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I456GB02_17

ADXL... (GB)

SOFT STARTER

INSTRUCTION MANUAL

- Read the manual carefully before installation and use.
- These devices must be installed by qualified personnel, in compliance with current plant-engineering regulations, in order to avoid damage to persons or property.
- Before any maintenance operation on the device, switch off power supply from measuring and supply inputs.
- The manufacturer assumes no responsibility for electrical safety in the event of improper use of the device.
- The products described in this document are subject to updates or modifications at any time. Data and descriptions in the catalogue therefore do not have any contractual value.
- The building's electrical system must incorporate a switch or circuit breaker. It must be installed close to the equipment and within easy reach of the operator. It must be marked as the disconnecting device of the equipment: IEC/ EN 61010-1 § 6.12.2.1.
- Clean the instrument with a soft cloth. Do not use abrasives, liquid detergents or solvents.

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Description

- Backlit icon LCD.
- 3 status LEDs (power, run, alarm).
- Texts for measurements, settings and messages in 6 languages (ENG-ITA-FRA-ESP-POR-DEU).
- Front-mounted keypad with 4 keys, for full parameter setting.
- AUTOSET wizard for quick configuration in 4 steps of typical applications (pumps, fire fighting pumps, belt conveyors, mixers, fan, general purpose).
- 2-phase controlled starting, with integrated bypass relays.
- 4 different mechanical sizes and 11 electrical ratings for motors with rated current from 30 up to 320A.
- Input voltage from 208 up to 600Vac.
- Voltage or torque ramp starting, with current limitation.
- Thermostatically controlled fan (optional for ADXL 0030 600…ADXL 0115 600), with dedicated diagnostics (fan disconnected or jammed).
- 3 programmable digital inputs, one of which is configurable for protection via the PTC sensor.
- 3 programmable relay digital outputs: one changeover, two NO.
- Separate auxiliary supply.
- Double power terminals.
- Integrated electronic thermal protection, multi-class, different for starting and running.
- Complete set of motor protection: phase loss, no line, phase sequence, phase imbalance, rotor jammed, dry running (minimal torque), starting timeout, too high/low voltage.
- Analogue temperature sensor to protect the thyristors, with display indication and alarm/pre-alarm thresholds.
- Advanced self-diagnostics.
- NFC interface for programming with smartdevice.
- Integrated frontal optical interface for programming and maintenance.
- Isolated RS485 interface (optional, mounted in a dedicated slot) with Modbus protocol.
- Alarms with language-specific messages and user-programmable properties.
- Compatible with the *SAM1 App*, *NFC App*, *Synergy* supervision software and *Xpress* remote control and configuration software.
- Optional accessory for DIN rail mounting (for ADXL 0030 600…ADXL 0115 600).
- Optional remote display unit for the controlling of multiple soft starters (code EXC RDU1).

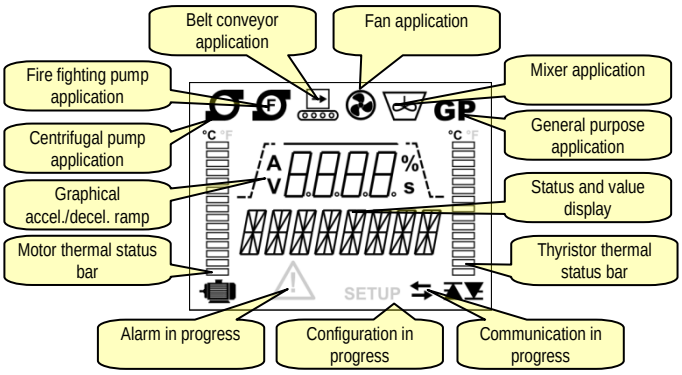
Front button functions

▲ ▼ **keys** – Scroll through options. Press together to enter or quit a menu.
START key – Confirms an option or increases the numerical value selected. If properly programmed, enables motor starting with the front panel keypad.
STOP key – Quits or decreases the numerical value selected. If properly programmed, enables motor stopping with the front panel keypad.

Front LEDs

POWER LED (green) – Auxiliary supply on.
RUN LED (green) – Flashing: ramp in progress. Steady on: full voltage operation.
ALARM LED (red) – Alarm on.

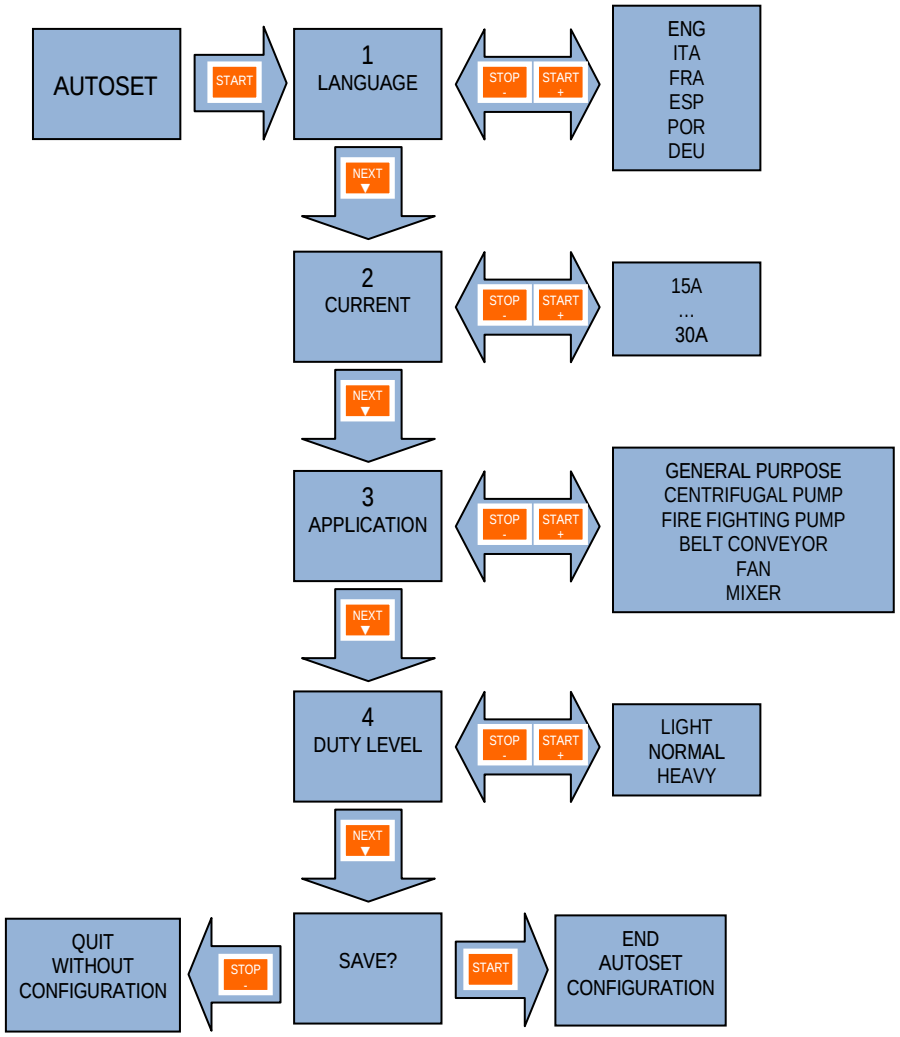
Display indications



AUTOSET guided configuration

- When a factory-new soft starter is first powered up, the *AUTOSET* configuration wizard launches, to simplify and speed up the configuration and commissioning of the device.
- This procedure consists in prompting the user for 4 simple items of information, which enable the ADXL to configure itself with the values most probably suited to the installation in question.
- In any case, once the *AUTOSET* procedure has completed, an expert user can fine tune these settings in programming mode.
- The system prompts the user for the following information, in sequence:

STEP	INFORMATION	DEFAULT	RANGE
1	Display language	ENG	ENG-ITA-FRA-ESP-POR-DEU
2	Nominal motor current	100% ADXL rating *Example: for ADXL 0030 600 30.0A*	50…100% ADXL rating *Example: for ADXL 0030 600 15.0….30.0A*
3	Type of application	General purpose	General purpose (GP) Centrifugal pump Fire fighting pump Belt conveyor Fan Mixer
4	Duty level	Normal	Light (e.g. low inertia, no load starting): 3.5 I_e Normal: 4.5 I_e Heavy (e.g. high inertia or loaded starting): 5.5 I_e



- In the table below are indicated the parameters which are automatically loaded into the ADXL during the AUTOSET procedure, according to the selected application and duty level.

APPLICATION	PARAMETER	DESCRIPTION	DUTY LEVEL		
			LIGHT	NORMAL	HEAVY
Centrifugal pump	P01.02	MAX CURRENT LIMIT	350%	450%	550%
	P01.03	STEP AT START	20%	30%	50%
	P01.04	ACCELERATION RAMP	5s	10s	10s
	P01.05	DECELERATION RAMP	15s	15s	15s
	P04.02	START THERMAL CLASS	10	10	15
	P05.01	TORQUE CONTROL	ON	ON	ON
Fire fighting pump	P01.02	MAX CURRENT LIMIT	350%	450%	550%
	P01.03	STEP AT START	10%	30%	50%
	P01.04	ACCELERATION RAMP	10s	10s	10s
	P01.05	DECELERATION RAMP	15s	15s	15s
	P04.02	START THERMAL CLASS	OFF	OFF	OFF
	P05.01	TORQUE CONTROL	OFF	OFF	OFF
Conveyor belt	P01.02	MAX CURRENT LIMIT	350%	450%	550%
	P01.03	STEP AT START	10%	30%	50%
	P01.04	ACCELERATION RAMP	10s	10s	30s
	P01.05	DECELERATION RAMP	5s	5s	5s
	P04.02	START THERMAL CLASS	10	10	15
	P05.01	TORQUE CONTROL	ON	ON	ON
Fan	P01.02	MAX CURRENT LIMIT	400%	500%	600%
	P01.03	STEP AT START	20%	40%	50%
	P01.04	ACCELERATION RAMP	20s	30s	60s
	P01.05	DECELERATION RAMP	OFF	OFF	OFF
	P04.02	START THERMAL CLASS	10	15	20
	P05.01	TORQUE CONTROL	ON	ON	ON
Mixer	P01.02	MAX CURRENT LIMIT	400%	450%	550%
	P01.03	STEP AT START	30%	40%	40%
	P01.04	ACCELERATION RAMP	15s	15s	15s
	P01.05	DECELERATION RAMP	OFF	OFF	OFF
	P04.02	START THERMAL CLASS	10	15	20
	P05.01	TORQUE CONTROL	OFF	OFF	OFF
General purpose	P01.02	LIMITE CORR. AVVIAM.	400%	500%	550%
	P01.03	GRADINO INIZIALE	30%	40%	50%
	P01.04	RAMPA ACCELERAZIONE	5s	10s	15s
	P01.05	RAMPA DECELERAZIONE	OFF	OFF	OFF
	P04.02	PROT. TERMICA AVV.	10	10	15
	P05.01	CONTROLLO DI COPPIA	OFF	OFF	OFF

Navigating the display pages

- The ▲ and ▼ buttons allow the measurement display pages to be scrolled one at a time. The current page is shown in text.
- Some of the values may not be displayed, depending on how the starter has been programmed.

VALUE	DISPLAY	UOM
Instantaneous current (highest of three phases)	CURRENT	A
Instantaneous current as % of nominal motor current	CURRENT	A %
Phase L1 current (displayed if enabled with parameter P02.07)	CURR L1	A
Phase L2 current (displayed if enabled with parameter P02.07)	CURR L2	A
Phase L3 current (displayed if enabled with parameter P02.07)	CURR L3	A
Motor torque as % of maximum nominal torque	TORQUE	%
Phase-to-phase line voltage	VOLTAGE	V
Total active power	POWER kW	kW
Total PF	PF TOT.	
Motor thermal status (note: protection trips at > 140%)	THERM. ST.	%
Starter thyristor temperature	INT. TEMP	°
Energy in kWh	ENER. kWh	kWh alternating with value
Motor hour meter	HOURS	H alternating with value
Start counter	ST. COUNT	alternating with value
Input/output status (on side bars)	INP OUT	
LIMx limit variable status	LIMITS	

- The user can specify to which value the display must return automatically after no buttons have been pressed for a given time.
- The system can be programmed so that the view always remains in the position in which it was left.
- For the set-up of these functions, see the menu *P02 – UTILITY*.

