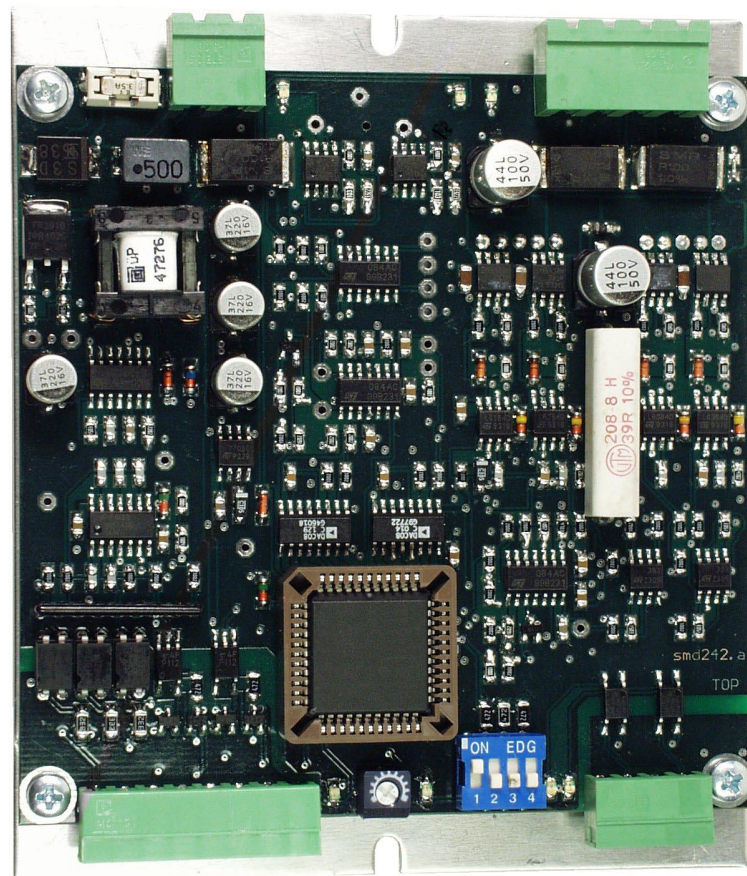


Operator Manual

2-Phase Stepping Motor Power Drive

smd 243



Product features

For all purpose 2-phase stepping motors,
primarily up to 60th motor size

Power drive operates bipolar, less noise and losses

Only one power supply necessary

Simple motor current adjustment with potentiometer

Steps / revolution:
standard: 200, 400, 800, 1600, 500, 1000
optional: 400, 500, 1000, 2000

Optimized torque ripple between steps

Step frequency up to 150 kHz

Automatic current reduction

Protected against over temperature, excessively high
motor current and power supply voltage surges
(integrated active ballast circuit)

Inputs: PULSE, DIRECTION, GATE, OFF, RESET,
FAST (Opto coupler with wide input range)

Outputs: READY, ZEROPHASE(Reference point)
(Opto coupler)

LED-indicators for supply voltage, over current, over
temperature, over voltage(ballast), and zero phase

