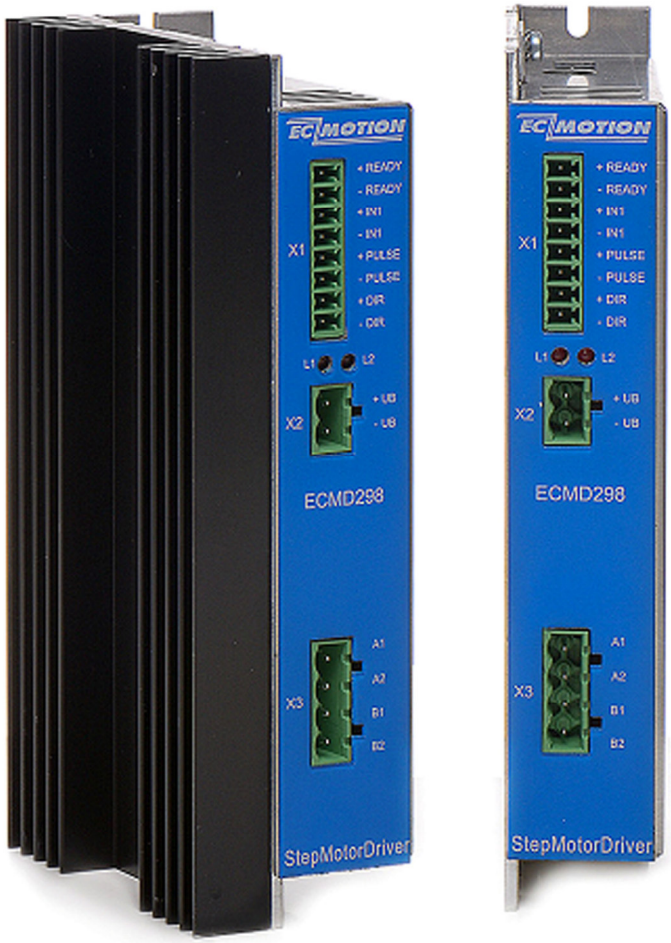
Manual

„Blue Power Line “

ECMD298

2-Phase-Stepp Motor Driver



Revision: 2014/48 subject to change without prior notice

Product Features

- suitable for motor flange □ 56.4, 60, 86 mm
HECM264 ... 269, SECM264 … 2913

- automatic Motor Setup at Power

- automatic adjustment of the Operating Parameters

- 24 ... 130 VDC, 4 ... 10 A/Phase

- 200 to 10,000 Steps / Revolution

- high Step accuracy and constant Torque Step by Step

- protection against Overcurrent, Overtemperature, Overvoltage, Undervoltage, reverse Polarity

- extensive diagnostic Displays

- Automatic current reduction at standstill

- Dimensions: H:W:D: 157x29x79
D = 90mm incl. Connector, W = 45mm incl. Head Sink

- Inputs(optically isolated):
Pulse, Direction, IN1 (Off, Reset, Gate)

- Outputs (optically isolated):
Ready

- Step Frequency up to 150 kHz

- LED-indicators for status and diagnostics

- ballast resistor at over-voltage

- automatic fan

- quality control and controls

Options:

- Open frame, wall mount, heat sink

Ordering Number Key

ECMD298.000

Stepper Motor Drive

Series Motor Type
2 2 Phase Step Motor

Series Nominal Voltage
9 24 VDC ... 130VDC

Series Nominal Current
8 4 ... 10 Amps

Cooling
0 without Heat Sink
1 with Heat Sink

Housing Version
0 with Housing

Mounting
0 Wall mount
1 DIN rail mounting clip

ECMD298 - Power-Drive for high performance

The power drive sets new standards for the digital control of Stepping Motors. Through the use of advanced DSP technology to develop new procedures and circuit technologies could be realized in the drive. The result is a very inexpensive power supply, super compact suitable in size, for highly dynamic applications and designed in construction for various industrial applications. The power section is a broad 2- and 3-phase stepper motor range from 60 can be covered up to 90 section.

Automatic Controller Setup When switching on the operating parameters are automatically adjusted so that dynamic and smoothness are optimal. Consequently the power adapts to the motor.

Boost and Current Reduction Depending on the acceleration measurement, the variable boost function is enabled and the motor current is increased accordingly. This results in higher acceleration values are possible. The current reduction reduces the motor current at standstill to 60% of the set current.

