ElectroCraft®
powering innovation™

| **2–Q PWM Drive – 06 A** | For Brushless-Commutated DC Motors up to 300 W |

EA2506

- Brushless drive in a small size, rugged aluminium housing in bookshelf form
- Different methods of mounting for fast installation
- Tool free connections for power terminations
- Inputs and outputs via RJ45-CAT5 plug
- Operation mode with simple DIP switch setting
- User adjustable current limit and ramp function
- Wide range supply voltage between +11 and +50 VDC for different kinds of DC-power supplies
- Protected against overtemperature and over-current
- MOSFet-technology, efficiency 97%
- Continuous current up to 6 A

Basic drive description: The EA2506 drives are designed to work with DC brushless type motors. They require a single DC power supply for operation. The drives are to be used with a single motor. They have the functionality to operate as an independent speed control and torque control. The EA2506 is protected against short circuits, under voltage, over temperature, hall error and over current. It has multiple possibilities of operation and serves as a reliable choice for your motion control needs.

Table of Contents

Used Symbols

Indicates a warning or caution concerning operations that may lead to death or injury to persons, or damage to property if not performed correctly. In order to use the drive safely, always pay attention to these warnings.

Indicates a clarification of an operation, or contains additional explanations, or operational requirements for a procedure. Reading these notes is much recommended.

1. Safety & Installation

The EA2506 requires installation by qualified personal which must pay attention to significant safety and other regulatory standards. They should be thoroughly familiar with the entire system before beginning installation.

Before final operation of machine be sure to test hookup with motor but disconnected from the load. Improper wiring could cause a "motor run away" condition, and cause serious injury or damage to the machine and personal.

Before starting installation of the EA2506, be sure that main power is disconnected. After powering the drive it should not be touched by hand or risk shock.

Take care that in case of regeneration or in brake operation the energy recovery must be buffered by the power supply and / or a braking module. Ensure with electronically stabilized power supplies that protection circuit isn't react.

Don't switch off the power supply while the motor is turning, in this case the drive could be destroyed by regeneration.

We recommend connecting a capacitor of 1000 µF per each ampere output current close to power input, in parallel.

Do not repair or open drives enclosure to prevent personal injury and void all warranties.

The EA2506 comply with the European directive EN 61800-3 (1996). The followings points must be followed:

- A metal mounting plate with correct grounding is mandatory.
- For installation purposes, tooth lock washers have to be used.
- For most wiring schemes, only shielded cables are admissible, to suppress interference with other devices. Damaged items have to be replaced.
- Provide for a large contact area between shields and mounting plate.
- The motor has to be grounded.
- The drive is an Electrostatic Sensitive Device (ESD). Electrostatic discharge needs to be avoided.

NOTE:

Certain applications may involve special requirements. Consult Factory!

2. Specifications:

2.1 Electrical Data

Power Supply Voltage	+11 to +50 VDC (Residual ripple <5 %) (The lower limit is monitored by integrated undervoltage trip) WARNING: Do not exceed 50V. Overvoltage will damage the drive.
Auxiliary Voltage Input Verror (*Verr*)	+5 to +30 VDC Supply voltage for the */Err* output. (Refer chapter 7.2)
Nominal Current	6 A
Maximum Power (only achievable with additional heatsink & proper mounting.)	300 W
Switching Frequency	50 kHz
Efficiency	97 %
Induction Specification & caution for low inductance motors	Optional choke modules are often an economical solution for low inductance or other motors, if an overheating situation occurs in regular intervals. Contact factory service for details.
Power terminals	The diameter must be suited for the connecting wires of the current load. The recommendation is 1,5 mm^2 (AWG16), the minimum is 0,13 mm^2 (AWG28). Maximum wire diameter with respect to the plug contact is 2,5 mm^2 (AWG14). Strip the wire insulation of the cables on a length of 10mm. For stranded wire, use end sleeves with the corresponding length. Wire ends have to be inserted into the contact, until they reach the stop.
Signal terminals	For the cabling of the RJ45 plugs, we recommended shielded CAT5 cables. The cables are available in different colours and lengths in the system accessories.

2.2   Mechanical Data

Mechanical Dimensions L x W x H	93 x 55,5 x 22,5 mm
Weight	120 g
Mounting	M3 screws or Din Rail Mounting

2.3   Ambient Conditions

Operation Temperature	-10 to +45 ^{o}C
Storage Temperature	-40 to +85 ^{o}C
Humidity (Non Condensing)	20 % to 80 % RH
Overtemperature Protection	+80 °C

2.4   Digital and Analog Inputs

|	
/Enable (/En)	TTL, +24 VDC; Resistance > 4,7 kOhm
Direction (Dir)	TTL, +24 VDC; Resistance > 4,7 kOhm
/Brake (/Br)	TTL, +24 VDC; Resistance > 4,7 kOhm
Hall A, B, C	TTL, +5 VDC; Resistance = 1 kOhm
Set value (Set v)	Analog 0 – +10 VDC ; Resistance = 100 kOhm

2.5   Outputs

|	
Auxiliary Voltage Outputs +5V	+5 V / 20 mA for each; 40 mA if connected in parallel
Auxiliary Voltage Outputs +10V	+10 V / 10 mA
/Error output (/Err)	Open Collector / Push Pull / TTL / +24 VDC; Resistance = 50 Ohm
Current monitor (Mon I)	Analog 0 – +10 VDC with 0,75 V / A; Resistance = 1 kOhm; max. 1 mA

2.6   Control LEDs

Power (Pr)	LED green
	The LED is lit when the operating voltage is present.
Error (Err)	LED red
	The lamp is lit if the overtemperature, overcurrent, the undervoltage protection circuit or a hall error has been initiated.

3. Drive Overview
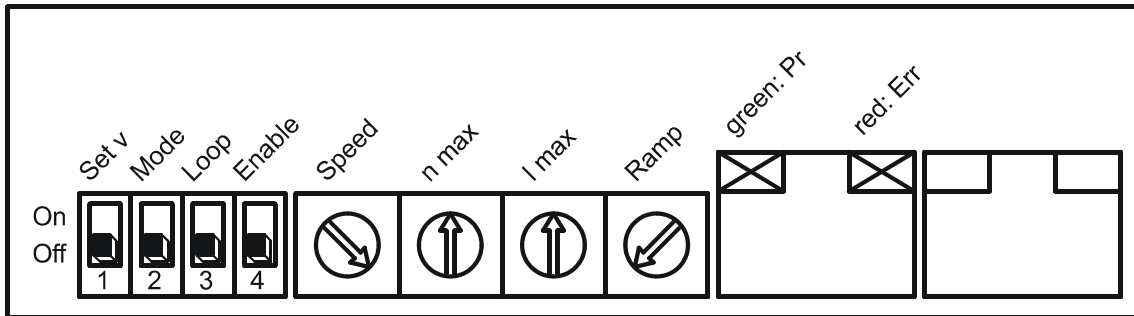
3.1 Block Diagram
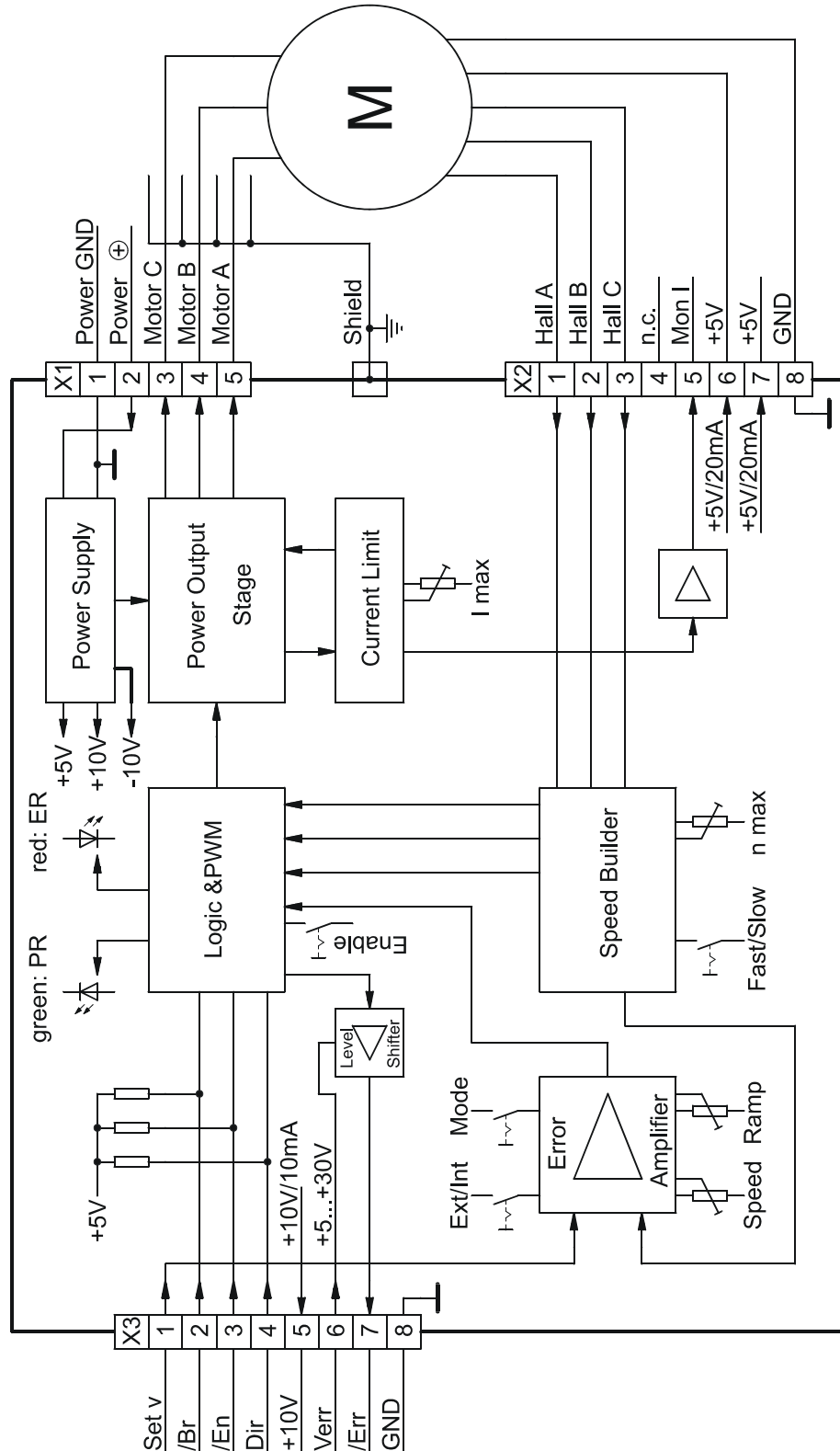
3.2 Input & Output Schematics

