

Star-delta controller

Motor starter controller for efficient start-up



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Project: 131203

Version overview

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1 Introduction

The star-delta controller in the standard version mainly starts motors from 4kW to 22kW, such as agitators, fans, pumps, etc., to minimise power surges when these are switched on. The motor is started manually via a rotary switch on the controller cabinet or via an external input, which can be selected via the operating selector switch. Via this input, the engine can be turned automatically on and off using a timer or a radio remote control.

The controller was purposely built into a large 300 x 300 x 280mm housing, so that additional customer requests or retrofits are possible without much effort.

The star-delta controller starts the motor in a two-stage process and protects it against overload by means of a thermocouple. Additional monitoring and features are available as options.

The controller is equipped with a lockable main switch according to the requirements of Machinery Directive 2006/42/EC and complies with the latest European standards (CE).

2 Operating conditions

Mains supply voltage	AC 400V +/- 10%
Supply frequency	50Hz +/- 3%
Connection standard controller	3L + PE (neutral is required only when using options such as timer, hour counter, etc.)
Supported engine type	3-phase asynchronous squirrel cage motor
Supported motor power	Depending on the product type from 4 to 22kW. Please check the corresponding type plate
Degree of protection complete	IP54 (protection against splashes of water on all sides)
Start-up cycles	Do not turn on/off more than 12 times per hour
Operating temperature	-15°C - +50°C
Relative humidity	90% without frost

3 Safety information



The installation, service and settings of the controller may only be carried out by electrically trained personnel.
It is imperative that all installation and safety standards are adhered to.



Before activation, check the receiver type plate to see if the correct operating voltage is used in terms of power and voltage.



The control box may only be opened when de-energised.
Therefore, never work on the terminals or on the controller under voltage!



Never wash out the device with water or clean it with a high-pressure hose.



The star-delta controller must NEVER be operated unearthed.



In an emergency, the controller can be switched off and de-energised via the "SOFORT" main switch.



The star-delta controller must NOT be used for safety-critical applications where a defect or malfunction of the product may endanger persons or cause material damage.

4 Intended use

The controller may only be used for starting asynchronous motors.



This product must **NOT** be used for safety-critical applications where a defect or malfunction of the product may endanger persons or cause serious material damage.

5 Foreseeable misuse

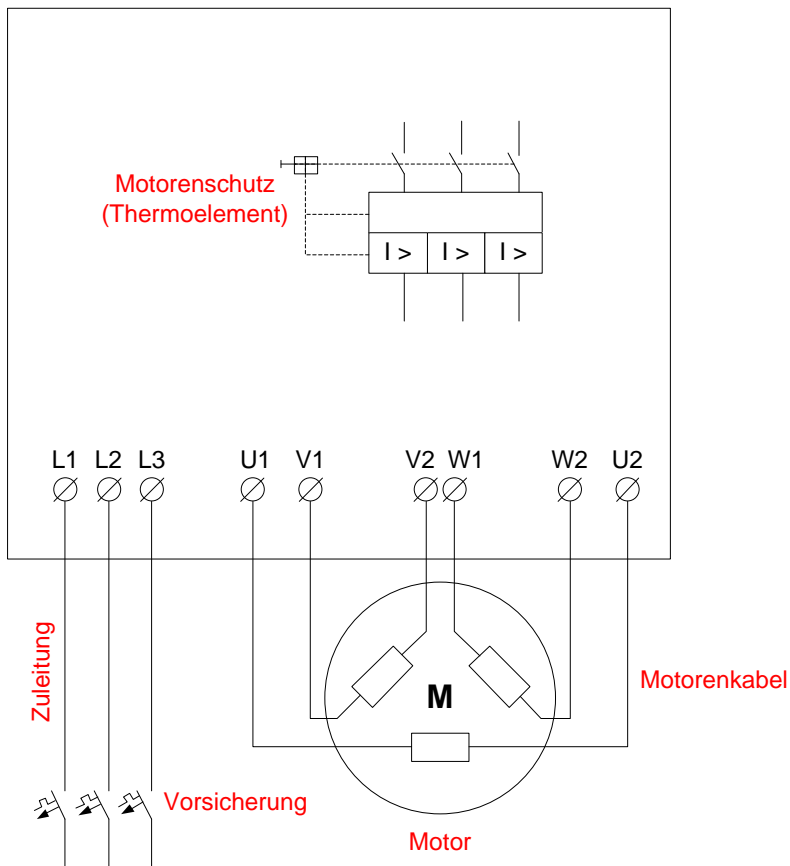
1. After installation/commissioning, check to see if the motor's direction of rotation is correct
2. Check that you have set the thermocouple according to Section 7.2.2, Page 9
3. Check that you have not set the star-delta switching time to < 1s. Otherwise, the backup fuse can trigger itself and/or the life of the contactors will be restricted.

