



## Quick Start Guide 3G3MX2

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# 01 General remarks

## 01.1 Notice

This document is only a quick start guide for the MX2 frequency inverter, and therefore it has no claim to be complete. The document is only intended for the proper commissioning of the frequency inverter. The safety instructions can be found in the MX2 operating manual. The 3G3MX2-E is replaced by the 3G3MX2-EV2. The quick start guide covers both frequency inverters, and all changes are summarized at the end of the document. The 3G3MX2-HF continues to be available.

## 01.2 Limitation of liability

SPINOGY doesn't assume liability for personal injuries, material damages, damages caused to the device and consequential damages caused by failure to follow this quick start guide, improper use of the device, repairs or any other actions done by non-qualified workers on the device or damages on this unit occur or occurred by using unauthorized non-approved spare parts.

## 01.3 Product name

This quick start guide is intended for the spindles of the following type:

<b>Product name:</b>	3G3MX2
<b>Types:</b>	E, EV2, HF

## 01.4 Labeling of the frequency inverter MX2

The Omron MX2 inverters are equipped with product labels on the right side of the housing, as pictured below. It must be ensured that the technical data on the label is compatible to the network supply and the safety requirements of the application.



## 02 Technical description

### 02.1 Product overview

Input	Type	ND-mode		HD-Mode	
		Rated current (A)	Motor output (kW)	Rated current (A)	Motor output (kW)
1 x 230 V	MX2-AB007	6,0	1,1	5,0	0,75
	MX2-AB015	9,6	2,2	8,0	1,5
	MX2-AB022	12,0	3,0	11,0	2,2
3 x 400 V	MX2-A4004	2,1	0,75	1,8	0,4
	MX2-A4007	4,1	1,5	3,4	0,75
	MX2-A4015	5,4	2,2	4,8	1,5
	MX2-A4022	6,9	3,0	5,5	2,2
	MX2-A4030	8,8	4,0	7,2	3,0
	MX2-A4040	11,1	5,5	9,2	4,0
	MX2-A4055	17,5	7,5	14,8	5,5
	MX2-A4075	23,0	11,0	18,0	7,5

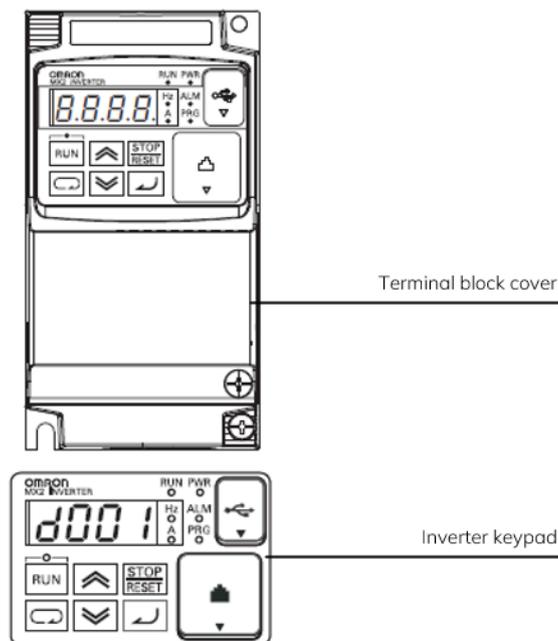
### 02.2 Technical data

Item	General specifications		
Protective housing	IP20		
Control method	Sinusoidal Pulse Width Modulation (PWM) control		
Carrier frequency	2 kHz to 15 kHz (derating required depending on the model)		
Output frequency range	0,1 to 1000 Hz		
Frequency accuracy	Digital command: 0.01% of the maximum frequency Analog command: 0.2% of the maximum frequency (25°C ±10°C)		
Frequency setting resolution	Digital: 0,01 Hz; Analog: max. Frequenz/400		
Volt./Freq. characteristic	V/f control (constant torque, reduced torque, free-V/F): base freq. 30 Hz to 1000 Hz adjustable Sensorless vector control, Closed loop control with motor encoder feedback: base freq. 30 Hz ~ 400 Hz adjustable		
Overload capacity	Dual rating: HD (heavy duty) : 60 s @ 150 % ND (Normal duty) : 60 s @120 %		
Acceleration/deceleration time	0.01 to 3600 seconds, linear and S-curve accel/decel,2. Einstellung für second accel/decel setting available		
Starting torque	200 % @ 0,5 Hz (sensorless vector control)		
Input signal	Freq. setting	Operator panel	Up and Down keys / Value settings
		External signal	0 to 10 VDC (input impedance 10 k Ohms), 4 to 20 mA (input impedance 100 Ohms), Potentiometer (1 k to 2 k Ohms, 2 W)
		Via network	RS485 ModBus RTU, other network option
	FWD/REV run	Operator panel	Run/Stop (Forward/Reverse run change by command)
		External signal	Forward run/stop, Reverse run/stop
		Via network	RS485 ModBus RTU, other network option
	Intelligent input terminal Seven terminals, sink/source		

