

Softstarter  
SAS 3...11  
SAS 11PUST, 22PUST  
Assembly- and Commissioning Instructions



Stand 11/16 10800.10002

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These commissioning instructions were prepared with great care. Nevertheless, PETER electronic GmbH & Co. KG does not assume liability for damage resulting from mistakes possibly contained in this manual. Technical changes that serve to improve the product are subject to change without notice.

### Notes and symbols used in these instructions

**Note:** Notes explain the advantages of certain adjustments or settings and help you to make use of the device in the best possible way.



**Warning notices: Read them carefully and follow them strictly!**

Warning notices are indicated in order to protect you against danger or to help you to prevent the device from being damaged.



**Caution: Danger to life through electric shock!**

When you see this sign, always make sure that the device is de-energized and secured against unintentional energizing.

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## 1. Safety notes



The described devices are electrical equipment for use in industrial electrical power installations. An impermissible removal of the covers during operation can cause serious damage to your health, since these devices contain live parts with high voltages.

Adjustment work may only be performed by trained staff observing the safety regulations. Assembly and mounting work may only be carried out with the equipment deenergized.

Make sure that all drive components are properly earthed.

Please read these commissioning instructions carefully before putting the device into operation.

Besides, the user must ensure that the devices and associated components are fitted and connected in accordance with the applicable local, legal and technical regulations. The VDE-regulations VDE 0100, VDE 0110 (EN 60664), VDE 0160 (EN 50178) , VDE 0113 (EN 60204, EN 61310), VDE 0660 (EN 50274) plus the appropriate regulations of the TÜV (Technical Control Association) and the trade associations apply in Germany.

The user must ensure that the drive turns into a safe operating state following a device failure, in the event of maloperation, or if the control unit has failed etc..

**Caution:** Even if the motor is at rest, it is **not** physically separated from the mains.

## 2. Conformity

In industrial linguistic usage the drive controllers of the type SAS are called "devices", however, in the sense of the "device-safety-law", the "EMC-law" or the "EC-guideline for machinery" they are not devices or machines ready for use or connection but they are components. It is only possible to define their final function, when these components are integrated into the design and construction of the user.

**To be able to use the devices to their intended purpose, it requires power supply networks according to DIN EN 50160 (IEC38).**

The user takes the responsibility that the user's design and construction comply with the applicable legal provision.

The commissioning is strictly forbidden as long as the conformity of the final product with the guidelines 2006/42/EC (Machinery directive) and 2006/95/EC (Low voltage directive) is not proved.

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### 3. General description

By means of a power semiconductor whose trigger angle is time-dependently controlled, one of the three motor phases is influenced to the effect that first a small (adjustable) and then a continuously increasing current flows when the device is switched on. The soft starter converts the normally circular rotating field in the motor into an elliptical field which during the acceleration period builds itself up to become circular again. During this period of time the motor torque increases from zero - or from an adjustable value - up to the required maximum torque. The maximum starting torque is reached at the end of the ramp-up time. This enables safe acceleration even in drives with high breakaway torques. After the acceleration period the electronics is bypassed by an integrated relay contact, so that the motor is again directly supplied from the mains.

#### Special features

- single-phase controlled soft starter
- all devices for pole-changing motors
- dual-voltage, for 400V and 230V networks
- terminal arrangement suitable for switchgear connection
- for snap-mounting on 35mm standard rail
- integrated bypass relay
- no mains neutral conductor (N) required
- special voltages up to 640V
- also for single-phase applications
- degree of protection IP 20 (SAS 3 ... SAS 11)
- degree of protection IP 00 (SAS 11PUST, 22PUST)

### 4. Usage to the intended purpose

The devices of the SAS-series are electrical equipment that is used in industrial electrical power installations. They are designed for the application in machines, in order to reduce the starting torque of drives with three-phase motors.

