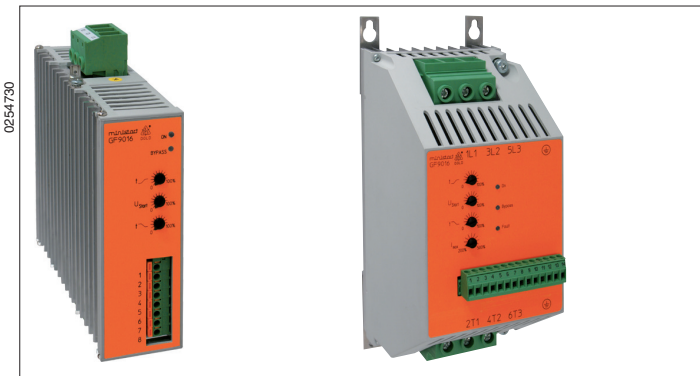
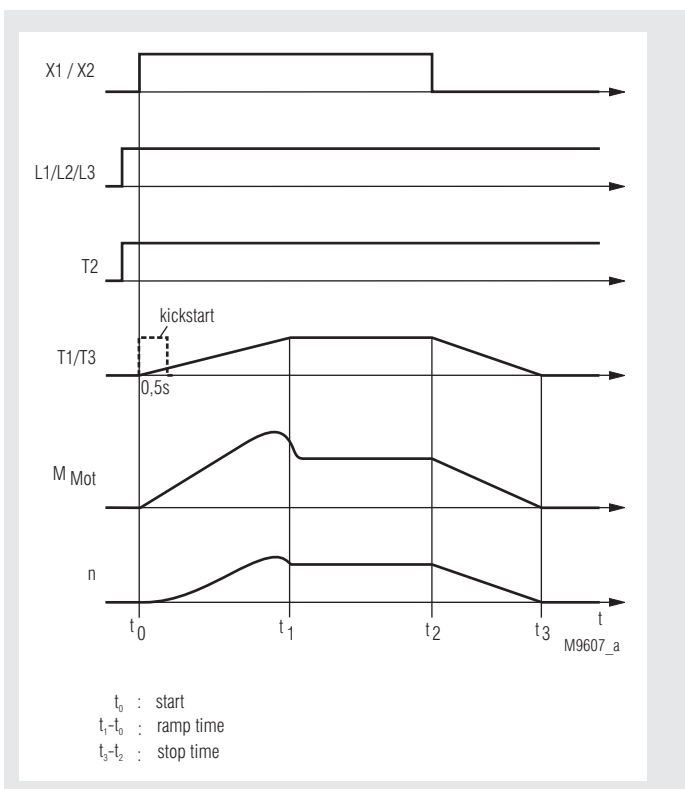


## MINISTART Softstarter And Softstop Device GF 9016



- For soft and shockfree start of your asynchronous motors
- Less wearing and longer life for your motors and components
- Space saving and easy fitting
- Reduce load from supply mains by reducing of starting current
- According to IEC/EN 60 947-4-2
- Softstart with softstop
- For motors up to 37 kW
- 2-phase control
- Adjustable start up and deceleration time als well as starting voltage, optionally with kickstart
- Without auxiliary voltage
- W3 connection is possible
- As option current control on softstart
- Up to 15 kW: width 45 mm  
Up to 22 kW: width 52.5 mm

