(6) PI regulator available

2 I/O MAP
2.1 LOGIC INPUT MAP
2.2 ANALOG INPUT MAP
2.3 LOGIC OUTPUT MAP
2.4 ANALOG OUTPUT MAP

Display assignment of the I/O and their state (0 or 1) or their value (as a %).

3 FAULT HISTORY

Display the last faults which occurred during operation.

Menus 4 to 10 can only be accessed if the speed controller is locked and the motor is stopped.

4 DISPLAY CONFIGURATION
4.1 ONE BAR GRAPH
4.2 TWO BAR GRAPH
SCROLL, 4 ITEMS

Select the display mode :

– 1 or 2 values with bargraph,
– 4 tables which can be accessed in succession.

Selection of values which can be displayed.

5 KEYPAD CONFIGURATION

The selection of menu 5 shows : terminal control not available.

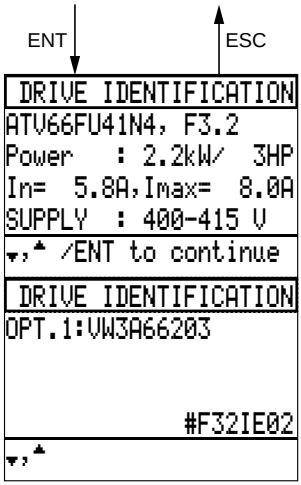
Contents of the Main menu

6 DRIVE CONFIGURATION 6.3 MOTOR POWER (ATV-66FU41N4 only)	Speed controller configuration : – constant torque, – command mode : 2-wire. Altivar ATV-66FU41N4 : it is possible to change the motor power to be able adapt the speed controller currents to the real power of the motor to which it is connected.
7 GENERAL CONFIGURATION 7.1 DRIVE PARAMETERS 7.2 APPLICATION FUNCTIONS 7.3 OUTPUT ASSIGNMENT 7.4 FAULT MANAGEMENT	Modification of the general configuration of the speed controller : – Configuration and setting of the drive parameters. – Selection of the application functions. – Reassignment of logic and analog outputs. – Fault management.
7.1 DRIVE PARAMETERS 7.11 MOTOR PARAMETERS 7.12 CONTROL PARAMETERS 7.13 CONTROL TYPE	**Motor parameters** : programming parameters specific to the motor. These depend on the speed controller configuration in terms of the control type selected (see page 107). **Control parameters** : modification of the speed controller settings by extending the adjustment ranges and modifying the ramp type. **Control type** : selecting the motor power characteristics for adapting the speed controller to the application. – "NORMAL“ and "HIGH TORQUE" : simple open loop application (i. e. hoisting with open loop). – "FVC“ : closed loop application.
8 DIAGNOSTIC MODE	Tests the speed controller : – Autodiagnostic : control card of transistors. – I/O test. – Testing of microprocessor and internal power supplies ± 15 V.
9 DRIVE INITIALIZATION 9.1 TOTAL FACTORY SETTING 9.2 PARTIAL FACTORY SETTING 9.3 CUSTOMER SETTING MEMORIZATION 9.4 RECALL USER SETTING	Total return to factory settings. Saves the configuration and the settings to a PCMCIA card which can be installed in the speed controller. Transfer of data to the speed controller from a PCMCIA card to which data was previously remotely downloaded.
10 ACCESS LOCK	Selects partial or total unlock.
11 COMMUNICATION	Refer to User's Manual of the correspondant communication protocol and to the ATV66-FVC "Internal variables" user's guide.
12 COMM. STATE	

Procedure for direct access to a numbered menu

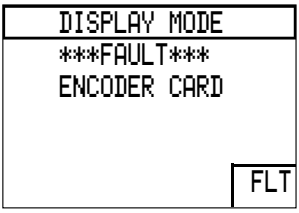
Press the F3 key : a message appears on the screen
Enter the number using the numerical keys and press ENT.
Example opposite : menu 7.11 Motor parameters.

The position of the switch on the graphic terminal and the access lock selected determines the menus which can be accessed. If the menu requested is not accessible, a warning message appears on the screen.



In the Drive Identification menu, it is possible to check the commercial symbol of the option and the sofware release using the ▼ ▲ keys.

The speed controller cannot operate without its encoder interface card VW3-A66203. When this is missing, the following message appears.



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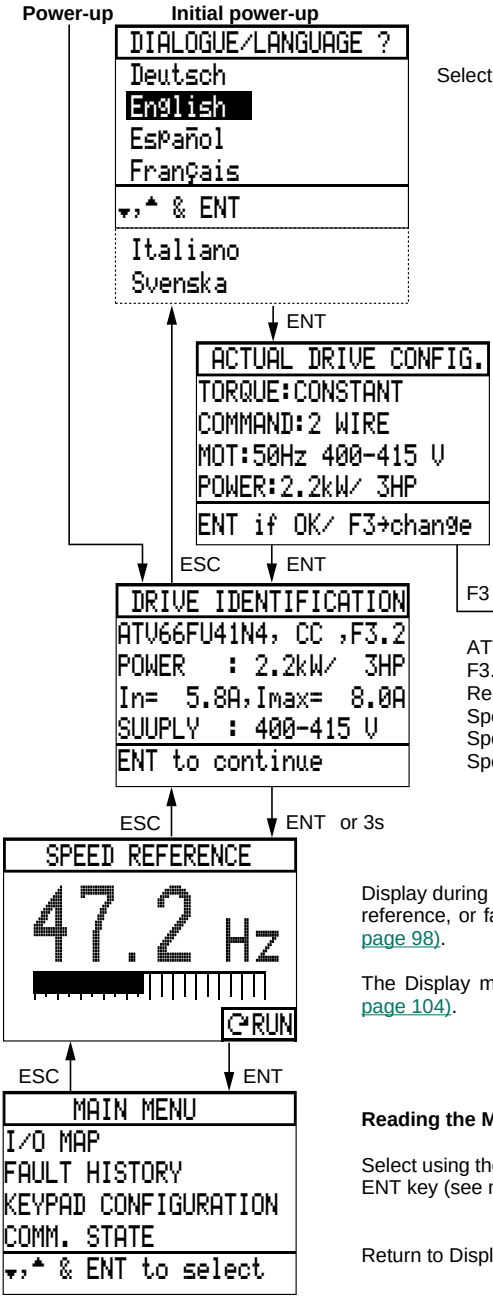
Switch in locked position



Selection of language

Factory configuration of the speed controller.

Voltage set by the speed controller according to the line frequency at the initial power-up.
Display of the power for the ATV-66FU41N4 only.

Procedure for modifying the configuration (see page 100)

ATV-66FU41N4 = speed controller reference
F3.2 = software version
Recommended motor power rating
Speed controller nominal current
Speed controller maximum current
Speed controller nominal voltage

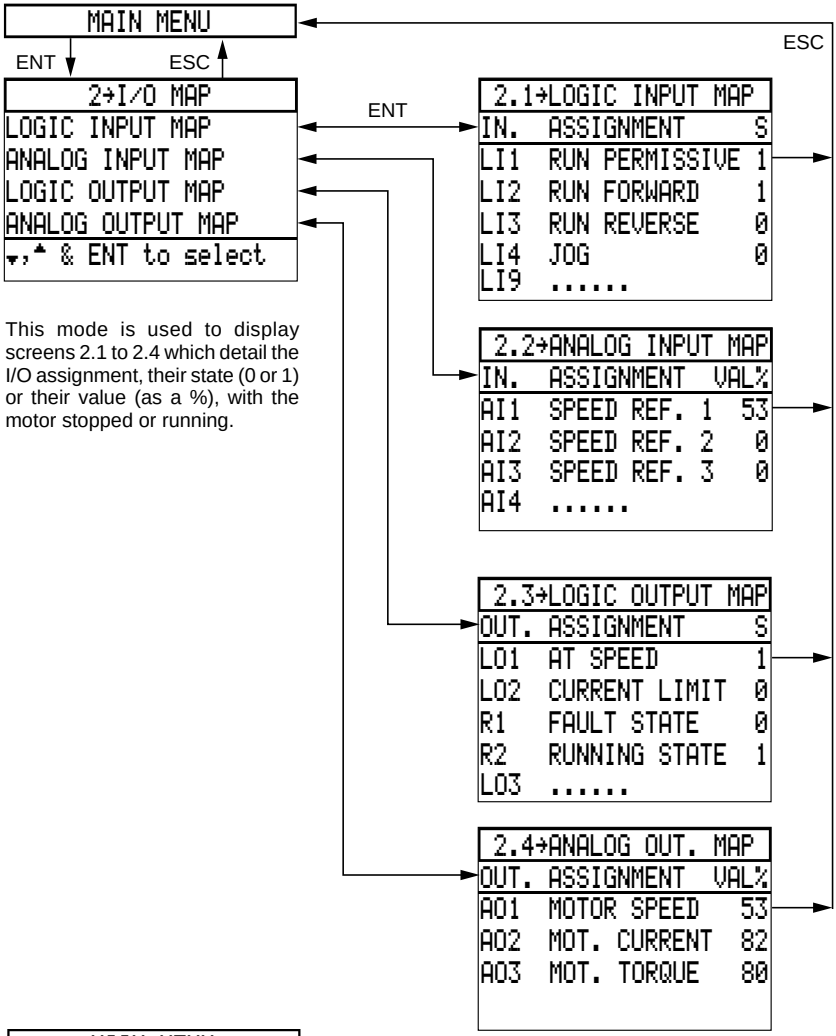
Display during operation, with the motor running : speed reference, or fault, and the status of the controller (see page 98).

The Display mode configuration can be modified (see page 104).

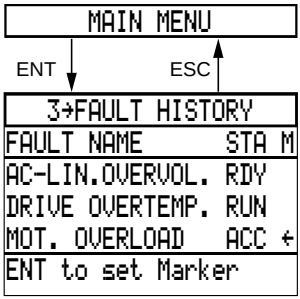
Reading the Main menu

Select using the ▲ ▼ keys and open the mode using the ENT key (see next page).

Return to Display mode using the ESC key.



This mode is used to display screens 2.1 to 2.4 which detail the I/O assignment, their state (0 or 1) or their value (as a %), with the motor stopped or running.

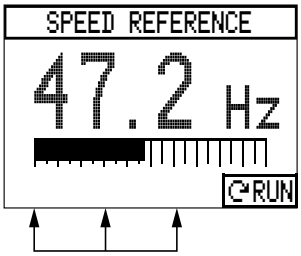


This mode displays the last faults (8 maximum) which occurred during operation, and the speed controller status when the faults appeared.

Use the ▲ ▼ keys to scroll through the menu.

The arrow indicates the fault marking at the time of the last control.

Display mode during operation



Display of the speed reference with bargraph, or of a fault (see next page).

The other values displayed can be accessed in succession using the ▲ ▼ keys (see list, page 105). If these keys are not pressed, the value currently displayed remains on screen.

Return to display initially programmed on energizing of speed controller after cut-off of control power supply and power.

The speed controller status is coded on the last line of the screen on the right hand side :

NLP	no power supply
NRP	operation not authorized
RDY	speed controller ready
RUN	running (steady state)
SLC	speed controller on line
↻	forward operation
↺	reverse operation
ACC	accelerating
DEC	decelerating
DCB	DC injection braking
CLI	current limit or not following ramp
JOG	step by step operation
BRK	resistor braking
FLT	in fault mode
FLX	in motor flux

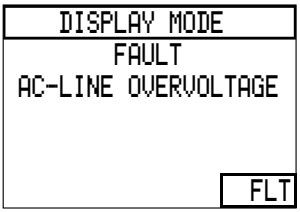
The Display mode configuration can be modified in the Main menu (Access lock set to total unlock) : Display configuration, see page 104.

Other values can also be programmed :

– 1 or 2 values with bargraph,
– 4 tables which can be accessed by scrolling using the ▲ ▼ keys.

If the programmed display is 2 values with bargraph, displaying the other values by scrolling using the ▲ ▼ keys only affects the second value : the first value remains displayed.

Displaying a fault



When a fault occurs : the speed controller is locked and the motor freewheels to a stop.

Clear display of the fault type and additional information for certain faults.

See example opposite.

List of faults

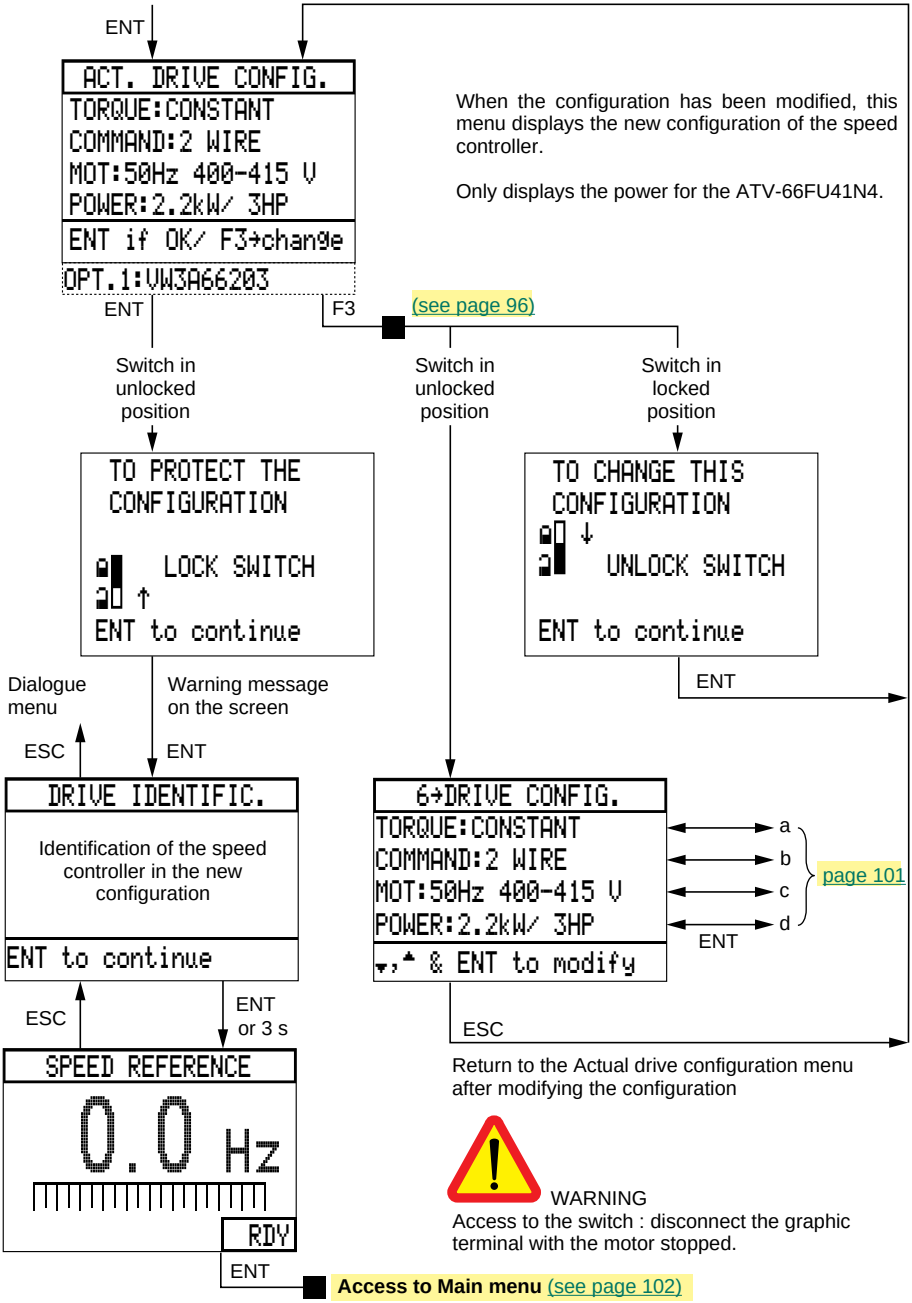
Input phase loss	: incorrect supply to controller or melting of fuses, transient fault of one phase of the line supply (t ≥ 1 s).
Undervoltage	: line supply too low or transient voltage dip (t ≥ 200 ms), load resistor damaged, speed controller incorrectly powered or blown fuses.
AC-line overvoltage	: line supply too high.
Drive overtemperature	: heatsink temperature too high.
Motor overload	: thermal tripping caused by prolonged overload.
DC-bus overvoltage	: excessive braking or driving load.
Output phase loss	: fault on one phase at speed controller output.
Loss follower	: loss of the 4-20 mA reference on input AI2.
Short-circuit	: short-circuit between phases at speed controller output.
Ground fault	: grounding (earthing) at speed controller output.
Precharge failure	: control fault in the capacitor charging relay, or load resistor damaged, or braking resistor short-circuited.
Internal fault	: internal or connection fault.
Memory failure	: memory error in EEPROM.
Serial link fault	: fault with communication by serial link (PCMCIA Communication card or keypad connector).
Link fault	: communication fault between the keypad and the ATV-66.
Overspeed	: with encoder feedback - motor speed greater than 10/9 of HSP, - motor overspeed or loss of load. : : without encoder feedback - estimated motor speed greater than 1,2 F max., - overspeed.
Transistor short-circuit Open transistor Dynamic brake fault	transistor fault detected by the automatic self-test each time the speed controller is powered up.
Sequence time out fault Process time out fault	with bypass function (see page 132).
Speed feedback	: encoder fault.
Encoder card	: encoder interface card disconnected.

Other faults may also appear if they have been programmed (see pages 155 to 159).

The speed controller stopping method may also have been modified (see page 155).

Switch unlocked : partial unlock

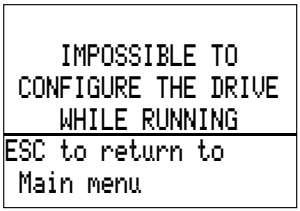
Initial power-up : Dialogue menu (see page 96)



Modifying the speed controller configuration

This operation can only be performed if the speed controller is locked and the motor is stopped.

If they are not, a warning message appears on the screen.

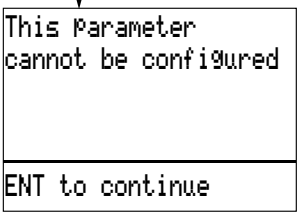


a

page 100

b

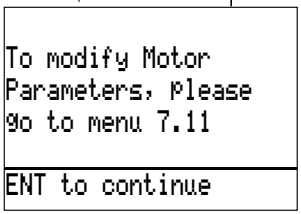
ENT



c

Special case : ATV-66FU41N4 with a < 2,2 kW (or 3 HP) motor : choice of the power of the motor to be used.

ENT ENT

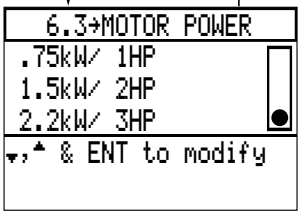


To access the Main menu and select total unlock in Access lock mode, see page 104.

To modify the motor parameters, see page 108.

d

ENT ENT



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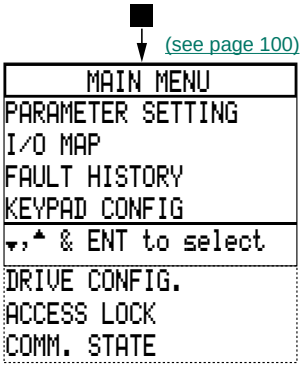
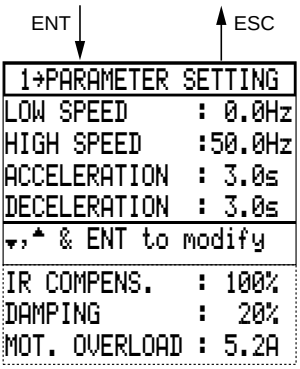
Switch unlocked : partial unlock



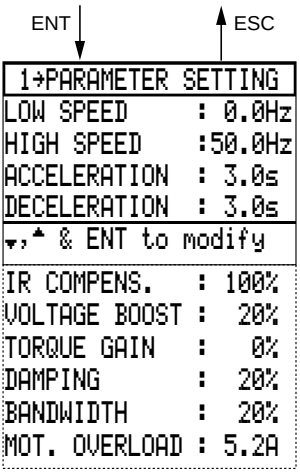
Parameter setting

In the Main menu, select the Parameter setting mode.
The settings can be selected with the motor running or stopped.
The settings available depend on the type of control selected ("Normal", "High Torque" , "FVC").

