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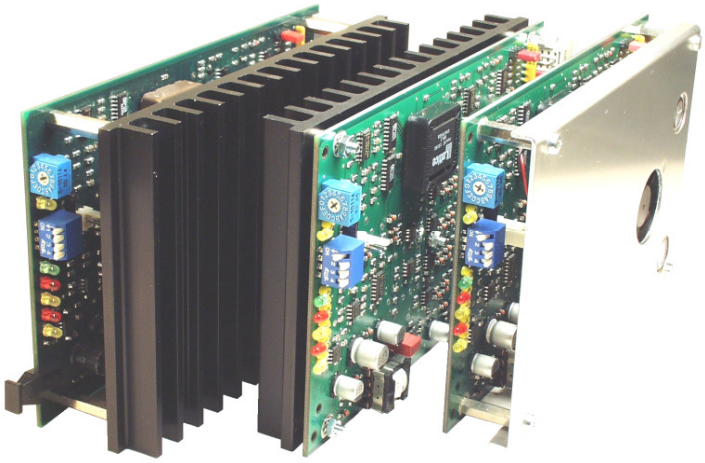
Operator Manual
for
2-Phase Stepper Motor Drive smde285



3- Phase Stepper Motor Drive smde385

Revision: 40/2009 subject to change without prior notice

Product features

For all common 2-phase and 3 Phase stepper motors,
primarily for 60mm (Nema 23) and .90mm (Nema34)
motor sizes

2 Phase Steppers:
8-wire technology, windings switched parallel or in series

3 Phase Steppers:
3-wire technology, windings switched in delta
configuration

Powerful drive: bipolar chopper, low noise and losses

Only one power supply necessary

Motor current adjustment with HEX-switch

Steps/revolution:
2-Phase : 200, 400, 800, 1600, 500, 1000
(Special resolutions 2000 and 4000 available)
3-Phase : 500, 1000, 2000
(Special resolutions 4000 available)

Optimized torque ripple between steps

Low voltage detection and drive switch off

Step frequency up to 100 kHz

Switchable automatic current reduction

Overtemperature protection at 70° C , LED indicator

Automatic fan control (optional)

Active ballast resistor circuit at overvoltage

Motor short circuit protected . LED indicator

Inputs: PULSE, DIRECTION, GATE, OFF, RESET,
FAST

Outputs: READY, ZERO-position(Reference point)

LED-status indicators

All connections via 32pol. VG-socket

European format (100x160x40)mm for 19“ technology

Ordering Number Key

smdex85.x0x00xx

Stepper Motor Drive 19"Euro Format

Series Motor Type*
- 2 2 phase stepper motor
- 3 3 phase stepper motor

Series Nominal Voltage**
- 8 24...80Vdc

Series Nominal Current
- 5 1,25...5Amps

Signal Voltage
- 0 5V Signal input voltage (! only for smde385)
- 1 24V Signal input voltage (! only for smde385)
- 2 3,5...24V Wide range (! only for smde285)

Housing Version
- 0 IP00 (no hood)

Cooling
- 1 Heat sink right
- 2 Heat sink left (! only available for smde285 series)
- 3 Slim cassette (!only available for smde285 series)

Mounting
- 0 für 19“rack

User Interface
- 0 none
- 1

Motor Voltage Range
- 0 Nominal voltage 24...80Vdc
- 1 Higher voltage 60…130Vdc

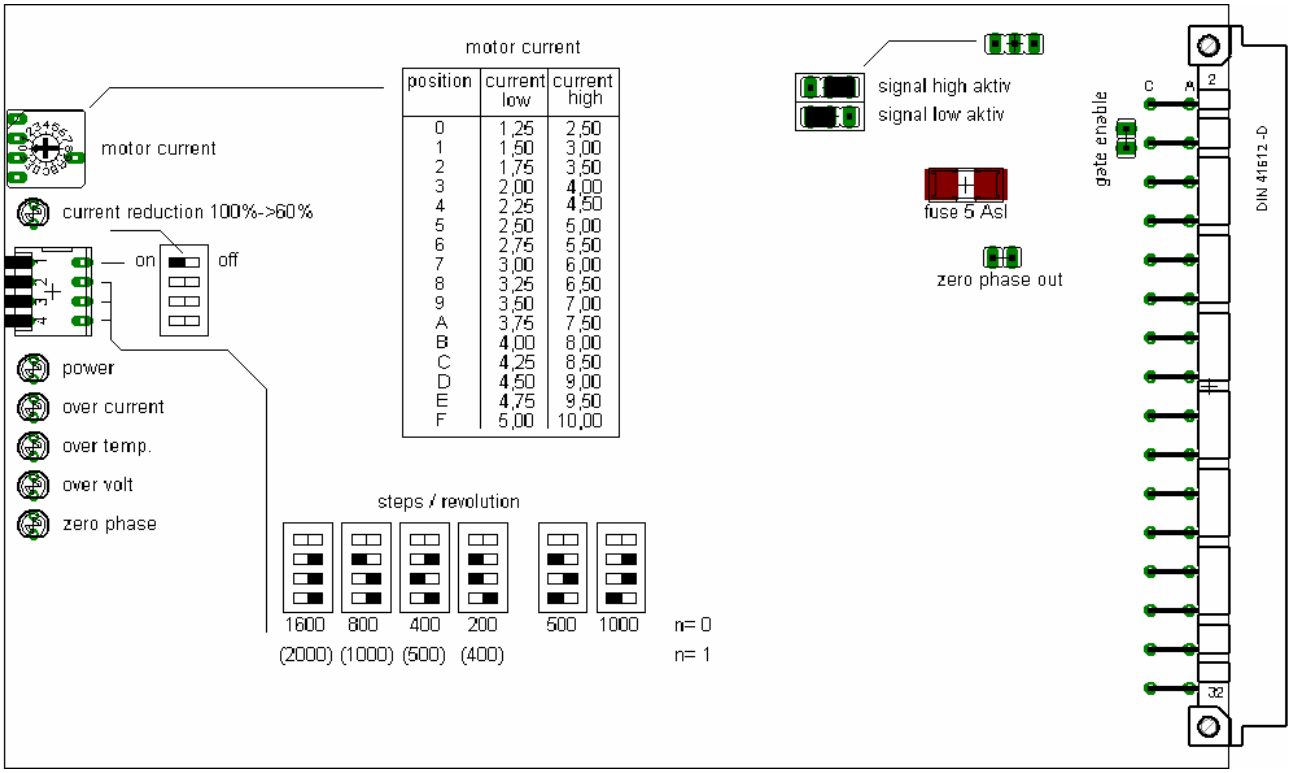
Motor Current Range
- 0 Nominal motor current 1.25...5 Amps
- 1 Higher motor current 2.5…10 Amps

