

Altivar 11

Guide d'exploitation
User's manual
Bedienungsanleitung
Guía de explotación
Guida all'impiego

Variateurs de vitesse pour
moteurs asynchrones,
Variable speed drives
for asynchronous motors,
Frequenzumrichter
für Drehstrom-Asynchronmotoren,
Variadores de velocidad
para motores asíncronos,
Variatori di velocità
per motori asincroni.

ATV 11.....E/U



Variateurs de vitesse pour moteurs asynchrones

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Variadores de velocidad para motores asíncronos

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Variatori di velocità per motori asincroni

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Steps for Setting Up the Drive

1 - Fit the drive

2 - Connect the following to the drive:

- The line supply, ensuring that it is:
 - **within the voltage range of the drive**
 - **voltage free**
- The motor, ensuring that its coupling corresponds to the supply voltage
- The control via the logic inputs
- The speed reference via the logic or analog inputs

3 - Switch on the drive, but do not give a run command

4 - Configure the following:

- The nominal frequency (bFr) of the motor, if it is other than 50 Hz for the E range or other than 60 Hz for the U range (only appears the first time the drive is switched on).
- The ACC (Acceleration) and dEC (Deceleration) parameters.
- The LSP (Low speed when the reference is zero) and HSP (High speed when the reference is maximum) parameters.
- The lTh parameter (Motor thermal protection).
- The preset speeds SP2-SP3-SP4.
- The speed reference if it is other than 0 - 5 V (0 -10V or 0 -20mA or 4 -20mA).

5 - Configure the following in the drC menu:

The motor parameters, only if the factory configuration of the drive is not suitable.

6 - Start the drive

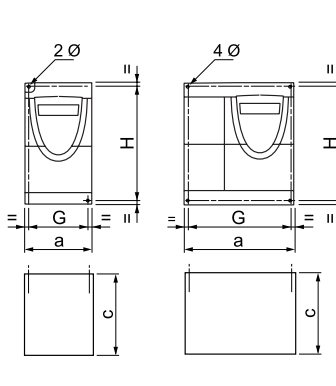
Factory configuration

The Altivar 11 is factory-configured for the most common operating conditions:

- Logic inputs:
 - LI1, LI2 (2 directions of operation): 2-wire control on transition, LI1 = forward, LI2 = reverse.
 - LI3, LI4: 4 preset speeds (speed 1 = speed reference or LSP, speed 2 = 10 Hz, speed 3 = 25 Hz, speed 4 = 50 Hz).
- Analog input AI1: speed reference (0 + 5 V).
- Relay R1: the contact opens in the event of a fault (or drive off)
- DO output: analog output, image of the motor frequency.

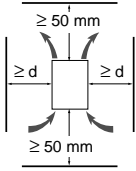
If the factory configuration is not suitable, the FUN menu can be used to modify the functions and the I/O assignments.

Dimensions



ATV 11H	a mm	b mm	c mm	G mm	H mm	Ø mm
U05●● E, U ranges U09●● U range	72	142	≤125	60±1	131±1	2 x 5
U09●● E range U12●● E range U18M● E range	72	142	≤138	60±1	120±1	2 x 5
U18M● U range	72	147	138	60±1	131±1	2 x 5
U18F1 U range U29●● E, U ranges U41●● E, U ranges	117	142	156	106±1	131±1	4 x 5
ATV 11P	a mm	b mm	c mm	G mm	H mm	Ø mm
all ratings	72	142	101	60±1	131±1	2 x 5

Mounting and Temperature Conditions



Install the unit vertically, at $\pm 10^\circ$.

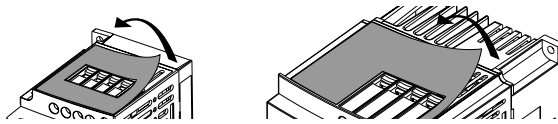
Do not place it close to heating elements.

Leave sufficient free space to ensure that the air required for cooling purposes can circulate from the bottom to the top of the unit.

Free space in front of unit: 10 mm minimum.

When IP20 protection is adequate, it is recommended that the protective cover on the top of the drive is removed, as shown below.

