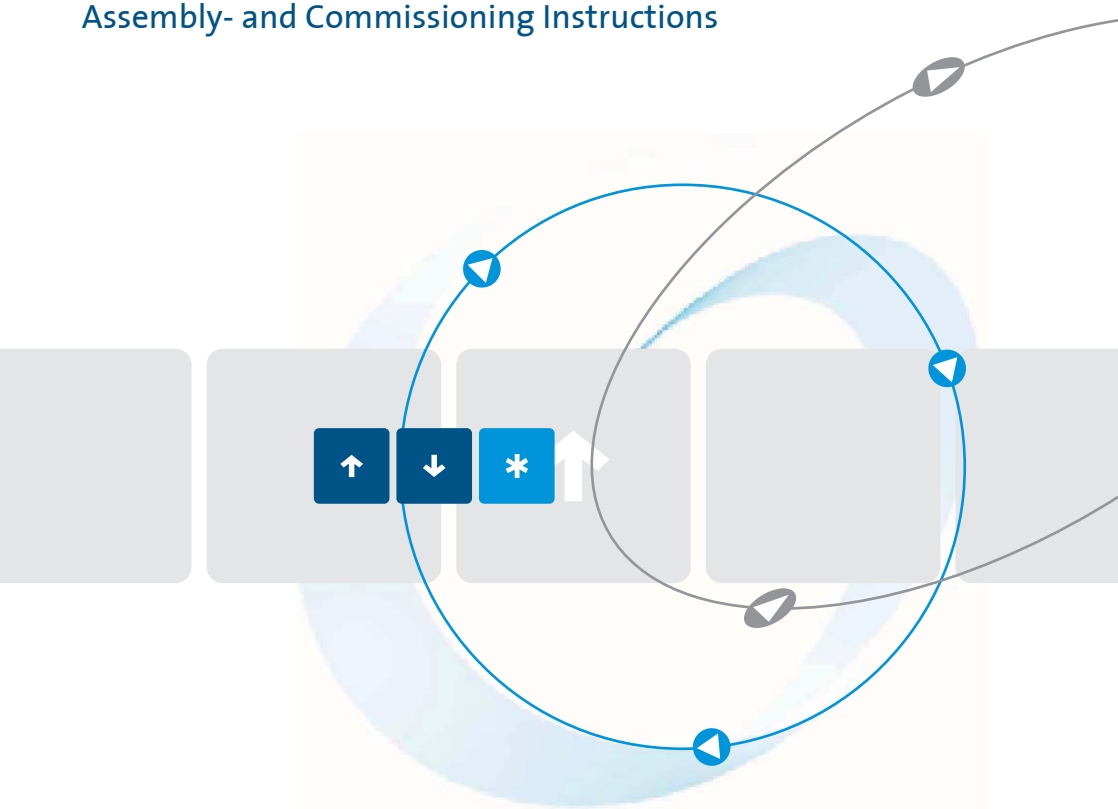
PETER electronic

Softstarter
DAS-T 7.5 ... 55
Assembly- and Commissioning Instructions



Zertifiziertes QM System ISO 9001:2008

Quality is our Drive.

as per: 04/10 10900.10001

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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.

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 appliable 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. Contormity

In industrial linguistic usage the drive controllers of the type series DAS-T are called "devices", however, in the sense of the "law on the safety of equipment", the "EMC-law" or the "EC-maschinery directive" 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.

3. General description

In the case of the soft starters of the DAS-T-type the motor voltage is changed in three phases (L1/L2/L3) by means of a generalized phase control and power semiconductors. Starting from an adjustable start trigger angle the trigger angle is continuously reduced. During the adjusted ramp-up time the motor torque increases according to a ramp function until the maximum value is reached. When the acceleration time is over, the power semiconductors are bypassed by integrated relays and the motor is directly supplied from the mains.

After opening of the start/stop-contact, the trigger angle is continuously increased via a ramp-function, and, as a result, the motor voltage is decreased. The motor softly decelerates with the adjusted deceleration time.

