Operating Instructions

LV-Unit

Edition: February 2010
Art.-No.: 230876

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Modification History

Document code	Date	Modification
Lv-unit_en.doc	12/99	First edition of the document
MAN_EN_230876_LV-Unit_R1a.doc	February 2010	Amendment as far as the declaration of conformity is concerned

We are always grateful for suggestions for improvements and information about errors.

Contents

1 Technical data in brief

1.1 Declaration of conformity

IEF Werner GmbH
Wendelhofstr. 6
78120 Furtwangen

Product Range PAC-Compact, PAC-Controller, PAC-Single
LV-Unit, PAC-Unit, LV-Single

The following standards are applicable:

89/336/EWG Electromechanical compatibility

EN 50081-1	Special standard emissive disturbances
EN 50081-2	
pr EN 50082-1	Special standard resistance to jamming
pr EN 50082-2	

Test procedures :

IEC 801-2/Level 3	Resistance to jamming due to electrostatic discharge (ESD)
IEC 801-3/Level 3	Resistance to jamming due to electrostatic fields
IEC 801-4/Level 3	Resistance to jamming due to fast transient disturbances
IEC 801-5/Level 3	Resistance to jamming due to voltage (Surge)
EN 55011/Class B	Limiting values and measuring methods for radio disturbances

18.10.96 .....
Date Authorised Signature (Managing Director)

This statement does not contain any assurance of features.
The safety and protection regulations of the operation instruction have to be strictly observed.
Above mentioned company places the following techn. documents at disposal for inspection:

	User	EU-Authorities
• Operating instruction conforming to specification	X	X
• User-Software	X	X
• Plans / Software-source coding		X
• Description of the methods to assure conformity		X
• Test records		X
• Other technical documentations		X

1.2 System concept

The power amplifier LV-Unit is designed for controlling stepping motors. It therefore represents the link between external control units and the stepping motors. Amongst others, the
PA-CONTROL from IEF Werner GmbH can be used as the control unit.

The collective term LV-Unit covers control units which optimally suit the relevant applications.

The LV-Unit can be fitted with the optimum power output stages for the applications which may arise in practice. Use of 2-phase or 5-phase stepping motors is envisaged. The output stages are fitted when the unit is manufactured.

2-phase power output stage

In the 2-phase version, power output stages from 1 to 12A per phase can be used. The features of these power output stages are:

- Constant current drive in chopper mode
- Current setting with potentiometer
- Protection against short circuits
- Protection against overvoltage and undervoltage from the motor power supply
- Standby and fault indication by means of LEDs
- Temperature monitoringCurrent reduction at standstill
- Full-step / half-step switchover

5-phase power output stage

In the 5-phase version, output stages from 0.55A to 2.8A per phase can be used. The features of these power output stages are:

- Constant current drive in chopper mode
- Current setting with hexadecimal-coded rotary switch
- Protection against short circuits and incorrect wiring of the power outputs
- Protection against motor power supply overvoltage and undervoltage and against heat sink overtemperature
- Standby and fault indication by means of LEDs
- Switchover between various operating modes by switches on the board of the output stages (V/H,...)
- Rotation monitoring (optional)

1.3 Technical data

Supply voltage
- 230 / 115 VAC +/- 10%

Mains frequency
- 50 - 60 Hz

Power consumption
- max. 1200 W

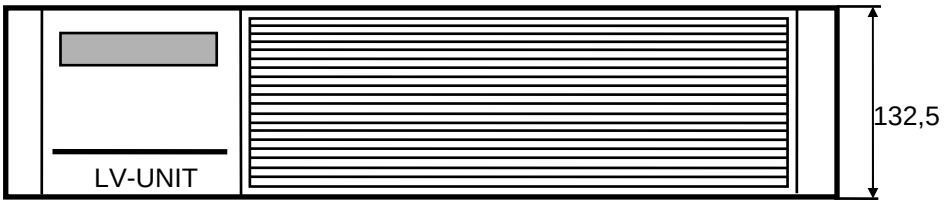
Ambient temperature
- max. 40°C

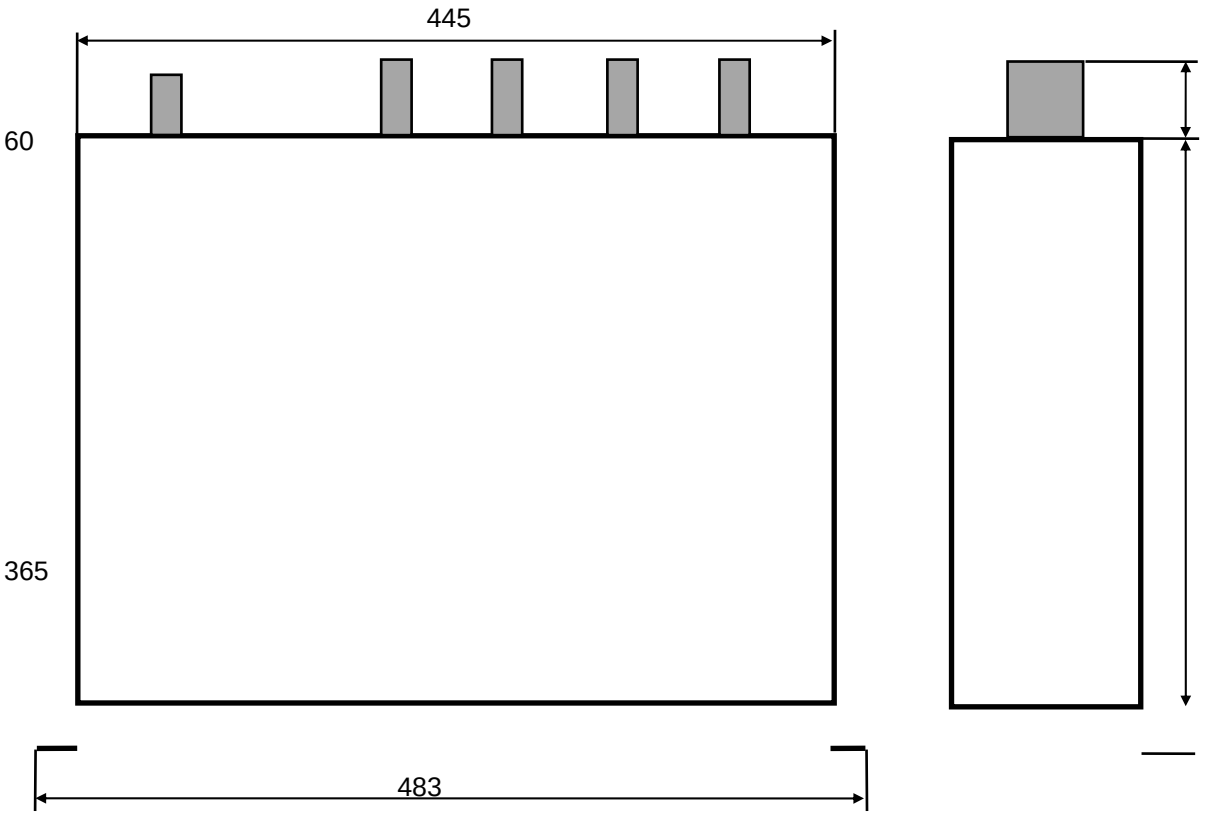
Input signals at signal socket
- optodecoupled
- 24VDC / 3,5VDC (can be changed via resistance network)
- typical input current 15 mA
- encoder for rotation monitoring (optional)