"Normal" mode



"High Torque" mode



Setting procedure :

– select the line in reverse video using the ▲ ▼ keys,
– press ENT : the numerical value stays underlined,
– adjust it to the required value using the numerical keys or the ▲ ▼ keys in + – mode and confirm with ENT.

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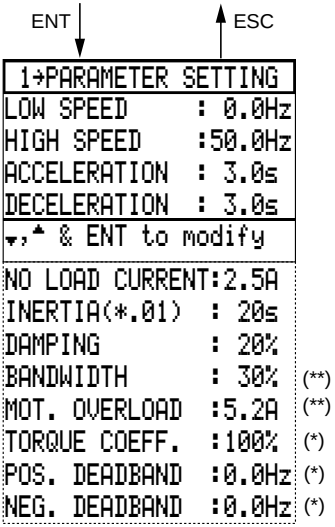
"FVC" mode



(*) This parameter appears if the "Torque control" function is validated.

(**) These parameters are adjusted separately from the "bandwith"and "damping" parameters of the "High Torque" mode.

Settings :

LOW SPEED :

speed corresponding to the minimum speed reference, from 0 to high speed, preset value is 0.

HIGH SPEED :

speed corresponding to the maximum speed reference, from low speed to maximum frequency (see page 122), preset value is 50/60 Hz.

ACCELERATION AND DECELERATION :

from 0.1 to 999.9 s, preset value is 3 s.
Time taken to go from 0 to the nominal frequency (menu 7.11). Preset value of the nominal frequency : 50 Hz for a 50 Hz supply and 60 Hz for a 60 Hz supply.

When the torque capacity is exceeded, the acceleration ramp times is automatically adapted and a braking resistor should be provided for deceleration purposes.

MOTOR OVERLOAD

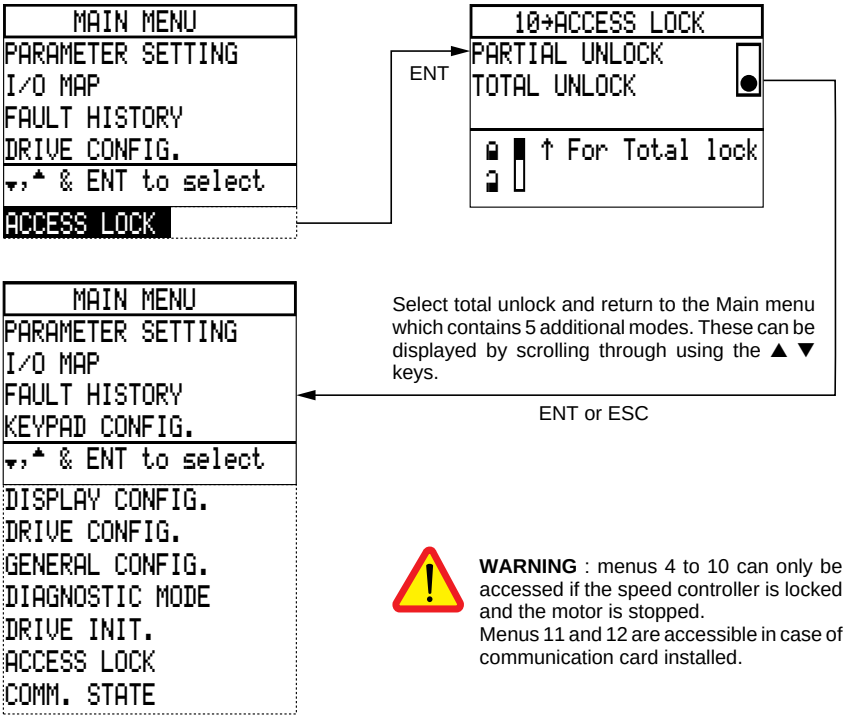
Current used for the thermal calculation, setting 0.45 to 1.36 times the nominal current of the speed controller, preset at 0.9 times. For the ATV-66FU41N4, this current is a function of the selected motor power, or a value of the parameter I NOMINAL if the setting has been modified (see page 109). Set at the nominal current shown on the motor identification plate.
To inhibit the thermal protection or adapt it to the particular motor type (self-cooled or force-ventilated), go to the Main menu with Access lock in total unlock (see page 158).

Comment : Other settings may also appear :
– acceleration 2 and deceleration 2, if the alternate ramp parameter has been selected (see page 124),
– slip compensation for constant torque applications, if manual configuration has been selected (see page 109).

For the other parameters of menu 1, refer to pages 110**,** 111 **and** 114**.**

Total unlock : access procedure

Access procedure



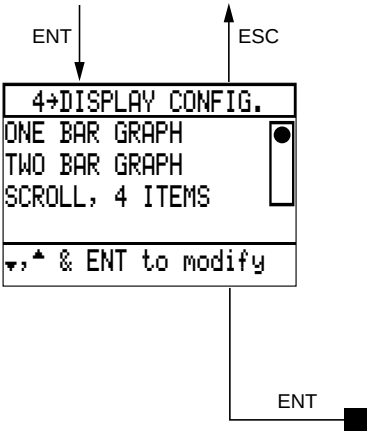
Select total unlock and return to the Main menu which contains 5 additional modes. These can be displayed by scrolling through using the ▲ ▼ keys.

ENT or ESC

WARNING : menus 4 to 10 can only be accessed if the speed controller is locked and the motor is stopped.
Menus 11 and 12 are accessible in case of communication card installed.

Display configuration

Select Display configuration mode in the Main menu.

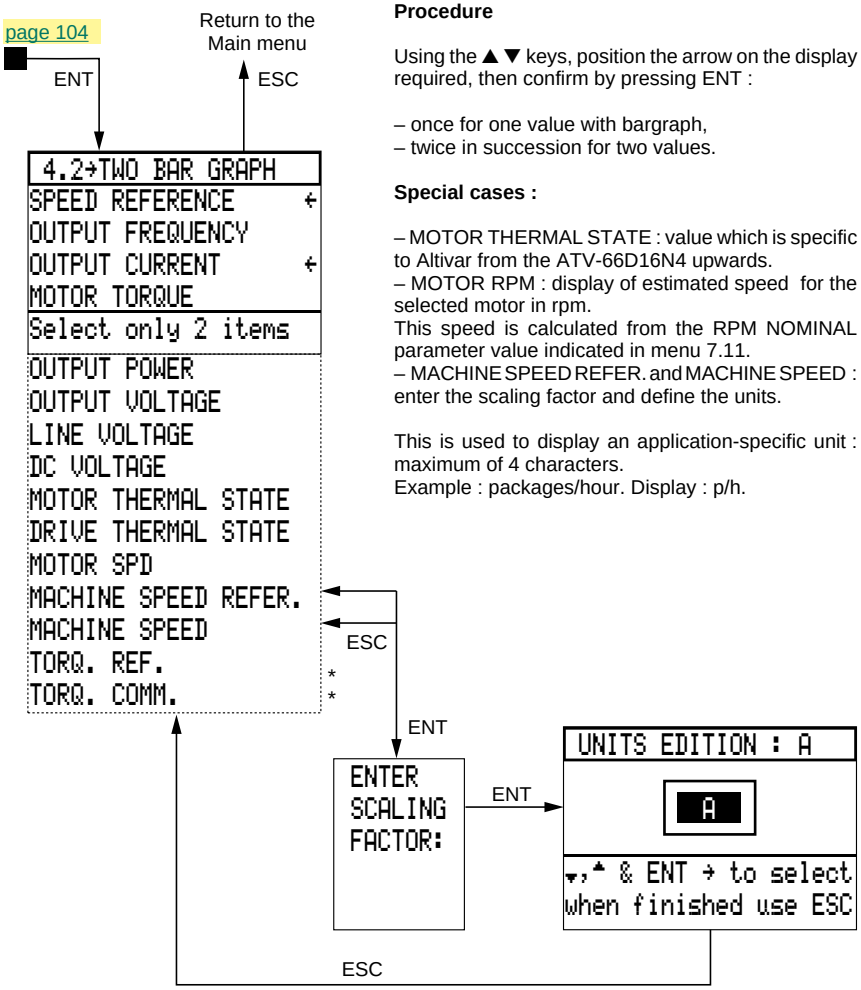


The speed controller is preset with a value which can be displayed with a bargraph : speed reference.

Select the display required during operation in Display mode :

– 1 or 2 values with bargraph,
– 4 parameters with scrolling menu to display 4 tables in succession (see page 106).

See example for selecting two values with bargraph on the next page.



Procedure

Using the ▲▼ keys, position the arrow on the display required, then confirm by pressing ENT :

– once for one value with bargraph,
– twice in succession for two values.

Special cases :

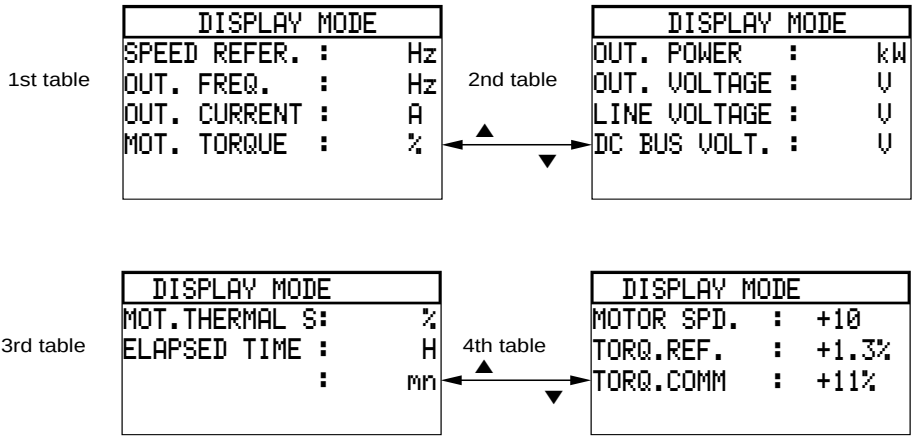
– MOTOR THERMAL STATE : value which is specific to Altivar from the ATV-66D16N4 upwards.
– MOTOR RPM : display of estimated speed for the selected motor in rpm.
This speed is calculated from the RPM NOMINAL parameter value indicated in menu 7.11.
– MACHINE SPEED REFER. and MACHINE SPEED : enter the scaling factor and define the units.

This is used to display an application-specific unit : maximum of 4 characters.
Example : packages/hour. Display : p/h.

(*) These parameters only appear if the "Torque reference" function is validated.

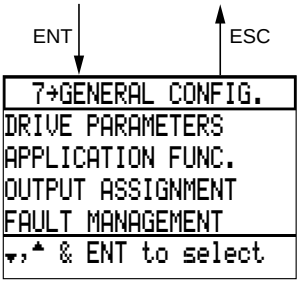
Total unlock : display configuration

Example of a display with 4 tables which can be accessed by scrolling from the FOUR-PARAMETER selection.



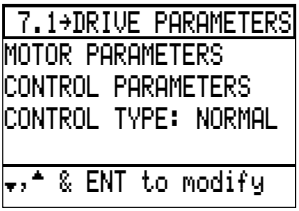
General configuration

Select the general configuration mode from the Main menu.



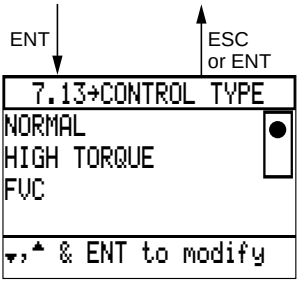
– DRIVE PARAMETERS :
  Summary of all the settings and the configuration
– APPLICATION FUNC. :
  Selection of application functions.
– OUTPUT ASSIGNMENT
  Assignment of logic and analog outputs.
– FAULT MANAGEMENT
  Fault configuration.

Drive parameters menu



– DRIVE PARAMETERS :
  Programming parameters specific to the motor (nominal current, nominal voltages, etc).
– CONTROL PARAMETERS :
  Programming parameters specific to the speed controller (acceleration, deceleration, etc).
– CONTROL TYPE :
  Selection of the type of motor control.
  This selection affects the :
  - operation of the "speed controller motor" unit (open or closed loop),
  - performance,
  - access to the motor parameter settings.

Control type



Since the selection of the control type affects performance and access to the settings, it should be selected first :
– "NORMAL" (factory setting) :
  Control of the motor in open loop operation.
  Speed range : 1 to 20.
– "HIGH TORQUE" :
  Control of the motor in open loop operation. Recommended when the application requires a higher torque at very low speed and a larger speed range (1 to 50), (hoisting application).
– "FVC" :
  Control of the motor in closed loop operation.
  Speed range : 1 to 1000.

Motor parameters

The parameter settings depend on the type of control selected.

"Normal" mode (open loop)

```
 7.11→MOTOR PARAMETER
NOM. CURRENT  : 5.2A
NOMINAL FREQ. :  50Hz
NOMINAL VOLT. : 400V
NOMINAL RPM   :1500
▼,▲ & ENT to modify
IR COMPENS.   : 100%
DAMPING       :  20%
ROTATION NORM.:  ABC
MOTOR SLIP        ...
CURRENT LIMIT     ...
BRAKE SEQUENCE    ...
```

"High torque" mode (open loop)

```
 7.11→MOTOR PARAMETER
NOM. CURRENT  : 5.2A
NOMINAL FREQ. :  50Hz
NOMINAL VOLT. : 400V
NOMINAL RPM   :1500
▼,▲ & ENT to modify
IR COMPENS.   : 100%
VOLTAGE BOOST :  20%
TORQUE GAIN   :   0%
DAMPING       :  20%
BANDWIDTH     :    %
ROTATION NORM.:  ABC
MOTOR SLIP        ...
TORQUE LIMIT      ...
CURRENT LIMIT     ...
BRAKE SEQUENCE    ...
```

"FVC" mode (close loop)

```
 7.11→MOTOR PARAMETER
NOM. CURRENT  : 5.2A
NOMINAL FREQ. :  50Hz
NOMINAL VOLT. : 400V
NOMINAL RPM   :1500
▼,▲ & ENT to modify
INERTIA(*.01) :  20s
DAMPING       :  30%
BANDWIDTH     :  20%
ROTATION NORM.:  ABC
MOTOR SLIP        ...
MOTOR FLUX    :   ...
PARAMETERS CODERS...
TORQUE LIMIT      ...
CURRENT LIMIT     ...
BRAKE SEQUENCE    ...
```

The following parameters :
damping, bandwith, brake sequence, can be configurated in open loop and closed loop mode with different values.

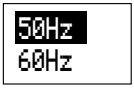
ENGLISH

NOM. CURRENT

This setting is used to adapt the speed controller to the motor.
Adjustment range : 0.45 to 1.05 times the nominal current of the speed controller.
Factory setting : 0.9 times.
Set at the nominal current shown on the motor identification plate.
If this setting is changed, the MOT. OVERLOAD setting is automatically modified (see page 103).

NOMINAL FREQ.
The value displayed is the line frequency detected at the initial power-up or during a full factory setting.

Example



If necessary, change the value.

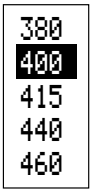
Setting : from 25 Hz up to the maximum frequency (see page 122).

Warning : when the power supply is changed, ensure that the value displayed conforms with the frequency of the motor.

NOMINAL VOLT.

The value displayed depends on the line frequency detected at the initial power-up or during a full factory setting.

Example :



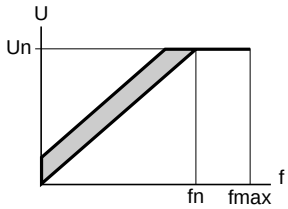
50 Hz supply : 400 V
60 Hz supply : 460 V.

If necessary, select the actual motor voltage.

RPM NOMINAL corresponds to the number of rpm at the nominal frequency. The value to be set is that indicated on the motor rating plate.
Example : 1500 rpm for a 4-pole motor supplied at 50 Hz, and 1800 rpm for a 4-pole motor supplied at 60 Hz.

IR COMPENS. ("NORMAL" and "HIGH TORQUE" modes only) :

Set according to the torque required at low speed
– 100 % to 0 : reduction of torque available at low speed,
– 100 % to 150 % : increase of torque available at low speed (only in "High Torque" mode).



VOLTAGE BOOST ("HIGH TORQUE" mode only) :

Setting the motor voltage at a very low speed to increase or decrease the torque build-up time.
Setting 0 to 100 % - factory setting 20 %.

TORQUE GAIN ("HIGH TORQUE" mode only) :

Set the speed controller behaviour during reversing phases of the rotating direction. If a load loss is detected , progressively increase step by step up to 100%.
Setting from 0 to 100%, pre-setting 0%.

DAMPING

Set the speed damping according to the dynamics of the application (cancelling the speed overshoot). Can be set from 0 to 100 %, preset value is 30 % in "HIGH TORQUE" or "FVC" modes and 20 % in "Normal" mode .

The default value should not cause an overshoot if the inertia value is correctly adjusted.

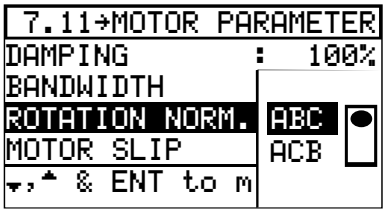
If an overshoot is tolerated, the damping value can be decreased.

For very unstable systems this value must be greater than the default value.

BANDWIDTH (available in "HIGH TORQUE" and "FVC")

Set the response time according to a speed scale or torque step function (speed of the system).
Can be set from 1 to 100 - preset value is 20.
Bandwidth = 1, very long response time
Bandwidth = 100, rapid response time

ROTATION NORM.



If necessary, the normal direction of rotation of the motor can be reversed (ABC → ACB) without having to modify the connection to the terminals of the speed controller or the motor.

INERTIA (✱. Ø1) ("FVC" mode only) :

Time taken by the motor to go from F = 0 Hz to 50 Hz under nominal torque.
This setting is required to obtain maximum performance using speed feedback control.

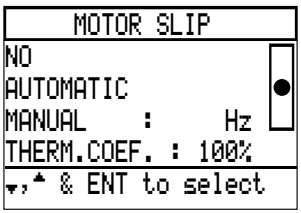
Measurement of the inertia of the system at nominal load to determine the INERTIA parameter :
– Select "FVC" mode in CONTROL TYPE,
– from a reading of the motor identification plate, enter the values of the following parameters in menu (7.11) : NOM. CURRENT, NOMINAL FREQ, NOMINAL VOLT, NOMINAL POWER, NO-LOAD CURRENT,
– set the ACCELERATION and DECELERATION parameters to 0.1 s and the HIGH SPEED parameter to the nominal frequency, in menu (7.12),
– select run forward or reverse and measure the ramp time for the speed to go from 0 Hz to 50 Hz,
– multiply this time by 100,
– enter the time value in the INERTIA parameter (in hundredths of a second)
minimum value : 2
maximum value : 1000

preset value : see table below.

Size	1	2	3	4	5	6	7
Preset	20	30	50	70	100	150	200

For applications which do not support a nominal speed step function, use a lower speed step function.

MOTOR SLIP (in "NORMAL" mode only)



Factory setting : AUTOMATIC.

It is possible to inhibit slip compensation (example : controlling a synchronized asynchronous motor).