#### Typical Applications

- packaging machinery
  - sliding doors
  - belt drives
  - conveying machinery
  - door drives of passenger and goods lifts
  - limitation of starting current for transformers
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## 5. EC Declaration of Conformity

### EC Declaration of Conformity

The manufacturer / company placing the product on the market  
(authorized representatives of the manufacturer / companies placing the product on the market  
that are established within the Community)

Name / Address: PETER electronic GmbH & Co. KG  
Bruckäcker 9  
92348 Berg

hereby declares that the following product (device, component, unit) in the version as supplied

<b>Product designation:</b>	<b>Soft starters</b>
Series / type designation:	SAS 3 ... 11, SAS 11PUST, SAS 22PUST
Article number:	207..., 208...
Year of manufacture:	2002

complies with the provisions of the following EU-directives:

<b>2014/30/EU</b>	Electromagnetic compatibility
<b>2014/35/EU</b>	Electrical equipment designed for use within certain voltage limits
<b>2011/65/EU</b>	The restriction of the use of certain hazardous substances in electrical and electronic equipment

The following harmonized standards have been applied:

<b>EN 60947-1:2007+A1:2012</b>	Low-voltage switchgear and controlgear General rules
<b>EN 60947-4-2:2012</b>	Low-voltage switchgear and controlgear Contactors and motor-starters - AC semiconductor motor controllers and starters

This EC Declaration of Conformity is no longer valid, if the product is modified or changed  
without our agreement.

This declaration is issued under the sole responsibility of the signatory.

Berg, 15.04.2016  
(place, date)

Dr. Thomas Stiller, Managing director  
(signatory and function of the signatory)

  
(signature)

## 6. Commissioning

The device is to be put into operation in 3 steps:

1. Mounting
2. Connection and
3. Parameter setting

### 6.1 Mounting instructions

Up to the type SAS 11 the electronics is accommodated in a housing (IP20). This housing is suitable for being snap-mounted onto 35mm standard rails or for being fixed with screws. The soft starters SAS 11 PUST and 22 PUST are to be fitted with the terminal strip facing downwards.



#### **Caution: Danger to life through electric shock!**

The following conditions are to be complied with in order to ensure a safe and reliable operation of the SAS.

1. The device series SAS is to be used under conditions of the overvoltage category III.
2. Make sure that pollution degree 2 or better, in accordance DIN EN60644-1 / IEC664, is complied with.
3. The device has to be installed into a housing (min. degree of protection: IP54).
4. The device must be operated without being exposed to contamination by water, oil, carbon deposits, dust, etc..



#### **Warning:**

To avoid heat concentrations, a distance of at least 40mm is to be kept between cable duct and device.

Place the device vertically on a perpendicular mounting plate with the motor terminals pointing downwards. The device is to be snap-mounted onto a 35mm top-hat rail according to DIN EN 50022. Underneath the device, no additional heat sources such as heating resistors must be mounted or arranged.

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## 6.2 Connection power section



### Warning:

Only connect the device according to the attached connection diagram.  
(..) = SAS 11PUST and SAS 22PUST

Terminal 1L1 (L1)	via main or reversing contactor to L1 mains cable
Terminal 3L2 (L2)	via main or reversing contactor to L2 mains cable
Terminal 5L3 (L3)	via main or reversing contactor to L3 mains cable
Terminal 2T1 (U)	to Motor terminal U
Terminal 4T2 (V)	to Motor terminal V
Terminal 6T3 (W)	to Motor terminal W

## 6.3 Connection control section

Terminal X1,X2	X1,X2 not jumpered 380 ... 480V/AC $\pm$ 10%
	X1,X2 jumpered 160 ... 240V/AC $\pm$ 10%
Terminal X3,X4	In the case of pole-changing motors with potential-free make-contacts of the pole-changing contactors connect acc. to terminal diagram. In the case of all other motors these terminals are to be jumpered.



### Caution: Danger to life through electric shock!

The motor is **not** physically separated from the mains.

If only soft starts are required, SAS may also be controlled via the main contactor. For this purpose, the terminals X3 and X4 have to be bridged.

## 6.4 Parameter settings

On the front panel there are 2 potentiometers by means of which the following settings can be made.

Parameter	Poti	Setting range
Acceleration time	t	Acceleration time adjustable from 0.5...10sec
Starting torque	M	0...50% of starting torque

### Adjusting soft start

			Default setting of potentiometers:
Potentiometer	t	(Acceleration time)	mid-position
Potentiometer	M	(Starting torque)	left stop (counter-clockwise)



To adjust an optimum starting behavior, you should carry out a test run.

Switch on the supply voltage and start acceleration. Watch the starting behavior and adapt the appropriate parameters to your drive. At any rate, the starting voltage should be adjusted with the potentiometer „M“ so that the motor starts immediately. At the same time, unnecessary humming with the motor being at rest is to be avoided.