6 Connection

6.1 General

All functions are wired to terminals and can, therefore, be easily and clearly connected (for diagram, see Section 0, Page 7)

Illustration 1: Controller connection and terminals



The supply line for the star-delta starter controller depends on the motor power used in terms of cross-section and fuse protection. The correct dimensioning of the supply line and its protection is the responsibility of the installer. However, the following table can be used as an installation aid.

Table 1: Cross-section of supply line, back-up fuse and motor cross-section

Motor wattage: [kW]	Cross-section Supply cable * [mm ²]	Cross-section Motor cable * [mm ²]	Back-up fuse [A]
5	2.5	1.5	16A
7.5	4	2.5	20A
11	6	2.5	32A
15	10	4	40A
18.5	16	6	63A
22	16	10	63A



The specified cross-sections are valid for a maximum cable length of 4 metres and freely routed. If the lines are longer and/or differently laid, an increase of the cross-section may be necessary. It is essential to comply with the relevant regulations.

Never work on the terminals or the controller under voltage!

6.2 Diagram

See separate sheet.

7 Operation

7.1 Controls in general

Illustration 2: Operating elements - star-delta controller

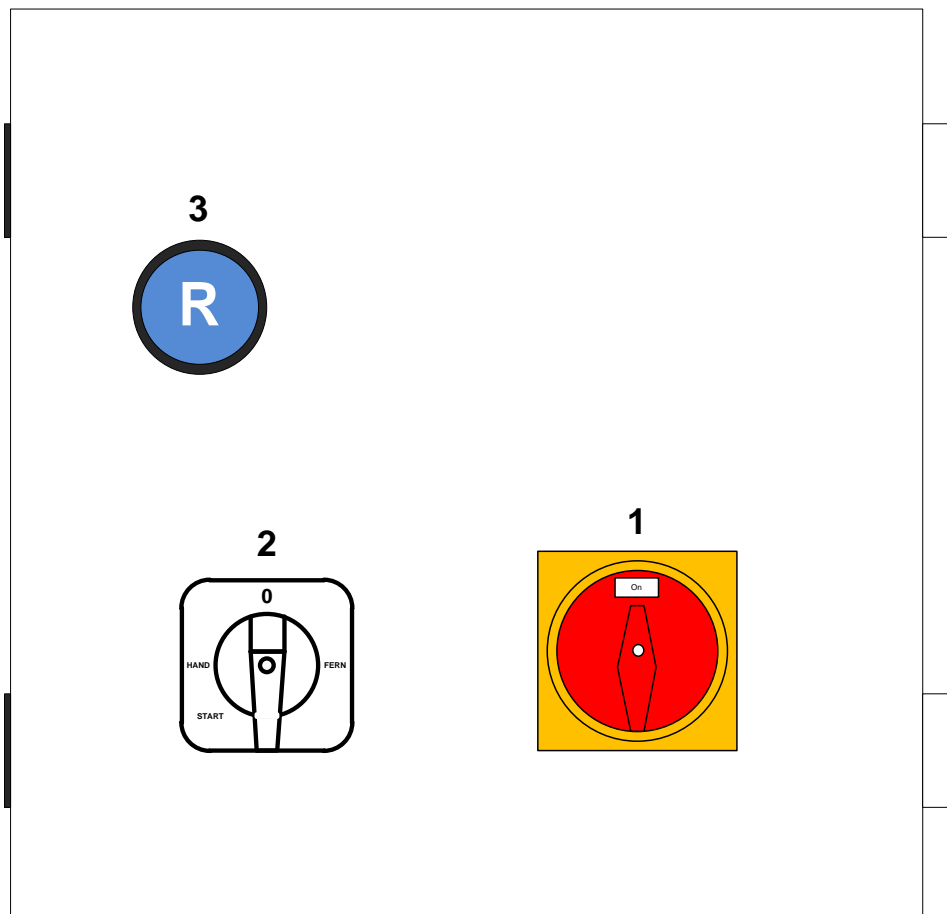


Table 2: Overview of operating elements of soft starter controller

Position	Function	Description
1	Main switch	Lockable main switch which disconnects the controller from the mains.
2	Rotary switch "Start- Manual - 0 - Remote"	Operation selector switch for manual start or via external input. If a timer is connected to the external input, the label can change to "Start – Manual – 0 – Time" or "Start – Manual – 0 - Auto"
3	Reset thermal relay	Reset the thermocouple, if this has responded. Additionally check why the motor was overloaded.