Input Hall A, B, C

Input /En,Dir, /Br

Input Set v

Output Mon I

Output /Err
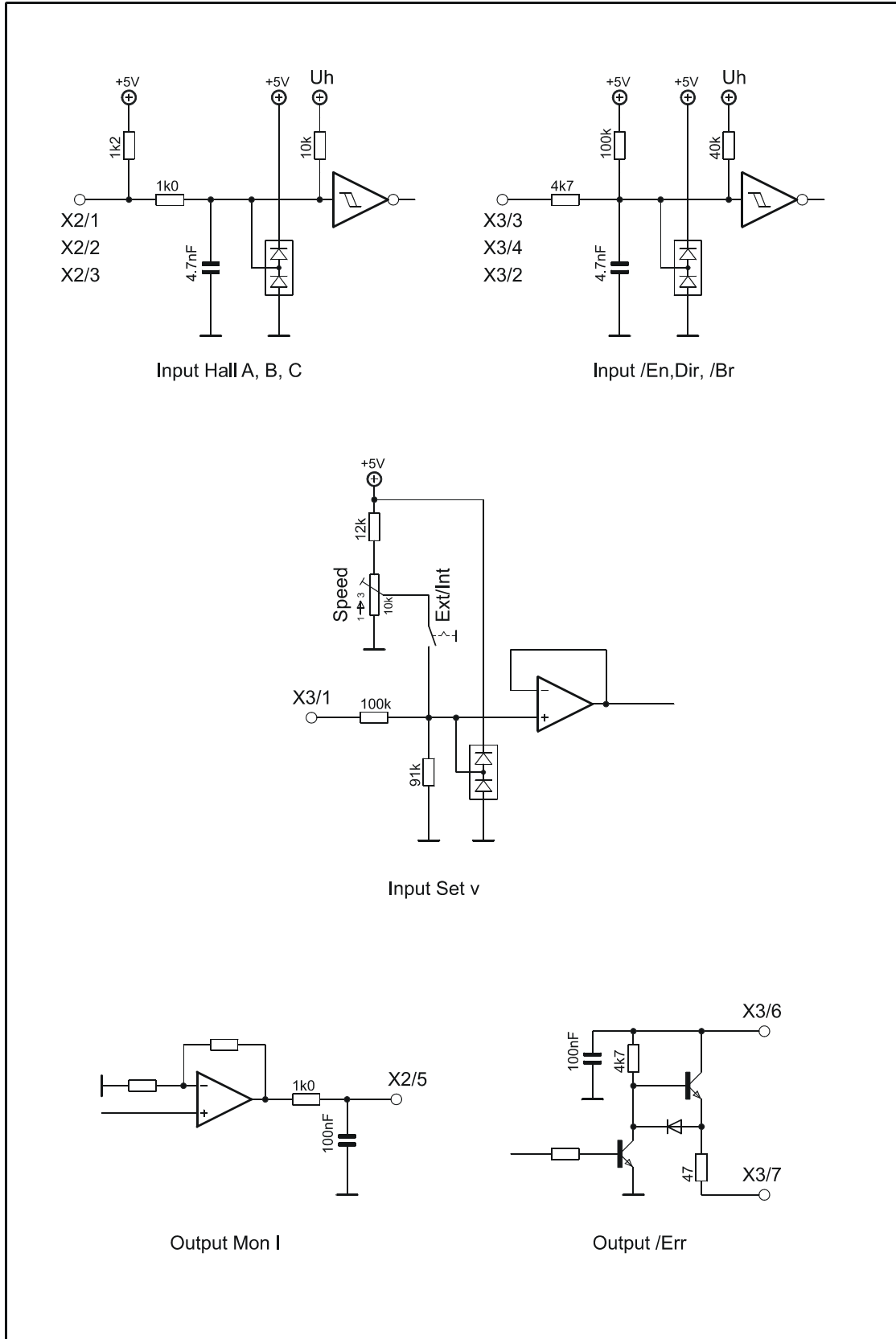
3.3   Control Elements

3.4   Operation Modes

Hall Mode

At hall mode the feedback information is coming from hall switches which are mounted in the motor or a hall encoder which is mounted at the motor. The speed regulation is good at each load condition and qualified for each application to control the speed of a system also for high speed application.

Torque Mode

At torque mode the drive does only control the current of the motor. This control loop is very fast but the speed is moving with the load due to the constant current. This mode is used in application with force control or as a fast power amplifier for positioning systems.

4. Wiring

According to the safety directives, a correct cable selection is mandatory. Regular inspection is advisable. Damaged, burned or kinked items have immediately to be exchanged.

Power (*Power ⊕ - Power GND*)

- Normally no shielding required.
- When connecting several amplifiers to the same supply pack, use star point wiring.

Motor Wiring (> 30 cm)

- Only shielded cables are recommended.
- Connect the shield to the ground lug of the drive.
- A separate cable has to be used.
- Choke modules are useful to reduce PWM-pulses.

Connection to hall (> 30 cm)

- Only shielded cables are recommended.
- Connect the shield to the controller.
- A separate cable has to be used.

Analog Signals (*Set v, Mon I*)

- In most cases no shielding required. This may be different for low level signals or in an environment with strong magnetic interference.
- Connect the shield on either end of the cable. For 50/60 Hz interference, remove the shield on one side.

Digital Signals (*/En; Dir; /Br; /Err*)

- No shielding required.

To verify a trouble-free operation and the conformity to CE regulation, it makes only sense to test the system as a whole, with all components installed (motor, amplifier, supply pack, EMC filters cables etc.).