Acceleration time, starting voltage and deceleration time can be separately adjusted via potentiometers.

The acceleration or deceleration is effected by closing or opening the contact on the terminals X6/X7.

The power unit supplies the voltage for the control electronics.

Features

- three-phase controlled soft starter
- terminal arrangement suitable for switchgear connection
- integrated bypass contactor
- no mains neutral conductor (N) required
- functional peak current reduction
- monitoring of heat sink temperature
- monitoring of motor temperature via motor thermistor
- potential-free control inputs and outputs
- special voltages up to 690V

4. Usage to the intended purpose

The devices of the DAS-T-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 or the inrush peaks and the soft stop torque of drives with three-phase motors.

Typical Applications

- pumps
- ventilators
- conveying machinery
- dryers, washing machines
- compressors
- cranes, trolleys

5. EC Declaration of Conformity

EC Declaration of Conformity CE

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
Germany

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

Product designation:	**Softstarter**
Serien / type designation:	DAS-T 7.5 ... 55
Article group:	209...
Year of manufacture:	1998

complies with the provisions of the following EC-directives:

2004/108/EG concerning Electromagnetic compatibility and **2006/95/EG** concerning Electrical equipment designed for use within certain voltage limits

The following harmonized standards have been applied:

EN 60947-1: 2008	Low-voltage switchgear and controlgear General rules	EN 60947-4-2: 2007	Low-voltage switchgear and controlgear Contactors and motor-starters - AC semiconductor motor controllers and starters

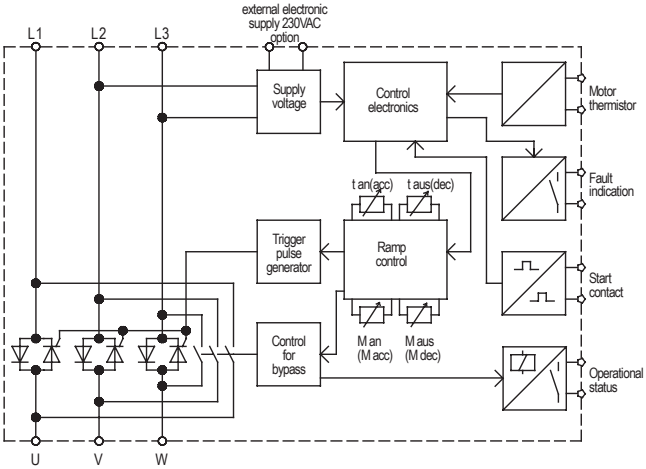
This EC Decleration of Conformity is no longer valid, if the products is modified or changed without our agreement.
This declaration is issued under the sole responsibility of the signatory.

Berg, 05.08.2009 (place, date)

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

(signature)

6. Block diagram



7. Commissioning

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

1. Mounting
2. Connection and
3. Parameter setting

7.1 Mounting instructions

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 DUOSTART.

1. The device series DUOSTART 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:

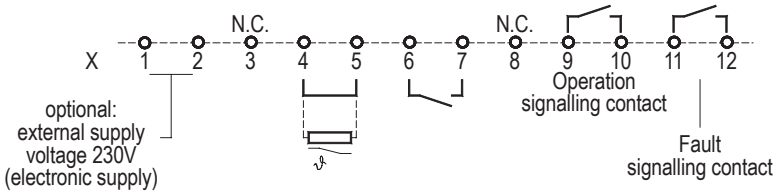
To avoid heat concentrations, a distance of at least 40mm is to be kept between cable duct and device..

The device has to be mounted in vertical position, terminal strip downside. Make sure that no additional heat sources, such as resistors etc. are placed underneath the device. Also, check the temperature of the switchgear cabinet. If the temperatures are too high, ventilation fans have to be installed.