- From -10°C to 40°C :
 - $d \geq 50$ mm: no special precautions.
 - $d = 0$ (mounted side by side): remove the protective cover on the top of the drive, as shown below (the degree of protection becomes IP20).
- From 40°C to 50°C :
 - $d \geq 50$ mm: remove the protective cover on the top of the drive, as shown below (the degree of protection becomes IP20).
- From 50°C to 60°C :
 - $d \geq 50$ mm: remove the protective cover on the top of the drive, as shown below (the degree of protection becomes IP20), and derate the drive nominal current by 2.2% for every $^\circ\text{C}$ above 50°C .



Mounting the drives on machines

ATV 11P drives can be mounted on (or in) a steel or aluminium machine frame, observing the following conditions:

Maximum ambient temperature: 40°C

Vertical mounting at $\pm 10^\circ$

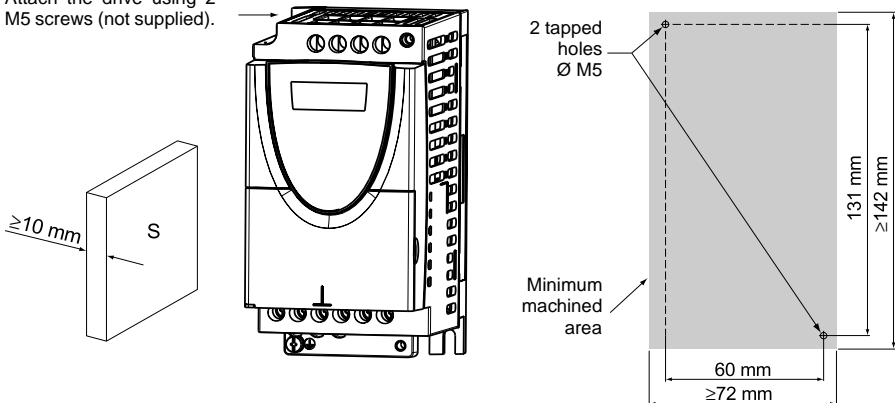
The drive must be fixed at the centre of a support (frame) which is a minimum of 10 mm thick and with a square cooling area (S) of 0.12 m^2 minimum for steel and 0.09 m^2 for aluminium, exposed to the open air.

Support area for the drive (min 142×72) machined on the frame with a surface smoothness of $100\ \mu\text{m}$ max and a roughness of $3.2\ \mu\text{m}$ max.

Mill the tapped holes lightly in order to remove any burrs.

Coat the whole support surface of the drive with thermal contact grease (or equivalent).

Attach the drive using 2
M5 screws (not supplied).

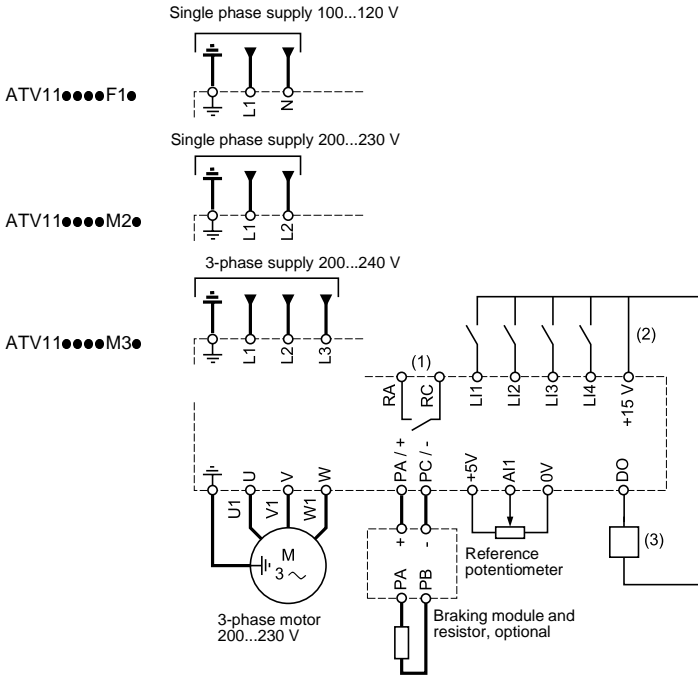


Verify the thermal state of the drive by checking parameter t_{Hd} (SUP menu), to confirm that the drive has been mounted correctly.

Wiring diagram for factory settings



- Supply terminals at the top, motor terminals at the bottom
- Connect the power terminals before the control terminals



(1) Fault relay contacts, for remote indication of the drive status.