Note: To improve the noise immunity, always connect unused logical inputs to a fix potential (*GND* or *+5V*). Do not connect the CAT5 connectors to any network.
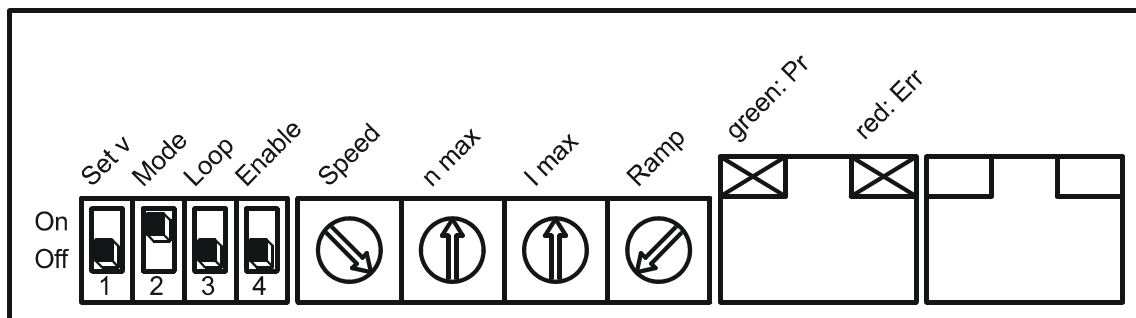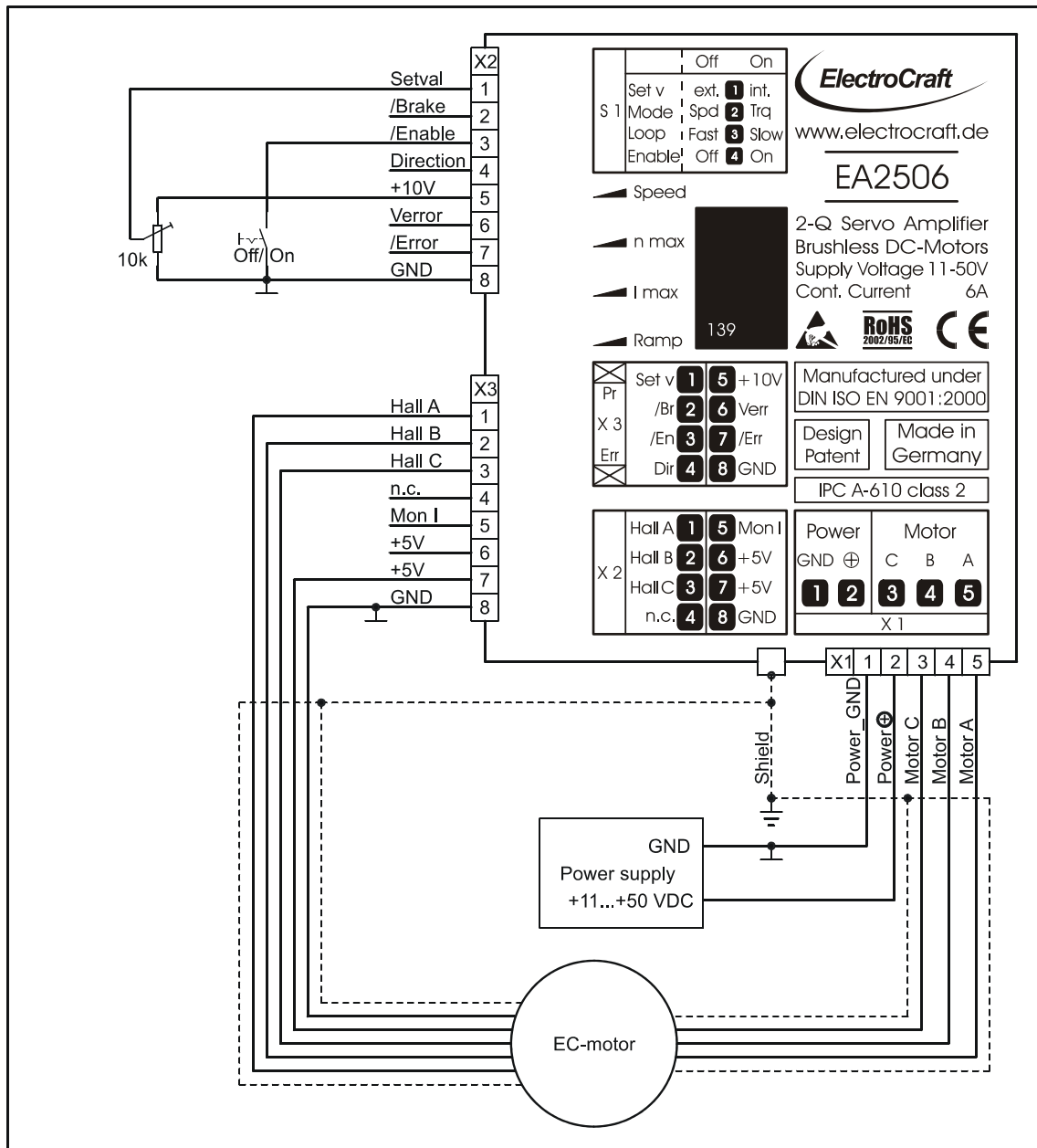
4.1 Wiring Example I - Hall Mode
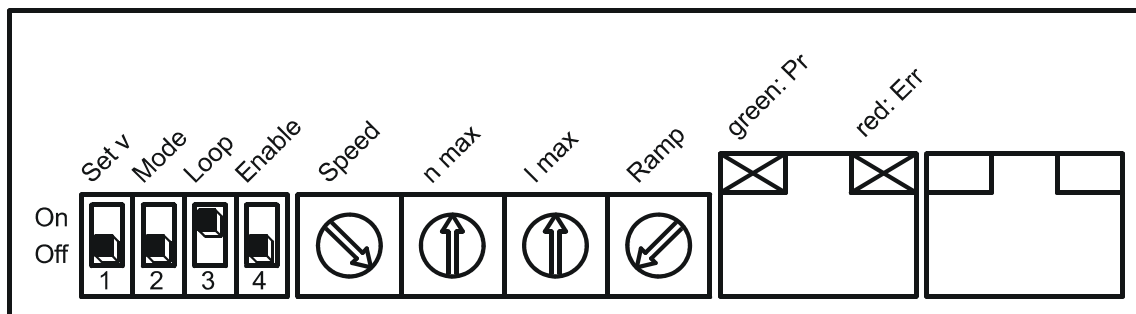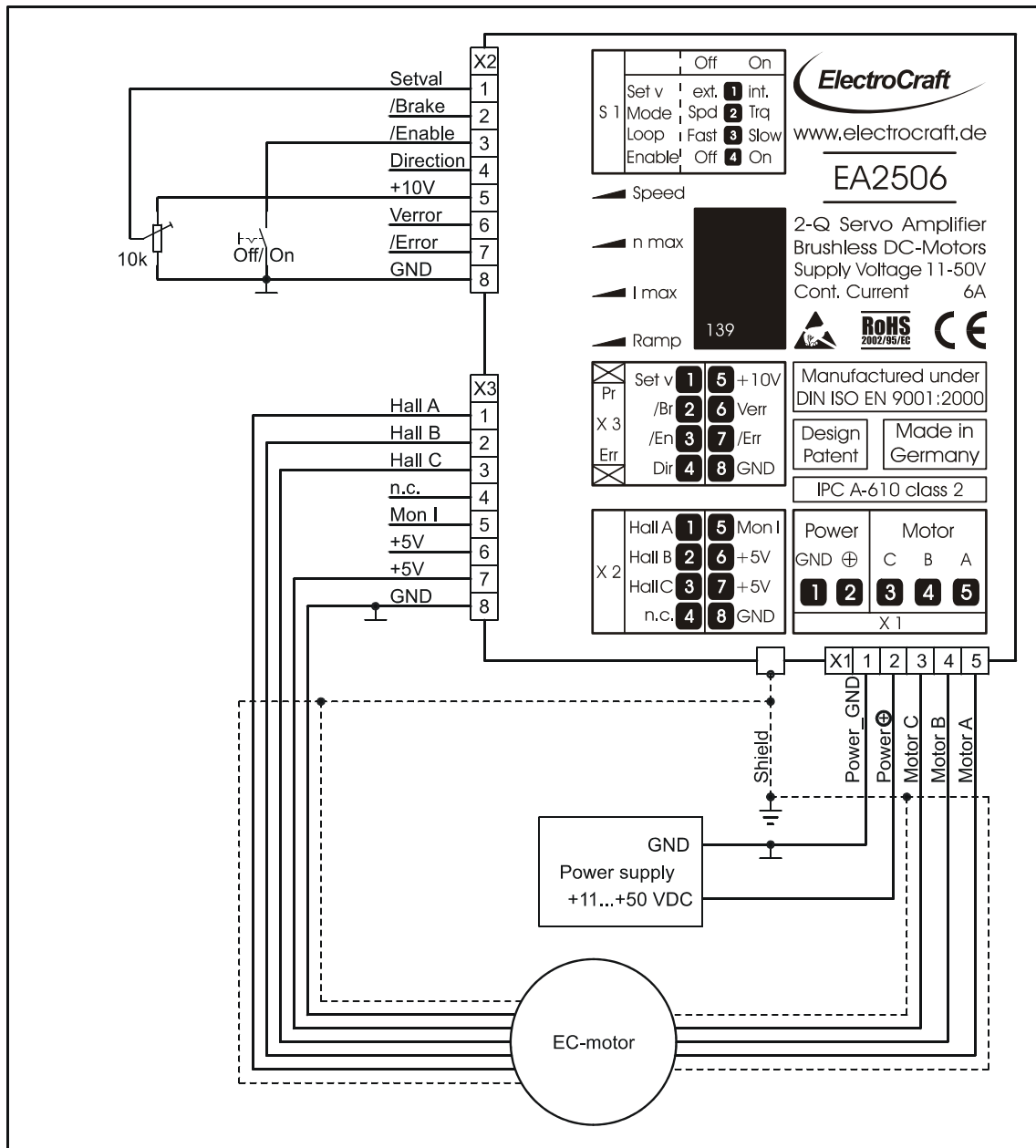
4.1.1 Adjustment procedure for Hall Mode

1. Potentiometer pre setting refer chapter 5.2.

2. To activate the drive switch the */En* input to ground after power up.

3. Set the external *Set v* potentiometer to maximum speed.

4. Turn the potentiometer *n max*, until the desired maximum speed is reached.

5. Adjust with the *I max* potentiometer the maximum motor current to a value requested by you. It is of major importance that this value is lower than the maximum admissible constant current (see motor data sheet). To measure the motor current use the *Mon I* output, a current probe in one of the motor cables with an oscilloscope.

