BAUR
ANTRIEBE
UND
REGELUNGEN

Operator Manual

2-Phase Stepping Motor Drive

smd244

Revision: 23/2000

Product features

For all 2-phase stepping motors
8 wire technology, windings switched in parallel or in series

Powerful drive: bipolar chopper drive, low noise, and low losses

Compact dimensions L:W:H (125:100:35) mm including heat sink

Only one supply voltage from 21 Volt to 40 Volt

Motor current adjustment with potentiometer with scale, (1,0 to 3,5) A

1600, 1000, 800,500, 400, 200 steps/revolution

Switchable automatic current reduction

All connections via robust screw terminals

Inputs: pulses, direction, high speed, Gate/Off/Reset,

Outputs: Zero position (reference point)
Ready
Fan control

All signals are galvanically isolated with opto couplers

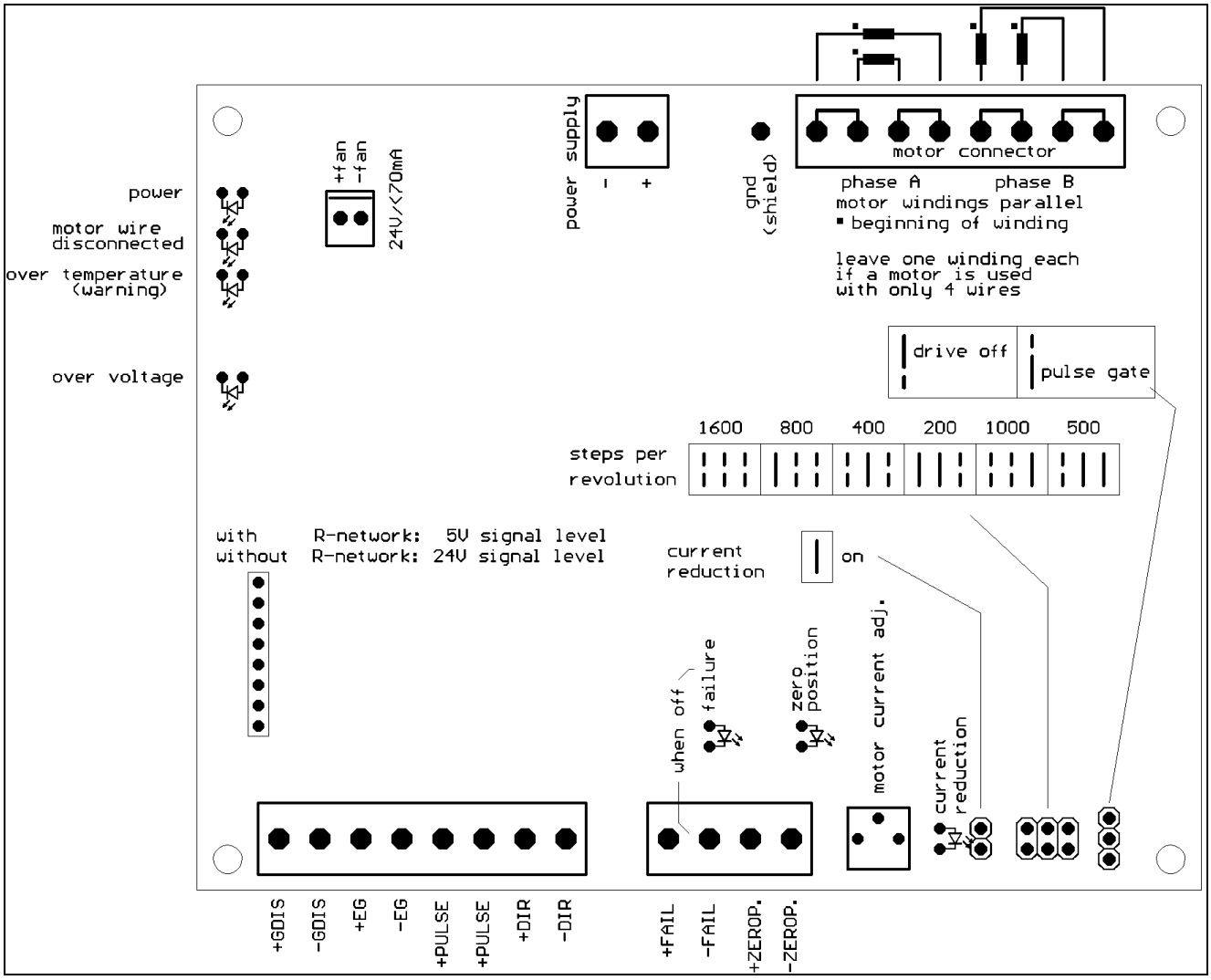
Step frequency up to 75 kHz

LED-indicators for supply voltage, readiness, zero position, over temperature, ballast circuit, current reduction, and phase interruption

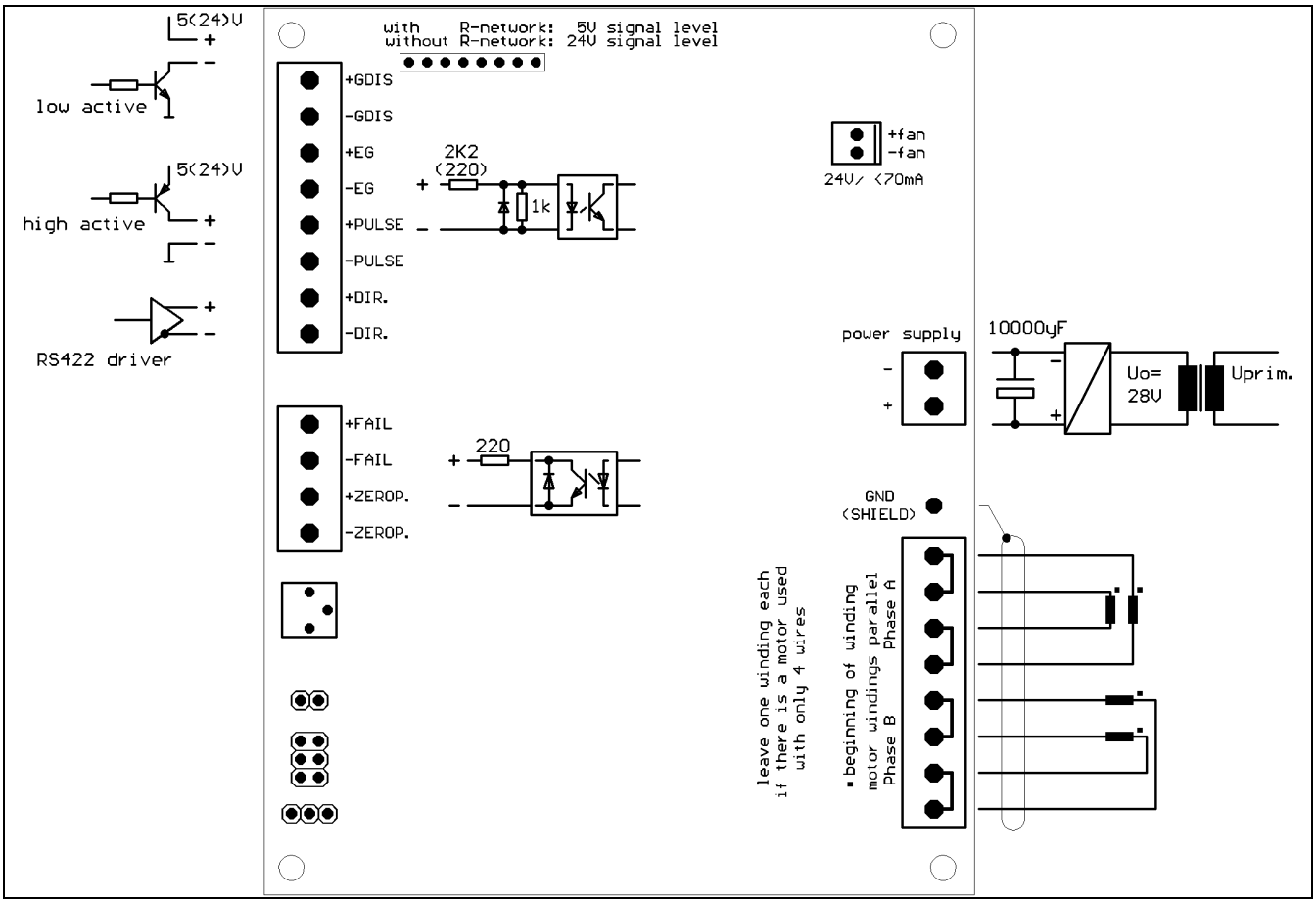
Protected against over temperature, excessively high motor current and power supply voltage surges (integrated active ballast circuit)