### Function Diagram



### Approvals and Markings



### Applications

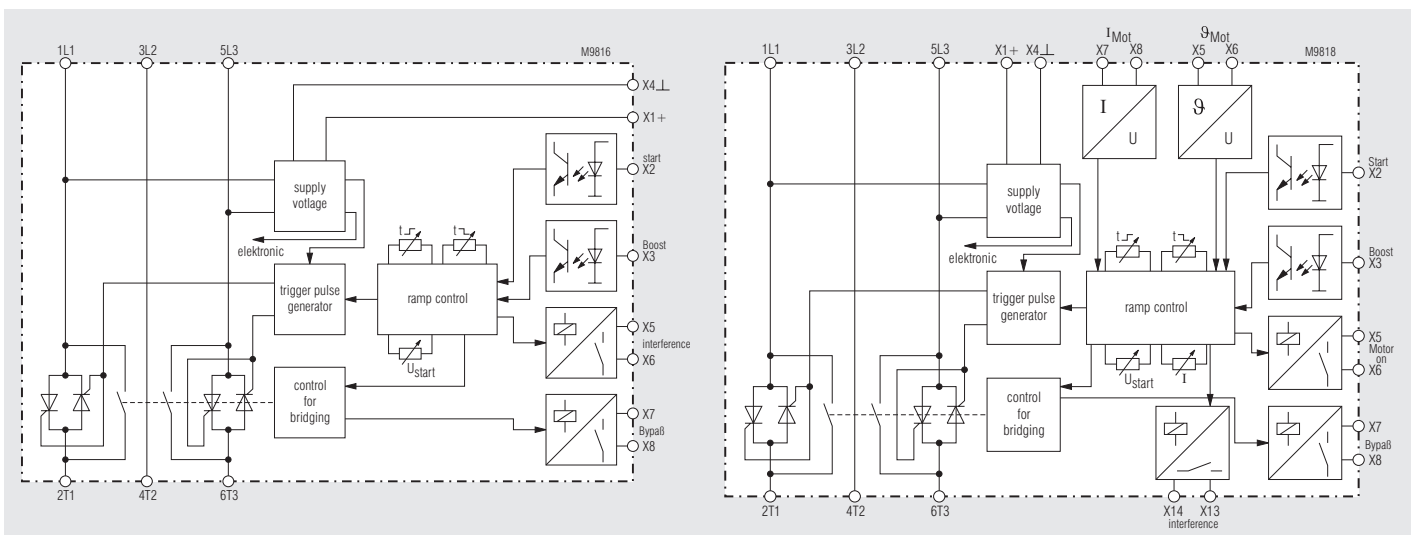
- Motors with gear, belt or chain drive
- Fans, pumps, conveyor systems, compressors
- Packaging machines, door drives
- Start current limiting on 3 phase motors

### Function

Softstarters are electronic devices designed to enable 1-phase or 3-phase induction motors to start smoothly. The GF 9016 slowly ramps up the current on two phases, therefore allowing the motor torque to build up slowly. This reduces the mechanical stress on the machine and prevents damage to conveyed material.

When the motor is up to full speed the power semiconductors in GF 9016 are bridged to prevent internal power losses and heat build up. In addition GF 9016 allows a softstop function prolonging the stop time of the motor, preventing high counter torques from abruptly stopping the motor.

### Block Diagram



up to 22 kW

25 to 37 kW

All technical data in this list relate to the state at the moment of edition. We reserve the right for technical improvements and changes at any time.

| Indication  |    |   |   |
|---|----|---|---|
| LED green   | ON | = | power connected   |
| LED yellow  | ON | = | power semiconductors bridged                                  |
|   |    |   | flashes with rising or falling speed at softstart - soft-stop |
|   |    |   | flashes with same frequency at error (see table)              |
| LED red: On, when failure detected (only on devices $\geq 25$ kW) |    |   |   |

#### Failure codes up to 22 kW-devices

| Fault | LED yellow                                    | Operating state  |
|-------|---|--|
| 1     | yellow LED flashes 2 x times with short space | device overloaded / heat sink temperature too high         |
| 2     | yellow LED flashes 3 x times with short space | failure in electronics                                     |
| 3     | yellow LED flashes 4 x times with short space | firing error in phase 1                                    |
| 4     | yellow LED flashes 5 x times with short space | firing error in phase 3                                    |
| 5     | yellow LED flashes 6 x times with short space | error in motor phase/ power semicond. defective in phase 1 |
| 6     | yellow LED flashes 7 x times with short space | error in motor phase/ power semicond. defective in phase 3 |
| 7     | yellow LED flashes 8 x times with short space | general synchronising error                                |