6. To change rotation direction of the motor connect the */Dir* input to ground.

7. The ramp function is deactivated if the potentiometer *Ramp* is set to the left.

8. To optimize the dynamic behaviour of the speed control loop to the motor use switch S1-3 *Loop* (refer chapter 5.3).
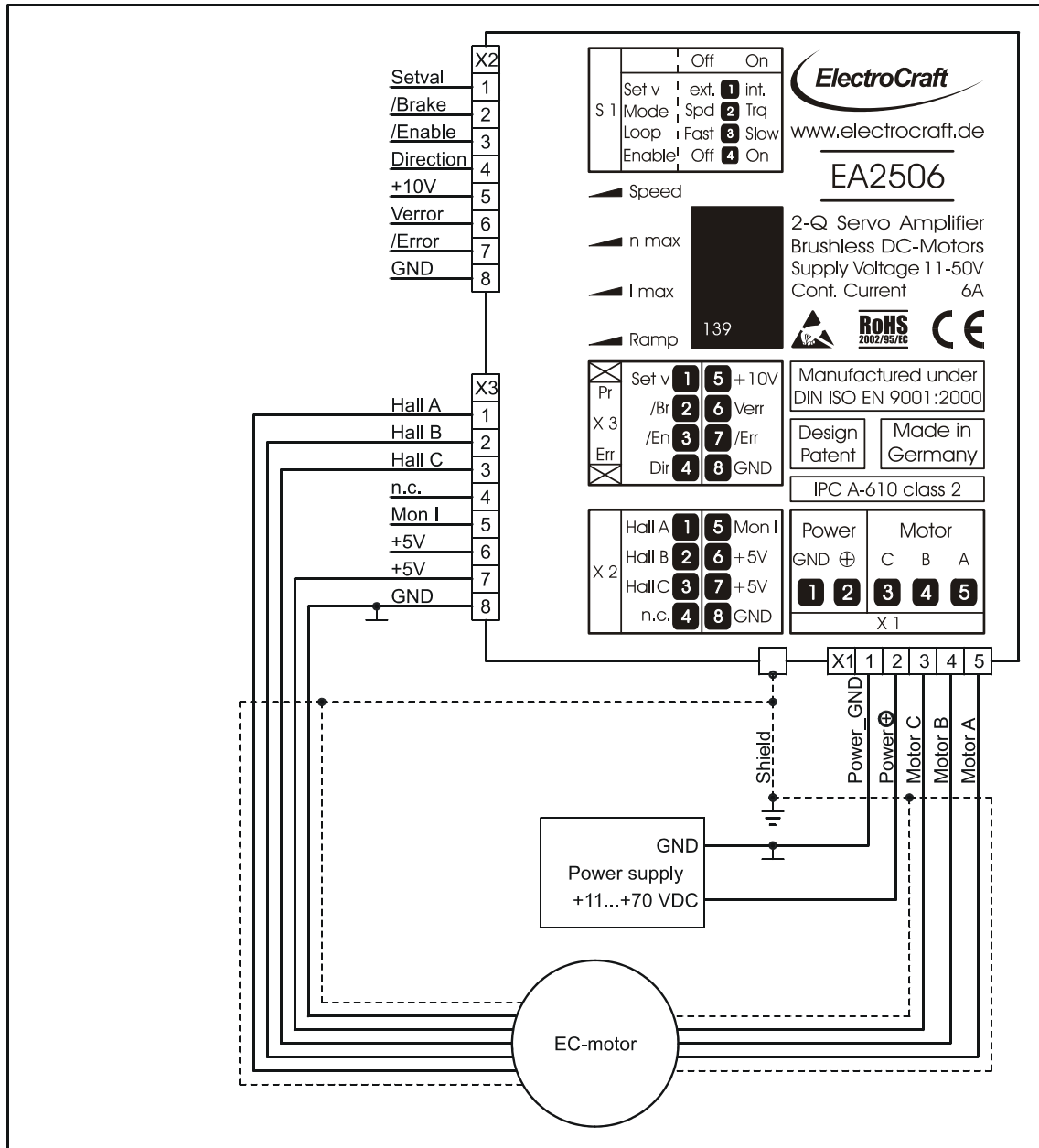
4.2   Wiring Example II - Torque Mode

4.2.1 Adjustment procedure for Torque mode

1. Potentiometer pre setting refer chapter 5.2.

2. To activate the drive switch the */En* input to ground after power up.

3. Adjust the current limiter to a value requested by you with the *I max* potentiometer. It is of major importance that this value is lower than the maximum admissible constant current (see motor data sheet). To measure the motor current use the *Mon I* output, a current probe in one of the motor cables with a oscilloscope.

4. To change the rotation directions of the motor connect the *Dir* input to ground.

5. The ramp function is deactivated if the potentiometer *Ramp* is set to the left.
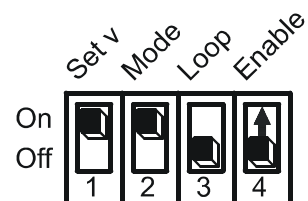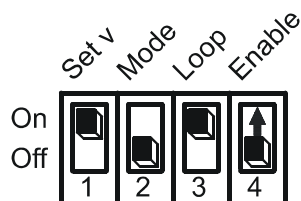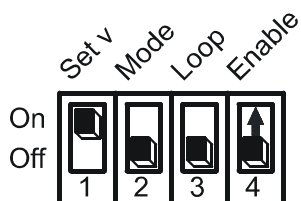
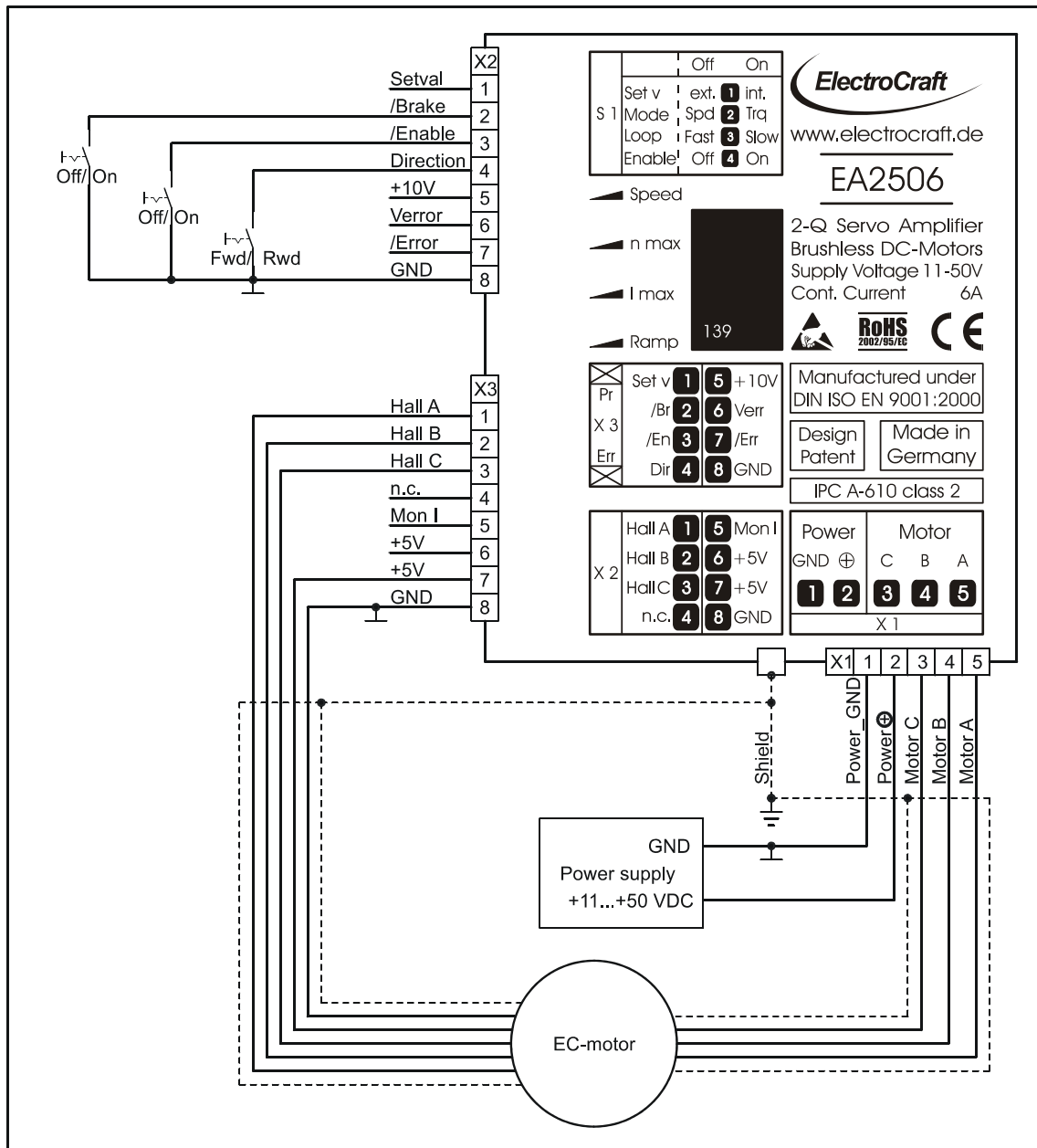## 4.3 Wiring Example III – Minimal Wiring