Options:
5V or 24V signal interface
Function Gate or Off (disable drive) selectable with jumpers
Fan option for operation with high motor current

Placement of the operating elements



Wiring diagram



Functional description

The signal inputs can be operated optionally with 24V signal level. For this simply remove the resistor network from the socket that is located near the signal terminal.

Never connect 24V to a 5V-interface, because the opto coupler will be damaged

GDIS: (GATE, DRIVE_OFF, RESET)
The function of the input GDIS depends on depends on the jumper setting " P.Drive off" or "Pulses-Gate".

Function GATE: (Jumper set to "Pulses-Gate")
The power drive ignores all input pulses if the input GDIS is activated. With this function it is possible to operate multiple power drives from one pulse source.

Function P.Drive off: (Jumper set to "P.Drive off")
If this signal is active the motor current is switched to zero. The motor shaft can now easily be rotated manually. The internal step counter is not reset.

Function RESET: (is always active)
Change form error condition to operating condition.

Independent of the current rotor position, the motor is switched to a half step position.

While the reset signal is active the motor current is switched to zero and the motor is without torque

EG: (Fast movement)
Activation of this input switches to a lower step resolution. It has the same effect as inserting the middle selection jumper for the step resolution.

This has the following effect on the step resolution:
- 1600 -> 400
- 1000 -> 500
- 800 -> 200
- 400 -> no effect
- 200 -> no effect

! Attention:
Switching without offset is only possible in the so-called zero position. The zero position is automatically set when the power drive is switched on and is indicated per LED and output.

PULSE:

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

READY: (Readiness)

This output is sourcing current when the drive is functional. The following faults switch the output to high impedance:
Low voltage, over temperature, phase interruption

ZEROP: (Zero position)

The “ZEROP“ or Zero position output can be used as an exact reference point. It is active and sources current in the so-called zero-position, which is set when switching on and is always a half-step position. The output is only active every 32 pulses, independent of the set step resolution, under the condition that the drive always moves in the same direction. The zero position is indicated with the LED “ZERO POSITION“.

UB, GND: (Power supply)

The power drive can be operated in the range of 21 to max. 40 Volt. It must be guaranteed that the power supply voltage doesn’t exceed 40 Volts at "no-load" condition and +10% line voltage and that there is a sufficient charge capacitor of at least 6800µF connected. An active ballast circuit eliminates over voltages caused by generator operation occurring during fast deceleration. This condition is indicated with the “OVER VOLTAGE“ LED that should only be lit only for a short period of time during this condition.

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

Motor connections

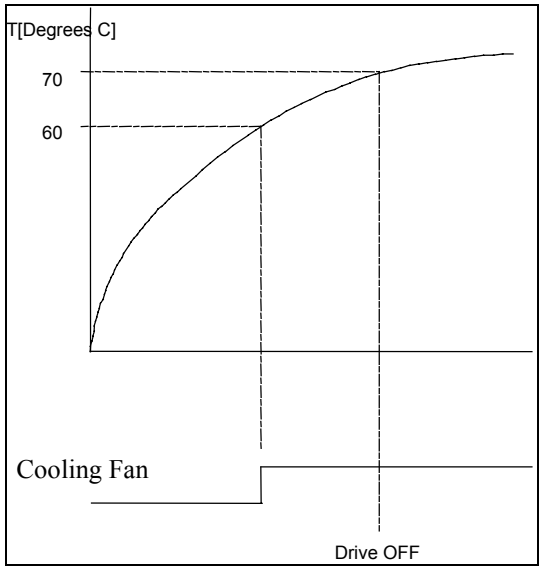
By swapping the wiring connections of one motor phase, e.g. phase A the motor sense of rotation can be inverted to the logic assignment of the direction signal.

