

## MINISTART

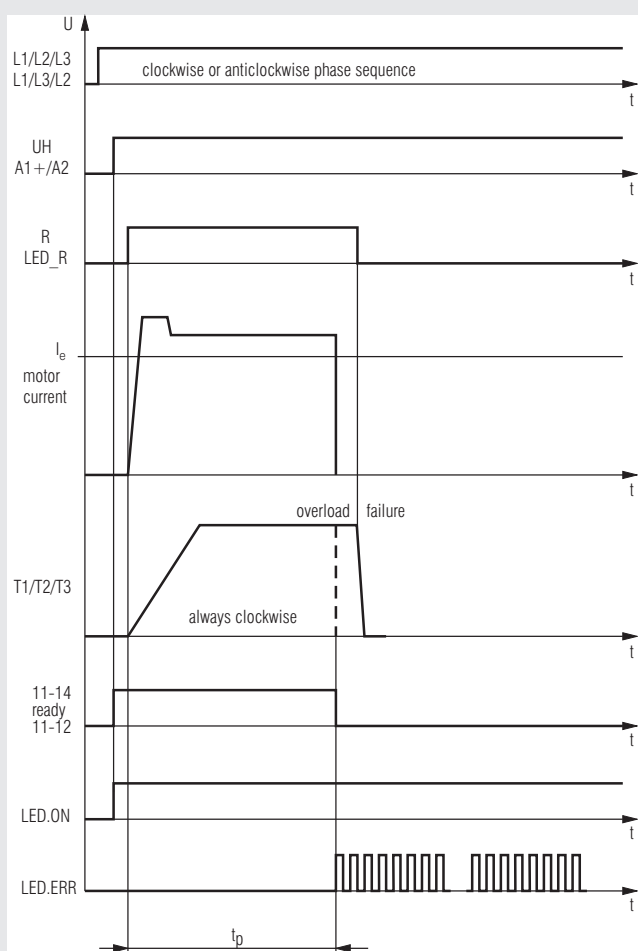
Smart Motorstarter with autom. phase sequence correction  
UG 9256/804, UG 9256/807



### Product Description

The smart motorstarter UG 9256/804 and UG 9256/807 is used to provide always a clockwise phase sequence and to start asynchronous motors. Independent of the the pase sequence on the input it will always provide clockwise sequence on the output to the motor. The unit also protects the motor against phase failure and motor overload. The relays of the reversing circuit switch without current. This provides a long electrical life.

### Function diagram



$t_p$  = overload response time according to characteristic class 10A or 5

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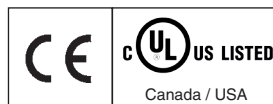
### Your Advantages

- Up to 3 functions in one unit
  - Providing clockwise phase sequence at the motor connection terminals
  - Phase failure detection
  - Motorprotection Class 10 A, Class 5
- Galvanic mains separation by forcibly guided contacts contact opening min. 0.5 mm (UG 9256/807)
- 66 % less space
- Simple and time-saving commissioning as well as user-friendly operation through setting via potentiometer on absolute scale
- Hybrid relay combines benefits of relay technology with non-wearing semiconductor technology
- High availability by
  - Temperature monitoring of semiconductors
  - High withstand voltage up to 1500 V
  - Load free relay reversing function

### Features

- According to UL 60 947-4-2, IEC/EN 60 947-4-2
- To reverse the rotary field
- For 3-phase motors with rated motor current from  $I_e$  1,5 A ... 9,0 A
- 1 potentiometer für setting of rated motor current
- 3 LEDs for status indication
- Reversing with relays without current, switching with thyristor
- Galvanic separated 24V-inputs for clockwise
- Reset button on front
- Connection facility for external reset button
- Relay indicator output for operation
- Galvanic separation between control circuit and power circuit
- Galvanic separation of motor terminals from mains voltage in off state or fault condition (UG 9256/807)
- Width 22.5 mm