Operational status

- During normal operation, if the user does not press the navigation keys to view values, the text bar indicates the starter's status.
- The possible statuses are given in the following table, with their explanations:

STATUS	DISPLAY	DESCRIPTION
Line absent	NO POWER	No power on terminals L1-L2-L3.
Starter ready	READY	Power present, soft starter ready to run.
Start delay xx	DELAY XX	Delay applicable to the current start command. A countdown displays.
Start kick	KICK.STA	Kickstart in progress.
Acceleration ramp	ACC. RAMP	Motor acceleration ramp in progress.
Current limit	CURR. LIM.	Current limitation during acceleration ramp.
Torque limit	TRQ. LIM.	Torque limitation during acceleration ramp.
Run	RUN	End of acceleration ramp, full voltage to motor via SCR.
By-pass closed	BYPASS	End of acceleration ramp, full voltage to motor via bypass.
Deceleration ramp	DEC. RAMP	Motor deceleration ramp in progress.
Protections disabled	INH. PROT.	Protections disabled by external command.
Freewheel	FREEWHEEL	External free-range stop command.
Preheating	PREHEAT	Motor winding preheating enabled.
Alarm	ALARM	One or more alarms present.

Remote display unit

- All the information available on the display of the ADXL soft starter can be viewed remotely on the remote display unit Lovato EXCRDU1.
- EXC RDU1 is provided with backlit graphic LCD display touch screen and built-in RS485 communication port, which allows the connection to soft starters ADXL series equipped with the optional RS485 card, code EXC 1042.
- EXC RDU1 is compatible with 96x96mm holes.
- Protection degree IP65 and 4X.
- EXC RDU1 is provided with connection cable 3mt length.
- With EXC RDU1 is possible to command the start and stop of the motor, access to the setup menu, modify the parameters of the soft starter and monitor the status and the electrical variables.
- EXC RDU1 can control up to 32 soft starters ADXL series in contemporary.
- The maximum distance between EXC RDU1 and the more distant soft starter can reach 600mt.

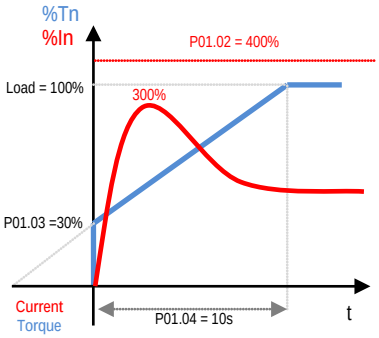
Startup methods

- ADXL supports two main start/stop methods:
  - Torque ramps (P05.01 = ON)
    When ADXL is set to work in torque ramp mode, it controls the output voltage with a PID closed-loop control to ensure that the motor delivers a variable torque to the shaft which follows the programmed acceleration and deceleration ramps. In this case, the resisting torque of the mechanical load defines the maximum torque demand during starting. If we set *P01.04 Acceleration ramp* to 10 sec, this means that the system will take 10 seconds to ramp up from 0 to 100% of the motor's nominal torque. If the load is lower and requires only 50% of motor torque, the starting process, for the same ramp up slope, will require proportionately less time to complete (in this case, 5 sec). If we start the motor without any load, the ramp will complete in a very short time and the starter will connect full voltage and the bypass in just a few seconds. The same criteria apply to the deceleration ramp, which also has a constant slope and variable duration.

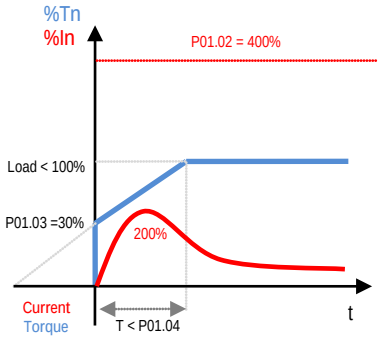
  - Voltage ramps (P05.01 = OFF)
    If, on the other hand, the ADXL is set to work in voltage ramp mode, is delivers a ramp with an open loop criterion, and thus delivers from minimal to 100% voltage in the time set in P01.04, with gradual growth, without varying the ramp duration in relation to the motor load. The same constant time criterion also applies to the deceleration ramp. In this case, even if the motor is running with no load, the bypass will close after a fixed time. The voltage ramp thus behaves in a more repeatable manner than the torque ramp, but it has the disadvantage of delivering the mechanical force in a non-linear fashion, thus providing a less gradual acceleration than the torque ramp.

- Together with these two starting methods, there is the maximum starting current limitation function:
  - Current limit (P01.02)
    If the current delivered by the highest of the three phases reaches or exceeds the set limit, the ADXL reduces its voltage on the motor so as to remain below the maximum limit setting (P01.02). This behaviour has priority over both torque and voltage ramps, and thus momentarily flattens them both. Obviously, reducing the current also reduces the motor's torque delivery: if the current limit is set too low, the torque delivery may be insufficient to overcome the resistant load and start the machine. One must therefore find the right compromise when setting this parameter.

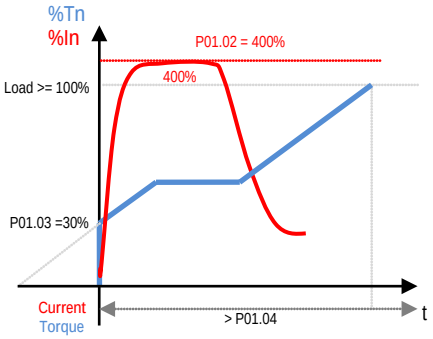
- There are minimum voltages and torques below which the motor will not turn at all, and which are therefore completely useless in practical terms (the motor makes noise and heats up without actually running). There are thus two steps for regulating the initial voltage/torque (P01.03) and the final voltage/torque (P01.06). ADXL switches from zero to P01.03 immediately when starting up, and from P01.06 to zero during deceleration .
- For further details on the starting parameter settings, refer to the description of the parameters in *P01 GENERAL* menu.



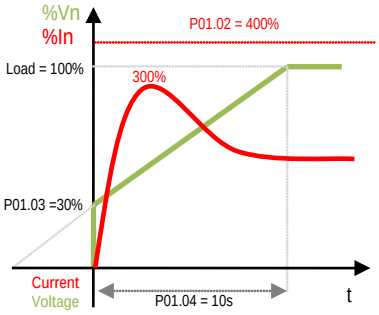
Torque ramp starting, without reaching the current limit.



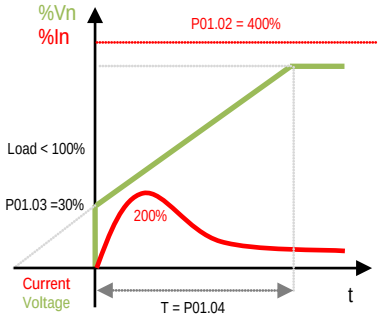
Torque ramp starting, light load.



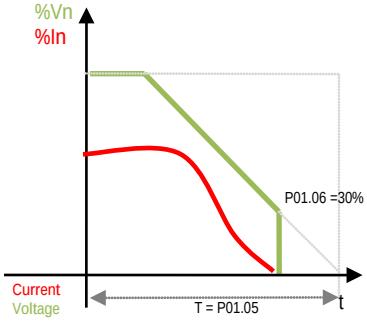
Torque ramp starting, current limit tripped.



Voltage ramp starting, without reaching the current limit.



Voltage ramp starting, light load.



Voltage ramp stop.

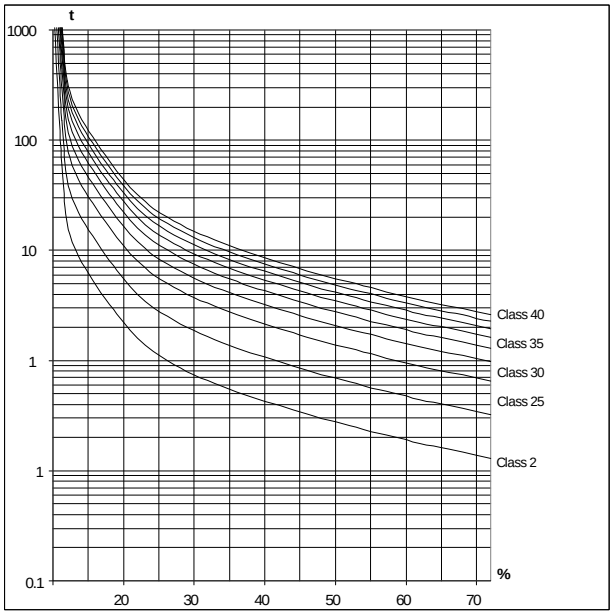
Protections

- The ADXL is equipped with a set of integrated protections to safeguard both the starter and the motor.
- Some of these are configurable. Their settings are to found in the *P04 Protections* menu.
- The following table summarises the available protections, and their parameters/alarms:

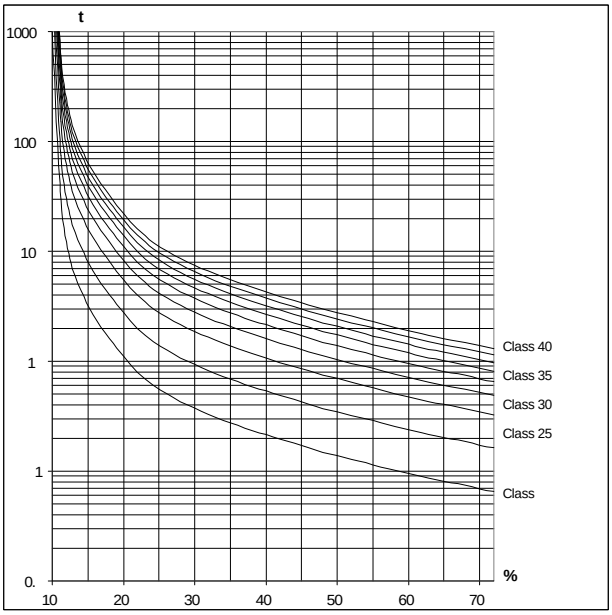
PROTECTION	MOTOR / STARTER	PARAMETERS	ALARMS	COMMANDS
Three-phase line absent	MOTOR	-	A01	-
No phase	MOTOR	-	A02	-
Phase sequence	MOTOR	P04.11	A03	-
Frequency out of bounds	MOTOR	-	A04	-
Auxiliary voltage fault	MOTOR-STARTER	-	A05	-
Current asymmetry	MOTOR	P04.16 – P04.17	A06	-
Overcurrent	MOTOR-STARTER	-	A07	-
Rotor jammed	MOTOR-STARTER	-	A08	-
Load too low (dry running, minimum torque)	MOTOR	P04.08 – P04.09	A09	-
Starting time too long	MOTOR	P04.10	A10	-
Bypass relay fault	STARTER	-	A11	-
Motor thermal protection pre-alarm	MOTOR	-	A12	-
Starter thermal protection pre-alarm	STARTER	-	A13	-
Motor thermal protection	MOTOR	P04.01-P04.02-P04.03- P04.04 – P04.05	A14	C02
Phases shorted	STARTER	-	A16 – A17	-
Temperature sensor fault	STARTER	-	A18	-
Line voltage too low	MOTOR	P04.12 – P04.13	A19	-
Line voltage too high	MOTOR	P04.14 – P04.15	A20	-
Maintenance interval	MOTOR-STARTER	P04.18	A22	C01
Fan fault / fans jammed	STARTER	-	A23-A24	-

Motor thermal protection

- The ADXL is equipped with an electronic motor thermal protection, which can be configured in menu *P04 Protections*.
- The display shows the thermal status of the motor both numerically and graphically, and by convention displays 100% when the motor is running stably at nominal voltage and current (100%).
- When the current is >112%In (In = motor nominal current) the thermal status increases to its maximum value, which is 140%, and trips alarm *A14 Motor thermal protection*.
- The trip time is shown in the tables given below as a function of the overload current. The curves for the various graphs refer to the curve selected with parameters P04.02 and P04.03. The cold trip curves indicate the trip time starting from thermal status 0%, while the hot trip curves start from thermal status 100%.
- With the motor stopped, the thermal status will tend to zero in a set time which depends on the configured class of thermal protection.
- The motor thermal protection alarm can be reset when the thermal status falls to or below the value of *P04.04 Motor thermal protection reset*, which has a default value of 120%. This value can be modified for specific needs, without changing the trip time in any way.
- The motor's thermal status updates correctly even if there is no auxiliary supply to the control board.