All connectors removable

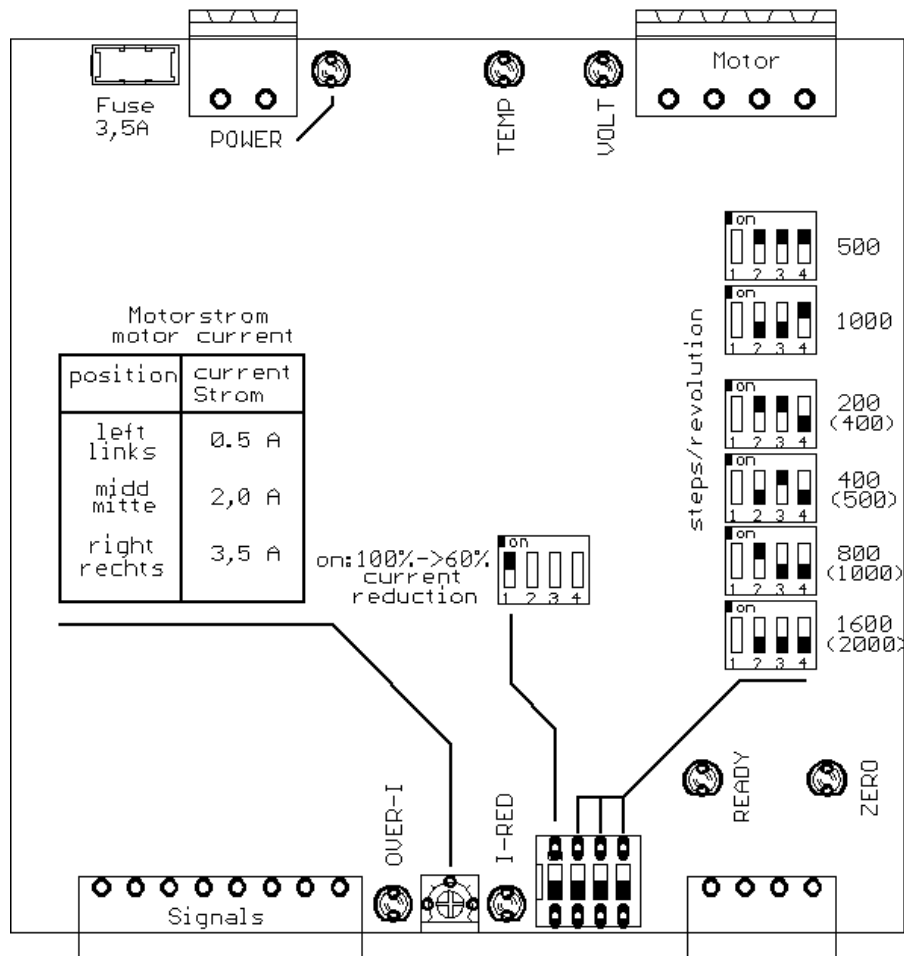
Super compact housing, metal

Variants/Order-key

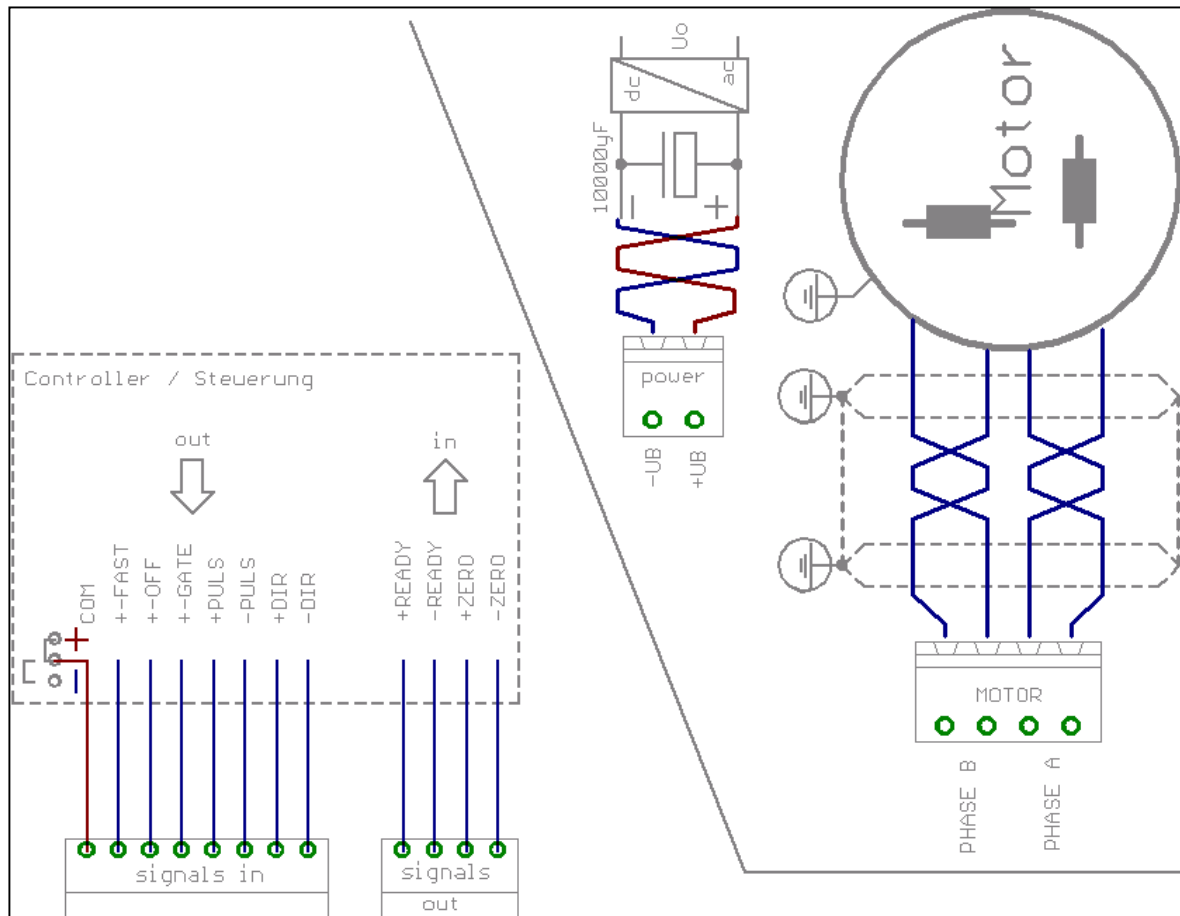
smd243.xxxx 42V, 3,5A

.x--- 0: standard n: optional Steps/revolution
.x-- ---
.--x- 0: wall mounted 1: DIN-rail mounting
---x 0: open frame 1: with housing

Placement of the operating elements:



Wiring diagram



Signal description

PULS:

A step is executed with each positive signal edge. The power drive exclusively reacts on signal edges. In case of an active current reduction (switch „current reduction“ on) and pulse pauses greater than approx. 100ms, the motor current is reduced to approx. 60% of the set value.

The current reduction is not active if the pulse signal stays on active.