Hall Mode:

Loop Fast

Loop Slow

Torque Mode:

4.4 Wiring Example IV

X2

Setval	1
/Brake	2
/Enable	3
Direction	4
+10V	5
Verror	6
/Error	7
GND	8

Off/ On

Off/ On

Fwd/ Rwd

X3

Hall A	1
Hall B	2
Hall C	3
n.c.	4
Mon I	5
+5V	6
+5V	7
GND	8

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EA2506

2-Q Servo Amplifier
Brushless DC-Motors
Supply Voltage 11-50V
Cont. Current   6A

Off   On
S 1 Set v   ext. ❶ int.
     Mode   Spd ❷ Trq
     Loop   Fast ❸ Slow
     Enable Off ❹ On

Speed
n max
I max
Ramp   139

RoHS 2002/95/EC   CE

Pr X 3 Err
Set v ❶ ❺ +10V
/Br ❷ ❻ Verr
/En ❸ ❼ /Err
Dir ❹ ❽ GND

Manufactured under
DIN ISO EN 9001:2000

Design Patent | Made in Germany

IPC A-610 class 2

X 2
Hall A ❶ ❺ Mon I
Hall B ❷ ❻ +5V
Hall C ❸ ❼ +5V
n.c. ❹ ❽ GND

Power
GND ⊕

Motor
C B A
❶ ❷ ❸ ❹ ❺
X 1

X1 | 1 | 2 | 3 | 4 | 5

Shield
Power_GND
Power⊕
Motor C
Motor B
Motor A

GND
Power supply
+11...+50 VDC
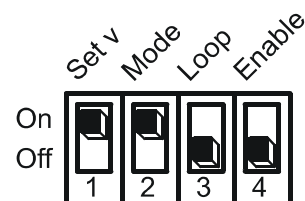
EC-motor

Hall Mode: **Torque Mode:**

Loop Fast   **Loop Slow**

Set v | Mode | Loop | Enable
On / Off
1 | 2 | 3 | 4

Set v | Mode | Loop | Enable
On / Off
1 | 2 | 3 | 4

Set v | Mode | Loop | Enable
On / Off
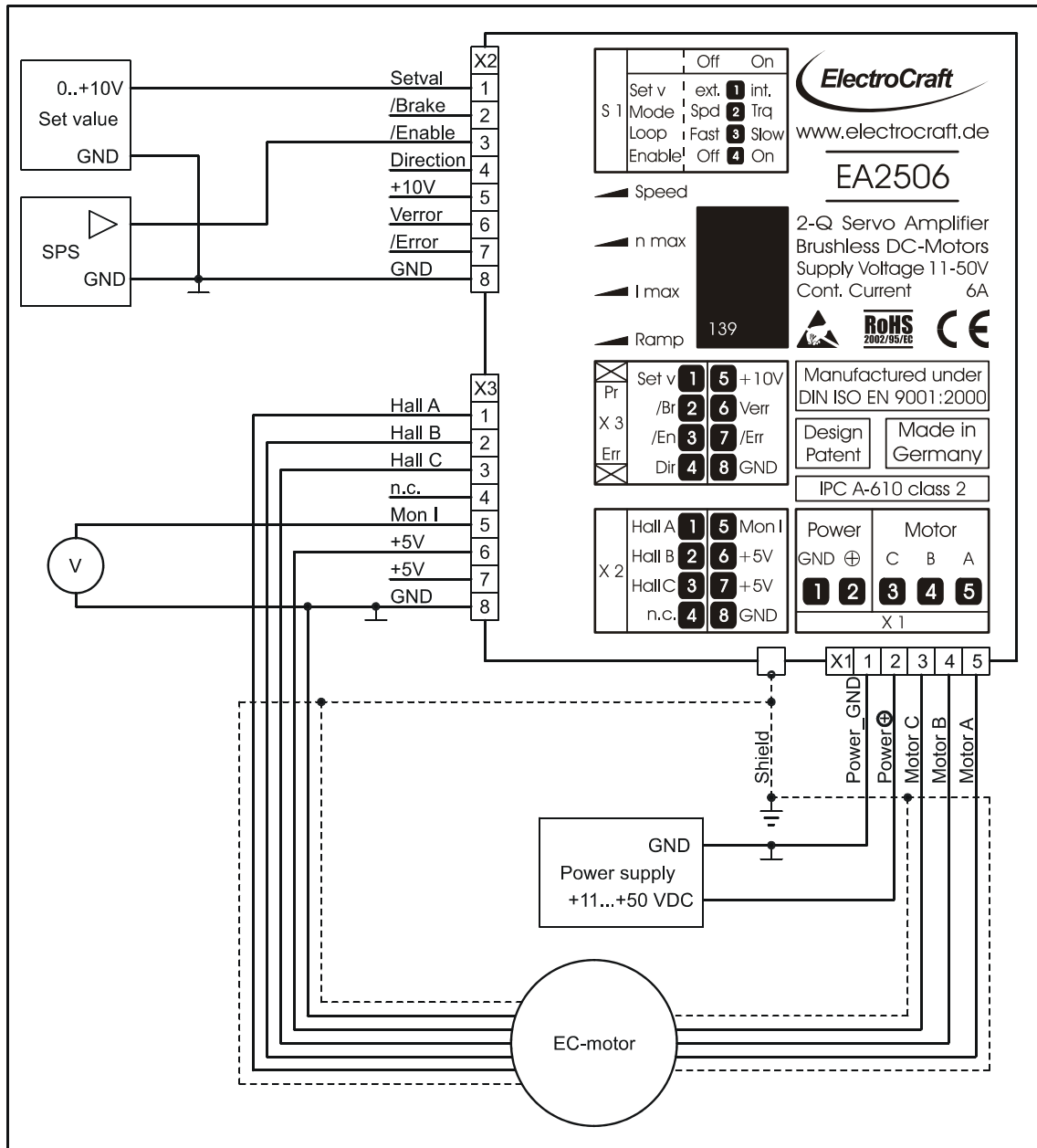1 | 2 | 3 | 4

Note: In case of using the switch for */Br* refer chapter 7.1.