Cold trip curves



Hot trip curves

Motor thermal protection via PTC

- The ADXL's IN3 input can be configured to connect to a PTC motor thermal protection sensor.
- The trip and reset values are conforming with DIN 44081.
- Tripping the sensor initiates the alarm *A14 Motor thermal protection* and stops the motor.
- The alarm can only be reset when the PTC sensor's resistance returns within the values defined by the standard.

Starter thermal protection

- The display shows the numerical temperature of the heatsink/thyristors and graphically shows the thermal status of the starter.
- When the graphic bar reaches its maximum value, it trips the alarm *A15 Starter thermal protection*.
- The alarm resets automatically when the starter returns to an acceptable temperature.

Main menu

- To access the main menu, press the ▲ and ▼ buttons together when the motor is stopped.
- This provides you access to the following functions:

FUNCTION	CODE	DISPLAY
Set password (if enabled – see menu *P03 Password*)	PAS	PASSWORD
Launch SETUP menu	SET	SETUP
Enter EVENTS log list	EVE	EVENTS
Launch COMMANDS menu	CnD	COMMANDS
Starter serial number	Sn	SERIAL N.
Starter firmware revision	Sr	REV. NUM.
Quit main menu	ESC	EXIT

- Select the required function by pressing ▲ and ▼ .
- Press START to confirm.

Password-protected access

- The password is used to enable or block access to the setup menu and the command menu.
- The password is deactivated and access is free on new equipment (default). If the passwords are enabled, they must be entered to access the equipment (the passwords are numeric).
- See *P03 Password* menu for how to enable and define passwords.
- There are two password access levels, according to the entered code:
  - User level access – allows you to display parameters but not to modify them.
  - Advanced level access - the same rights as the user level, with the addition of being able to edit all settings.
- If the password is enabled, you are prompted to enter the password when you call up the main menu.
- The password setting window will appear:
  - Use the ▲ and ▼ buttons to change the value of the current digit in the range 0 to 9.
  - Press START to move to the next digit on the right.
  - The respective unlock message will appear when the entered password corresponds to the *User level password* or to the *Advanced level password*.
- After having unlocked the password, access will remain enabled until:
  - the soft starter is switched off.
  - the soft starter is reset (after closing the settings menu).
  - two minutes elapse without the operator touching any button.
  - press the STOP button to abort setting the password.

Event list

- The ADXL can store a list of the last 60 events, which is stored even in absence of power supply.
- The events stored are the following:
  - Power supply on/off
  - Start/stop of the motor
  - Overcoming of current/torque limit thresholds
  - Alarms (both events of starting alarm and ending alarm)
  - Access to the parameters setup
  - Use of commands
  - Serial communication
  - Memory transfer from CX02 dongle
- To access to the event list you have to enter in the main menu (by pressing in contemporary the buttons ▲ and▼), with button ▼ select the voice 02 EVENTS and press START.
- It will be displayed the most recent event, with the event code Exxx and a description of the event.
- With the buttons ▲ and ▼ you can scroll the events. With the button ▲ PREV you can see the previous events and with the button ▼ NEXT the next events up to the most recent one.
- The display notify when you reach the oldest event or the most recent event.
- While you are watching an event, if you press START you can see from how many hours, minutes and seconds the event is happened from the power up of the soft starter. This is useful to give an idea of the time interval between an event and the next one.
- To exit from the event list press STOP or the buttons ▲ and ▼ in contemporary.

Inputs, outputs, internal variables

- The ADXL's inputs and outputs are identified by a code and a sequential number. For example, the digital inputs are named INPx, where x is the input number. In the same way, the digital outputs are denominated OUTx and the communications ports COMx.
- The respective configuration menus allow you to map any function to any input/output. The default programming maps the most commonly used functions, to facilitate commissioning the soft starter.

CODE	DESCRIPTION	RANGE
INPx	Digital inputs	1…3
OUTx	Digital outputs	1…3
COMx	Communication ports	1

- Like the inputs/outputs, there are internal variables (bit) which may be associated to the outputs or combined each other. For example, limit thresholds can be associated to the measurements performed by the soft starter (voltage, current etc.). In this case, the internal variable, named LIMx, will be activated when the measurement is beyond the limits defined by the user by means of the respective setting menu.
- The following table shows all the internal variables managed by the ADXL with their range (number of variables for each type).

CODE	DESCRIPTION	RANGE
LIMx	Limit thresholds on measurements	1…4
REMx	Variables controlled remotely	1…8
UAx	User alarms	1…4

Limit thresholds (LIMx)

- The LIMx limit thresholds are internal variables the status of which depends on a measurement performed by the soft starter exceeding the limits defined by the user (e.g. total active power higher than 25kW).
- To speed up setting considering that each threshold can span across an extremely wide range, each threshold can be set to a base value and a multiplying coefficient (e.g.: 25 x 1k = 25000).
- Two thresholds are available for each LIM (upper and lower). The upper threshold must always be set to a value higher than the lower value.
- The meaning of the thresholds depends on the following functions:

  Min function: with the Min function the lower threshold is the tripping threshold and the upper threshold is the resetting threshold. The limit is activated after the set delay when the value of the selected measurement is under the lower threshold. Reset is activated after the set delay when the value of the measurement is higher than the upper threshold.

  Max function: with the Max function the upper threshold is the tripping threshold and the lower threshold is the resetting threshold. The limit is activated after the set delay when the value of the selected measurement is higher than the upper threshold. Reset is activated after the set delay when the value of the measurement is lower than the lower threshold.

  Min+Max function: with the Min+Max function both the upper and the lower thresholds are trip thresholds. The limit is activated after the respective delays when the value of the selected measurement is either lower than the lower threshold or higher than the upper threshold . Resetting is immediate as soon as the value returns within the limits.

- Tripping may mean energising or de-energising the LIM limit according to the setting.
- If the LIM limit is programmed with latch, manual resetting is possible using the specific control in the commands menu.
- See the menu *P10 Limits*.

Remote variables (REMx)

- The ADXL can manage up to 8 variables controlled remotely (REM1…REM8).
- The status of these variables can be edited as required by the user by means of the communication protocol and may be used in combination with outputs.
- Example: a relay can be freely activated and deactivated with the control software by using a remote variable (REMx) as source of an output (OUTx). This would allow you to use the ADXL output relays to control user devices.
- Another use of the REM variables may be to enable or disable given remote functions, for instance to generate alarms or messages remotely.

User alarms (UAx)

- The user can define up to 4 programmable alarms (UA1…UA4).
- For each alarm you can configure:
  1- the *source*, i.e. the condition which generates the alarm ;
  2- the *text* of the message which must appear on the display when the condition occurs;
  3- the *properties* of the alarm (like for the standard alarms).
- For example, one condition which generates the alarm could be a measure which goes beyond a limit threshold. In this case, the alarm source must be one of the limit thresholds (LIMx).
- Differently, if the alarm must be displayed as a consequence of the activation of an external digital input, then the source will be an input INPx.
- The user can define a freely editable message which will appear in the alarm pop-up window.
- Properties can be defined for the user alarms using the same method applied for standard alarms. In other words, it is possible to determine whether a given alarm must stop the motor, close the global alarm output etc. See the *Alarm properties* chapter.
- Multiple simultaneous alarms will be displayed in sequence.
- To reset an alarm programmed with latch enabled, use the specifc command of the Command menu.
- See menu *P13 User Alarms* for the configuration of user alarms.

IR programming port

- The ADXL's parameters can be configured via the front optical port, using the IR-USB CX01 programming adapter or the IR-Wi-Fi CX02 adapter.
- Simply approach a CX.. adapter to the front port and insert the plugs in the specific holds to obtain the mutual recognition of the devices, as indicated by the green LINK LEDs on the programming adapter.
- Both adapters CX01 and CX02 can be used for the connection of the soft starter to *Xpress* remote control and configuration software.
- Through the Wi-Fi adapter CX02 (Wi-Fi) is also possible to connect to the App *Lovato Electric SAM1*.

USB adapter CX01

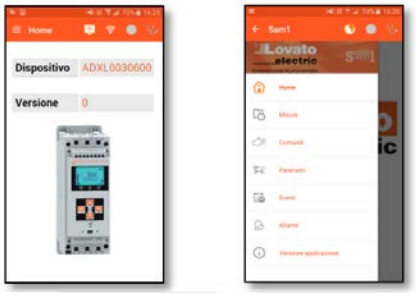
Wi-Fi adapter CX02

Parameter setting from PC

- With the *Lovato Electric Xpress* remote control and configuration software is possible to read and modify the parameters of the ADXL and save them on a file on the hard disk of the PC, or alternatively you can upload a parameters file from the PC and download it into the soft starter ADXL.
- The connection of the ADXL soft starter to the software Xpress can be made via the front optical port (with USB adapter CX01 or Wi-Fi adapter CX02) or by using the optional RS485 card (code EXC 1042).
- In addition to the parameters setting, with the software Xpress you can also monitor the measures of the ADXL on pre-configured graphical indicators, read events and create graphical trends for the real-time monitoring of the variables of the soft starter.

Parameter setting from smartphone or tablet with CX02 Wi-Fi dongle

- With CX02 Wi-Fi adapter you can connect to the App *Lovato Electric SAM1*, available for tablet and smartphone (Android or iOS).
- The App SAM1 can be used to set parameters, send commands, read measurements, download events and send the collected data via e-mail.



Parameter setting from smartphone or tablet with NFC

- You can use the *Lovato Electric NFC A*pp, available for Android tablets and smartphones, to program the parameters in a simple, intuitive manner, without the need for cables, and even with the ADXL powered off.
- Simply place the smart device on the ADXL's front panel to transfer the programmed parameters.
- Conditions for operation:
  1- The smart device must have the NFC function activated and must be unlocked (active).
  2- The ADXL, if it is powered on, must have the motor switched off.
  3- If you have set an advanced password (see parameter P03.03), it must be known, otherwise access will not be possible.
  4- We recommend having the App already installed into your smart device. If not, you can still go to the next step, you will be automatically guided to the installation site on the online store.
  5- Place the smart device against the ADXL's front panel, more or less as shown in the figure and hold it in position (for a few seconds) until it beeps. The app will launch automatically and the parameters will be loaded and displayed.
  6- The access to the parameters menu and their editing can be done in the same way as for the other Apps we have considered previously.

- Once you have completed the modifications, to download the parameters into the ADXL, press the button *Send* on the App and place the smartdevice against the ADXL's front panel. The display of the ADXL will reboot to save the parameters. This is confirmed by the NFC message on the ADXL's display.

