

Variable frequency drive for doors and entrances



Benefits

- **Flexible configuration via digital inputs:** various configuration options are possible via the 5 digital inputs
- **Easy to use:** limited configuration parameters required for shorter setup times
- **Time savings during installation:** Push-in connectors for faster and more reliable installation
- **Space saving solution:** designed on a very compact PCB to minimise space in the electrical panel'
- **Management of electromechanical brake:** dedicated and programmable relay output to switch an external electromechanical brake contactor
- **Condition monitoring:** Modbus RTU interface for real time monitoring of motor variables.
- **Robust design:** Fanless design for increased reliability in harsh environment
- **Remote control:** RVDS can be controlled via voltage control or via serial communication for increased operational flexibility

Description

RVDS is a single phase input variable frequency drive (VFD) for industrial doors and entrances powered from induction motors. This VFD uses sensorless vector control (SLV) for higher torque at low speeds.

The RVDS comes in two versions 0.55 kW (2.5 Arms) and 0.75 kW (4.2 Arms). The open board design results in a very compact solution that can fit in electrical panels with limited space. Configuration of the RVDS can be done via a dedicated PC software, via an optional remote keypad or directly via the PLC through the RJ45 port via Modbus.

Specifications are stated at 40°C at a switching frequency of 6kHz unless otherwise stated.

Applications

Industrial doors - rolling doors, sliding doors.

Main functions

- Speed control, reversing of motors
- Control via serial communication or via digital inputs
- Pre-set speed profiles
- 4-speed setpoints via 2 digital inputs

References

Order code

 RVDS120 F

Enter the code entering the corresponding option instead of

Code	Option	Description	Notes
R	-	Product family: Variable frequency drive for doors	
V	-		
D	-		
S	-		
1	-	1-Phase supply	
20	-	Input voltage: 200 - 240 VAC (-15%, +10%), 50/60 Hz	
<input type="checkbox"/>	055	Output power: 0.55 kW	
	075	Output power: 0.75 kW	
F	-	EMC filter	

Selection guide

AC supply	Rated output power	Rated output current @ 40°C	Cooling method	Ordering code
1 - phase (230 VAC)	0.55 kW	2.5 Arms	Heatsink	RVDS120055F
	0.75kW	4.2 Arms		RVDS120075F

