

# SP MINI

phytron®

## Stepper Motor Power Stage Including Supply Unit



Manual 1127-A003 GB

customized solutions  
in motion



**SP MINI**  
**Stepper Motor Power Stage**  
**Including Supply Unit**

© 2003

All rights with:

Phytron-Elektronik GmbH

Industriestraße 12

82194 Gröbenzell, Germany

Tel.: +49(0)8142/503-0

Fax: +49(0)8142/503-190

Every possible care has been taken to ensure the accuracy of this technical manual. All information contained in this manual is correct to the best of our knowledge and belief but cannot be guaranteed. Furthermore we reserve the right to make improvements and enhancements to the manual and / or the devices described herein without prior notification.

We appreciate suggestions and criticisms for further improvement. Please send your comments to the following  
E-mail address: [info@phytron.de](mailto:info@phytron.de)

## Contents

1	SP MINI POWERPACK Stepper Motor Power Stage.....	4
1.1	Technical Characteristics.....	6
1.1.1	Overview.....	6
1.1.2	Dimensions / Mounting Position .....	8
1.1.3	I/O Connector X2.....	9
1.1.4	Connection to Type SPS Control Units (PLC) ..	10
1.1.5	Screw Terminal Motor Connection X4 .....	11
1.1.6	Screw Terminal Mains Connnection X1.....	11
1.2	Description of Operation .....	12
1.2.1	Full Step / Half Step / Ministep Modes.....	13
1.2.2	BOOST .....	16
1.2.3	OVERDRIVE.....	17
2	Motor Connection .....	18
2.1	Connection of Different Types of Stepper Motors.....	18
2.2	Motor Cables .....	19
2.3	Motor Brake .....	19
3	Inputs.....	20
3.1	Push-Pull- or OC-Controlling .....	20
3.2	Logic Level.....	21
3.3	CONTROL PULSES .....	23
3.4	MOTOR DIRECTION +/- .....	23
3.5	BOOST .....	24
3.6	DEACTIVATION .....	24
3.7	RESET.....	25
3.8	BRAKE.....	25
4	Outputs .....	25
4.1	READY .....	26
4.2	ERROR.....	26
5	Front Panel Controls.....	27
5.1	Multiple Color LED.....	28
5.2	Setting Switches .....	29
6	Putting-Into-Service .....	31
7	<b>CE</b> - Sign.....	31
8	Accessories .....	31
9	Quality Assurance System.....	32
10	Index.....	33

## 1 SP MINI POWERPACK Stepper Motor Power Stage

---

SP MINI POWERPACK is the ministepp stepper motor power stage for highest demands. The supply unit is integrated, SP MINI POWERPACK is therefore connected directly to the mains voltage 230 V<sub>AC</sub> (option 115 V<sub>AC</sub> ).

SP MINI control signals may be provided from control units delivering the step pulses and +/- direction signals or from PC's equipped with a stepper motor interface. The power stages can be connected to 4-, 6- or 8-lead two-phase stepper motors. Also the SP MINI supports the operation of stepper motors with a permanent magnet motor brake.

- SP MINI vario power packs exist in 3 versions for the following maximum phase currents:

SP MINI 92-70: 9 A<sub>peak</sub>

SP MINI 72-70: 7 A<sub>peak</sub>

SP MINI 52-70: 5 A<sub>peak</sub>

The maximum phase current A<sub>peak</sub> flows, when only one motor phase is energized and BOOST is activated.