The potentiometer „t“ is to be adjusted so that the requested acceleration time or starting characteristics is achieved. The acceleration time should always be chosen as short as possible, in order to keep the thermal stress acting on device and motor as small as possible. This leads to short times until the bypass relays pull in and ensures good acceleration characteristics while the power semiconductors and motor are less heated. This is of special importance in the case of high-inertia starting or high switching frequencies. The acceleration time, however, has to be adjusted so that the motor reaches nominal speed before the internal bypass relays close.



**Warning:**

If the adjusted acceleration time is too short, the internal bypass relays close **before** the motor has reached nominal speed. This can cause damage to the bypass relays.



**Caution: Danger to life through electric shock!**

Even if the motor is at rest, it is **not** physically separated from the mains.



**Warning!**

Make sure that the specified switching frequency is not exceeded!

## 7. LED indicators

On the device front panel there are 2 light-emitting diodes indicating the following operational states.

LED	Operational status
green - illuminated	Device is connected to mains voltage
yellow - illuminated	Start completed, device bypassed

## 8. Technical data

Type designation	SAS				SAS .. PUST	
	3	5,5	7,5	11	11	22
Mains/Motor voltage X1-X2 jumpered according to DIN EN 50160 (IEC 38)	160 ... 240V $\pm 10\%$ 50/60Hz				400V $\pm 15\%$ 50 Hz	
Mains/Motor voltage X1-X2 not jumpered according to DIN EN 50160 (IEC 38)	380 ... 480V $\pm 10\%$ 50/60Hz					
max. Motor rating at 230V (rated power)	1,5kW	3kW	4kW	5,5kW		
max. Motor rating at 380/415V (rated power)	3kW	5,5kW	7,5kW	11kW	11kW	22kW
Rated device current	6,5A	12A	15A	25A	25A	32A
min. Motor load	10% of device rating					
Acceleration time	0,5 ... 5s					
Starting torque	0 ... 50%					
Restart time	200ms					
max. Switching frequency at $5x I_N$ and $5s t_{acc}$	100/h	80/h	50/h	30/h	120/h	60/h
$I^2t$ - Power semiconductors in (A <sup>2</sup> s)	265	610	4900	4900	4900	6050
ext. semiconductor protection fuses	25A	35A	60A	100A	100A	125A
ext. fuses to UL Claas J	20A	35A	60A	80A	80A	100A
Weight	300g		400g		2700g	3000g

The SAS ... devices is suitable for all winding connections, even for Dahlander pole-changing motors and motors with separated windings.

## 8.1 Environmental conditions

Ambient temperature	0 ... 40°C up to an installation altitude of 1000m, not exposed to moisture condensation
Storage temperature	-25 ... 75°C
Power reduction <sup>a</sup>	above 40°C - 2% per 1°C up to max. 60°C and altitudes above 1000m -2% per 100m
Degree of protection	IP 00
Environment	Overvoltage categ. III (TT / TN-systems), pollution degree 2
Installation class	3

a. The reductions refer to rated power output.

**Note:** Please pay attention and consider for the operation of IE3 motors while dimensioning of softstarters the resulting higher starting currents. For the use of IE3 motors we highly recommend to dimension and design the needed softstarters one size higher.

## 9. Dimensioning rules

### 9.1 Dimensioning of pre-fuses

Pre-fuses F can be dimensioned according to the following instructions.

Basically, two types of fuse protection are available for the user.

1. Fusing according to allocation type „1“, DIN EN 60947-4-2.  
After a short circuit, the VersiStart II device is allowed to be inoperative and repair work is possible.
2. Fusing according to allocation type „2“, DIN EN 60947-4-2.  
After a short circuit, the device must be suitable for further use. However, there is the danger that the contacts of the bypass or braking relays weld. Therefore, if possible, these contacts are to be checked prior to reconnecting these contacts to the mains supply. If this check cannot be carried out by the user, the device has to be returned to the producer in order to have it checked.

The following dimensioning information refers to the below operating conditions:

- Use of standard asynchronous motors
- Standard acceleration and/or deceleration times
- Switching frequencies not exceeding the values specified in the data sheet

**Fusing according to allocation type „1“**

As pre-fuses we recommend to use line protection fuses (utilization category gL) or automatic circuit-breakers with type K tripping characteristic. In the case of automatic circuit-breakers the tripping characteristic of the type series is to be taken into account. With  $2x I_n$  the tripping time should be at least 20s ( $I_1$ ).

