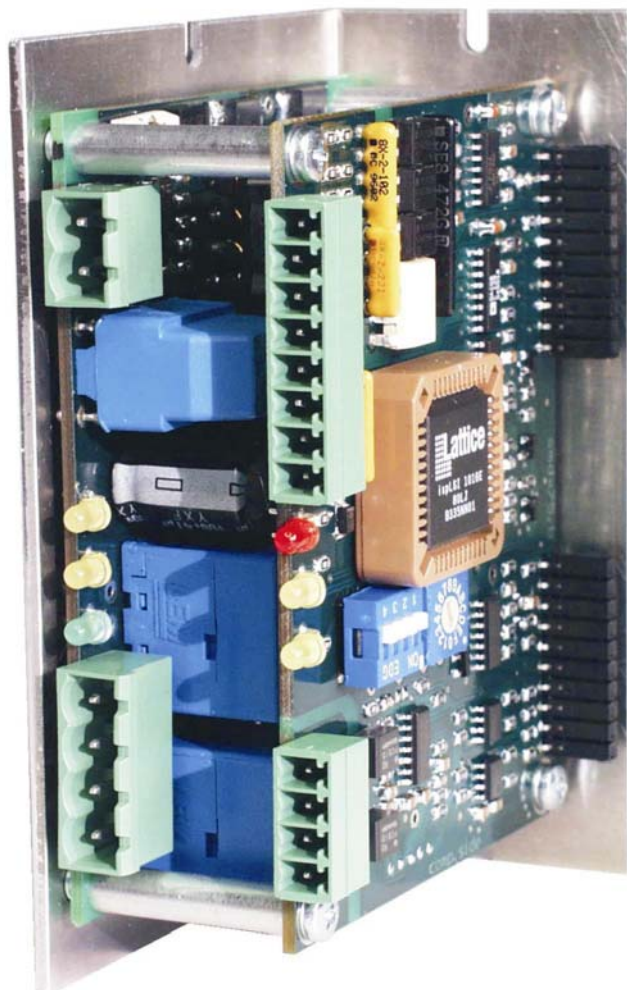




*Manual for
2-Phase Stepper Motor Drive*

ECMD 275



Features

for all regular 2-phase stepper motors,
primarily for the 60...90th motor size

powerful drive: bipolar chopper, low noise and losses

only one power supply necessary

current adjust via HEX-switch

steps per revolution:
standard: 200, 400, 800, 1600, 500, 1000
optional: 400, 500, 1000, 2000

high torque constant step by step

drive off at under voltage failure

step frequency up to 150 kHz

automatic current reduction can be enabled

automatic fan control (optional, with housing)

break resistance included

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

Inputs: opto coupler
pulse, direction, gate, off, fast

Outputs: opto coupler
ready, zero phase (null point)