Automatic adjustment of the operating parameters during operation, certain states continuously recorded and adjustment of various operating parameters set automatically. Thereby, possible high dynamic positioning up to the top speed range.

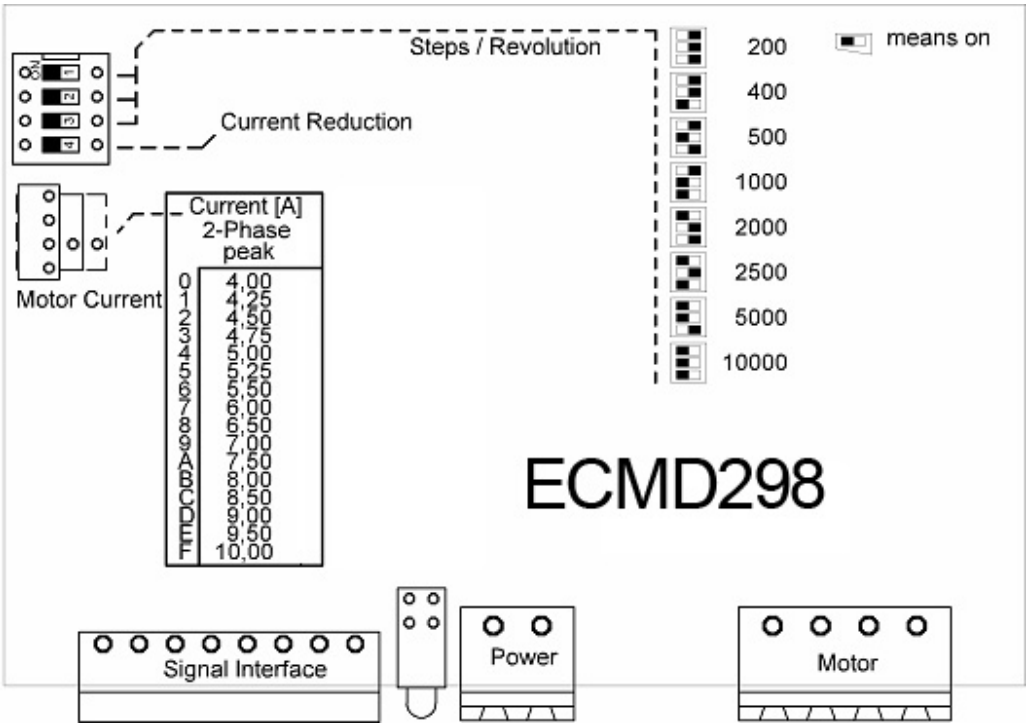
StandBy Mode With lower speeds down to stand still the power drive gradually switches to the standby mode, the motor is then absolutely quiet with full torque. A big advantage for office and lab environments.

Automatic Fan The internal fan is the mounting position of the power unit largely uncritical.

Ballast Circuit The brake chopper prevents surges when braking. Thus, the power unit can be operated with simple power supplies.

Digital Phase Current Controller The power amplifier is fully digital. The phase current is measured directly in the motor cables. It was strictly to comply with the good running properties such as low resonance run, high step angle accuracy and high and constant torque from step to step.

Controls



Description of operation

! Only when power drive is off

STEP RESOLUTION: (Steps / Revolution)
Starting from 50-pin (1.8 °) hybrid stepper motors. the steps 200, 400, 500, 1000, 2000, 2500, 5000 and 10,000 steps per revolution can be adjusted.

Runnability:
☹ less than 400 😐 400 ☺ more than 400

Resonance behavior
The resonance behavior and thus the smooth running of the stepping motor is reduced by increasing step resolution. Following table will show this, assuming that we set the resonance at full step will be 100%.

Mode:	Resonance behavior
Full Step	100 %
Half Step	29 %
Quarter Step	8 %

MOTOR CURRENT SETTING: (Motor Current)
The motor current is adjusted with the hex switch. Only as much current as needed to be set, even if this means the rated motor current is not reached. (See figure "Controls") At higher pulse rates the motor current can not be imprinted due to the motor inductance. Torque reduction is the result. (See diagrams of the manufacturer) Motor with less inductance or a higher motor voltage recommended.