Setting parameters (set-up) from the front panel

- To access to the menu 01 SETUP press in contemporary the buttons ▲ and ▼ .
- The available sub-menus are shown in the following table:

Code	MENU	DESCRIPTION
P01	GENERAL	Main motor characteristic data
P02	UTILITY	Language, brightness, display, etc.
P03	PASSWORD	Access code setup
P04	PROTECTIONS	Motor/starter protection equipment
P05	MISCELLANEOUS	Accessory functions
P06	INPUTS	Programmable digital inputs
P07	OUTPUTS	Programmable digital outputs
P08	COMMUNICATION	Communication ports
P09	MULTIPLE MOTORS	Multiple motors configuration
P10	LIMITS	Measurement thresholds
P13	USER ALARMS	User alarms
P14	ALARMS	Alarm properties

- Select with the buttons ▲ and ▼ the sub-menu and press START to access to the parameters.
- All parameters are shown with code, description, current value.

Parameter table

P01 – GENERAL		UoM	Default	Range
P01.01	Motor nominal current In	A	30.0 (100%Ie)	15.0…30.0 (50…100%Ie)
P01.02	Max (starting) current limit ILt	%In	300	150…700
P01.03	Initial acceleration step	%	10	0…100
P01.04	Acceleration ramp	sec	10	1…120
P01.05	Deceleration ramp	sec	OFF	OFF / 1…120
P01.06	End of deceleration threshold	%	20	0…100
P01.07	Kick start	%	OFF	OFF / 50…100
P01.08	Motor nominal cosΦ		0.80	0.50…1.00

P01.01 – Motor nominal current rating. The range of settings in A depends on the ADXL size, but for all models ranges from 50% to 100% of the soft starter's rated current Ie.
P01.02 – Maximum limit current delivery during starting, as % of nominal motor current In. Given that the currents of the three phases are not balanced during starting, this limit considers the highest of the three phases, i.e. L2 (phase connected directly). The maximum value may not exceed 550% of the soft starter's maximum current. *For example: with a 25A motor on the ADXL 0030 600, the maximum current limit Ilt is 550% of 30A = 165A, which is the 660% of the motor nominal current.*
P01.03 – Initial acceleration step, delivered immediately after start. This step may refer to the torque or voltage, depending on whether torque or voltage mode is active. It must be set in such a way that the motor starts running slowly immediately after the start command.
P01.04 – With torque control enabled (P05.01 = ON), this parameters determines the time required to reach 100% motor torque, and thus sets the acceleration ramp slope. If the torque demand from the load is less than 100%, the time required to deliver it will be shorter in proportion, to keep the slope constant. If voltage ramp mode is enabled, on the other hand (P05.01 = OFF), since 100% of the voltage is independent of the load, the time needed will always be constant.
P01.05 – Same concept as the previous parameter, for the deceleration ramp.
P01.06 – Final deceleration step. When the descending ramp reaches this level of torque or voltage, the motor is powered off.
P01.07 – If enabled, defines the voltage applied instantly after the start, for a period of 200ms. This gives an initial pulse of torque to the machines jammed on starting.
P01.08 – The nominal motor cosΦ. This is used to calculate the nominal maximum torque.

P02 – UTILITY		UoM	Default	Range
P02.01	Language		ENG (*English*)	ENG ITA FRA ESP POR DEU
P02.02	Temperature unit of measurement		°C	°C / °F
P02.03	Low backlight delay	sec	60	5-600
P02.04	Default measure return	sec	60	OFF / 10-600
P02.05	Default measure		CURRENT	CURRENT CURRENT % TORQUE VOLTAGE
P02.06	Keyboard start/stop		OFF	OFF/ ON
P02.07	Phase current visualization		OFF	OFF / ON

P02.01 – Language selection for text on display.
P02.02 – Defines the unit of measurement for the temperature.
P02.03 – Low display backlighting switch delay.
P02.04 – Reset to default page delay when buttons are not pressed. If set to OFF the last manually selected page will always remain on the display.
P02.05 – Default page shown on the display when it is switched on and after the delay.
P02.06 – Enables motor start/stop from the front keypad. The STOP input terminal must be connected to the common (run enable). The START button must be held down for 2 sec.
P02.07 – Enables display of the three individual phase currents.

P03 – PASSWORD		Default	Range
P03.01	Enable password	OFF	OFF-ON
P03.02	User level password	1000	0-9999
P03.03	Advanced level password	2000	0-9999
P03.04	Remote control password	OFF	0-9999

P03.01 - If set to OFF, password management is deactivated; the access to the settings and the command menu is free.
P03.02 - With P03.01 active, value to be specified to activate User level access. See the chapter *Password-protected access*.
P03.03 - As P03.02, referred to Advanced level access.
P03.04 - If set to a numeric value, it becomes the code to be specified via serial communication line before being able to send remote controls.

P04 – PROTECTIONS		UoM	Default	Range
P04.01	Thermal motor protections enable		ON	OFF / ON
P04.02	Starting thermal protection class		10	2 10A 10 15 20 25 30 35 40
P04.03	Run thermal protection class		10	2 10A 10 15 20 25 30
P04.04	Motor thermal protection reset	%	120	0…140
P04.05	IN3 input type		Digital	DIGITAL PTC
P04.06	Number of automatic alarm reset attempts		OFF	OFF / 1…6
P04.07	Automatic alarm reset interval	min	1	1…30
P04.08	Minimum torque threshold (load too low)	%Tn	OFF	OFF / 20…100
P04.09	Minimum torque trip delay	sec	10	1…20
P04.10	Maximum starting time	sec	OFF	OFF / 10…1000
P04.11	Phase sequence control		OFF	OFF L1-L2-L3 L3-L2-L1
P04.12	Minimum voltage threshold	V	OFF	OFF / 170…760
P04.13	Minimum voltage trip delay	sec	5	0…600
P04.14	Maximum voltage threshold	V	OFF	170…760 / OFF
P04.15	Maximum voltage trip delay	sec	5	0…600
P04.16	Current asymmetry	%	OFF	OFF / 1…25
P04.17	Current asymmetry delay	sec	5	0…600
P04.18	Maintenance interval	h	OFF	OFF / 0…50,000
P04.19	Alarm reset mode		STOP	STOP START STA-STO
P04.20	Start after power off	sec	10	0...900

P04.01 – General enabling of thermal protections set with parameters P04.02 and P04.03. If this parameter is set to OFF (for example, for starting multiple motors with a single starter) both protections will be disabled.
P04.02 – P04.03 - Define the motor electronic thermal protection class, for the starting and run phases respectively. The thermal protection class is set in relation to the type of use of the motor. Class 10 is adapted to normal use, classes 15, 20 etc. for heavier duty use. If the motor has a heavy duty application, for more effective protection you can set the starting protection class higher than the run protection class.
P04.04 – Determines the value of the thermal status beneath which the motor thermal protection alarm is reset.
P04.05 – Defines whether terminal IN3 is used as a digital input or as PTC sensor input.
P04.06 – This function is used in unsupervised applications with 2-wire motor starting command. If the motor is stopped by an alarm with 'Automatic reset' enabled, after a time defined in P04.07 the alarm resets and hence the motor starts again. If after the reset the motor does not restart, a number of motor reset and restarting attempts are made as set. During the alarm status, the display alternates the active alarm and the time remaining to the automatic reset.
P04.07 – Delay between successive automatic reset attempts.
P04.08 – Normally used as protection against pumps dry running or to detect failure of transmission chains or belts. When the torque is lower than this setting, after the delay set in P04.09 the alarm *A09 Load too low* is generated. The trip delay is reset if the torque returns to a value of 10% higher than the setting.
P04.09 – Load too low alarm trip delay.
P04.10 – Checks that the motor starting process does not exceed the set time, i.e. that the mechanical assemblies have not been modified (due to wear or failure) in such a way that prevents the machine from starting properly. A starting time longer than this setting cause the alarm *A10 Starting time too long*.
P04.11 – Enables control of the power phase sequence, i.e. the direction of rotation of the motor. Setting L1-L2-L3 corresponds to forwards rotation, L3-L2-L1 to reverse. If the soft starter detects a phase sequence different thant the set one, it generates the alarm *A03 Incorrect phase sequence*.
P04.12 – P04.13 – A voltage lower than P04.12 for a time longer than the time set on P04.13 generates the alarm *A19 Line voltage too low*.
P04.14 – P04.15 – A voltage higher than P04.14 for a time longer than the time set on P04.15 generates the alarm *A20 Line voltage too* high.
P04.16 – P04.17 – Controls the current asymmetry during full voltage running. Asymmetry greater than the setting P04.16 for a time longer than P04.17 generates the alarm *A06 Current asymmetry*.
P04.18 – Generates alarm *A22 Maintenance request* when the motor exceeds the set number of hours of operation. This can be reset with the command *C01 Reset maintenance counter* which simultaneously restores the hour meter.
P04.19 – Defines the source of the alarms reset command. STOP = The alarms are reset when the STOP input opens. START = The alarms are reset when the START input closes. STA-STO = Both of the above.
P04.20 – It defines a delay of the start following a power down of the auxiliary voltage: when the auxiliary voltage comes back, if the START contact is already closed, the soft starter doesn't restart the motor immediately but only after the time specified in the parameter P04.20. During this time on the display appears the alarm *A05 Auxiliary power failure*. This parameter is available from firmware revision >=2.

P05 - MISCELLANEOUS		UdM	Default	Range
P05.01	Torque control		OFF	ON OFF
P05.02	Torque linearization coefficient		100	50…150%
P05.03	Maximum torque limit		OFF	OFF / 10…200%Tn
P05.04	Delay to start	sec	0	0.0…20.0
P05.05	Main RS485 function		SLAVE	SLAVE REM EXP

P05.01 – Determines whether the acceleration and deceleration ramps have to be run under torque control or voltage control.
P05.02 – Due to the various construction standards (IE2, IE3, etc.), motors may have a different torque delivery than envisaged. In such cases, is useful to modify this parameter to optimise the torque delivery. Values greater than 100% are set when the acceleration is smooth during the initial stage and abrupt at the end. Vice-versa, values lower than 100% are set when acceleration is abrupt at the start and gradual at the end.
P05.03 – Limits the maximum torque during acceleration. This is used when, due to large inertial masses, there may be transmission problems such as slipping belts or failure of mechanical parts.
P05.05 – Defines the operation of the optional RS-485 interface. SLAVE = Normal operation as a Modbus slave. REM EXP = control by an external expansion unit.

P06 – PROGRAMMABLE INPUTS (INPn, n=1…3)		UoM	Default	Range
P06.n.01	INPn input function		INP1=START INP2 =STOP (NC) INP3=OFF	(see *Programmable input functions table*)
P06.n.02	Channel nr. (x)		OFF	OFF / 1…99
P06.n.03	Contact type		NO	NO NC
P06.n.04	Closing delay	sec	0.05	0.00-600.00
P06.n.05	Opening delay	sec	0.05	0.00-600.00

Note: This menu is divided into 3 sections for each programmable digital input INP1..INP3.
P06.n.01 - Selects the function of the input in question (see *Programmable input function table*).
P06.n.02 - Index possibly associated to the function programmed under the previous parameter. Example: If the input function is set to Commands menu execution Cxx and this input must execute the command C.07, then P06.n.02 must be set to value 7.
P06.n.03 - Contact type selection: NO = normally open or NC = normally closed.
P06.n.04 – Delay on the closing of the selected input contact.
P06.n.05 - Delay on the opening of the selected input contact .

P07 – PROGRAMMABLE OUTPUTS (OUTn, n=1..3)		UoM	Default	Range
P07.n.01	Output function		OUT1=GLB. ALA OUT2=LIN.CONT OUT3=RUN	(see *Programmable output functions table*)
P07.n.02	Channel nr. (x)		1	1 - 8
P07.n.03	Normal status		NOR	NOR-REV
P07.n.04	Delay ON	sec	0	0.0-6000.0
P07.n.05	Delay OFF	sec	0	0.0-6000.0

Note: This menu is divided into 3 sections, referred to digital outputs OUT1…OUT3.
P07.n.01 - Selects the function of the output (see *Programmable output function table*).
P07.n.02 - Index possibly associated to the function programmed under the previous parameter. Example: If the function of the output is set to the *Alarm Axx* function and this output must be energised when alarm A16 occurs, then P07.n.02 must be set to value 16.
P07.n.03 - This parameter sets the output status when the associated function is not active: NOR = de-energised output, REV = energised output.
P07.n.04 – Defines the output energisation delay.
P07.n.05 – Defines the output de-energisation delay.