Outputs
- floating standby contact on signal socket; 36VDC / 30VAC; 0,2A
- floating contact for brake (4-pole socket); 36VDC / 2A
- 24VDC / 3A unregulated for customer use (3-pole socket)
- motor socket (11-pole)

1.4 Outer dimension

19" / 3HE





1.5 Installation / Unit cooling

The unit is designed for horizontal installation into 19" modules. The unit must rest on lateral guide rails due to its intrinsic weight of approx. 22kg.

The heat arising during operation must be dissipated. The unit must therefore be installed in such a way that air is supplied and removed unhindered at all times (see drawing below).

(Side view)

CAUTION

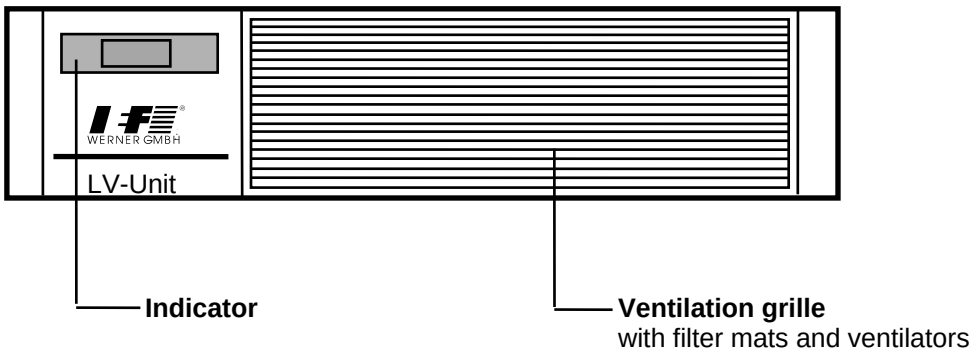
It is essential to connect the unit to the protective conductor!

The unit's two fans are operated with 24VDC. If 24VDC is not supplied, it is probable that the output stages will overheat.

The motor connector may be connected and withdrawn only with the power supply disconnected!

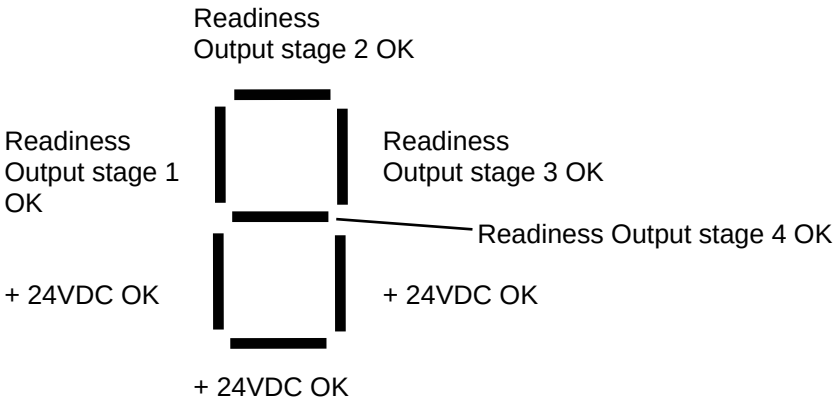
2 Overview plan

2.1 Frontal view



Indicator

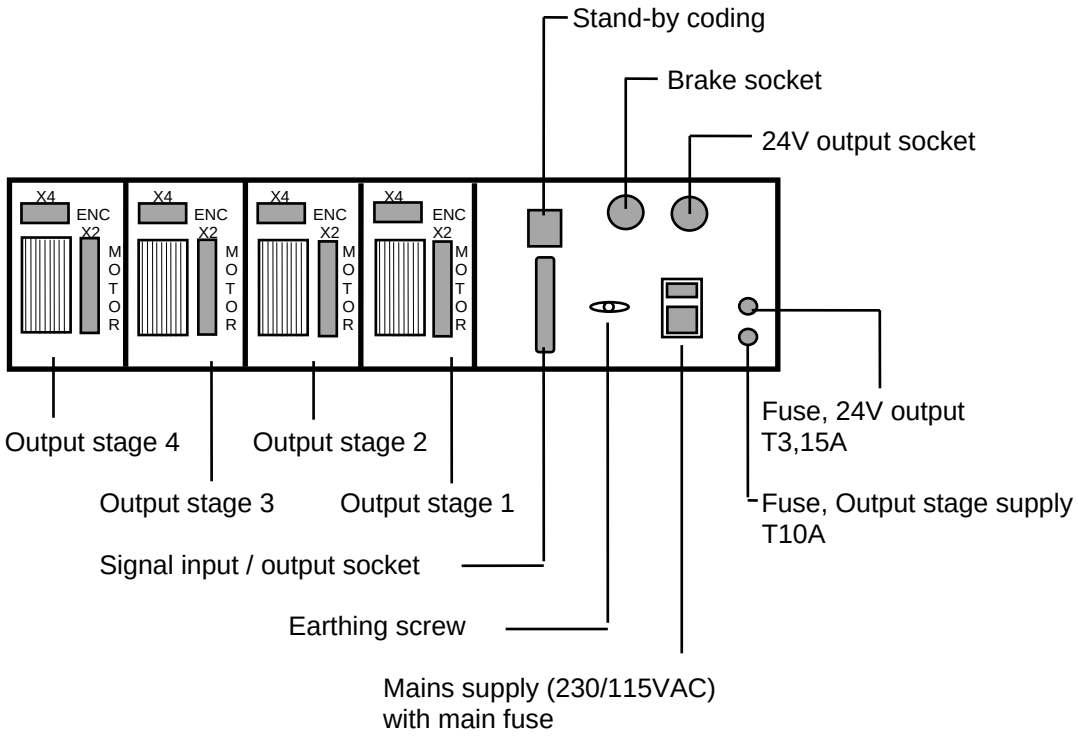
Segment illuminated:



CAUTION

The unit does not indicate readiness if 24VDC is not present!

2.2 View of rear panel

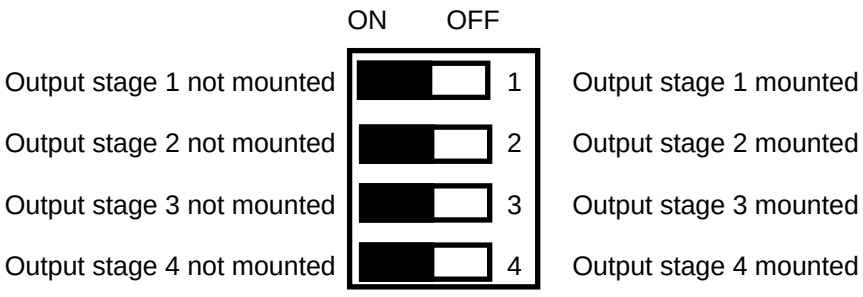


Generating the stand-by signal of the LV-UNIT:

The LV-Unit provides the "Stand-by" output signal. This signal is the logic AND connection of the stand-by signals of the individual output stages.

If an output stage is not mounted, the stand-by signal for this free slot must be generated by the corresponding switch.

Stand-by coding

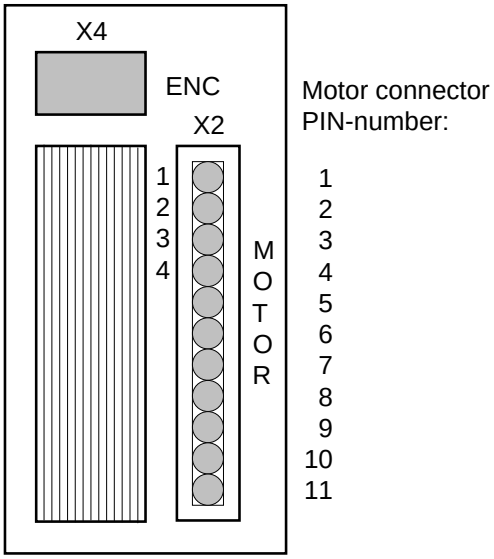


NOTE If the output stage is mounted, the corresponding switch must be switched to "OFF"!

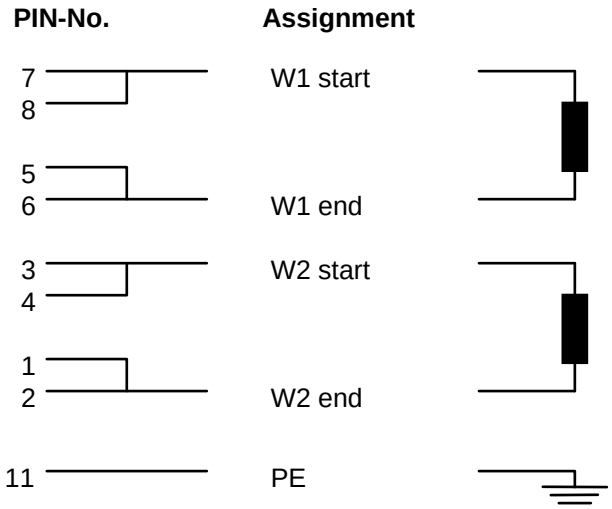
3 Connector assignment

3.1 Motor connector

3.1.1 2-phase stepping motor



Terminal connection diagram:



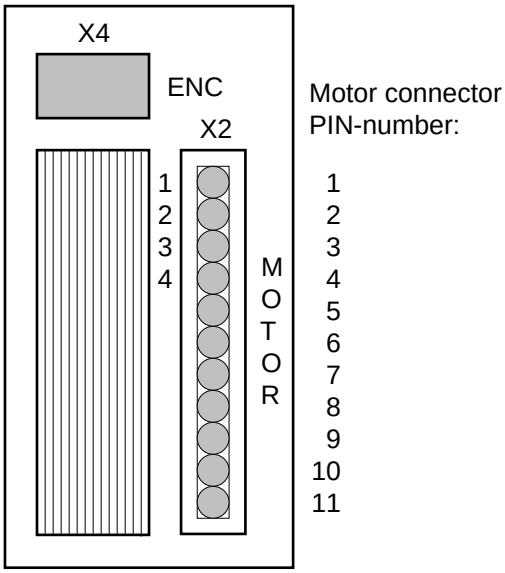
NOTE

In the power connector both connector pins have to be used for windingstart and windingend.

It's absolutly necessary to connect the connector housing with both screws at the device.

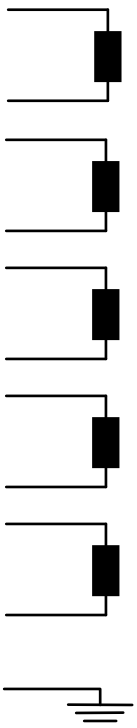
The motor connector may be connected and withdrawn only with the power supply disconnected!

3.1.2 5-phase stepping motor



Terminal connection diagram:

PIN-No	Assignment
1	W1 start
2	W1 end
3	W2 start
4	W2 end
5	W3 start
6	W3 end
7	W4 start
8	W4 end
9	W5 start
10	W5 end
11	PE



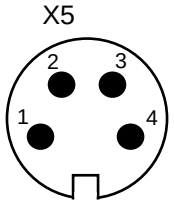
NOTE

It's absolutly necessary to connect the connector housing with both screws at the device.

