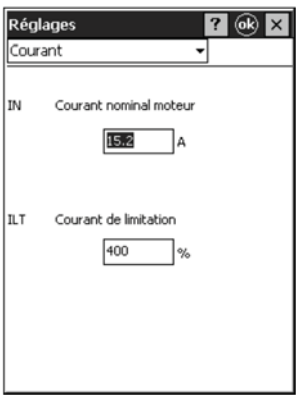
Soft starters
Altistart 48 soft start - soft stop units

Summary of functions



Current setting with PowerSuite on PPC

Starter factory setting

The starter is supplied ready for use in most applications. The main functions enabled and the default function values are as follows:

- Nominal motor current (depends on the starter rating)
- Limiting current: 400%
- Acceleration ramp time: 15 s
- Initial starting torque: 20%
- Selection of the type of stop: freewheel stop
- Motor thermal protection: class 10
- Time before restarting: 2 s
- Motor phase loss threshold: 10%
- Line frequency: automatic
- RUN and STOP logic inputs: 2-wire or 3-wire control via wiring
- Logic input LI3: forced freewheel stop
- Logic input LI4: local mode control (serial link disabled)
- Logic output LO1: thermal motor alarm
- Logic output LO2: motor powered
- Relay output R1: fault relay
- Relay output R3: motor powered
- Analogue output: motor current

Soft starters
Altistart 48 soft start - soft stop units

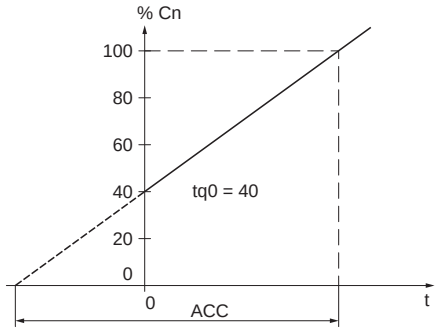
Adjustment functions

■ **Nominal motor current** (maximum permanent current)
The nominal current of the starter can be adapted to the nominal motor current indicated on the rating plate.
Adjustment range: 0.4 to 1.3 times the starter nominal current.

■ **Limiting current**
The maximum starting current can be adjusted.
Adjustment range: 150% to 700% of the nominal motor current set and limited to 500% of the maximum permanent current defined for the starter rating.

■ **Acceleration ramp time**
During the starting phase, the Altistart 48 applies a torque ramp to the motor. The time (ACC) set corresponds to the time taken by the ramp to reach the nominal torque (starting at 0). Adjustment range: 1 to 60 s.

■ **Initial starting torque**
The initial torque tq0 applied to the motor can be used to instantly overcome any resistive starting torque. Adjustment range: 0 to 100% of the nominal motor torque.

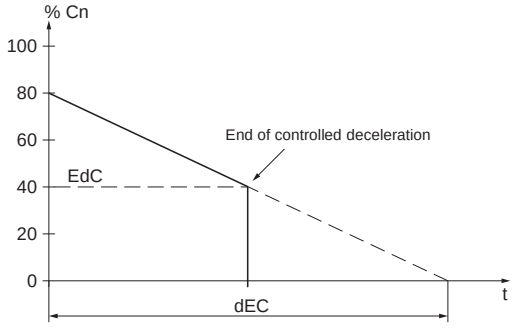


Acceleration ramp during time ACC with initial starting torque Iq0 = 40% of the nominal motor torque

■ **Selection of the type of stop**
Three types of stop are available for selection:

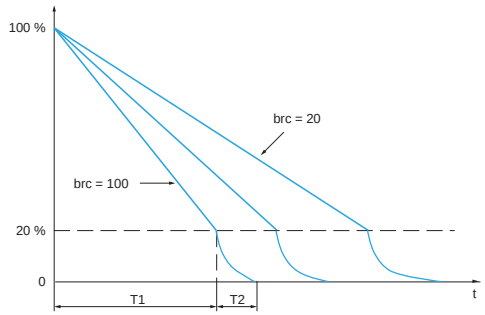
□ **Freewheel motor stop**

□ **Motor stop by deceleration via torque control (pump application)** This type of stop enables a centrifugal pump to be decelerated gradually on a ramp in order to avoid a sudden stop. It can be used to dampen the hydraulic transient in order to significantly reduce pressure surges.
The deceleration ramp time (dEC) can be adjusted.
During deceleration, the pump flow rate decreases and becomes negligible at a certain speed. To continue to decelerate would serve no purpose. A torque threshold (EdC) can be set at which the motor will change to freewheel stop mode, avoiding the unnecessary heating of the motor and the pump.

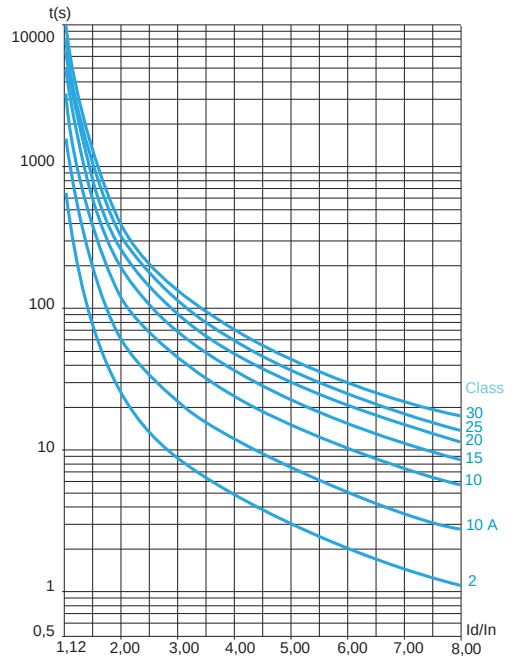


Decelerated stop by torque control during time dEC with threshold Edc for changing to freewheel stop mode
Edc = 40% of nominal motor torque

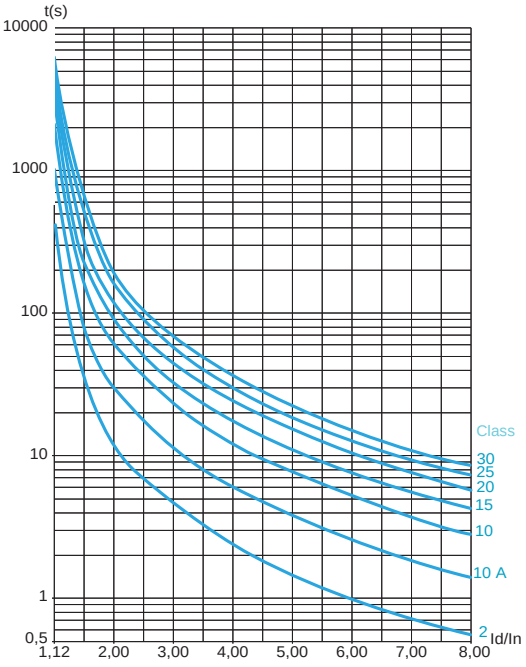
□ **Dynamic braking motor stop (application: stopping high inertia machines)**
This type of stop will decelerate the motor if there is considerable inertia.
The braking torque level (brc) can be adjusted. The dynamic braking time (T1) corresponds to the time taken to decelerate from 100% to 20% of the nominal motor speed. To improve braking at the end of deceleration, the starter injects a d.c. current for an adjustable period of time (T2).



Dynamic braking stops for different braking torque levels brc



Motor thermal protection curves (cold)



Motor thermal protection curves (warm)

Protection functions

The Altistart 48 offers functions for protecting the motor and the machine.