Zubehör (getrennt lieferbar)

KM*m*	Motor cable 2x2 0.75mm^2 twisted pairs with overall shielding *m* = Length in Meter 01, 02, 05, 10 (e.g.: 2 Meter motor cable = KM02)
DOKU	DIN-A5 paper bound operator manual

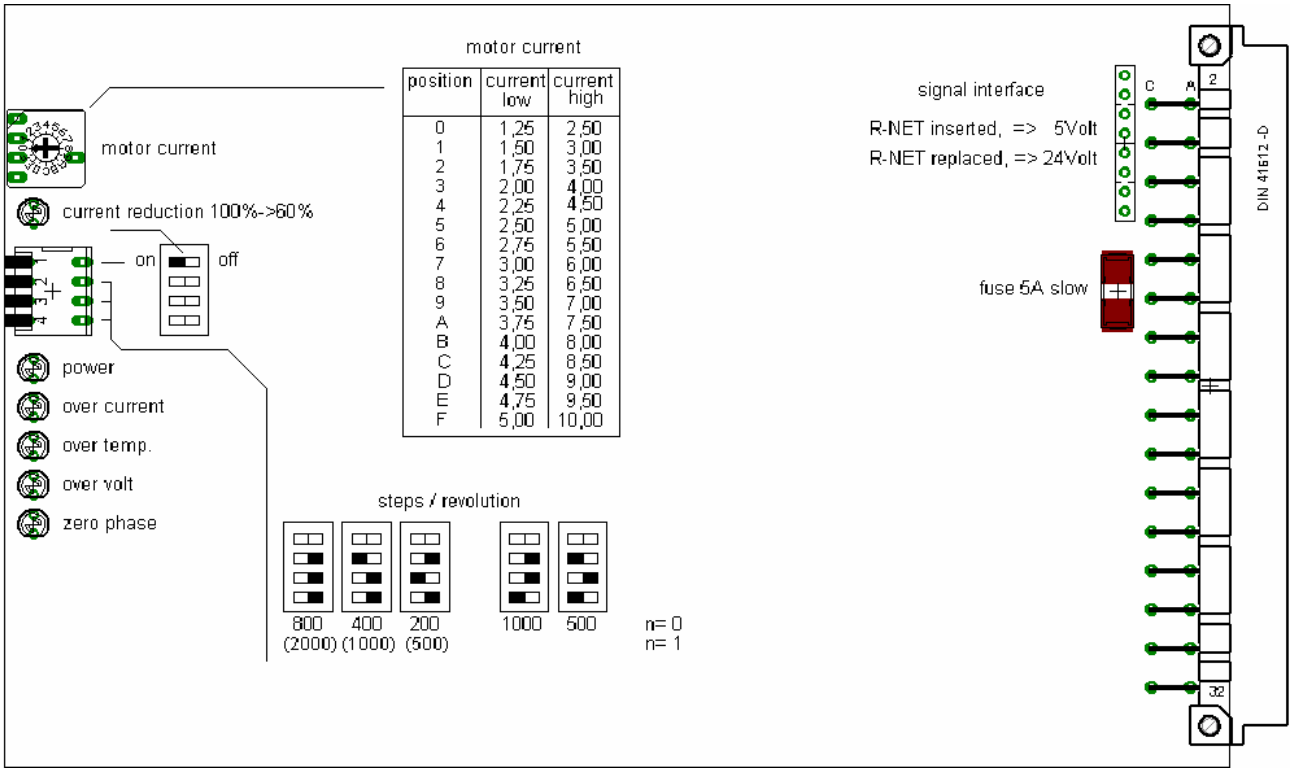
* 2 phase or 3 phase stepper motors upon request. We can assist with motor sizing and drive calculation.
** PFC power supply ps400 (400 Watt 80Vdc or 130Vdc) upon request