P08 – COMMUNICATION (COMn, n=1..1)		UoM	Default	Range
P08.n.01	Serial node address		01	01-255
P08.n.02	Baudrate	bps	9600	1200 2400 4800 9600 19200 38400 57600 115200
P08.n.03	Data format		8 BIT – N	8BIT – N 8BIT – O 8BIT – E 7BIT – O 7BIT - E
P08.n.04	Stop bits		1	1-2
P08.n.05	Protocol		MOD RTU	MOD RTU MOD ASCII MOD TCP

P08.n.01 - Serial address (node) of the soft starter.
P08.n.02 - Communication port transmission speed.
P08.n.03 - Data format. 7 bit setting is available for ASCII protocol only.
P08.n.04 - Stop bit number.
P08.n.05 - Communication protocol selection (Modbus RTU, Modbus ASCII or Modbus TCP).

P09 - MULTIPLE MOTORS MOTn=1..3		UoM	Default	Range
P09.n.01	Motor nominal current In	A	30.0 (100%Ie)	15.0…34.5 (50…105-115%Ie)
P09.n.02	Max (starting) current limit ILt	%In	300	150…700
P09.n.03	Step at start	%	10	0…100
P09.n.04	Acceleration ramp	sec	10	1…120
P09.n.05	Deceleration ramp	sec	OFF	OFF / 1…120
P09.n.06	Deceleration end step	%	20	0…100
P09.n.07	Kick start	%	OFF	OFF / 50…100
P09.n.08	Motor nominal cosΦ		0.80	0.50…1.00

Note: This menu is divided into 3 sections for each additional motor MOT1..3.
The motors are selected via the digital inputs configured with the function "multiple motor selection" (MOT. SEL).
P09.n.01 – P09.n.08 - Same meaning as menu P01, referred to multiple motors.

P10 - LIMITS (LIMn, n = 1…4)		UoM	Default	Range
P10.n.01	Reference measure		OFF	OFF- (measurements list) ST. COUNT.
P10.n.02	Channel nr. (x)		1	OFF/1..99
P10.n.03	Function		MAX	MAX MIN MIN+MAX
P10.n.04	Upper threshold		0	-9999 - +9999
P10.n.05	Multiplier		x1	/100 – x10k
P10.n.06	Delay	sec	0	0.0 - 600.0
P10.n.07	Lower threshold		0	-9999 - +9999
P10.n.08	Multiplier		x1	/100 – x10k
P10.n.09	Delay	sec	0	0.0 - 600.0
P10.n.10	Normal status		OFF	OFF-ON
P10.n.11	Latch		OFF	OFF-ON

Note: This menu is divided into 4 sections for limit thresholds LIM1..4.
P10.n.01 - This defines which measure of the ADXL must be associated to the limit threshold.
P10.n.02 - If the reference measure is a multichannel internal measure, this defines the channel.
P10.n.03 - This defines the limit threshold operating mode. Max = LIMn active when the measurement is higher than P10.n.04. P10.n.07 is the resetting threshold. Min = LIMn active when the measurement is lower than P10.n.07. P10.n.04 is the resetting threshold. Min+Max = LIMn active when the measurement is higher than P10.n.04 or lower than P10.n.07.
P10.n.04 and P10.n.05 - These define the upper threshold, which is given by the value of P10.n.04 multiplied by P10.n.05.
P10.n.06 - Tripping delay on the upper threshold.
P10.n.07, P10.n.08, P10.n.09 - as above, for the lower threshold.
P10.n.10 - This define the status of the limit LIMn when it is not active.
P10.n.11 – If set to ON, the limit LIMn remains stored and must be manually reset using the Command menu; differently, if set to OFF, the limit LIMn is reset automatically.

P13 - USER ALARMS (UAn, n=1…4)		Default	Range
P13.n.01	Alarm source	OFF	OFF INPx OUTx LIMx REMx
P13.n.02	Channel nr. (x)	1	OFF/1...99
P13.n.03	Description	UAn	(text - 16 characters)

Note: this menu is divided into 4 sections, for user alarms UA1..4
P13.n.01 - This defines the source (digital input or internal variable) the activation of which generates the user alarm.
P13.n.02 - Channel number referred to the previous parameter.
P13.n.03 - Free text which will appear in the alarm window.

Alarms

- When an alarm occurs, an alarm icon will appear on the display together with an ID code and the description of the alarm in the selected language.
- If the page navigation buttons are pressed, the window with the alarm indications momentarily disappears and then reappears after few seconds.
- The red ALARM LED on the front panel will blink for as long as an alarm is active.
- The alarms can be reset according to the mode selected with parameter P04.19.
- If the alarm is not reset, it means that its cause is still active.
- If one or more alarms occur, the behaviour of the ADXL will depend on the active alarms properties setting.

Alarm properties

For each alarm, included the User Alarms (UAx), can be defined different properties:

- Enabled alarm - Alarm enable. If not enabled, it's like it does not even exist.
- Retaining alarm - This remains stored even if its cause was removed.
- Global alarm - This activates the output assigned to this function.
- Stop motor – Stops the motor.
- Deceleration – If deceleration is programmed, stops the motor with a deceleration. If the property is not enabled, the motor stops immediately.
- Auto reset – The alarm can be reset automatically depending on the criteria defined in P04.06 and P04.07.
- Inhibit - The alarm may be temporarily deactivated by activating a programmable input with the alarm inhibit function.
- No LCD - The alarm is normally managed but is not shown on the display.

Table of alarms

The following table shows the alarm codes, together with a description and the default properties of each one.

CODE	Description	Enabled	Retaining	Global alarm	Stop motor	Deceleration	Auto reset	Inhibit	No LCD
A01	NO POWER LINE	●	●	●	●		●	●	
A02	PHASE LOSS	●	●	●	●		●	●	
A03	WRONG PHASE SEQUENCE	●	❷	●	●			●	
A04	FREQUENCY OUT LIMITS	●	❷	●	●		●	●	
A05	AUX POWER FAILURE	●		●	●			●	
A06	CURRENT ASYMMETRY	●	●	●	●	●	●	●	
A07	OVERCURRENT TRIP	●	●	●	●			●	
A08	LOCKED ROTOR	●	●	●	●			●	
A09	MOTOR LOAD TOO LOW	●	●	●	●	●	●	●	
A10	STARTING TOO LONG	●	●	●	●	●		●	
A11	BYPASS RELAY FAILURE	●	●	●	●	●		●	
A12	MOT. THERMAL WARNING	●						●	
A13	STARTER TH. WARNING	●						●	
A14	MOTOR THERMAL TRIP	●	●	●	●	●		●	
A15	STARTER THERMAL TRIP	●	●	●	●	●		●	
A16	L1-T1 PHASE SHORTED	●	●	●	●			●	
A17	L3-T3 PHASE SHORTED	●	●	●	●			●	
A18	TEMP. SENSOR FAULT	●	●	●				●	
A19	LINE VOLTAGE TOO LOW	●	❷	●	●	●	●	●	
A20	LINE VOLTAGE TOO HIGH	●	❷	●	●	●	●	●	
A21	MOTOR CURRENT TOO LOW	●	●	●	●		●	●	
A22	MAINTENANCE REQUEST	●		●				●	
A23	COOLING FAN FAILURE	❶		●				●	
A24	COOLING FAN LOCKED	●		●				●	
A25	SYSTEM ERROR	●						●	
UA1..4	User alarm	●						●	

❶ Alarm disabled by default for ADXL 0030 600...ADXL 0115 600 and enabled by default for ADXL 0135 600...ADXL 0320 600.

❷ Alarms conditional retentive:

- If they are retentive from the alarms property table, then they will be always retentive.
- If they aren't retentive from the parameter, they will become retentive when there is a request of motor start.

Description of the alarms

CODE	DESCRIPTION	REASON FOR THE ALARM
A01	NO POWER LINE	All three phases are not present when start command given.
A02	PHASE LOSS	One phase not present when start command given or when motor is running.
A03	WRONG PHASE SEQUENCE	Phase sequence does not match the setting.
A04	FREQUENCY OUT LIMITS	Frequency of line voltage outside of +-5% tolerance around 50 or 60Hz.
A05	AUX POWER FAILURE	Voltage too low or micro interruption longer than the allowed one.
A06	CURRENT ASYMMETRY	When the motor is running, current asymmetry greater than setting for time longer than setting.
A07	OVERCURRENT TRIP	Current >750%Ie (soft starter current) for a time ≥200msec during starting.
A08	LOCKED ROTOR	Current >500%In (nominal motor current) for a time ≥200msec during bypass.
A09	MOTOR LOAD TOO LOW	Motor load torque lower than setting during bypass.
A10	STARTING TOO LONG	Starting time (from start to bypass) longer than setting.
A11	BYPASS RELAY FAILURE	Bypass relay contacts did not close or open.
A12	MOT. THERMAL WARNING	Imminent motor protection trip with motor in bypass.
A13	STARTER TH. WARNING	Imminent soft starter protection trip.
A14	MOTOR THERMAL TRIP	Motor thermal protection tripped (inside soft starter or via PTC input).

A15	STARTER THERMAL TRIP	Heatsink temperature greater than maximum allowed value.
A16	L1-T1 PHASE SHORTED	SCR in short circuit or bypass contacts welded.
A17	L3-T3 PHASE SHORTED	SCR in short circuit or bypass contacts welded.
A18	TEMP. SENSOR FAULT	NTC internal temperature sensor for starter heatsink interrupted or broken.
A19	LINE VOLTAGE TOO LOW	Line voltage L1-L3 lower than setting for set time.
A20	LINE VOLTAGE TOO HIGH	Line voltage L1-L3 higher than setting for set time.
A21	MOTOR CURRENT TOO LOW	Motor current <10%In (In = set nominal motor current) for all three phases.
A22	MAINTENANCE REQUEST	Maintenance interval expired.
A23	COOLING FAN FAILURE	No fans detected.
A24	COOLING FAN LOCKED	Fan current too high, rotor probably jammed.
A25	SYSTEM ERROR	Internal error. Please contact Lovato Electric customer service.
UA1..4	USER ALARM	The user alarm was generated by the activation of the variable associated with menu P13.

Programmable input functions table

- The following table shows all the functions which can be associated to the programmable digital inputs INPn.
- Each input may be set so as to have inverted function (NO - NC), with energising or de-energising delay with independent set times.
- Some functions require a further numeric parameter defined by index (x) specified by parameter P06.n.02.
- See menu P06 *Programmable inputs* for further details.

NO.	FUNCTION	DESCRIPTION
0	OFF	Disabled input.
1	START	Motor start (mandatory: at least one programmable input must be configured with this function). When closed, it enables the starting. It can be used both as a three-wire pulse command or two-wire continuous command (see connection diagrams).
2	STOP	Motor stop. When opened, stops the motor either immediately or with a ramp. If a programmable input is configured with this function, it must remain closed to provide the motor run enable signal, in combination with the above START input (see connection diagrams). If no input is configured with STOP function, the START input provides both the run (closed) and stop (open) functions.
3	FREEWH.	Freewheel: when active, no deceleration ramp is executed to stop the motor (even if programmed); the motor stops immediately.
4	PREHEAT.	Preheating: enables the winding preheating function. A small current is injected into the motor to preheat the windings without making it rotate. It only works if the thermal status is 0%.
5	COM. LOCK	Commands lock: blocks input commands via the serial interface.
6	AL. INH.	Alarms inhibition: Inhibits alarms with the *Inhibit* property active. It allows the user to disable some alarms selectively.
7	TS RESET	Thermal Stauts reset: When the contact is closed, it forces the thermal status of the motor to 100%, if it is higher. In case of trip of the protection, it also provides the reset, by allowing the reset of the alarm with the STOP command. *CAUTION: using this function affects the trip of the motor thermal protection and may cause the motor to overheat dangerously.*
8	KBD LOCK	Keyboard lock: blocks the functioning of the front keypad.
9	MOT. SEL.	Motor Selection: for applications with multiple motors, selects which setting to use in menu P09 Multiple motors, using binary logic. See menu P09.
10	CONFIG.	Configurable input. Used as a source for user alarms, for instance.
11	COMMAND	It performs the command Cx of the commands menu. The number of the command to be executed is x, set in P06.n.02.