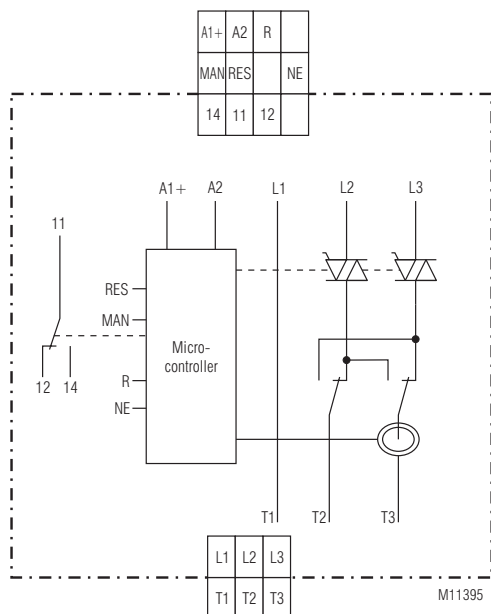
### Approvals and Markings



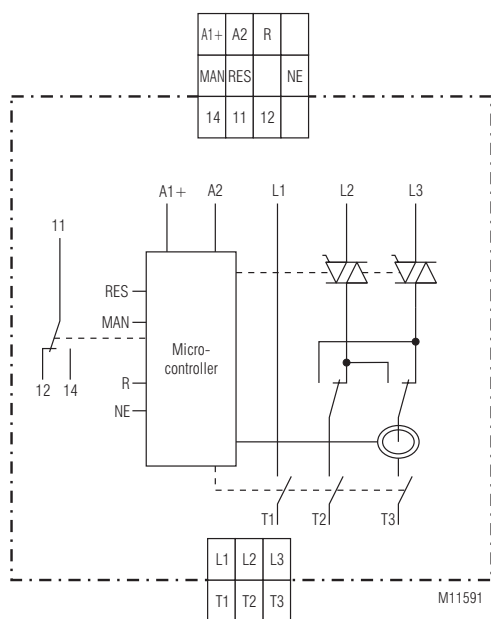
### Application

- Conveyor systems with preferred direction of rotation
- Actuating drives in process controls with preferred direction of rotation

### Circuit Diagrams



UG 9256/804



UG 9256/807

## Connection Terminals

Terminal designation	Signal description
A1 (+)	Auxiliary voltage + DC 24 V
A2	Auxiliary voltage 0 V
R+	Control input clockwise
NE	Earth connection control input
MAN	Output for remote reset
RES	Input for remote reset
11, 12, 14	Indicator relay for operation
L1	Phase voltage L1
L2	Phase voltage L2
L3	Phase voltage L3
T1	Motor connection T1
T2	Motor connection T2
T3	Motor connection T3

## Functions

**Motor protection (variant / 1\_\_)**

The thermal load of the motor is calculated using a thermal model. To calculate the thermal load the current is measured in phase T3.

A symmetric current load of all 3 phases of the motor is assumed for flawless functioning. When the trigger value – stored in the trigger characteristics -, is reached, the motor is switched off and the device switches to fault 8. The fault can be acknowledged via the reset button or reset input.

**Attention:** The data of the thermal model is cleared through reset or voltage failure. In this case, the user must provide adequate cooling time of the motor.

### Phase failure

To make sure the motor is not loaded with asymmetric currents, a check takes place during motor start whether phases L1, L2 and L3 are present. If one or several phases are absent, the device switches to fault 4. The fault can be acknowledged via the reset button or reset input.

Phase failure is detected when the phase is missing for at least 1 second.

### Motor connection (UG 9256/807)

In off state or fault condition the motor terminals are isolated from the mains voltage by a 4 pole, forcibly guided contact relay. The contact opening is min. 0.5 mm

Control input  $R_+$ 

Clockwise rotation can be selected via one control input R+. The reference connection for the control input is the terminal NE. The control input is galvanically separated from the rest of the unit.

### Signalling output “Ready”

Contact 11/14 is closed if no device fault is present.

### Indication

green LED "ON": permanent on - auxiliary supply connected

yellow LED "R": permanent on - clockwise,  
power semiconductors bridged

red LED "ERR": short impulse	- Phase reversal detected (note)
red LED "ERR": flashing	- Device fault
1*)	- Overtemperature on semiconductors
2*)	- Wrong mains frequency
4*)	- Incorrect synchronisation signal
6*)	- mains isolating energized
7*)	- Incorrect temperature measurement circuit
8*)	- Motor protection has responded

1\*) - 8\*) = Number of flashing pulses in sequence

## Reset Function

2 options are available to acknowledge the fault

**Manual (reset button):**

Acknowledgement is performed by operating the reset button at the front of the device. If the button is still actuated after 2 seconds, the device resumes the fault state.

