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Altivar 11

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

Telemecanique

Schneider Electric

FRANÇAIS

ENGLISH

DEUTSCH

ESPAÑOL

ITALIANO

Variateurs de vitesse pour moteurs asynchrones **Page 1**

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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 ItH 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

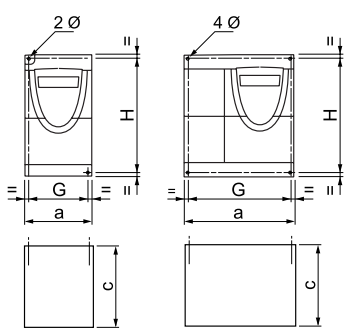
Factory configuration

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.

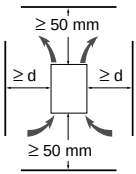
Dimensions



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 ± 10°.
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 ≥ 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 ≥ 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 ≥ 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 °C above 50°C.

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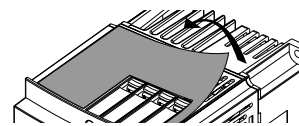
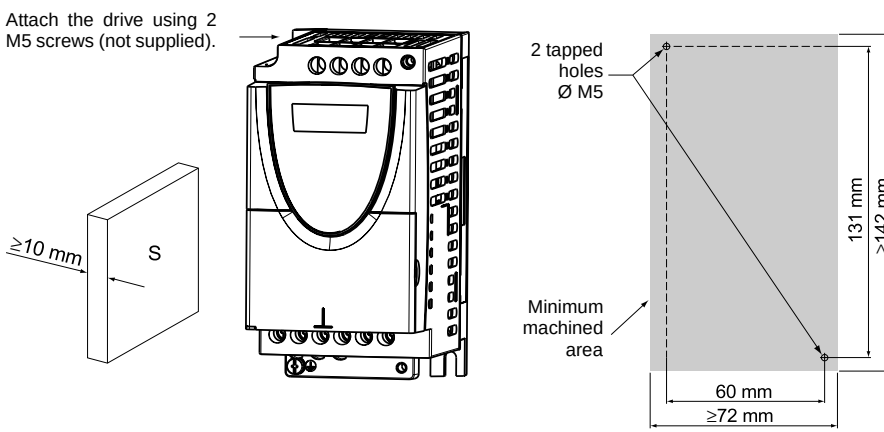


Mounting the drives on machines

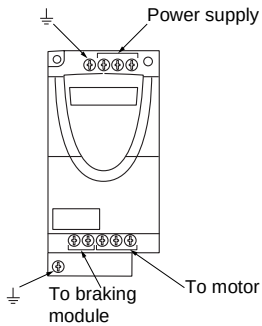
ATV 11P●●●●●● drives can be mounted on (or in) a steel or aluminium machine frame, observing the following conditions:
Maximum ambient temperature: 40 °C
Vertical mounting at ± 10°
The drive must be fixed at the centre of a support (frame) which is a minimum of 10 mm thick and with a square cooling area (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 x 72) machined on the frame with a surface smoothness of 100 µm max and a roughness of 3.2 µm 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).

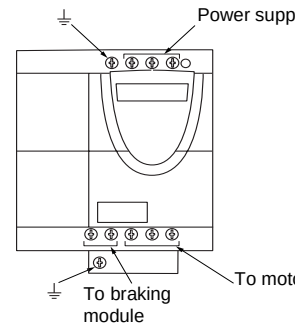


Verify the thermal state of the drive by checking parameter tHd (SUP menu), to confirm that the drive has been mounted correctly.

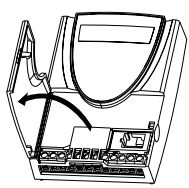
Power Terminals

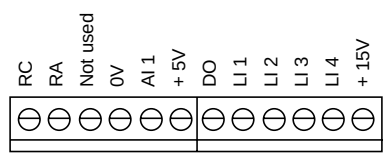
Altivar ATV 11●	Maximum connection capacity		Tightening torque in Nm
	AWG	mm^2	
U05●●●, U09●●●, U18M●●	AWG 14	1.5	0.75
U18F1●, U29●●●, U41●●●	AWG 10	4	1