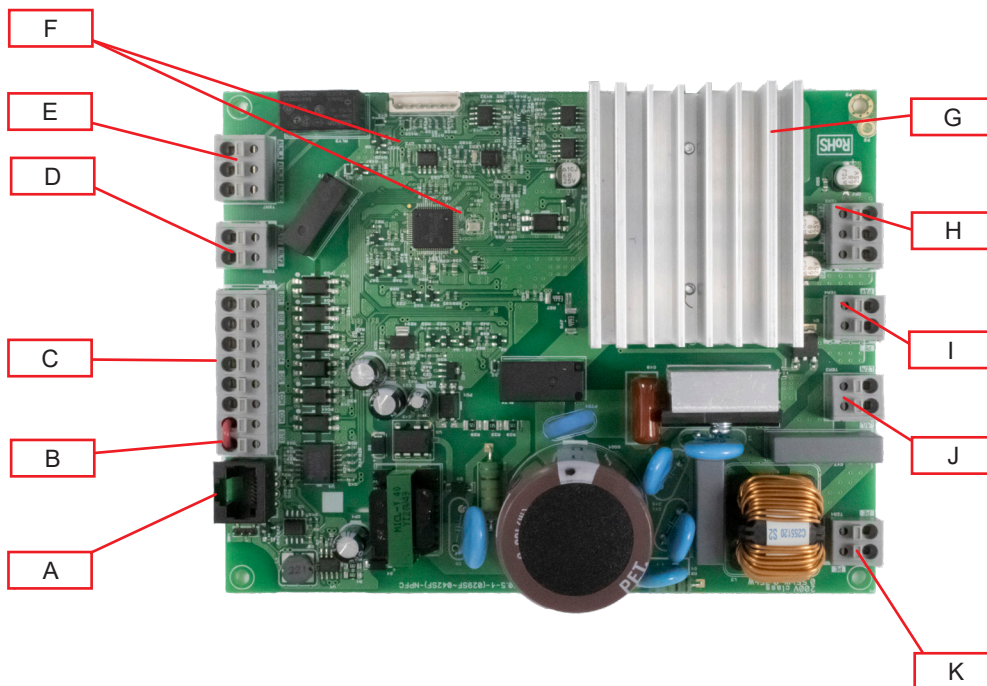
Further reading

Information	Where to find it

CARLO GAVAZZI compatible components

Purpose	Component name / code	Notes
Remote operator	RV-KEYPAD	

Structure



Element	Component	Function
A	RJ45 connector	Configuration port (Modbus RTU over RS485)
B	Drive enable/disable	Input to enable or disable drive operation (Normally closed)
C	Digital inputs	Programmable digital inputs (q.ty: 5) for start, stop, reversing of motor rotation and alarm reset. Topology: 24 V NPN
D	Digital output 1	Electro-magnetic brake management
E	Digital output 2	Relay output for fault indication
F	LED indicators	LED 1: Power ON (Green) LED 2: Fault indication (Red)
G	Heatsink	Thermal dissipation
H	Load connection	Load side connections (U, V, W)
I	External brake resistor connection	Connection for external brake for high inertia loads
J	Mains input connection	Connection for input voltage
K	PE connections	Protective earth connection

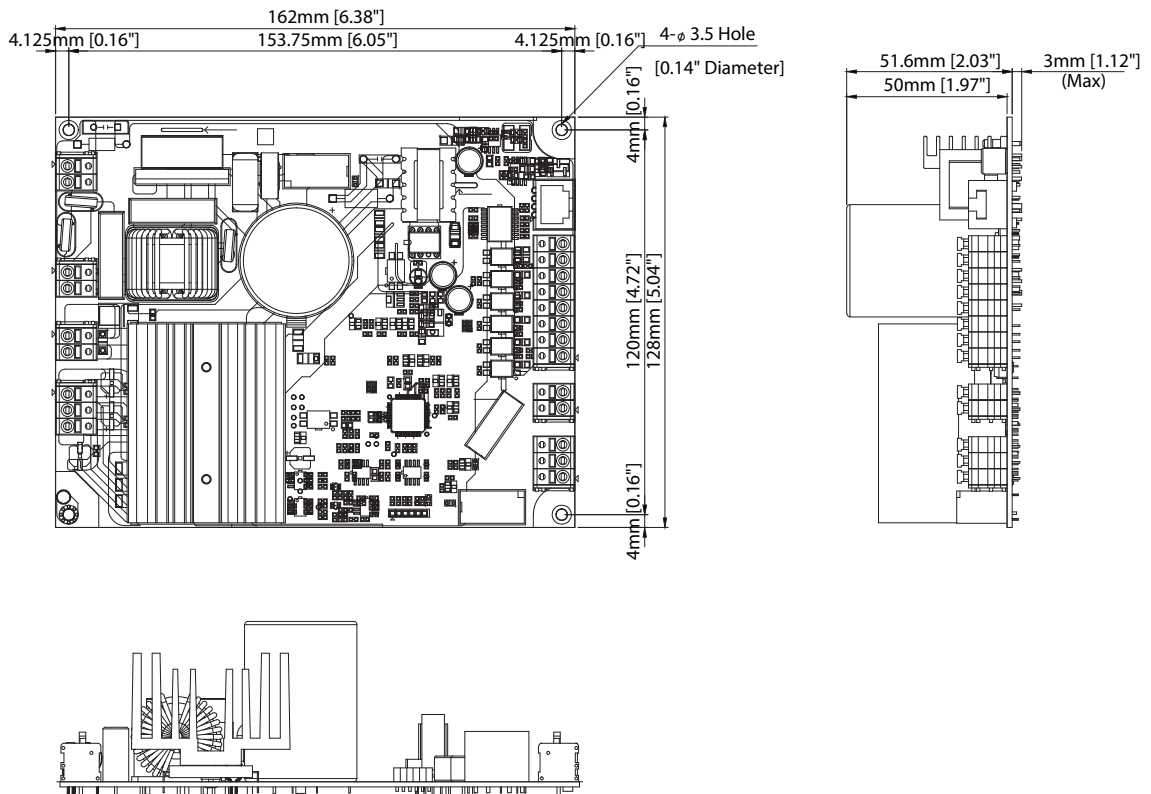
Features

General data

Control mode	Sensor-less vector control (SLV) for induction motors
Control method	Via digital inputs (NPN) or Modbus RTU
Frequency range	0 - 90 Hz
Configuration	Via serial port (Modbus RTU) or via remote keypad (RV-KEYPAD)
Protection grade	IP00
Cooling type	Heatsink
Weight	RVDS120055F: 0.43 kg
	RVDS120075F: 0.45 kg