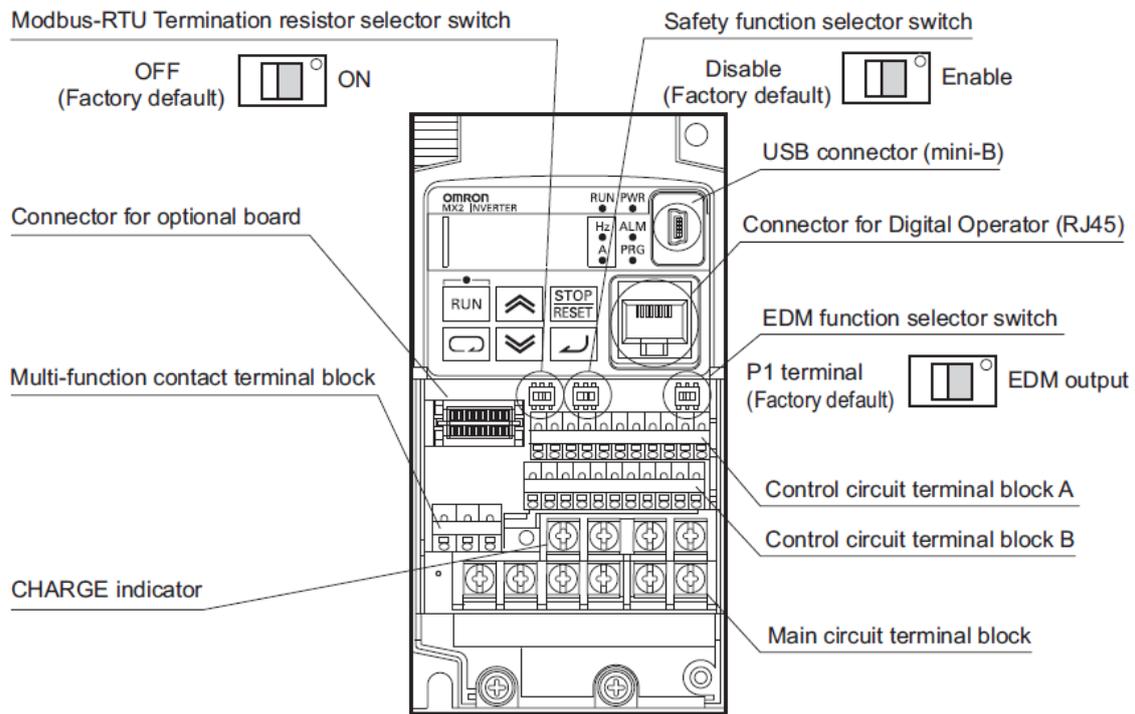
	changeable by a short bar 68 functions assignable	
Output signal	Intelligent output terminal 48 functions assignable	
	Monitor output (analog)	
	Pulse train output (0~10 Vdc, 32 kHz max.)	
Alarm output contact	ON for inverter alarm (1c contacts, both normally open or closed available.)	
Operating environment	Temperature	Operating (ambient): -10 to 50°C / Storage: -20 to 65°C
	Humidity	20 to 90% humidity (non-condensing)
	Vibration	5,9 m/s <sup>2</sup> (0,6 G), 10 to 55 Hz
	Location	Altitude 1,000m or less, indoors (no corrosive gasses or dust)

## 02.3 Construction of the 3G3MX2

The following figure shows the basic structure of the 3G3MX2 frequency inverter.



The following figure shows the designation of the parts inside the terminal block cover.

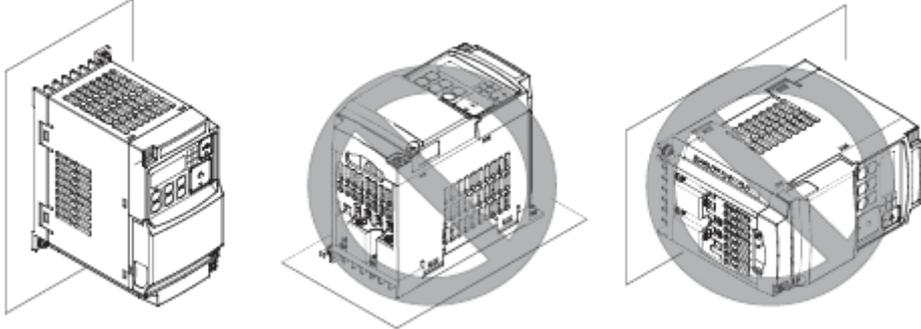


Name	Description
Modbus-RTU Termination resistor selector switch	Use this Terminal Resistor selector switch for RS-485 terminals on the control circuit terminal block. When this switch is turned ON, the internal 200 Ω Resistor is connected.
Safety function selector switch	Turn this switch ON when using the safety function. Turn OFF the power before turning this switch ON/OFF.
EDM function selector switch	Turn this switch ON when using the EDM output of the safety function. Turn OFF the power cable before turning this switch ON/OFF.
USB connector	Use this mini-B USB connector to connect a PC. Even when the Inverter is being operated by a PC, etc., via USB connection, it can still be operated using the Digital Operator.
Connector for Digital Operator	Use this connector to connect the Digital Operator.
Connector for optional board	Use this connector to mount the optional board. (The optional board will be released soon.)
Control circuit terminal blocks A and B	These terminal blocks are used to connect various digital/analog input and output signals for inverter control.
Multi-function contact terminal block	Use this SPDT contact terminal block for relay outputs.
Main circuit terminal block	Use this terminal block to connect an output to the motor and Braking Resistor, etc. Also, use this terminal block to connect the inverter to the main power supply.
CHARGE indicator (Charge indicator LED)	This LED indicator is lit if the DC voltage of the main circuit (between terminals P/+2 and N/-) remains approx. 45 V or above after the power has been cut off. Before wiring, etc. confirm that the Charge LED indicator is turned OFF.