**Manual (remote acknowledgement):**

Remote acknowledgement can be realised by connecting a button (N/O contact) between the terminals MAN and RES. Acknowledgement is triggered as soon as the contact of the button closes. If the button is still actuated after 2 seconds, the device resumes the fault state since a defect in the acknowledgement circuit cannot be ruled out.

## Setting Facilities

Rotary switch I<sub>e</sub>: - Nom. motor current 1.5 A<sub>off</sub> ... 9.0 A<sub>off</sub>

## Set-up Procedure

1. Connect motor and device according to application example.  
The unit works with clockwise or anticlockwise phase sequence.
2. Adjust the nominal current of the connected motor with potentiometer I<sub>e</sub>
3. Connect device to power and start motor via control input R.

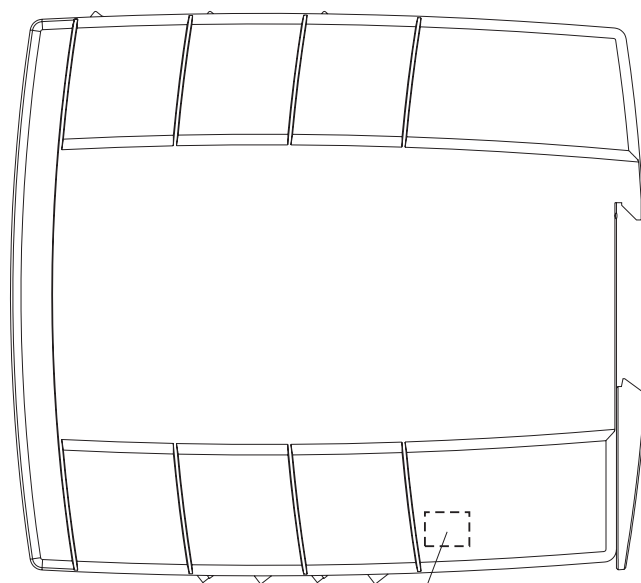
## Safety Notes

- Never clear a fault when the device is switched on
- The user must ensure that the device and the necessary component are mounted and connected according to the locally applicable regulations and technical standards (VDE, TÜV, BG).
- Adjustments may only be carried out by qualified specialist staff and the applicable safety rules must be observed.
- After a short circuit the motor starter is defective and has to be replaced (Assignment type 1).
- Group supply:  
If several motor starters are protected together, the sum of the motor currents must not exceed 25 A.
- For reliable operation the auxiliary supply DC 24 V has to be continuously available during operation and should only be switched off not before 1 sec after the load voltage has been disconnected. Voltage dips of the auxiliary supply with load on Output T1, T2, T3 can lead to higher wearing of the relays or even to damage of the device.

## Mounting Notes

When operated with rated continuous current the devices must not be placed closer than 10 mm side-by-side.

The phase current in the device is measured with a hall effect sensor. Due to this principle also magnetic fields next to the sensor may have an influence. When designing circuits with this motorstarter components that generate magnetic fields like contactors, transformers, high current wires should not be placed close to the sensor.



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position of the current sensor

## Technical Data

<b>Nominal voltage L1/L2/L3:</b>	3 AC 200 ... 480 V ± 10%
<b>Nominal frequency:</b>	50 / 60 Hz , automatic detection
<b>Auxiliary voltage:</b>	DC 24 V ± 10%
<b>Motor power:</b>	4 kW at AC 400 V
<b>Min. motor power:</b>	25 W
<b>Operating mode:</b>	9.0 A: AC 53a: 6-2: 100-30 IEC/EN 60947-4-2
<b>Rated continuous current <sup>1)</sup>:</b>	9.0 A
<b>Measured nominal current:</b>	9.0 A

<sup>1)</sup> The rated continuous current is the arithmetic mean value of starting and rated operating current of the motor in a cycle.