#### Failure codes from 25 kW-devices

| Fault | LED yellow                                     | Operating state   |
|-------|--|---|
| 0     | yellow LED flashes 1 x times with short space  | low supply voltage  |
| 1     | yellow LED flashes 2 x times with short space  | device overloaded / heat sink temp. too high; motor overtemp. |
| 2     | yellow LED flashes 3 x times with short space  | current control time out                                      |
| 3     | yellow LED flashes 4 x times with short space  | phase failure 1   |
| 4     | yellow LED flashes 5 x times with short space  | phase failure 2   |
| 5     | yellow LED flashes 6 x times with short space  | phase failure 3   |
| 6     | yellow LED flashes 7 x times with short space  | frequency failure   |
| 7     | yellow LED flashes 8 x times with short space  | firing error in phase 1                                       |
| 8     | yellow LED flashes 10 x times with short space | firing error in phase 3                                       |
| 9     | yellow LED flashes 11 x times with short space | mains failure   |

Motor load must always be connected as continuous operation of the softstart with no load may cause overheating of the motor and softstart. It is recommended that the softstart is protected by superfast semiconductor fuses rated as per the current rating of the softstart or motor. However, standard line and motor protection is acceptable, but for high starting frequencies motor winding temperature monitoring is recommended.

| Technical Data  |   |
|---|---|
| <b>Nominal voltage:</b>                               | 3 AC 400 V $\pm$ 15 %<br>(others on request)                      |
| <b>Nominal frequency:</b>                             | 50/60 Hz  |
| <b>Rated current:</b>                                 | 16   25   32   45   50   65   75 A                                |
| <b>Nominal motor power at P<sub>N</sub> at 400 V:</b> | 7.5   11   15   22   25   30   37 kW                              |
| <b>Min. motor power:</b>                              | approx. 0.2 P <sub>N</sub>  |
| <b>Start torque:</b>                                  | 40 ... 80 %   |
| <b>Ramp time:</b>                                     | 0.5 ... 10 s  |
| <b>Deceleration time:</b>                             | 0.5 ... 10 s  |
| <b>Staring current:</b>                               | 200 ... 500 %<br>with connected current transformer               |
| <b>Recovery time:</b>                                 | 200 ms  |
| <b>Switching frequency:</b>                           | 60   45   35   10   35   25   30 1/h                              |
| <b>I<sup>2</sup>t-Power semiconductor fuse</b>        | 4900   4900   6050   6600   6600   11200   25300 A <sup>2</sup> s |

#### General Data

|   |  |
|---|--|
| <b>Temperature range:</b>                       | 0 ... + 45°C                                   |
| <b>Storage temperature:</b>                     | - 25 ... + 70°C                                |
| <b>Overvoltage category / pollution degree:</b> | III / 2  |
| <b>Insulation class:</b>                        | 3  |
| <b>Peak voltage resistance:</b>                 | 4 kV   |
| <b>Degree of protection:</b>                    | IP 20 IEC/EN 60 529                            |
| <b>Wire connection</b>                          |  |
| Load terminals up to 22 kW:                     | plug in screw terminal                         |
| Stranded wire:                                  | 6   6   16   16   25   25   25 mm <sup>2</sup> |
| <b>Control terminals:</b>                       |  |
| up to 22 kW:                                    | 1.5 mm <sup>2</sup> cage clamp terminals       |
| to 25 kW:                                       | 2.5 mm <sup>2</sup> screw terminal             |
| <b>Mounting:</b>                                | DIN-rail mounting IEC/EN 60 715                |
| <b>Weight:</b>                                  | 1.0   1.0   1.0   1.0   1.5   1.5   2.2 kg     |

#### Dimensions

##### Width x height x depth (incl. terminals)

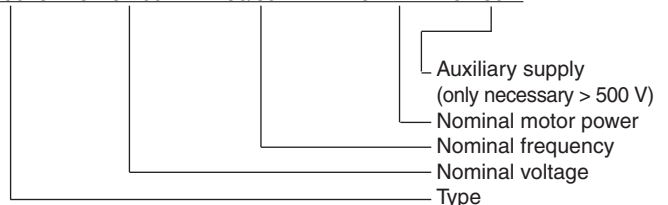
|                   |                     |
|-------------------|---------------------|
| 7,5 / 11 / 15 kW: | 45 x 173 x 158 mm   |
| 22 kW:            | 52.5 x 178 x 158 mm |
| 25 / 30 kW:       | 103 x 230 x 125 mm  |
| 37 kW:            | 103 x 230 x 140 mm  |