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 screw terminals.

COOLING FAN:

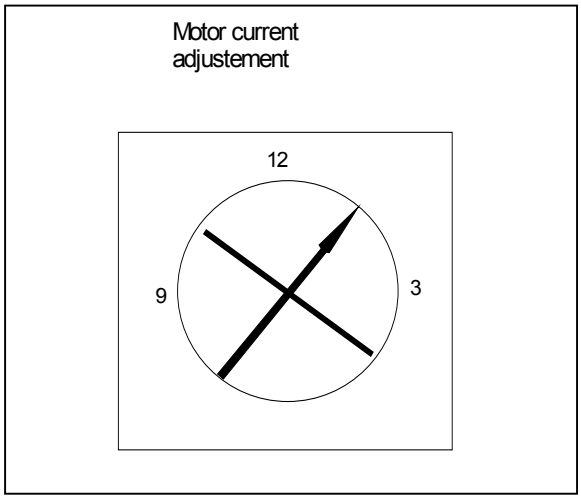
The output “FAN“ is switched on if the heat sink temperature exceeds approx. 60 ° Celsius. This should be interpreted as an over temperature warning. With the output the optional cooling fan module can be controlled automatically. The condition is indicated with the LED “OVER TEMPERATURE“. The power drive is disabled if the heat sink temperature exceeds approx. 70 ° Celsius

Motor current setting:



The motor current can set very easily with the motor current potentiometer In general only as much current should be set as actually is required for the application. The following chart can be helpful when setting the motor current.

CCW stop	approx. 1,0 A
“9 o’clock“	approx. 1,5 A
“12 o’clock“	approx. 2,0 A
“3 o’clock“	approx. 2,8 A
CW stop	approx. 3,5 A

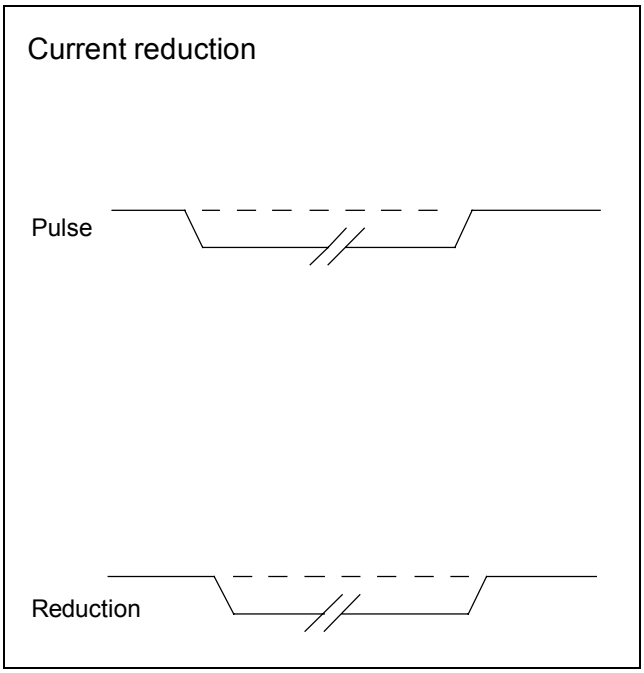


At higher step frequencies the current controller is no able to impress the set motor current because of the motor inductance. Torque reduction is the consequence (see motor characteristic curve of the motor manufacturer). We recommend using high current motor versions with low impedance. If 8-lead motors are used we generally recommend switching the windings in parallel.