The motor connector may be connected and withdrawn only with the power supply disconnected!

3.2 Connection of the brake

PIN assignment of the connector for the brake:



(intern)

1 : +24VDC OUT

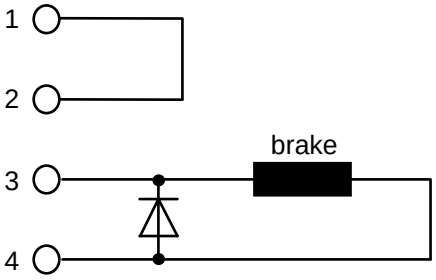
2 :

3 :

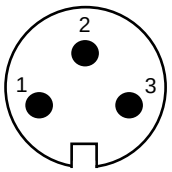
4 : 0V (+24VDC OUT)

The potential-free contact between pin 2 and pin 3 closes when all output stages are ready.

Example for controlling a brake from the internal supply voltage (24VDC OUT), given a maximum braking current of 2A.



3.3 Output socket 24V



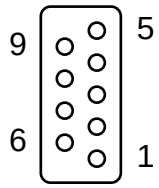
1 : +24VDC / max. 3A
(internal power supply unit)

2 : PE (protective conductor)

3 : GND (internal power supply)

This voltage can be used to supply the control unit PA-Control.

3.4 PIN assignment ENC

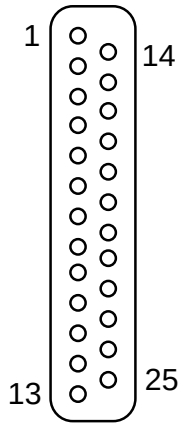


Sub-D, 9-pole socket

1 A
2 +5V / 100mA
3 GND
4 GND
5 $\overline{B}$
6 $\overline{A}$
7 +5V / 100mA
8 GND
9 B

The connection for the encoder for rotating monitoring is optional.

3.5 Signal socket

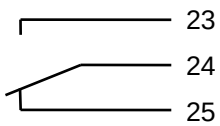


Sub-D 25-pole socket

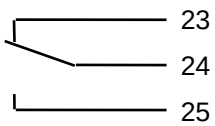
1 +Pulse 1
2 +Direction 1
3 +Pulse 2
4 +Direction 2
5 +Pulse 3
6 +Direction 3
7 +Pulse 4
8 +Direction 4
9 +Reserve 1
10 not occupied
11 not occupied
12 not occupied
13 not occupied
14 -Pulse 1
15 -Direction 1
16 -Pulse 2
17 -Direction 2
18 -Pulse 3
19 -Direction 3
20 -Pulse 4
21 -Direction 4
22 -Reserve 1
23
24 Stand-by contact
25

Stand-by LV-Unit:

LV-Unit ready:



LV-Unit not ready:

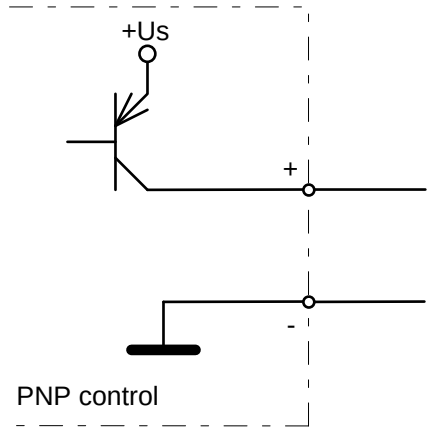


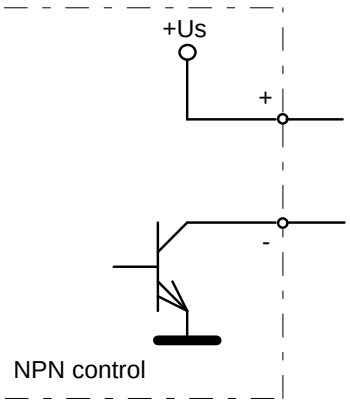
4 Signal inputs

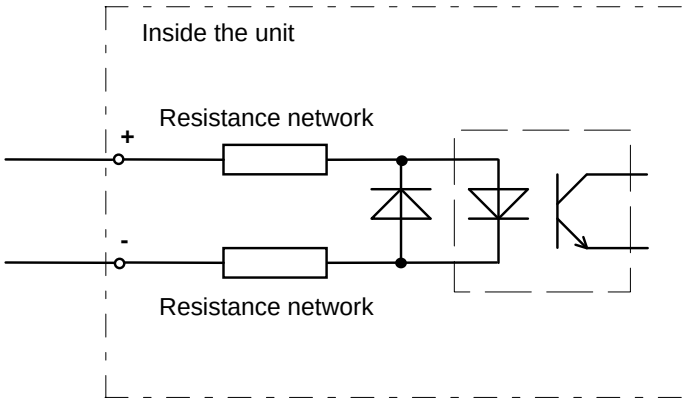
4.1 Connection

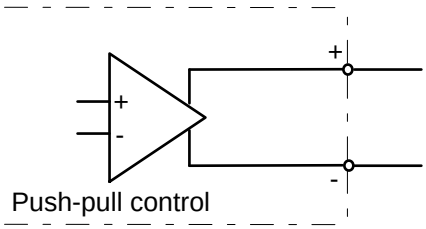
Since the signal inputs are of a potential-free design, there are various control possibilities.

Push-pull control is the most noise-immune control possibility, since in this case, a current is always flowing and the signal lines have load-resistance termination.







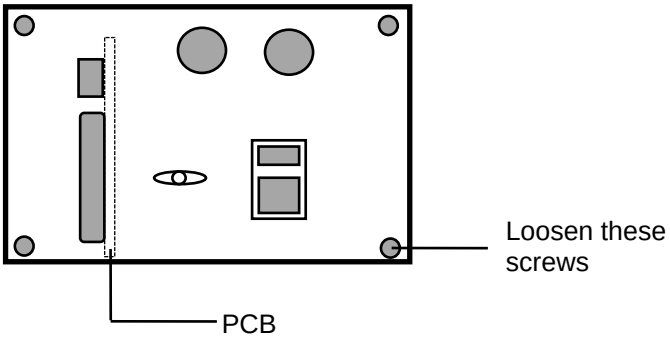


4.2 Adapting the signal input level

The three resistance networks, with the help of which adaption to the various signal voltage levels is realized, are accommodated on a PCB together with the signal input connector.