4.5 Wiring Example V

Hall Mode:

Loop Fast

Loop Slow

Torque Mode:

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4.5 Wiring Example VI
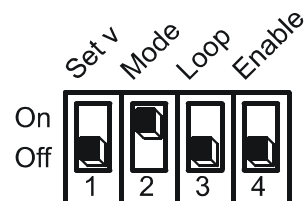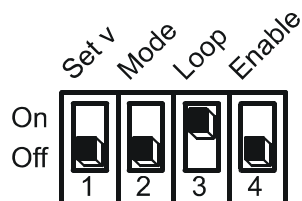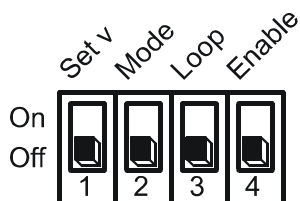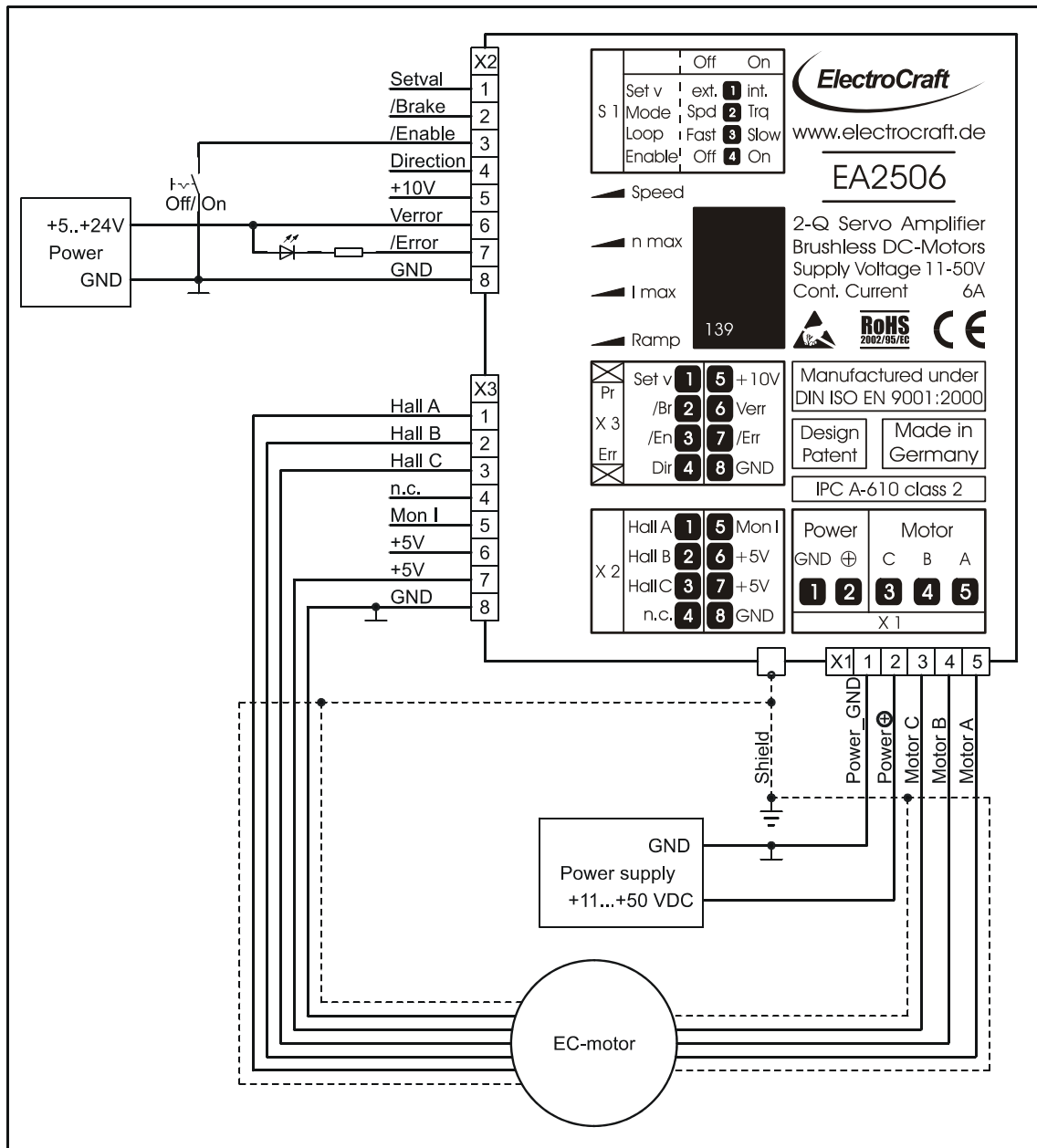

Hall Mode: **Torque Mode:**
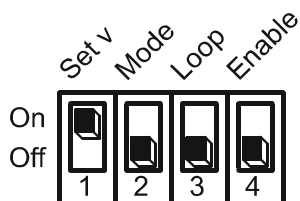
Loop Fast   **Loop Slow**
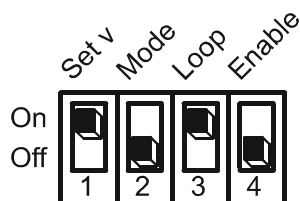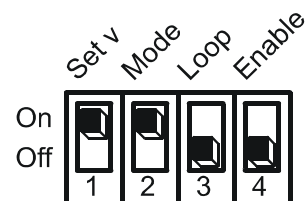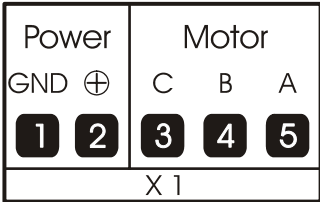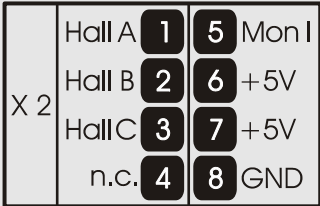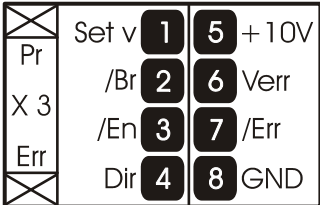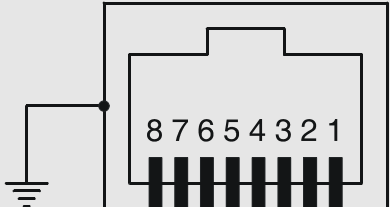
5. Explanation of Terminals, Dip Switches, & Potentiometers

5.1 Terminals

Terminal	Label	Description
X1		Pin 1 & 2 connect to power supply. Pin 3 & 4 &5 connect to motor.
X2		Pin 1 & 2 & 3 input for hall signals. Pin 4 do not contact. Pin 5 voltage output for current. Pin 6 & 7 voltage output +5 VDC. Pin 8 GND.
X3		Pin 1 input set value. Pin 2 input /Brake (*/Br*). Pin 3 input /Enable (*/En*) extern. Pin 4 input Direction (*Dir*). Pin 5 voltage output +10 VDC. Pin 6 voltage input for */Err* output. Pin 7 output signal /Error (*/Err*). Pin 8 GND.
X2; X3		Pinning of CAT5 connectors.

5.2 Potentiometers
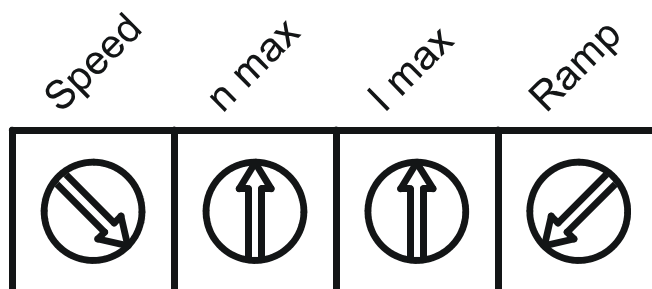
Potentiometer	Function	Turning to the Left (ccw)	Turning to the Right (cw)
Speed	Set the motor speed	Decrease motor speed	Increase motor speed
n max	Definition of max. number of revolutions	Value is decreased	Value is increased
I max	Set value for max. current	Reduce the current	Increase the current
Ramp	Switch On/Off and adjust the time of the *Ramp*	Ramp time is lowered; at left stop the function is disabled	Ramp time is raised

Potentiometer setting for start up:

Speed	*n max*	*I max*	*Ramp*
Right stop	Middle	Middle	Left stop

5.3 Dip switches
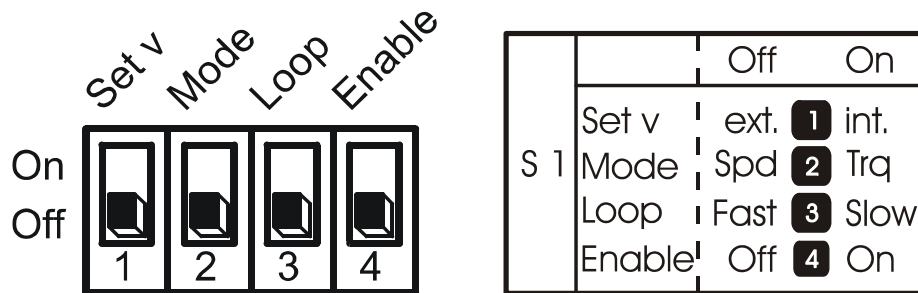
S1-1	*Set v*	**Methods of entering the set value**
Off:	Set value extern	External selection using a voltage between X3/1 and X3/8.
On:	Set value intern	The internal *Speed* potentiometer is used.