#### Standard Type

|                        |            |          |        |
|------------------------|------------|----------|--------|
| GF 9016                | 3 AC 400 V | 50/60 Hz | 7.5 kW |
| • Nominal voltage:     | 3 AC 400 V |          |        |
| • Nominal motor power: | 7.5 kW     |          |        |
| • Width:               | 45 mm      |          |        |

#### Ordering Example

GF 9016 3 AC 400 V 50/60 Hz 7.5 kW AC 230 V



#### Accessories

A current transformer for current control on softstart is included in delivery.

## Control Input

### Up to 22 kW

Connect contact to X1, X2 and select softstart (close contact) or softstop (open contact). As option the unit can also be started by an external control voltage of DC 10-24 V. This has to be connected to terminals X2, X3, X4 connecting means starting up, disconnection stopping. On terminal X3 a kickstart function can be activated. This is useful on motors that have a high starting load as e.g. mills, breakers, conveyors. Kickstart takes 0.5 sec at fully switched thyristors.

### From 25 kW

X5, X6: Connection for notor thermistor, must be linked, when not used

X7, X8: Connection for current transformer with current control Input is only active, if a current transformer is connected

## Indicator Outputs

### Up to 22kW

X5, X6: error at phase failure, frequency variation, thyristor failure, overtemperature of the unit, disconnected motor. Reset by switching the unit off and on.

X7, X8: softstart finished, semiconductor bridged.

### ≥ 25 kW

X9, X10: motor runs, device on operation

X11, X12: end of softstart, semiconductor bridged

X13, X14: interference (common alarm)

## Adjustment Facilities

| Potentiometer      | Description              | Initial setting      |
|--------------------|--------------------------|----------------------|
| $U_{start}$        | Starting voltage         | fully anti-clockwise |
| $t_r$              | Ramp-up time             | fully clockwise      |
| $t_d$              | Deceleration time        | fully clockwise      |
| I (only for 25 kW) | current controlled start | fully anti-clockwise |

## Set-up Procedure

Set potentiometer " $U_{start}$ " to minimum (fully anti-clockwise).

Set potentiometer " $t_r$ " to maximum (fully clockwise).

Set potentiometer " $t_d$ " to mid position.

Start the motor and turn potentiometer " $U_{start}$ " up until the motor starts to turn without excessive humming.

Stop the motor and restart.

Adjust potentiometer " $t_r$ " to give the desired ramp time.

Stop and restart the motor.

Adjust potentiometer " $t_d$ " to give the desired deceleration time.

Stop and restart the motor, readjusting the potentiometers until the desired starting/stopping characteristics are achieved.

- **Attention:** If the ramp-up time is adjusted to short, the internal bridging contact closes before the motor is on full speed. This may damage the bridging contactor or bridging relay.