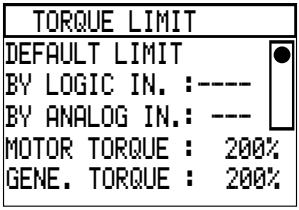
It is possible to select a compensation which can be adjusted between 0.1 and 10 Hz in order to adapt the speed controller to the characteristics of the motor (example : motor with low slip).
This adjustment can be accessed in Parameter setting mode (see page 103).
With the thermal compensation of the motor slip (in "FVC" mode only) it is possible to optimise the motor control in relation to its thermal state.

• 100 % : total compensation of the motor slip according to thermal state.
• 0 % : no compensation of the motor slip according to thermal state.

Presetting : 100 %

Note : slip = g = (Ns-Nr) / Ns
Ns = synchronous speed in rpm (revolutions/min.).
Nr = nominal speed with nominal torque in rpm (take the speed indicated on the motor plate).

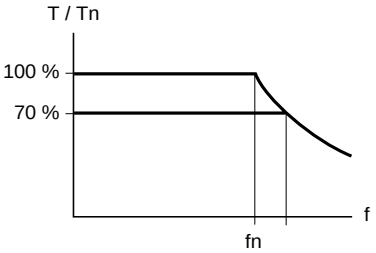
TORQUE LIMIT ("FVC" and "HIGH TORQUE" modes only)



DEFAULT LIMIT :
– motor and generator torque are directly limited by the values entered for the MOTOR TORQUE and GENE. TORQUE parameters.

BY LOGIC IN. :
– if LI is active : motor and generator torque are limited by the values entered for the MOTOR TORQUE and GENE. TORQUE parameters.
– if LI not active : limitation to 200 % Tn.

BY ANALOG IN. :
Motor and generator torque are limited by the absolute value of the AI input selected :
Minimum AI value = 0 % Tn motor,
0 % Tn generator.
Maximum AI value = 200 % Tn motor,
200 % Tn generator.
x % of AI = twice the % of Tn motor,
twice the % of Tn generator.



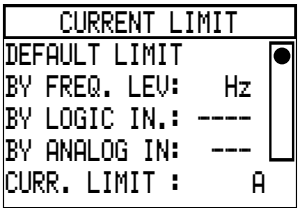
These 2 parameters MOTOR TORQUE and GENE. TORQUE are used to limit the torque, independently of the current limit, with separate settings for the motor and generator quadrants (speed controller with braking resistor).

Example opposite : extension of the constant torque operating zone above the nominal speed (in the constant power zone) by limiting the motor torque to 70 % for low resistive torque applications.

Values expressed as % : settings from 0 to 200 % of the motor nominal torque, preset at 200 %.

Note :
When the torque limit function is used, the speed error control must be deleted in order to prevent OVERSPEED. In menu 7.4 FAULT MANAGEMENT set the SPEED ERR VE protection to NO.

CURRENT LIMIT



It is possible to reduce the current limit for certain applications.

Factory setting : DEFAULT LIMIT.

Select the command mode if necessary : see below and the next page.

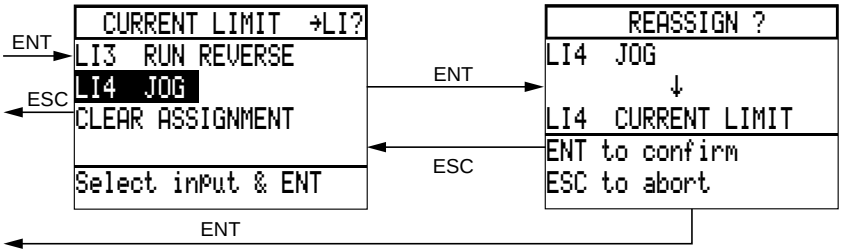
Reduction of current : adjustment from 40 % to 136 % of the speed controller nominal current, preset at 136 %.

Selecting the command mode (choice of 3) :

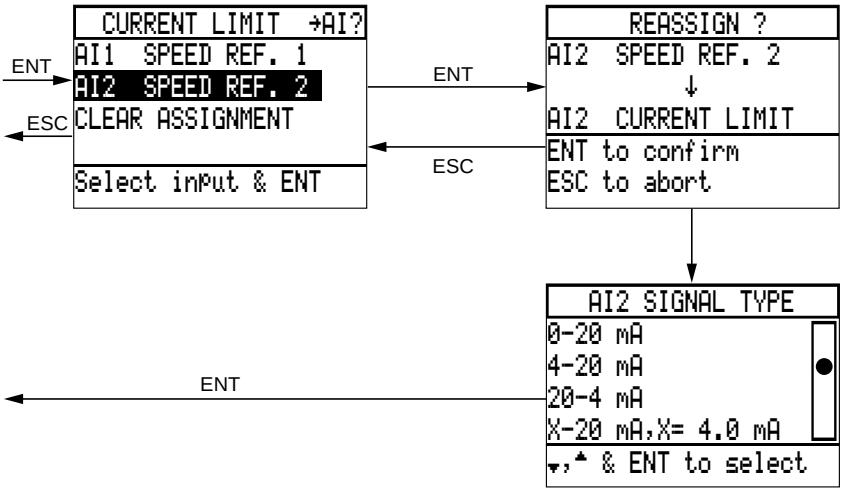
– At a specific frequency level (example : limitation of current above a certain speed), adjustment from 0 to maximum frequency (see page 121), preset at 50/60 Hz (line frequency).
– A logic input must be reassigned and its state changed (example : cutting to length followed by a stop and maintaining torque at a mechanical end stop).
– A signal must be varied on an analog input which must be reassigned (example : winder with simple regulation of traction).

I LIMITATION controlled either by frequency threshold or by logic input.

Procedure for reassigning a logic input

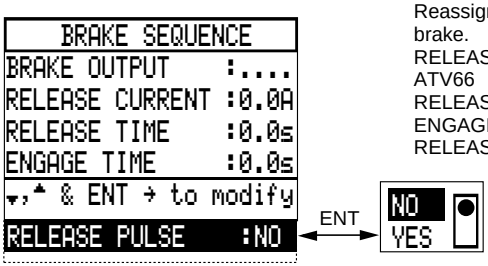


Procedure for reassigning an analog input

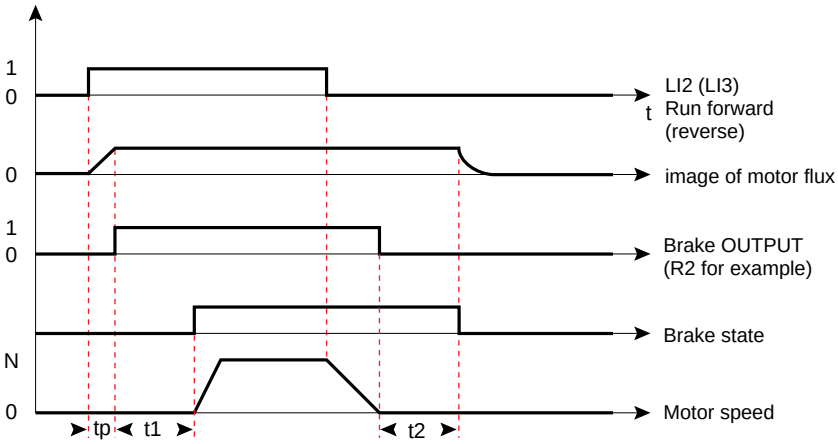


If necessary, modify the type of signal on input AI2. X can be programmed with a resolution of 0.1 mA. When set at 0-20 mA, it is possible to convert AI2 to a 0-5 V voltage input using a switch on the control card (to the left of terminal block J13), set I → U.

BRAKE SEQUENCE (in" FVC" mode)



Reassign a logic or relay output for controlling the brake.
RELEASE CURRENT : can be set from 0 to I max. ATV66
RELEASE TIME : can be set from 0 to 5 s
ENGAGE TIME : can be set from 0 to 5 s
RELEASE PULSE : YES - NO (1)



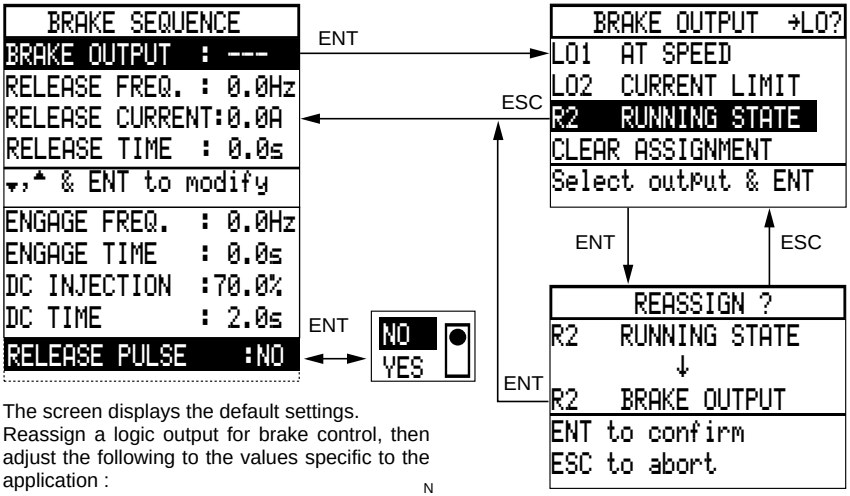
t1 : release time (torque regulated at zero speed)
t2 : engage time (during this time, the speed controller maintains regulation of the torque at zero speed)
tp : preflux time

(1) in the case of a driving load it is possible to maintain the load at zero speed during t1.

Note :
• The control output is common to the three control modes.
• The FVC brake sequence settings are independent from the settings of the other control modes.

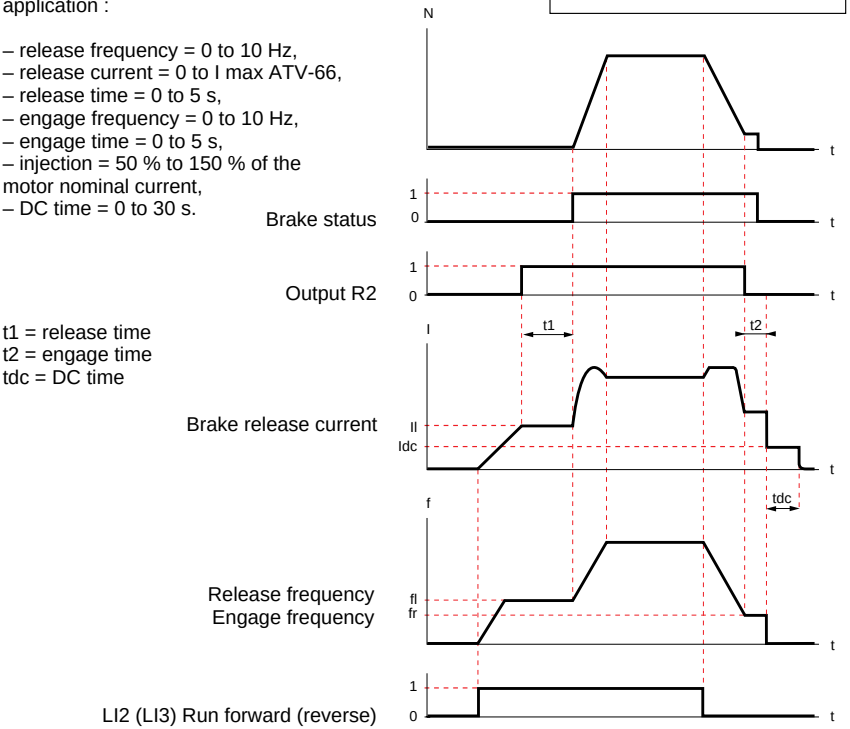
ENGLISH

BRAKE SEQUENCE ("NORMAL" and "HIGH TORQUE" modes only) :



The screen displays the default settings.
Reassign a logic output for brake control, then adjust the following to the values specific to the application :

– release frequency = 0 to 10 Hz,
– release current = 0 to I max ATV-66,
– release time = 0 to 5 s,
– engage frequency = 0 to 10 Hz,
– engage time = 0 to 5 s,
– injection = 50 % to 150 % of the motor nominal current,
– DC time = 0 to 30 s.

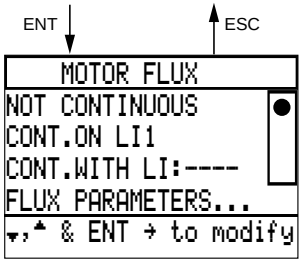


Recommendation :
In menu 7.4 FAULT MANAGEMENT/DB FAULT select YES to remove self-adaption of the deceleration ramp. In the event of the speed controller capacity being exceeded this will generate a fault.

MOTOR FLUX (available in "FVC")

To have a high torque on start-up, flux should be applied to the motor before starting. The flux time can be determined automatically by the speed controller, but this time can vary.

The effect of setting a value is to apply flux for a repeatable time prior to the motor starting. This value must always be higher than the actual flux time.



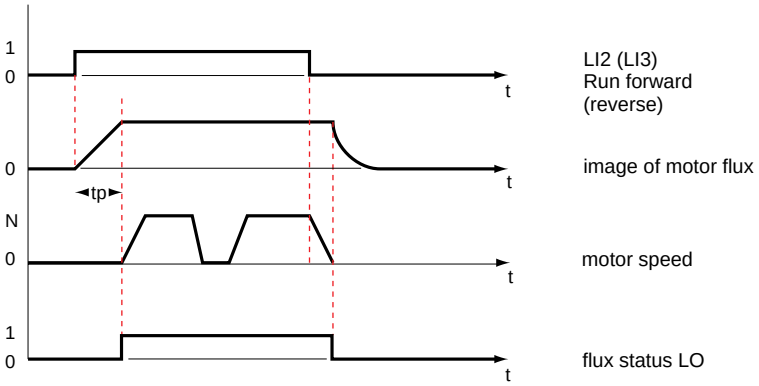
– NON CONTINUOUS : automatic flux time.
– CONTINUOUS ON LI1 : the flux is established with the command via the unlock input LI1.
– CONTINUOUS WITH LOGIC IN : the flux is established with the command given by an input LI (LI1 enabled).

The preflux time depends on the value of the preflux current. The assignment of a logic or relay output that gives the image of the flux status is optional.

NON CONTINUOUS

In NON CONTINUOUS mode, the speed controller automatically establishes the flux from the run command.

Advantage : No temperature rise when motor is stopped.
Disadvantage : Preflux time before starting (tp).

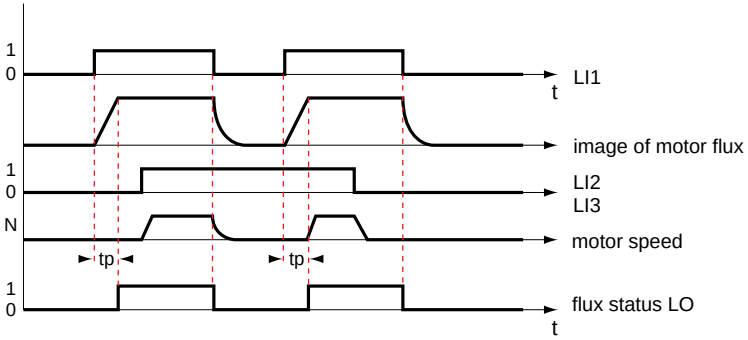


ENGLISH

CONTINUOUS ON LI1

In CONTINUOUS ON LI 1 mode, the motor flux establishment command is performed using the unlock input (LI1).

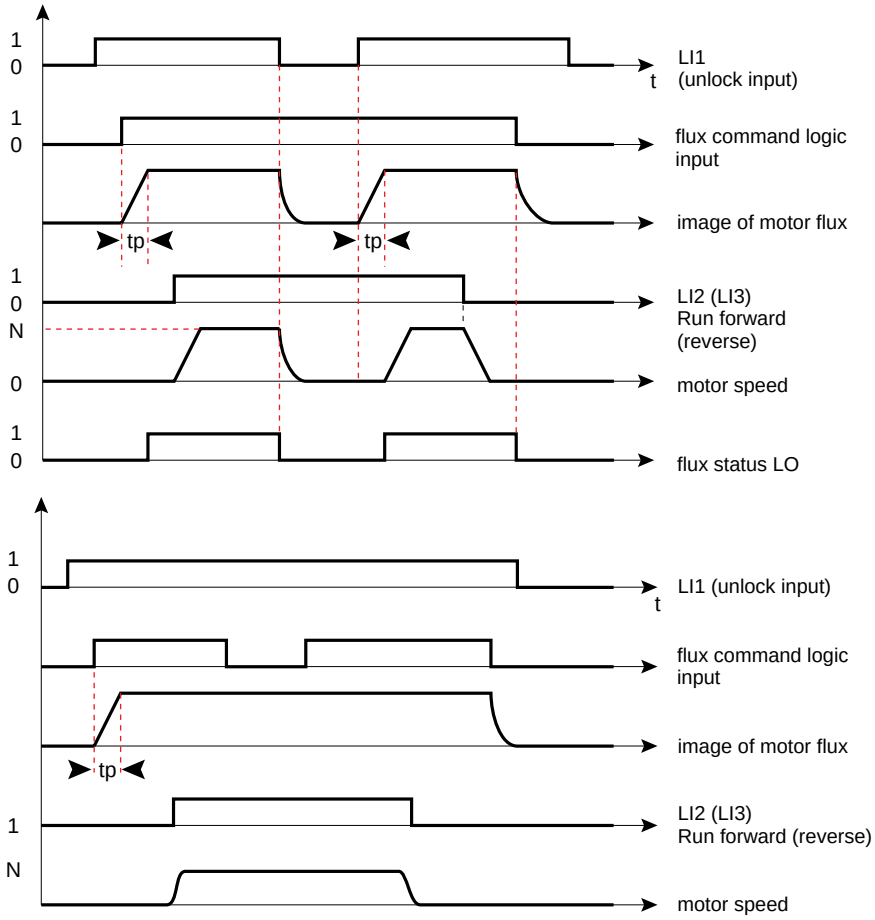
Advantage : Immediate start on run command.
Disadvantage : Fluxing of motor when stopped.



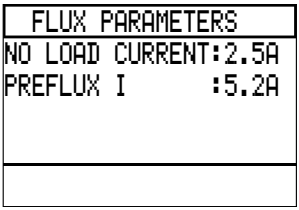
CONTINUOUS WITH LOGIC INPUT

In CONT WITH LI mode, assign a logic input (using the procedure page 114) enabling the command for establishing flux in the motor, which must be performed **before the run command.**

Advantage : Used to control the moment of fluxing :
– not fluxed on a prolonged stop,
– flux maintained on a short stop.
Disadvantage : Sequence is hard-wired.



FLUX PARAMETERS



NO LOAD CURRENT

This parameter must be set to obtain maximum performance
Take the value of the no-load current indicated on the motor identification plate or use the following procedure :

Measurement of the no-load current I0 :
– using a motor with no load, select "FVC" mode, display a speed reference equal to half the nominal frequency ;
– in display configuration mode, display the OUTPUT VOLTAGE parameter;
– modify the value of the NO-LOAD CURRENT parameter in order to obtain an OUTPUT VOLTAGE equal to half the nominal voltage.
minimum value equal to 10 % of the nominal speed controller current,
maximum value equal to 90 % of the nominal speed controller current.

preset value :

Motor power (kW)	**0,75**	**1,5**	**2,2**	**3**	**4**	**5,5**	**7,5**	**11**	**15**
No-load current I0 (A)	1,2	2,3	2,5	3,8	4,6	6,2	7,2	10	12

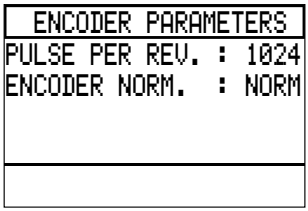
Motor power (kW)	**22**	**30**	**37**	**45**	**55**	**75**	**90**	**110**	**132**
No-load current I0 (A)	18,5	23	25	29	34	44	47	62	73

Motor power (kW)	**160**	**200**	**220**
No-load current I0 (A)	85	127	161

PREFLUX CURRENT

This parameter determines the preflux time value (tp).
Minimum value : Io (no load motor current),
Maximum value : speed controller Imax,
Preset value : nominal motor current.