Programmable inputs default settings

- The following table reports the factory default settings for the programmable inputs.
- If necessary, these settings can be modified with menu *P06 Programmable inputs*.

INPUT	TERMINALS	DEFAULT FUNCTION
INP1	IN1	START
INP2	IN2	STOP
INP3	IN3	OFF (*disabled*)

Programmable output functions table

- The following table shows all the functions which can be associated to the programmable digital outputs OUTn.
- Each output may be configured with normal or reversed function (NOR or REV).
- Some functions require a further numeric parameter defined by index (x) specified by parameter P07.n.02.
- See menu *P07 Programmable outputs* for more details.

No.	Function	Description
0	OFF	Output disabled.
1	LIN. CONT.	Line Contactor: controls the line contactor. It is energised immediately after the start. Remains activated so long as there is voltage to the motor, i.e. during the acceleration ramp, run, bypass and deceleration ramp.
2	RUN	Energised when the ramp is completed, with full voltage to the motor. Gives the enable signal to the load.
3	GLB. ALA	Global alarm: one or more alarms with the *Global alarm* property enabled are active.
4	LIM	Output which represents the status of the limit variable LIMx (x defined by P07.n.02).
5	REM	Output which represents the status of the remote variable REMx (x defined by P07.n.02).
6	ALA Axx	Active when a specific alarm is present (x defined by P07.n.02).
7	UAxx	Active when a specific user alarm is present (x defined by P07.n.02).

Programmable output default settings

- The following table reports the factory default settings for the programmable outputs.
- If necessary, these settings can be changed with menu *P07 Programmable outputs*.

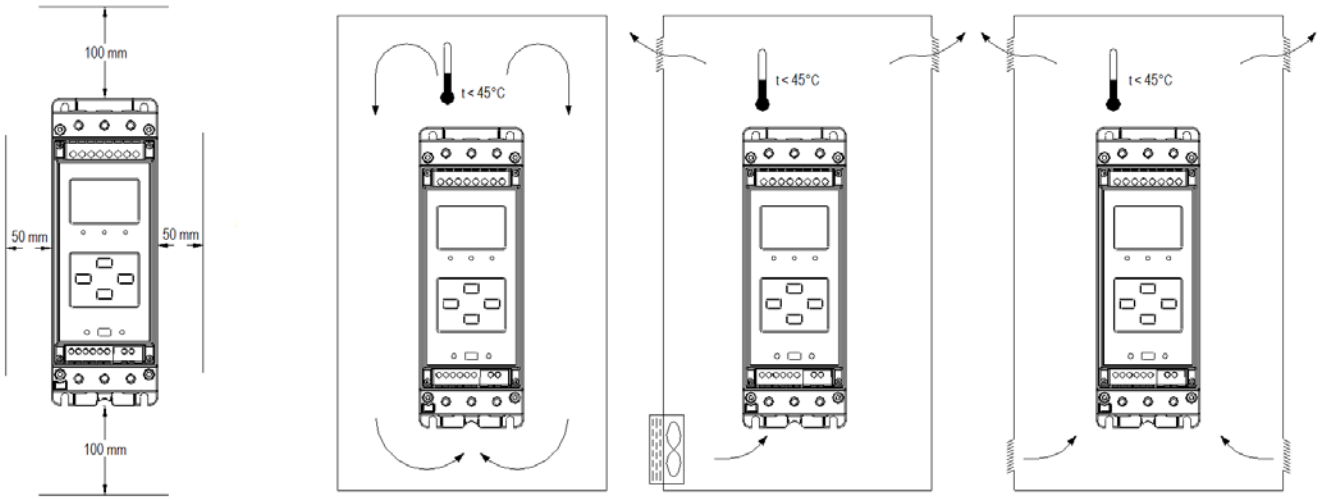
OUTPUT	TERMINALS	DEFAULT FUNCTION
OUT1	11-14-12	GLB. ALA (*global alarm*)
OUT2	21-24	LIN. CONT (*line contactor control*)
OUT3	21-34	RUN (*ramp completed*)

Commands menu

- The commands menu is used to perform occasional operations, like resetting of counters, alarms, etc.
- If the advanced level password was entered, the commands menu can also be used to perform automatic operations useful for configuring the instrument.
- The following table shows the functions which are available with the commands menu divided according to the required access level.

CODE	CONTROL	ACCESS LEVEL	DESCRIPTION
C01	MAINTENANCE RESET	ADVANCED	Resets the maintenance interval and resets the alarm
C02	THERMAL STATUS RESET	ADVANCED	Sets the thermal status to 0%
C03	START COUNTER RESET	ADVANCED	Resets the number of startings counter
C04	HOUR METER RESET	ADVANCED	Resets the motor's hour meter
C05	ENERGY METER RESET	ADVANCED	Resets the energy counters
C06	LIMITS RESET	ADVANCED	Resets LIM variables with memory
C11	REPEAT AUTO SET	USER	Repeats the AUTOSET wizard
C12	SETUP TO DEFAULT	USER	Restores the factory default settings
C13	BACKUP SETUP	ADVANCED	Saves a copy of the setup parameters
C14	RESTORE SETUP	ADVANCED	Restores a copy of the setup parameters
C15	TEST LOW POWER MOTOR	ADVANCED	Test with low power motor – Ignores current-related alarms for a bench test with low power motors
C16	EVENT LOG RESET	ADVANCED	Resets the memory of the event list

Installation



Recommendations

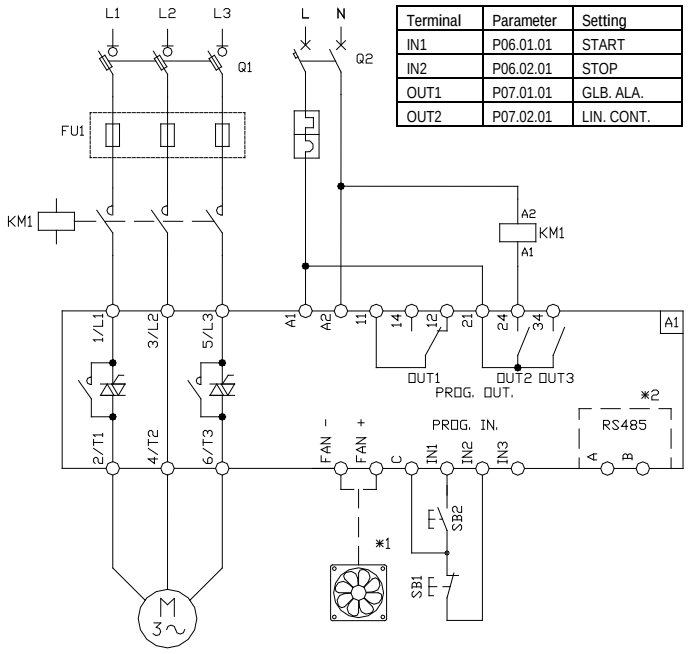
- Switch off power to the soft starter every time you need to work on the electrical or mechanical equipment of the system or machine.
- A disconnecting device, such as switch disconnector, line contactor, etc. must always be included to cut off the power supply.
- Never use the soft starter to drive motor power transformers.
- Do not install the soft starter in areas containing flammable gas or explosives.
- Do not place the soft starter close to sources of heat.
- Do not use insulating enclosures since they are poor heat conductors.
- You can protect the soft starter's SCR properly against short circuit only by using ultra-rapid fuses. To select the fuses, refer to the tables on the last pages of this manual. Note that when the bypass relay is closed (i.e. motor running), the SCR are protected against short circuit, overload and overvoltage.

Power factor correction

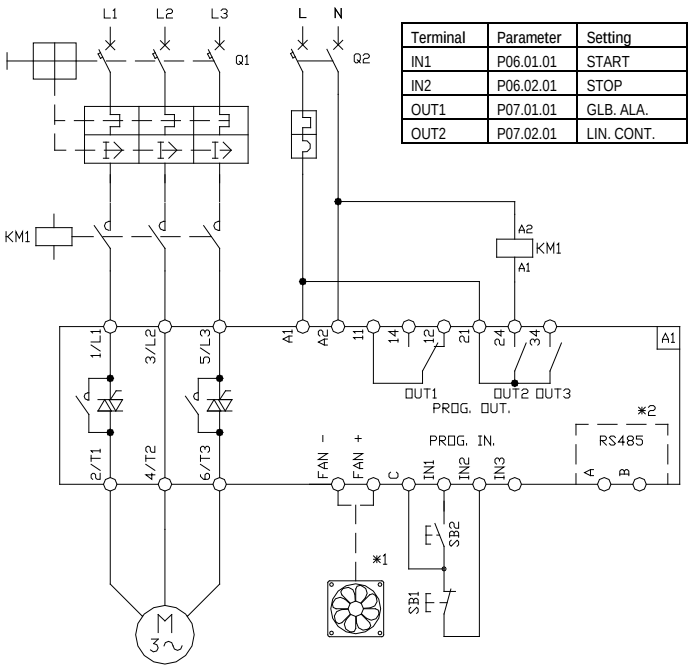
- If power factor correction capacitors are to be used, they must be installed upstream the soft starter, with a contactor and protection fuses. They must be engaged once the starting is terminated, and disengaged before stopping. The contactor can be controlled with a relay output programmed with function “RUN”.

Connection diagrams

Switch disconnector + ultra-rapid fuses *3	MCCB



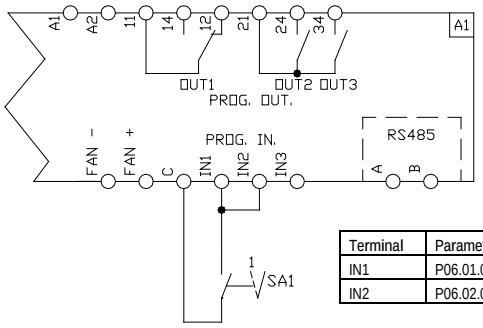
Terminal	Parameter	Setting
IN1	P06.01.01	START
IN2	P06.02.01	STOP
OUT1	P07.01.01	GLB. ALA.
OUT2	P07.02.01	LIN. CONT.



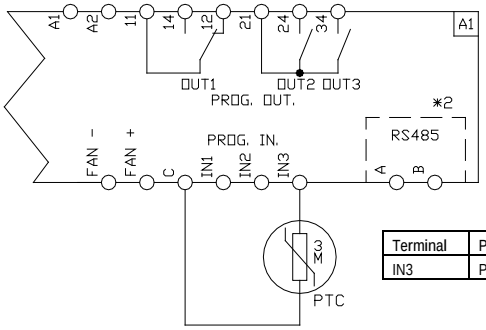
Terminal	Parameter	Setting
IN1	P06.01.01	START
IN2	P06.02.01	STOP
OUT1	P07.01.01	GLB. ALA.
OUT2	P07.02.01	LIN. CONT.

*1 – Optional cooling fan (code EXP8004), only for ADXL 0030 600..ADXL 0115 600. The supply of the fan is provided directly by the soft starter. Don't apply any voltage on the terminals FAN+ and FAN- !
*2 – Optional RS485 communication card (code EXC1042).
*3 – Fuses class CC rated 1A max.