If you want to start the motor manually, the selector switch (2) must be in the "Manual" position and briefly turned to the "Start" position. The motor then starts and the rotary switch returns to the "Manual" position

7.2 Settings/internal functions

7.2.1 General

The star-delta controller can be set for different start times and different motor currents. Basically, the settings of the thermocouple (2) and the start time (3) are preset for the corresponding motor power. Thus, the commissioning person only has to carry out fine adjustment with regard to time (3) and current (2).

Illustration 3: Operating elements of frequency converter

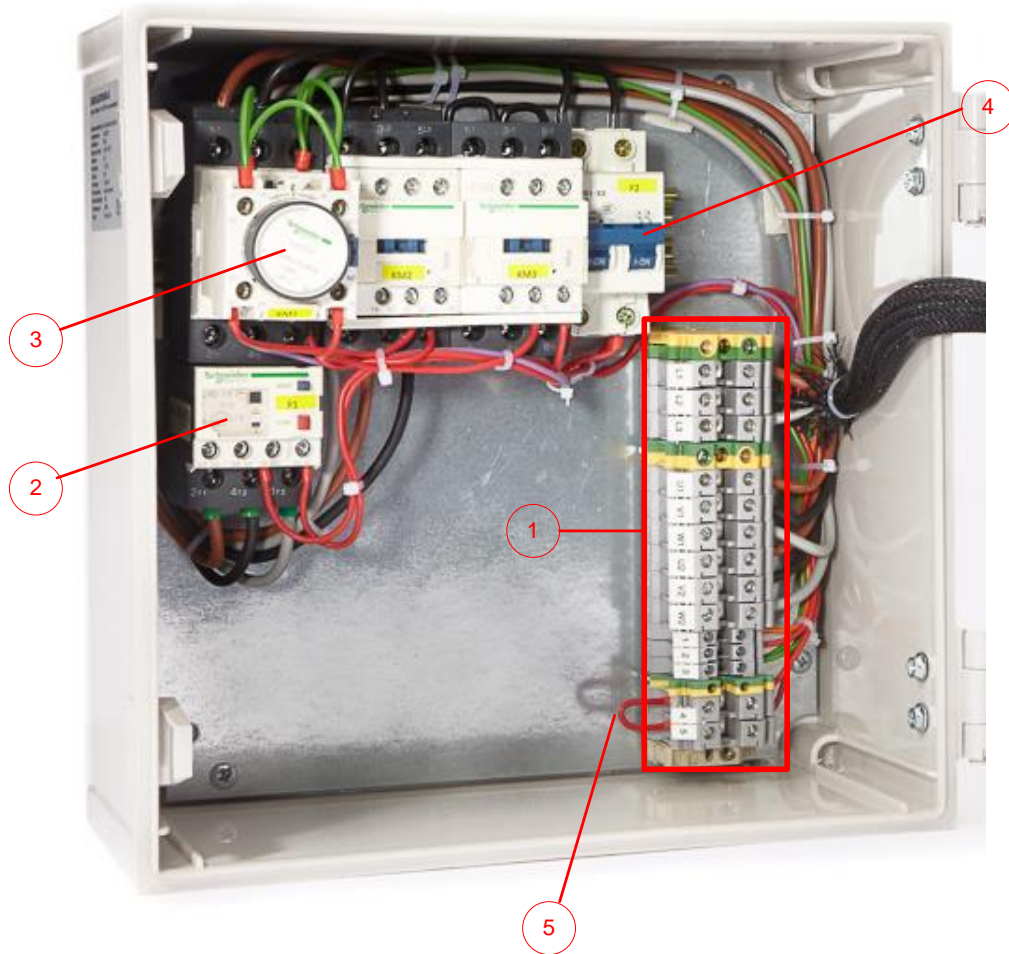


Table 3: Description of adjustment elements

Number	Function	Description
1	Clamps	Infeed, motor connection and Klaxon are wired to terminals
2	Motor protection/thermocouple	Set current according to Table 4, Page 9
3	Time block (0..30s)	Switchover time from star to delta. The time block must not be set to < 1s, otherwise the motor will be started almost directly. This leads to problems with the electricity supplier and reduces the lifetime of the controller!
4	Circuit breaker	The circuit breaker (CB) must be switched on for the controller to work.
5	Klaxon connection	If the motor has a Klaxon monitor, the controller will switch off when this input is opened. If no Klaxon connection is available, a wire bridge must be inserted.