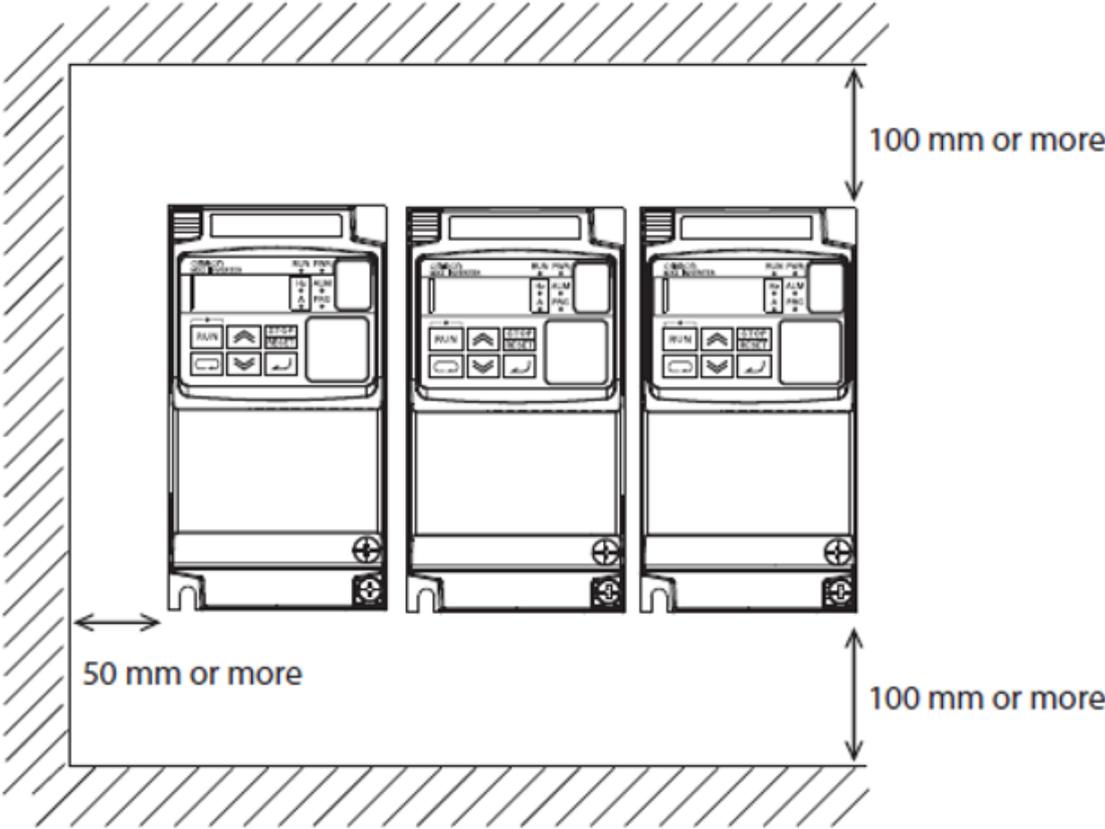
# 03 Installation

## 03.1 Mounting of the 3G3MX2

The frequency inverter is intended for vertical wall mounting. The frequency inverter must be installed on a wall surface made of non-flammable material (e.g. metal).



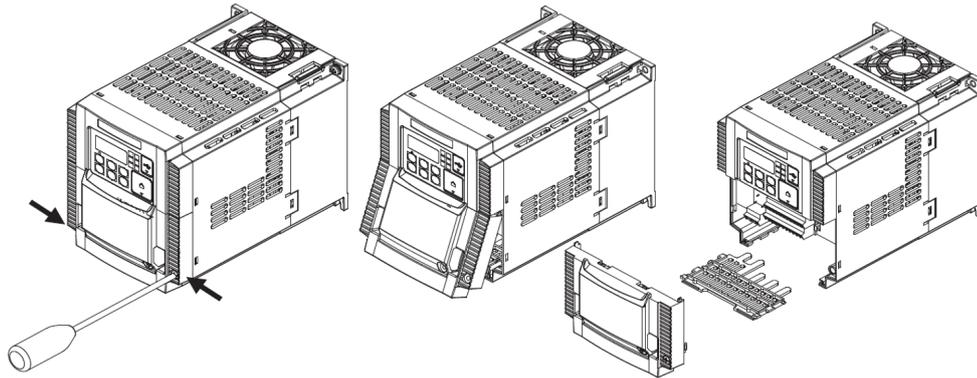
The following mounting distances to other components must be observed to ensure sufficient ventilation.



## 03.2 Installation/removal method of the terminal block cover

Disassemble the terminal block cover in the following steps:

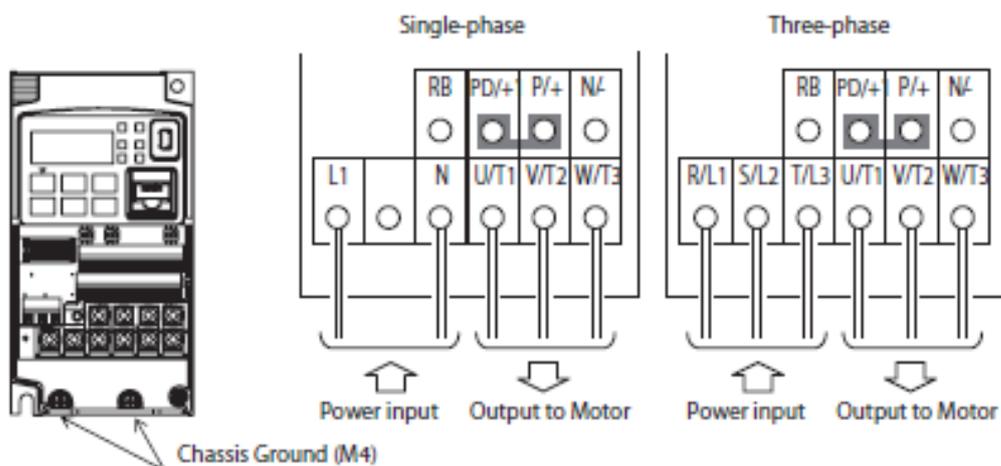
1. Loosen the screw(s) securing the terminal block cover.
2. Press the terminal block cover in the direction of the arrow and lift it down to remove it.



## 03.3 Wiring of the 3G3MX2

### Power connections

Initially, it must be determined whether the frequency inverter used requires a three-phase power supply only with terminals [R/L1], [S/L2] and [T/L3] or a single-phase power supply only with terminals [L1] and [N]. The corresponding connections can be seen in the figure below.