The fuse values are to be determined by taking the conductor cross-sectional area of the wiring into account. Depending on the rated motor current, the maximally occurring starting current (normally up to the 5-fold rated device current) and the starting frequency, the wiring cross-sectional area is to be determined. Table 1 shows the values for numerous applications, i.e., with a 3-fold nominal current as mean starting current and a max. starting time of 10s. In the case of parameter values exceeding these values, it may be necessary to adapt the fuse value accordingly.

**Note:** Wiring cross-sectional area according to DIN VDE 0100-430, DIN EN 57100-430.

**Fusing according to allocation type „2“:**

The power semiconductors are to be protected by fuses of the utilization class gR (semiconductor protection fuses, high-speed fuses). However, since these fuses do not ensure line protection, it is necessary to use additionally line protection fuses (utilization category gL).

To protect the semiconductors it is necessary to select gR-fuses featuring cutoff- $I^2t$ -values which are approx. 10-15% below the  $I^2t$ -value of the power semiconductor (see technical data). In this connection, the fuse rating of the selected fuse should not be smaller than the starting current to be expected.

**Note:** PETER electronic does not prescribe the use of semiconductor protection fuses. However, for some UL- or CSA-listed devices there are exceptions which are indicated in the relevant commissioning instructions.

**Note 1** On the basis of the  $I^2t$ -value of the power semiconductors, the starting time and possibly the max. starting current, the fuse supplier is able to select a suitable type. Due to the great variety of producers, sizes and types, PETER electronic does not recommend any particular fuses.

**Note 2** If the value of the fuse or the cutoff- $I^2t$ -value is selected too small, it may happen that the semiconductor fuse reacts during the starting phase or during deceleration.

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Table 1

Rated device current (techn. data)	Device type	Fuse value in the case of allocation type 1	Starting frequencies Starts / h
6,5A	SAS 3	16A	40
12A	SAS 5,5	20A	20
15A	SAS 7,5	25A	30
25A	SAS 11	35/40A	20
25A	SAS 11 PUST	35/40A	10
32A	SAS 22 PUST	50A	10

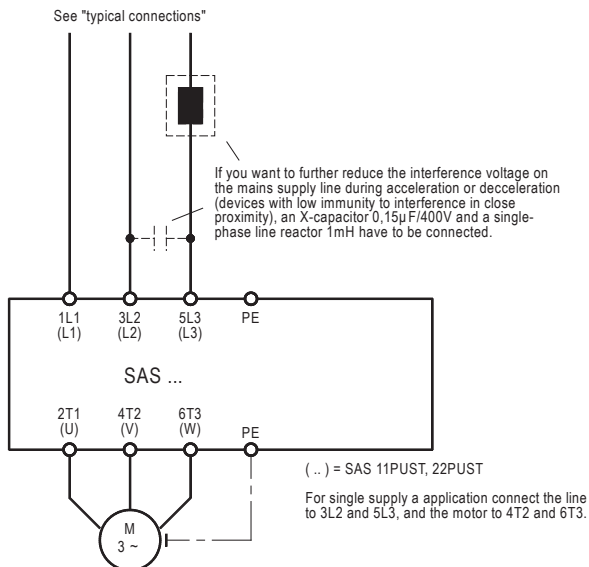
## 10. Installation guideline

The braking device has to be connected according to the attached connection diagram. For other connections refer to the factory.