Forced air-cooling must be provided for a set phase current higher than approx. 2A

Automatic current reduction

Inserting the jumper “CURRENT REDUCTION” activates the automatic current reduction. The motor current is reduced to approx. 60% of the set motor current.
The motor power dissipation as well as the power dissipation of the power drive is significantly reduced. The current reduction is activated, if the pulse input



is inactive for more than approx. 100ms. For pulse frequencies below 10 Hz it can be possible that the current reduction is activated for a short period of time. To avoid this the Start/Stop-Frequency should be significantly higher than this value.
Immediately after the pulse input is activated the nominal current is set again.

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

It is recommended to generally activate the current. Actual values seen in field applications show that the temperature can be lowered more that 10° Celsius.

Phase interruption detection

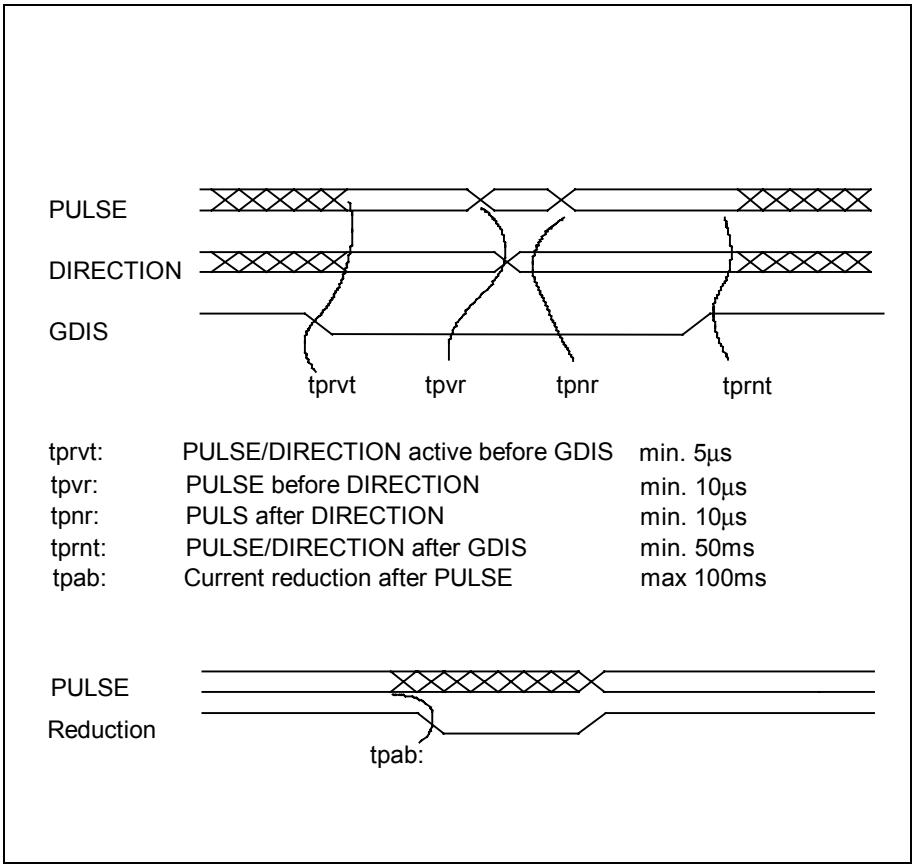
Under the following circumstances it is possible to detect a broken cable in the motor connection
- Pulse frequency less than 8Hz
- Pulse input not permanently active
- No half step position (because..no phase current)
- No power drive off (because .. no phase current)

The power drive switches to the error mode.
The LED is lit and the error condition remains.