(2) Internal + 15 V. If an external source is used (+ 24 V max.), connect the 0 V of the source to the 0V terminal, and do not use the + 15 V terminal on the drive.

(3) Galvanometer or low level relay.

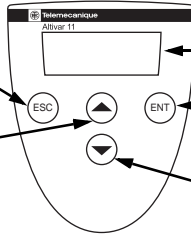
Note: Fit interference suppressors to all inductive circuits near the drive or coupled to the same circuit (relays, contactors, solenoid valves, etc)

Choice of associated components:


See the Altivar 11 catalog.

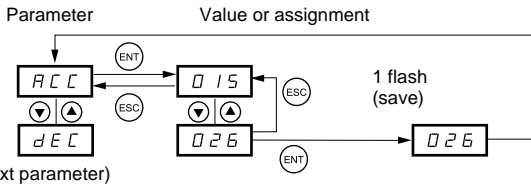
Functions of the display and the keys

- Exits a menu or parameter, or aborts the displayed value to return to the previous value in the memory
- Returns to the previous menu or parameter, or increases the displayed value
- 3 "7-segment" displays
- Enters a menu or a parameter, or saves the displayed parameter or value
- Goes to the next menu or parameter, or decreases the displayed value



Pressing  or  does not store the selection.

Save the selection: 
 Example:



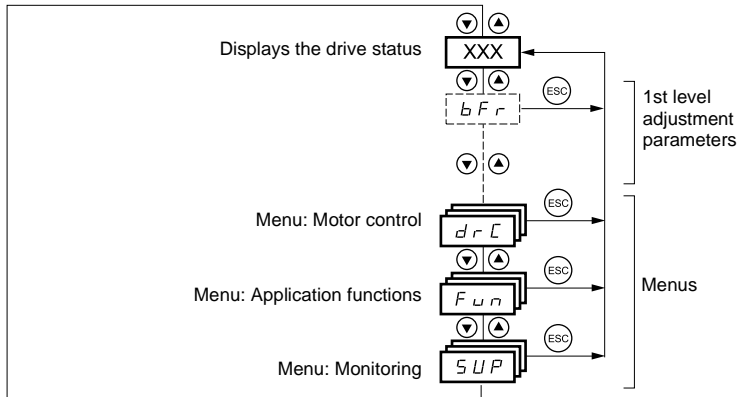
The display flashes when a value is stored.

Normal display, with no fault present and no startup:

- rdY: Drive ready
- 43.0: Display of the parameter selected in the SUP menu (default selection: frequency reference).
- dcb: DC injection braking in progress
- nSt: Freewheel stop

If there is a fault, it is shown with a flashing display.

1st level adjustment parameters



The parameters in clear boxes can only be modified when the drive is stopped and locked.

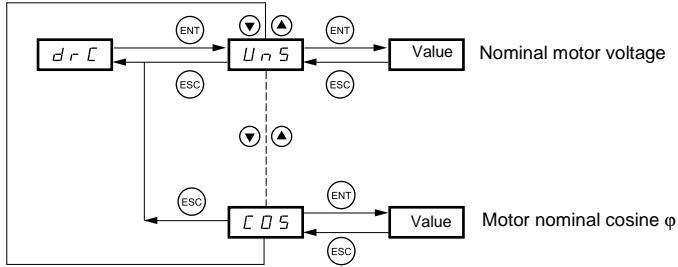
Parameters in shaded boxes can be modified with the drive operating or stopped.

Code	Description	Adjustment range	Factory setting
<i>b F r</i>	Motor frequency	50 Hz or 60 Hz	50 (E range) or 60 (U range)
	This parameter is only visible the first time the drive is switched on. It can be modified at any time in the FU n menu.		
<i>R C C</i>	Acceleration ramp time	0.1 s to 99.9 s	3
Range: 0 Hz to motor nominal frequency FrS (parameter in drC menu).			
<i>d E C</i>	Deceleration ramp time	0.1 s to 99.9 s	3
Range: motor nominal frequency FrS (parameter in drC menu) to 0 Hz.			
<i>L S P</i>	Low speed	0 Hz to HSP	0
	Motor frequency to 0.		
<i>H S P</i>	High speed	LSP to 200 Hz	= bFr
	Motor frequency to max. reference. Check that this setting is appropriate for the motor and the application.		
<i>I t H</i>	Motor thermal current	0 to 1.5 In (1)	According to drive rating
	Current used for motor thermal protection. Set ItH to the nominal current marked on the motor rating plate. The memory of the motor thermal state returns to zero when the drive is switched off.		
<i>S P 2</i>	2 nd preset speed (2)	0.0 to 200 Hz	10
<i>S P 3</i>	3 rd preset speed (2)	0.0 to 200 Hz	25
<i>S P 4</i>	4 th preset speed (2)	0.0 to 200 Hz	50
<i>R I t</i>	Configuration of the analog input	5U, 10U, 0A, 4A	5U
	- 5 U: voltage 0 - 5 volts (internal power supply)		
	- 10 U: voltage 0 - 10 volts (external power supply)		
	- 0 A: current 0 - 20 mA		
	- 4 A: current 4 - 20 mA		