7.2 Connection power unit (see also connection diagram)

Terminal L1:	Mains voltage L1
Terminal L2:	Mains voltage L2
Terminal L3:	Mains voltage L3
Earth terminal PE:	Mains voltage: neutral contuctor
Terminal U:	Motor terminal U
Terminal V:	Motor terminal V
Terminal W:	Motor terminal W
Earth terminal PE:	Motor terminal: neutral contuctor

7.3 Connection control unit

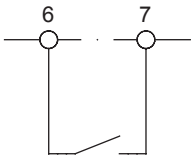


Control via contact

As a standard, the device is configured for control via a contact. Jumper BR5 to „K“..

Terminal strip
Control unit

Contact for starting or stopping
Contact loading 12VDC/15mA



If a contact is closed across terminals 6 and 7, the motor starts with the adjusted ramp-up time. If the contact is open, the motor runs down with the adjusted ramp-down time. The motor, however, is not disconnected from the mains.

Note: To enable safe starting or stopping, it is due to the low control current not allowed to use power switching contacts.

Caution: Danger to life through electric shock!

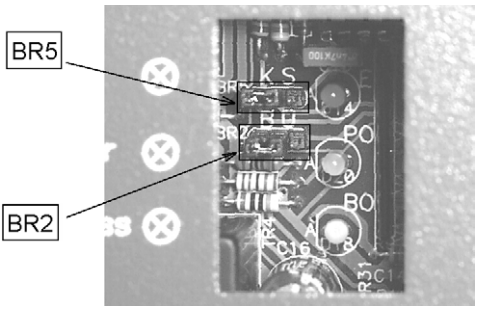
Even if the motor is at rest, it is **not** physically separated from the mains.

If only soft starting is required, the DAS-T can also be controlled via the main contactor. For this the terminals 6 and 7 have to be always jumpered.

Control with d.c. control voltage (e.g., SPC)

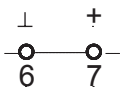
To enable the starting or stopping of the unit by means of an SPC, the device is equipped with a potential-free d.c. voltage control input. For this purpose the jumper BR5 in the inspection window has to be plugged to „S“ (see figure 1).

Figure 1:



Terminal strip
control unit

Control voltage
e. g. from an SPC
10...42VDC / 10mA



If d.c. voltage (10V - 42V/ 10mA) is applied to the terminals 6 and 7, the motor is started with the adjusted ramp-up time. If it is not subjected to a control signal, the motor runs down with the adjusted ramp-down time. The motor, however, is not physically separated from the mains.

Connecting a motor thermistor

The device offers the possibility to connect a thermistor or a thermostat integrated in the motor to the control terminals X4 and X5. The device then monitors the motor temperature. When the temperature in the motor is exceeded, the device switches off and indicates a fault via an LED and a relay contact.

The switching sensivity of this input is about 3k Ohm.

7.4 Parameter settings

4 potentiometers that enable the following settings are located on the circuit board.

Parameter	Poti	setting range
Acceleration time	t_{an}	Acceleration time adjustable from 0.5 ... 25 sec Poti turned to right stop = longest acceleration time
Breakaway torque	M_{an}	0…80% of rated voltage Poti turned to right stop = maximum torque
Deceleration time	t_{aus}	Deceleration time adjustable from 0 ... 15 sec Poti turned to right stop = longest deceleration time
Soft stop torque	M_{aus}	80% ... 20% Poti turned to left stop = maximum torque

Adjusting soft start

Potentiometer	t_{an}	(Acceleration time)	= mid position
Potentiometer	M_{an}	(Breakaway torque)	= left stop
Potentiometer	t_{aus}	(Deceleration time)	= left stop
Potentiometer	M_{aus}	(Soft stop torque)	= left stop

Folgende Schritte sind bei der Erstinbetriebnahme durchzuführen:

1. Switch on the DAS-T and select start-up.
2. Turn potentiometer M_{an} clockwise so that the motor starts up immediately. Avoid unnecessary humming when the motor is at rest.
3. Adjust potentiometer t_{an} until the desired acceleration time or acceleration characteristic is reached.
4. Turn potentiometer t_{an} counter-clockwise as far as possible!