Arrangement, specifications and functions of the control terminals



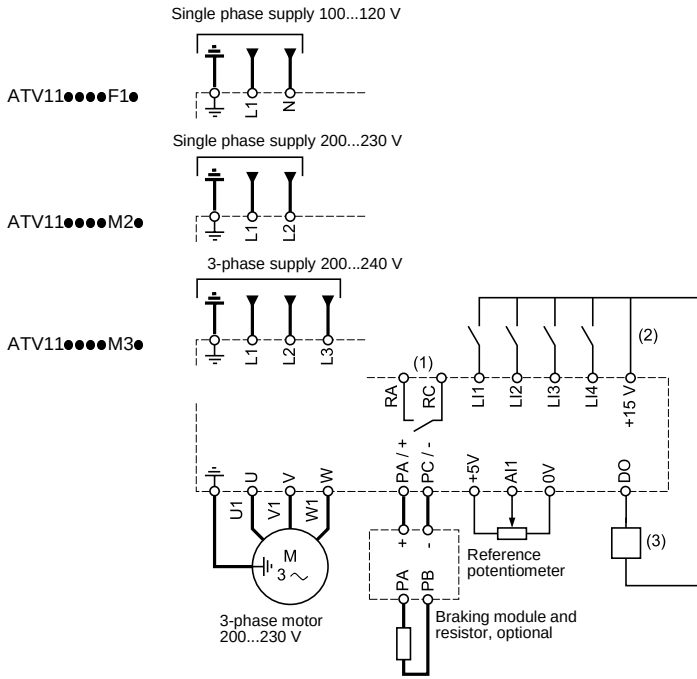


- Maximum connection capacity: 1.5 mm2 - AWG 16
- Max. tightening torque: 0.5 Nm.

Terminal	Function	Electrical characteristics
RC RA	Fault relay contact (open if there is a fault or the drive is off)	Min. switching capacity: 10 mA for 24 V ⎓ Max. switching capacity: • 2 A for 250 V ∿ and 30 V ⎓ on inductive load (cos φ = 0.4 - L/R = 7 ms) • 5 A for 250 V ∿ and 30 V ⎓ on resistive load (cos φ = 1- L/R = 0)
0V	I/O common	0 V
AI1	Voltage or current analog input	Analog input 0 + 5V or 0 + 10 V: impedance 40 kΩ, 30 V max. Analog input 0 - 20mA or 4 - 20mA: impedance 250 Ω (with no additional resistor)
+5V	Power supply for reference potentiometer 2.2 to 10 kΩ	• Precision: - 0 + 5% • Max. current available: 10 mA
DO	Output which can be configured as analog or logic output	PWM open collector analog output at 2 kHZ: • voltage 30 V max., impedance 1 kΩ, 10 mA max. Open collector logic output: • voltage 30 V max., impedance 100 kΩ, 50 mA max.
LI1 LI2 LI3 LI4	Programmable logic inputs	• Power supply + 15 V (max. 30 V), Impedance 5 kΩ • State 0 if < 5 V, state 1 if > 11 V
+ 15V	Logic input power supply	+ 15 V ± 15% protected against shorts-circuits and overloads. Max. customer current available 100 mA

Wiring diagram for factory settings

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



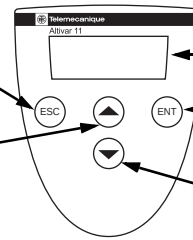
(1) Fault relay contacts, for remote indication of the drive status.
(2) Internal + 15 V. If an external source is used (+ 24 V max.), connect the 0 V of the source to the 0V terminal, and do not use the + 15 V terminal on the drive.
(3) Galvanometer or low level relay.

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

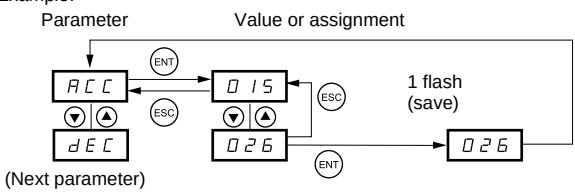


- 3 "7-segment" displays
- Enters a menu or a parameter, or saves the displayed parameter or value
- Goes to the next menu or parameter, or decreases the displayed value

Pressing ▲ or ▼ does not store the selection.

Save the selection: ENT

Example:



The display flashes when a value is stored.

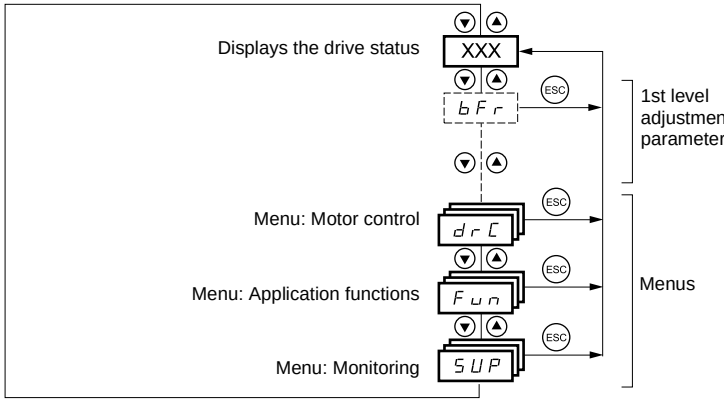
Normal display, with no fault present and no startup:

- 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.