ENCODER PARAMETERS



PULSES PER REVOLUTION

Defines the number of pulses per mechanical revolution.
Can be set from 90 to 5000 pulses per mechanical revolution.
Preset at 1024 pulses per mechanical revolution.

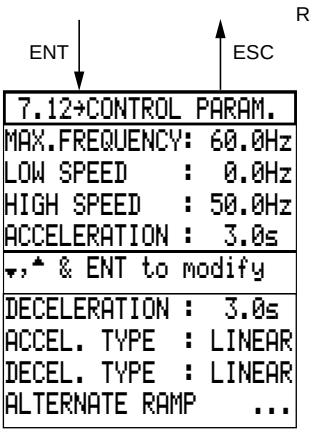
ENCODER PARAMETERS

Defines the sign of the speed feedback. It can be reversed without having to modify the connection of the encoder to the speed controller.

NORM : normal operation
REV : reverse operation

Control parameters

Select the Control parameters menu in the Drive parameters menu.



Set to the required values using the ▲ ▼ keys in + – mode and confirm with ENT.

Settings :

– MAXIMUM FREQUENCY :

in "NORMAL", "HIGH TORQUE" and "FVC" modes : 200 Hz for ATV-66FU41N4 to FC31N4,

– LOW SPEED : speed corresponding to the minimum speed reference, from 0 to high speed.

– HIGH SPEED : speed corresponding to the maximum speed reference, from low speed to a speed varying from 25 Hz to maximum frequency.

– ACCELERATION AND DECELERATION : from 0.1 to 999.9 s, presets 3s.
Time taken to go from 0 to the nominal frequency (menu 7.11). Preset value for the nominal frequency : 50 Hz for a 50 Hz supply and 60 Hz for a 60 Hz supply.

Note

When selecting a parameter, the original setting appears on the screen. This is either the factory setting or a value which has previously been programmed in Parameter setting mode (see page 102).

The new value programmed in the Control parameters menu is automatically saved in Parameter setting mode.

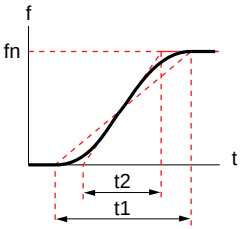
ACCEL. TYPE and DECEL. TYPE

The ramp types are linear by default.

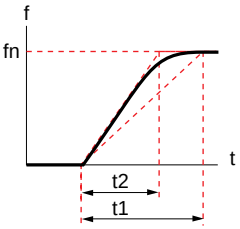
Each ramp can be independently selected as S or U.

Acceleration

S ramp

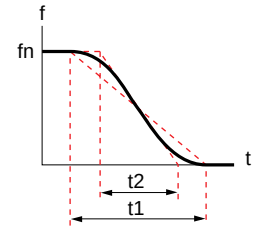


U ramp

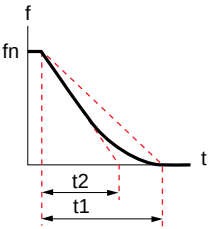


Deceleration

S ramp



U ramp



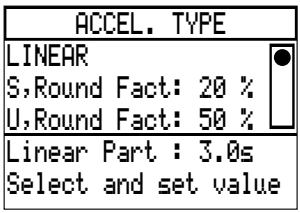
In each case, the rounding factor can be programmed as a % of the total time t1. Overall times remain unchanged.

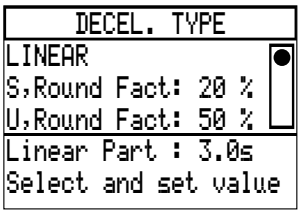
The new linear time t2 which represents the slope of the ramp is displayed on the screen.

Adjustment range : 0 to 100 %, that is t2 can be adjusted from t1 to 0.5 t1.

Factory settings :

– 20 % for S ramp,
– 50 % for U ramp.





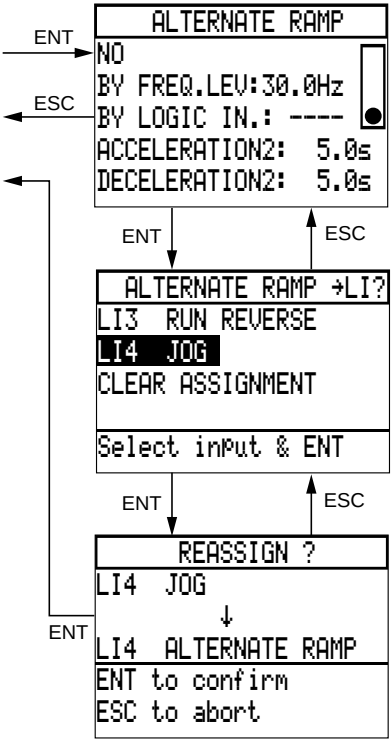
ALTERNATE RAMP

Choice of a second ramp time for acceleration and deceleration.
In this case, ramps 1 and 2 are automatically linear.

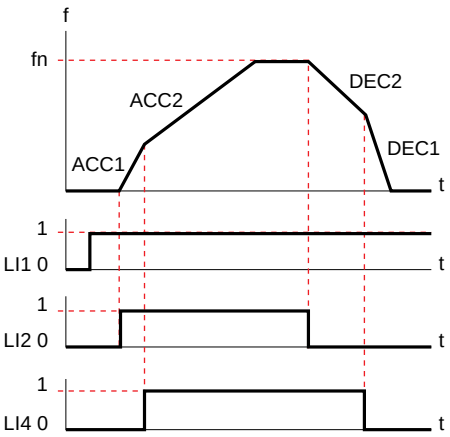
Select the type of switching between the two ramp times :

– at a specific frequency level, adjustment from 0 to maximum frequency, preset at 30 Hz,
– or by reassigning and changing the state of a logic input.

Then adjust the ramp times : from 0.1 to 999.9 s, preset at 5 s.
These adjustments can be accessed in Parameter setting mode (see page 102).



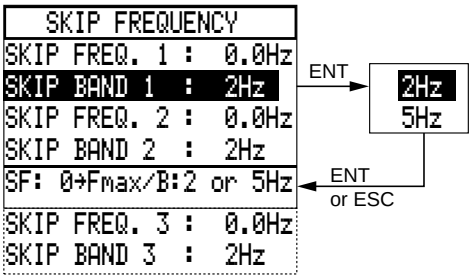
Example of switching using LI4



SKIP FREQUENCY

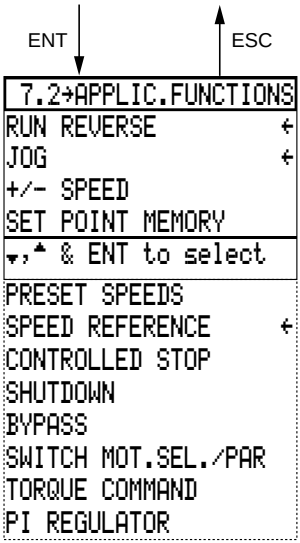
Prevents critical speeds which would cause mechanical resonance phenomena.

Prolonged operation of the motor can be prohibited in up to 3 adjustable frequency bands with a bandwidth of 2 or 5 Hz.



Application functions

Select the Application functions menu in the General configuration mode.



A number of application functions can be selected using this menu.

The three arrows indicate the factory settings :

– RUN REVERSE (input LI3),
– JOG (input LI4),
– SPEED REFERENCE.

The selection of functions is limited by :

– the number of reassignable logic inputs LI on the speed controller,

– the incompatibility of certain functions with each other, or with the selection of the brake sequence.

Inputs and outputs necessary for selecting functions

Application functions	LI inputs	AI inputs	LO or R2 outputs
Run reverse	1		
JOG (step by step)	1		
+/– speed	2		
Set point memory	1		
Preset speeds	1, 2 or 3		
Speed reference	0	1, 2 or 3	
Controlled stop	0 or 1		
Shutdown	0		1
Bypass	2		1
Switch mot.sel./Par.	1 or 2	1 or 2	
Torque command		1	
PI Regulator	1 or 2	1 or 2	

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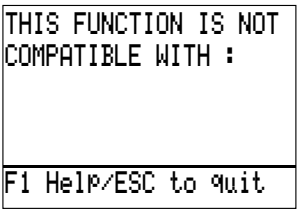
Total unlock : application functions

Table showing application functions which are not compatible

The ● indicates incompatibilities	RUN REVERSE	JOG	+ / – SPEED	SET POINT MEMORY	PRESET SPEEDS	SPEED REFERENCE	CONTROLLED STOP	SHUTDOWN	SWITCH MOT.SEL./PAR.	PI REGULATOR	BRAKE SEQUENCE	TORQUE COMMAND	ALTERNATE RAMP	BYPASS
RUN REVERSE										●				
JOG								●		●				
+ / – SPEED				●	●					●				
SET POINT MEMORY			●		●				●	●	●			
PRESET SPEEDS			●	●						●				
SPEED REFERENCE										●				
CONTROLLED STOP									●		●			
SHUTDOWN		●							●	●	●			
SWITCH MOT.SEL./PAR.				●			●	●						
PI REGULATOR	●	●	●	●	●	●		●			●	●	●	
BRAKE SEQUENCE				●			●	●		●				●
TORQUE COMMAND										●				
ALTERNATE RAMP										●				
BYPASS											●			

If a function is selected which is not compatible with another which has previously been validated, a warning message appears on the screen.



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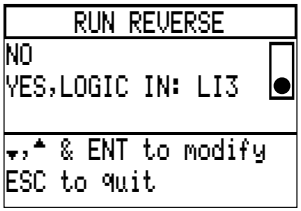
RUN REVERSE

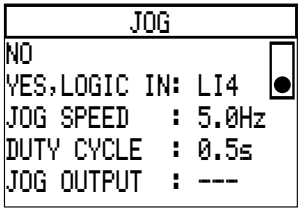


It is possible to inhibit this function for applications with a single direction of rotation of the motor.

Input LI3 then becomes available, and can be reassigned to another function.

Reassignment procedure : see example on page 114.

JOG

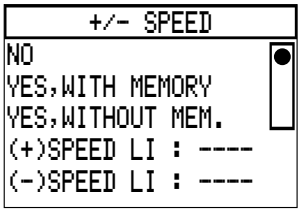


Fast pulsed operation with minimum ramp times : 0.1 s.

It is possible to inhibit this function or to modify the settings :

– JOG speed : preset at 5 Hz, adjustment from 0.2 to 10 Hz,
– duty cycle (time between 2 pulses) : preset at 0.5 s, adjustment from 0.2 to 10 s.

+ / – SPEED



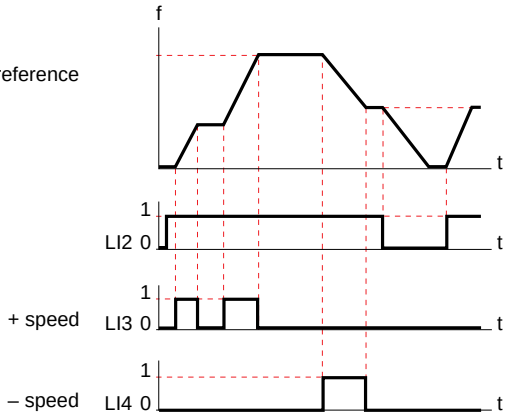
Speed reference increased or decreased via 2 logic commands with or without saving the last reference.

The speed reference cannot exceed the reference given by the summing of AI1 and AI2.

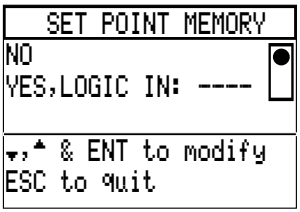
In this case, reassign 2 logic inputs.

Reassignment procedure : see example on page 114.

Example with saving the last reference



SET POINT MEMORY



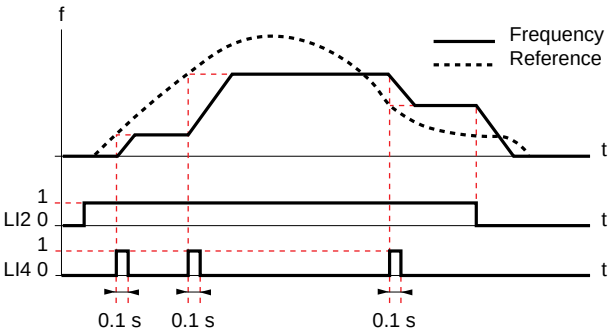
Acceptance and storing of a speed reference level for the reference input with a logic command lasting longer than 0.1 s.

The memory is maintained until the next command or inhibition of the direction of rotation command.

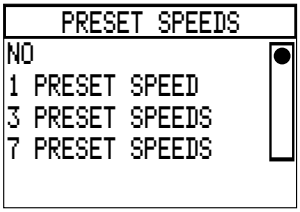
This function enables the speed of several speed controllers to be controlled via a single analog reference and a logic input for each speed controller.

To reassign a logic input, follow the procedure described on page 114.

Example of control via input LI4



PRESET SPEEDS

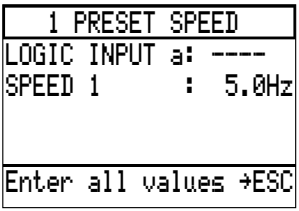


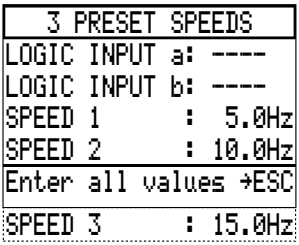
Switching between preset speed references using logic commands.

Selection between 1,3 or 7 preset speeds by reassigning 1, 2 or 3 logic inputs.

Adjustment from 0.1 Hz to maximum frequency, factory settings :
– 1 speed : 5 Hz,
– 3 speeds : 5, 10 and 15 Hz
– 7 speeds : 5, 10, 15, 20, 25, 30, and 35 Hz

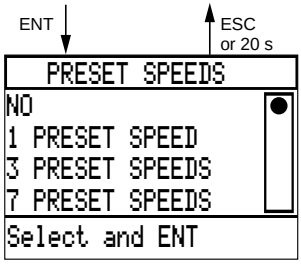
Reassignment of logic inputs : follow the procedure described on page 114.



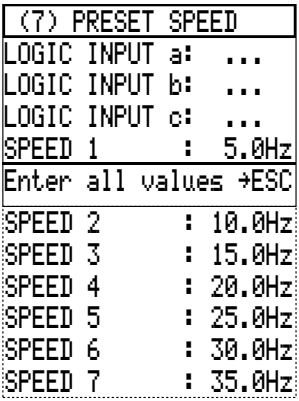


	LIb	LIa
Speed ref.	0	0
Speed 1	0	1
Speed 2	1	0
Speed 3	1	1

PRESET SPEEDS



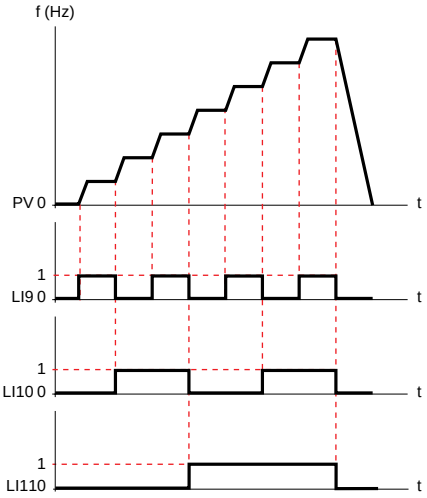
Switching by logic command of preset speed references.
Assignment of logic inputs LI9, LI10, LI11.



Setting preset speeds from 0.1 Hz to the maximum frequency.
The values for SPEED 1 to SPEED 7 must be in ascending order.
The table below shows the states between the logic inputs and the preset speeds.

	LIc	LIb	LIa
Speed reference	0	0	0
SPEED 1	0	0	1
SPEED 2	0	1	0
SPEED 3	0	1	1
SPEED 4	1	0	0
SPEED 5	1	0	1
SPEED 6	1	1	0
SPEED 7	1	1	1

Example with 8 speeds



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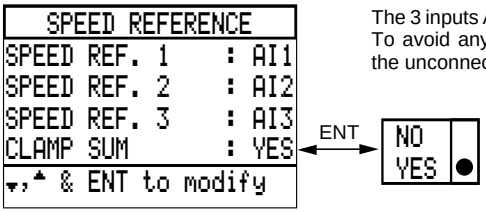
SPEED REFERENCE

It is possible to change the characteristics of current analog input AI2 because the setpoint for the voltage input AI1 (0-10 V) cannot be modified.



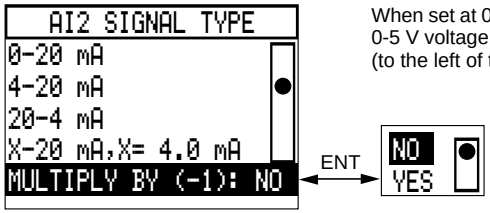
The 3 inputs AI1 and AI2 and AI3 are summing inputs. To avoid any disturbance from unconnected inputs, the unconnected inputs must be deconfigured.

Application example : machine whose speed is controlled by a loop controller signal on input AI2.

AI2 preset at : 4-20 mA.

The screen below is obtained by pressing ENT after 2 intermediate screens.

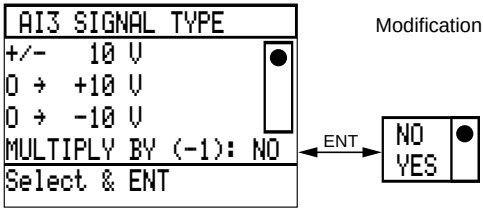
Settings : 0-20 mA, 4-20 mA, 20-4 mA, or X-20 mA by programming X with a resolution of 0.1 mA between 0 and 20, preset at 4 mA.



When set at 0-20 mA, it is possible to convert AI2 to a 0-5 V voltage input using a switch on the control card (to the left of terminal block J13), set I → U.

It is possible to assign a negative signal by selecting YES.

In this case, the AI2 reference is subtracted from the AI1 reference.

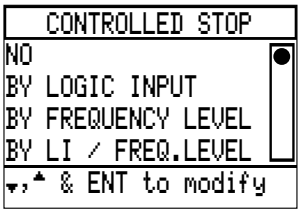


Modification of the type of signal on input AI3.

- 10/+ 10 V [- HSP, + HSP)
0 → + 10 V [LSP HSP)
0 → - 10 V [- LSP - HSP)
MULTIPL. BY (-1) : inversion of the speed

ENGLISH

CONTROLLED STOP



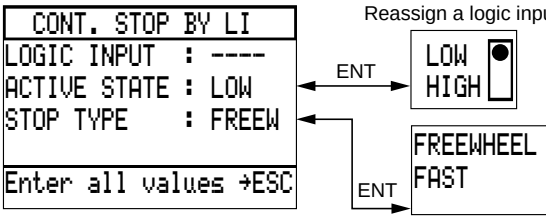
Selecting the stop command :

– by reassigning a logic input,
– by a specific frequency level,
– or by using both these commands.

In each case, there are three stopping methods :

– “Freewheel” stop : locks the speed controller and stops the motor according to the inertia and the resistive torque.
– Fast stop : braking with minimum acceptable deceleration ramp time without locking on a fault (provide a braking resistor).

Control by logic input

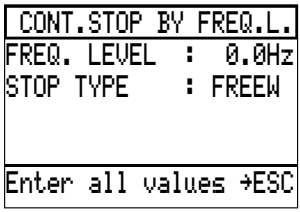


Reassign a logic input : see example on page 114.