While ensuring good acceleration characteristics, this results in short times until the bypass contactor is energized, and consequently the power semiconductors and the motor is less heated. This is particularly important in the case of high loading and switching cycles.

Warning:

If the ramp-up time is adjusted too short, the internal bypass contact closes before the motor has reached its nominal speed. This can cause damage to the bypass contactor or the bypas relay.

Adjusting soft stop

Note: Soft stop is only useful for pump drives or applications in the case of which the drive comes to a stop **immediately** after switch off. In the case of drives driving high-inertia loads, soft stop is not sensible.

Note: **To enable soft stop, the VersiStart II, during the deceleration phase, has to be supplied with power from the supply mains.**.

Potentiometer	t_{aus}	(Deceleration time)	= mid position
Potentiometer	M_{aus}	(Soft stop torque)	= right stop

Now the potentiometer M_{aus} has to be turned counter-clockwise so that the motor immediately reduces its speed after the soft stop function has been selected. If the load on the motor is too small and the soft stop torque is adjusted too high, the motor will continue to run at an almost unchanged speed and only at the end of the adjusted deceleration time will it rapidly reduce its speed.

Now, adjust potentiometer t_{aus} until the required deceleration time or deceleration characteristic is reached.

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

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

Warning:

It must be ensured that the specifed switching cycle is not exceeded!

8. Operational indications, control outputs

8.1 Operational indications

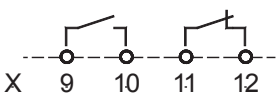
3 LEDs indicating the following operating states are located on the control board.

LED	Operating state
green	device connected to mains voltage
red	fault
green	top of ramp / bypass active

8.2 Control outputs

The device has two relay contacts for operation and fault signalling available..

Control terminals



Operation signalling contact

Two functions can optionally be assigned to the operation signalling contact.

If the jumper BR2 is plugged to „B“ (see figure 1), the relay contact on the terminals X9 and X10 closes at the beginning of the soft start and opens again when the soft stop is finished.

Device bypassed

If the jumper BR2 is plugged to position „Ü“ the relay contact on the terminals X9 and X10 is configured as a signalling contact „device bypassed“.

Fault signalling contact

The device monitors the internal electronics supply voltage, the heat sink temperature and an externally connected motor thermistor. If no fault is present, the contact across the terminals X11 and X12 is permanently closed. If a limit value is exceeded, the device switches over to failure mode. The power unit will be switched off (the bypass contactor opens), the motor coasts. The red LED is illuminated and the fault signalling contact on the terminals X11 and X12 opens.

9. Fault indication

If one or several limit values (electronics supply, heat sink temperature, motor temperature) are exceeded, the device will be switched to failure mode. The power semiconductors are switched off and the bypass contactor opens. The motor runs down in an uncontrolled way.

Caution: Danger to life through electric shock!

Even when the motor is at rest, it is not physically separated from the mains!

The device indicates the fault via a red LED and a relay contact to the outside.

The device is reset by switching the supply voltage off and on..

Warning!

At any rate, prior to switching the device on again the failure cause has to be identified and eliminated.

10. Technical data

Type designation	DAS-T						
	7.5	11	15	22	30	37	55
Mains / motor voltage acc. to DIN EN 50160 (IEC 38)	380/415V ±10% 50/60Hz[a]						
max. Motor rating at 400V (rated power)	7.5kW	11kW	15kW	22kW	30kW	37kW	55kW
Rated device current	17A	25A	32A	48A	63A	75A	105A
min. Motor load	10% of device rating						
Acceleration time	0.5 … 25s						
Starting voltage	0 … 80%						
Deceleration time	0 … 15s						
Soft stop torque	20 ... 80%						
Restart time	200ms						
max. Switching frequency at 5x I_N and 5s t_{an}	100/h	100/h	80/h	60/h	60/h	40/h	20/h
Cross-sect. area for connection: Power terminals Control terminals	 16mm² 1.5mm²				 35mm² 1.5mm²		
I^2t - Power semiconductors in A^2s	610	4900	4900	6050	18000	51200	125000
external semiconductor fuse „high-speed“	80A	100A	125A	160A	200A	250A	450A
Contact rating of output relays	3A/250V AC 3A/30V DC						
Weight	3.8kg	3.8kg	4kg	4kg	7.8kg	8kg	8.2kg