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

all connectors able to remove

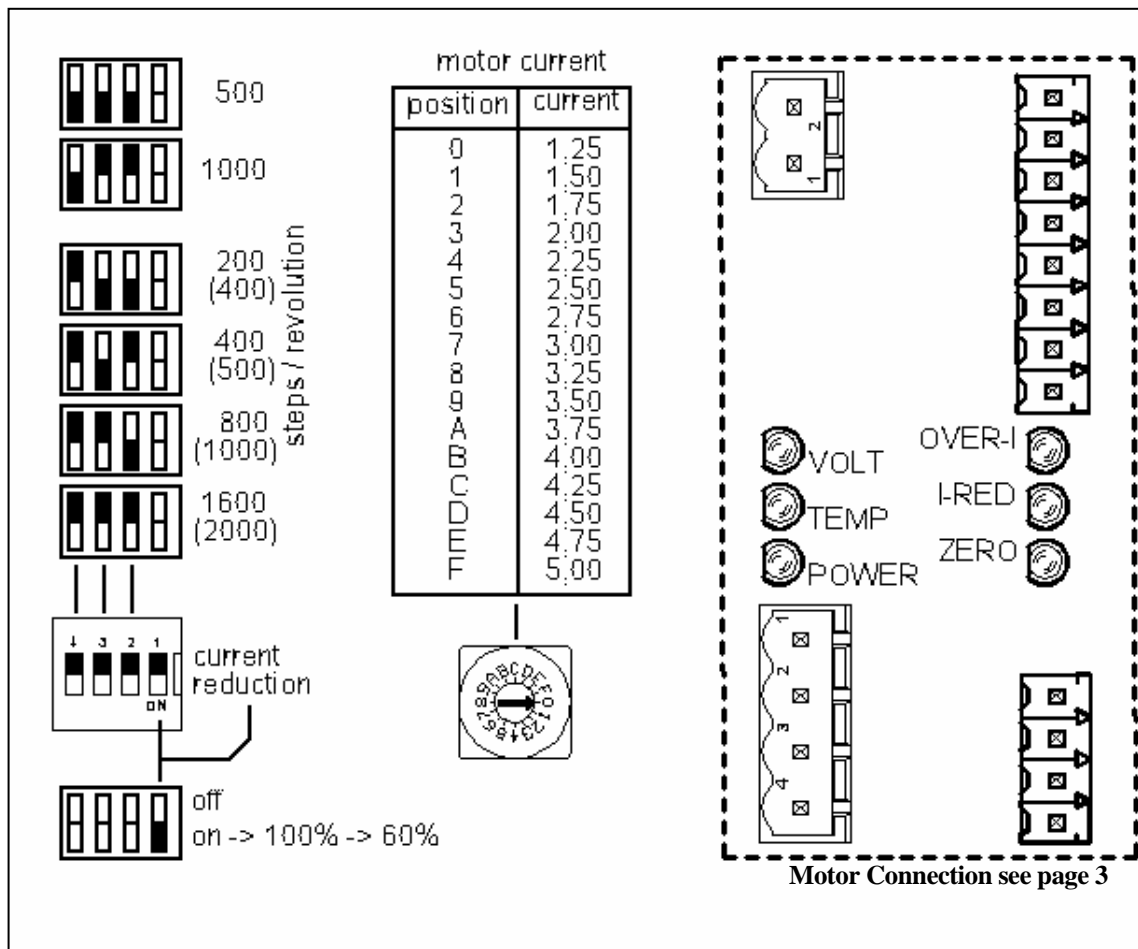
very compact in size

Variants / Order-key

ECMD275.xxxx 75V, 5A

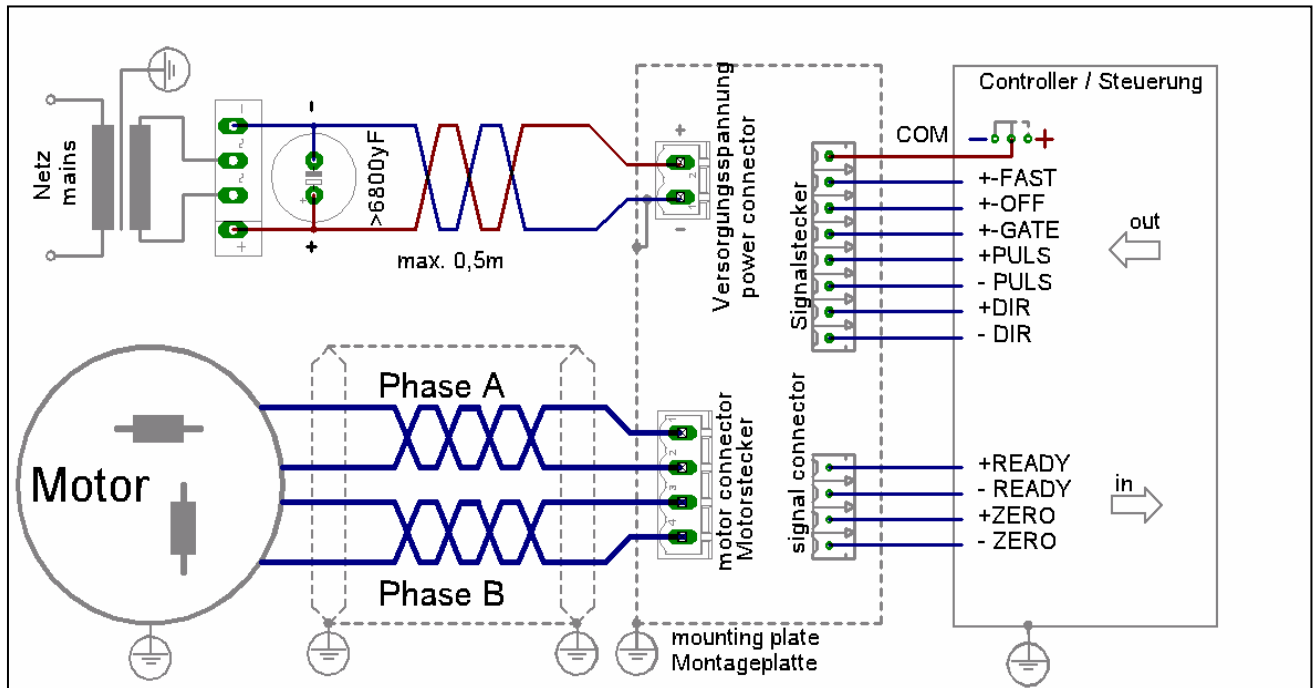
.x--	0: standard	n: specially
-.x-	0: 5Volt	1: 24Volt signal
--x-	0: wall mounted	1: with DIN-rail clip
---x	0: open frame	1: with housing

Adjustment/Display: steps/revolution, motor current, current reduction



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:

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

OFF/RESET:

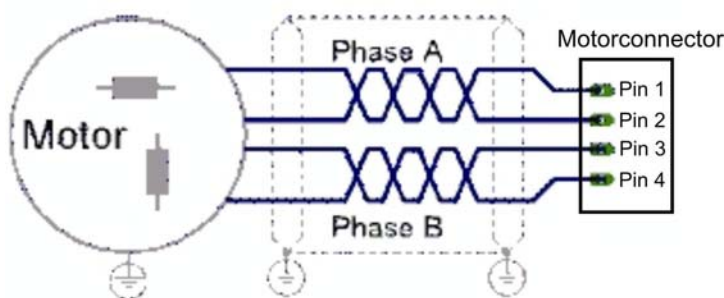
Change from error condition to operating condition. Independent of the current motor position, the motor switches to ZERO position.

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

READY:

This output is switched when the drive is functional. The following faults switch 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.