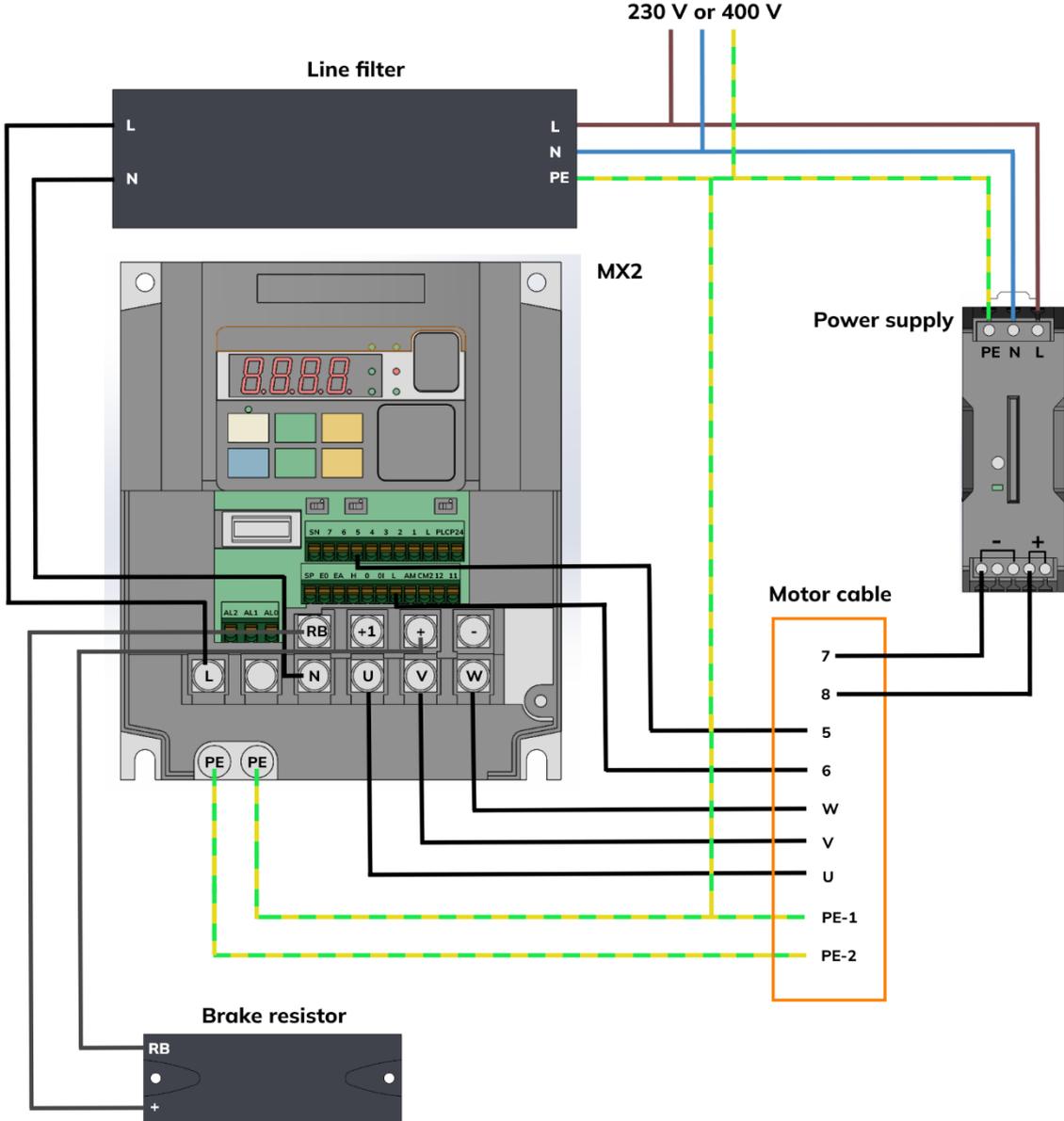
### WARNING: Do not connect AC voltage to output terminals

It must be ensured that no AC voltage is connected to the output terminals. Otherwise, the inverter may be damaged and there is a risk of injury and/or fire.