Procedure:

1. Switch off unit and pull out mains plug
2. Undo the rear panel

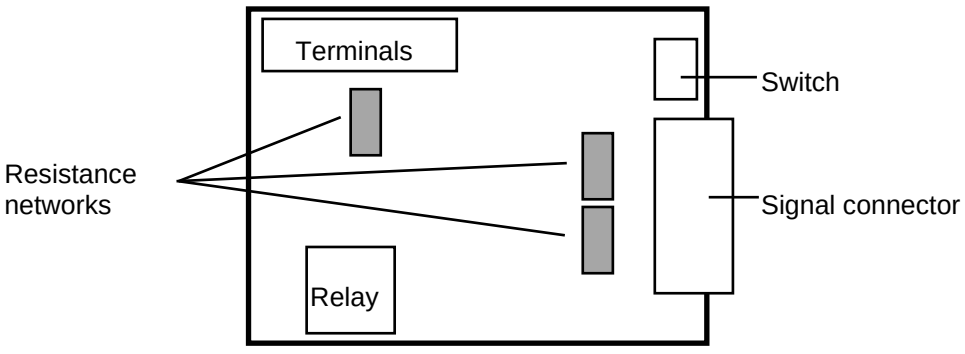


NOTE The rear panel and the screwed-on PCB cannot be completly pulled out of the unit.

3. Replace the resistance networks on the PCB

Dimensioning of the resistance networks:

Signal level	**Resistance value**
3,5V	10 Ohm
24V	560 Ohm

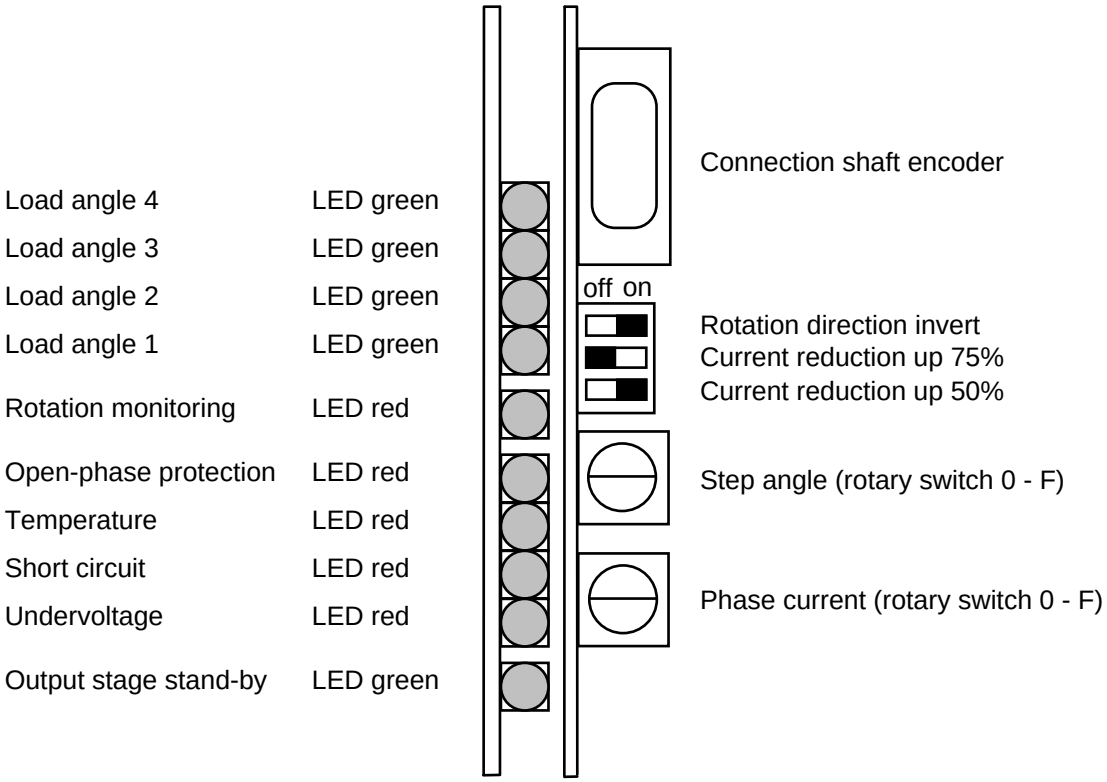


4. Fit the rear panel

5 Power output stage

5.1 2-phase power output stage

5.1.1 LE12-140



Setting step angle:

Step angle	200	400	800	1600 */**					500	1000
Switchposition	0	1	2	3*/**	4	5	6	7	8	9