Select the state of the input : active at low (0) or high (1), preset at low.

Select the stopping method.

Control by frequency level



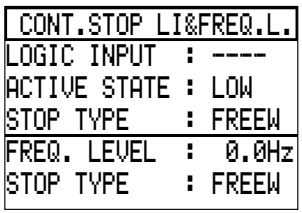
Set at the required frequency level.

Adjustment range : from 0 to the maximum frequency.

Select the stopping method (see above).

When a shutdown request is made, the controlled shutdown type that is selected will be activated as soon as the motor frequency drops below the threshold value.

Control by logic input and frequency level



Reassign, select and set as shown above.

Operation is as follows :

– at the initial stop command, the stopping method which corresponds to this command is validated,
– if the other stop command is given, the stopping method which corresponds to this command is only validated if it has priority over the first (priority : "freewheel", fast).

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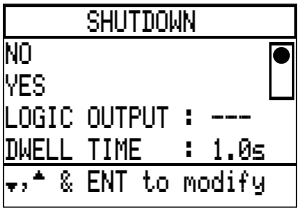
SHUTDOWN



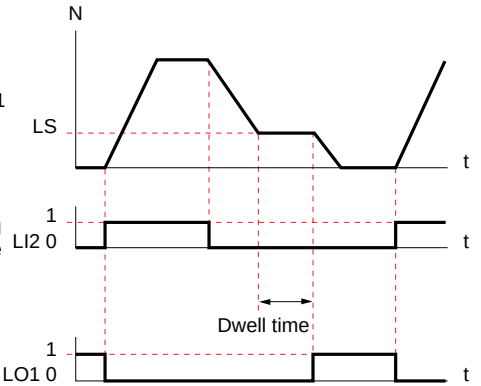
Low speed maintained for an adjustable time between 0.1 and 60 s : preset at 1 s.

Indicates the end of low speed operation by the change in state of a logic output.

Application example : pumping station control of closing a valve before the pump stops completely.

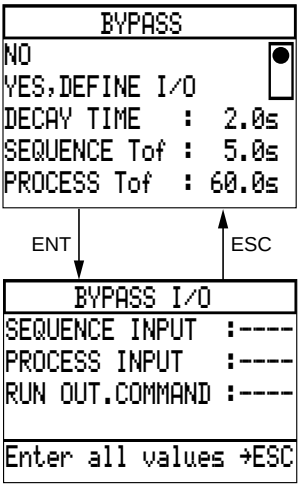
Reassign a logic output (see example on page 114), and set the dwell time.

Example with LO1



Comment : a run command given during the dwell time will only be enabled at the end of low speed operation.

BYPASS



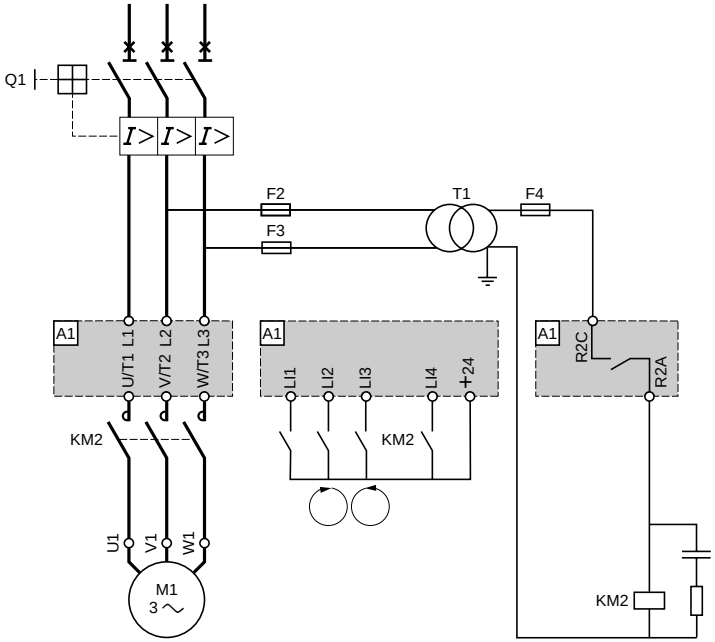
This function can be used :
– either to isolate the motor when there is no run command, using a contactor between the speed controller and the motor : see the next page,
– or to supply the motor by direct connection to the line supply (see pages 134 and 135).

The contactor is controlled according to the following conditions :
– "NORMAL" mode (CONTROL TYPE), if run forward or reverse, no fault and speed reference other than ZERO,
– "FVC "with NON CONTINUOUS option, if run forward or reverse, and no fault,
– "FVC" with CONTINUOUS WITHOUT LI option, if run reverse or speed controller unlocked and no fault,
– "FVC" with CONTINUOUS WITH LI option, if run forward or reverse or speed controller unlocked and LI and no fault.
Reassign 2 logic inputs :
– LI4 for SEQUENCE INPUT,
– LI3 for PROCESS INPUT (if necessary).
Reassign relay output R2 for RUN OUT. COMMAND.
Set the values according to the application :
– DECAY TIME (motor demagnetization) : can be set from 0.2 to 10 s, preset at 2 s,
– SEQUENCE Tof (time delay to be set above the energization time of KM2) : can be set from 0.2 to 300 s, preset at 5 s,
– PROCESS Tof : can be set from 0.2 to 300 s, preset at 50 s.

BYPASS : isolating the motor

This function avoids frequent switching of the power circuit upstream of the speed controller, and must be used for cycles < 60 s requiring isolation of the motor when stationary.

Connection diagram (example with circuit-breaker)



Input LI3 can be reassigned to RUN REVERSE for example.

Operation

Stopping by inhibiting the run direction command on input LI2 or LI3 :

– de-energization of relay R2 when the deceleration ramp is at zero,
– de-energization of contactor KM2.

Enabling of a run direction command on input LI2 :

– motor demagnetization (DECAY TIME),
– energization of relay R2,
– monitoring the energization of contactor KM2 : input LI4 (SEQUENCE INPUT) is enabled by closing the auxiliary contact ; if not, the speed controller locks after the time delay SEQUENCE Tof.

When the BYPASS function is selected, the motor phase fault is no longer taken into account.

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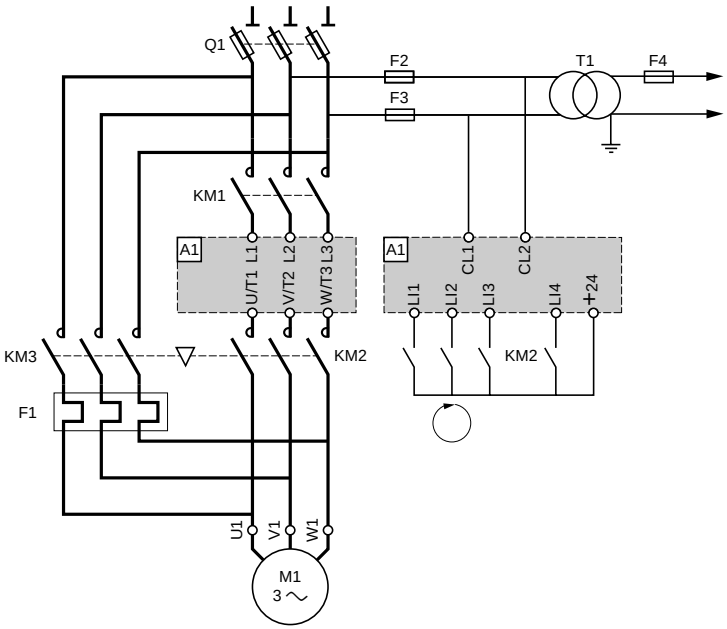
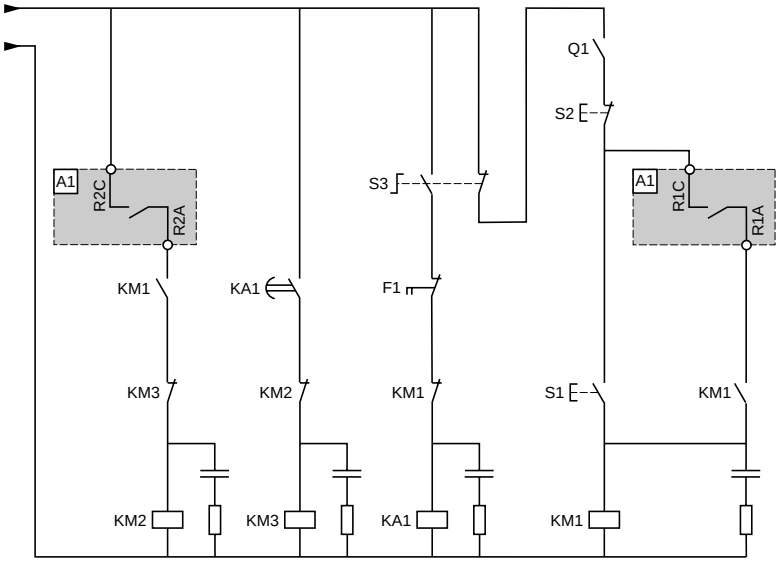
BYPASS : motor supplied directly from line supply

Connection diagram (control by switch)





Total unlock : application functions

Operation

The motor is connected directly to the line supply in the event of a speed controller fault :

– manual control via switch S3,
– de-energization of contactors KM1 and KM2 : isolates the speed controller power,
– dwell time of auxiliary contactor KA1 : demagnetizes the motor,
– energization of contactor KM3.

After the fault has disappeared, the motor power supply can be reconnected by the speed controller (this can be performed without the need for a prior stop request) :

– manual control via switch S3,
– de-energization of contactor KM3,
– manual control via pushbutton S1,
– energization of contactor KM1 : supplying power to the speed controller,
– enabling of run commands on inputs LI1 and LI2,
– motor demagnetization (DECAY TIME),
– energization of relay R2,
– energization of contactor KM2 : input LI4 (SEQUENCE INPUT) is enabled by closing the auxiliary contact; if not, the speed controller locks after the dwell time SEQUENCE Tof,
– if necessary, validate input LI3 (PROCESS INPUT) by closing a load detection contact; if not, the speed controller locks after the dwell time PROCESS Tof (example : checking flow rate or pressure in a pumping station).

Other possibilities :

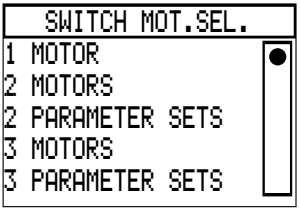
– Start on a ramp up to nominal frequency, then direct connection to the line supply.
– Reconnection of supply via the speed controller for controlled deceleration.

Applications : conveyor systems, starting several motors in cascade.

WARNING : when the BYPASS function is selected, the “motor phase fault” is no longer taken into consideration.

Note :
Motor parameters are measured when the speed controller is powered up.
If the motor is present on power-up : the measured parameters are used.
If the motor is missing on power-up : tabulated parameters or the last parameters measured are used.
For maximum performance when the motor is electrically isolated from the speed controller on power-up, an initialization sequence (motor connected to the speed controller on power-up) must be performed in order to measure and memorize the motor parameters at least once.
This sequence will result in optimal performance.
If this initialization sequence is not performed, the speed controller will operate using parameters from standard motors memorized in the speed controller.

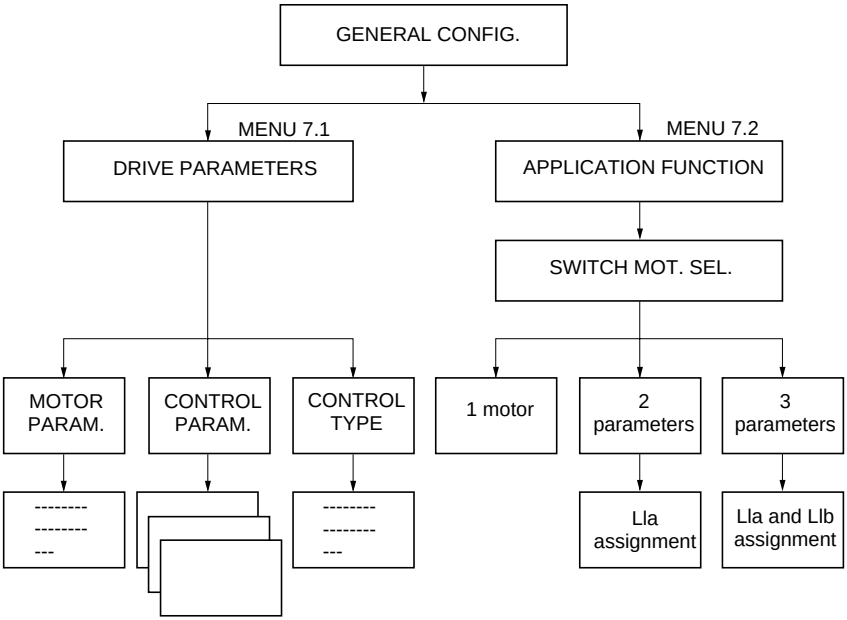
MOTOR AND PARAMETER SWITCHING



The SWITCH MOT. SEL. menu accesses two types of function :
– motor switching
– switching parameters for the same motor.

PARAMETER SWITCHING

– During parameter switching, only control parameters can be switched. The parameters are set in menu 7.1. Drive Parameters - Control Parameters 1, 2, or 3.



The parameter blocks 1, 2 or 3 can be selected during operation using logic input Lla or Llb.

ENGLISH

CONFIGURATION :

Menu : 7.2 APPLICATION / SWITCH MOT. SEL. function

```
SWITCH MOT.SEL.
1 MOTOR
2 MOTORS
2 PARAMETER SETS
3 MOTORS
3 PARAMETER SETS
```

Selects the number of parameter blocks.
1 Motor : standard operation.
2 Parameters : 2 blocks (1 logic input required).
3 Parameters : 3 blocks (2 logic inputs required)

1 MOTOR : selecting 1 motor deconfigures the motor and parameter SWITCHING function. Operation is then standard.

```
2 PARAMETERS
```

```
SWITCH 2 PARAMETERS
PARAM.SEL. LIa:---

     PAR1   PAR2
LIa   0      1
```

2 PARAMETERS :
– 2 parameter blocks can be selected.
– Assign the logic input used to select the parameter block.
– Note the combination of LIa, LIb inputs in the parameter selection menu.

```
3 PARAMETERS
```

```
SWITCH 3 PARAMETERS
PARAM. SEL. LIa:---
PARAM. SEL. LIb:---
     PAR1  PAR2  PAR3
LIa   0     1     0
LIb   0     0     1
```

3 PARAMETERS :
– 3 parameter blocks can be selected.
– Assign the 2 logic inputs used to select the parameter block.
– Note the combination of LIa, LIb inputs in the parameter selection menu.

Note :

LIa = LIb =1 : no switching.

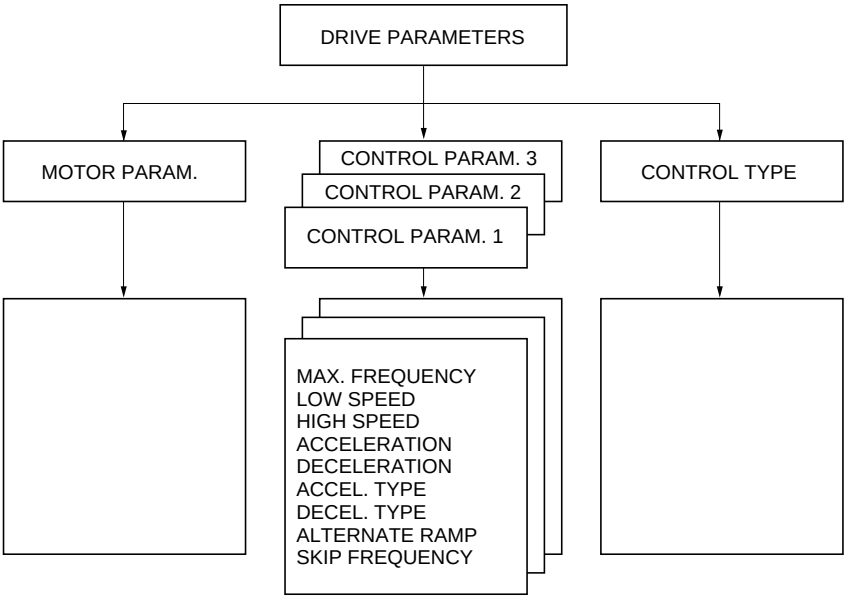
PARAMETER BLOCK SETTINGS

```
7.1→ DRIVE PARAMETERS
MOTOR PARAMETERS
CONTROL PARAM.1
CONTROL PARAM.2
CONTROL PARAM.3
↓,↑ & ENT to modify
CONTROL TYPE :NORMAL
```

Go to MENU 7.1 DRIVE PARAMETERS.
Only control parameters can have 1, 2 or 3 configurations. The motor parameters and the control type are the same for all selections.

– Select :

CONTROL PARAM. 1 for the 1st configuration
CONTROL PARAM. 2 for the 2rd configuration
CONTROL PARAM. 3 for the 3rd configuration.



– Set the parameters using the programming manual, Control Parameters section.

MOTOR SWITCHING

Introduction

The speed controller can only control one motor at a time. The motor must be selected when the motor is stopped.
This function imposes the use of a sequence of contactors located between the speed controller and the motor.

Restrictions on use

I/O :

Logic and analog inputs, logic and analog outputs and relay commands are not multimotor. They retain their configuration regardless of the motor selected. However, they are assigned to the motor selected, and can therefore change state during switching.
An external sequence may be required in some cases.

Command rules :

The configuration of the high torque rule menu 7.13 is only possible on motor 1.

Thermal fault :

Thermal protection is assigned to the motor identified as MOTOR 1 in the configuration.
The calculation is incremented when motor 1 is selected and decremented when motor 2 or 3 is selected.

Measurement of motor parameters :

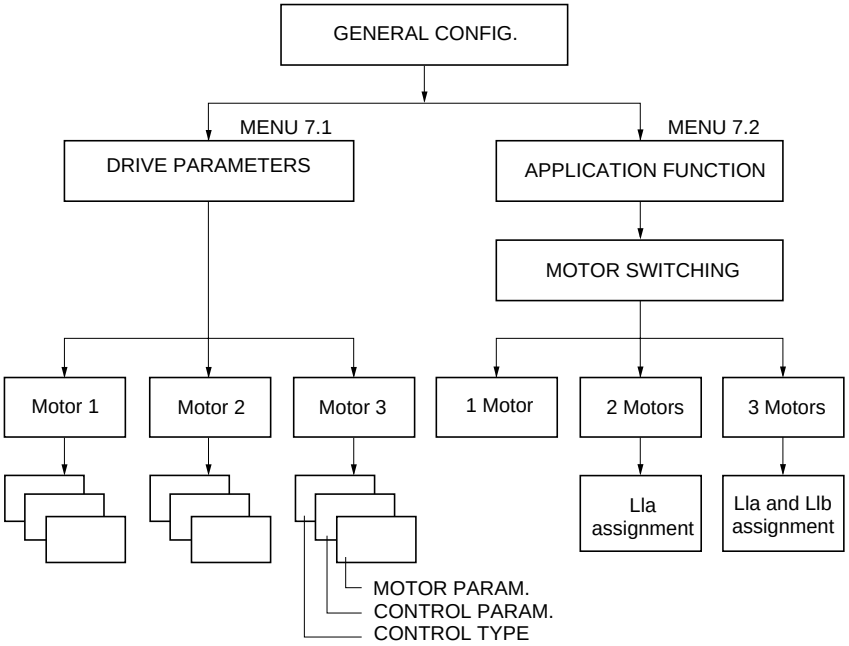
Motor parameters are only measured on motor 1 as long as this motor is connected to the speed controller at least once on power up. It is therefore possible to obtain maximum performance on motor 1.
On motors 2 and 3, the speed controller uses the tabulated parameters of standard motors available on the market.