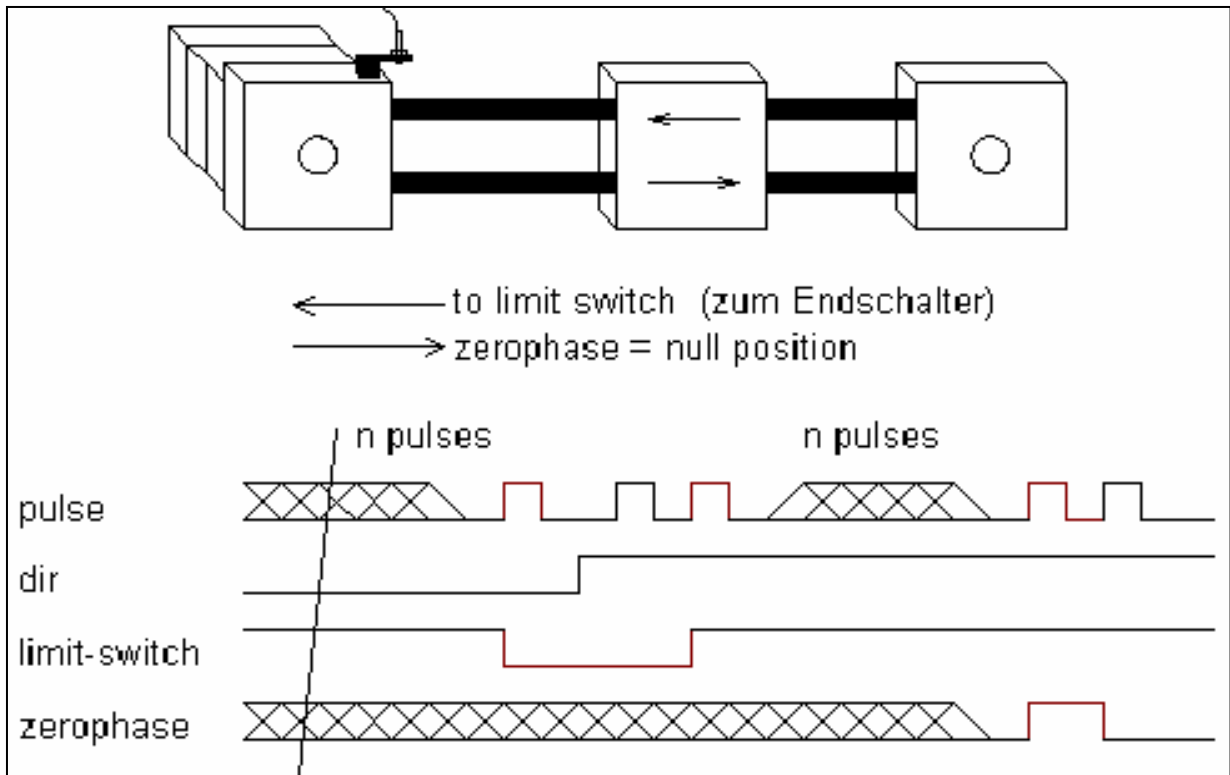
Motor Connection:



Bipolar Parallel:

Pin1: black and white/orange
 Pin2: orange and white/black
 Pin3: red and white/yellow
 Pin4: yellow and white/red

ZEROPHASE: (Reference point)



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,...