CURRENT REDUCTION: (Current Reduction)
"Current Reduction" automatic electricity is lowering activated when longer than 2s arrive no more pulses. The motor current is reduced to approximately 60% of the set motor current. The power loss in the motor as well as in the final stage therefore be significantly reduced. The start / stop frequency is significantly more than this value. Immediately after an active pulse input nominal current is restored.

It is recommended to activate the current reduction. Practical experience values show that the temperature can be lowered by more than 10°.

We recommend to attach our Heat-Sink and/or suitable Colling-Fan from approx. 50% of the max. Voltage and/or approx. 50% of the max. Phase-Current of the driver.

Status Display with L1 and L2

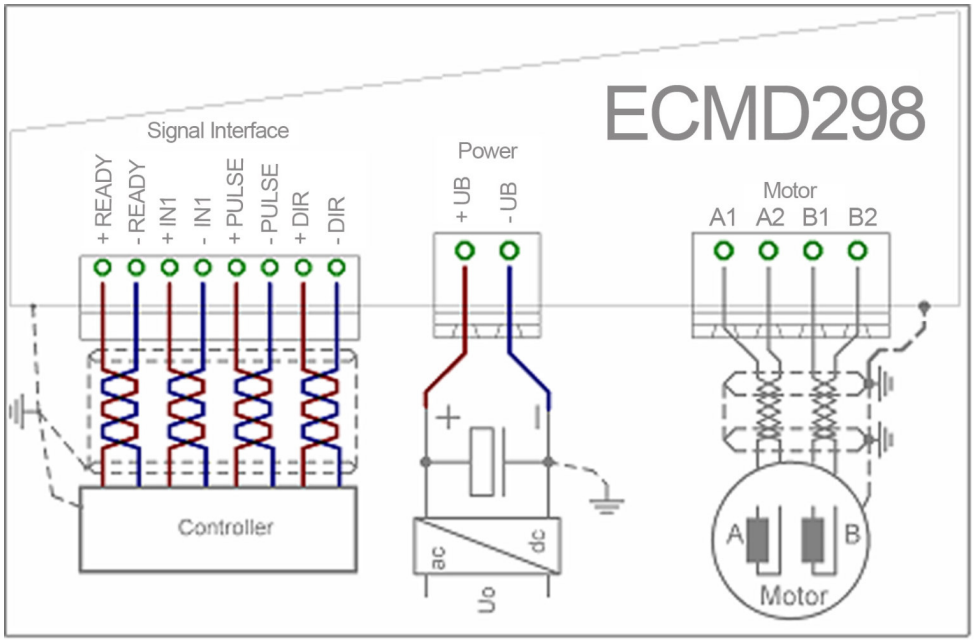
Operable:	L1 is on
	L2 is on in Zero-Position
Error:	L1 is off, L2 flashed as follows:
	2x Low-voltage has occurred
	3x Overtemperature
	4x Over-current detected
	5x Motor wiring

With the input **IN1**, the fault state **2x** upto **4x** flashing can be reset after the fault has been rectified.

The fault **5x** flashing can **ONLY** be reset by switching off the supply voltage after the fault has been rectified.

Wiring Diagram

(Valid from 1.9.2016, see also Information Appendix, page 11)



Motor connection bipolar parallel: **A1** = black and white/black **A2** = orange and black-white
B1 = red and white/yellow **B2** = yellow and white/red

Motor connection bipolar serial: **A1** = black **A2** = orange
B1 = red **B2** = yellow

PULSE: wide range inputs (3.5 ... 24) VDC
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. 1s, the motor current is reduced to approx. 60% of the set value.

DIR: wide range inputs (3.5 ... 24) VDC
The direction signal defines the sense of motor rotation. The logic assignment can be inverted by swapping the wires of one motor phase.