2-wire starting	Motor PTC connection

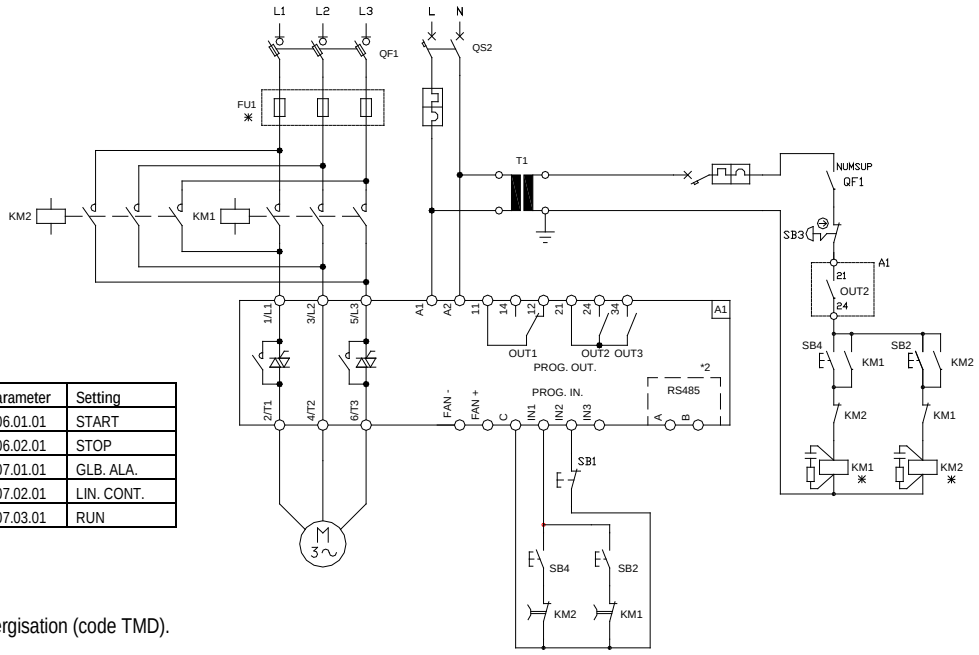


Terminal	Parameter	Setting
IN1	P06.01.01	START
IN2	P06.02.01	STOP



Terminal	Parameter	Setting
IN3	P04.05	PTC

Starting with reversible rotation	

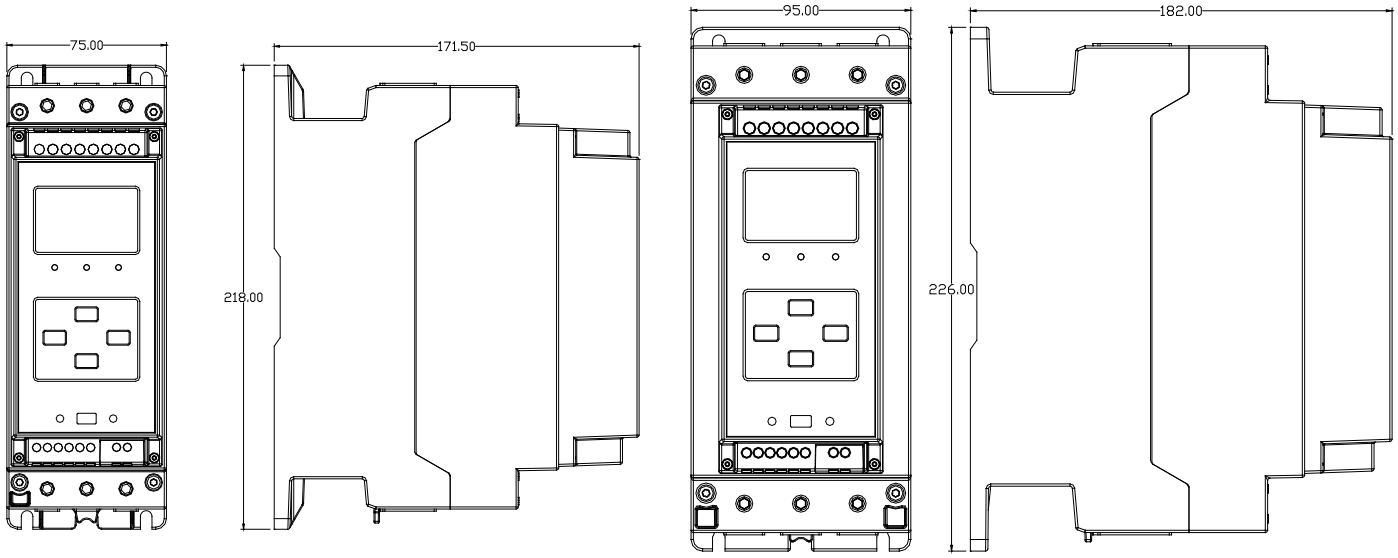


Terminal	Parameter	Setting
IN1	P06.01.01	START
IN2	P06.02.01	STOP
OUT1	P07.01.01	GLB. ALA.
OUT2	P07.02.01	LIN. CONT.
OUT 3	P07.03.01	RUN

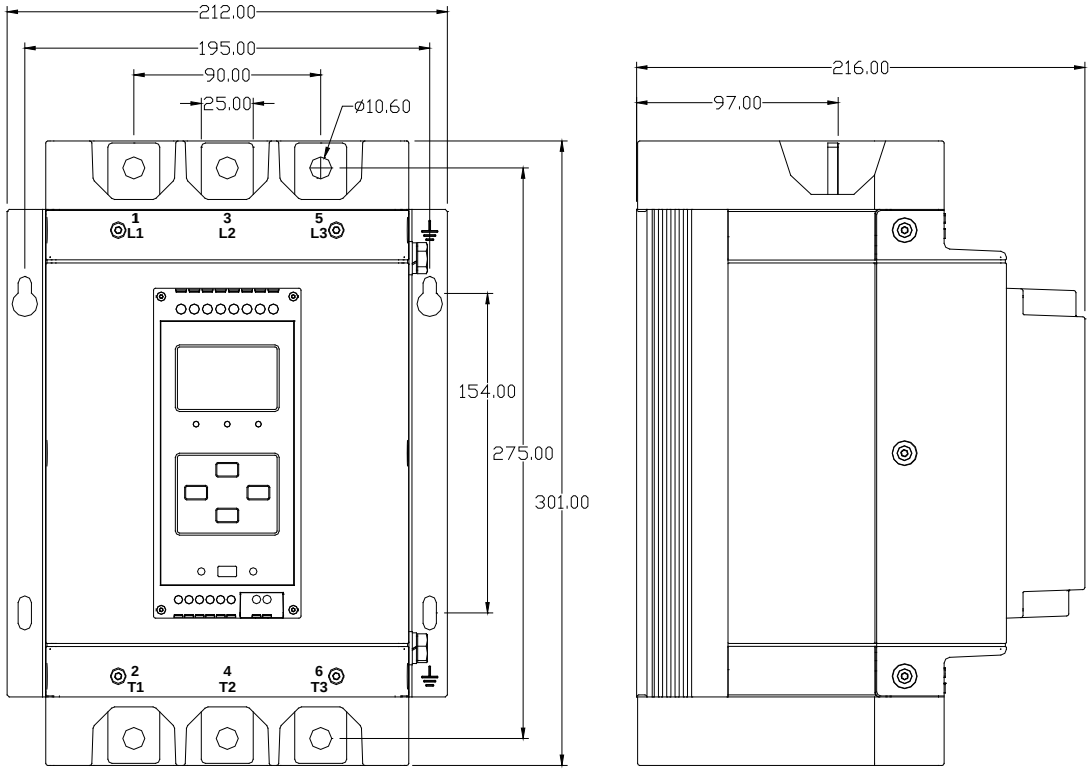
* – Timer delayed at de-energisation (code TMD).