■ **Calculated motor thermal protection**

The starter continuously calculates the temperature rise of the motor based on the nominal current which has been set and the actual current absorbed. In order to adapt the Altistart to individual motors and applications, several protection classes are offered in accordance with standard IEC 60947-4-2:
class 30, class 25, class 20 (severe application), class 15, class 10 (standard application), class 10 A, sub-class 2.
Different protection classes are defined for the starting capacities of the motor:
- cold start without thermal fault (corresponding to a stabilised motor thermal state, motor switched off)
- warm start without thermal fault (corresponding to a stabilised motor thermal state, at nominal power)

The motor thermal protection function can be disabled.
After the motor has stopped or the starter has been switched off, the thermal state is calculated even if the control circuit is not energised. The Altistart thermal control prevents the motor from restarting if the temperature rise is too high. If special motors are used which do not have thermal protection via curves, provide external thermal protection via probes or thermal overload relays.
The starter is factory-set to protection class 10.
The tripping curves are based on the relationship between the starting current Is and the (adjustable) nominal motor current In.

Trip time (cold)

Trip time for a standard application (class 10)			Trip time for a severe application (class 20)		
Is = 3 In	Is = 4 In	Is = 5 In	Is = 3.5 In	Is = 4 In	Is = 5 In
46 s	23 s	15 s	63 s	48 s	29 s

Trip time (warm)

Trip time for a standard application (class 10)			Trip time for a severe application (class 20)		
Is = 3 In	Is = 4 In	Is = 5 In	Is = 3.5 In	Is = 4 In	Is = 5 In
23 s	12 s	7.5 s	32 s	25 s	15 s

■ **Reset motor thermal state**

Activating the function resets the motor thermal state calculated by the starter to zero.

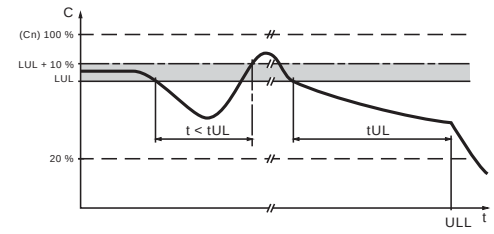
■ **Motor thermal protection with PTC probes**

The starter integrates the processing of PTC probes, thus avoiding the use of an external device. The "PTC probe thermal overshoot" fault or alarm can be indicated using a configurable logic output or displayed via the serial link. The function can be disabled.
Note: The "PTC probe protection" and "calculated motor thermal protection" functions are independent and can be active simultaneously.

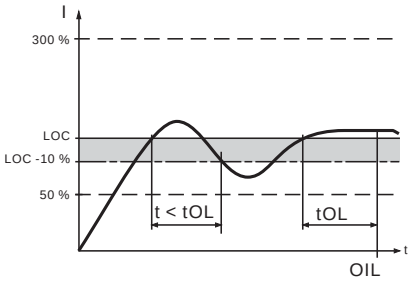
■ **Starter ventilation**: The cooling fan on the starter is switched on as soon as the heatsink temperature reaches 50°C. It is switched off when the temperature returns to 40°C.

■ **Starter thermal protection**

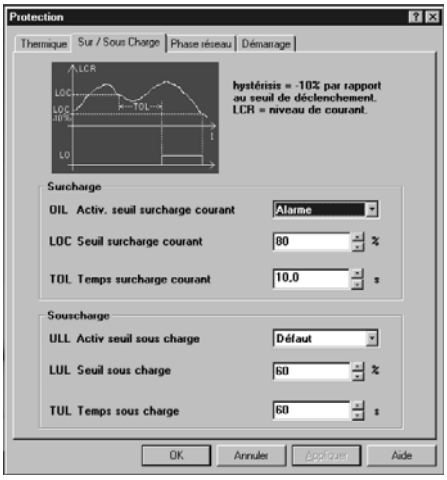
The starter is protected against thermal overloads by an analogue thermal probe.