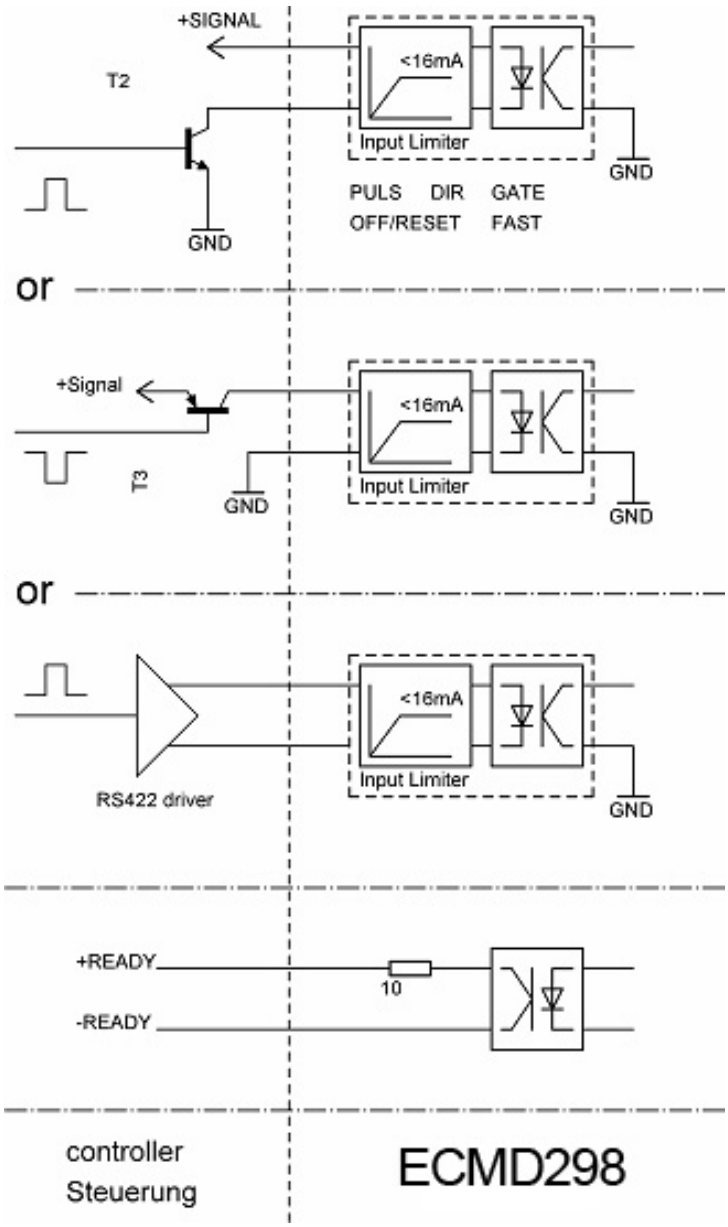
READY: wide range inputs (3.5 ... 24) VDC
This output is switched on when the drive is functional. In an error state the contact is opened , the condition is indicated with LED L1.

IN1: (OFF standard**)** wide range inputs (3.5 ... 24) VDC
Input IN1 is an auxiliary input that can be defined for different tasks. Per default the function of the input is “OFF“.

The motor is switched off by activating the input “OFF“. The current chopper is switched off. This feature is occasionally used in measuring equipment to be able to measure even the smallest signal amplitudes without interference. This condition allows to move the motor mechanically.

„**RESET**“ In case of a failure, the Reset input resets the error

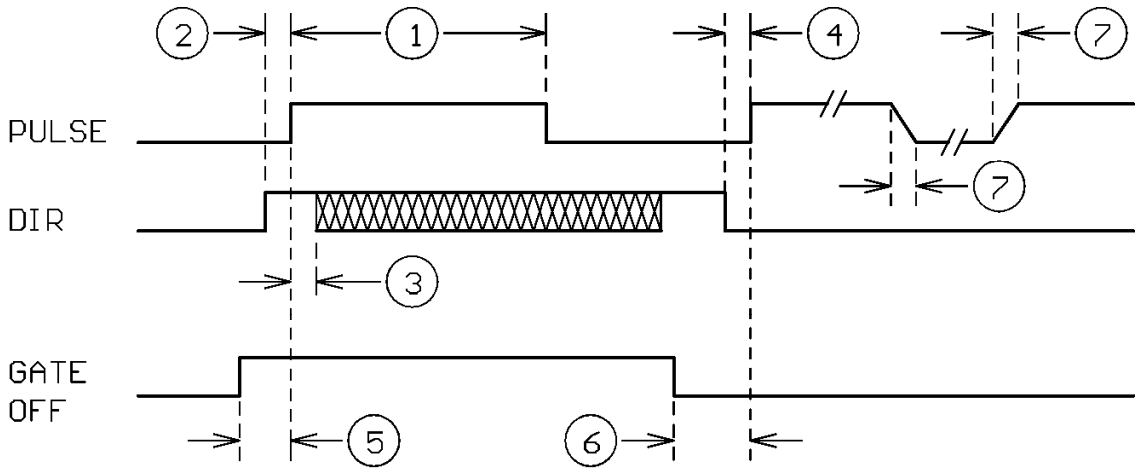
Signal Interface



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

All signals have a wide range voltage input and can be operated with signal voltage levels between 3.5V to 24V