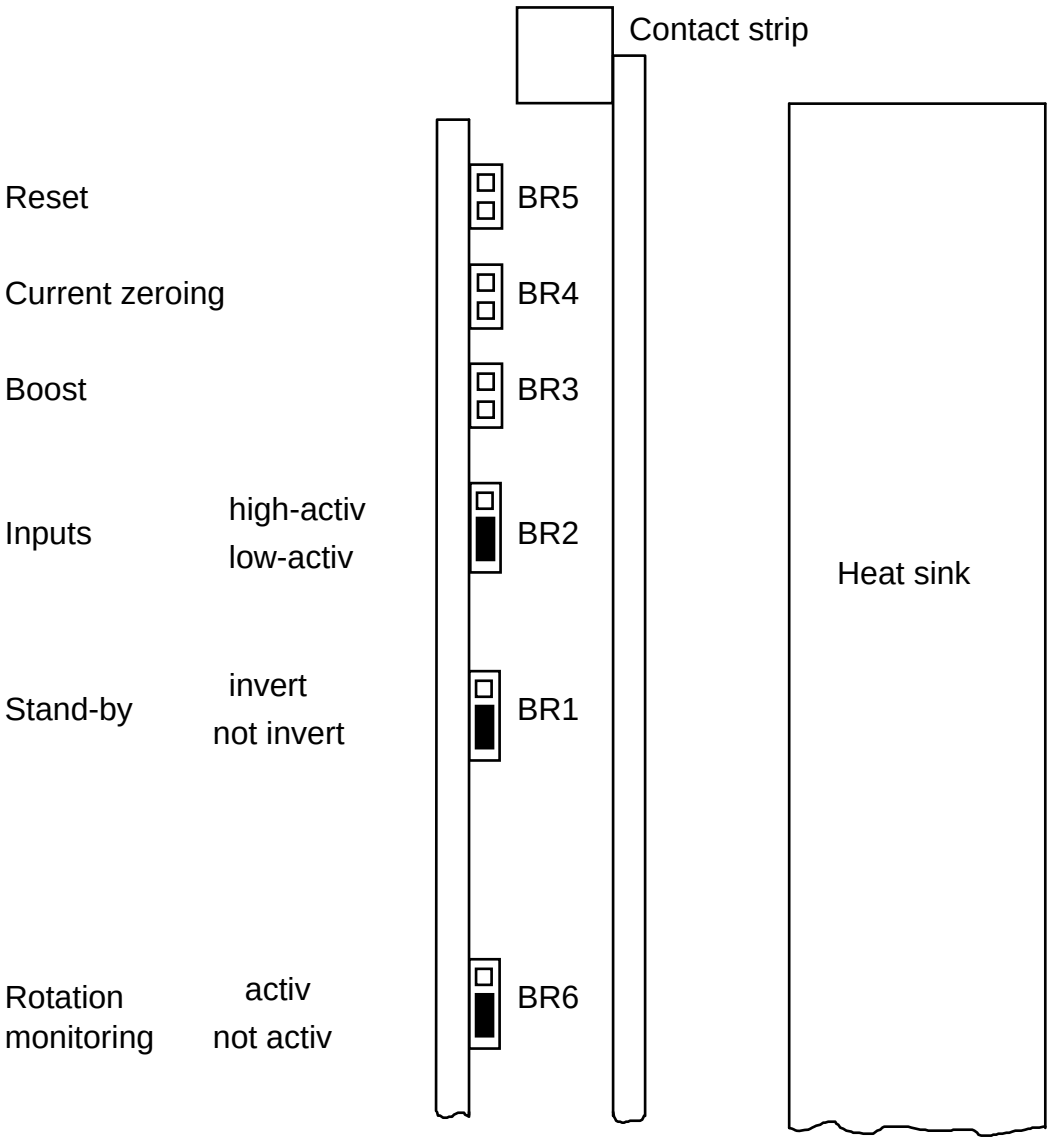
* Rotation monitoring by this step angle not available
** In preparing

Setting phase current:

Phase current (A)	1,0	1,7	2,5	3,2	4,0	4,6	5,4	6,1
Switchposition	0	1	2	3	4	5	6	7

Phase current (A)	6,8	7,5	8,3	9,0	9,7	10,4	11,3	12,0
Switchposition	8	9	A	B	C	D	E	F

Jumperposition:



Drive BR3, BR4 and BR5 about input "Wahl" alternative!
=> BR3, BR4 and BR5 not tip!

Rotation monitoring:

The rotation monitoring can be activated via the jumper BR6. When the rotation monitoring is active, a rotary transducer with 50 increments per motor revolution must be connected to the plug-in connector "Rotary transducer connection".

A supply voltage of 5V with up to 100mA current is available for the rotary transducer. The rotary transducer output signals channels A and B are rectangular signals with a 90° phase offset. They must be 5V push-pull signals (RS422 agreement).

Load angle display:

An assessment of the dynamic state of the drive can be made with the "Load angle 1-4" LEDs. When low demands are placed on the drive system, only the LEDs "Load angle 1" and "Load angle 2" light up when the motor is running. If the LEDs "Load angle 1-3" light up simultaneously, the drive is at the limit of its capabilities.

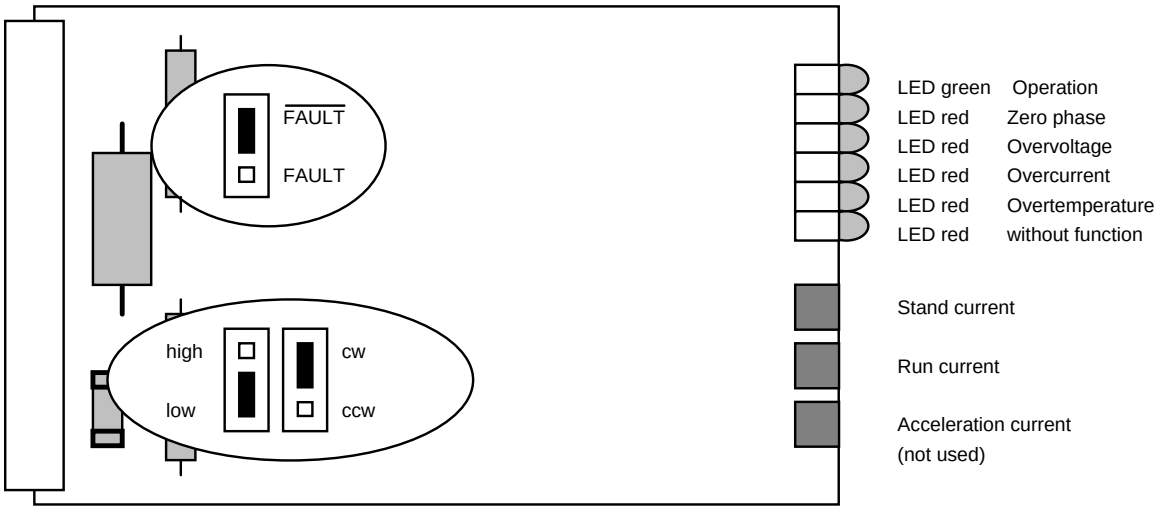
Rotation monitoring display:

The following is displayed with the red LED "Rotation monitoring":