- Optimum motor drive by means of rotating field synchronized current regulation based on the patented SYNCHROCHOP principle
- Setting switches for setting the run current into 16 increments
- Use of the maximum torque with the BOOST and OVERDRIVE functions in the higher frequency range
- Step resolution setting switch: Full step, half step, 1/2.5 and 1/5 step. The initial motor direction and the positive or negative input signal logics are also set by this setting switch.
- Electrical insulation of inputs and error output by means of opto-couplers  
We recommend controlling via RS422 push-pull drivers to ensure high immunity against disturbances. It is also possible to drive the unit by means of open-collectors.
- Direct connection to the mains voltage:  
Electrical insulation is provided by a toroidal core transformer.
- Multiple color status LED
- Electronic monitoring of overheating, short-circuits and voltage drops
- Easy-to-mount design:  
Flat Vario-housing for wall mounting in electrical cabinets  
Mounting brackets for various mounting positions  
All connections on one side

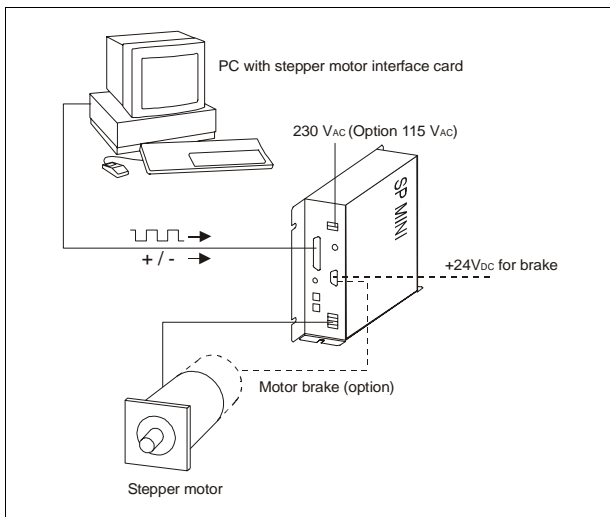


Fig. 1: PC – SP MINI – Stepper motor

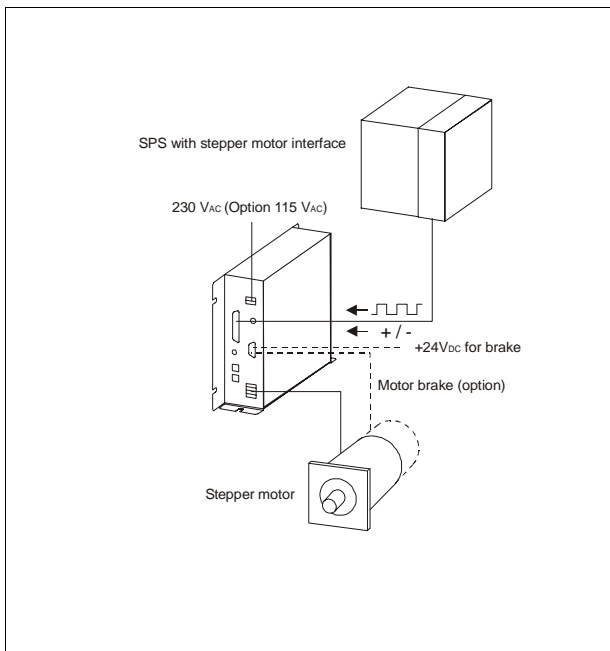


Fig. 2: SPS – SP MINI – Stepper motor

# SP MINI POWERPACK

## 1.1 Technical Characteristics

### 1.1.1 Overview

<b>Supply voltage</b> [ $V_{AC}$ ]	230 $V_{AC}$ $\pm 10\%$ 50-60 Hz (Option 115 $V_{AC}$ )
	Fuse: T 2.5 A (230 $V_{AC}$ ), T 5 A (115 $V_{AC}$ )
	Disturbance filter (EMI filter) integrated
<b>Stepper motor</b>	2-phase-stepper-motors with 4-, 6- or 8-lead wiring scheme Winding inductance per phase: min. 0.5 mH 200 W max. power requirement
<b>Step resolution</b>	Full step, Half step, 1/2,5, 1/5 step. Programming by means of the setting switch S1.
<b>Motor currents</b>	Run current is set in 16 increments by setting switch S2.
<b>Max. motor currents</b>	SP MINI 92-70: 9 A SP MINI 72-70: 7 A SP MINI 52-70: 5 A
	The maximum motor current flows at switch position F (S2) when only single motor phase is energized and BOOST is activated.
<b>Duty</b>	70% for a S6 duty cycle according to VDE 0530
Ambient temperature	0 to 40 °C
Max. heat sink temperature	+ 85 °C (185 °F)
Max. motor cable length	50 m
Min. motor cable area	1 mm <sup>2</sup> per 10 Ampere motor current.