a. special voltages see type plate

10.1 Environmental conditions

Ambient temperature	0 ... 45°C up to an installation altitude of 1000m, not exposed to moisture condensation
Lagertemperatur humity	-25 ... 75°C max. 93% without condensate
Power reduction[a]	above 45°C - 1% per 1°C up to max. 60°C and altitudes above 1000m - 0,5% per 100m
Degree of protection	case IP 40 terminals IP 20
Environment	Overvoltage categ. III (TT / TN-systems), pollution degree 2
Installation class	3

a. The reductions refer to rated power output.

11. Dimensioning rules

11.1 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 determied 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.

Rated device current (techn. data)	Device type	**Fuse value in the case of allocation type**1	Starting frequencies Starts / h
17A	DAS-T 7.5	25A	100
25A	DAS-T 11	35/40A	100
32A	DAS-T 15	50A	80
48A	DAS-T 22	63A	60
63A	DAS-T 30	80A	60
75A	DAS-T 37	100A	40
105A	DAS-T 55	125A	20

Table 1

12. Special voltage >= 480V

For special voltage devices (see type plate) up to 480V the connection to the mains is made in the same way as standard 400V devices. Special voltage devices from 500V require a external supply voltage of 230V connected to the terminals X1 and X2 (refer to Chapter 7.3 on page 8 and Chapter 13.5 on page 22).

Parameter adjustment an commissioning is carriedant in the same way as the standard devices.

13. Installation guideline

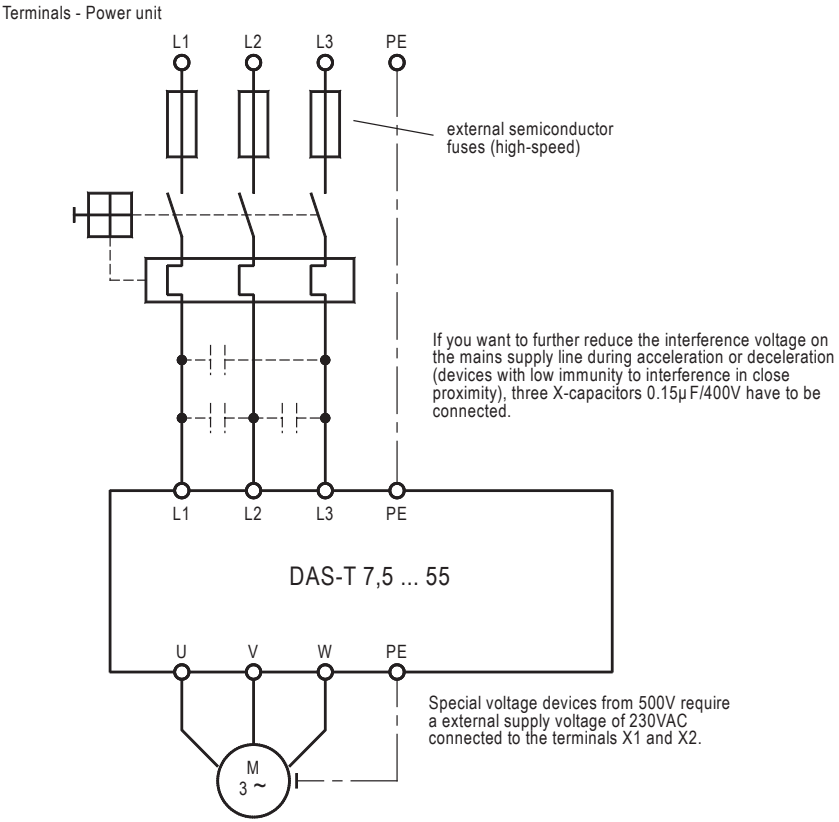
The device is to be installed according to the attached connection diagram. For other connections please consult PETER electronic GmbH & Co. KG.