DIR: (Direction)

The direction signal defines the sense of motor rotation. The logic assignment can be inverted by swapping the wires of one motor phase.

GATE:

The power drive ignore all input pulses if the input GATE is activated. With this function it is possible to operate multiple power drives from one pulse source.

OFF / RESET: (power drive off)

When active, the motor current is switched to zero. The motor shaft can now easily be rotated manually.

OFF/RESET (failure condition)

Change from error condition to operating condition. Independent of the current motor position, the motor switches to ZERO position.

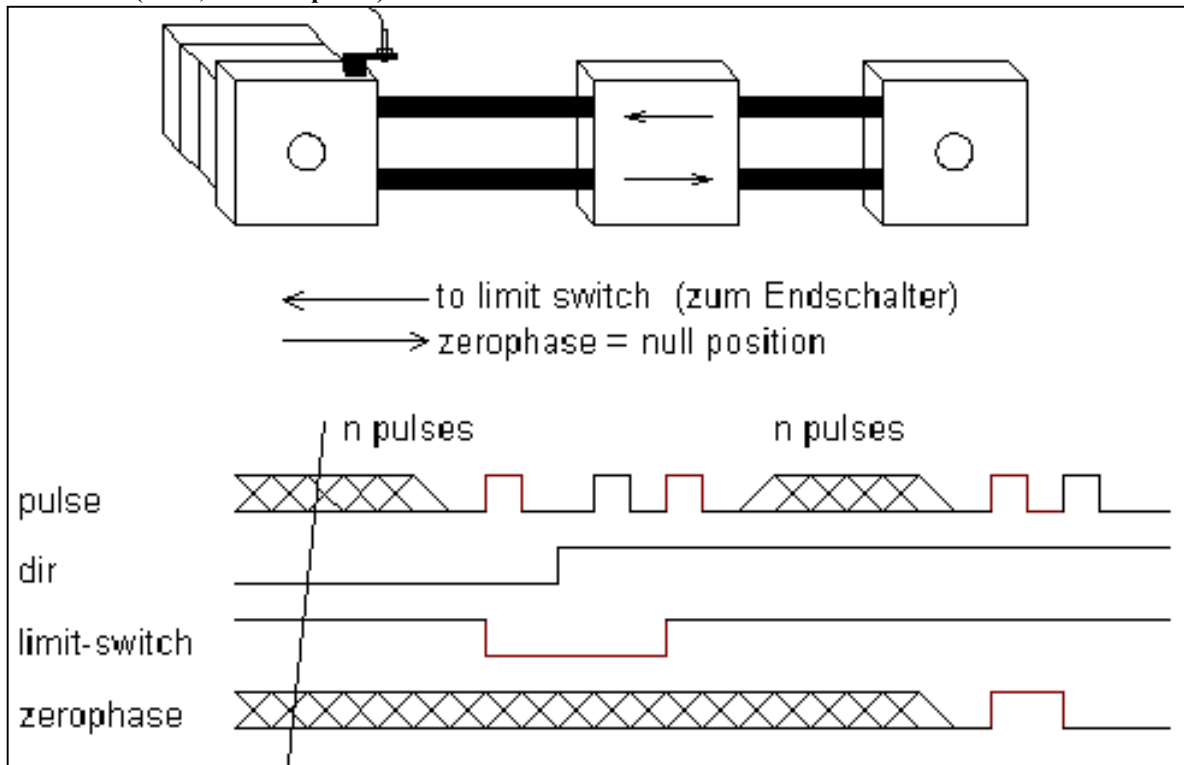
While the RESET signal is active, the motor current is switched to zero and the motor is without torque.