Dimensions

Unit: mm [inches]




▶ Power supply

	RVDS120055F	RVDS120075F
AC supply phase	1 - phase	
Input voltage	200 - 240 Vrms	
Input frequency	50 / 60 Hz (± 5%)	
Topology	Internally supplied (via mains)	
Integrated varistor	Yes	

▶ Environmental

Working temperature	-20 °C to +60 °C (-4 °F to + 140 °F)
Storage temperature	-20 °C to +60 °C (-4 °F to +140 °F)
Relative humidity	< 90% non-condensing @ 40 °C
Installation category	2
Installation altitude	1000 m

▶ Compatibility and conformity

Standard compliance	Low voltage directive	IEC / EN 61800-5-1
	Electromagnetic compatibility	IEC / EN 61800-3 (Industrial environment)
Marks		

Input specifications

	RVDS120055F	RVDS120075F
Rated input current	7.2 Arms	11 Arms
Input voltage range	Single phase: 200 - 240 VAC (+10% / -15%), 50/60 Hz	

Output specifications

	RVDS120055F	RVDS120075F
Rated output power	0.55 kW	0.75 kW
Output voltage range	3 - phase: 0 - 240 Vrms	
Output frequency range	0 - 90 Hz	
Frequency resolution	1 to 2 Hz (+/- 3 Hz)	
Switching frequency	2 kHz to 10 kHz	
Rated output current @ 40 °C	2.5 Arms	4.2 Arms
Duty cycle	60 sec ON (60 starts/hr) Acceleration time: 5 sec Deceleration time: 5 sec 10% ED (for braking)	

Digital inputs specifications

	RVDS120055F	RVDS120075F
Number of inputs	5	
Topology	NPN, 24V (Internally supplied)	
Function	Configurable (FWD, REV, Pre-set speed reference, Alarm reset)	

STO input specifications

	RVDS120055F	RVDS120075F
Number of inputs	1	
Topology	Normally closed	
Function	Disables drive operation when contact is open Enables drive operation when contact is closed	

Digital output specifications

	RVDS120055F	RVDS120075F
Number of outputs	2	
Digital output 1 Topology	Electro-magnetic brake management Normally open (NO)	
Digital output 2 Topology	Alarm relay Changeover (NO, NC)	
Relay rating	2 Arms @ 230 VAC	

Communication interface

Protocol	Modbus (RTU)
Function code	0x03h: Read holding registers (Maximum: 8 registers per command) 0x06h: Write single holding register
Type	Bi-directional (static and dynamic variables and parameters)
Functions	Parameter configuration and update Real-time monitoring of electrical variables Frequency setpoint and run/stop command
Physical layer	RS485
Data format	Data bits: 8 Parity: none Stop bits: 1
Baud rate	9,600 bits/s to 38,400 bits/s. Default: 19,200 bits/s

Communication settings

Parameter	Register	Keypad parameter	Default value	Range
Device address	0x0401h	Y01	1	1 - 255
Baud rate	0x0404h	Y04	1: 19,200 bits/s	0 : 9,600 bits/s 1 :19,200 bits/s 2: 38,400 bits/s
Parity	0x0406h	Y06	No parity	3: No parity
Stop bits	0x0407h	Y07	1 stop bit	1: 1 bit