ENGLISH

1st level adjustment parameters



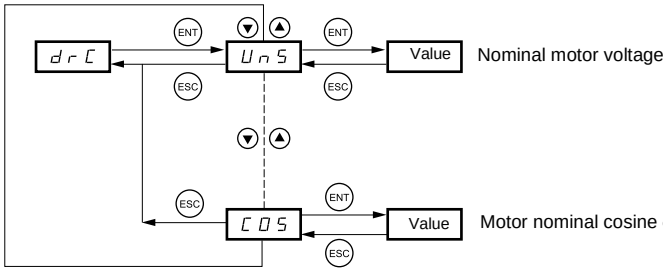
The parameters in clear boxes can only be modified when the drive is stopped and locked.

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

Code	Description	Adjustment range	Factory setting
bFr	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 FUn menu.		
ACC	Acceleration ramp time	0.1 s to 99.9 s	3
	Range: 0 Hz to motor nominal frequency FrS (parameter in drC menu).		
dEC	Deceleration ramp time	0.1 s to 99.9 s	3
	Range: motor nominal frequency FrS (parameter in drC menu) to 0 Hz.		
LSP	Low speed	0 Hz to HSP	0
	Motor frequency to 0.		
HSP	High speed	LSP to 200 Hz	= bFr
	Motor frequency to max. reference. Check that this setting is appropriate for the motor and the application.		
ItH	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.**		
SP2	2nd preset speed (2)	0.0 to 200 Hz	10
SP3	3rd preset speed (2)	0.0 to 200 Hz	25
SP4	4th preset speed (2)	0.0 to 200 Hz	50
AIt	Configuration of the analog input	5U, 10U, 0A, 4A	5U
	- 5U: voltage 0 - 5 volts (internal power supply) - 10U: voltage 0 - 10 volts (external power supply) - 0A: current 0 - 20 mA - 4A: 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 FUn menu.

Motor control menu drC



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

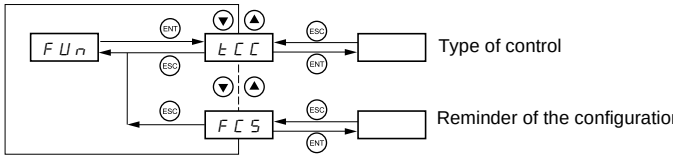
Parameters in shaded boxes can be modified with the drive operating or stopped.

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

Code	Description	Adjustment range	Factory setting
UnS	Nominal motor voltage marked on the rating plate.	100 to 500 V	Acc. to rating
FrS	Nominal motor frequency marked on the rating plate.	40 to 200 Hz	50 / 60Hz dep. on bFr
StA	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.		
FLG	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		
UFr	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
nCr	Nominal motor current marked on the rating plate	0.25 to 1.5 In (1)	Acc. to rating
CLI	Limiting current	0.5 to 1.5 In (1)	1.5 In
nSL	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		
SLP	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).		
COS	Nominal motor cosine φ marked on the rating plate	0.50 to 1.00	Acc. to rating

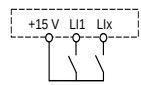
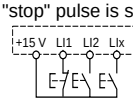
(1) In = nominal drive current

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.

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

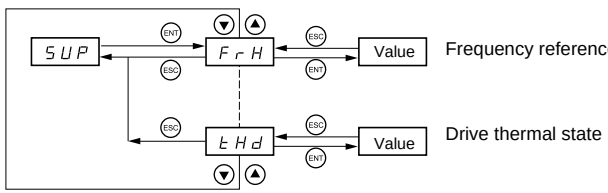
(1) The preset speeds can also be accessed in the 1st level adjustment parameters.