Conditions for failure are short cuts in motor windings or over temperature. The power drive switches off, the ready output switches to high impedance.

READY:

This output is switched when the drive is functional. The following faults switches the output to high impedance: low voltage, over current/temperature. This condition is hold until „RESET-Signal“ is active or the power drive is switched off and on again. The power drive senses READY approx. 200ms after power supply is stable.

ZEROPHASE: (Null-, Referenzpunkt)



ZERO phase or ZERO position can be used as an exact reference point. Following is a procedure to handle with ZERO points.

First move carefully to the limit switch, reverse the direction and move until ZERO phase is active. Be sure, the ZERO phase don't coincides with the limit switch hysteresis and perhaps adjust the limit switch position.

Depending on the pulses/revolution the ZERO phase becomes active after n pulses under the condition the direction doesn't change

steps/rev.:	ZEROPHASE after n pulses
200	4
400	8
800	16
1600	32
500	10
1000	20

FAST:

Activating of this input switches to the halve resolution. So the result is the double motor speed.

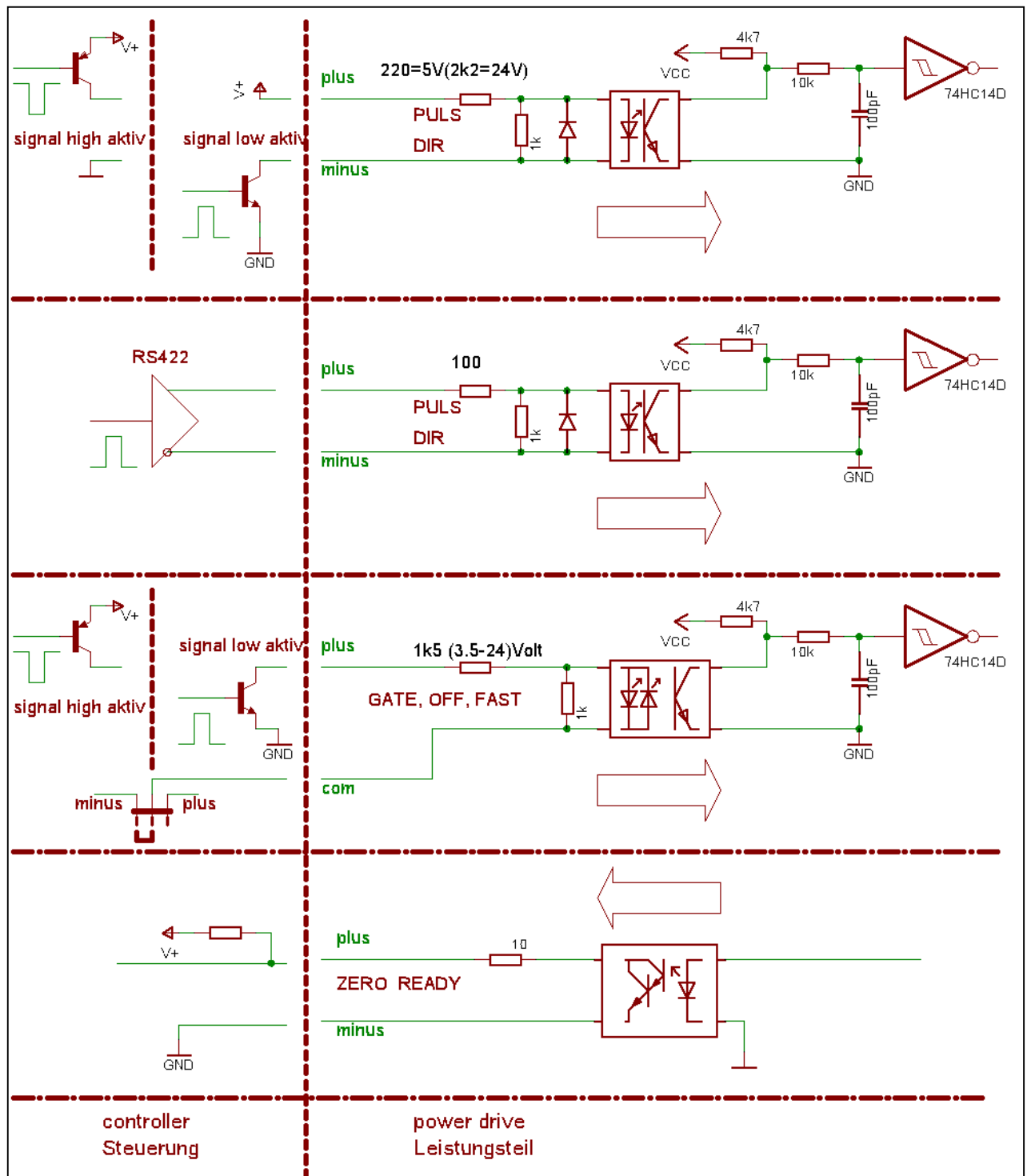
! It acts only at the 1600, 1000 and 400 steps/revolution.
! Switching only at even positions 2,4,6,...