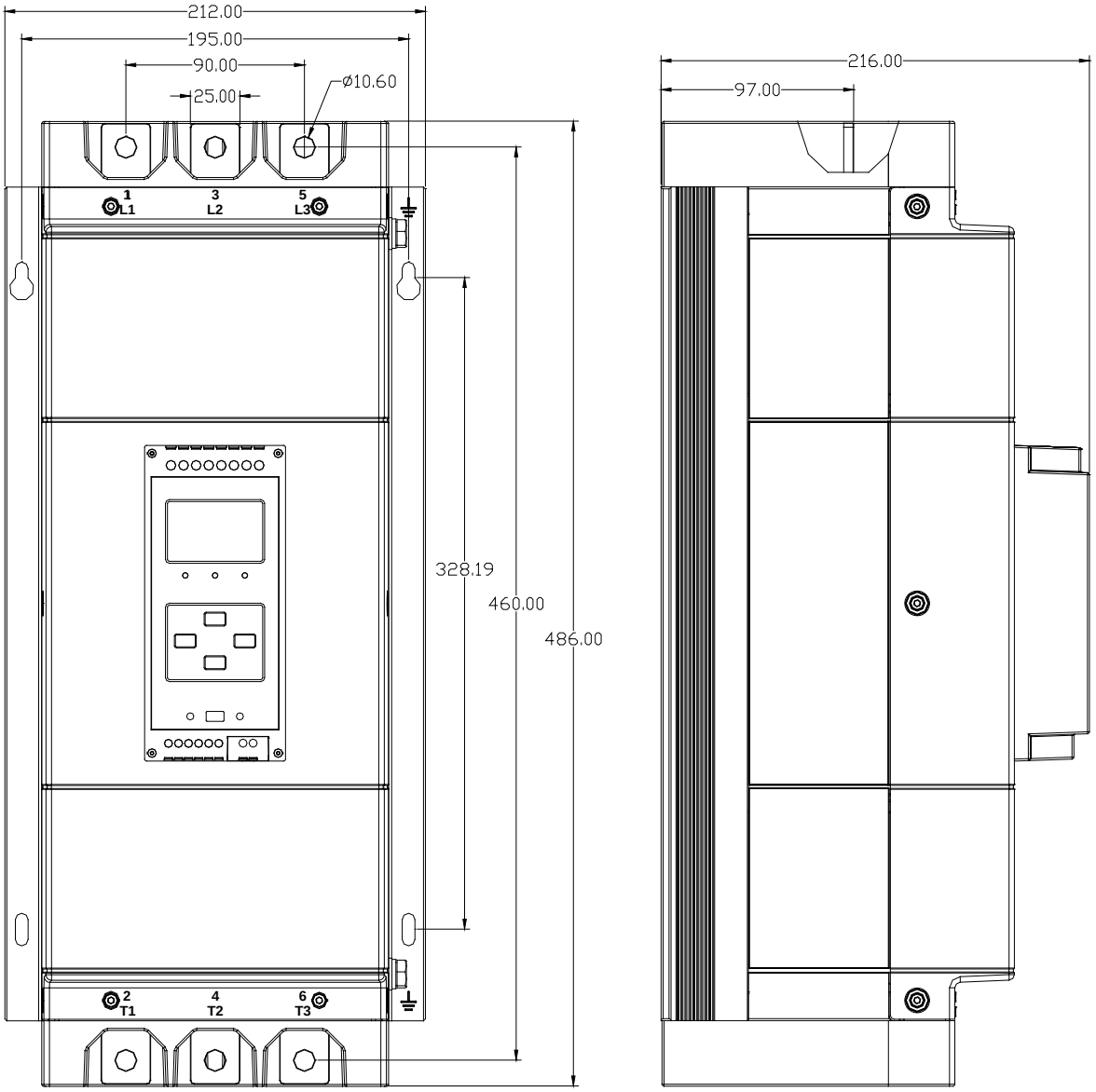
Mechanical dimensions

ADXL 0030 600 – ADXL 0045 600 – ADXL 0060 600	ADXL 0075 600 – ADXL 0085 600 – ADXL 0115 600

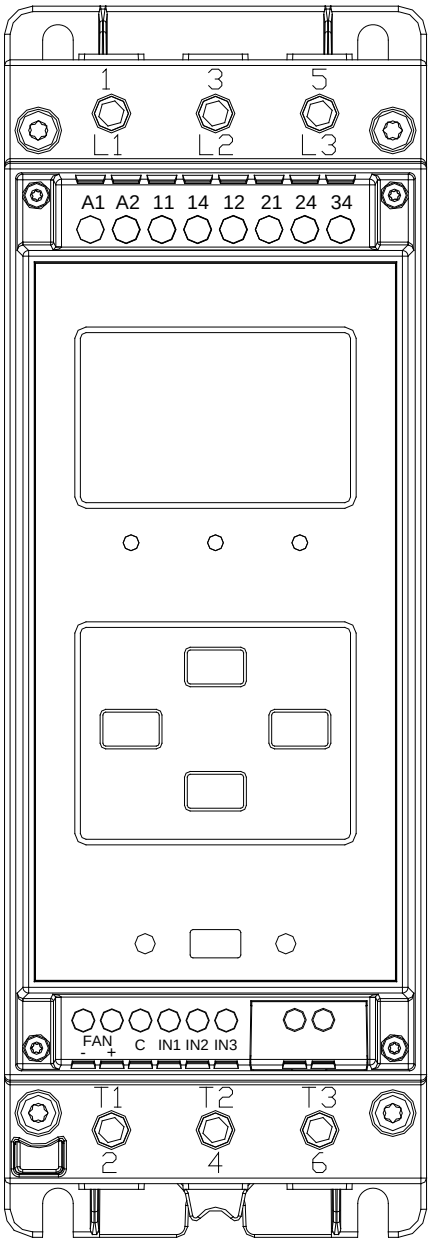


ADXL 0135 600 - ADXL 0162 600




212.00
195.00
90.00
25.00
ø10.60
1
L1
3
L2
5
L3
328.19
460.00
486.00
2
T1
4
T2
6
T3
216.00
97.00

Terminal layout



Note.
The terminals “FAN +/-”, for the connection of the optional fan (code EXP8004), are present only on soft starters ADXL 0030 600…ADXL 0115 600.
Soft starters ADXL 0135 600…ADXL 0320 600 already have two integrated fans as standard.

Choosing the soft starter

Code	Starter rated current Ie [A]	Rated duty power IEC			FLA [A]	Rated duty power UL				
		Motor power [kW]				Motor power [Hp]				
		P_e@230 VAC	P_e@400 VAC	P_e@500 VAC		P_e@208 VAC	P_e@220-240 VAC	P_e@380-415 VAC	P_e@440-480 VAC	P_e@550-600 VAC
ADXL 0030 600	30	7.5	15	18.5	28	10	10	15	20	25
ADXL 0045 600	45	11	22	30	44	10	15	25	30	40
ADXL 0060 600	60	15	30	37	60	20	20	30	40	50
ADXL 0075 600	75	22	37	45	75	25	25	40	50	60
ADXL 0085 600	85	22	45	55	83	25	30	50	60	75
ADXL 0115 600	115	37	55	75	114	40	40	60	75	100
ADXL 0135 600	135	37	75	90	130	40	50	75	100	125
ADXL 0162 600	162	45	90	110	156	50	60	75	125	150
ADXL 0195 600	195	55	110	132	192	60	60	100	150	200
ADXL 0250 600	250	75	132	160	248	75	100	150	200	250
ADXL 0320 600	320	90	160	200	320	100	125	200	250	300

Attention! The data in the table, relative to the rated operational power, were obtained in accordance with EN 60947-4-1: 2012-05, so the data in kW and HP are not linked together by the relation 1 Hp = kW * 1.36.

Coordination

TYPE 2 COORDINATION (IEC/EN 60947-4-2)

Code	Max fuse size Class aR [A]	Fault current [kA]	Max. voltage [VAC]	FU1 Fuse Bussman	British BS 88 Bussman
ADXL 0030 600	80	5	600	FWP-80B	80FE
ADXL 0045 600	125	5	600	FWP-125A	120FEE
ADXL 0060 600	160	5	600	FWP-150A	160FEE
ADXL 0075 600	250	10	600	FWP-175A	180FEE
ADXL 0085 600	315	10	600	FWP-200A	200FEE
ADXL 0115 600	400	10	600	FWP-250A	250FM
ADXL 0135 600	450	10	600	FWP-300A	315FM
ADXL 0162 600	500	10	600	FWP-500A	500FMM
ADXL 0195 600	630	10	600	FWP-600A	630FMM
ADXL 0250 600	700	18	600	FWP-700A	700FMM
ADXL 0320 600	800	18	600	FWP-800A	-

COORDINATION ACCORDING UL508

	Fault current [kA] *	Max. voltage [VAC] **	RK5 class fuses [A] ***
ADXL 0030 600	5	600	30
ADXL 0045 600	5	600	45
ADXL 0060 600	5	600	60
ADXL 0075 600	10	600	75
ADXL 0085 600	10	600	90
ADXL 0115 600	10	600	125
ADXL 0135 600	18	600	150
ADXL 0162 600	18	600	175
ADXL 0195 600	18	600	200
ADXL 0250 600	18	600	250
ADXL 0320 600	18	600	350

Note for UL
ADXL is suitable for use on a circuit of delivering not more than _*_ symmetrical Amperes, _**_ Volts maximum when protected by _***_ RK5 class fuses.
Refer to the above table for corresponding current level and corresponding voltage level for a given device.

Technical characteristics

Auxiliary supply: terminals A1-A2	
Us rated voltage	100 - 240V~
Operating range	90 - 264V~
Frequency	45 - 66 Hz
Power draw/dissipation	
Size 1	100V~ 110mA 5.5W 240V~ 70mA 5.8W
Size 2	100V~ 120mA 6.8W 240V~ 75mA 7W
Size 3	100V~ 125mA 7W 240V~ 75mA 7,2W
Size 4	100V~ 125mA 7W 240V~ 75mA 7,2W
Immunity time for micro-interruptions	≤40ms (110V~) ≤160ms (220V~)
Motor supply voltage L1 – L2 – L3	
Operating range	208-600V~ ±10%
Frequency range	50/60Hz (limits: at 50Hz: 47.5-52.5Hz, at 60Hz: 56.4-63.6Hz)
Rated current and power	(see table "*Choosing the soft starter*", page 22)
Digital inputs, terminals C - IN1, IN2	
Input type	Negative
Applied voltage at contact	5V=
Input current	≤10mA
Low input signal	≤0,8V
High input signal	≥3,2V
Input signal delay	≥50ms
PTC input, terminals C - IN3	
Compatible types of PTC sensor	2 wires, conforming with DIN 44081
Total PTC sensor resistance	≤ 1,5 kΩ a 25°C
Trip resistance	≅ 2,9 kΩ
Reset resistance	≅ 1,6 kΩ
Fan power, terminals FAN + / -	
Fan voltage	5V= supplied by soft starter (only for ADXL 0030 600..ADXL 0115 600)
Fan type	Use exclusively accessory code EXP8004
Output, terminals 11-12-14	
Output arrangement:	1 NO/NC switching contact
Operating voltage	250V~
Ratings	NO contact AC1 5A-250V~ 5A 30V= NC contact AC1 3A-250V~ 3A 30V=
UL ratings	D300
Maximum switching voltage	250V~
Electrical duration	NC contact – $10x10^3$ cycles NO contact – $20x10^3$ cycles
Mechanical duration	10^7 cycles
Output, terminals 21-24, 34	
Output arrangement	2 x 1 NO
Operating voltage	250V~
Nominal thermal rating	3A 250V~ 3A 30V=
UL ratings	3A 30V= L/R 0ms - 3A 250V~ cosΦ 1
Maximum switching voltage	250V~
Electrical/mechanical duration	2×10^7 / 1×10^5
Insulation voltage	
Rated insulation voltage Ui	600 V~
Rated impulse withstand voltage Uimp	9.5 kV
Operating frequency withstand voltage	5.2kV
Ambient operating conditions	
Operating temperature	-20 ... +40°C (max temperature 60°C, from 40° to 60°C apply a derating of the starter current by 1.5%/°C)
Storage temperature	-30 ... +80°C
Relative humidity	<80% (IEC/EN 60068-2-78)
Pollution degree environment	Degree 2
Overvoltage category	3
Measurement category	III
Maximum altitude	1000m without derating (above 1000m, apply a derating of the starter current by 0.5%/100m)
Climate sequence	Z/ABDM (IEC/EN 60068-2-61)
Shock resistance	15g (IEC/EN 60068-2-27)
Vibration resistance	0.7g (IEC/EN 60068-2-6)
Supply - relay connections	
Terminal types	Screw-type (fixed)
Wire cross-section (min and max)	0.2...4 mm^2 (26...10 AWG)
Tightening torque	0.8 Nm (7 lbin)
Type of conductor	Use copper conductors only, 75°C

Fan supply and digital inputs connections	
Terminal types	Screw-type (fixed)
Wire cross-section (min and max)	0.2 - 2.5 mm² (24 - 12 AWG)
Tightening torque	0.44 Nm (4 lbin)
Type of conductor	Use copper conductors only, 75°C
Power connections for ADXL from 30 to 115 A	
Terminal types	Fixed, double
Wire cross-section (min and max)	2 x 2,5-35mm² 2 x 18-2 AWG
Tightening torque for ADXL 0030 600 ... ADXL 0060 600	4-5 Nm / 2.95-3.69 lbft
Tightening torque for ADXL 0075 600 ... ADXL 0115 600	5.5-6.5 Nm / 4.06-4.79 lbft
Type of conductor	Use copper conductors only, 75°C
Power connections for ADXL from 135 to 320 A	
Type of bars	25x5mm, hole diam.11mm
Type of conductor	Use copper conductors only, 75°C
Conductors section for ADXL 0135 600	Max. 50 mm² 1 x AWG 3/0 (use lugs kit code EXA 01 + terminal shrouds kit code EXA 02)
Conductors section for ADXL 0162 600	Max. 70 mm² 1 x AWG 3/0 (use lugs kit code EXA 01 + terminal shrouds kit code EXA 02)
Conductors section for ADXL 0195 600	Max. 95 mm² 1 x AWG 3/0 (use lugs kit code EXA 01 + terminal shrouds kit code EXA 02)
Conductors section for ADXL 0250 600	Max. 120 mm² 2 x AWG 3/0 (use lugs kit code EXA 03 + terminal shrouds kit code EXA 04)
Conductors section for ADXL 0320 600	Max. 185 mm² 2 x AWG 3/0 (use lugs kit code EXA 03 + terminal shrouds kit code EXA 04)
Type of wrench	Socket wrench 17mm
Tightening torque for ADXL 0135 600 ... ADXL 0320 600	35 Nm / 25.8 lbft
Container	
Execution	Panel interior
Material	Polycarbonate RAL 7035
Protection rating	IP00
Mounting	Screw or DIN-rail (IEC/EN60715) via optional accessory EXP8003 (only for ADXL0030600 ... ADXL0115600)
Weight ADXL 0030 600, ADXL 0045 600, ADXL 0060 600 ADXL 0075 600, ADXL 0085 600, ADXL 0115 600 ADXL 0135 600, ADXL 0162 600 ADXL 0195 600, ADXL 0250 600, ADXL 0320 600	 1970g 2704g 7350g 12730g
Type-approvals and conformity	
Type-approvals obtained	cULus and EAC for all sizes. RCM for ADXL 0030 600 ... ADXL 0115 600
Type-approvals pending	RCM for ADXL 0135 600 ... ADXL 0320 600
Conformity to standards	IEC/EN 60947-4-2:2011, IEC/EN 60947-1:2014, IEC/EN 60068-2-61, IEC/EN 60068-2-27, IEC/EN 60068-2-6, UL508, CSA C22.2-N°14

Manual review history

Rev	Date	Notes
00	29/06/2016	• First release
01	03/10/2016	• Second release
02	24/02/2017	• Third release