S1-2	*Mode*	**Selecting the operation mode**
Off:	Speed (*Spd*)	The drive is working in a closed loop hall speed mode.
On:	Torque (*Trq*)	The drive is working in a closed loop current mode.

S1-3	*Loop*	**Setting the time constant of the speed loop**
Off:	*Fast*	This is a short loop time for high dynamic motors.
On:	*Slow*	This is a longer loop time with a better transient behaviour or to control bigger motors.

S1-4	*Enable*	**Enabling of the output**
Off:	*Enable Off*	The enable is following the signal at the input X3/3. With high the output stage will be activated. (Refer chapter 7.1)
On:	*Enable On*	With switching the switch from Off to On the output stage will be activated.

6. Glossary

Speed

The function for the *Speed*-potentiometer is to adjust the motor speed.

n max

Use this potentiometer to adapt the desired maximum speed to the amplitude of the present set value. For Example: if maximum of 5V is to be used for maximum Speed then send 5V and adjust that maximum with the *n max* potentiometer

Take care not to exceed meaningful limits. An exaggerated value may avoid to control the drive and making it impossible e.g. to line-up the system in speed control operation under load.

I max

The following action requires the motor to be operated with maximum load. The motor current may be measured e.g. using current probe with effective value display, or by means of an ammeter located in the motor line.

I max decide on the maximum possible motor current.

The following limits have to be observed:

- Left stop: 5 % of rated current of 06 A

- Right stop: 100 % of rated current + (0 – +5 %)

Note:

Do not overheat the motor. For this reason, the *I max* limit should always be selected lower than the maximum admissible constant current.

Ramp

The ramp function is deactivated if the *Ramp* potentiometer is set to minimum.

The ramp time defines the increasing time to reach the scheduled value defined by *n max*. The ramp is active after the drive is enabled, also by changing the *Speed.*

Hall mode

This is a closed loop speed mode which is using the hall signals as a feedback input for the speed.

Torque mode

In this mode the driver controls only the current of the motor. The speed of the motor depends on the load because only the output force of the motor is regulated.

Brushless motor

A class of motors that operate using electronic commutation of phase currents, rather than electromechanical (brush-type) commutation. Brushless motors typically have a permanent magnet rotor and a wound stator.

Commutation

Is a term which refers to the action of steering currents or voltages to the proper motor phases so as to produce optimum motor torque. In brush type motors, commutation is done electromechanically via the brushes and commutator. In brushless motors, commutation is done by the switching electronics using rotor position information obtained by Hall sensors.

Hall sensor

Is a feedback device which is used in a brushless servo system to provide information for the amplifier to electronically commutate the motor. The device uses a magnetized wheel and hall effect sensors to generate the commutation signals.

Back EMF

The voltage generated when a permanent magnet motor is rotated. This voltage is proportional to motor speed and is present regardless of whether the motor winding(s) are energized or de-energized.

Closed loop

This is broadly applied term, relating to any system in which the output is measured and compared to the input. The output is then adjusted to reach the desired condition. In motion control, the term typically describes a system utilizing a velocity and/or position transducer to generate correction signals in relation to desired parameters.

Cogging

A term used to describe non-uniform angular velocity. Cogging appears as jerkiness, especially at low speeds.

Continuous rated current

The maximum allowable continuous current a motor can handle without exceeding the motor temperature limits

Continuous stall torque

Is the amount of torque at zero speed, which a motor can continuously deliver without exceeding its thermal rating. To determined by applying DC current through two windings with locked rotor, while monitoring temperature. It's specified with motor windings at maximum rated temperature and 25 °C ambient temperature, motor mounted to a heat sink. Refer to individual specs for heat sink size.

Controller

This term describes a functional block containing an amplifier, power supplies, and possibly position-control electronics for operating a servomotor or step motor.

Demag current

Is the current level at which the motor magnets will start to be demagnetized. This is an irreversible effect, which will alter the motor characteristics and degrade performance.

Drive

It's an electronic device that controls torque, speed and/or position of an AC or brushless motor. Typically a feedback device is mounted in or on the motor for closed-loop control of velocity and position.

Driver

Is the electronics which convert step and direction inputs to high power currents and voltages to drive a step motor. The step motor driver is analogous to the servomotor amplifier's logic.

Efficiency

The ratio of power output to power input.

Encoder

Is a feedback device which converts mechanical motion into electronic signals. The most commonly used, rotary encoders, output digital pulses corresponding to incremental angular motion. For example, a 1000-line encoder produces 1000 pulses every mechanical revolution. The encoder consists of a glass or metal wheel with alternating transparent and opaque stripes, detected by optical sensors to produce the digital outputs.

Feedback

It is a signal which is transferred from the output back to the input for use in a closed loop system.

Four quadrants

Refers to a motion system which can operate in all four quadrants; i.e., velocity in either direction and torque in either direction. This means that the motor can accelerate, run, and decelerate in either direction.

Gain

The dynamical behaviour of the servo amplifier must be compatible to the particular connected motor. The adjusting procedure is performed using the *Gain* potentiometer. A bad adaptation (i.e. if the *Gain* value has been selected too high) can be easily recognized by excessive motor vibration or noise. Consequential mechanical damages cannot be excluded; furthermore an overtemperature situation may arise, due to high currents inside the motor.

Inductance

The electrical equivalent to mechanical inertia; that is, the property of a circuit, which has a tendency to resist current flow when no current is flowing, and when current is flowing has a tendency to maintain that current flow.

NTC - Negative Temperature Coefficient

A negative temperature coefficient thermistor is used to detect and protect a motor winding from exceeding its maximum temperature rating it is also used in a servo amplifier. Resistance of the device decreases with an increase in temperature.

Open-loop

A system in which there is no feedback. Motor motion is expected to faithfully follow the input command. Stepping motor systems are an example of open-loop control.

Pulse Width Modulation (PWM)

1. A PWM controller (amplifier) switches DC supply voltage on and off at fixed frequencies. The length of the on/off interval or voltage waveform is variable.

2. Pulse width modulation (PWM), describes a switch-mode (as opposed to linear) control technique used in amplifiers and drivers to control motor voltage and current. PWM offers greatly improved efficiency compared to linear techniques.

Regeneration

The action during motor braking, in which the motor acts as a generator and takes kinetic energy from the load, converts it to electrical energy, and returns it to the amplifier.

Resonance

Oscillatory behavior caused by mechanical limitations.

Ringing

Is an oscillation of a system following a sudden change in state.

Speed

Describes the linear or rotational velocity of a motor or other object in motion.

Tachometer

A small generator normally used as a rotational speed sensing device. The tachometer feeds its signal to a control which adjusts its output to the motor accordingly (called "closed loop feedback" control).

Thermal protection

A thermal sensing device mounted to the motor to protect it from overheating. This is accomplished by disconnecting the motor phases from the drive in an over temperature condition.

Torque

Is a measure of angular force which produces rotational motion. This force is defined by a linear force multiplied by a radius; e.g. lb-in or Nm. Torque is an important parameter of any motion control system.

Two Quadrants

Refers to a motion system which can operate in two quadrants by changing the direction of the motor speed ore in one quadrant with active accelerate and decelerate.

Watt

One horsepower equals 746 watts.

7. Description of Inputs and Outputs

7.1 Digital Inputs

*/En - /*Enable: Activating or Disabling the Output Stage

If the /*En* input X3/3 isn't at GND potential or not wired at all, the output stage remains in the locked state (active – LO). The motor stands still or slow down without brake. To reactivate the output stage, a voltage signal <0.6V to the /*En* input is necessary.

If the ramp function is applied as well, it will immediately be carried out after the activation of */Enable*.

Additional information about the schematic refer chapter 3.2.

Range of Input Voltage	0 to +24 VDC
Input Impedance	4.7 kOhm to GND
Permanent Input Protection	-0.6 to +50 VDC
/Enable activated	<0.6 VDC or connected to GND
/Enable disabled	>3.5 VDC or open

Remark:

Alternative this function is also possible with switch S1-4. (Refer chapter 5.3)

Dir - Direction: Changing the Direction of the Rotation

If the *Dir* input X3/4 is at LO the motor turns in one direction, at HI or open the direction is opposite. The direction depends by the commutation sequence of the motor.

Additional information about the schematic refer chapter 3.2.

Range of Input Voltage	0 to +24 VDC
Input Impedance	4.7 kOhm to GND
Permanent Input Protection	-0.6 to +50 VDC
Direction (e.g. CW-rotation)	<0.6 VDC or connected to GND
Direction (e.g. CCW-rotation)	>3.5 VDC or open

Note:

It is allowed to change the direction on fly. The drive uses a special protection circuit to avoid damage by changing the direction.