Timing



! Pulse slope: < 2µs

! Pulse width: > 5µs

1: Pulse width	> 5µs
2: Direction active before pulse	> 1µs
3: Direction keep after pulse	> 1µs
4: Direction deactivated before pulse	> 3µs
5: Gate, Off active before pulse	> 500µs
6: Gate, Off deactivated before pulse	> 1ms
7: Pulse edges	< 2µs

Current reduction active after pulse	2s
Current reduction deactivate after pulse	<500µs
Ready after switching	< 1s
Motor current after Off	< 10ms

POWER SUPPLY: (+Ub, -Ub)
The drive can be operated in the range of 24 to max. 130 Volt. It must be guaranteed that the power supply voltage at no load and +10% mains over-voltage does not exceed 130 Volt and that there is a sufficient charge capacitor of at least 6800µF.

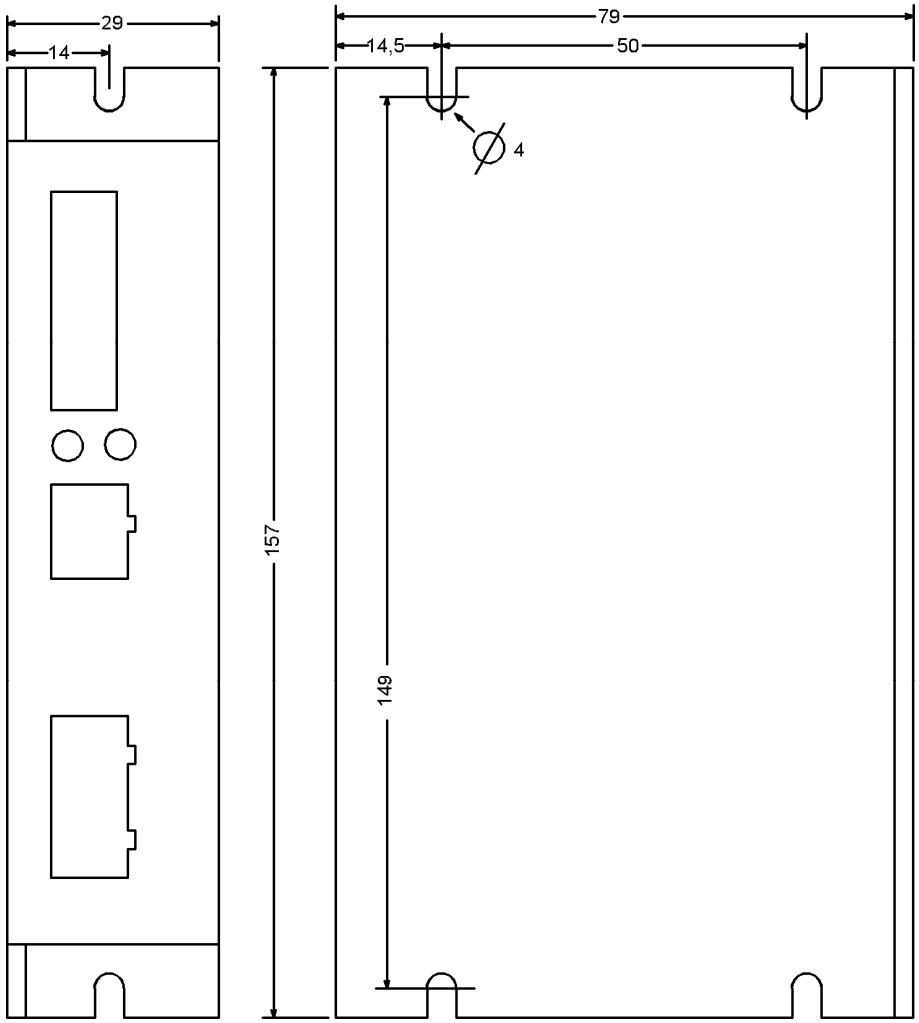
Never connect live supply voltage wires to the terminals, because the sudden charge current of the internal electrolytic capacitors can destroy the internal fuses

C H E C K F O R C O R R E C T P O L A R I T Y

MOTOR CONNECTION:
By swapping a phase, e.g. phase A1 and A2 the motor sense of rotation can be inverted to the logic assignment of the direction signal „DIR“.