<b>Inputs</b>	The input logic is set by setting switch S1 (see chap.5.2)	
	The inputs are optocoupler-isolated and can be controlled via a RS 422 line signal or an open collector signal (see chap. 3).	
	<b>CONTROL PULSES</b>	Maximum frequency: 100 kHz, minimum pulse width: 5µs
	<b>MOTOR DIRECTION +/-</b>	When the optocoupler is energized, the motor rotates in the reverse direction (as compared to the preferential motor direction selected).
	<b>BOOST</b>	When the optocoupler is energized, the motor current is set to 130 % of the run current.
	<b>DEACTIVATION</b>	When the optocoupler is energized, the motor current is cut off.
	<b>RESET</b>	A RESET causes resetting of all error messages and initialization of the monitoring circuits.
	<b>BRAKE</b>	When the optocoupler is energized, the brake supply voltage is connected to the brake. The brake is released as long as this input is activated.
<b>Outputs</b>	Optocoupler, open-collector Darlington type outputs $I_{max} = 20 \text{ mA}$ , $U_{max} = 30 \text{ V}$ , $U_{CE \text{ sat}}$ for $20 \text{ mA} < 1 \text{ V}$	
	<b>READY</b>	This output indicates that the SP MINI module is ready to operate.
	<b>ERROR</b>	This common error output is opened if an error signal occurs
<b>Motor brake</b> (optional connection)	Stepper motors with permanent magnet motor brake $24 V_{DC}$ /max. 0.75A. The brake supply voltage must be externally supplied to the X3 connector. The brake is controlled by an input (X2).	
<b>Connectors</b>	I/O signals	25-pole D-SUB socket
	Motor brake	9-pole D-SUB connector
<b>Screw terminals</b>	Motor	4pol. Print lead-through terminal DMKDS 2,5 plus PE-threaded terminal end
	Mains	2pol. Print lead-through terminal DMKDS 2,5 plus PE- threaded terminal end
<b>Weight</b>	4.5 kg	

1.1.2 Dimensions / Mounting Position

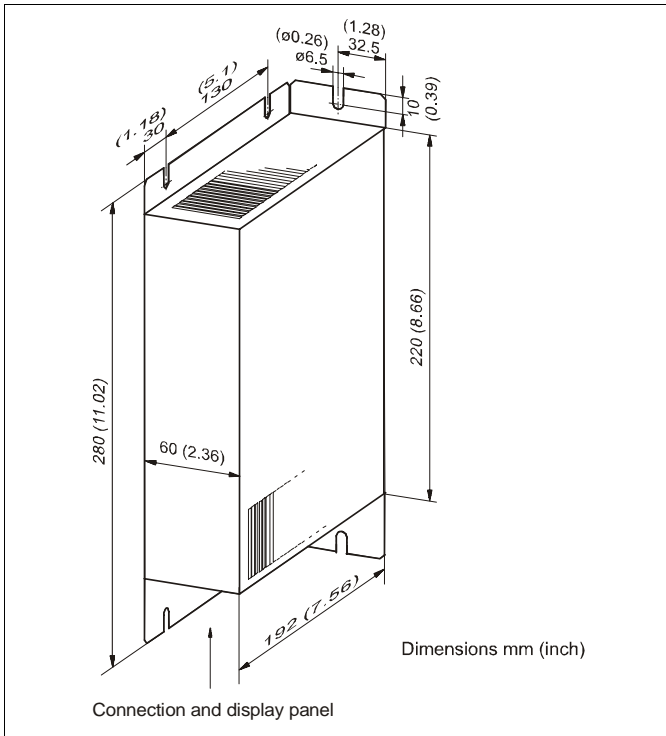


Fig. 3: Dimensions SP MINI

**Mounting instructions**

The SP MINI must be mounted in the electric cabinet to allow correct air circulation. Fig. 3 shows the preferred mounting position. Vertical mounting provides better ventilation.