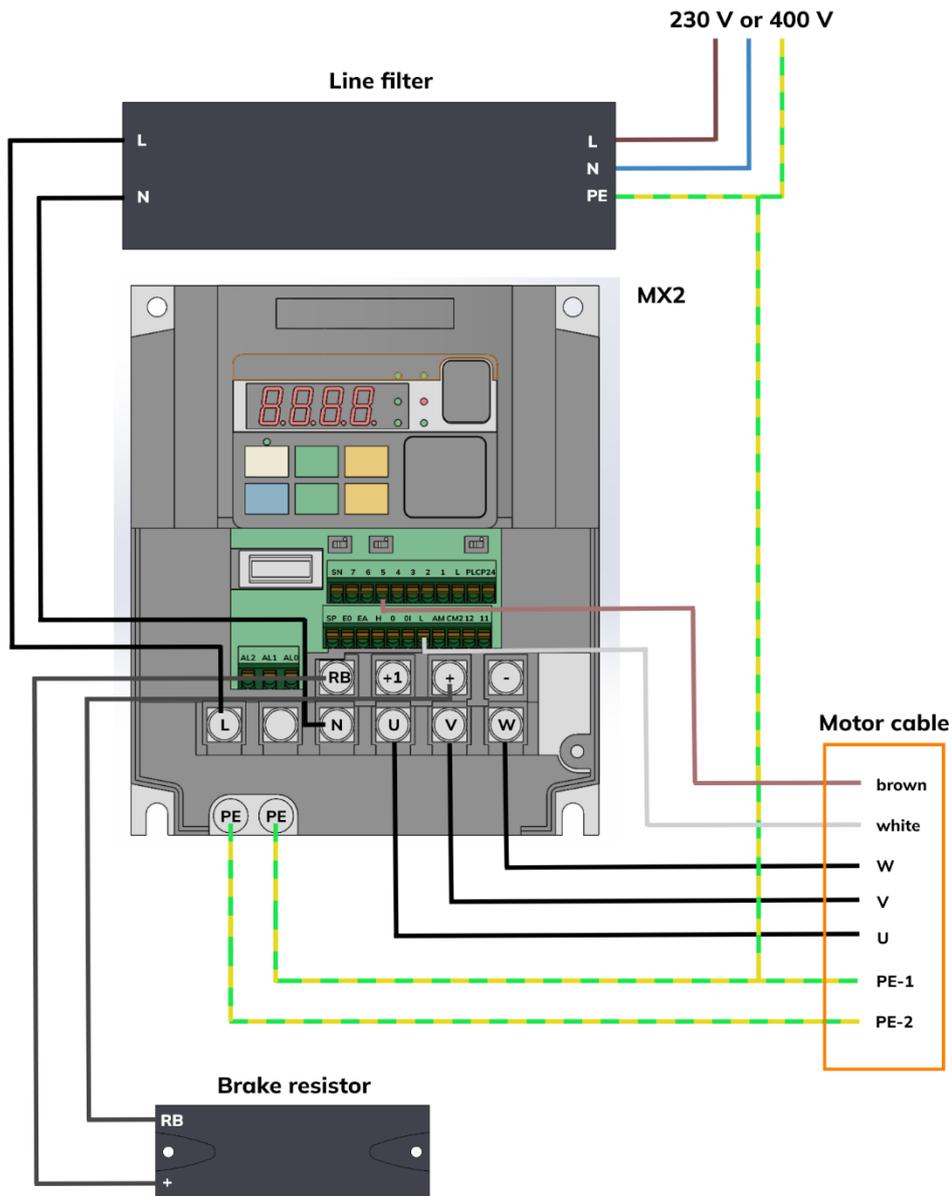


### 03.4 Wiring of the SPINOGY X22/X30 to the MX2

Circuit diagram SPINOGY X22 | X30 air-cooled

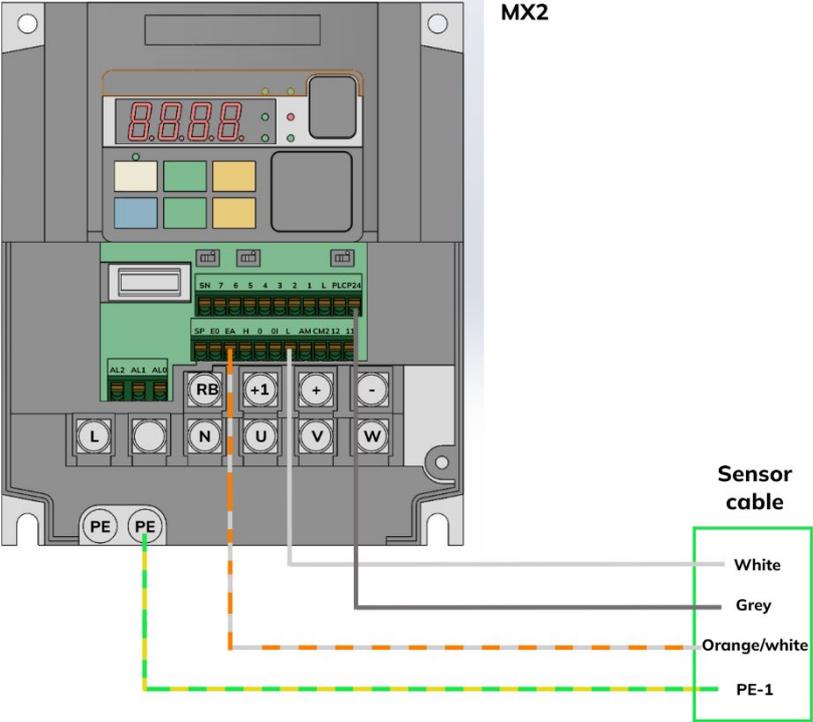


# Circuit diagram SPINOGY X22 | X30 liquid-cooled



### Connection diagram inductive rotational speed control

For all spindles equipped with the inductive rotational speed control option (CG104), the sensor cable must also be connected to the frequency converter.



The sensor can be deactivated (24V at terminal 6) or activated (0V at terminal 6) via terminal 6. This is only possible if the inverter is not in RUN mode. The sensor must be deactivated at speeds above 6,000 rpm.

# 04 Commissioning

## 04.1 Power-up test

After wiring the frequency inverter and motor, the power-up test follows. The procedure that follows is designed for the first-time use of the drive. Please verify the following conditions before conducting the power-up test:

- The inverter is new, and is securely mounted to a non-flammable vertical surface.
- The inverter is connected to a power source and a motor.
- No additional wiring of the inverter connectors or terminals has been done.
- The motor is securely mounted, and is not connected to any load.

### Powering the inverter

After switching on the inverter, the following events should occur:

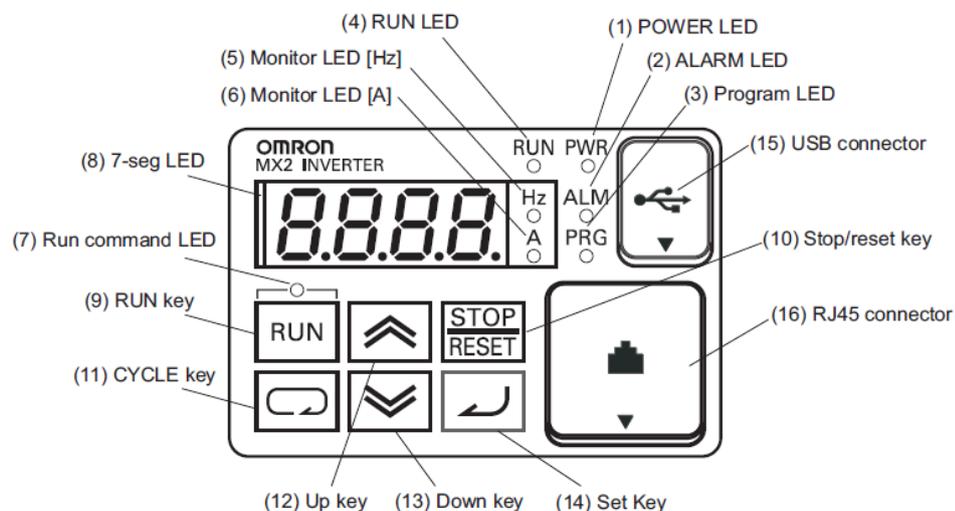
- The POWER LED will illuminate.
- The numeric (7-segment) LEDs will display a test pattern, then stop at 0.0.
- The Hz LED will be ON..

If the motor starts running unexpectedly or any other problem occurs, press the STOP key. Only if necessary, should you remove power to the inverter as a remedy.

**Note:** If an already programmed frequency inverter was purchased, the LEDs may illuminate differently than as indicated above.

## 04.2 Using the front panel keypad

The display is used for programming the inverter's parameters, as well as monitoring specific parameter values during operation.