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 terminal.

Dimensions



Dimensions: H:W:D: 157x29x79 D = 90 mm incl. Connector, W = 45 mm incl. Head Sink

SPECIFICATIONS:

Power drive supply:

Absolute max. voltage:	130 Vmax.
Minimum voltage:	21V
Recommended voltage:	24..120 V
Voltage ripple:	< 2.0V peak
Input peak current at power on:	< 4 A peak
Fusing:	5,0 A medium
Power supply charge capacitor:	>6800µF
Power supply cable cross section:	0,75mm²
Distance to power supply capacitor:	< 1m

Motor connection:

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

Signal input interface: (wide range 3.5V to 24V)

Input type:	opto coupler, reverse polarity protected	
Input voltage:	low:	<1V
	high:	>3.5V
	nominal:	>4.5V
	max:	<28V
Input current:		< 16 mA
Pulse width:		> 5µs
Pulse slope:		< 2µs

Ready:

Output type:		opto coupler
Switching voltage:	min.	3 V
	max.	30 V
Switching current:		< 50 mA
Impeadance:		<20 Ohm
Load:		non-reactive

Motor current setting:

Hex-Switch, 16 steps	4...10A

ambient conditions: (for Ub<=80V)

Temperature:	I_{Motor} 4A	50° max
	I_{Motor} 6A	45° max
	I_{Motor} 10A	30° max

Heat-Sink: **We recommend to attach our Heat-Sink and/or suitable Colling Fan from approx. 50% of the max. Voltage and/or approx. 50% of the max. Phase-Current of the driver.**

UL94V-1 all components

IP20

TROUBLE SHOOTING:

Motor has no holding torque but supply voltage is connected
-The motor voltage is below the minimum value
-Signal inputs "Off" is active

Motor has holding torque, but doesn't execute steps
- The pulse signal level is too low

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 (all ground signals must be connected one common potential)
- The mechanical shaft coupling has play
- The motor stalls and can't follow

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 (pulse duration 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 current reduction is not enabled

The motor is hot
Up to 85 ° Celsius should be no problem

The power drive ICs are hot
Up to 85 ° Celsius should be no problem

Poor step accuracy
- Motor inductance is too high
- Motor current setting is too low

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.

! External Magnetic Fields not allowed
Fan, electrical Valves, Relays, etc.
Minimum distance > 20cm

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.

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[1] if available

[2] not with open frame (only PCBs)

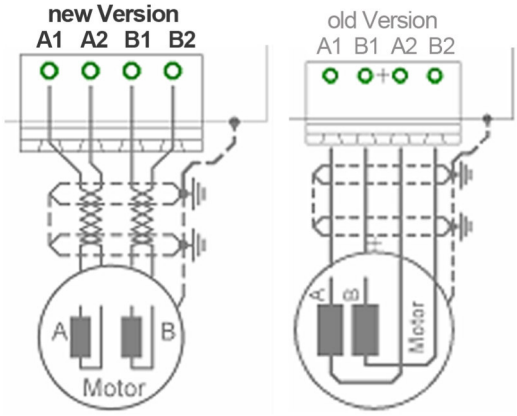
[3] if available

Appendix

Pin assignment of the motor connector:

the new Pin assignment of the power driver ECMD298,
it is compatible with that of the power driver ECMD288.

If the power in your application change and it requires a stronger power drive it is a simple exchange of power drive ensured.