### 1.1.3 I/O Connector X2

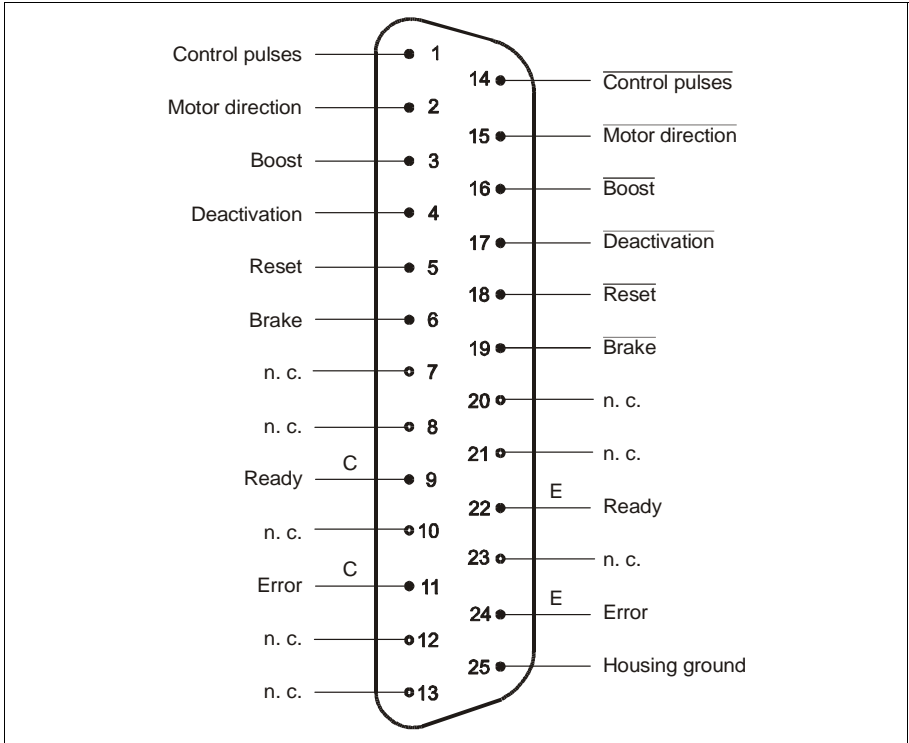


Fig. 4: 25-pole D-SUB connector according to DIN 41652

Inputs and outputs: please refer to pages 21 to 27

**Attention:**

Use shielded cables only!

# SP MINI POWERPACK

## 1.1.4 Connection to Type SPS Control Units (PLC)

As the SP MINI power stages are equipped with galvanically separated inputs and outputs, they can be connected to any control unit equipped with a stepper motor interface. The example below shows the cable connections to type IP 267 and IP 247 control units.