Motor switching :

Motors must only be switched when they are stopped.
The motor switched to the speed controller using the external sequence must always conform to the state of LIa and LIb (MOTOR SEL) configured in menu 7.2 Application function / SWITCH MOT. SEL.

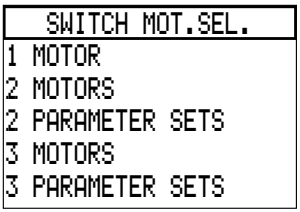
Adjustment mode :

In multimotor operation, the control parameters, motor parameters, and control type can be switched.
The parameters are set in menu 7.1 DRIVE PARAMETERS



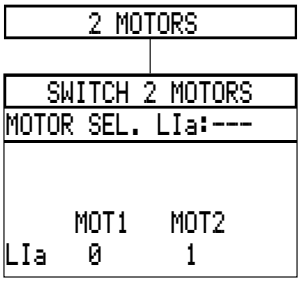
Configuration :

Menu : 7.2 APPLICATION / SWITCH MOT. SEL. function.

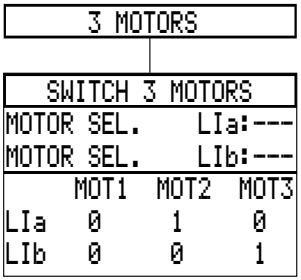


Selects the number of motors.
1 Motor : 1 single motor
2 Motors : 2 motors
3 Motors : 3 motors

1 MOTOR : selecting 1 Motor deconfigures the SWITCH MOT. SEL. function. Operation is then standard.



2 MOTORS :
– 2 motor configurations can be selected.
– Assign the logic input used to select the configuration.
– Note the combination of LIa and LIb inputs in the motor selection menu.

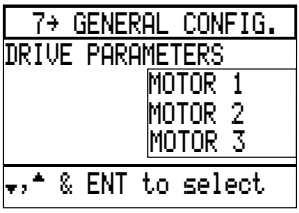


3 MOTORS :
– 3 motor configurations can be selected.
– Assign the logic inputs used to select the motor.
– Note the combination of LIa and LIb inputs in the motor selection menu.

Note :

LIa = LIb =1 : no switching.

CONFIGURING THE PARAMETERS OF MOTORS 1, 2 AND 3



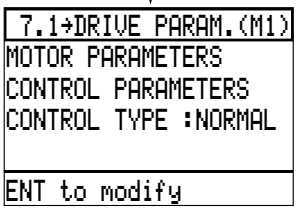
Go to MENU 7. GENERAL CONFIGURATION.
Select menu 7.1 DRIVE PARAMETERS
A window appears :

– Motor 1 for the parameters of motor 1,
– Motor 2 for the parameters of motor 2,
– Motor 3 for the parameters of motor 3.

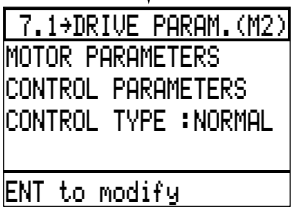
ENGLISH

Selecting the motor in the window accesses the drive parameters of the corresponding motor :

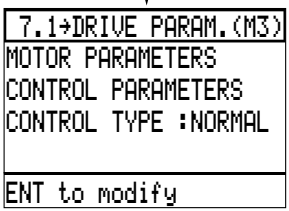
MOTOR 1



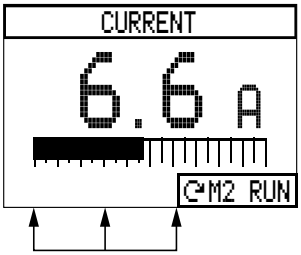
MOTOR 2



MOTOR 3



Select : MOTOR PARAM., for the corresponding motor.
or CONTROL PARAM.,
or CONTROL TYPE.
Then set according to the sections in the appropriate programming manual.
"High torque" and "FVC" are not available on M2 and M3.

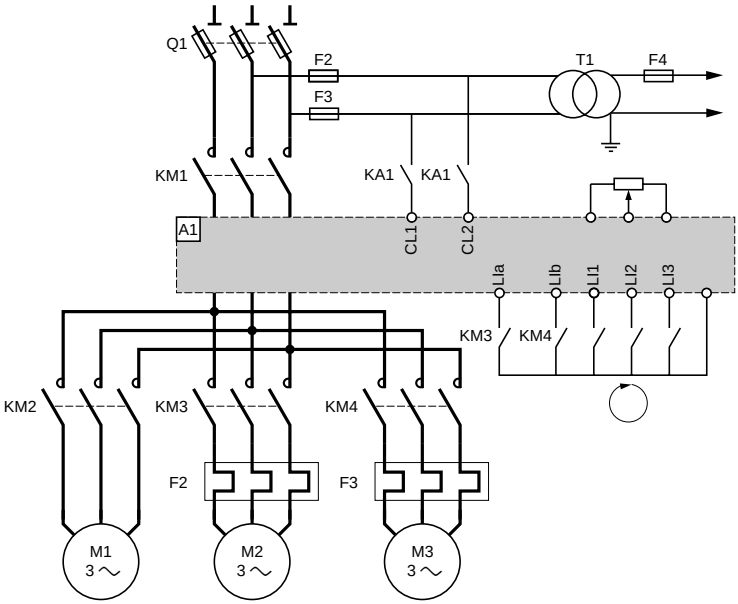


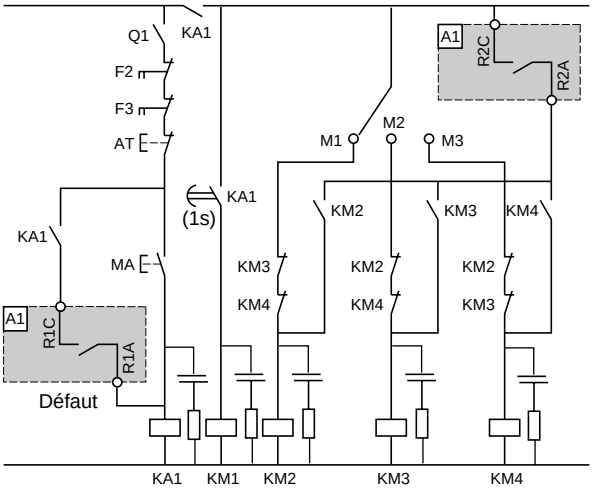
Note : on the terminal, in display mode, an identification of the selected motor appears :

M1 : Motor 1	P1 : Parameters 1
M2 : Motor 2	P2 : Parameters 2
M3 : Motor 3	P3 : Parameters 3

ENGLISH

Recommended sequence :

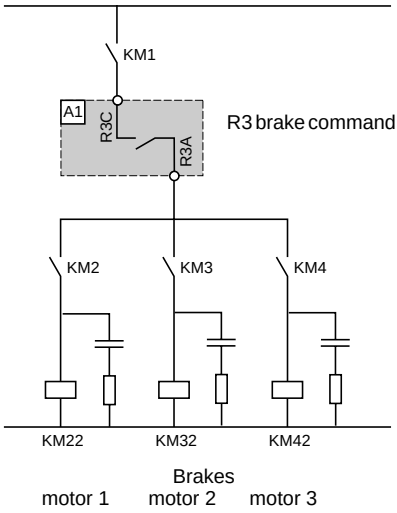




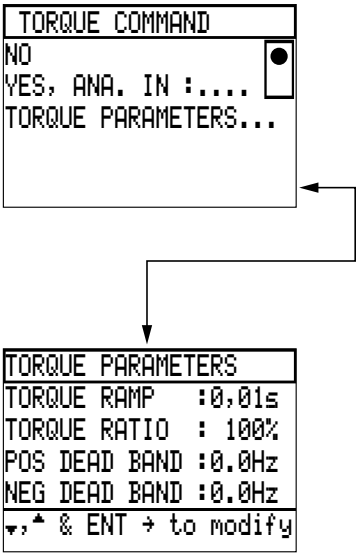
R2 configured with the speed controller running. It is necessary to cut the run signal to change the motor, because relay R2 in this configuration does not change state for a zero reference if the run signal has not been disabled.
Thermal protection only on motor 1.

Check that the power required for the contactor coils corresponds with that provided by contacts R1 and R2.

Example of brake sequence :



TORQUE REFERENCE



Function used when selecting FVC in the CONTROL TYPE menu (7.13).

ANALOG INPUT : Analog torque reference input.
This input can be :
– either AI3 input as ± 10 V with the following correspondence :
  + 10 V gives 200 % of the nominal motor torque,
  0 V gives 0 % of the nominal motor torque,
  -10 V gives - 200 % of the nominal motor torque.
– or AI4 input as 4-20 mA current with the following correspondence :
  20 mA gives 200 % of the nominal motor torque,
  12 mA gives 0 % of the nominal motor torque,
  4 mA gives - 200 % of the nominal motor torque.
  If the reference is less than 3 mA, appearance of fault LOSS FOLLOWER : 4-20 mA.

TORQUE RAMP : parameter which can be set from 0 to 10 s.

TORQUE RATIO : is used to set the ratio between the torque input setpoint and the required command torque - can be set from 1 to 1000 %.
Factory setting : 100 %.

SPEED DEAD BAND : can be set from 0 to f.max.
Preset to 0 Hz.

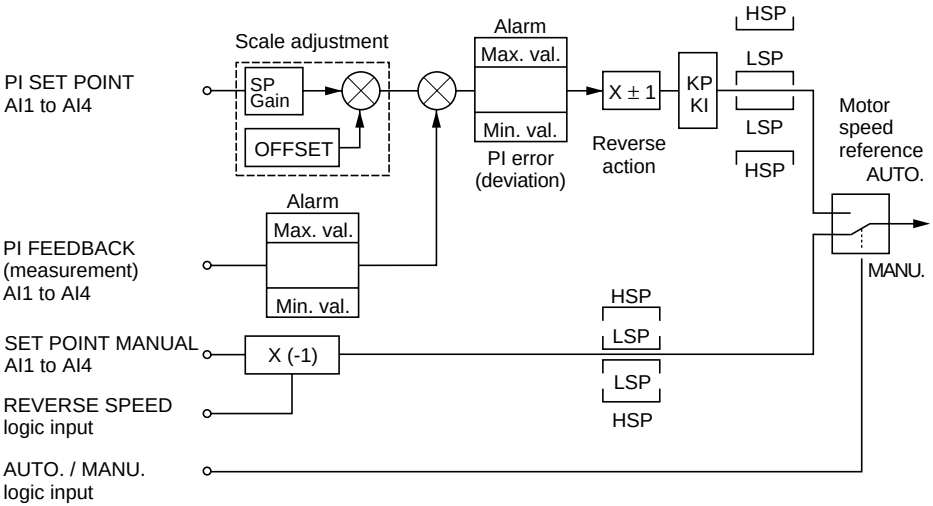
ENGLISH

PI REGULATOR

The PI regulator operates in one of the following two modes :

– AUTO. : process set point with PI regulator,
– MANU. : motor speed reference (excluding PI regulation).

AUTO. / MANU. is selected using a logic input (MENU 7.2 SET POINT MANUAL)



Possible in MANU. mode :

– REVERSE DIRECTION of rotation of the motor by logic input

Possible in AUTO. mode : MENU 7.2 PI PARAMETER

– Selection of the analog input for the set point and feedback :
(0 –> 10 V, 0/4 –> 20 mA, - 10 V + 10 V with the I/O card).
– Adaption of the set point input to the process feedback : SP GAIN and OFFSET.
– REVERSE PI ACTION possible (error ↗ motor speed ↘).
– Adjustment of the integral and proportional gain (KI, KP).
– Prevention of motor rotation in reverse direction.
– Motor speed limited to LSP (low speed) and HSP (high speed).
– Alarm when logic output exceeds the Max. and Min. thresholds of the PI error and feedback.
– Analog output for PI set point, PI feedback, PI error.

Note : REVERSE mode (reversing the direction of operation) is not available.
The acceleration and deceleration ramps of the speed controller are activated at the regulator output.

– It is possible to display the PI set point or PI feedback on a bar graph (MENU 4.1 : ONE BAR GRAPH).

ENGLISH

WIRING PI SET POINT / SET POINT MANUAL, PI FEEDBACK INPUTS.

The input should be wired to an analog input selected according to the following table and the type of signal.
Take care to respect the following ranges: minimum and maximum values imposed by the input selected.

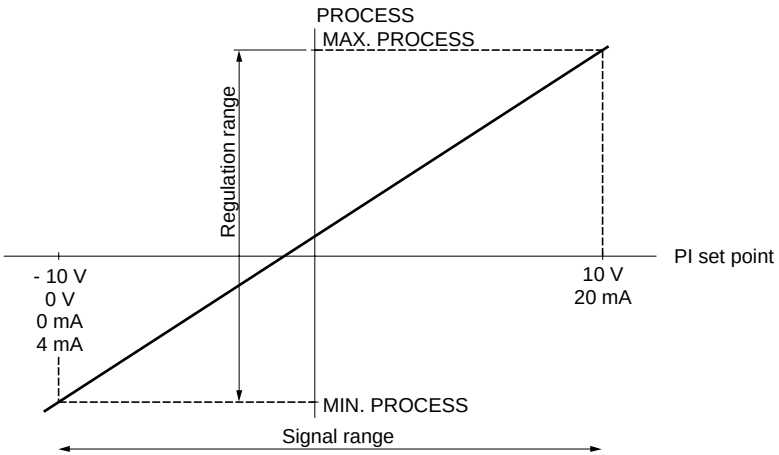
Input	Type of signal	Range of signal MIN.	MAX.	Available
AI1	Voltage	0	10 V	On standard product
AI2	Current	0 4	20 mA 20 mA	On standard product
AI3	Differential voltage	- 10 V	+ 10 V	With I/O card
AI4	Current	0 4	20 mA 20 mA	With I/O card

Vocabulary :

MAX. PROCESS and MIN. PROCESS correspond to the regulation range expressed in units defined by the user.
Example : regulate between 5 bars and 10 bars,

MAX. PROCESS corresponds to the maximum analog input signal (10 V, 20 mA) selected for the PI set point,

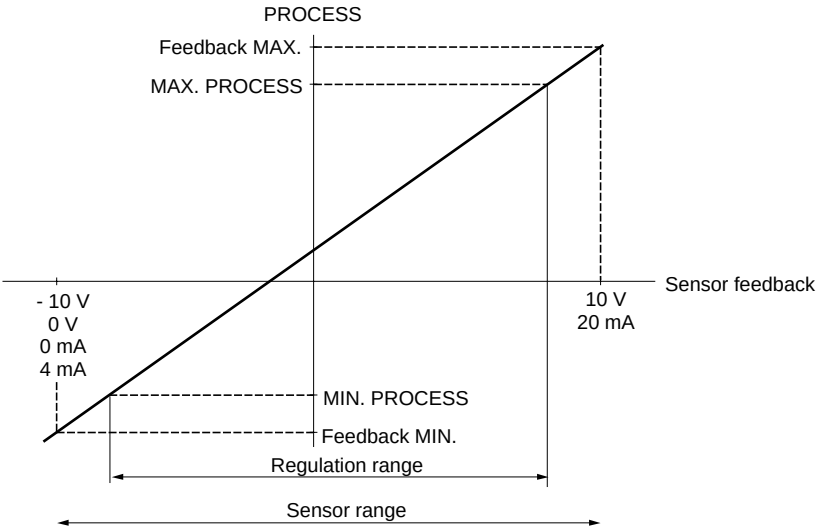
MIN. PROCESS corresponds to the minimum analog input signal (- 10 V, 0V, 0 mA, 4mA) selected for the PI set point.



Feedback MIN. and Feedback MAX. correspond to the sensor range expressed in units defined by the user.
Example : 0 mA -> 0 bar
20 mA -> 20 bars

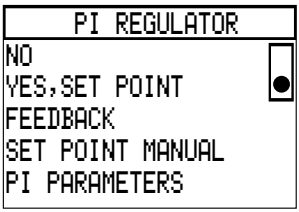
Feedback MIN. corresponds to the minimum analog input signal (- 10 V, 0V, 0 mA, 4 mA) selected for the PI feedback.

Feedback MAX. corresponds to the maximum analog input signal (10 V, 20 mA) selected for the PI feedback.



Note : the regulation range [MIN PROCESS and MAX PROCESS] must be included in the sensor range [FEEDBACK MIN. and FEEDBACK MAX.]

PI REGULATOR



– NO : PI not active.

– YES, SET POINT : activates the PI and accesses the PI set point menu.

– FEEDBACK : accesses the PI feedback menu.

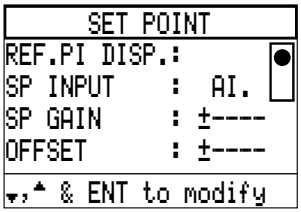
– SET POINT MANUAL : accesses the speed reference menu (only to be used for a motor speed reference which is external to the process regulation).

– PI PARAMETERS : accesses the regulation loop menu.

Note : AUTO. = loop regulated
MANU. = loop not regulated

Selection is made via the logic input, menu 7.2 PI regulator / PI set point

PI SET POINT



– REF. PI DISP. : the set point is sent directly by the graphic terminal. The set point value can be set using menu 1
PARAM. SETTINGS / REF. PI DISP.
0000 corresponds to MIN. PROCESS,
9999 corresponds to MAX. PROCESS.

– SP INPUT : selects the analog input for the PI regulation set point.

– SP GAIN : adapts the sensor feedback to the set point

$$\text{Gain} = \left(\frac{\text{MAX. PROCESS - MIN. PROCESS}}{\text{Max. Feedback - Min. Feedback}}\right) \times 9999.$$

Can be set between - 9999 and + 9999.

– OFFSET : parameter correction

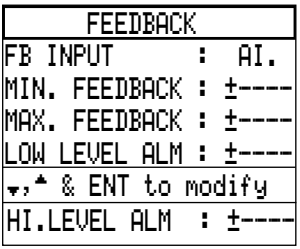
$$\text{OFFSET} = \left(\frac{\text{MIN. PROCESS - Min. Feedback}}{\text{Max. Feedback - Min. Feedback}}\right) \times 9999.$$

Can be set between - 9999 and + 9999.

Note :

OFFSET and SP GAIN can be set during operation using menu 1 PARAMETER SETTINGS.

PROCESS FEEDBACK



– FEEDBACK INPUT : selects the analog input for the control sensor feedback.

– MIN. FEEDBACK : process value expressed in user-defined units for the minimum sensor signal. Can be set between - 9999 and + 9999.
Example : 0 V corresponds to 2 bars or 2000 mbars.
Enter value 2 or 2000.

– MAX. FEEDBACK : process value expressed in user-defined units for the maximum sensor signal. Can be set between - 9999 and + 9999.
Example : 10 V corresponds 9 bars or 9000 mbars.
Enter value 9 or 9000.

– LOW LEVEL ALM : process value in user-defined units, below which the FB. LOW ALARM output (menu 7.2 PI PARAMETERS) changes to 1.
Example : 2 bars enter 2.

– HI. LEVEL ALM : process value in user-defined units, above which the FB. HIGH ALARM output (menu 7.2 PI PARAMETERS) changes to 1.
Example : 2 bars enter 2.

Note :

MIN. FEEDBACK ≤ ALARM MIN, ALARM MAX. ≤ MAX. FEEDBACK

Examples of calculating the GAIN and OFFSET.

The user wants to regulate the volume of a tank between 100 m^3 and 10 m^3.

(1) The sensor provides a current signal
0 mA -> 5 m^3
20 mA -> 200 m^3
input : AI2
min. signal = 0 mA, max. signal = 20 mA
find the process value corresponding to the min. and max. input signal to define the MIN. and MAX. feedback values.