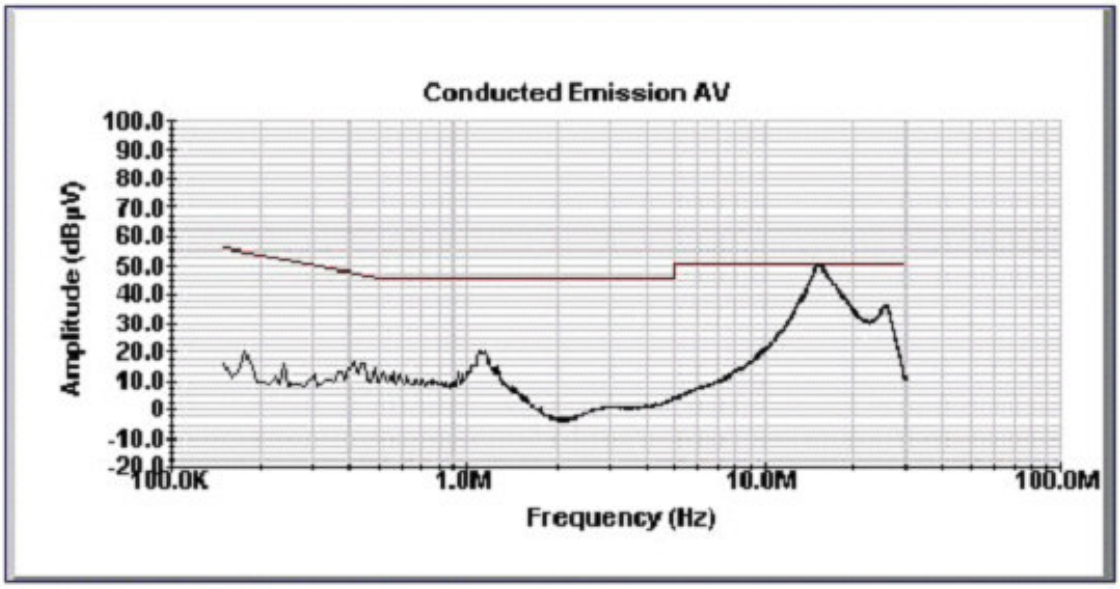
External Magnetic Interference

The motor currents are measured by current sensors directly in the motor cable. External stray magnetic fields can influence the current sensors and are therefore in the immediate vicinity of the power electronics to be strictly avoided.

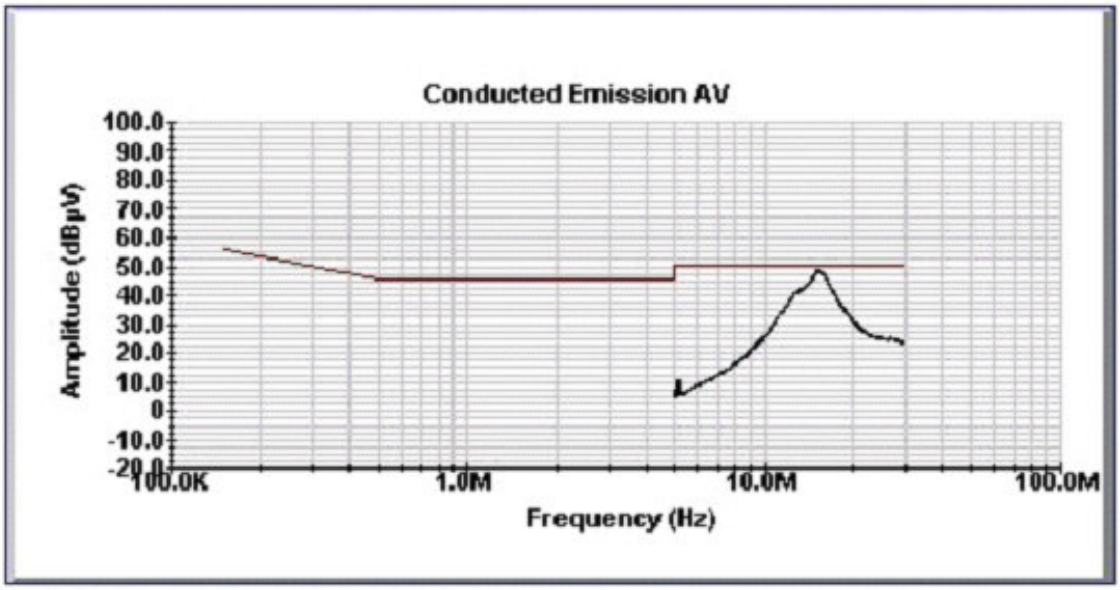
This can easily by external fans, relays, transformers, motors, permanent magnets, etc. caused and may interfere with the current controller.

Such external components to operate at a minimum distance> 20cm.

Conducted Noise Emission



Motor performance and power network performance spatially separated



additionally Würth ferrite 74271222 over power line

Lower picture:
shows the effect of ferrites at frequencies above 20MHz external magnetic interference.