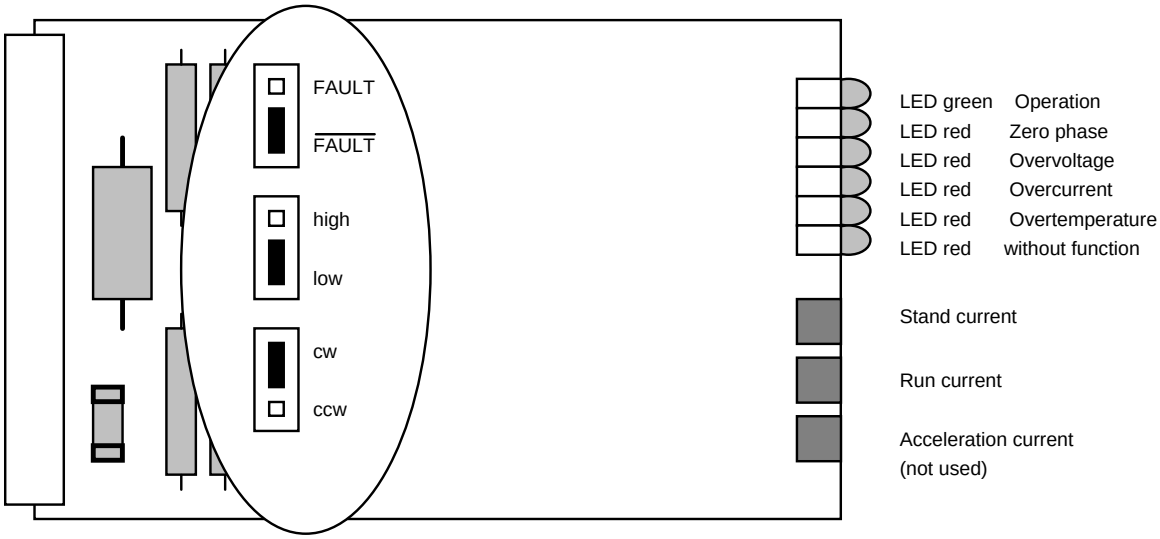
- If the LED "Rotation monitoring" lights up continuously together with the LEDs "Load angle 2 and 4", the rotation monitoring module signals that the maximum permissible load angle has been exceeded
- If only the red LED "Rotation monitoring" lights up continuously, the output stage is in reset state.
- If the red LED "Rotation monitoring" lights up with the green LEDs "Load angle 1-4" within a run light, the rotation monitoring is not active.

5.1.2 B900624, B901224, B1600624, B1601224

In frame of the further development at our control systems is it possible, by 2-phase stepping motors to build-in an output stage of this side.



B 900624



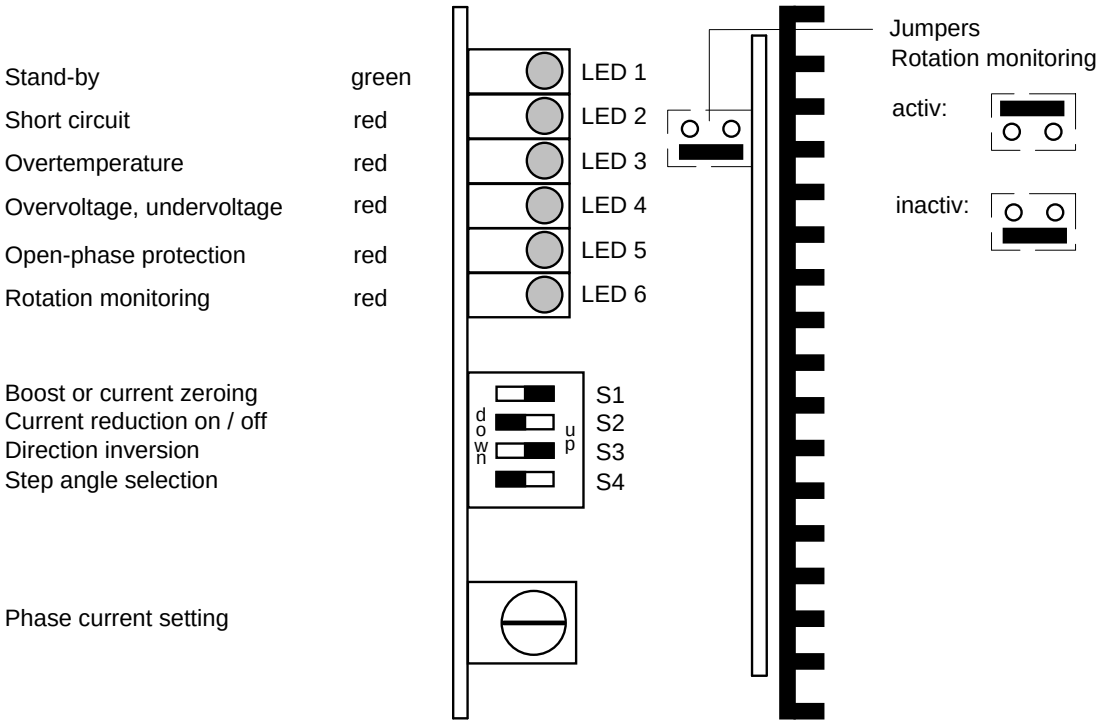
B 901224 B 1600624 B 1601224

Current setting:

Switchposition	Output stage typs	
Standcurrent Runcurrent	B 900624 B160624	B 901224 B 1601224
0	1,00 A	2,20 A
1	1,35 A	2,85 A
2	1,70 A	3,55 A
3	2,05 A	4,25 A
4	2,40 A	4,90 A
5	2,75 A	5,65 A
6	3,10 A	6,30 A
7	3,45 A	6,95 A
8	3,80 A	7,00 A
9	4,15 A	8,35 A
A	4,50 A	9,00 A
B	4,85 A	9,65 A
C	5,20 A	10,30 A
D	5,55 A	10,95 A
E	5,90 A	11,60 A
F	6,25 A	12,25 A

5.2 5-phase output stage

5.2.1 D550.04



Basic setting:

S1	:	up	:	Current zeroing
S2	:	down	:	Current reduction at standstill active (to approx. 70%)
S3	:	up	:	Clockwise rotation
S4	:	down	:	step angle half-step

Phase current setting:

Phase current (A)	0,55	0,70	0,85	1,00	1,15	1,30	1,45	1,60	1,75
Switchposition	0	1	2	3	4	5	6	7	8

Phase current (A)	1,90	2,05	2,20	2,35	2,50	2,65	2,80
Switchposition	9	A	B	C	D	E	F