Signal provided by input AI2	Corresponding process value
MIN. signal 0 mA MAX. signal 20 mA	5 m^3 = MIN. feedback 200 m^3 = MAX. feedback

(2) The user selects a voltage set point input between 0 -> 10 V
input : AI1
min. signal = 0 V, max. signal = 10 V.
the user wants to regulate the volume between 100 m^3 and 10 m^3.

Signal provided by input AI1	* Corresponding process value
MIN. signal 0 V MAX. signal 10 V	100 m^3 = MIN. PROCESS set point 10 m^3 = MAX. PROCESS set point

(3) Scaling.

$$SP\ GAIN = \left(\frac{10 - 100}{200 - 5}\right) \times 9999 = -0.4615 \times 9999 = -4615$$

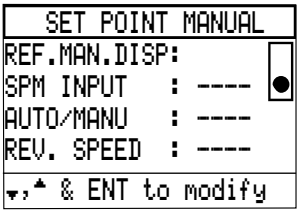
$$OFFSET = \left(\frac{100 - 5}{200 - 5}\right) \times 9999 = 0.4871 \times 9999 = 4871$$

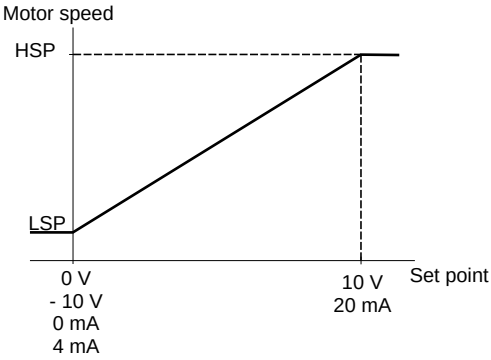
Note :

* This configuration has been chosen to demonstrate the possibilities of the function. However, the most common values are :
– MIN PROCESS = 10 m^3
– MAX PROCESS = 100 m^3

ENGLISH

SET POINT MANUAL :





– REF. MAN. DISP. : the set point is sent directly by the graphic terminal. The set point value can be set using menu 1 (REF. MAN. DISP. setting in Hz).
Can be adjusted from low speed to high speed.

– SPM INPUT : selects the analog input for the speed reference.

Note : if the input (- 10 V, + 10 V) is selected,
- 10 V –> LSP
+ 10 V –> HSP

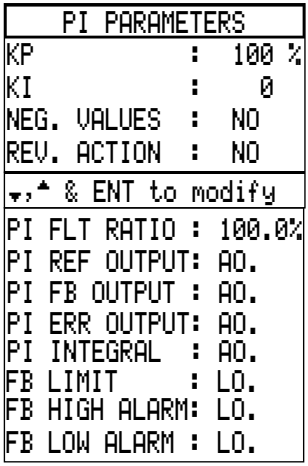
– AUTO./ MANU. : selects the logic input for switching between AUTO. mode (process regulation) and MANU. mode (speed regulation).
LI. at high level : AUTO.
LI. at low level : MANU.

– REV. SPEED : select the logic input to reverse the direction of movement.
LI. at high level : reverse operation
LI. at low level : forward operation

Note : to configure this function, one analog input and one logic input must be programmed.

ENGLISH

PI PARAMETERS



– KP : proportional gain :
  can be adjusted from 0 to 9999.
  The proportional gain affects the speed of the loop.
  Factory setting : 100 (100 = gain of 1)

– KI : integral gain :
  can be adjusted from 0 to 9999.
  The integral gain affects the precision of regulation.
  Factory setting : 0 (1 = 1 s^{-1})

– NEG. VALUES :
  Yes : the motor can rotate in a reverse direction (↺ ↻ possible).
  No : the motor cannot rotate in a reverse direction (↻ possible).

– REV. ACTION :
  No : an increase in the PI error causes an increase in the speed of the motor.
  Yes : an increase in the PI error causes an decrease in the speed of the motor.

– PI FLT RATIO : ratio of the PI error as a %.
  The PI fault Ratio is given as a % of the sensor range = % (MAX. feedback - MIN. feedback).
  When the actual error becomes greater or equal to the value set, the logic output configured in the FB limit [PI PARAMETER menu] changes to 1.
  Can be adjusted from [0 % to 100 %].

– PI REF OUTPUT : configuration of an analog output as PI set point.
  MIN. PROCESS –> 0 (0 –> 20 mA) or 4 (4 –> 20 mA)
  MAX. PROCESS –> 20 mA.

– PI FEEDBACK : configuration of an analog output as PI feedback.
  MIN. PROCESS –> 0 (0 –> 20 mA) or 4 (4 –> 20 mA)
  MAX. PROCESS –> 20 mA.

– PI ERR OUTPUT : configuration of an analog output as PI ERROR, this error is given as a % of the sensor range = % (Max. feedback - Min. feedback).
  - 5 % –> 0 (0 –> 20 mA) or 4 (4 –> 20 mA)
  + 5 % –> 20 mA.

– PI INTEGRAL : configuration of an analog output on the integral of the error.
  LSP –> 0 (0 –> 20 mA) or 4 (4 –> 20 mA)
  HSP –> 20 mA.
  corresponds to the frequency in steady state.

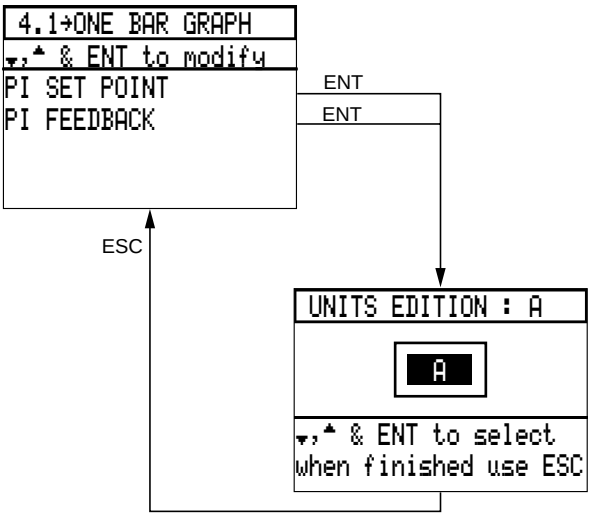
– FB LIMIT : configuration of the logic output indicating that the error (MAX. feedback - MIN. feedback) given as a % has exceeded the value set in PI FLT RATIO at high level : error ≥ PI FLT RATIO.

– FB HIGH ALARM : configuration of the logic output indicating that the process feedback has exceeded the value set in FB HIGH ALARM in menu 7.2 PI Parameters / FEEDBACK at high level : Process Feedback ≥ FB HIGH ALARM.

– FB LOW ALARM : configuration of the logic output indicating that the process feedback is less than the value set in FB LOW ALARM in menu 7.2 PI Parameters / FEEDBACK at high level : Process Feedback ≤ FB LOW ALARM.

DISPLAY CONFIGURATION

– MENU 4. DISPLAY CONFIG. : it is possible to configure a value for PI which can be displayed :
ONE BAR GRAPH menu with the following options : PI set point or PI feedback.
A user-defined unit can be selected in the same menu by setting the parameters for each letter (max. of 4).



PARAMETER SETTING

In order to access the most commonly used parameter settings more easily, some PI parameters have been added to menu 1. PARAMETER SETTING.
These are :

1→PARAMETER SETTING	
SP GAIN	:+9999
OFFSET	:+0
KP	: 100 %
KI	: 0
PI FLT RATIO	: 100.0%
REF.PI.DISP.	:----
REF.MAN.DISP.	:---- Hz

– SP GAIN AND OFFSET : scales the PI set point input.

– KP, KI : sets the proportional and integral gain.

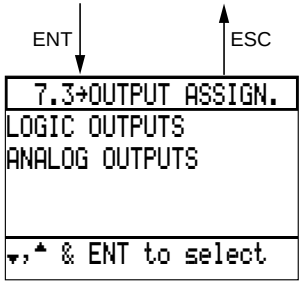
– PI FLT RATIO : sets the PI fault ratio :
% (MAX. feedback - MIN. feedback).

– REF.PI.DISP. : PI set point given by the graphic terminal. This set point is taken into account when the KEYPAD set point is selected in menu 7.2 - PI REGULATOR / PI SET POINT.
0000 corresponds to MIN. PROCESS,
9999 corresponds to MAX. PROCESS.

– REF.MAN.DISP : speed reference given by the graphic terminal to be set in Hz. This set point is taken into account when the KEYPAD set point is selected in menu 7.2 PI REGULATOR / SET POINT MANU.

Total unlock : output assignment

Output assignment



Select the Output assignment menu in the General configuration mode.

This menu is used to :

– display the assignment of the logic and analog outputs,

– reassign outputs which have not previously been reassigned.

LOGIC OUTPUTS

Lists the functions which can be assigned to logic outputs.

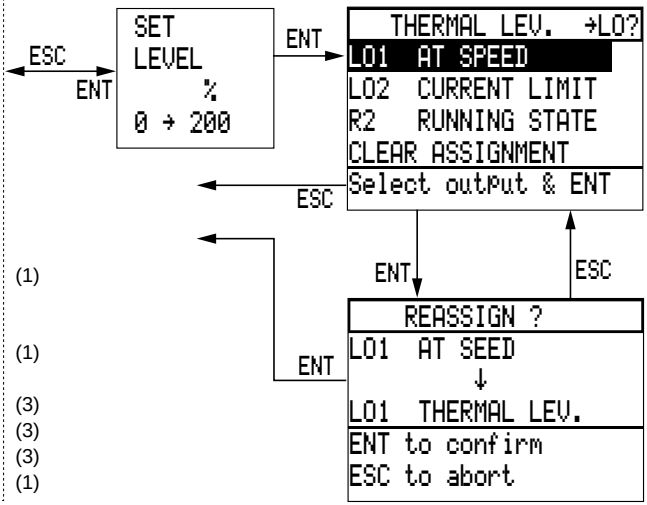
Each assigned function is marked by an arrow : these are either factory settings or reassignments carried out previously.

Comments :
– The FAULT STATE function is assigned to relay R1 which cannot be reassigned.
– The DRIVE THER. AL. function only applies to Altivar models from the ATV-66FD16N4 upwards.

The LOSS FOLLOWER, SHUTDOWN, DRIVE THER. AL. functions appear on this screen only if they have previously been selected.

LOGIC OUT. FUNCTIONS	
READY STATE	←
RUNNING STATE	←
AT SPEED	←
FWD. DIRECTION	
▼,▲ & ENT → Select	
REV. DIRECTION	
CURRENT LIMIT	←
TORQUE LIMIT	(2)
FAULT STATE	←
DRIVE THER.AL.	
LOSS FOLLOWER	
NO RAMP FOLLOW	
FEEDBACK LOSS	
OVER SPEED	
FREQ. LEV.	
FREQ. LEV. 2	
CURRENT LEV.	
CURRENT LEV. 2	
THERMAL LEV.	
THERMAL LEV. 2	
TORQUE LEVEL	(1)
BRAKE COMMAND	
JOG ENABLED	
FIELD STATUS	(1)
BRAKE STATUS	
FB LIMIT	(3)
FB HIGH ALARM	(3)
FB LOW ALARM	(3)
IN TORQ.REGUL.	(1)

Example of reassigning a logic output

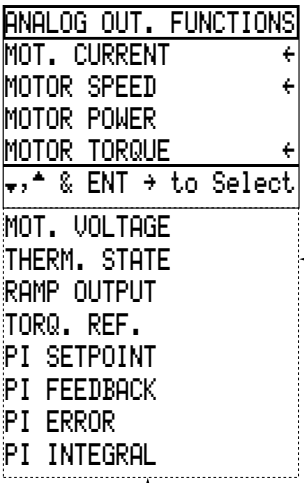


(1) in "FVC" mode only
(2) in "FVC" or "High Torque" mode only
(3) if PI regulator function available.

Comments :
– If the selected output is assigned to a function, a warning message appears on the screen.
– It is possible to assign the same function to several logic outputs.

ENGLISH

ANALOG OUTPUTS



Lists the functions which can be assigned to analog outputs.

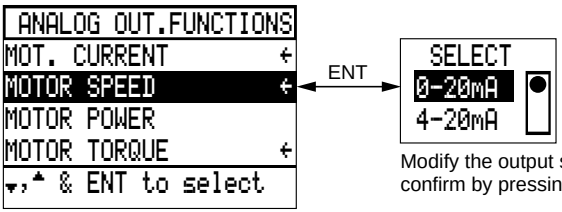
Each function assigned a factory setting is marked by an arrow.

Example of reassigning an analog output

If necessary, change the output signal : preset at 0-20 mA.

(1) in "FVC" mode only
(2) if PI regulator available

Special case : modification of the signal of an assigned output



Modify the output signal and confirm by pressing ENT.

Characteristics :

– MOT. CURRENT	:	20 mA = 200 % of the motor nominal current.
– MOTOR SPEED	:	20 mA = 100 % of high speed HS, 0 mA or 4 mA = zero speed.
– MOTOR POWER	:	20 mA = 200 % of the power of the motor to be used with the speed controller in constant torque configuration.
– MOTOR TORQUE	:	20 mA = 200 % of nominal torque.
– MOTOR VOLTAGE	:	20 mA = 110 % of the nominal motor voltage.
– THERM. STATE	:	20 mA = 200 % of the nominal thermal state of the motor.
– RAMP OUTPUT	:	20 mA = 100 % of high speed, 0 mA or 4 mA = low speed.
– TORQ. REF	:	assigned to output AO3 only with the following correspondence : 20 mA = 200 % of the nominal motor torque 12 mA = 0 % of the nominal motor torque 4 mA = - 200 % of the nominal motor torque

ENGLISH

Fault management

Methods of stopping on a fault

For safety reasons, certain faults cause a “freewheel” stop : the speed controller locks and the motor stops according to the inertia and the resistive torque.

The method of stopping for other faults can be programmed :

– Normal stop, following the deceleration ramp.
– Fast stop with minimum deceleration ramp time to avoid causing an overvoltage on the DC bus.
– “Freewheel” stop : factory setting.

Only one selection can be made for faults of this type.

Methods of restarting :

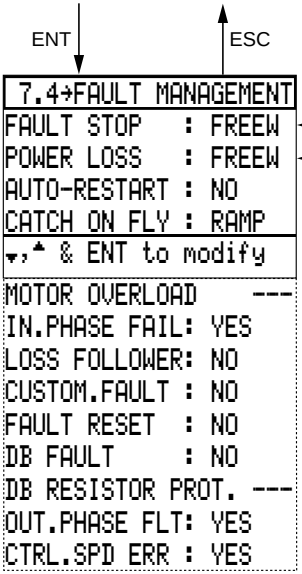
– Manual after intervention to correct the fault.
– Automatic without intervention.

Faults causing a “freewheel” stop	
Cannot be reset automatically	Can be reset with automatic restart
Short-circuit Ground fault Precharge failure Internal fault Memory failure DB resistor fault (fault which can be configured) Transistor short-circuit Open transistor Dynamic brake fault Braking resistor temperature Encoder card fault	Overspeed Undervoltage AC-line overvoltage DC-bus overvoltage Sequence Tof (with bypass) Loss of speed feedback
Faults with a programmable stop	
Cannot be reset automaticaly	Can be reset with automatic restart
	Serial link fault Input phase loss Drive overtemperature Motor overload Output phase loss Loss follower Process T of (with bypass) Customer fault

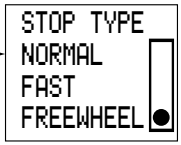
ENGLISH

Total unlock : fault management

Select the Fault management menu in the General configuration mode.



The menu shows the factory settings.



Select the type of stop for the faults concerned (see list on page 155).

Preset at FREEWHEEL.

Operation in the event of a power loss :

– speed controller locks,
– control supply is maintained by the DC bus,
– logic outputs are maintained for 1 second,
– restart when the line supply returns, if the power supply and the control commands have been maintained.

If a considerable amount of kinetic energy has been stored by the machine in motion (high inertia and low resistive torque), selecting a RAMP stop ensures controlled deceleration in the event of a power loss.

Operation :

– when the DC bus voltage reaches 80 % of its initial value, the deceleration takes following a ramp which depends on the stored kinetic energy,
– when the DC bus voltage becomes too low, the speed controller locks and the motor stops on “freewheel”. To activate this function, it is necessary to deselect the “In. phase fail” fault.

AUTO-RESTART

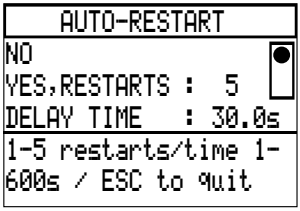
Selecting YES confirms the automatic restart function when the speed controller has locked on a fault : see faults concerned on page 155.

The power supply and the control commands must be maintained.

Applications : machines operating without supervision, where a restart does not present any danger to either personnel or equipment.

Operation of the automatic restart :

– In the event of a fault, the speed controller locks for an adjustable period of time, then restarts the motor if the fault has disappeared and the other operating conditions are suitable.
– If the fault persists, the “locking + restart command” sequence is repeated (up to a maximum of 5 sequences) before the final locking.

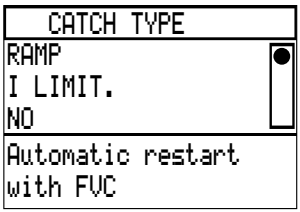


Select the number of restarts : from 1 to 5, preset at 5.

Display the locking time : set between 1 and 600 s, preset at 30 s.

Confirm by pressing ENT.

CATCH ON FLY



RAMP function

In "normal" mode :
The motor speed is estimated thanks to the remanent field of the motor when the power supplies are cut off or when a resettable fault occurs, if the operating order is present (2-wires control); the speed controller then activates the acceleration ramp beginning from the estimated speed of the motor.

In "FVC" mode :
As the motor speed data is provided by the coder feedback, if the run command (2-wires command) is present when a power failure or resettable fault occurs, the controller activates the acceleration ramp from the sensed motor speed.

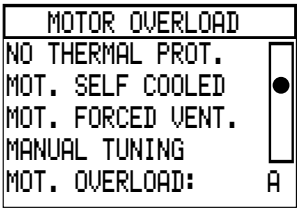
I LIMIT. function

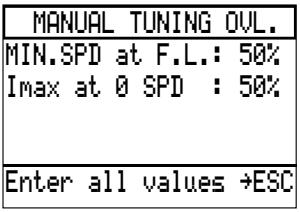
Catch on fly restarting is activated when control and power are energized simultaneously and if the operating orders are present (2-wires control).
In this case, the speed reference displayed is taken into account without a ramp.
Application : high inertia machine with weak remanent field.

NO function

Catch on fly restart is never activated.

MOTOR OVERLOAD





Select the motor thermal protection :

– Adaptation to the motor : self-cooled (factory setting) or force-ventilated.

– No thermal protection.

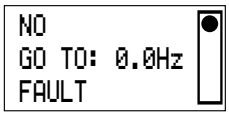
– Manual tuning and programming of the minimum motor speed at nominal current, and the maximum current at zero speed (as a % of the nominal values), adjust from 0 to 100 %, preset at 50 %.

Motor overload : factory preset at 0.9 times the nominal current of the speed controller. Adjust the motor nominal current if this has not already been performed in Parameter setting mode : see page 103.

IN. PHASE FAIL

Inhibit this fault by selecting NO either when the speed controller is powered by a DC bus at the + and – terminals or when a stop on gradient is selected in the POWER LOSS function.

LOSS FOLLOWER 4 - 20 mA

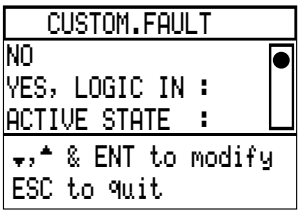


Select operation in the event of a 4-20 mA speed reference failure on input AI2 :

– NO : no detection (factory setting).
– GO TO : program an adjustable speed reference from 0 to 200 Hz, preset at 0.
Function activated if AI2 is the single frequency reference,
– FAULT : lock on a fault.