The mains, motor, and control lines are to run in separate cables that must be laid separately from each other.

Note: Further connection diagrams for special circuit arrangements are available on our homepage at **www.peter-electronic.com**.

Note: Prior to putting the DUOSTART into operation the wiring is to be checked..

13.1 Anschluss Leistungsteil



13.2 Connection control unit

See Chapter 7.3 on page 8.

13.3 Soft start EMC installation guide

Introduction

The EMC Directive defines a broad legal framework which all devices and equipment manufactured and sold within the EC must comply. EMC is an abbreviation of Electro Magnetic Compatibility and is defined as a unit's ability to resist electrical noise and not to emit excessive amounts of electrical noise into it's operating environment. Emission is the electromagnetic energy emitted from the unit and Immunity is the unit's ability to resist electromagnetic disturbance. Relevant product standards should be consulted for specific information on emission and immunity limits.

This guide is written to highlight to the equipment installer, issues he must be made aware of, in the areas of electromagnetic compatibility and also product safety in order to maximize the EMC of any installation involving soft starter drives.

Installation guide

Your soft starter unit has been designed to function properly within ist normal electromagnetic operating environment provided proper installation practices are adhered too. The methods normally used to ensure good EMC are:

- screening and shielding
- suppression
- proper installation, earthing and grounding

Earthing and grounding

The electricalearthing provided ensures a low impedance connection between all metallic surfaces. Apart from providing a degree of electrical safety and isolation, the earthing also has the beneficial effect that the flow of RF currents can be directed through the structure of the equipment rather than through sensitive circuits, where it could be disruptive. It is for this reason that it is vitally important to provide separate earth conductors for each part of the installation all connected to a common star point.

Screening and shielding

To prevent the softstarter from radiating interfering energy to the environment, the softstarter should be installed into a metal-enclosed housing (switchgear cubicle or switchbox).

a. motor cable

For soft starter installations, suitably rated conventional cable for connection to the motor load is adequate provided it can be segregated from any sensitive circuits. If there is evidence of interference then the motor cable should be screened. The screen must be bonded at both ends, to the drive earth terminal and the motor chassis earth. This connection will minimise any stray magnetic field external to the screen.

b. control cable

Cables for digital signal transmission must be connected to the earth potential on both ends. Cables for highly impedant analog control signals (setpoint) must only be earthed on one side in order to avoid a 50Hz-hum.

The shield bondings must always be implemented with large-surface contact. (Figure 1a,1b). Therefore bondings with sheath wire, via connector pins or wire connectors are not allowed (Figure 1c).

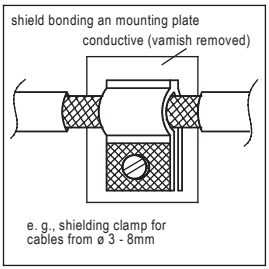


Figure 1a

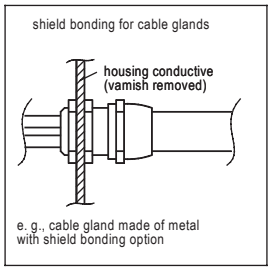


Figure 1b

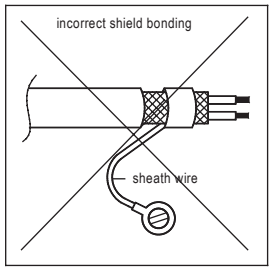


Figure 1c

Arrangement and cabling

The softstarter and the filter resp. EMC-components have to be mounted as close as possible next to each other and must be earthed with a large-surface contact. This is best done by means of a mounting plate (figure 2). The varnish on the contact areas of this mounting plate must be removed in advance. The varnish on the contact areas of the inverter or of the filter has to be removed too.