Motor connections:

By swapping the wiring connection of one motor phase, e.g. phase A, the motor sense of rotation can be inverted to the logic assignment of the direction signal.

Under no circumstances motor wires must be disconnected during operation. Induction voltages can destroy the power drive. For this reason assure proper contact of the motor wires at the socket.

Interface:



The signal interface is completely isolated by opto couplers. To have a wide flexibility, both inputs plus and minus of the opto couplers are available. So its easy to drive the signal interface with high-, low- or RS422 active signals. (Puls, Direction)
The control inputs GATE, OFF

and FAST have a common reverence input and are available for driving direct from a PLC with 24V.

All signals have a wide voltage range from 3V to 24V.

Steps per revolution

Select the steps/revolution with the DIP-switch.

! Only when power drive is off

Using a standard hybrid stepper motor with 50 magnetic poles result in following steps/revolution:

200, 400, 800, 1600,	500, 1000	oder
400,	500, 1000, 2000	optional

Performance of rotation smoothing:

☹ less than 400 ☺ more than 400

Behavior of resonance

The motor resonance can be reduced by increasing the steps/revolution. Following table will show the effect under the condition the resonance at full step will be 100%

steps/rev.:	behavior of resonance
200	100%
400	29%
800	8%

Motor current setting:

The motor current is set with the Potentiometer. In the picture „placement of the operator elements“ on side 2 you can see the motor current according to the position of the Potentiometer. The value represents the amplitude of the sinusoidal phase current. The total motor current is the sum $I_{\text{motor}} = \sqrt{(I_a^2 \sin^2() + I_b^2 \cos^2())}$.

In general only as much current should be set as actually is required for the application. Too high motor currents results in unnecessary losses in motor and drive.

At higher pulse rates the motor current reduces because of the motor inductance. (see diagrams from manufactures)

Automatic current reduction

In operating modes with pauses between movements it is useful to activate the current reduction. The motor current is reduced to approx. 60% of the set motor current. The losses in motor and drive are reduced as could be seen in following table:

current reduction	0%	to	60%
losses	100%		36%
motor torque	100%		60%

! Current reduction reduces holding torque. Assure the resulting holding torque is acceptable for your application.

The current reduction is activated, if the pulse input is inactive for more then approx. 100ms.

The current reduction can be blocked if the pulse input remains in a static active level.

With the next pulse, the current reduction is disabled immediately. The time to full motor current depends on motor type, motor voltage and pulse width(if < 15µs)