Code		Description	Factory setting
rSF		**Fault reset** - nO: function inactive - LI1 to LI4: 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
rP2		**Second ramp**	
	LI1	Assignment of the 2nd ramp control input - nO: function inactive - LI1 to LI4: choice of assigned input AC2 and dE2 are only accessible if LI is assigned.	nO
	AC2	2nd acceleration ramp time, adjustable from 0.1 to 99.9 s	5.0
	dE2	2nd deceleration ramp time, adjustable from 0.1 to 99.9 s	5.0
StP		**Controlled stop on loss of line supply** - nO: locking of the drive and freewheel stopping of the motor - FrP: stop according the valid ramp (dEC or dE2) - FSt: fast stop, the stopping time depends on the inertia and the braking ability of the drive.	nO
brA		**Deceleration ramp adaptation** - nO: function inactive - YES: 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
AdC		**Automatic DC injection**	
	ACt	Operating mode - nO: function inactive - YES: 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. - Ct: 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 LI1 is at 1. tdC is only accessible if ACt = YES, SdC if ACt = YES or Ct.	YES
	tdC	Injection time on stopping, adjustable from 0.1 to 30.0 s	0.5
	SdC	Injection current, adjustable from 0 to 1.2 In (In = nominal drive current)	0.7 In
SFt		**Switching frequency**	
	ACt	Frequency range - LFr: random frequency around 2 or 4 kHz according to SFr - LF: fixed frequency of 2 or 4 kHz according to SFr - HF: fixed frequency of 8, 12 or 16 kHz according to SFr	LF
	SFr	Switching frequency: - 2: 2 kHz (if ACt = LF or LFr) - 4: 4 kHz (if ACt = LF or LFr) - 8: 8 kHz (if ACt = HF) - 12: 12 kHz (if ACt = HF) - 16: 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
FLr	**Catch on the fly** Enables a smooth restart if the run command is maintained after the following events: - loss of line supply or disconnection - fault reset or automatic restart - freewheel stop. 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. nO: function inactive YES: function active 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.	nO
dO	**Analog/logic output DO**	
AOt	Assignment - nO: not assigned - OCr: analog output = current in the motor. The full signal corresponds to 200% of the nominal drive current. - rFr: analog output = motor frequency. The full signal corresponds to 100% HSP. - FtA: logic output = frequency threshold reached, closed (state 1) if the motor frequency exceeds the adjustable threshold Ftd. - SrA: logic output = reference reached, closed (state 1) if the motor frequency is equal to the reference. - CtA: logic output = current threshold reached, closed (state 1) if the motor current exceeds the adjustable threshold Ctd. Ftd is only accessible if ACt = FtA, Ctd is only accessible if ACt = CtA.	rFr
Ftd	frequency threshold, adjustable from 0 to 200 Hz	= bFr
Ctd	current threshold, adjustable from 0 to 1.5 In (In = nominal drive current)	In
Atr	**Automatic restart** - nO: function inactive - YES: 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. 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. ⚠ Check that an accidental start does not present any danger to personnel or equipment.	nO
bFr	**Motor frequency** (Same as bFr 1st level adjustment parameter) Set to 50 Hz or 60 Hz, taken from the motor rating plate.	50 (E range) or 60 (U range)
IPL	**Line phase loss fault configuration** This parameter is only accessible on 3-phase drives. - nO: inhibition of the line phase loss fault - YES: monitoring of the line phase loss fault	YES
SCS	**Configuration backup** - nO: function inactive - YES: saves the current configuration to the EEPROM memory. SCS automatically switches to nO as soon as the save has been performed. 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.	nO

Code	Description	Factory setting
FCS	**Reminder of the configuration** - nO: function inactive - rEC: 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. - InI: the current configuration becomes identical to the factory setting. FCS automatically switches to nO as soon as this action has been performed. ⚠ For rEC and InI to be taken into account the ENT key must be held down for 2 s.	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
FrH	Display of the frequency reference (factory configuration)	Hz
rFr	Display of the output frequency applied to the motor	Hz
LCr	Display of the motor current	A
ULn	Display of the line voltage	V
tHr	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%.	%
tHd	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
OCF overcurrent	• 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.
SCF motor short-circuit, insulation fault	• Check the cables connecting the drive to the motor, and the insulation of the motor.
InF internal fault	• Check the environment (electromagnetic compatibility). • Replace the drive.
CFF configuration fault	• Return to factory settings or call up the backup configuration, if it is valid. See parameter FCS in the FUn menu.
SOF overspeed	• 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.
OHF drive overload	• Check the motor load, the drive ventilation and the environment. Wait for the drive to cool before restarting.
OLF motor overload	• Check the setting of the motor thermal protection, check the motor load. Wait for the drive to cool before restarting.
OSF overvoltage	• Check the line voltage.
ObF overvoltage during deceleration	• 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.
PHF line phase failure	This protection only operates with the drive on load. • 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).
USF undervoltage	• Check the voltage and the voltage parameter.
CrF charging circuit	• Replace the drive.

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