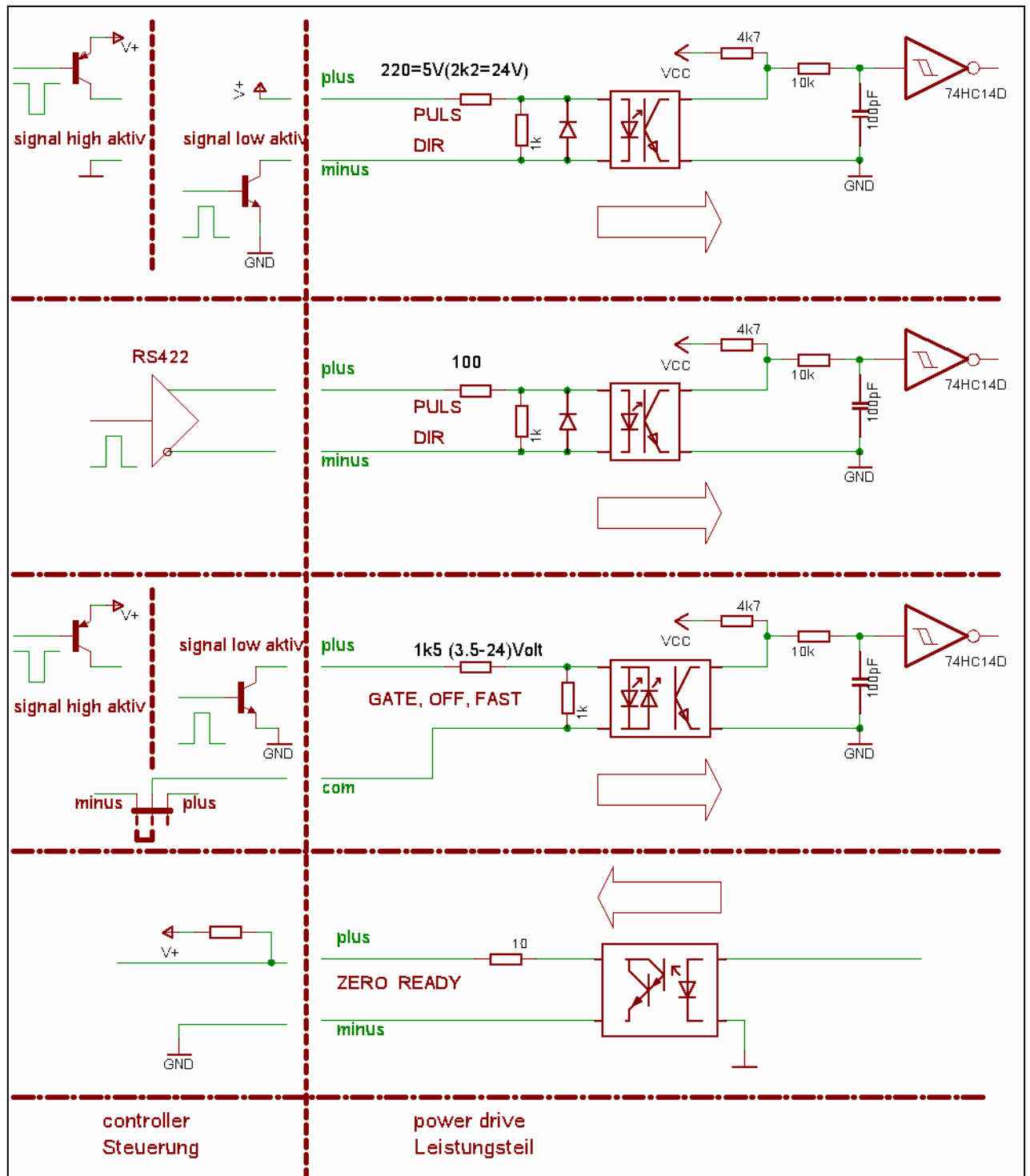
Motor connections:

The motor connector is optimized to drive stepping motors with 4 wires. Having 8 wires, connect 2 windings for each phase in parallel mode. This results in well dynamics at higher frequencies.

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.(PULSE, DIRECTION) The control signals GATE, OFF, and FAST have a common reference signal

and can be driven direct via an PLC with 24 Volts.

Never operate a power drive prepared for 5V-signals with 24V signals, the opto couplers will be damaged

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 HEX switch. In the picture „adjustment/display“ on side 2 you can see the motor current according to the position of the HEX switch. 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%	auf 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 < 15ys)