<b>Surge current:</b>	200 A ( t <sub>p</sub> = 20 ms )
<b>Load limit integral:</b>	200 A²s ( t <sub>p</sub> = 10 ms )
<b>Peak reverse voltage:</b>	1500 V
<b>Overvoltage limiting:</b>	AC 550 V
<b>Leakage current in off state:</b>	< 3 x 0.5 mA
<b>Consumption:</b>	2 W
<b>Start up delay</b>	
<b>for master tick:</b>	min. 100 ms
<b>Release delay</b>	
<b>for master tick:</b>	min. 50 ms
<b>Overcurrent measuring device:</b>	AC 0.5 ... 50 A
<b>Measuring accuracy:</b>	± 5% of end of scale value
<b>Measured value update time</b>	
at 50 Hz:	100 ms
at 60 Hz:	83 ms
<b>Motor protection</b>	
I <sub>e</sub> 1.5 A to 6.9 A:	Class 10 A
I <sub>e</sub> 6.9 A to 9.0 A:	Class 5
<b>Short circuit strength:</b>	
<b>max. fuse rating:</b>	25 A gG / gL IEC/EN 60 947-5-1

## Inputs

<b>Control input right:</b>	DC 24V
<b>Rated current:</b>	4 mA
<b>Response value ON:</b>	DC 10 V ... 30 V
<b>Response value OFF:</b>	DC 0 V ... 8 V
<b>Connection:</b>	polarity protected diode
<b>Manual:</b>	DC 24 V (connect button on terminals "MAN" and "RES")
<b>RES:</b>	DC 24 V, semiconductor, short circuit proof, rated continuous current 0.2 A

## Indicator Outputs

<b>Ready:</b>	Changeover contact 250 V / 5 A
<b>Contact:</b>	1 Changeover contact
<b>Switching capacity</b>	
to AC 15	
NO contact:	3 A / AC 230 V IEC/EN 60 947-5-1
NC contact:	1 A / AC 230 V IEC/EN 60 947-5-1
<b>Thermal current I<sub>th</sub>:</b>	5 A
<b>Electrical life</b>	
to AC 15 at 3 A, AC 230 V:	2 x 10 <sup>5</sup> switch. cycles IEC/EN 60 947-5-1
<b>Mechanical life:</b>	15 x 10 <sup>6</sup> switching cycles
<b>Permissible switching frequency:</b>	1800 switching cycles/h
<b>Short circuit strength</b>	
<b>max. fuse rating:</b>	4 A gG / gL IEC/EN 60 947-5-1

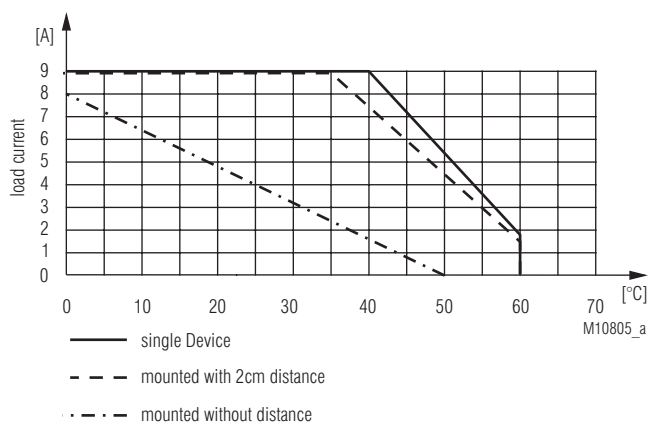
Technical Data		
General Data		
Device type:	Hybrid Motor Controller H1B	
Operating mode:	Continuous operation	
Temperature range:		
Operation:	0 ... + 60 °C (see derating curve)	
Storage:	- 25 ... + 75 °C	
Relative air humidity:	93 % at 40 °C	
Altitude:	< 1.000 m	
Clearance and creepage distances		
Rated insulation voltage:	500 V	
overvoltage category / contamination level		
between control input- , auxiliary voltage and Motor voltage respectively		
indicator contact:	4 kV / 2	IEC/EN 60 664-1
Overvoltage category:	III	
EMC		
Interference resistance		
Electrostatic discharge (ESD):	8 kV (air)	IEC/EN 61 000-4-2
HF-irradiation		
80 MHz ... 1.0 GHz:	10 V / m	IEC/EN 61 000-4-3
1.0 GHz ... 2.5 GHz:	3 V / m	IEC/EN 61 000-4-3
2.5 GHz ... 2.7 GHz:	1 V / m	IEC/EN 61 000-4-3
Fast transients:	2 kV	IEC/EN 61 000-4-4
Surge voltage		
between		
wires for power supply:	1 kV	IEC/EN 61 000-4-5
between wire and ground:	2 kV	IEC/EN 61 000-4-5
HF-wire guided:	10 V	IEC/EN 61 000-4-6
Voltage dips:		IEC/EN 61 000-4-11
Interference emission		
Wire guided:	Limit value class B	IEC/EN 60 947-4-2
Radio irradiation:	Limit value class B	IEC/EN 60 947-4-2
Degree of protection:		
Housing:	IP 40	IEC/EN 60 529
Terminals:	IP 20	IEC/EN 60 529
Vibration resistance:	Amplitude 0.35 mm	
	frequency 10 ... 55 Hz, IEC/EN 60 068-2-6	
Climate resistance:	0 / 060 / 04 IEC/EN 60 068-1	
Wire connection:	DIN 46 228-1/-2/-3/-4	
Screw terminal (fixed):		
Control terminals		
Cross section:	1 x 0.14 ... 2.5 mm <sup>2</sup> solid or stranded wire with sleeve	
Power terminals		
Cross section:	1 x 0.25 ... 2.5 mm <sup>2</sup> solid or stranded wire with sleeve	
Insulation of wires or sleeve length:	8 mm	
Fixing torque:	0.5 Nm	
Wire fixing:	captive slotted screw	
Mounting:	DIN rail	IEC/EN 60 715
Weight:	220 g	
Dimensions		
Width x height x depth:	22.5 x 105 x 120.3 mm	