the current reduction must be activated at motor currents over 3A

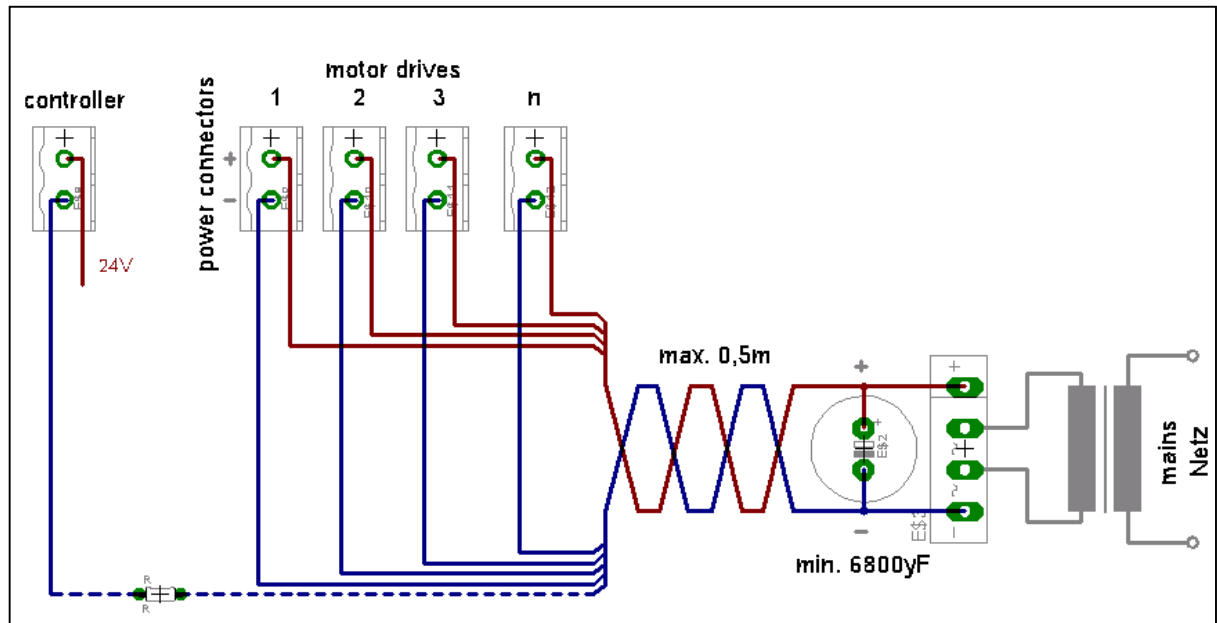
Temperature monitoring

The power drive is disabled, if the heat sink temperature exceeds 70° Celsius.

The condition is indicated with the LED „over temp.“.

Dependent of external environment and higher motor currents makes an additional cooling necessary.

Versorgung



To reduce fault influences it is highly recommended to have separated power lines for each power drive. To avoid static charges when controller and power drive operates with different power supplies, it is a good praxis to insert a resistor of approx. 100kOhm between controller and power drive.

Power supply

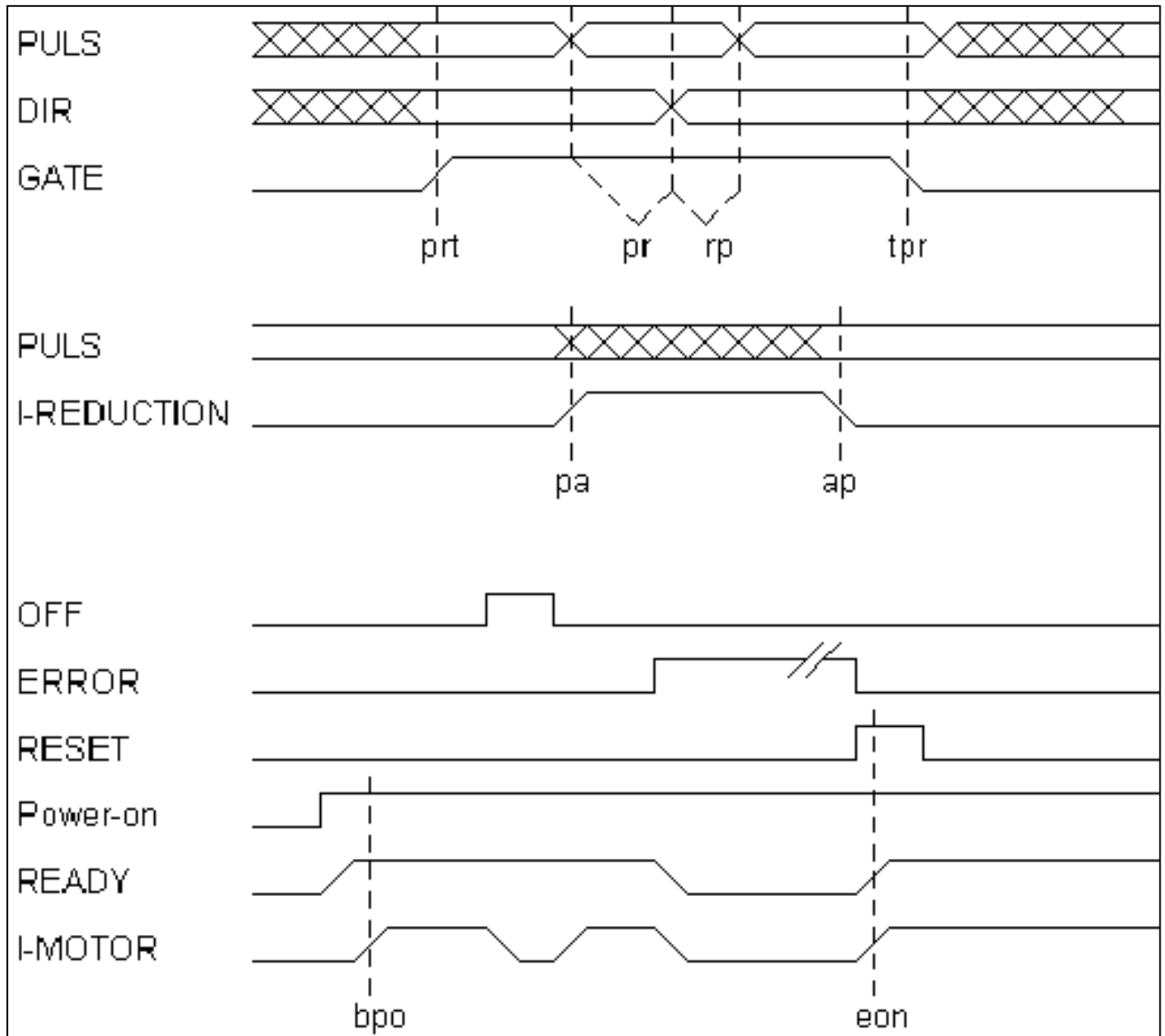
It must be guaranteed that the power supply have an capacitor of at least 6800yF. An active internal ballast circuit eliminates short over voltages caused by generator operation occurring during fast deceleration. This condition is indicated with the over voltage LED that only be lit for a short period of time during this condition.