Items	Contents
(1) POWER LED	Turns ON (Green) while the inverter is powered up.
(2) ALARM LED	Turns ON (Red) when the inverter trips.
(3) Programm LED	<ul style="list-style-type: none"> <li>· Turns ON (Green) when the display shows changeable parameter.</li> <li>· Blinks when there is a mismatch in setting.</li> </ul>
(4) RUN LED	Turns ON (Green) when the inverter is driving the motor.
(5) Monitor LED [Hz]	Turns ON (Green) when the displayed data is current related.
(6) Monitor LED [A]	Turns ON (Green) when the displayed data is current related.
(7) RUN command LED	Turns ON (Green) when a Run command is set to the operator. (Run key is effective.)
(8) 7-seg LED	Shows each parameter, monitors etc.
(9) RUN key	Makes inverter run.
(10) STOP/RESET key	<ul style="list-style-type: none"> <li>· Makes inverter decelerates to a stop.</li> <li>· Reset the inverter when it is in trip situation.</li> </ul>
(11) CYCLE key	<ul style="list-style-type: none"> <li>· Go to the top of next function group, when a function mode is shown.</li> <li>· Cancel the setting and return to the function code, when a data is shown.</li> <li>· Moves the cursor to a digit left, when it is in digit-to-digit setting mode.</li> <li>· Pressing for 1 second leads to display data of d001, regardless of current display.</li> </ul>
(12) Up key (13) Down key	<ul style="list-style-type: none"> <li>· Increase or decrease the data.</li> <li>· Pressing the both keys at the same time gives you the digit-to-digit edit.</li> </ul>
(14) SET key	<ul style="list-style-type: none"> <li>Go to the data display mode when a function code is shown.</li> <li>· Stores the data and go back to show the function code, when data is shown.</li> <li>· Moves the cursor to a digit right, when it is in digit-to-digit display mode.</li> </ul>
(15) USB connector	Connect USB connector (mini-B) for using PC communication.
(16) RJ45 connector	Connect RJ45 jack for remote operator.

## 04.3 Function groups of the parameters

The parameters are divided into individual function groups. The term function applies to both monitoring modes and parameters. These are all accessible through function codes that are primary 4-character codes. The various functions are separated into related groups identifiable by the left-most character, as the table shows.

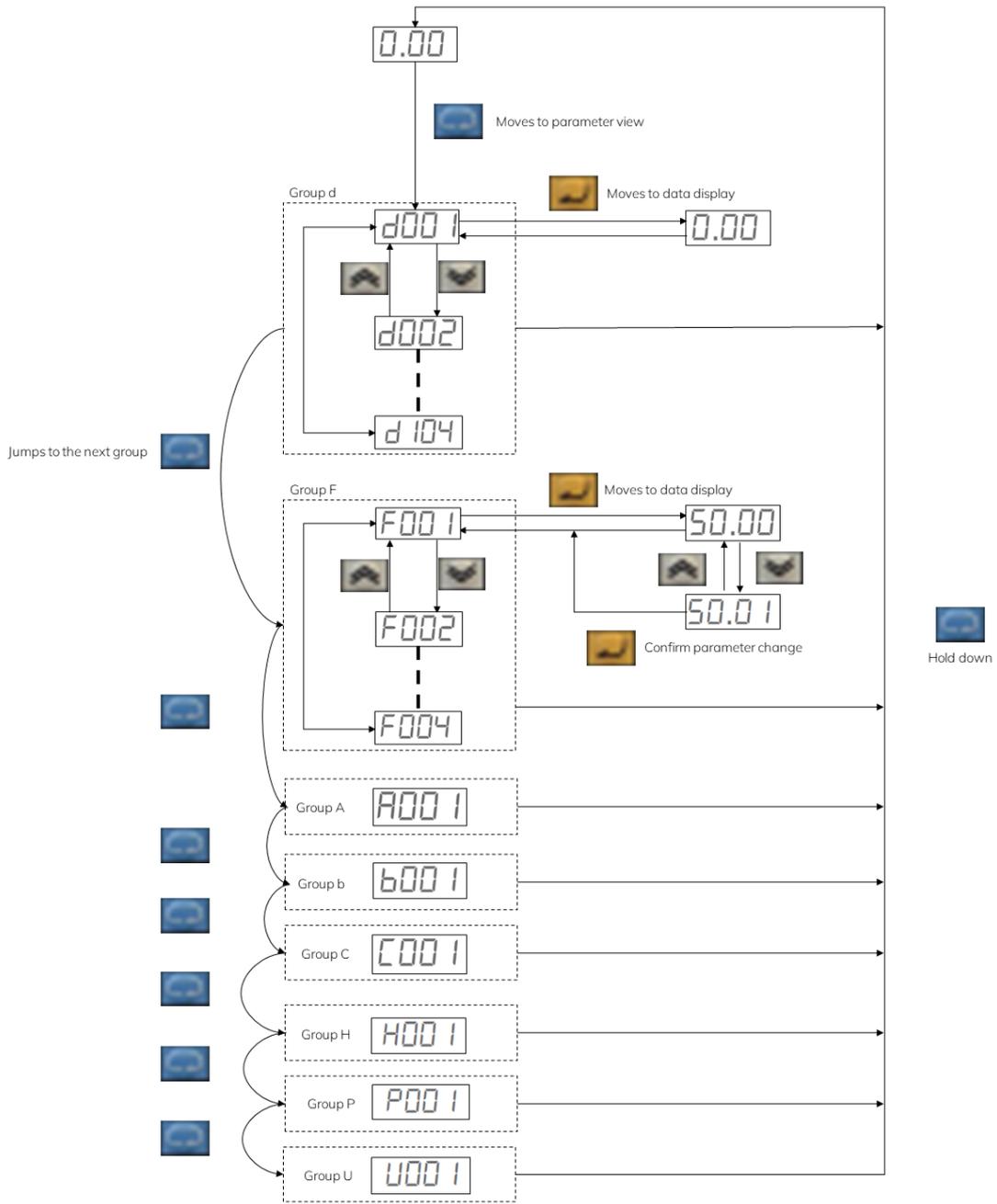
Function group	Type (category) of function	Mode to access
d	Monitoring functions	Monitor
F	Main profile parameters	Program
A	Standard functions	Program
b	Fine tuning functions	Program
C	Intelligent terminal functions	Program
H	Motor constant related functions	Program
P	Pulse train input, torque, Drive Programming, and communication related functions	Program
U	User selected parameters	Program
E	Error codes	-

## 04.4 Keypad navigation map

The programming of the MX2 can be done via the keypad. Only the following keys on the front keypad are required for programming:

	CYCLE key
	SET key
	Up key
	Down key

The following figure explains the procedure for navigating through the function groups and their parameters, as well as setting parameters.