(1) In = nominal drive current

(2) The preset speeds only appear if the corresponding function has remained at the factory setting or has been reconfigured in the FU n menu.

Motor control menu drC



The parameters in clear boxes can only be modified when the drive is stopped and locked.

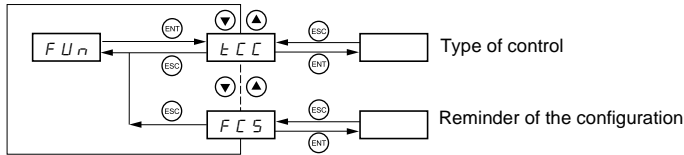
Parameters in shaded boxes can be modified with the drive operating or stopped.

Drive performance can be optimised by entering the values marked on the motor rating plate

Code	Description	Adjustment range	Factory setting
U n S	Nominal motor voltage marked on the rating plate.	100 to 500 V	Acc. to rating
F r S	Nominal motor frequency marked on the rating plate.	40 to 200 Hz	50 / 60Hz dep. on bFr
S t P	Frequency loop stability	0 to 100% when stopped 1 to 100% when operating	20
	Value too high: lengthening of response time Value too low: overspeed, possible instability.		
F L G	Frequency loop gain	0 to 100% when stopped 1 to 100% when operating	20
	Value too high: overspeed, instability. Value too low: lengthening of response time		
U F r	IR compensation Used to optimise the torque at very low speed, or to adapt to special cases (example: for motors connected in parallel, lower UFr).	0 to 200%	50
n I r	Nominal motor current marked on the rating plate	0.25 to 1.5 In (1)	Acc. to rating
C L I	Limiting current	0.5 to 1.5 In (1)	1.5 In
n S L	Nominal motor slip	0 to 10.0 Hz	Acc. to rating
	Calculate using the formula: nSL = parameter FrS x (1 - Nn/Ns) Nn = nominal motor speed marked on the rating plate Ns = motor synchronous speed		
S L P	Slip compensation	0 to 150% (of nSL)	100
	Used to adjust the slip compensation around the value set by the nominal motor slip nSL, or to adapt to special cases (example: for motors connected in parallel, lower SLP).		
C D S	Nominal motor cosine φ marked on the rating plate	0.50 to 1.00	Acc. to rating

(1) In = nominal drive current

Application functions menu FUN



The parameters in clear boxes can only be modified when the drive is stopped and locked.


Parameters in shaded boxes can be modified with the drive operating or stopped.