Motor underload detection (ULL)



Motor overcurrent detection (OIL)



Configuring the starter overload and underload with PowerSuite on a PC

Protection functions (continued)

Motor underload protection

The starter detects a motor underload if the motor torque falls below a preset torque threshold (LUL) for a specific (adjustable) period of time (tUL).
The motor underload threshold can be set between 20% and 100% of the nominal motor torque. The permissible underload duration can be set between 1 and 60 s.
The detection function can trigger an alarm or a fault. The detection function can be disabled. The "motor underload detected" alarm can be indicated by a configurable logic output and/or displayed via the serial link in the state of the starter.
The "motor underload detected" fault (ULF) locks the starter and can be displayed via the serial link.

Excessive acceleration time protection

This protection function can be used to detect a start which takes place in adverse conditions. Examples of such conditions include a locked rotor or a motor unable to reach its nominal rotation speed.
If the start duration is greater than the value set (between 10 and 999 s), the drive changes to fault mode. The function can be disabled.

Current overload protection

The starter detects a current overload if the motor current exceeds a preset overcurrent threshold (LOC) for a specific (adjustable) period of time (tOL).
The overcurrent threshold can be set between 50% and 300% of the nominal motor current.
The permissible overcurrent duration can be set between 0.1 and 60 s.
This function is only active in steady state.
The detection function can trigger an alarm or a fault. It can also be disabled.
The "current overload detected" alarm can be indicated by a configurable logic output and/or displayed via the serial link.
The "current overload detected" fault (OLC) locks the starter and can be displayed via the serial link in the state of the starter.

Protection against line phase inversion

This function can be used to detect the direction of rotation of the motor phases and, if it is enabled, to indicate a fault when the direction of rotation is reversed.

Time before restarting

This function can be used to avoid several consecutive starts which may cause:
- the thermal overheating of the application, which is not permitted
- a thermal fault which will require maintenance work to be carried out
- overcurrents (if the direction of rotation is reversed) or repeats (run/stop commands)

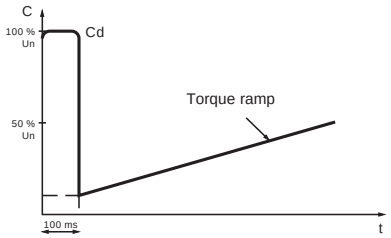
Following a stop command, the motor can only restart once the preset time delay has elapsed.
The motor is restarted once the time delay has elapsed if a run command is still valid or if a new run command is sent.
Adjustment range: 0 to 999 s.

Motor phase loss detection

The function is used to adjust the sensitivity of the protection function in order to detect a loss of current or a low current in one of the three motor phases for at least 0.5 s or in all three motor phases for at least 0.2 s. The value of the minimum current level can be set between 5% and 10% of the starter nominal current.

Automatic restart

After locking on a fault, the function permits up to six restart attempts at intervals of 60 s if the fault has disappeared and the run commands are still present. After the sixth attempt, the starter will remain locked and the fault will have to be reset before a restart is permitted.
If the function is active, the fault relay remains activated if line phase loss, motor phase loss or line frequency out of tolerance faults are detected. This function can only be used in 2-wire control.



Application of a voltage boost equal to 100% of the nominal motor voltage

Advanced adjustment functions

■ **Torque limit**
Designed primarily for high inertia and constant torque conveyor applications , the function restricts the torque ramp reference to the preset value.
For example, the function can be used to limit the torque to a constant value throughout the starting period.
Adjustment range: 10% to 200% of the nominal motor torque.

■ **Voltage boost level**
The function can be used to avoid any "starting" torque (phenomenon caused by friction on stopping or by mechanical play). When a run command is sent, the starter applies a fixed voltage to the motor for a limited period of time before starting. The function can be disabled.
The voltage setting value varies between 50% and 100% of the nominal motor voltage.