UL-Data	
<b>Standards:</b>	
<b>for all products:</b>	
-	U.S. National Standard UL508, 17 <sup>th</sup> Edition
-	Canadian National Standard - CAN/CSA-22.2 No. 14-13, 12 <sup>th</sup> Edition
<b>with restrictions at motor switching power:</b>	
-	ANSI/UL 60947-1, 3 <sup>rd</sup> Edition (Low-Voltage Switchgear and Controlgear Part1: General rules)
-	ANSI/UL 60947-4-2, 1 <sup>st</sup> Edition (Low-Voltage Switchgear and Controlgear Part 4-2: Contactors and Motor-Starters - AC Semiconductor Motor Controllers and Starters)
-	CAN/CSA-C22.2 No. 60947-1-07, 1 <sup>st</sup> Edition (Low-Voltage Switchgear and Controlgear - Part1: General rules)
-	CSA-C22.2 No. 60947-4-2-14, 1 <sup>st</sup> Edition (Low-Voltage Switchgear and Controlgear - Part 4-2: Contactors and Motor-Starters - AC Semiconductor Motor Controllers and Starters)
<b>Motor data:</b>	
<b>UL 508, CSA C22.2 No. 14-13</b>	
<b>3 AC 200 ... 480 V,</b>	
<b>3-phase, 50 / 60 Hz:</b>	up to 7.6 FLA, 45.6 LRA at 40 °C up to 4.8 FLA, 28.8 LRA at 50 °C up to 2.1 FLA, 12.6 LRA at 60 °C
<b>UL 60947-4-2, CSA 60947-4-2</b>	
<b>3 AC 200 ... 300 V,</b>	
<b>3-phase, 50 / 60 Hz:</b>	up to 7.6 FLA, 45.6 LRA at 40 °C up to 4.8 FLA, 28.8 LRA at 50 °C up to 2.1 FLA, 12.6 LRA at 60 °C
<b>3 AC 301 ... 480 V,</b>	
<b>3-phase, 50 / 60 Hz:</b>	up to 2.1 FLA, 12.6 LRA at 60 °C
<b>Motor protection</b>	
I <sub>e</sub> 1.5 A bis 6.8 A:	Class 10 / 10 A
I <sub>e</sub> 6.9 A bis 9.0 A:	Class 5
Electronically, without thermal memory	
Reset:	manual
<b>Indicator output relay:</b>	5 A 240 V ac Resistive
<b>Wire connection:</b>	60 °C / 75 °C copper conductors only
<b>Connections</b>	
A1+, A2, X1+, X2, MAN, RES, NE, 11, 12, 14:	AWG 22 - 14 Sol/Str Torque 3.46 Lb-in (0.39 Nm)
L1, L2, L3, T1, T2, T3:	AWG 30 - 12 Str Torque 5-7 Lb-in (0.564-0.79 Nm)
<b>Additional Notes:</b>	
-	This device is intended for use on supply systems with a maximum voltage from phase to ground of 300 V (e.g. for a three phase-four wire system 277/480 V or on a three phase-three wire systems of 240 V), rated impulse withstand voltage of max. 4 kV
-	Suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical Amperes, 480 Volts maximum when protected by class CC, J or RK5 fuse rated maximum 20 A
-	For use in pollution degree 2 Environment or equivalent
-	The control circuits of this device shall be supplied by an isolated 24 Vdc power supply which output is protected with a fuse rated max. 4 A dc
-	For installations according to Canadian National Standard C22.2 No. 14-13 (cUL Mark only) and supply voltages above 400V:
-	Transient surge suppression devices shall be installed on the line side of this equipment and shall be rated 240 V (phase to ground), 415 V (phase to phase), suitable for overvoltage category III, and shall provide protection for a rated impulse withstand voltage peak of 4 kV
-	Transient surge suppression devices shall be installed on the line side of this equipment and shall be rated 277 V (phase to ground), 480 V (phase to phase), suitable for overvoltage category III, and shall provide protection for a rated impulse withstand voltage peak of 4 kV