Too high motor voltages may damage the power drive.

Never connect live supply voltage wires to the terminals, because the sudden charge current of the internal electrolytic capacitors can destroy the internal fuses

! Check for correct polarity

Zeitverhalten, (Timing)



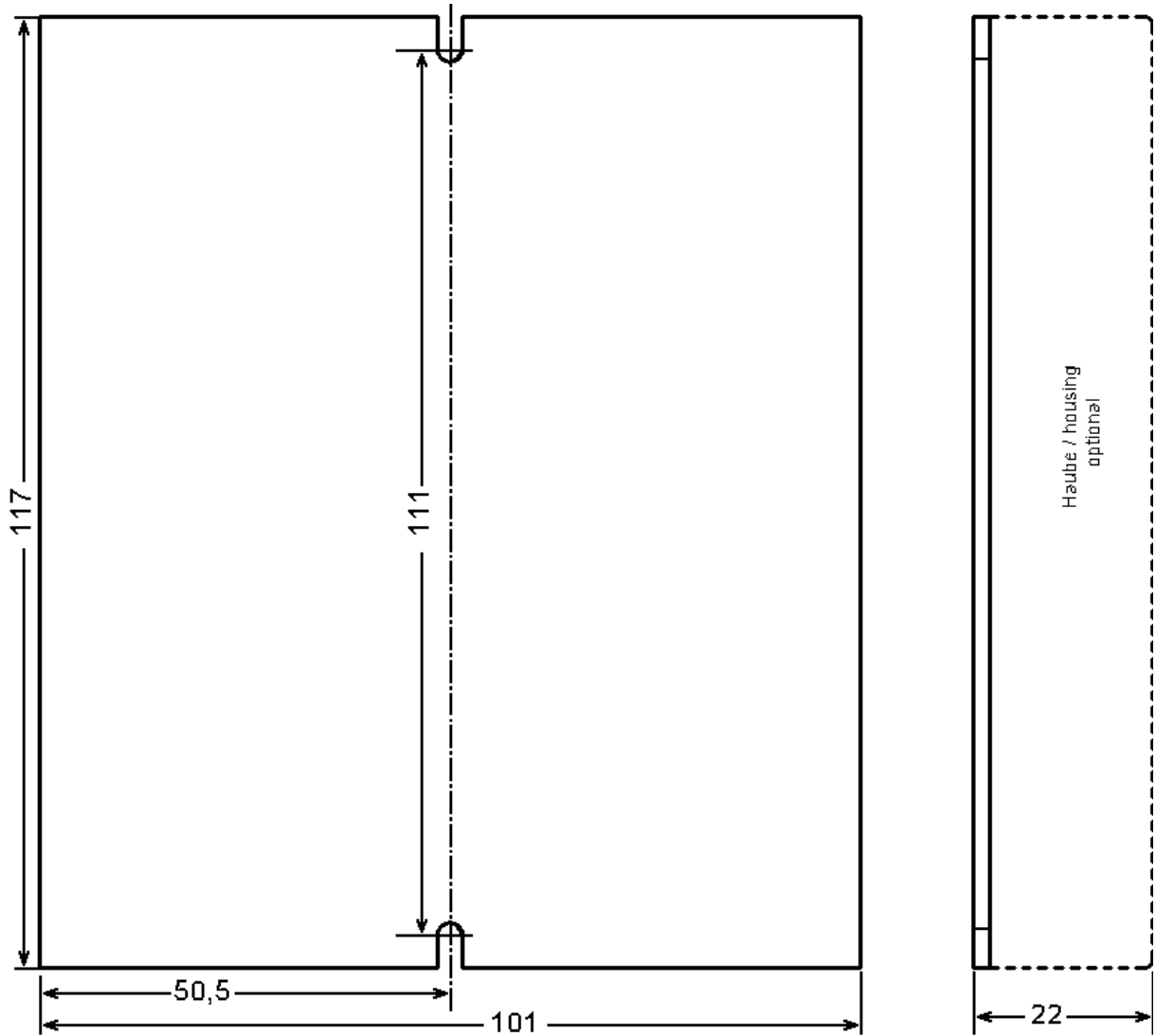
! Pulse slope: max 2vs
! Pulse width: min 5vs
! ERROR: OFF-Signal in fault condition