## 04.5 Important parameters

The parameters for operating a SPINOGY spindle can be taken from the corresponding parameter list (available from SPINOGY). This includes a useful selection of the respective parameters. In case one of the parameters should be programmed differently, the following table lists the most important parameters with the respective option possibility. In addition, these parameters must be programmed before starting the spindle for the first time, if an unprogrammed frequency converter has been purchased from SPINOGY.

### Base parameters

Func. code	Name	Description
A001	Frequency reference selection	Eight options; select codes: 00 ... VR (Digital Operator) 01 ...Terminal 02 ...Operator (F001) 03 ...ModBus (RS485) 04 ...Option 06 ...Pulse train frequency 07...EzSQ (Drive programming) 10...Math (operator function result)
A002	Run command selection	Five options; select codes: 01 ...Terminal 02 ...Operator (F001) 03 ...ModBus (RS485) 04 ...Option
A003	Base frequency	See type plate spindle
A004	Maximum frequency	
B012	Rated current	
F001	Output frequency setting/monitor	Standard default target frequency that determines constant motor speed, range is 0.0 / start frequency to maximum frequency (A004)
F002	Acceleration time	0,00 bis 3600,00
F003	Deceleration time	
H004	Motor pole number selection	See type plate spindle

### Parameters for braking resistor

The following parameters must be set when using an external braking resistor. The parameters can be taken from the parameter list when using a SPINOGY braking resistor or must be set according to the specifications of the braking resistor used.

Func. code	Name	Description
B090	Usage rate of regenerative braking function	Selects the rate of use (in %) of the regenerative braking resistor per 100 sec. intervals, range is 0.0 to 10.0%. 0%: Function disabled
B095	Regenerative braking function operation selection	Three option codes: 00 OFF (Disabled) 01 RUN-ON (Enabled) (Disabled during stop) 02 Alws-ON (Enabled during stop)
B097	BRD resistor	Ohmic value of the braking resistor connected to the drive 100.0 to 600.0 $\Omega$

## Parameters for DC-Brake

Compared to the normal deceleration to stop, the DC braking function provides additional stopping torque. This setting is recommended by SPINOGY because in case of an emergency stop, the spindle is decelerated faster.

Func. code	Name	Description
A051	DC injection braking selection	Three options, select codes: 00... OFF (Disabled) 01... ON (Enabled) 02... ON (Freq.) (Frequency control [A052])

## Parameters for PTC-Thermistor

SPINOGY spindles are equipped with a PTC in the base configuration. To parameterize this in the frequency inverter, the following values are necessary.

Func. code	Name	Description
C005	Multi-function input [5] [PTC assignable]	19: PTC-Thermistor
C085	Thermistor adjustment	Scale factor of PTC input. Range is 0.0 to 200.0%

## 04.6 First operation of the spindle

When the basic parameters have been programmed and the spindle has been properly connected, the entire system is ready for use. To start a first test run via the keypad, parameter A001 must be set to the value 02 and parameter A002 must also be set to the value 02. The following steps must be carried out for the first spindle start:

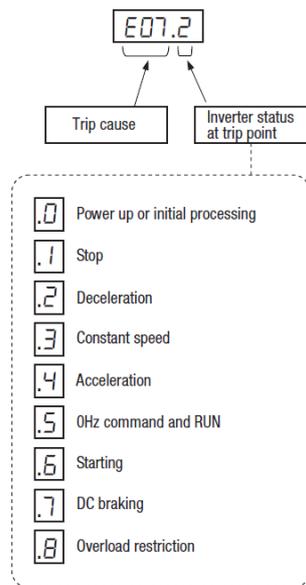
01. Verify the power LED is ON. If not, check the power connections.
02. Verify the Run Key Enable LED is ON. If it is OFF, check the A002 setting.
03. Make sure the spindle is disconnected from any mechanical load.
04. Parameter F001 must be called up and checked whether it shows 0.00. If not, press the key  to decrease the value.
05. Now the RUN key on the keypad can be pressed. The "RUN" LED lights up.
06. The key  must be pressed for a few seconds. The motor should start.
07. Press the STOP key to stop the motor rotation.

# 05 Troubleshooting

This chapter gives a brief overview of possible errors and their causes that may occur during operation with the MX2 frequency inverter. For a detailed explanation, refer to OMRON's MX2 Operation Manual.

## 05.1 Error codes

An error code will appear on the display automatically when a fault causes the inverter to trip. An error is represented in the following form.



The following table lists the error codes, their designation and the causes of each error.

Error Code	Name	Cause(s)
E01	Over-current event while at constant speed	The inverter output was short-circuited, or the motor shaft is locked or has a heavy load. These conditions cause excessive current for the inverter, so the inverter output is turned OFF. The dual-voltage motor is wired incorrectly.
E02	Over-current event during deceleration	
E03	Over-current event during acceleration	
E04	Over-current event during other conditions	
E05	Motor overload protection	When a motor overload is detected by the electronic thermal function, the inverter trips and turns OFF its output. Check that the thermal model is properly set in parameter b012, b013, b910, b911 and b912. Check if the application can accept softer acceleration rates to minimize peak currents F002/F202/A092/A292. Check if motor parameters are not correctly set (H020 to H034 or H005), depending in motor control method (A044/A244).