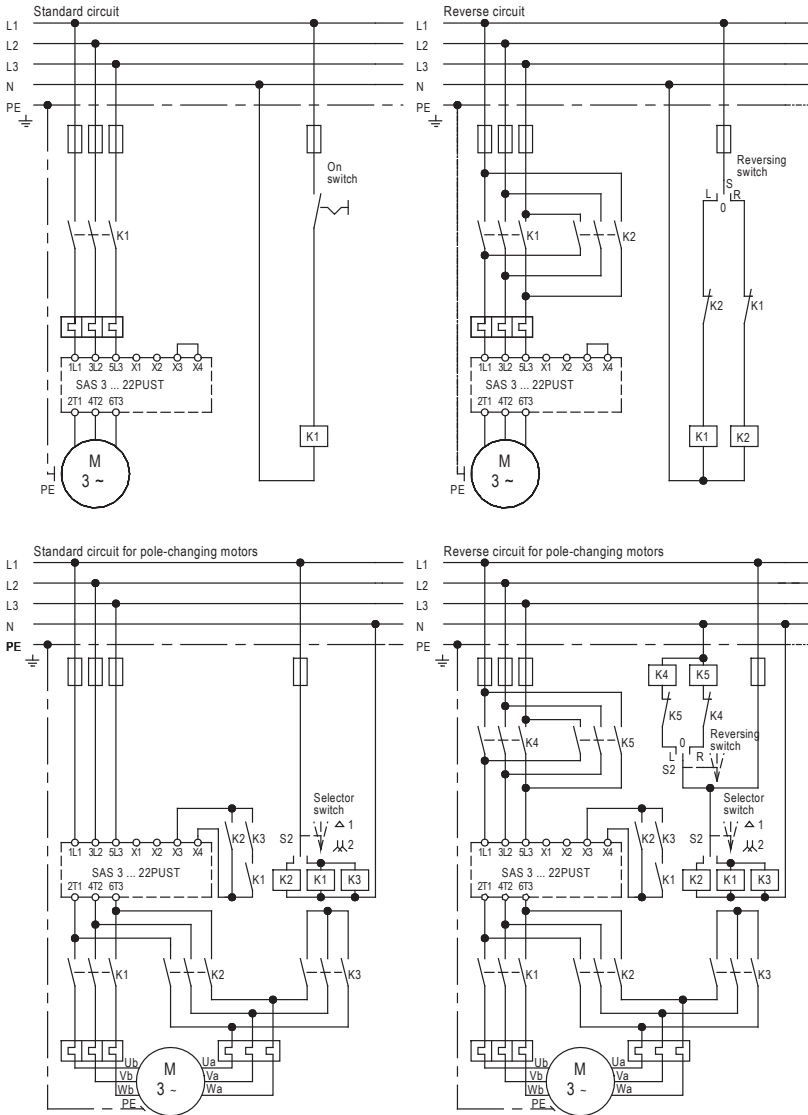
**Note:** Further connection proposals for special circuit arrangements are available via our homepage at [www.peter-electronic.com](http://www.peter-electronic.com).

**Note:** Prior to putting the motor brake into operation, the wiring has to be checked.

### 10.1 General connection diagram

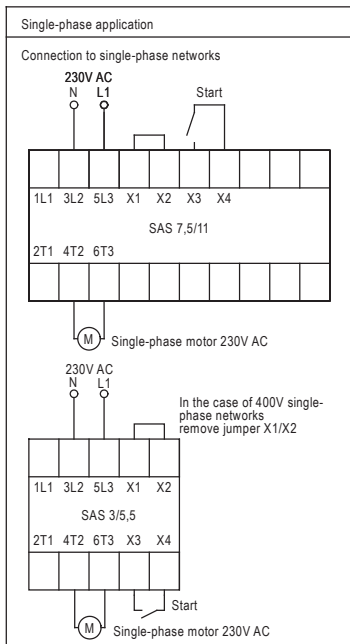


**10.2 Typical connections**

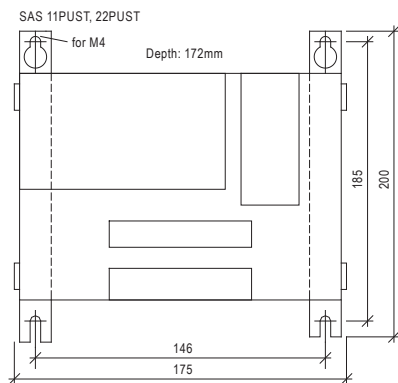
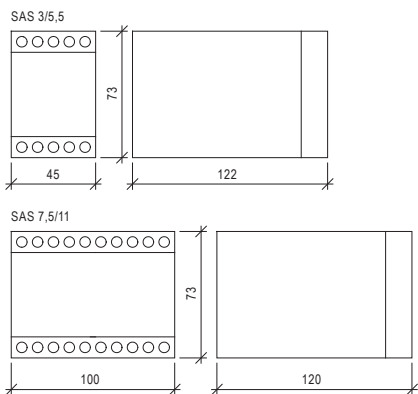


Further connection diagrams are available via the internet at [www.peter-electronic.com](http://www.peter-electronic.com)

### 10.3 Connection single-phase application



### 10.4 Dimensions



All dimensions in mm.









[www.peter-electronic.com](http://www.peter-electronic.com)