Placement of the operating elements smde285



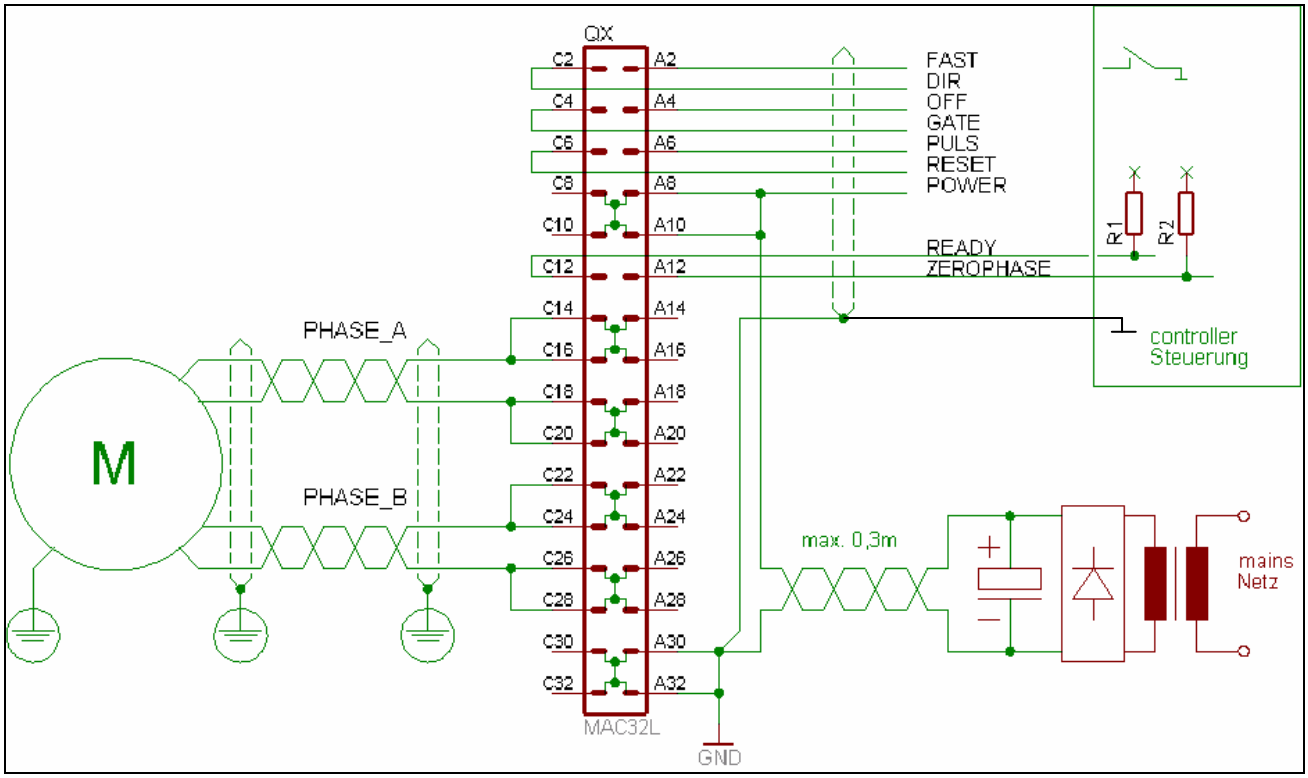
smd285 board versions with special resolution 4000 steps per revolution are set fix and no other step resolution is selectable with the DIP switches