ENGLISH

Code	Description	Factory setting
tCC	<p>Type of control</p> <p>2C = 2-wire control 3C = 3-wire control</p> <p>2-wire control: The open or closed state of the input controls the running or stopping.</p> <p>Example of wiring: LI1: forward LIx: reverse</p> <p>3-wire control (pulse control): a "forward" or "reverse" pulse is sufficient to command starting, a "stop" pulse is sufficient to command stopping.</p> <p>Example of wiring: LI1: stop LI2: forward LIx: reverse</p> <p>⚠ To change the assignment of tCC press the "ENT" key for 2 s. This causes the following functions to return to factory setting: rrS, tCC, Atr, PS2 (LIA, Llb).</p>	2C
tCt	<p>Type of 2-wire control (parameter can only be accessed if tCC = 2C):</p> <p>LEL: state 0 or 1 is taken into account for running or stopping. tcr: a change of state (transition or edge) is necessary to initiate operation, in order to prevent accidental restarts after a power supply interruption. PF D: same as LEL, but the "forward" input always takes priority over the "reverse" input.</p>	trn
rrS	<p>Reverse</p> <p>nD: function inactive L11 to L14: choice of the input assigned to the reverse command</p>	if tCC = 2C: LI2 if tCC = 3C: LI3
PS2	<p>Preset speeds</p> <p>If LIA and Llb = 0: speed = reference on AI1 If LIA = 1 and Llb = 0: speed = SP2 If LIA = 0 and Llb = 1: speed = SP3 If LIA = 1 and Llb = 1: speed = SP4</p> <p>LIA: Assignment of input LIA - nD: function inactive - L11 to L14: choice of the input assigned to LIA</p> <p>Llb: Assignment of input Llb - nD: function inactive - L11 to L14: choice of the input assigned to Llb SP2 is only accessible if LIA is assigned, SP3 and SP4 if LIA and Llb are assigned.</p>	if tCC = 2C: LI3 if tCC = 3C: LI4
SP2	2 nd preset speed, adjustable from 0.0 to 200 Hz (1)	10
SP3	3 rd preset speed, adjustable from 0.0 to 200 Hz (1)	25
SP4	4 th preset speed, adjustable from 0.0 to 200 Hz (1)	50

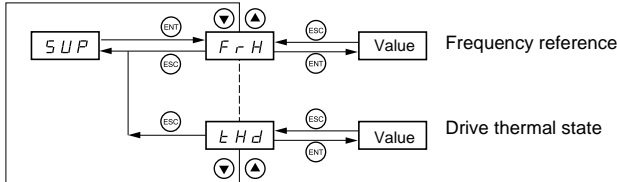
(1) The preset speeds can also be accessed in the 1st level adjustment parameters.

Code	Description	Factory setting
<i>r S F</i>	Fault reset - <i>n D</i> : function inactive - <i>L 1 1</i> to <i>L 1 4</i> : choice of the input assigned to this function The reset takes place at a transition on the input (rising edge: 0 to 1). It is only authorised if the fault has disappeared.	nO
<i>r P 2</i> <i>L 1</i>	Second ramp Assignment of the 2nd ramp control input - <i>n D</i> : function inactive - <i>L 1 1</i> to <i>L 1 4</i> : choice of assigned input AC2 and dE2 are only accessible if L1 is assigned.	nO
<i>R C 2</i> <i>d E 2</i>	2nd acceleration ramp time, adjustable from 0.1 to 99.9 s 2nd deceleration ramp time, adjustable from 0.1 to 99.9 s	5.0 5.0
<i>S t P</i>	Controlled stop on loss of line supply - <i>n D</i> : locking of the drive and freewheel stopping of the motor - <i>F r P</i> : stop according the valid ramp (dEC or dE2) - <i>F S t</i> : fast stop, the stopping time depends on the inertia and the braking ability of the drive.	nO
<i>b r R</i>	Deceleration ramp adaptation - <i>n D</i> : function inactive - <i>y E 5</i> : This function automatically increases the deceleration time, if this has been set at too low a value for the inertia of the load, thus avoiding the overvoltage fault.	YES
<i>R d C</i> <i>R C t</i>	Automatic DC injection Operating mode - <i>n D</i> : function inactive - <i>y E 5</i> : DC injection on stopping, duration adjustable via tdC, when operation is no longer controlled and the motor speed is zero. The value of this current can be adjusted via SdC. - <i>C t</i> : Continuous DC injection on stopping, when operation is no longer controlled and the motor speed is zero. The value of this current can be adjusted via SdC. In 3-wire control the injection is only active when L11 is at 1. tdC is only accessible if Act = YES, SdC if Act = YES or Ct.	YES
<i>t d C</i> <i>S d C</i>	Injection time on stopping, adjustable from 0.1 to 30.0 s Injection current, adjustable from 0 to 1.2 In (In = nominal drive current)	0.5 0.7 In
<i>S F t</i> <i>R C t</i>	Switching frequency Frequency range - <i>L F r</i> : random frequency around 2 or 4 kHz according to SFr - <i>L F</i> : fixed frequency of 2 or 4 kHz according to SFr - <i>H F</i> : fixed frequency of 8, 12 or 16 kHz according to SFr	LF
<i>S F r</i>	Switching frequency: - <i>2</i> : 2 kHz (if Act = LF or LFr) - <i>4</i> : 4 kHz (if Act = LF or LFr) - <i>8</i> : 8 kHz (if Act = HF) - <i>1 2</i> : 12 kHz (if Act = HF) - <i>1 6</i> : 16 kHz (if Act = HF) When SFr = 2 kHz, the frequency automatically changes to 4 kHz at high speed. When SFt = HF, the selected frequency automatically changes to the lower frequency if the thermal state of the drive is too high. It automatically returns to the SFr frequency as soon as the thermal state permits.	4 (if Act = LF or LFr) 12 (if Act = HF)