Hall A / B / C: Hall Feedback of the Motor

The *Hall* inputs X2/1, X2/2 and X2/3 are connected to the hall signals of the motor. The supply voltage is given by the *+5V* output at X2/6 or X2/7 to GND (X2/8). The drive needs the signals to do the commutation and control the speed.

Additional information about the schematic refer chapter 3.2.

Range of Input Voltage	0 to +5 VDC
Input Impedance	1 kOhm to +5 V
Permanent Input Protection	-0.6 to +24 VDC
High level	>2,4 VDC
Low level	<1 VDC

/Br - /Brake: Braking the Motor

If the /Br input X3/2 isn't at GND potential or not wired at all, the function is not activated (active – LO). At GND the motor is breaking suddenly by shorting the motor windings to GND, if the *Enable* input is switched on.

Additional information about the schematic refer chapter 3.2.

Range of Input Voltage	0 to +24 VDC
Input Impedance	4.7 kOhm to GND
Permanent Input Protection	-0.6 to +50 VDC
Brake activated	<0.6 VDC or connected to GND
Brake disabled	>3.5 VDC or open

Note:

Don't exceed the maximum breaking speed, otherwise the output stage could be destroyed.

The maximum allowed breaking speed is limited by the maximum permitted short circuit current and the maximum allowed kinetic energy:

- I <= 10 A

- W_k <= 4 Ws

max. allowed braking speed limited by current

(I = 8 A)

By the motor data's it is possible to calculate the maximum breaking speed:

$$n_{max} = 8A \bullet k_n \bullet \left(R_{Ph-Ph} + 0.08\Omega\right)\left[min^{-1}\right]$$

k_n = Speed Constant [$min^{-1}V^{-1}$]

R_{Ph-Ph} = Terminal Resistance Phase-Phase [Ω]

max. allowed braking speed limited by kinetic energy

(W_k = 4 Ws)

At a given moment of inertia the maximum breaking speed is calculated as follow:

$$n_{max} = \sqrt{\frac{365}{J_R + J_L}} \bullet 10000 \left[min^{-1}\right]$$

J_R = Rotor Inertia [gcm^2]

J_L = Load Inertia [gcm^2]

7.2 Digital Outputs

/Err - /Error: Monitoring Output

Whenever a system failure occurs (i.e. overtemperature or hall error), the *Err* output responds (LO position), and the red LED on the front panel is switch on. The drive output stage is switched off and the error will not reset until the user resets the drive with power off. If the error occurs again the problem still exists.

The output is applicable in three different modes:

A) As Open-Collector, LO active, TTL-compatible or up to +30 V industrial logic.

B) As Push-Pull output with an output impedance = 50 Ohm, when connecting the upper voltage signal to input *Verr*.

With *Verr* = +24 V, an SPS with photocoupler inputs can directly be controlled.

C) Together with a bridge between the *+5V* output and *Verr* input, applicable as Push-Pull-output for a connection to TTL or CMOS-Logics without external upper voltage signal.

Additional information about the schematic refer chapter 3.2.

Range of Output Voltage	0.6 V –(*Verr* – 0.6 V) with *Verr*= +5 V to +30 V
Output Impedance	50 Ohm
Permanent Output Current	100 mA max., source and sink

Note:

The logical state of this output is clearly visible by the red *Err -* LED on the front panel.

7.3 Analog Inputs

Set v: Set Value Input for Speed

An external analog signal for speed entered using *Set v* input. If the voltage is 0 V, the motor stops. If the voltage is positive the drive is working in the regulation area. Over 10 V the motor is unregulated with a limited maximum speed through the *n max* potentiometer.

Additional information about the schematic refer chapter 3.2.

Range of Input Voltage	0 V to +10 V
Input Impedance	100 kOhm
Permanent Input Protection	-0,6 V to +30 V

Remark:

To use the external *Set v* input set switch S1-1 to Off.

Mon I - Monitor I*: Motor Current Output*

Mon I delivers a result representing the actual value of the motor current. The proportionality factor is fixed to 0.75 V per 1 A motor current.

Additional information about the schematic refer chapter 3.2.

Range of Output Voltage	0 to +10 VDC
Output Impedance	1 kOhm
Permanent Output Current	1 mA max., source and sink

8.   Basic Troubleshooting

The servo amplifier has included some different protective functions. Hall error, under voltage, over temperature, and over current are monitored and shown with the red-LED at the front side.

> **Important:**
>
> The motor starts only by cut-off power. Before resetting an error by resetting the power supply make sure that the cause of the failure is eliminated.

Motor runaway

- Logic of the hall connection is permuted.
- No load in torque mode.
- Reduce the maximal speed with pot *n max*.

Motor noise

- Use additional choke in the motor

Motor has no torque

- Increase the admissible current with *I max* pot.

Motor drifts at standstill

- The input value for the set value isn't stable.

Motor is going hot

- Use an additional choke in series with the motor (see accessories).

Motor speed too low

- Increase the range with pot *n max*.
- Increase the admissible current with *I max* pot.
- Supply voltage too low.

No motion even though the drive is enabled

- Check power supply and the wiring.
- Overheating protection or another error condition is active.
- Check the wiring of the motor windings and hall signals.
- Is the phasing (120°) of the hall correct?
- The polarity of the motor windings or hall signals is permuted.
- The feedback loop is open. Check wiring.

Over temperature

- Use an additional cooling.

- Reset the amplifier by cut-off power.

Note:

Beware that the maximal working temperature of 80°C in the driver is not reached; otherwise the drive will be switched off.

9. Accessories & Options

- Mounting adaptor for Din rail MA0025

- Connecting module WA2509

- Choke modules IA3100 (with 3 x 50 µH)

  and IA3101 (with 3 x 100 µH)

- Shielded CAT5 Cables:

CA2005	Red	5"
CA2010	Red	10"
CA2020	Red	20"
CA2030	Red	30"
CA8005	Yellow	5"
CA8010	Yellow	10"
CA8020	Yellow	20"
CA8030	Yellow	30"
CA4005	Grey	5"
CA4010	Grey	10"
CA4020	Grey	20"
CA4030	Grey	30"
CA6005	Blue	5"
CA6010	Blue	10"
CA6020	Blue	20"
CA6030	Blue	30"

10. Warranties & Disclaimers

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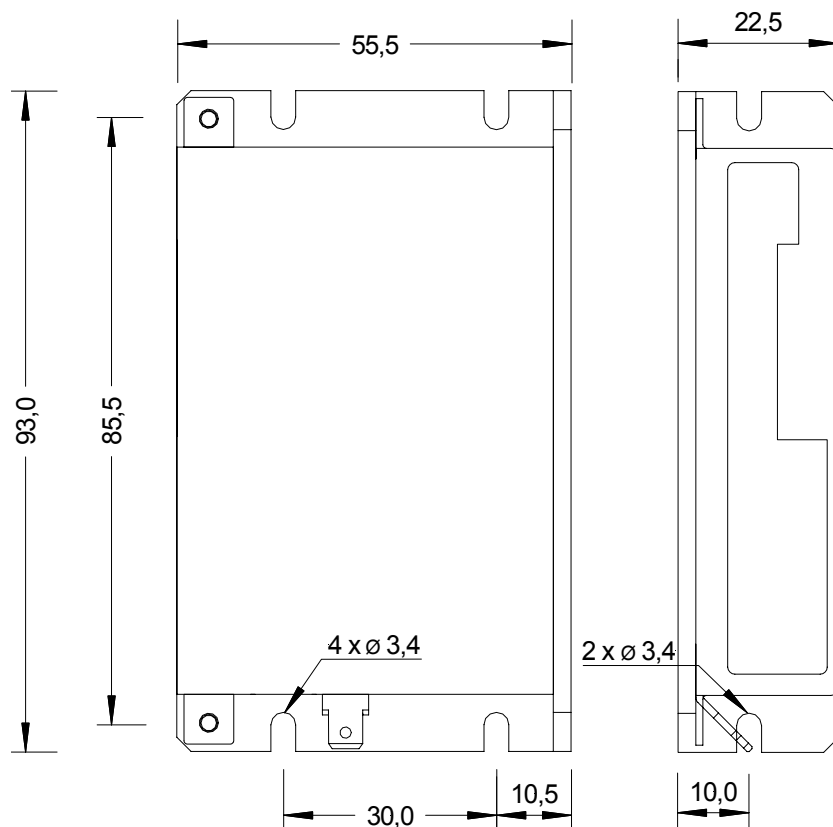
Customer service at +44 (0) 127 050 8800   Email: EMEAsales@electrocraft.com

Customer Support, Germany

Customer service at +49 (0) 711 727205 0   Email: info@electrocraft.de

11. Dimensions

All dimensions in mm.

12. Mounting Din rail adapter