Some switchgear cabinet suppliers offer mounting plates with conductive coating.

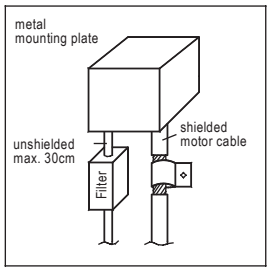


Figure 2

To avoid mutual interference/cross couplings of the cables, it must be ensured that a minimum distance of 20 cm is maintained between control cables and power cables. If control cables have to cross power cables, they have to be laid at an angle of 90° (Figure 3).

When connecting shielded cables make sure that the unshielded cable ends are as short as possible. The large-surface shield bonding must not necessarily be located on the end of the shielding but may also be established in a suitable place - at a distance of some centimetres (Figure 4).

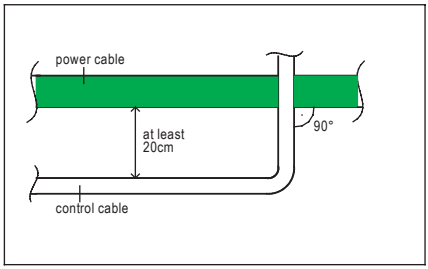


Figure 3

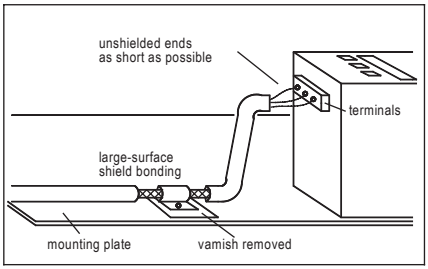
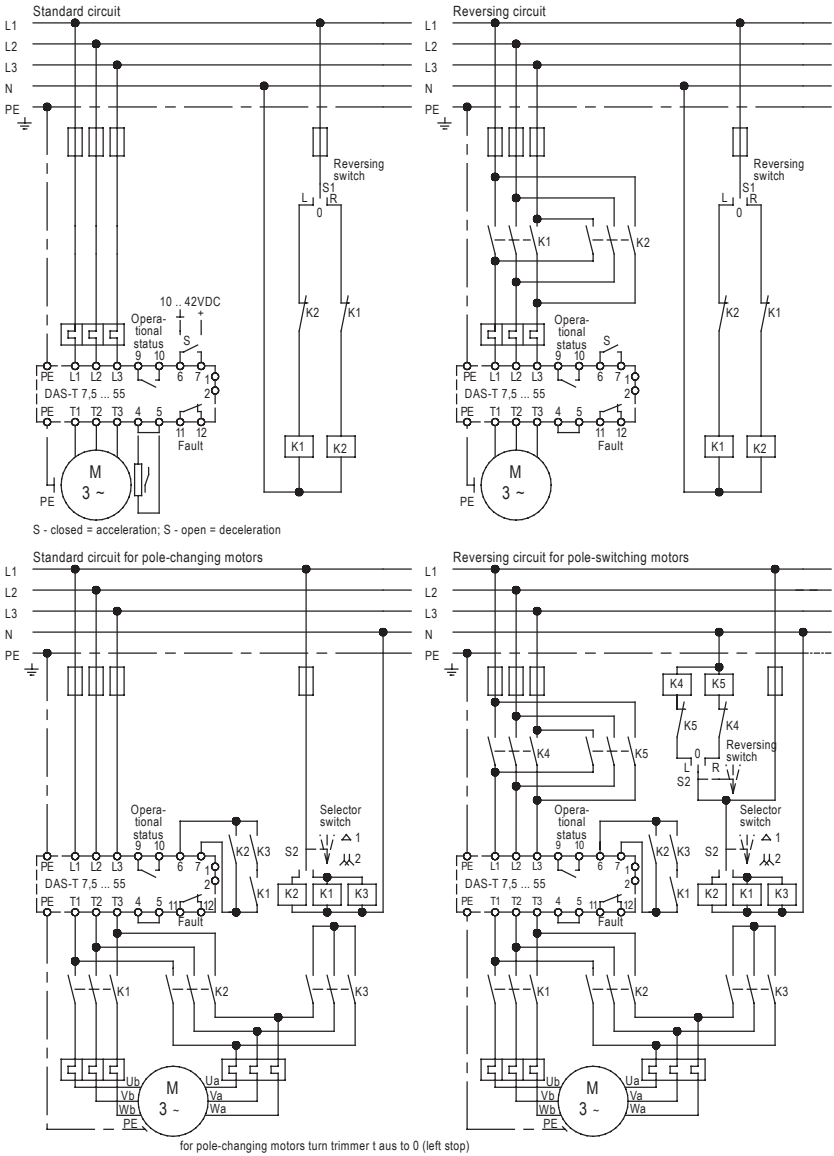