Placement of the operating elements smde385

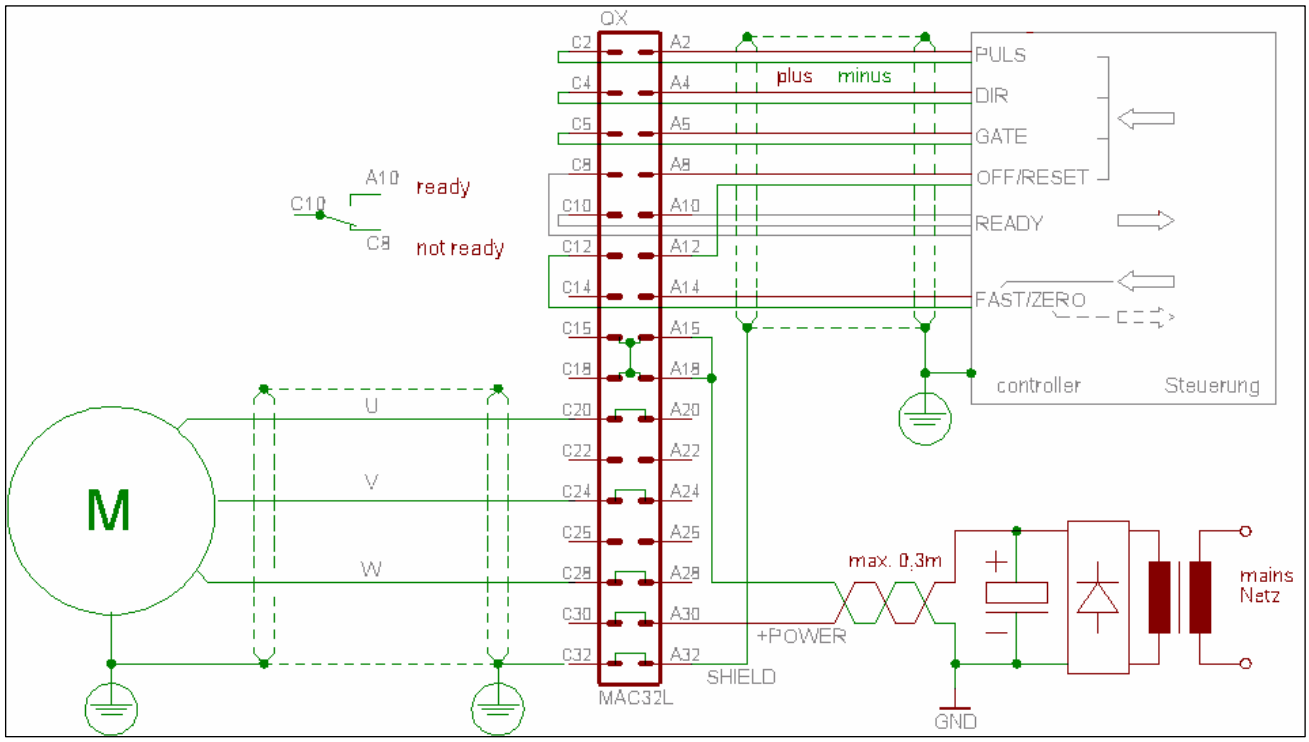


smd385 board versions with special resolution 4000 steps per revolution are set fix and no other step resolution is selectable with the DIP switches

Wiring Diagram 2 Phase Stepper



Wiring Diagram 3 Phase Stepper



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 (jumper „current reduction“ inserted) 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.

only active if jumper „Gate enable“ inserted

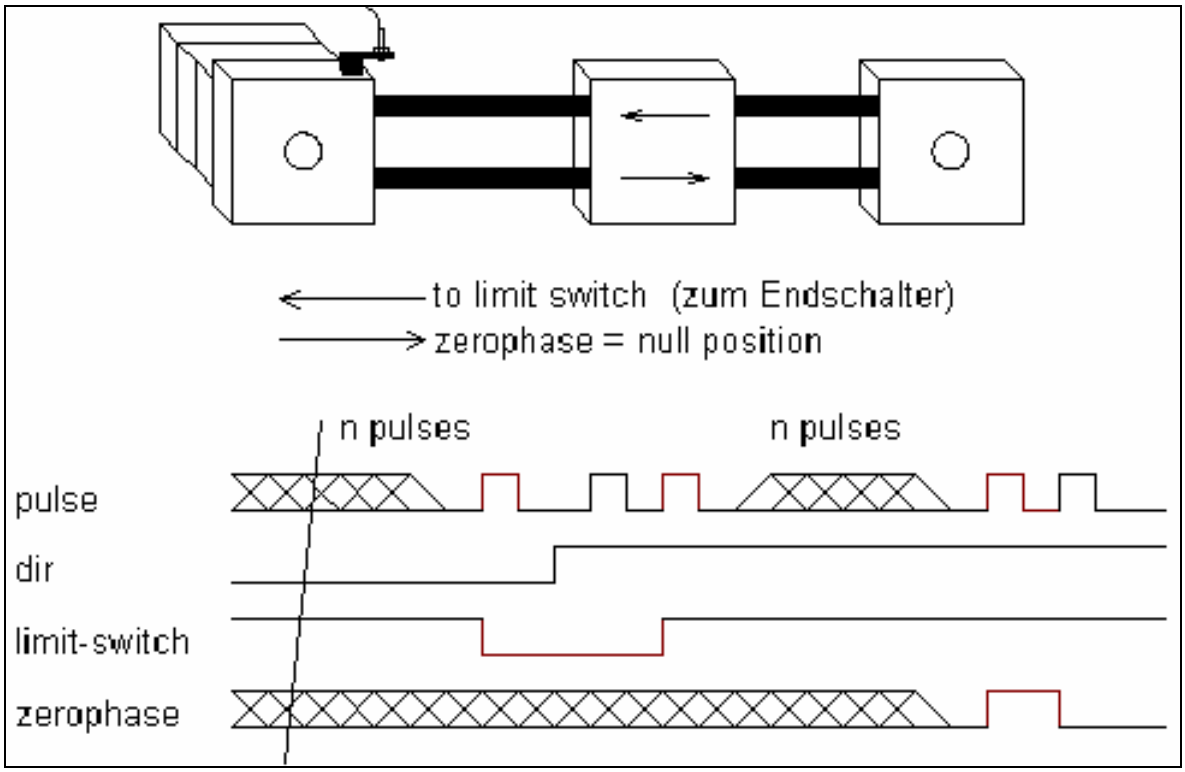
OFF:
When active, the motor current is switched to zero. The motor shaft can now easily be rotated manually.