Current setting by 5-phase power output stage

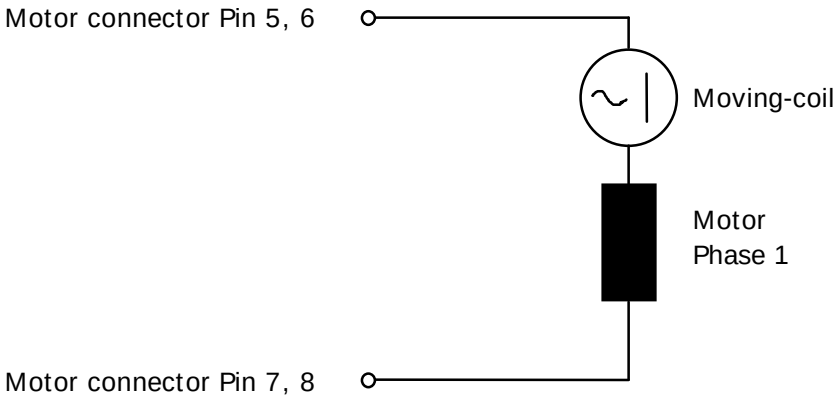
The current is set correctly for the stepping motors driven on these output stages by Messrs. IEF Werner. In the event of exchange, the current must be readjusted with the aid of a moving-coil instrument (connected in series with the coil winding).

NOTE

This measurement measures the effective value of the phase current. This measurement should be conducted at a rate of F=500Hz. This value is defined for the corresponding axis on a PAC in the Parameters menu option, parameter value Traversing speed.

This operating mode is necessary so as to deactivate current reduction at motor standstill.

Do not disconnect the connector with the power supply connected!



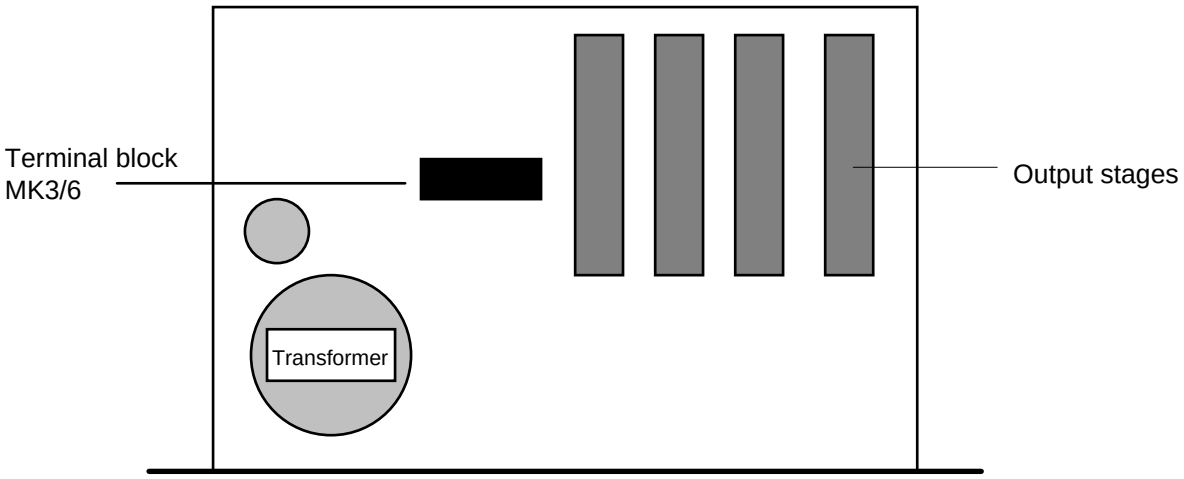
6 Switchover 115/230VAC

The PAC-Compact is set to 230VAC when delivered. It is possible to switch over to 115VAC within the unit on terminal block MK3/6.

Procedure:

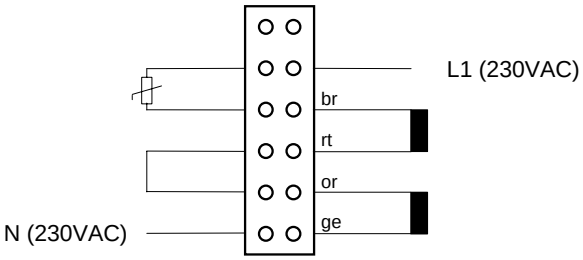
- Switch off the unit and disconnect the mains plug
- Wait for the electrolytic capacitor to discharge
- Remove the cover plate
- Carry out the appropriate reconnection on the terminal block
- Close the unit

Top view of the unit:

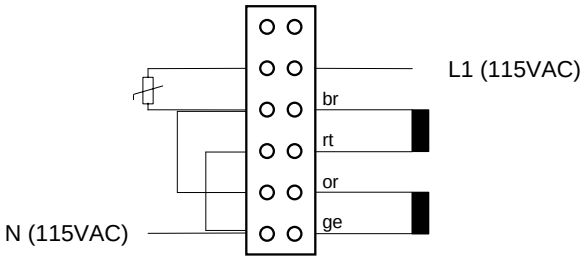


Wiring of terminal block MK3/6:

230VAC



115VAC



NOTE

Mark the new supply voltage clearly on the unit!
Use a mains fuse corresponding to the set supply voltage:

230VAC: Slow-blow, 6.3A fuse

115VAC: Slow-blow, 10A fuse

7 Service

Filter mat:

To provide protection from dirt and dust, the cooling air for the power output stages is sucked in through two filter mats at the front of the LV-Unit.

The filter mats must be replaced every six months or more frequently, depending on the amount of contamination.

Procedure:

- Switch off unit and pull out mains plug
- Open the ventilation grille on the front panel by undoing 6 screws
- Replace filter mats
- Replace ventilation grille

Replacing power output stages:

The power output stages are of a robust design. However, if they still need to be replaced, proceed as follows:

- Switch off unit and pull out the mains plug
- Remove the ventilation grille on the front panel by undoing the 6 screws in the edge of the ventalation grille
- Remove the ventilators
- Replace the required power output stage(s)
- Replace ventilators and ventilation grille

NOTE Check the settings for the phase current and output stage functions (V/H,...).

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