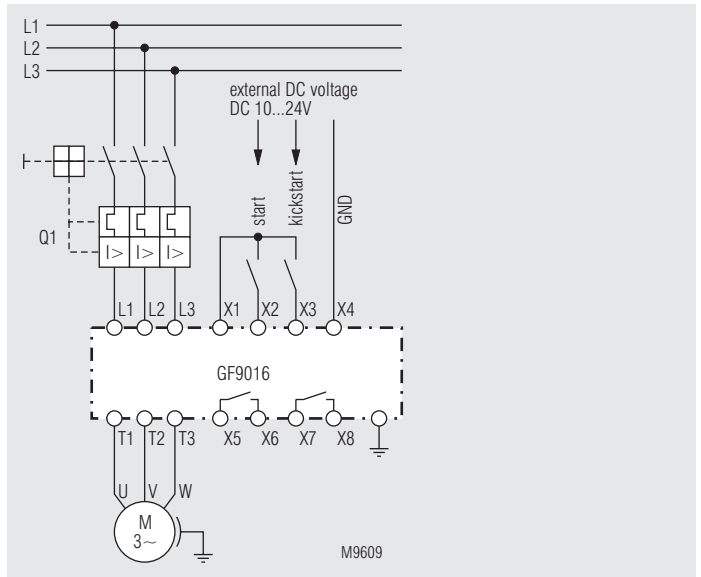


## Safety Notes

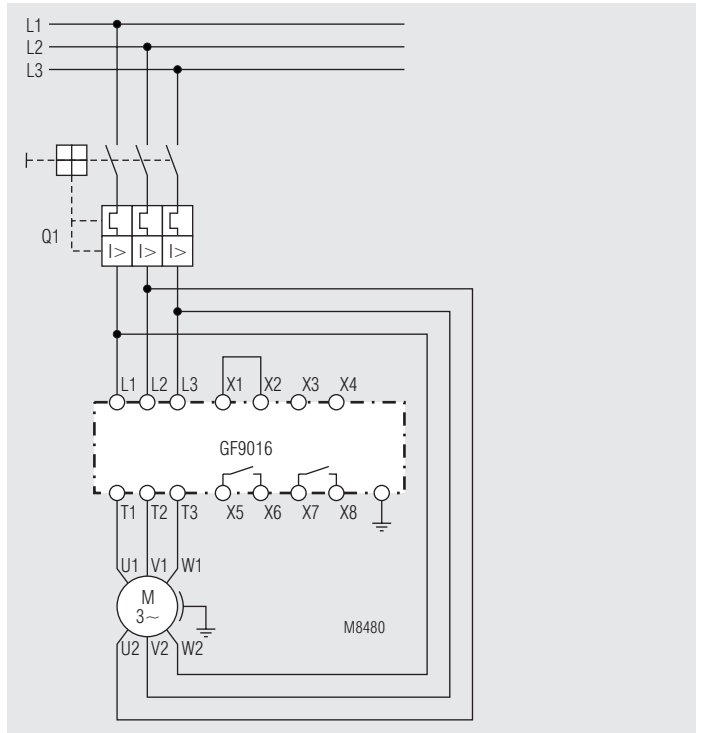
- Never clear a fault when the device is switched on
- **Attention:** This device can be started by potential-free contact, while connected directly to the mains without contactor (see application example). Please note, that even if the motor is at rest, it is not physically separated from the mains. Because of this the motor **must** be disconnected from the mains via the corresponding manual motor starter.
- The user must ensure that the device and the necessary components are mounted and connected according to the locally applicable regulations and technical standards.
- Adjustments may only be carried out by qualified specialist staff and the applicable safety rules must be observed.



## Application Examples



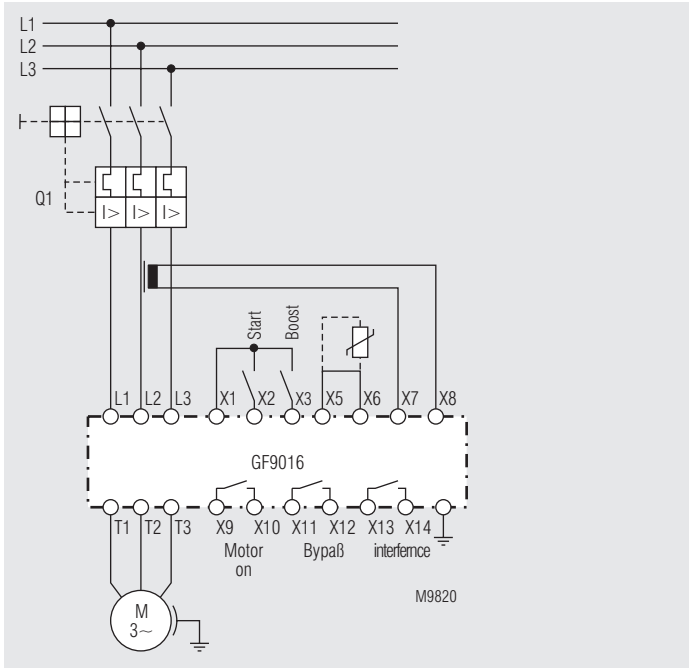
Softstart with softstop



Softstart in a  $\sqrt{3}$ -circuit up to 22 kW

Start only by connecting the mains voltage, terminals X1-X2 bridged

## Application Example



Softstart and softstop function from 25 kW with controlled current on start up.