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.

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.

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
2000	40
4000*	80

Output only with jumper „zerophase out"

*Special board versions with up to 4000 steps per revolution available upon request

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,...

2 Phase Stepper 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.

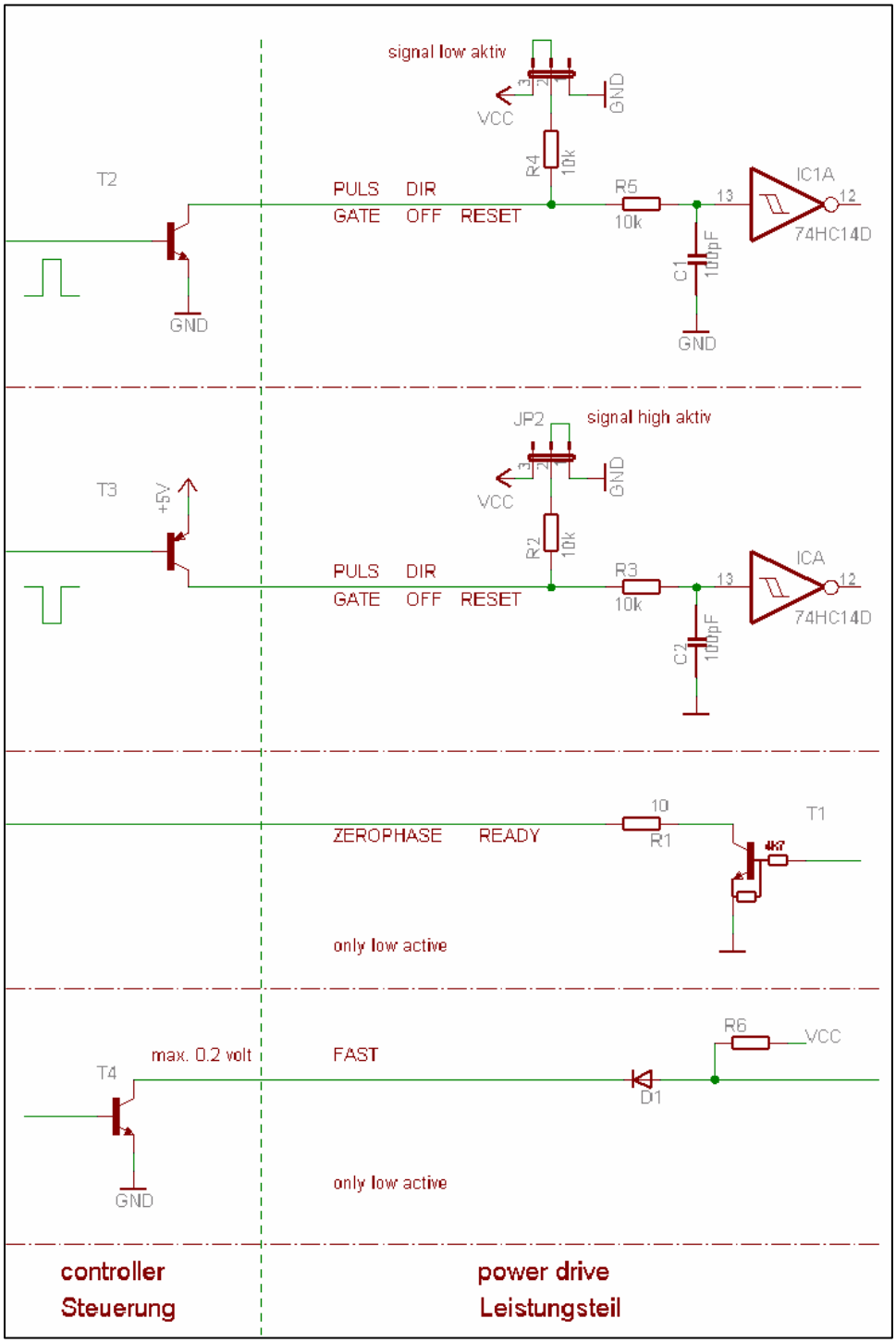
By swapping the wiring connection of one motor phase, e.g. phase A, the motor sense of rotation can be inverted to the logic assignment of the direction signal.

3 Phase Stepper Motor connections:
In regular, the motor is driven in triangle mode. This results in well dynamics at higher frequencies.

By swapping the wiring connection of two phases, e.g. phase U and V, 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:



Optional, the signals can be driven with high or low active levels. There for set the jumper (near VG-socket) to the appropriate position.

The jumper must be inserted in any case

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:

2-Phase : 200, 400, 800, 1600, 500, 1000*
3-Phase : 400, 500, 1000, 2000*

*Special board versions with up to 4000 steps per revolution available upon request

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%

2 Phase 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 Imotor= $\sqrt{(Ia^2 \sin() + Ib^2 \cos())}$.
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)

3 Phase Motor current setting:
The motor current is set with the HEX switch. In the picture „adjustment/display“ on page 2 you can see the motor current according to the position of the HEX switch. The motor torque results from the sum of the 120° shifted currents of phases U,V and W.
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.