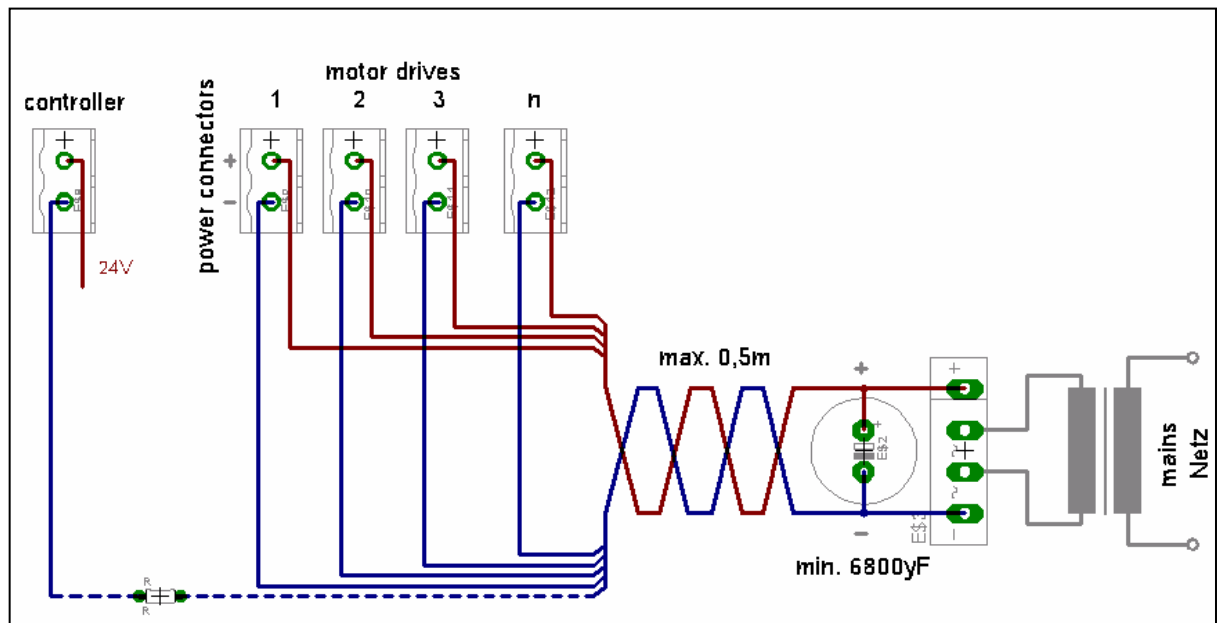
the current reduction must be activated at motor currents over 4A

Temperature monitoring

The fan automatic (optional) is switched on if the heat sink temperature exceeds approx. 60°C. This should be interpreted as an over temperature warning. The condition is indicated with the LED „over temp.“. The power drive is disabled, if the heat sink temperature exceeds 70° Celsius.

Motor currents grater than 4A makes an additional cooling necessary.