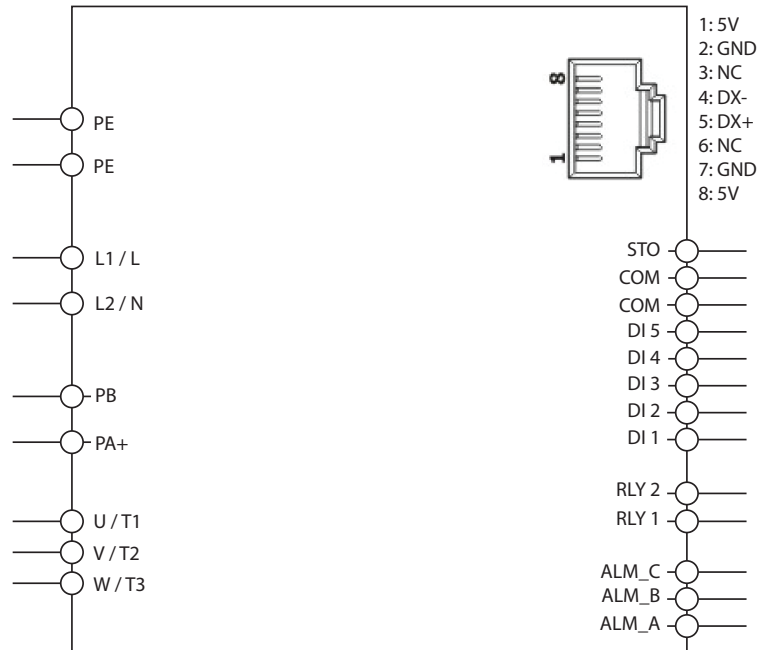
Performance

Current / power ratings: kW and HP @ 40 °C

Model	IEC rated current	Rated output power	
RVDS120055F	2.5 Arms	0.55 kW	0.75 HP
RVDS120075F	4.2 Arms	0.75 kW	1 HP

Connection diagrams

Terminal markings



Function	Terminal marking
Line connections	L1 / L, L2 / N
Load connections	U / T1, V / T2, W / T3
Modbus connections	RJ45 (see diagram for terminal assignment)
Functional ground	PE
External brake connection	PA+, PB
Relay output (fault indication)	ALM_A, ALM_B, ALM_C
Relay output (EM brake)	RLY1, RLY2
Digital inputs	DI1 to DI5, COM
Enable/disable input	STO, COM

Note (1): Use shielded cables. The cable shield must be connected to ground.

▶ Connection specifications

Function	Termination type	Wire dimensions	Stripping length
Line connections	Push-in	0.2 - 1.5 mm (26 - 16 AWG)	8 - 9 mm
Load connections			
Digital inputs			
Digital outputs			
Functional ground			
Modbus connection	RJ45	Not applicable	Not applicable

Notes

1) Use shielded cables. The cable shield must be connected to ground.

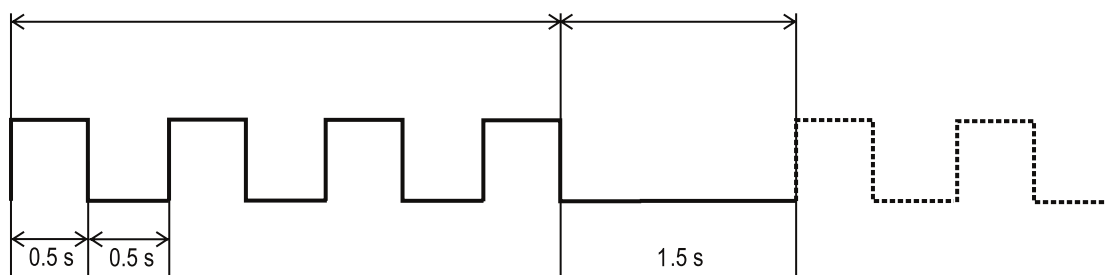
Troubleshooting



Alarms



The RVDS includes a number of diagnostics and protection alarms. Each of these alarms is signalled through a flashing sequence on the red LED according to the tables shown below.



The alarm code is available through the keypad function code (D02 [register: 0x0502]).



The last 4 alarms generated by RVDS are memorised in a FIFO alarm queue that can be accessed via the keypad function codes (D12 [register: 0x050C] to D15 [register: 0x050F]). The most recent alarm is stored in D12.