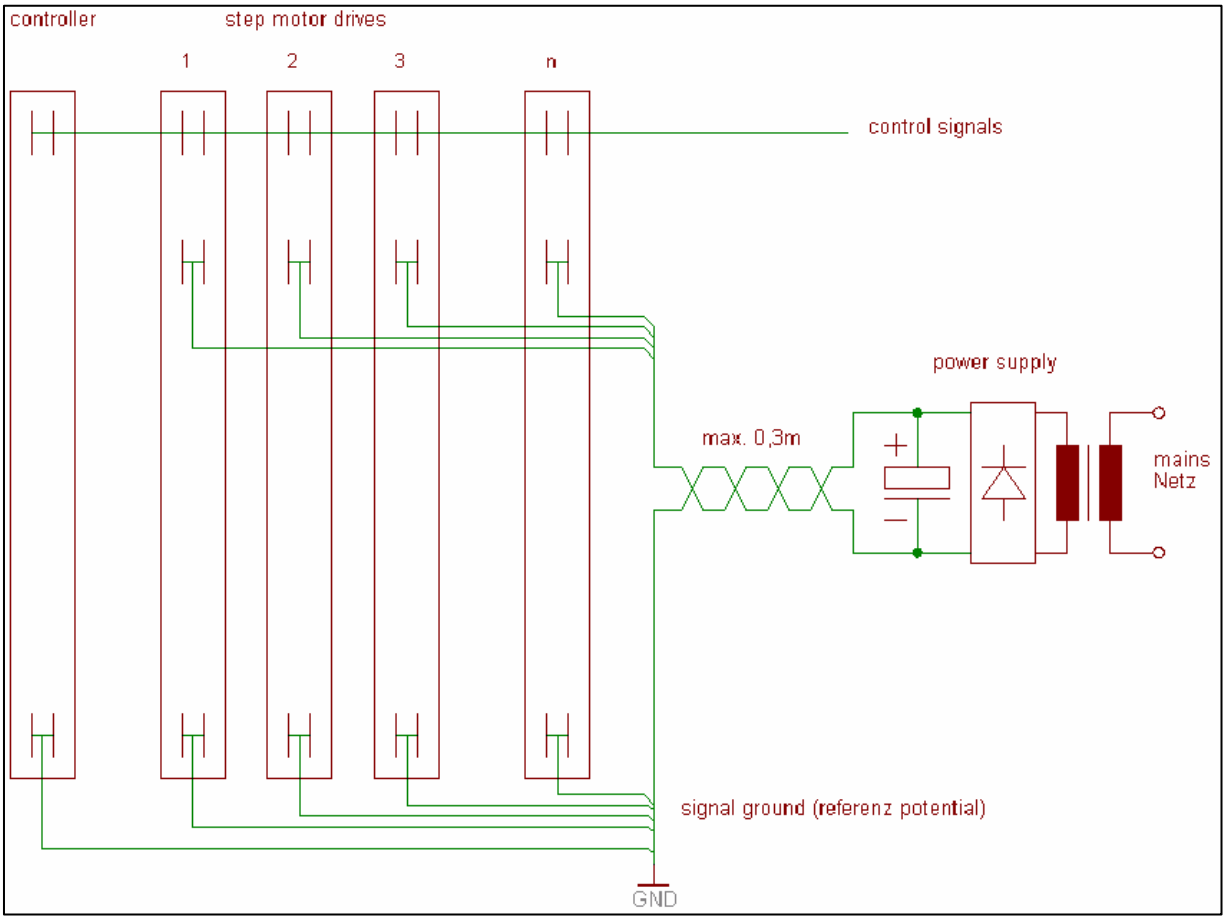
With the next pulse, the current reduction is disabled immediately. The time to full motor current depends on motor type, motor voltage and pulse width(if < 15ys)

the current reduction must be activated at motor currents over 7,5A

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 5A makes an additional cooling necessary.

Reference potential



To reduce fault influences it is highly recommended to have separated power lines for each power drive, especially for the power ground, which acts also as the signal ground.

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.