Power supply



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

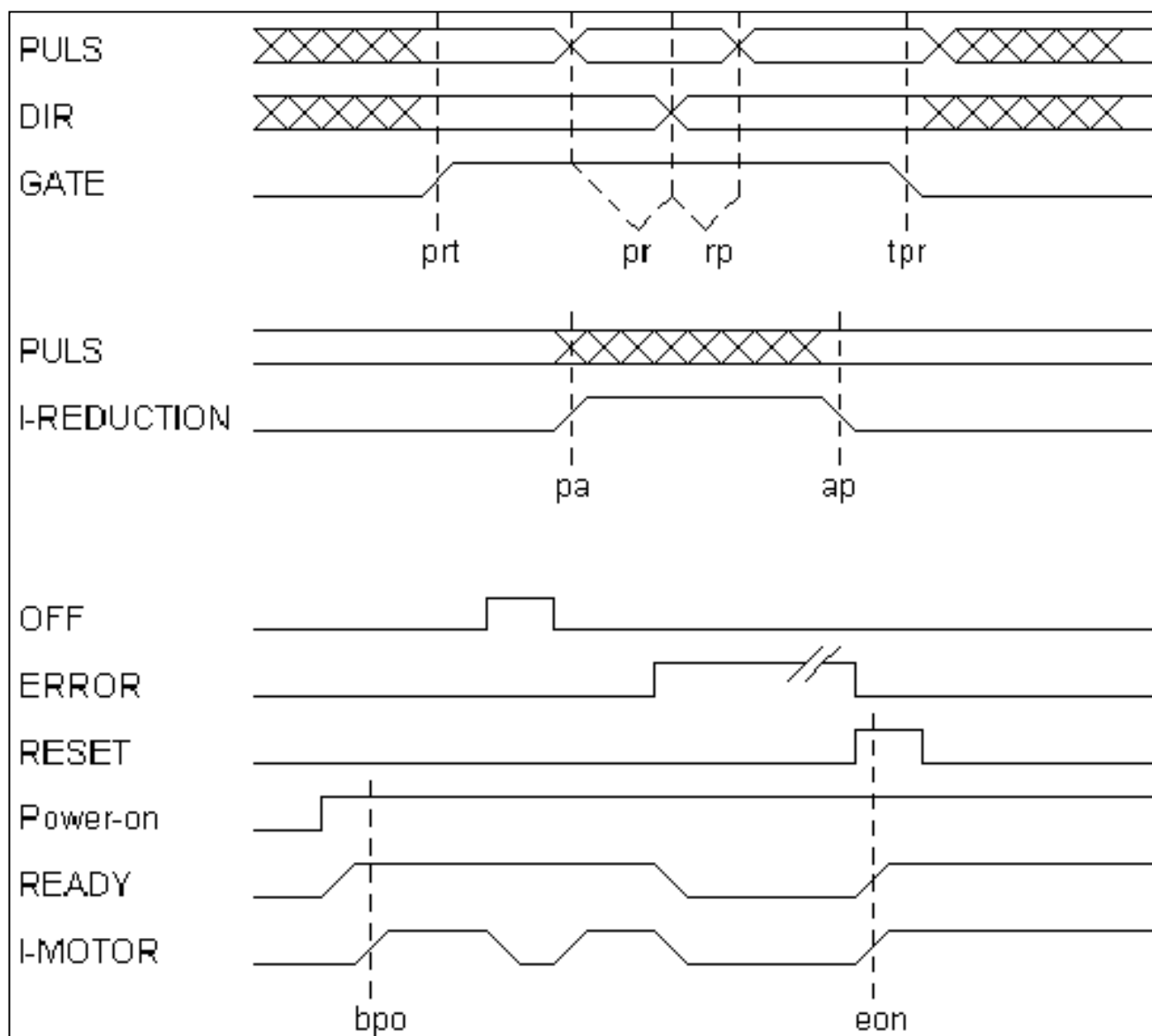
It must be guaranteed that the power supply have an capacitor of at least 6800yF. An active internal ballast circuit eliminates short over voltages caused by generator operation occurring during fast deceleration. This condition is indicated with the over voltage LED that only be lit for a short period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