Error mode

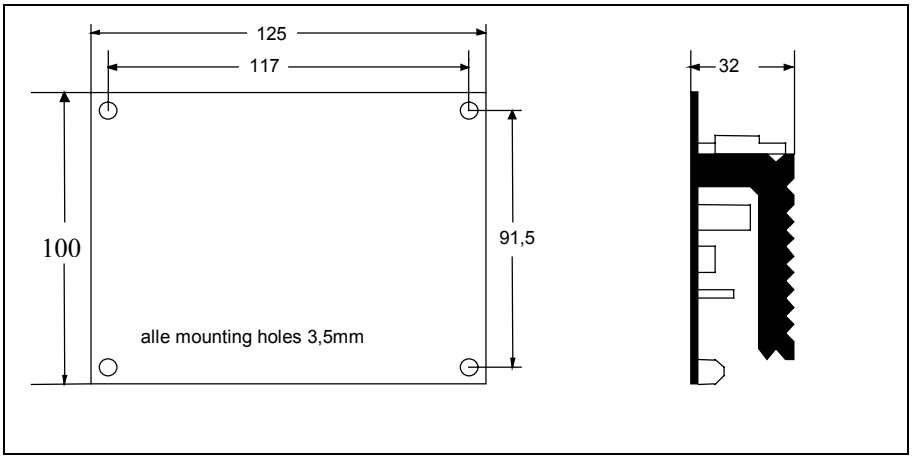
The ready signal is switched of. The motor current is switched off. The ready LED is switched off. The error condition is stored and can only be reset by activating the input “GDIS“.
The error mode is activated if
- Temperature higher than approx. 70°C
- A phase interruption was detected

Signal timing



tprvt:	PULSE/DIRECTION active before GDIS	min. 5µs
tpvr:	PULSE before DIRECTION	min. 10µs
tpnr:	PULS after DIRECTION	min. 10µs
tprnt:	PULSE/DIRECTION after GDIS	min. 50ms
tpab:	Current reduction after PULSE	max 100ms

Board dimensions



Technical specifications:

Module supply:

Absolute max. supply voltage:	40 V max.
Minimum supply voltage:	21 V
Recommended supply voltage:	38 V
Active ballast circuit:	> 46V
Voltage ripple:	2 Vss max.
Supply current at 35V/Im=max	1.5 A max.
Input peak current at power on:	<3.0 A
Fusing:	4.0 A mt
Power supply electrolytic charge capacitor:	10000 µF
Power supply cable cross sections:	0.75 mm²
Distance to the power supply capacitor	1.0m max.

Motor connection:

Cable cross section:	0,75 mm²
Cable length:	10 m max

Signal input interface: **5V (24V optional)**

Input type:	Opto coupler reverse polarity proof	
Input voltage:	minimum	4 V (21V)
	maximum	6 V (28V)
	nominal	5 V (24V)
Input current		15 mA (10mA)
Pulse width:	minimal	5µs
Pulse signal edge:	maximal	100µs

Signal output interface:

Output type:	Opto coupler reverse polarity proof	
Switching voltage:	minimum	3 V
	maximum	30 V
Switching current:	maximum	50 mA
Output resistor:		220 Ohm
Load:		only ohmic

Motor current setting:

Potentiometer	Fully CCW:	1,0 A
	Fully CW:	3,5 A
	Linear in between	

Forced air-cooling must be provided.for a set phase current higher than 2A

Temperature monitoring:

Warning, Output "FAN"	60 °
Switch off:	70 °

Current reduction/phase interruption at pulse frequency

Pulse width:	5µs	10µs	50µs	100µs
Current red.:	50Hz	30Hz	20Hz	15Hz
Phase inter.:	30Hz	23Hz	10Hz	---

Ambient conditions:

Temperature:	40° max

UL94V-1 all components
IP00

Trouble shooting:

Motor has no holding torque moment, although voltage is connected
-The motor voltage is below the minimum value
-The power drive is disabled by the input "GDIS"
-The over temperature monitoring is still active
- A non-valid step resolution is selected

The motor has holding torque, but doesn't execute steps
- The "GATE" input is active
- The pulse level is too low (24V interface)

The "TEMP"-LED is switched on immediately after power on
- The heat sink couldn't cool down sufficiently

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, motor wires with small cross section
- Power supply is not powerful enough and voltage drops under load

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 (all system ground connections must be connected to a common ground point in star configuration)
- The mechanical shaft coupling has play

The motor vibrates at pulse frequency and doesn't start
- Start/Stop-frequency too high
- Motor windings are connected wrong or broken cable
- The automatic current reduction remains active (the pulse duration time is too low at low pulse frequencies)
- The motor current is set too low

The automatic current reduction doesn't work
- The pulse input remains active after the last
- The jumper is not inserted

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