prt: > 5vs gate active after pulse/direction
 tpr: > 10ms pulse/direction active after gate
 pr: > 5vs pulse before direction
 rp: > 5vs pulse after direction
 pa: <150ms I-reduction active after pulse
 ap: < 0,5ms I-reduction deactive after pulse
 bpo: < 1s ready after power-on
 eon: <100ms ready after reset

Abmessungen

In general, the power drive is used for wall mounting.
This is best for heat sinking.

With a clip (optional) the power drive can be easily fitted
on a DIN-rail.



Technical specifications:

Power drive supply: (safe for wrong polarity)

absolute max. voltage:	45V
minimum voltage:	21V
recommended voltage	24...42V
voltage ripple:	< 2,0Vss
input peak current at power on:	< 3,0A
Fusing:	3,5Amt
Power supply charge capacitor:	>6800yF
Power supply cable cross section:	0,50mm ²
Distance to power supply capacitor:	<0,3m

Motor connection:

Cable cross section:	>0,5mm ²
Cable length:	<10m

Signal input interface: (wide range 3V to 24V)

Pulse, Direction, Gate, Off, Fast

Input type:	opto coupler
input voltage: low:	<1V <1V
high:	>3,2V >3,5V
nominal:	>5V >5V
max:	<28V <28V
input resistance:	aktiv I-Limit 1k50hm

Signal output interface:

Ready, Zerophase

Output type:	opto coupler
Switching voltage:	<30V
Inner resistance:	<15 Ohm
Switching current:	< 50 mA
Load:	only ohmic

Temperature monitoring:

Switch off:	> ca. 70 °
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Current reduction, active at frequencies lower than

Pulse width:	5ys	10ys	50ys	100ys
Current red.:	50Hz	30Hz	20Hz	15Hz

Ambient conditions:

Temperature:	40° max
UL94V-1 all components	
IP20	

Problemhilfen

Motor has no holding torque

- The motor voltage is below the minimum value
- Signal inputs "reset" or "off" are active
- The over temperature monitoring is still active
- A non-valid step resolution is selected

Motor has holding torque, but doesn't execute steps

- The "GATE" input is active
- The pulse level is too low (24V interface)

"TEMP"-LED is on immediately after power on

- The heat sink couldn't cool down sufficiently

"Over curr."-LED is on immediately after power on

- The power drive is damaged
- The motor winding has a short cut

Sudden "crackling" noises in the motor

- Motor is operated at the minimum voltage limit
- The motor connection is bad

The motor doesn't reach the set speed but starts

- The motor voltage is too low for the required speed
- The motor current was set too low
- The acceleration ramp was set too high
- Motor wires are too long or too small cross section
- Power supply is not powerful enough

The motor "loses" steps and drifts

- The amplitudes of the control signals are too low
- Signal cable noise is too high (shielded cables?)
- The wiring concept is not optimal (system ground)
- The mechanical shaft coupling has play

Motor vibrates at pulse frequency and doesn't start

- Start/Stop-frequency too high
- Motor windings are connected wrong or broken cable
- The motor current is set too low

The automatic current reduction doesn't work

- The pulse input remains active after the last
- The current reduction is not enabled

The over voltage LED is often/permanently lit

- The supply voltage is too high

The motor is hot

Up to 85 ° Celsius should be no problem

Step angle too different

- Motor inductance is too high
- Motor current too less