E06	Braking resistor overload protection	When the BRD operation rate exceeds the setting of "b090", this protective function shuts off the inverter output and displays the error code.
E07	Over-voltage protection	When the DC bus voltage exceeds a threshold, due to regenerative energy from the motor.
E08	EEPROM error	When the built-in EEPROM memory has problems due to noise or excessive temperature, the inverter trips and turns OFF its output to the motor.
E09	Under-voltage error	A decrease of internal DC bus voltage below a threshold results in a control circuit fault. This condition can also generate excessive motor heat or cause low torque. The inverter trips and turns OFF its output.
E10	Current detection error	If an error occurs in the internal current detection system, the inverter will shut off its output and display the error code.
E11	CPU error	A malfunction in the built-in CPU has occurred, so the inverter trips and turns OFF its output to the motor.
E12	External trip	A signal on an intelligent input terminal configured as EXT has occurred. The inverter trips and turns OFF the output to the motor.
E13	USP	When the Unattended Start Protection (USP) is enabled, an error occurred when power is applied while a Run signal is present. The inverter trips and does not go into Run Mode until the error is cleared.
E14	Ground fault	The inverter is protected by the detection of ground faults between the inverter output and the motor upon during powerup tests. This feature protects the inverter, and does not protect humans.

E15	Input over-voltage	The inverter tests for input over-voltage after the inverter has been in Stop Mode for 100 seconds. If an over-voltage condition exists, the inverter enters a fault state. After the fault is cleared, the inverter can enter Run Mode again.
E21	Inverter thermal trip	When the inverter internal temperature is above the threshold, the thermal sensor in the inverter module detects the excessive temperature of the power devices and trips, turning the inverter output OFF.
E22	CPU communication error	When communication between two CPU fails, inverter trips and displays the error code.
E25	Main circuit error	The inverter will trip if the power supply establishment is not recognized because of a malfunction due to noise or damage to the main circuit element.
E30	Driver error	If instantaneous overcurrent occurs the Inverter will shut off IGBT's output to protect the main circuit element. After tripping due this protective function the inverter cannot retry the operation.
E35	Thermistor	When a thermistor is connected to terminals [5] and [L] and the inverter has sensed the temperature is too high, the inverter trips and turns OFF the output.
E36	Braking error	When "01" has been specified for the Brake Control Selection (b120), the inverter will trip if it cannot receive the braking confirmation signal within the Brake Wait Time for Confirmation (b124) after the output of the brake release signal. Or when the output current doesn't reach the brake release current (b126) during the brake wait time for release (b121)
E37	Safe Stop	Safe stop signal is given.
E38	Low-speed overload protection	If overload occurs during the motor operation at a very low speed, the inverter will detect the overload and shut off the inverter output.

E40	Operator connection	When the connection between inverter and operator keypad failed, inverter trips and displays the error code.
E41	Modbus communication error	When "trip" is selected (C076=00) as a behavior in case of communication error, inverter trips when timeout happens.
E43	Drive Programming invalid instruction	The program stored in inverter memory has been destroyed, or the PRG terminal was turned on without a program downloaded to the inverter.
E44	Drive Programming nesting count error	Subroutines, if-statement, or for-next loop are nested in more than eight layers
E45	Drive Programming instruction error	Inverter found the command which cannot be executed.
E50 bis E59	Drive Programming user trip (0 to 9)	When user -defined trip happens, inverter trips and displays the error code.
E60 bis E69	Option errors (error in connected option board, the meanings change upon the connected option).	These errors are reserved for the option board. Each option board can show the errors for a different meaning .. To check the specific meaning, please refer to the corresponding option board user manual and documentation.
E80	Encoder disconnection	If the encoder wiring is disconnected, an encoder connection error is detected, the encoder fails, or an encoder that does not support line driver output is used, the inverter will shut off its output and display the error code shown on the right.
E81	Excessive speed	If the motor speed rises to "maximum frequency (A004) x overspeed error detection level (P026)" or more, the inverter will shut off its output and display the error code shown on the right.
E83	Positioning range error	If current position exceeds the position range specification (P072-P073), the inverter will shut off its output and display the error code.

It is recommended not to acknowledge an error until the cause of the error has been found, to avoid greater damage. If the cause is not found, please contact SPINOGY.

An error can be acknowledged by pressing the STOP/RESET key, and the frequency inverter can be reset to the initial state.

## 05.2 Restoring factory settings

The MX2 frequency inverter can be reset to the original factory/default settings. To initialize the inverter, follow the steps below.

01. Select initialization mode in b084.
02. If b084 = 02, 03 or 04, select initialization target data in b094.
03. If b084 = 02, 03 or 04, select country code in b085.
04. Set 01 in b180.
05. After successful initialization, the display jumps to d001.

Func. code	Name	Description
b084	Initialization selection	Select initialized data, five option codes: <ul style="list-style-type: none"> <li>• 00 no (Clears the trip monitor)</li> <li>• 01 Trip data (Initializes data)</li> <li>• 02 Parameters (Clears the trip monitor and initializes data)</li> <li>• 03 Trip+Param (Clears the trip monitor and parameters)</li> <li>• 04 Trp+Prm+EzSQ (Clears the trip monitor, parameters and Drive program)</li> </ul>
b094	Initialization target data	Select initialized parameters, four option codes: <ul style="list-style-type: none"> <li>• 00 All</li> <li>• 01 All parameters with the exception of input/output terminals and communication</li> <li>• 02 Only parameters registered in U***</li> <li>• 03 All parameters except those registered in U*** and b037</li> </ul>
b085	Initialization parameter selection	Select initial data for initialization: <ul style="list-style-type: none"> <li>• 00 JPN</li> <li>• 01 EUR</li> </ul>
b180	Initialize trigger	This is to perform initialization by parameter input with b084, b085 and b094. Two option codes: 00 No action 01 Initialize

## 06 Product changes

The 3G3MX2-E is being replaced by the 3G3MX2-EV2. The changes are summarized briefly below:

01. The installation depth increases by 10 mm when the EtherCAT option card is installed.
02. The GS1 and GS2 safety inputs have been added. Multifunction inputs 3 and 4 are no longer used for the safety function.
03. The output frequency range has been extended to 0.01 to 590 Hz.
04. The 3G3MX2-EV2 can be operated using the jog dial. All descriptions in the quick start guide that include   are replaced by the jog dial.
05. The display on the 3G3MX2-EV2 has been expanded to 5 digits.
06. Several parameters have been changed or newly added. These have no effect on the operation of SPINOGY spindles.

For detailed information, please contact SPINOGY

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