Number of flashes	1
Alarm code (on keypad)	Er8 or ErF
Alarm code (Modbus)	38 or 51
Alarm	Er8 (38): Modbus communications error ErF (51): Data saving error during under-voltage alarm
Alarm description	Er8 (38): Upon detection of an RS-485 communications error, the inverter stops its output. ErF (51): If the data could not be saved during activation of the under-voltage alarm, the inverter displays this alarm code.
Possible cause(s)	<ul style="list-style-type: none"> Er8: Loss or errors detected in the communication ErF: Under-voltage alarm active during data saving function
Reaction	Er8: Switch off output and activate alarm relay ErF: Alarm indication changes from under-voltage (LU) to data saving error (ErF). Inverter output should already be swithed off. Alarm relay will remain activated.
Action to recover alarm	<ul style="list-style-type: none"> Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active)
Troubleshooting	<ul style="list-style-type: none"> Er8: Check that there is a proper connection on the RJ45 terminals ErF: Check that the mains voltage level i within limits



Number of LED flashes	2
Alarm code (on keypad)	Er7
Alarm code (Modbus)	37
Alarm	Tuning error
Alarm description	The tuning error is triggered when the auto-tuning routine fails, is interrupted or an abnormal tuning result is detected during the tuning of motor parameters.
Possible cause(s)	•
Reaction	Switch off output and activate alarm relay
Action to recover alarm	<ul style="list-style-type: none"> Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active).
Troubleshooting	<ul style="list-style-type: none"> Check that the motor is properly connected to the inverter



Number of LED flashes	3
Alarm code (on keypad)	OU1, OU2, OU3, LU
Alarm code (Modbus)	6, 7, 8, 10
Alarm	OU1: Over-voltage (during acceleration) OU2: Over-voltage (during deceleration) OU3: Over-voltage (during steady state) LU: Under-voltage
Alarm description	OU1, OU2, OU3 ¹ : The over-voltage alarm is triggered when the inverter detects an over-voltage (> 400 VDC) in the DC link bus during acceleration (OU1), deceleration (OU2) or steady state operation (OU3). LU ² : The under-voltage alarm is triggered when the inverter detects a DC link bus voltage < 200 VDC. Note (1) : The over-voltage protection is not assured if excess AC line voltage is applied inadvertently. Note (2) : When function code F12 = 4 or 5, no alarm will be triggered even if the DC link bus is < 200 VDC.
Possible cause(s)	<ul style="list-style-type: none"> OU1: Ramp-up time setting is too short OU2: Ramp-down time setting is too short OU3: Over-voltage on the mains network
Reaction	Switch off output
Action to recover alarm	<ul style="list-style-type: none"> Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active).
Troubleshooting	<ul style="list-style-type: none"> Increase the acceleration and/or deceleration time Use an external brake resistor if the alarm OU2 keep on triggering even after a longer ramp-up time has been set OU3: check whether there are any surges on the mains network

Number of LED flashes	4
Alarm code (on keypad)	Err
Alarm code (Modbus)	254
Alarm	Mock alarm
Alarm description	The mock alarm is used to simulate the reaction and sequence of events generated by the inverter in case of an alarm. This alarm can be triggered by setting the parameter H30 [register: 0x031E] to value 1.
Possible cause(s)	<ul style="list-style-type: none"> This alarm is triggered intentionally by the user to check the correct sequence of events in case of an alarm generated by the inverter.
Reaction	When this alarm is triggered, Err will be displayed on the keypad screen (if available). The register 0x0502 will change to value 254 accordingly. The alarm relay is also activated to indicate the alarm condition.
Action to recover alarm	<ul style="list-style-type: none"> Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active).
Troubleshooting	<ul style="list-style-type: none"> Not applicable



Number of LED flashes	5
Alarm code (on keypad)	OC1, OC2, OC3
Alarm code (Modbus)	1, 2, 3
Alarm	OC1: Instantaneous over-current (during acceleration) OC2: Instantaneous over-current (during deceleration) OC3: Instantaneous over-current (during steady state)
Alarm description	<p>This alarm is triggered in case of over-current resulting from:</p> <ul style="list-style-type: none"> overload condition short circuit in the output circuit ground fault in the output circuit <p>Note: This function is effective only when the inverter is in Run state.</p>
Possible cause(s)	<ul style="list-style-type: none"> OC1: Acceleration time too short / too fast change in speed OC2: Deceleration time too short / too fast change in speed OC1, OC2, OC3: Motor is over-sized for the inverter
Reaction	Switch off output
Action to recover alarm	<ul style="list-style-type: none"> Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active).
Troubleshooting	<ul style="list-style-type: none"> OC1, OC2: Extend the acceleration and/or the deceleration time OC3: Monitor the measured motor current during operation to check whether the current absorbed by the motor (especially at speeds > 50 Hz) is larger than the maximum current allowed by the inverter