■ **Connecting the starter to the motor delta terminal**
ATS48●●●Q starters connected to motors with delta terminals can be wired in series in the motor windings. This type of connection reduces the current in the starter by a ratio of $\sqrt{3}$, which enables a lower rating starter to be used. The nominal current and limiting current settings as well as the current displayed during operation are on-line values and are indicated on the motor. For this application, the braking or decelerating stop functions are inactive. Only freewheel stopping is possible.
The adjustment range of the nominal motor current and the limiting current are multiplied by $\sqrt{3}$ if the function is selected.
This function is not compatible with the following functions: motor phase loss detection, motor preheating, cascade, decelerated stop and dynamic braking.
Use the scheme recommended on page 60524/4 for this type of configuration.

■ **Test on low power motor**
This function can be used to test a starter on a motor whose power is very much lower that of the starter. It can be used for example to check the electrical wiring of a device.
The function is automatically cancelled when the starter is switched off.
The next time the starter is switched on, the starter returns to its initial configuration.

■ **Activation of the cascade function**
This function can be used to start and decelerate several cascaded motors with a single starter.
In order to gain maximum benefit from torque control, it is advisable to use motors with powers between 0.5 and 1 times the power of the motor.
The wiring diagram for the cascaded motor function is shown on page 60524/6.
This function is not compatible with the following functions: motor preheating and connection to the motor delta terminal.

■ **Line frequency**
The following frequencies can be selected for the function:
- 50 Hz. The frequency fault monitoring tolerance is ± 20%.
- 60 Hz. The frequency fault monitoring tolerance is ± 20%.
- Automatic detection of the line frequency by the starter The frequency fault monitoring tolerance is ± 6%.

□ 50 Hz and 60 Hz are recommended if the power supply is provided by a generating set, given their high tolerance.

■ **Reset kWh or the operating time**
Sets the value of the power in kW/h or the operating time value to 0. The calculation of the values is updated once the reset command has been sent.

■ **Return to factory settings**
The function can be used to reset each setting to its initial value (starter factory setting, see page 60526/2).

2nd motor adjustment functions

In order to access the 2nd motor adjustment functions, one logic input must be assigned to the second set of motor parameters function. The adjustment functions and ranges are identical for both sets of motor parameters.
The settings are as follows (see page 60526/3):

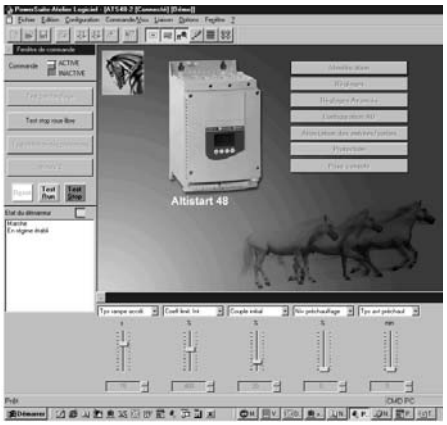
- Nominal motor current
- Limiting current
- Acceleration ramp time
- Initial starting torque
- Deceleration ramp time
- Threshold for changing to freewheel stop mode at the end of deceleration
- Maximum torque limit

Communication functions

The Altistart 48 is supplied with an RS 485 multidrop serial link with Modbus protocol as standard. The serial link is configured in the Communication menu using:

□ The address of the starter, which can be set between 0 and 31
□ The communication speed, which can be set at: 4800, 9600 or 19200 bps
□ The format of the communication data. The following formats can be selected:
- 8 data bits, odd parity, 1 stop bit
- 8 data bits, even parity, 1 stop bit
- 8 data bits, no parity, 1 stop bit
- 8 data bits, no parity, 2 stop bits

□ The time-out, which can be set between 1 and 60 s



Displaying the commands and settings with PowerSuite on PC

PowerSuite advanced dialogue solutions

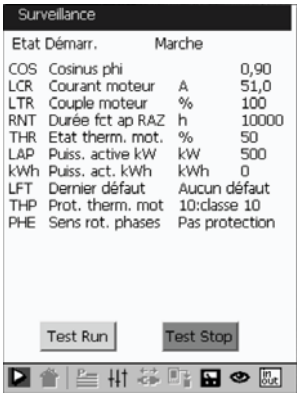
The PowerSuite advanced dialogue solutions (see pages 60200/2 and 60200/3) offer the following advantages:

□ Connection to the Altistart 48 and access to the adjustment, monitoring and control functions
□ Display of messages in plain text in 5 languages (English, French, German, Spanish and Italian)
□ Preparation and saving of settings to hard disk
□ Comparison and editing of settings using office automation tools
□ Downloading of starter settings to the PC and uploading from the PC to the starter

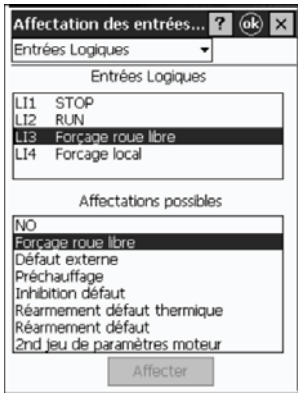
Application monitoring functions

The monitoring functions provide the following information:

■ Cosine φ, displayed between 0.00 and 1.00
■ Motor thermal state: 100% corresponds to the thermal state of the motor consuming the permanently set nominal current
■ Motor current: displayed in amperes between 0 and 999 A and in kilo amperes between 1000 and 9999 A
■ The operating time corresponding to the total number of starter operating hours during heating, acceleration, steady state, deceleration, braking and continuous bypass operation. It is displayed in hours between 0 and 999 hours and in kilo hours between 1000 and 65536 hours.
■ The active power is displayed between 0 and 255%, where 100% corresponds to the power at the set nominal current and at full voltage.
■ The motor torque is displayed between 0 and 255%, where 100% corresponds to the nominal torque.
■ The active power consumed is displayed in kW. The line voltage value must be configured. The accuracy of this setting will depend on the error between the voltage configured and the actual voltage.
■ Power in kW/h displayed with PowerSuite
■ The following starter states are shown in the display of the current state:
□ Starter without run command and power not supplied
□ Starter without run command and power supplied
□ Acceleration/deceleration in progress
□ Steady state operation
□ Braking in progress
□ Starter in current limiting mode
□ Starting time delay not elapsed
■ Last fault. Displays the last fault which occurred.
■ Phase rotation direction. Displays the direction of rotation (direct or indirect).
■ **Terminal locking code**
□ An access code can be used to protect access to the adjustment and configuration parameters of the starter. Only the monitoring parameters will then be visible.



Monitoring the parameters with PowerSuite on PPC



Assigning the logic inputs with PowerSuite on PPC

Logic input application functions

The starter has 4 logic inputs:

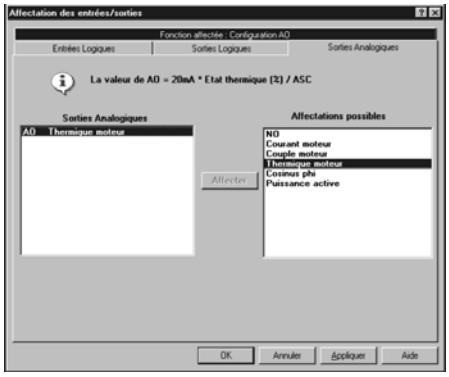
■ **2 logic inputs (RUN and STOP) are reserved for run/stop commands** which can be sent in the form of stay-put contacts or as pulsed contacts.
□ **2-wire control**: Starting and stopping are controlled by a single logic input. State 1 of the logic input controls starting and state 0 controls stopping.
□ **3-wire control**: Starting and stopping are controlled by 2 separate logic inputs. A stop is obtained on opening (state 0) the STOP input.
The pulse on the RUN input is stored until the stop input opens.