7.2.2 Setting thermal or motor protection

The motor protection is set with the aid of the thermocouple (2) or the thermal relay. Since the motor is connected through six-wire, only 0.58 times the current flows through the thermocouple. This must be taken into account when setting the thermal relay. The following table provides information about the setting of the thermal relay and which type should be used for which power

Table 4: Motor protection/thermocouple and their setting

Motor wattage: [kW]	Motor wattage: [PS]	Rated current I _n [A]	Motor protection/thermo- element	Set current [A] 0.58 x I _n	Adjustment range [A]
5.5	7.5	12	LRD14	7.0	7-10
7.5	10	16	LRD16	9.5	9-13
9	12	19	LRD16	11.5	9-13
11	15	23	LRD21	13.5	12-18
15	20	31	LRD22	18.0	16-24
18.5	25	38	LRD22	22.5	16-24
22	30	45	LRD32	26.5	23-32



Depending on the motor power, the motor protection or the thermal relay must be set according to the yellow column (set current) so that the motor is optimally protected.

8 Error and troubleshooting

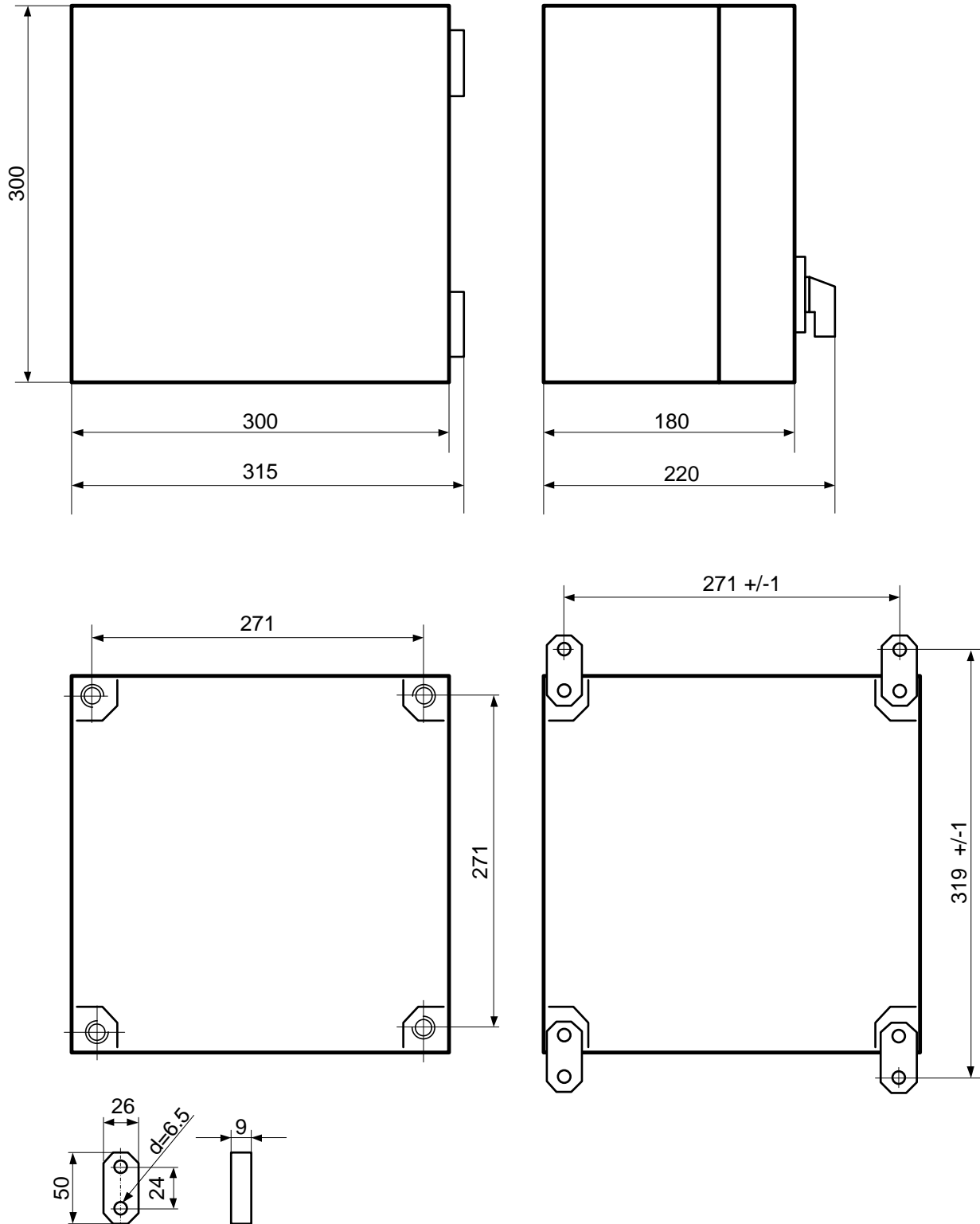
If the controller does not work properly, check the following points:

Table 5: Error analysis

Error description	Possible cause	Possible rectification
Motor does not start, although selector switch is turned to "Start".	Circuit breaker (CB) has triggered	Activate CB again
Motor does not start, although selector switch is turned to "Start".	Thermocouple has triggered	Reset thermocouple via reset button
Motor does not start, although selector switch is turned to "Start".	Klixon monitoring has triggered	Check Klixon input. The Klixon input must be closed.
Motor does not start, although selector switch is turned to "Start".	Main switch is not turned on	Activate main switch
Motor does not start, although selector switch is turned to "Start".	No input voltage available	Check input voltage
Motor does not change in delta	Time block is not set up correctly	Check if the time block is set up correctly.
Motor does not change in delta	Contactors lock is jammed	Check if KM2 and KM3 can be pressed one by one and if they are locked against each other. If not, the mechanical interlock is defective. CAUTION: Do not press both contactors with too much force; otherwise the mechanical lock can break.
Motor does not change in delta	Loose cables	Check the connections of the cables
Motor is emitting an unusual noise	Loss of a phase voltage	Check the voltage of all phases both at the input and at the motor terminals.
Contactors emitting an unusual noise	Bad wiring	Check the connections of the cables
Contactors emitting an unusual noise	Solenoid magnet is not working properly	Knock on contactor. If the noise persists, replace the contactor.
Strong heat development of the conductors	Low input voltage	Check input voltage (400V +/- 10%)

9 Housing dimensions

Illustration 4: Housing dimension



10 CE Declaration of Conformity

For the purposes of the EC Machinery Directive 2006/42 / EC, Annex II B for machines to be installed

Manufacturer: Meier Elektronik AG
Gewerbezone 61
CH-6018 Buttisholz

Type: Standard star-delta controller 5.5 – 7.5kW
Standard star-delta controller 11 kW
Standard star-delta controller 15-18.5 kW
Standard star-delta controller 22 kW

Factory no.: 131203

The undersigned, acting as Authorised Representatives, declare that the equipment mentioned above complies with the following Radio Equipment, EMC and Electrical Safety Requirements

DIRECTIVE 2006/42/EG: Machinery Directive
RICHTLINIE 2006/42/EG: Maschinenrichtlinie

DIRECTIVE 2014/30/EU Electromagnetic Compatibility (EMC)
RICHTLINIE 2014/30/EU Elektromagnetische Verträglichkeit

DIRECTIVE 2014/35/EU Low Voltage Directive (LVD)
RICHTLINIE 2014/35/EU Niederspannungsrichtlinie

DIRECTIVE 2011/65/EU Restriction of Hazardous Substances (RoHS)
RICHTLINIE 2011/65/EU Beschränkte Verwendung bestimmter gefährlicher Stoffe

The following standards were applied:
EN 301 489-1 V2.1.1 2017-02
EN 301 489-3 V2.1.1 2017-03
EN 60950-1: 2006 + A2:2013
EN 60204-1

Full technical documentation is available.

Documentation manager (acc. MRL 2006/42(EC): Markus Kurmann

The instruction manual belonging to the control cabinet is available in DE and EN.

Buttisholz, 28.08.13

Place, Date



Signature of the authorised person

Managing Director

Function of the authorised person