Number of LED flashes	7
Alarm code (on keypad)	OH1
Alarm code (Modbus)	17
Alarm	Heatsink overheated
Alarm description	This alarm is triggered when the inverter detects an excess temperature on the heatsink
Possible cause(s)	<ul style="list-style-type: none"> • Too many starts per hour (duty cycle exceeded) • Acceleration time is too long • Deceleration time is too long • Overload condition
Reaction	Switch off output
Action to recover alarm	<ul style="list-style-type: none"> • Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. • Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active).
Troubleshooting	<ul style="list-style-type: none"> • Reduce the acceleration and/or deceleration time • Check that the maximum number of starts/hr (60 / hr) is not exceeded • Check surrounding temperature

Number of LED flashes	8
Alarm code (on keypad)	dbH, OL1, OLU
Alarm code (Modbus)	22, 23, 25
Alarm	dbH: Braking resistor overheated OL1: Motor overload OLU: Inverter overload
Alarm description	<p>dbH: This function protects the braking resistor from overheat according to the setting of the electronic thermal overload relay for the braking resistor.</p> <p>OL1: This alarm is triggered according to the setting of the electronic thermal overload relay to protect the motor. The operation level and thermal time constant can be configured.</p> <p>OLU: This alarm is triggered when the inverter heatsink temperature and the power unit temperature limits is exceeded.</p>
Possible cause(s)	<ul style="list-style-type: none"> • Too many starts per hour (duty cycle exceeded) • Overload condition
Reaction	Switch off output
Action to recover alarm	<ul style="list-style-type: none"> • Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. • Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active).
Troubleshooting	<ul style="list-style-type: none"> • OL1: Check that the parameter P02 [register: 0x0202] for motor rated current is of the correct value • OLU: Check that the surrounding temperature around the inverter is within limits

Number of LED flashes	9
Alarm code (on keypad)	OPL
Alarm code (Modbus)	46
Alarm	Output phase loss
Alarm description	This alarm is triggered when the inverter detects a fault in the output wiring during active states (running, acceleration and deceleration)
Possible cause(s)	<ul style="list-style-type: none"> • Loose connection on the load terminals U, V, W • Faulty motor winding
Reaction	Switch off output
Action to recover alarm	<ul style="list-style-type: none"> • Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. • Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active).
Troubleshooting	<ul style="list-style-type: none"> • Check motor connections on the inverter • Measure the motor coils resistance

Number of LED flashes	10
Alarm code (on keypad)	STO
Alarm code (Modbus)	61
Alarm	Safe torque off (STO)
Alarm description	This alarm is triggered when the connection between STO and COM is interrupted
Possible cause(s)	<ul style="list-style-type: none"> • Bridging wire between STO and COM terminal not connected properly • STO input not active
Reaction	Switch off output
Action to recover alarm	<ul style="list-style-type: none"> • Activate the STO input • If STO input is not used, make sure that STO and adjacent COM terminal are at the same potential (bridged)
Troubleshooting	<ul style="list-style-type: none"> • Check that the connection STO and COM is bridged or that the input to the STO is in closed position

Number of LED flashes	Fully ON
Alarm code (on keypad)	Er1, Er3
Alarm code (Modbus)	31, 33
Alarm	Er1: Memory error Er3: CPU error
Alarm description	The inverter checks memory data after power-on and during a data write operation. If a memory error is detected, Er1 will be triggered. Er3 is triggered if the inverter detects a CPU error caused by external noise/interference.
Possible cause(s)	<ul style="list-style-type: none"> • External noise in close proximity to the inverter • Use of unshielded cables
Reaction	Switch off output
Action to recover alarm	<ul style="list-style-type: none"> • Go to function code H19 [register: 0x0314] and set the value to 1. This action will clear the alarm. Note: To change the value in H19, press the  key +  key simultaneously. • Depending on the parameter setting for Retry function, the inverter will automatically reset and restart (if the Run command is active).
Troubleshooting	<ul style="list-style-type: none"> • Make sure that power cables are not in close proximity of the communication line and/or digital inputs • Ensure that cable shield is connected to ground • Connect the PE terminal to ground