Timing



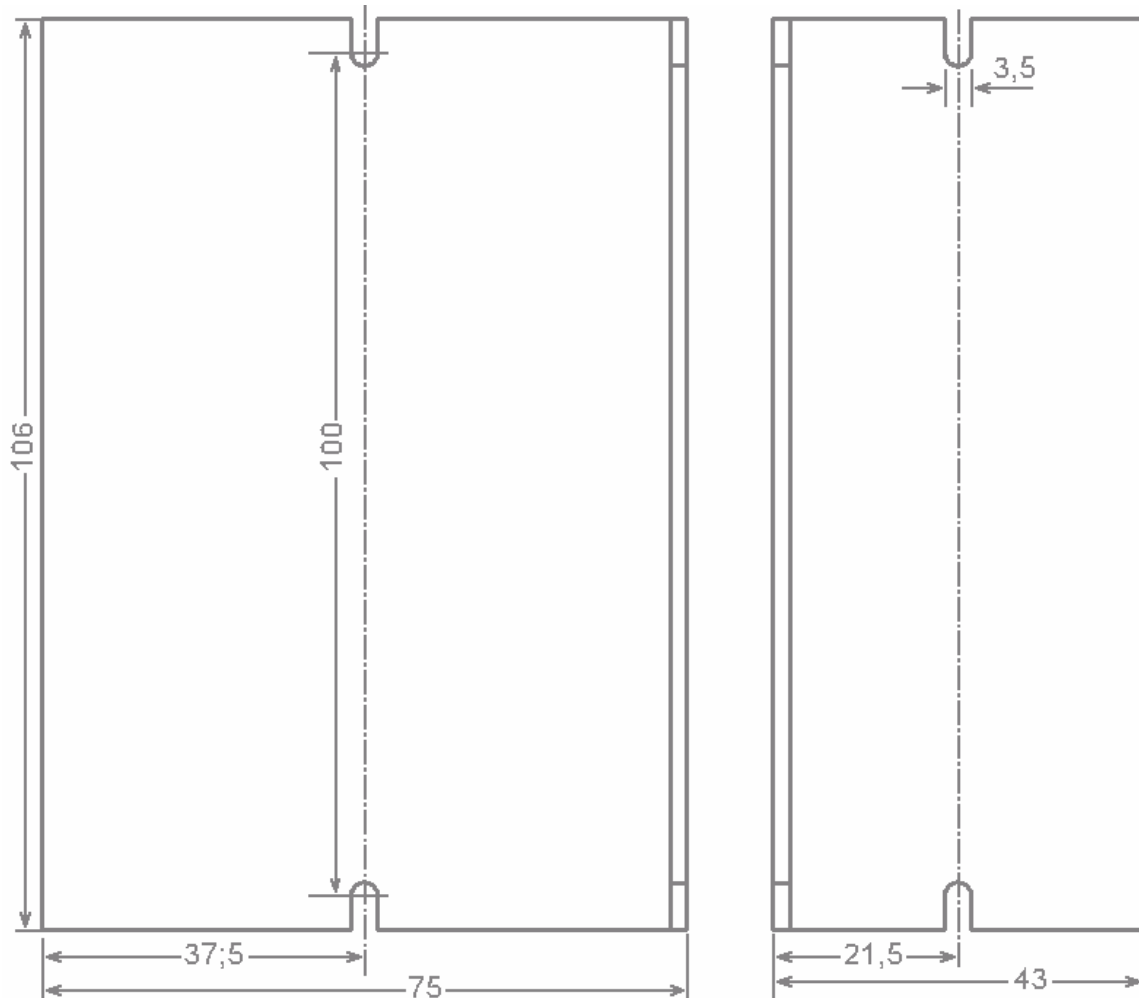
! Pulsflanken:	max	2ys
! Pulsdauer:	min	5ys
! ERROR:	OFF-Signal im Fehlerzustand	

prt:	> 5ys	gate active after pulse/direction	Tor aktiv nach Puls/Richtung
tpr:	> 10ms	pulse/direction active after gate	Puls/Richtung aktiv nach Tor
pr:	> 5ys	pulse before direction	Puls vor Richtung
rp:	> 5ys	pulse after direction	Puls nach Richtung
pa:	< 150ms	I-reduction active after pulse	Stromabsenkung aktiv nach Puls
ap:	< 0,5ms	I-reduction deactive after pulse	Stromabsenkung deaktiv nach Puls
bpo:	< 1s	ready after power-on	Bereitschaft nach Power-on
eon:	< 100ms	ready after reset	Bereitschaft nach RESET

Dimensions

As a standard, the power drive is wall mounted. This results in best heat sink conditions

Also, it is possible to clip it on a DIN-Rail. For this fastest mounting mode a clip holder is necessary. (optional)



Technical specifications

Power drive supply:

absolute maximum voltage:	80V
minimum voltage:	21V
recommended voltage Un:	24...75V
voltage ripple:	< 2,0Vss
input peak current at power on:	< 4,0A
fusing:	5,0Amt
Power supply charge capacitor:	>6800yF
Power supply cable cross section:	0,75mm ²
Distance to power supply capacitor	<0,3m

Motor connection:

Cable cross section:	>0,75mm ²
Cable length:	<10m

Signal input interface:

5V **24V**

Pulse, Direction, GATE, Off, FAST

Input type:	Opto coupler
Input voltage	low: <1V <6V <1V
high	>3,5V >15V >3,5V
nominal	5V 24V 24V
max.	6V 28V 28V
input resistance	ca.220 2k2 1k5Ohm

Signal output interface:

READY, ZEROPHASE

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

Temperature monitoring:

Automatic fan control active :	->ca. 60°
Switch off:	> ca. 70 °

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	

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Trouble shooting:

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