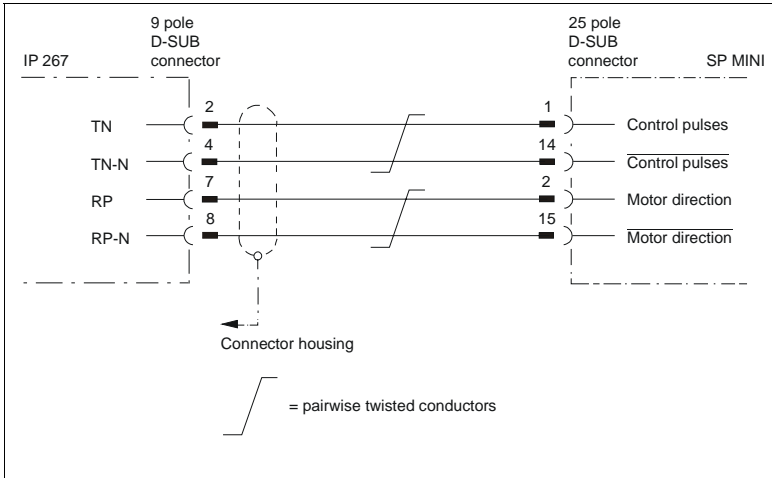


Fig. 5: Cable connections IP 267 – SP MINI

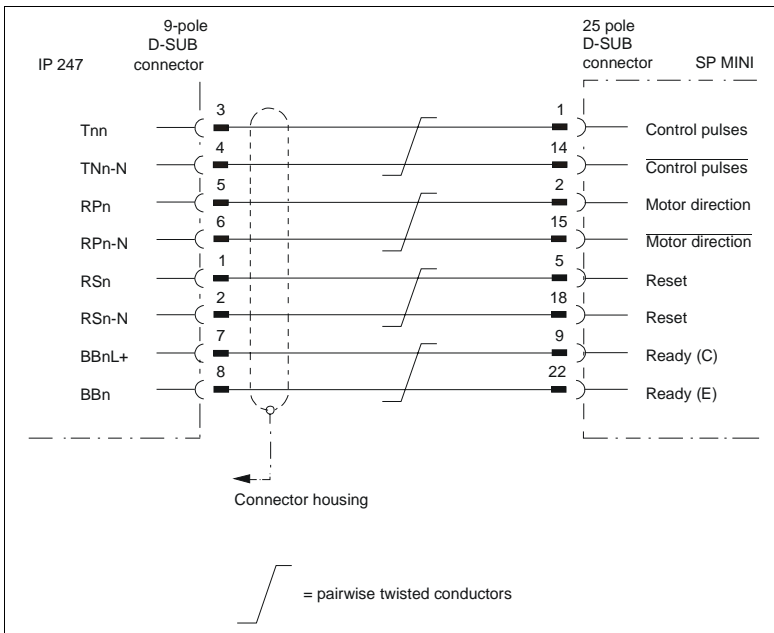


Fig. 6: Cable connections IP 247 – SP MINI

### 1.1.5 Screw Terminal Motor Connection X4

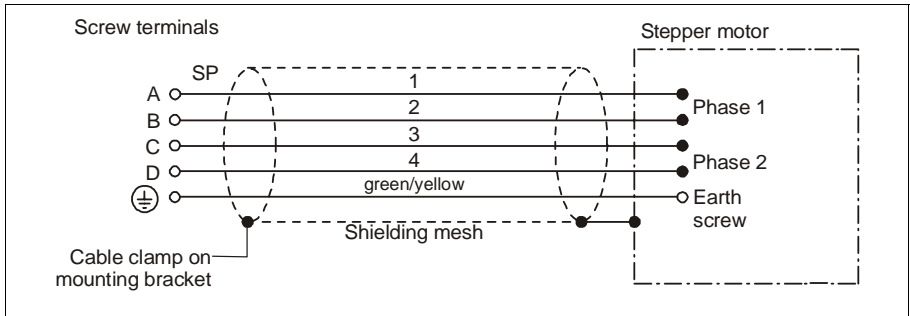


Fig. 7: Motor connection SP MINI

#### Important!

When connecting the shielded motor cables to the screw terminals, the contact resistance must be as low as possible.

We recommend to use cables with crimp terminals according to DIN EN 50 027.

### 1.1.6 Screw Terminal Mains Connection X1

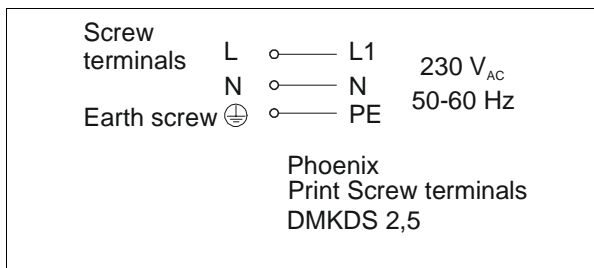


Fig. 8: Mains connection 230 V<sub>AC</sub>



















