Code	Description	Factory setting
<i>F L r</i>	<p>Catch on the fly Enables a smooth restart if the run command is maintained after the following events:</p> <ul style="list-style-type: none"> - loss of line supply or disconnection - fault reset or automatic restart - freewheel stop. <p>The motor resumes from the estimated speed at the time of the restart then follows the ramp to the reference speed. This function requires 2-wire control (tCC = 2C) with tCt = LEL or PFO.</p> <p><i>n D</i>: function inactive <i>y E 5</i>: function active</p> <p>The function intervenes at each run command, resulting in a slight delay (1 second max.). If continuous automatic injection braking has been configured (Ct) this function cannot be activated.</p>	nO
<i>d D</i> <i>R C t</i>	<p>Analog/logic output DO Assignment</p> <ul style="list-style-type: none"> - <i>n D</i>: not assigned - <i>D C r</i>: analog output = current in the motor. The full signal corresponds to 200% of the nominal drive current. - <i>r F r</i>: analog output = motor frequency. The full signal corresponds to 100% HSP. - <i>F t A</i>: logic output = frequency threshold reached, closed (state 1) if the motor frequency exceeds the adjustable threshold Ftd. - <i>S r A</i>: logic output = reference reached, closed (state 1) if the motor frequency is equal to the reference. - <i>C t A</i>: logic output = current threshold reached, closed (state 1) if the motor current exceeds the adjustable threshold Ctd. <p>Ftd is only accessible if ACT = FtA, Ctd is only accessible if ACT = CtA.</p>	rFr
<i>F t d</i> <i>C t d</i>	<p>frequency threshold, adjustable from 0 to 200 Hz current threshold, adjustable from 0 to 1.5 In (In = nominal drive current)</p>	= bFr In
<i>R t r</i>	<p>Automatic restart</p> <ul style="list-style-type: none"> - <i>n D</i>: function inactive - <i>y E 5</i>: Automatic restart, after locking on a fault, if the fault has disappeared and the other operating conditions permit the restart. The restart is performed by a series of automatic attempts separated by increasingly long waiting periods: 1 s, 5 s, 10 s, then 1 min for the following periods. If the restart has not taken place after 6 min, the procedure is aborted and the drive remains locked until it is disconnected and then reconnected. <p>The following faults permit this function: OHF, OLF, ObF, OSF, PHF. The drive fault relay remains activated if this function is active. The speed reference and the operating direction must be maintained. This function is only accessible in 2-wire control (tCC = 2C) with tCt = LEL or PFO.</p> <p> Check that an accidental start does not present any danger to personnel or equipment.</p>	nO
<i>b F r</i>	<p>Motor frequency (Same as bFr 1st level adjustment parameter) Set to 50 Hz or 60 Hz, taken from the motor rating plate.</p>	50 (E range) or 60 (U range)
<i>I P L</i>	<p>Line phase loss fault configuration This parameter is only accessible on 3-phase drives.</p> <ul style="list-style-type: none"> - <i>n D</i>: inhibition of the line phase loss fault - <i>y E 5</i>: monitoring of the line phase loss fault 	YES
<i>S C S</i>	<p>Configuration backup</p> <ul style="list-style-type: none"> - <i>n D</i>: function inactive - <i>y E 5</i>: saves the current configuration to the EEPROM memory. SCS automatically switches to nO as soon as the save has been performed. <p>This function is used to keep another configuration in reserve, in addition to the current configuration. When drives leave the factory the current configuration and the backup configuration are both initialised to the factory configuration.</p>	nO

Code	Description	Factory setting
<i>F L 5</i>	<p>Reminder of the configuration</p> <ul style="list-style-type: none"> - <i>n D</i>: function inactive - <i>r E C</i>: the current configuration becomes identical to the backup configuration previously saved by SCS. rEC is only visible if the backup has been carried out. FCS automatically switches to nO as soon as this action has been performed. - <i>! n !</i>: the current configuration becomes identical to the factory setting. FCS automatically switches to nO as soon as this action has been performed. <p>For rEC and !n! to be taken into account the ENT key must be held down for 2 s.</p> 	nO

Monitoring menu SUP



When the drive is running, the value displayed is that of one of the monitoring parameters. The default value which is displayed is the motor reference (parameter FrH).