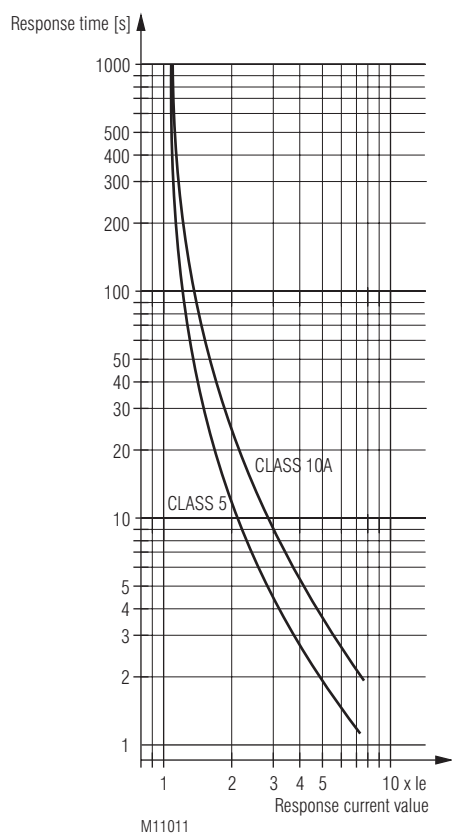
Technical data that is not stated in the UL-Data, can be found in the technical data section.

## Characteristics



Derating curve:

Rated continuous current depending on ambient temperature and distance  
Enclosure without ventilation slots



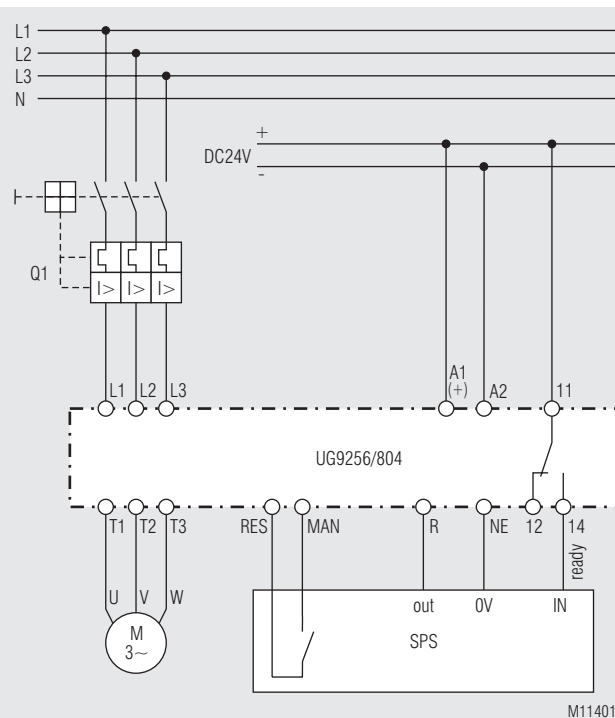
Trigger characteristics  
Motor overload protection

## Standard Types

UG 9256.11/804/61 3 AC 200 ... 480 V 9.0 A  
Article number: 0066450  
• Nominal voltage: 3 AC 200 ... 480 V  
• Nominal current: 9.0 A  
• Control input R  
• Width: 22.5 mm

UG 9256.11/807/61 3 AC 200 ... 480 V 9.0 A  
Article number: 0067133  
• Nominal voltage: 3 AC 200 ... 480 V  
• Nominal current: 9.0 A  
• Main isolating  
• Control input R  
• Width: 22.5 mm

## Application Example



Motor control with UG 9256/804 and PLC