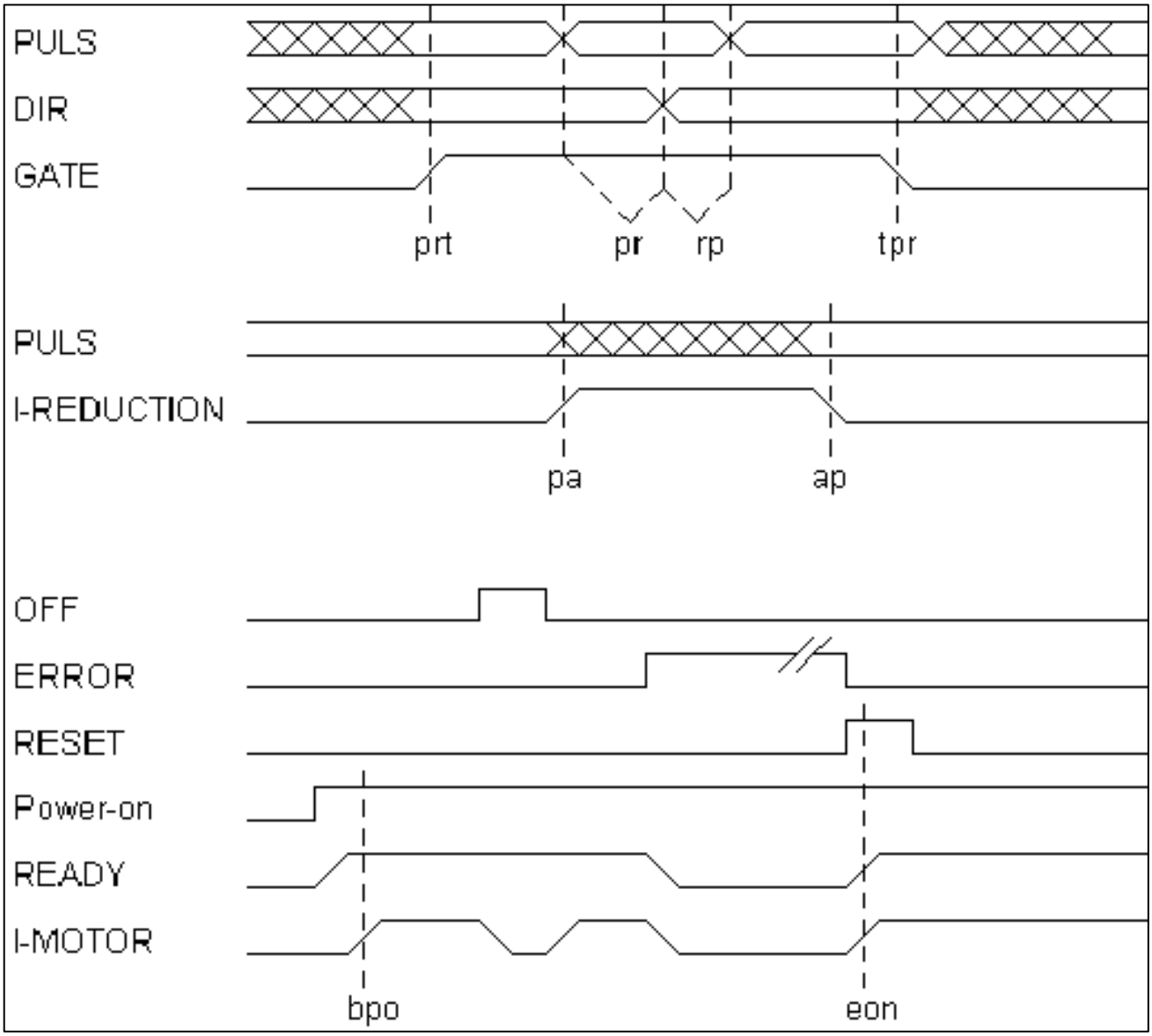
Too high motor voltages may damage the power drive.

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

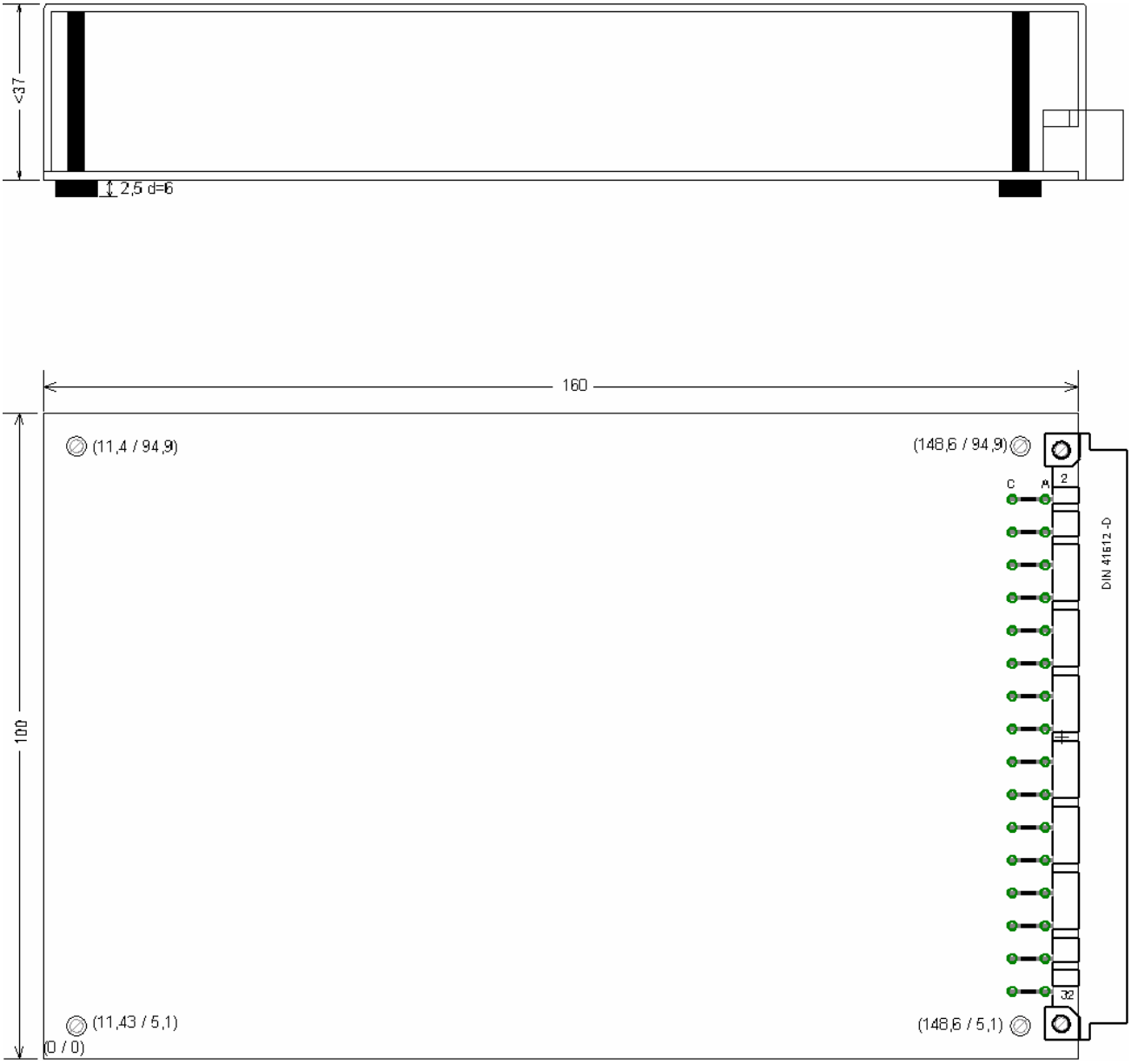
! Pulse slope:	**max**	**2µs**
! Pulse width:	**min**	**5µs**