While the value of the required new monitoring parameter is being displayed, the "ENT" key must be pressed a second time to confirm the change of monitoring parameter and to store it. From then on the value of this parameter will be displayed during operation (even after the drive has been switched off).

If the new choice is not confirmed by pressing the "ENT" key for a second time, the drive will return to the previous parameter after it has been switched off.

The following parameters can be accessed, with the drive stopped or running.

Code	Parameter	Unit
<i>FrH</i>	Display of the frequency reference (factory configuration)	Hz
<i>rFr</i>	Display of the output frequency applied to the motor	Hz
<i>LcI</i>	Display of the motor current	A
<i>ULn</i>	Display of the line voltage	V
<i>tHr</i>	Display of the motor thermal state: 100% corresponds to the nominal thermal state. Above 118%, the drive trips on an OLF fault (motor overload). It can be reset below 100%.	%
<i>tHd</i>	Display of the drive thermal state: 100% corresponds to the nominal thermal state. Above 118%, the drive trips on an OHF fault (drive overheating). It can be reset below 80%.	%

Faults - Causes - Remedies

Starter does not start, no fault displayed

- Check that the run command input(s) have been actuated in accordance with the chosen control mode.
- When the drive is switched on, at a manual fault reset, or after a stop command, the motor can only be powered once the "forward" and "reverse" commands have been reset. If they have not been reset, the drive will display "rdY" or "nSt" but will not start.

Faults displayed

The cause of the fault must be removed before resetting.

Faults SOF, OHF, OLF, OSF, ObF, and PHF can be reset via a logic input if this function has been configured.

Faults OHF, OLF, OSF, ObF, and PHF can be reset via the automatic restart function, if this function has been configured. All faults can be reset by switching the drive off then on again.

Fault	Remedy
<i>D C F</i> overcurrent	<ul style="list-style-type: none"> • Ramp too short, check the settings. • Inertia or load too high, check the size of the motor/drive/load. • Mechanical locking, check the state of the mechanism.
<i>S C F</i> motor short-circuit, insulation fault	<ul style="list-style-type: none"> • Check the cables connecting the drive to the motor, and the insulation of the motor.
<i>I n F</i> internal fault	<ul style="list-style-type: none"> • Check the environment (electromagnetic compatibility). • Replace the drive.
<i>C F F</i> configuration fault	<ul style="list-style-type: none"> • Return to factory settings or call up the backup configuration, if it is valid. See parameter FCS in the FUn menu.
<i>S O F</i> overspeed	<ul style="list-style-type: none"> • Instability, check the motor, gain and stability parameters. • Driving load too high, add a braking module and resistor and check the size of the motor / drive / load.
<i>D H F</i> drive overload	<ul style="list-style-type: none"> • Check the motor load, the drive ventilation and the environment. Wait for the drive to cool before restarting.
<i>D L F</i> motor overload	<ul style="list-style-type: none"> • Check the setting of the motor thermal protection, check the motor load. Wait for the drive to cool before restarting.
<i>D S F</i> overvoltage	<ul style="list-style-type: none"> • Check the line voltage.
<i>D b F</i> overvoltage during deceleration	<ul style="list-style-type: none"> • Braking too harsh or driving load. Increase the deceleration time, add a braking resistor if necessary and activate the brA function if it is compatible with the application.
<i>P H F</i> line phase failure	<p>This protection only operates with the drive on load.</p> <ul style="list-style-type: none"> • Check the power connection and the fuses. • Reset. • Check the line supply / drive compatibility. • If there is an unbalanced load, inhibit the fault via IPL = nO (FUn menu).
<i>U S F</i> undervoltage	<ul style="list-style-type: none"> • Check the voltage and the voltage parameter.
<i>C r F</i> charging circuit	<ul style="list-style-type: none"> • Replace the drive.



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