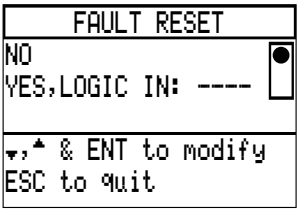
CUSTOM. FAULT

Assignment of a logic input to a specific fault. This fault has a stop mode which can be programmed.



ENGLISH

FAULT RESET

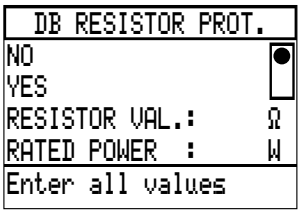


Selecting YES offers the possibility of resetting the speed controller after locking on a fault (if the fault has disappeared) by reassigning a logic input, active at state 1 (on positive-going edge).

DB FAULT

Speed controller with braking resistor : selecting YES means that a check is made on power-up that the resistor is present and the connection is correct. A fault appears in the event of a failure.

DB RESISTOR PROT.



Selecting YES enables thermal protection of the braking resistor.

Program the characteristics of the resistor.

OUT. PHASE FLT

The speed controller may or may not recognize the output phase fault : preset at YES.

CTRL SPEED ERR

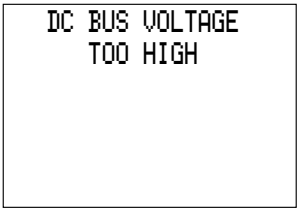
Acceptance or not by the speed controller of the motor running too fast (motor speed faster than the ramp selected). The fault signalled is OVERSPEED. The condition for detecting this fault is : motor speed and speed setpoint having the same sign. Preset at YES.

Diagnostic mode

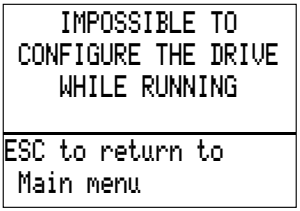
Using Diagnostic mode requires the following conditions :

– no power voltage on terminals L1, L2 and L3,
– filter capacitors discharged (DC bus voltage less than 18 V),
– control voltage present at terminals CL1 and CL2,
– motor stationary.

If these conditions are not satisfied, an error message is displayed on the screen.

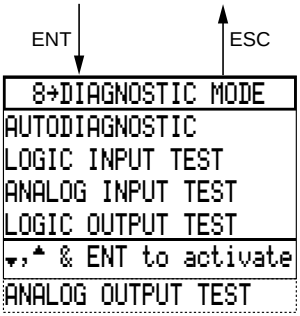


OR



Warning : when being controlled via a circuit-breaker, connect terminals CL1 and CL2 temporarily to the line supply to be able to use Diagnostic mode.

Select Diagnostic mode in the Main menu.

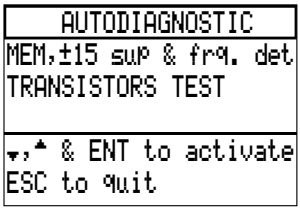


This mode includes a number of tests :

– Speed controller autodiagnostic.
– I/O test, with output forcing.

Select autodiagnostic to test the speed controller, and to locate the suspect faulty element in the event of a stop with display of one of the following faults :

– Short-circuit.
– Ground fault.
– Internal fault.
– Transistor short-circuit.
– Open transistor.

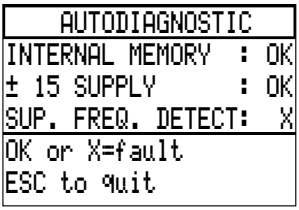


Selection of tests :

– Selecting the 1st line tests the speed controller ROM, checks the ± 15 V power supply and detects the line frequency.

– The 2nd line is used to test the transistors.

Results of the autodiagnostic tests

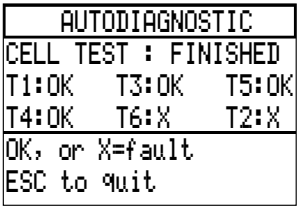


Control test

Example on the screen opposite :

– OK if the test is positive.
– X if the test fails or the element tested is faulty.

Transistor test



During the test, the 1st line displays the message IN PROCESS. The duration of the test is variable but no indication is given if it is still in progress.

At the end of the test, the 1st line displays the message FINISHED and each transistor is assigned a state, see example on the screen opposite :

– OK if the transistor is satisfactory.

– X if the transistor is faulty.

I/O test

Selecting the tests on the Diagnostic mode screen displays screens similar to those obtained in I/O map mode (see page 97) : display of the I/O assignment, and their state or value.

To test the inputs, change their state one after the other, checking the display on the screen.

For outputs, selecting the test line displays their state at 0 on the screen, whatever their real state.

To force their state, press key 1, then confirm with ENT : the display changes to 1 for a logic output, or to 100 for an analog output.

WARNING : ensure that forcing the outputs does not present any danger.

Checking the change of state requires the use of a measuring device which must be connected to the output being tested.

ENGLISH

Drive initialization

Select Drive initialization mode in the Main menu.

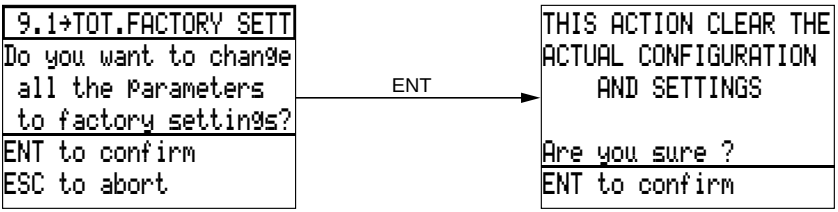
When this mode is used, the motor must be stationary.

This mode is used to return to factory settings :
– either totally
– or partially.

It can also be used to download the configuration and all the settings remotely onto a blank PCMCIA card which can be installed on the speed controller.

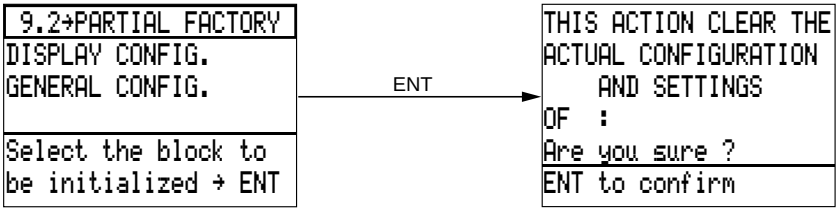
Return to factory settings

Total return



Warning message

Partial return



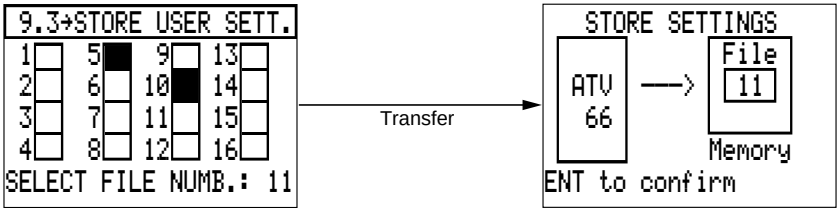
Select the required mode to be reset to factory settings.

Warning message with indication of the mode selected

Comment : a total return to factory settings returns the speed controller to its initial state before the first power up (see pages 91 and 96).

Saving the settings on a PCMCIA card

Warning message for inserting the PCMCIA card into the connector : follow the instructions in the leaflet supplied with the card.

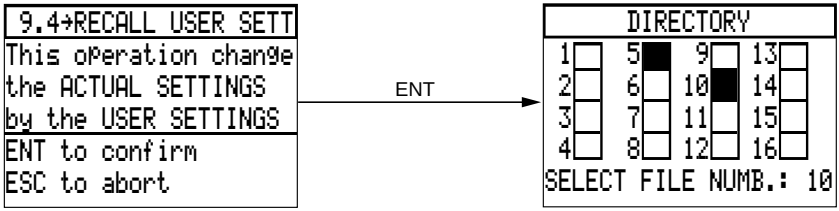


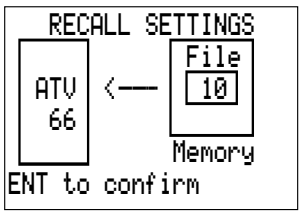
The card can contain up to 16 configurations (1 per speed controller).
The black boxes correspond to the configurations loaded in the card.
Select 1 white box for transfer to the card, example above : 11.
Confirm the transfer with ENT. When the loading is complete, a message appears on the last line of the screen : TRANSFER OK.
FAULTY TRANSFER is displayed in the event of an error.

Recall user settings

Transfer data which has been remotely downloaded to a PCMCIA card : if the card is not installed, a message appears requesting its insertion in the connector.

Adjustment transfer takes place only with speed controllers bearing the same catalogue reference.





Select 1 black box for transfer to the speed controller, example above : 10. Confirm with ENT.
When the transfer is complete, a message appears on the last line of the screen :

- TRANSFER OK,
- or FAULTY TRANSFER.

If there is an error on the number, a message appears :

- INCOMPATIBLE PAGE,
- or EMPTY PAGE.

ENGLISH

Note :
Some of the listed parameters do not appear, they depend on configurated functions.

	Factory setting	Customer setting
1 – PARAMETER SETTING		
LOW SPEED	0.0 Hz	
HIGH SPEED	50.0 Hz	
ACCELERATION	3.0 s	
DECELERATION	3.0 s	
ACCELERATION 2	5.0 s	
DECELERATION 2	5.0 s	
MOTOR SLIP	2.4 Hz	
RI COMPENSATION	100 %	
VOLTAGE BOOST	20 %	
TORQUE GAIN	0 %	
DAMPING	20 %	
BANDWIDTH	20 %	
NO LOAD CURRENT		
INERTIA (✶.01)		
DAMPING	20 %	
BANDWIDTH	20 %	
MOTOR OVERLOAD		
TORQUE COEFF.	100 %	
POS DEAD BAND	0.0 Hz	
NEG DEAD BAND	0.0 Hz	
SP GAIN	+ 9999	
OFFSET	+ 0	
KP	100 %	
KI	0	
RATIO ERR. PI	100.0 %	
PI FLT RATIO	1000	
REF MAN DISP	0.0 Hz	
2 – I/O MAP		
2.1 – LOGIC INPUT MAP		
IN. ASSIGNMENT		
LI1	Run permissive	
LI2	Run forward	
LI3	Run revers	
LI4	JOG	
LI9	-	
LI10	-	
LI11	-	
2.2 – ANALOG INPUT MAP		
IN. ASSIGNMENT		
AI1	Speed ref. 1	
AI2	Speed ref. 2	
AI3	Speed ref. 3	
AI4	-	
2.3 – LOGIC INPUT MAP		
OUT. ASSIGNMENT		
LO1	AT speed	
LO2	Current limit	
LO3	Thermal level	
LO4	Frequency level	
R1	Fault state	
R2	not assigned	
2.4 – ANALOG OUT. MAP		
OUT. ASSIGNMENT		
AO1	Motor speed	
AO2	Output current	
AO3	Motor torque	

		Factory setting	Customer setting
3 – FAULT HISTORY			
1			
2			
3			
4			
5			
6			
7			
8			
4 – DISPLAY CONFIG.			
ONE BAR GRAPH	●	Speed refer.	
TWO BAR GRAPH			
SCROLL, 4 ITEMP			
6 – DRIVE CONFIG.			
TORQUE		Constant	not configurable
COMMAND		2 wire	not configurable
MOT.		-	
POWER			-
7 – GENERAL CONFIG.			
7.11 – MOTOR PARAMETERS			
NOMINAL CURRENT			
NOMINAL FREQUENCY		50 Hz	
NOMINAL VOLTAGE			
NOMINAL RPM		1500	
RI COMPENS.		100 %	
INERTIA (✶.01)			
VOLTAGE BOOST		20 %	
TORQUE GAIN		0 %	
DAMPING		20 %	
BANDWIDTH		20 %	
ROTATION NORMALIZATION		A B C	
MOTOR FLUX			
NOT CONTINUOUS	●		
CONT. ON LI1			
CONT. WITH LI			
FLUX PARAMETERS			
NO LOAD CURR.			
PREFLUX CURR.			
MOTOR SLIP			
NO			
AUTOMATIC	●		
MANUAL		2.4 Hz	
THERM. COEF.		100 %	
ENCODER PARAMETERS			
PULSE PER REV.		1024	
ENCODER NORM.		NORM	
TORQUE LIMIT			
DEFAULT LIMIT	●		
BY LOGIC IN.		-	
BY ANALOG IN.		-	
MOTOR TORQUE		200 %	
GENE. TORQUE		200 %	
CURRENT LIMIT			
DEFAULT LIMIT	●		
BY FREQ. LEV.		50.0 Hz	
BY LOGIC IN.		-	
BY ANALOG IN.		-	
CURR. LIMIT			

	Factory setting	Customer setting
BRAKE SEQUENCE		
BRAKE OUTPUT	Not assigned	
RELEASE FREQ.	0.0 Hz	
RELEASE CURRENT	0.0 A	
RELEASE TIME	0.0 s	
ENGAGE FREQ.	0.0 Hz	
ENGAGE TIME	0,0 s	
DC INJECTION	70 %	
DC TIME	2.0 s	
RELEASE PULSE	NO	
7.12 – CONTROL PARAM.		
MAX. FREQUENCY	60.0 Hz	
LOW SPEED	0.0 Hz	
HIGH SPEED	50.0 Hz	
ACCELERATION	3.0 s	
DECELERATION	3.0 s	
ACCEL. TYPE	LINEAR	
S, Round Fact.	20 %	
U, Round Fact.	50 %	
DECEL. TYPE	LINEAR	
S, Round Fact.	20 %	
U, Round Fact.	50 %	
ALTERNATE RAMP		
TYPE	NO	
BY FREQ. LEV	30.0 Hz	
BY LOGIC IN	-	
ACCELERATION 2	5.0 s	
DECELERATION 2	5.0 s	
SKIP FREQUENCY		
SKIP FREQ. 1	0.0 Hz	
SKIP BAND 1	2 Hz	
SKIP FREQ. 2	0.0 Hz	
SKIP BAND 2	2 Hz	
SKIP FREQ. 3	0.0 Hz	
SKIP BAND 3	2 Hz	
7.13 – CONTROL TYPE		
NORMAL ●		☐
FVC ☐		☐
HIGH TORQUE ☐		☐
7.2 – APPLIC. FONCTIONS		
RUN REVERSE	YES	
YES, LOGIC IN	LI3	
JOG	YES	
YES, LOGIC IN	LI4	
JOG SPEED	5.0 Hz	
DUTY CYCLE	0.5 s	
JOG OUTPUT	-	
+/– SPEED	NO	
YES, WITH MEMORY ●		☐
YES, WITHOUT MEM. ☐		☐
(+) SPEED LI	-	
(–) SPEED LI	-	
SET POINT MEMORY	NO	
YES, LOGIC IN	-	

		Factory setting	Customer setting
PRESET SPEEDS			
NO	●		
1 PRESET SPEED			
3 PRESET SPEEDS			
7 PRESET SPEEDS			
LOGIC INPUT a			
LOGIC INPUT b			
LOGIC INPUT c			
SPEED 1		5 Hz	
SPEED 2		10 Hz	
SPEED 3		15 Hz	
SPEED 4		20 Hz	
SPEED 5		25 Hz	
SPEED 6		30 Hz	
SPEED 7		35 Hz	
SPEED REFERENCE			
SPEED REF. 1		AI1	
SPEED REF. 2		AI2	
SPEED REF. 3		AI3	
CLAMP SUM		YES	
CONTROLLED STOP		NO	
BY LOGIC INPUT	●		
BY FREQUENCY LEVEL			
BY LI/FREQ. LEVEL			
BY LOGIC INPUT		-	
ACTIVE STATE		0	
STOP TYPE		Free	
FREQ. LEVEL		0.0 Hz	
STOP TYPE		Free	
SHUTDOWN			
NO	●		
YES			
LOGIC OUTPUT			
DWELL TIME		1.0 s	
BYPASS		NO	
SEQUENCE INPUT		-	
PROCESS INPUT		-	
RUN OUT. COMMAND		-	
DECAY TIME		2.0 s	
SEQUENCE Tof		5.0 s	
PROCESS Tof		5.0 s	
SWITCH MOT. SEL.			
1 MOTOR			
2 MOTORS			
2 PARAMETERS			
3 MOTORS			
3 PARAMETERS			
MOTOR SEL. LIa			
MOTOR SEL. LIb			
FORCED LOCAL		NO	
YES, LOGIC IN		----	
TORQUE REFERENCE		NO	
YES, ANALOG. IN		-	
TORQUE RAMP		0.01 s	
TORQUE RATIO		100 %	
POS. DEAD BAND		0.0 Hz	
NEG. DEAD BAND		0.0 Hz	

		Factory setting	Customer setting
PI REGULATOR		NO	
REF. PI DISP.			
SP INPUT	●	-	
SP GAIN		+ 9999	
OFFSET		+ 0	
FB INPUT			
MIN FEEDBACK		+ 0	
MAX FEEDBACK		+1000	
LOW LEVEL ALM		+ 0	
HI. LEVEL ALM		+ 1000	
REF. MAN. DISP			
SPM INPUT	●	-	
LI AUTO/MANU		-	
LI REV. SPEED		-	
KP		100 %	
KI		0	
NEG. VALUES		NO	
REV. ACTION		NO	
PI FLT RATIO		100 %	
PI REF OUTPUT			
PI FB OUTPUT			
PI ERR OUTPUT			
PI INTEGRAL OUTPUT			
FB LIMIT OUTPUT			
FB HIGH ALARM OUTPUT			
FB LOW ALARM OUTPUT			
7.3 – OUTPUT ASSIGN.			
LOGIC OUTPUTS			
READY STATE			
RUNNING STATE		R2	
AT SPEED		LO1	
FWD. DIRECTION			
REV. DIRECTION			
CURRENT LIMIT		LO2	
TORQUE LIMIT			
FAULT STATE		R1	
DRIVE THER. AL.			
LOSS FOLLOWER 4-20 mA			
NO RAMP FOLLOW			
FEEDBACK LOSS			
OVER SPEED			
FREQ. LEV.		LO4	
FREQ. LEV. 2			
CURRENT LEV.			
CURRENT LEV. 2			
THERMAL LEV.		LO3	
THERMAL LEV. 2			
TORQUE LEVEL			
JOG ENABLE			
SHUTDOWN			
BRAKE RELEASE			
FIELD STATUS			
BRAKE STATE			
IN TORQ. REGUL			

	Factory setting	Customer setting
ANALOG OUTPUTS		
MOT. CURRENT	AO2	
MOT. SPEED	AO1	
MOT. POWER		
MOT. TORQUE	AO3	
MOT. VOLTAGE		
THERM. STATE		
RAMP OUTPUT		
TORQ. REF.		
7.4 – FAULT MANAGEMENT		
FAULT STOP	Freew	
POWER LOSS	Freew	
AUTO. RESTART	NO	
YES, RESTARTS		
DELAY TIME		
CATCH ON FLY	Ramp	
MOTOR OVERLOAD		
NO THERMAL PROT.		
MOT. SELF COOLED	●	
MOT. FORCED VENT.		
MANUAL TUNING		
MIN. SPD at F.L.	50 %	
I max at 0 SPD	50 %	
MOT. OVERLOAD	0.9 In. Var.	
IN. PHASE FAIL.	YES	
LOSS FOLLOWER 4-20 mA	NO	
GO TO		
FAULT		
CUSTOM. FAULT	NO	
FAULT RESET	NO	
DB FAULT	NO	
DB RESISTOR PROT.	NO	
RESISTOR VAL.		
RATED POWER		
OUT. PHASE FLT	YES	
CTRL SPD ERR	YES	

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