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 bevore 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

! Note: power drives with extruded heat sinks <42mm (standard)



Technical specifications:

Power drive supply:	**285, 2810, 2135, 21310**
Absolute max. voltage:	85, 85, 135, 135V
Minimum voltage:	24, 24, 80, 80V
recommended voltage Un:	80, 80, 130, 130V
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:	0,75mm²
Distance to power supply capacitor	<0,3m

Motor connection:

Cable cross section:	<4A	>0,75mm²
	>4A	>1,00mm²
Cable length:		<10m

Signal input interface:
Pulse, direction, gate, off, reset

Input type:		RC, HC-MOS
Input voltage	low:	<0,8V
	high	4,0..26,0V
	nominal	5V
Input resistance		ca.5kOhm

Fast:

Input type:	low active	10k an 5V
Input voltage:	maximum	0,2V

Signal output interface:
Ready, zero phase

Output type:	Transistor
switching voltage:	<30V
Inner resistance:	<15 Ohm
switching current:	< 50 mA
Load:	only ohmic

Temperature monitoring:

Warning (fan on):	->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
IP00

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

Signal gate, zero phase without reaction
- the jumpers are not inserted

GENERAL INSTALLATION REQUIREMENTS

The device housing[1] must be grounded separately. In most cases a wing nut on the front panel or another grounding connection is available. Each component must be grounded wit a separate grounding wire at a central ”grounding point“. This is usually the machine bed or a grounding rail inside the electrical cabinet.

Before installation and setup make sure that the required drive power is sufficient for your application and that the maximum values are not exceeded.

Mounting orientation is vertical, make sure air intake[1] and cooling slots are not blocked.

Only shielded motor cable must be installed. For identical potential between motor flange and power drive)short distance) the shield is grounded on both ends. Otherwise it is recommended to ground only the device end and that the shield on the motor end is ground connected galvanically isolated via a capacitor.

In general the ground potential difference must be in the range of only a couple mV.

For symmetrical motor cables such as with 2 phase steppers twisted pair wires are recommended per circuit.

Signal cables must also be shielded. Twisted pair wires are recommended per circuit.

The ground potential common point should be located directly at the housing or the mounting point of the power drive.

Signal cable and motor cable must be separated. Long parallel cable installation must be avoided. Cable crossings (if necessary) should be installed vertically.

Check all device settings for validity..

SAFETY AND PROTECTION REQUIREMENTS

The installation of the device must only be conducted by an educated, trained and experienced expert (electro). The local guidelines for safety, installation of electrical and mechanical systems and EMI must be observed.

Unintended operation and faulty installation of the device can lead to personal injury (incl. the possibility of death)
and the device as well as other external components can be damaged or an excessive pollution of the environment can occur.

Operation is only permitted with the mounted housing[2]. Because of eventually present high voltage the device must not be opened (also not after a long period of idle time). Make sure children have no direct access to the device.

No technical modifications of the device are permitted.

The device housing[3] must be grounded separately. In most cases a wing nut on the front panel or another grounding connection is available. The device must be grounded prior to the installation.

Under no circumstances live of functional connectors must be removed or connected. All installations must be conducted in the powerless de-energized state.

Device operation in damp, humid environment or with present spray water is not permitted.

[1] if available

[2] not with open frame (only PCBs)

[3] if available