■ **2 logic inputs (LI3 and LI4) can be configured with the following functions**:
□ **Freewheel stop**: When combined with a braked stop or decelerated stop command, activating the logic input will stop the motor in freewheel mode.
□ **External fault**: Enables the starter to detect an external user fault (level, pressure, etc.). When the contact is open, the starter changes to fault mode.
□ **Motor preheating**: Used to prevent the motor from freezing or to prevent temperature variations which may cause condensation. When the logic input is activated, an adjustable current flows through the motor after a time delay which can be set between 0 and 999 s. This current heats the motor without causing it to rotate. This function is not compatible with the following functions: connection to the motor delta terminal and cascading.
□ **Force to local control mode**: If a serial link is used, this function can be used to change from line mode (control via serial link) to local mode (control via the terminal).
□ **Inhibit all protection**: Enables the forced operation of the starter in an emergency by overriding the main faults (smoke extraction system for example).
Warning: This type of use invalidates the starter warranty.
□ **Reset motor thermal fault**: Enables the fault to be reset remotely.
□ **Activation of the cascade function**: In this case, the motor thermal protection is disabled and relay R1 is configured as the fault isolation relay. Can be used to start and decelerate several motors one after the other with a single starter (see application diagram on pages 60524/6 and 60524/7).
❐ **Reset all faults**: Enables all faults to be reset remotely.
❐ **Second set of motor parameters**: Enables a second set of parameters to be selected to start and decelerate two different motors with a single starter.

Logic output application functions

The starter has 2 logic outputs (LO1 and LO2) which, depending on their configuration, can be used for remote indication of the following states or events:

- Motor thermal alarm: Indicates that the motor thermal state has exceeded the alarm threshold and can be used for example to avoid starting a motor if the thermal reserve is insufficient.
- Motor powered: Indicates that there may be current in the motor.
- Motor overcurrent alarm: The motor current is higher than the threshold set.
- Motor underload alarm: The motor torque is lower than the threshold set.
- Motor PTC probe alarm: Indicates that the thermal state monitored by the PTC motor probe has been exceeded.
- Second set of motor parameters activated



Assigning the analogue output with PowerSuite on PC

Relay and analogue output application functions

The starter has 3 relays, 2 of which are configurable.

- **End of starting relay R2**: Cannot be configured.

The end of starting relay controls the bypass contactor on the starter. It is activated when the motor has completed the starting phase. It is deactivated when a stop command is sent and in the event of a fault. The starter regains control when a braking or deceleration command is sent.

- **Relay R1 application functions**

Relay R1 can be configured as follows:

□ Fault relay: Relay R1 is activated when the starter is powered and there are no faults. It is deactivated when a fault occurs and the motor switches to freewheel mode.

□ Isolating relay: The contact of relay R1 closes when a run command is sent and re-opens when a stop command is sent, at the end of deceleration on a decelerated stop or in the event of a fault. The line contactor is deactivated and the motor is isolated from the line supply
(see application diagram page 60524/3).

- **Relay R3 application functions**

Relay R3 is configured to indicate the same states or events as logic outputs LO1 or LO2 (see above).

- **Analogue current output AO application functions**

□ The analogue output AO provides an image of the following values:
motor current, motor torque, motor thermal state, cosine φ, active power.

□ The following settings are associated with the analogue output:
- the type of signal supplied: 0-20 mA or 4-20 mA
- the scale setting of the signal. The function associates the maximum amplitude of the analogue output (20 mA) with a percentage of the nominal value of the parameter, which can be set between 50% and 500%.

Function compatibility table

Functions	Decelerating stop	Dynamic braking stop	Forced freewheel stop	Thermal protection	Motor phase loss detection	Connection to the motor delta terminal	Tests on low power motor	Cascaded motors	Motor preheating
Decelerating stop									
Dynamic braking stop									
Forced freewheel stop									
Thermal protection									*(1)*
Motor phase loss detection						*(1)*			*(1)*
Connection to the motor delta terminal					*(1)*				
Tests on low power motor									
Cascaded motors									
Motor preheating				*(2)*	*(1)*				

Compatible functions
Incompatible functions
Not applicable

(1) Motor phase loss not detected.

(2) Thermal protection is not provided during motor preheating.