Figure 4

Attention! The protective conductor connection to the motor must no be laid in shielded motor cables, but is to be separately laid with an appropriate cross-sectional area.

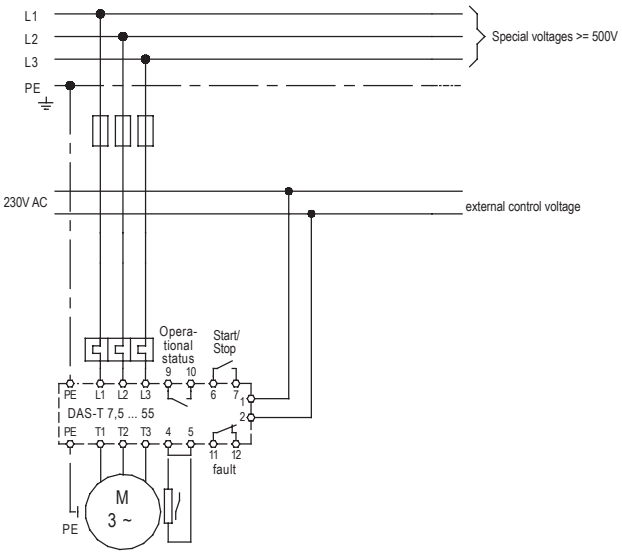
The individual earthing systems, power earth, protective earth, digital earth, and analog earth conductors should be laid separately by using a suitable star-point wiring.

13.4 Typical connections

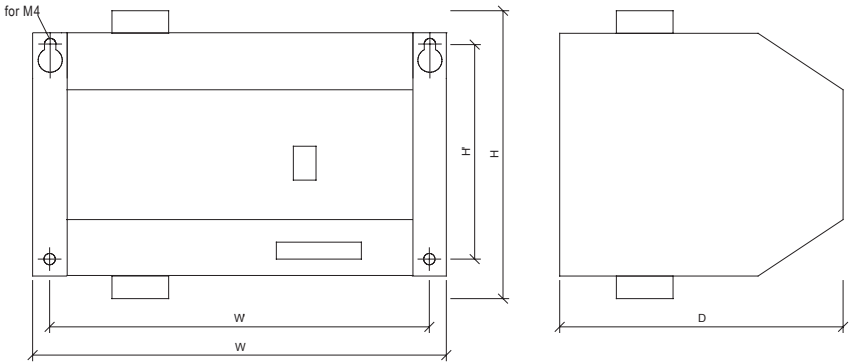


Further connection diagrams are available via the internet at **www.peter-electronic.com**

13.5 Typical connections for special voltages >= 500V



13.6 Dimensions



Mounting dimensions	W	W'	H	H'	D
DAS-T 7,5	235	218	245	170	140
DAS-T 11	235	218	245	170	140
DAS-T 15	235	218	245	170	140
DAS-T 22	235	218	245	170	140
DAS-T 30	335	318	245	170	170
DAS-T 37	335	318	245	170	170
DAS-T 55	335	318	245	170	170

All dimensions indicated in mm.

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