4-Q-DC Servoamplifier ADS in module housing

Power
- Power supply
- Motor terminal

LED
- Status indicator

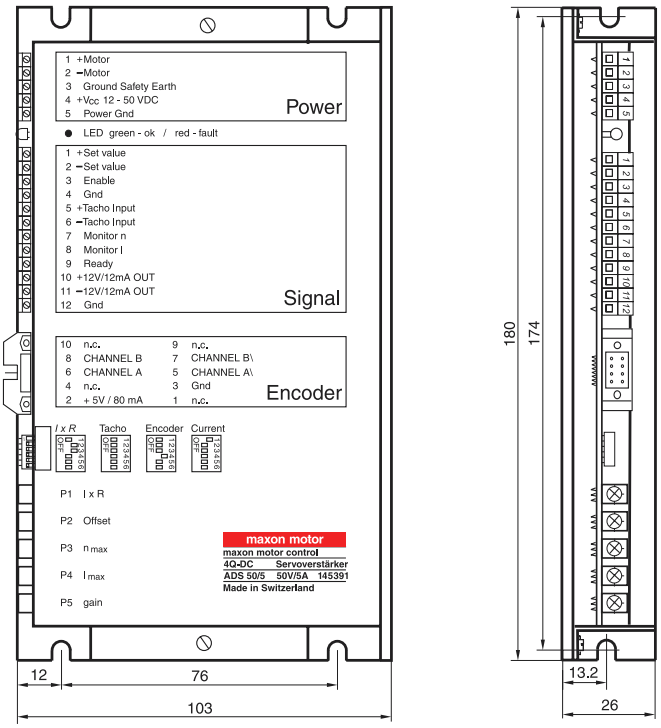
Signal
- Terminals for input
- Terminals for output
- Terminals for DC Tacho

Encoder
- Terminal for Digital Encoder

DIP Switches
- Operation mode setting

Potentiometer
- Mode adjustments

Dimensions in [mm]



Performance Data

Electrical data

• Supply voltage Vcc Ripple < 5 %	12 - 50 VDC
• Max. output voltage	0.9 x V_{CC}
• Max. output current I_{max}:	
ADS 50/10 POWER	20 A
ADS 50/5 STANDARD	10 A
• Continuous output current I_{cont}:	
ADS 50/10 POWER	10 A
ADS 50/5 STANDARD	5 A
• Switching frequency of power stage	50 kHz
• Efficiency	95 %
• Band width current controller	2.5 kHz
• Built-in motor choke:	
ADS 50/10 POWER	none
(Terminal inductance	min. 200 µH)
ADS 50/5 STANDARD	160 µH / 5 A

Inputs

• Set value	-10 ... +10 V (R_i = 20 kΩ)
• Enable	+4 ... +50 V (R_i = 15 kΩ)
• DC tacho min. 2 VDC, max. 50 VDC	(R_i = 14 kΩ)
• Encoder signals Channel A, A\, B, B\,	max. 100 kHz, TTL

Outputs

• Current monitor „Monitor I“, short circuit protected	-10 VDC … +10 VDC (R_o = 10 kΩ)
• Speed monitor „Monitor n“, short circuit protected	-10 VDC … +10 VDC (R_o = 10 kΩ)
• Status reading „Ready” Open collector	max. 30 VDC (I_L < 20 mA)

Voltage outputs

• Aux. voltage, short circuit protected	+12 VDC, -12 VDC, max. 12 mA
• Encoder supply voltage	+5 VDC, max. 80 mA

Trim potentiometers

- IxR compensation
- Offset
- n_{max}
- I_{max}
- gain

LED indicator

• 2 colours, LED	green = READY red = ERROR

Ambient temperature- / humidity range

• Operation	-10 ... +45°C
• Storage	-40 ... +85°C
• Non condensating	20 ... 80 %

Mechanical data

• Weight	approx. 360 g
• Mounting plate:	Flange for M4-screws

Terminal

• PCB-clamps	(plug-in terminal clamps) Power (5 poles), Signal (12 poles)
Pitch:	3.81 mm
suitable for wire cross section:	
	0.14 - 1 mm^2 multiple-stranded wire or 0.14 - 1.5 mm^2 single wire
• Encoder Plug	DIN 41651
for flat band cable, with AWG 28	1.27 mm

Order numbers

ADS 50/10 **201583**	4-Q-DC Servoamplifier in module housing
ADS 50/5 **145391**	4-Q-DC Servoamplifier in module housing

Accessories for ADS

137303	Choke module 3 x 250 µH, 5 A
232359	Choke module 3 x 150 µH, 10 A
235811	Brake chopper

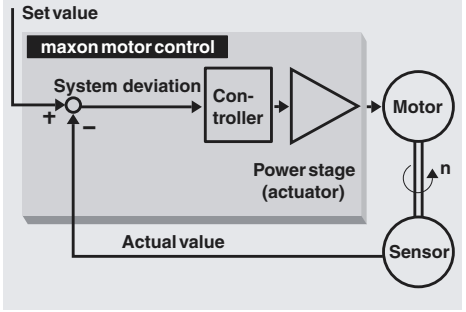
Note:

General specifications on ADS 4-Q-DC servoamplifier see page 220.

Technology – **short and to the point**

The **maxon motor control** program contains servo amplifiers for controlling the fast reacting maxon DC and EC motors.

Principle of a control circuit



Speed control
The function of the speed servo amplifier is to keep the prescribed motor speed constant and independent of load changes. To achieve this, the set value (desired speed) is continuously compared with the actual value (actual speed) in the control electronics of the servo amplifier. The controller difference determined in this way is used by the controller to regulate the power stage of the servo amplifier in such a manner that the motor reduces the controller difference. This represents a closed speed regulating circuit.

Position control
The positioning control ensures a match between the currently measured position with a target position, by providing the motor with the corresponding correction values, as with a speed controller. The position data are usually obtained from a digital encoder.

Current control
The current control provides the motor with a current proportional to the set value. Accordingly, the motor torque changes proportionally to the set value.
The current controller also improves the dynamics of a superior positioning or speed control circuit.

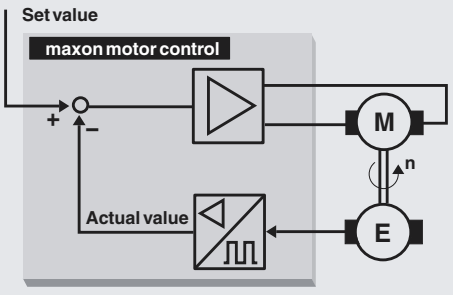
Digital encoder control
The motor is equipped with a digital encoder that provides a certain number of pulses per revolution. The turning direction is detected with the square pulses of channels A and B offset by 90 electric degrees.

- Digital encoders are often found in positioning controls, in order to derive and measure the travel or angle.
- Digital encoders are not subject to mechanical wear.
- In conjunction with digital controllers there are no drift effects.

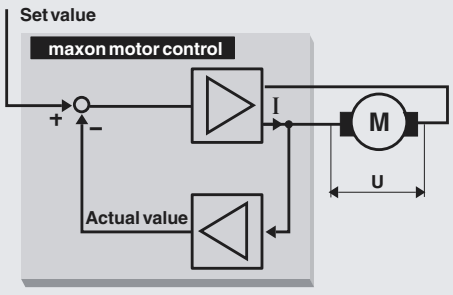
IxR compensation
The motor is provided with a voltage that is proportional to the applied speed set value. The speed would drop with increasing motor load. The compensation circuitry increases the output voltage with increasing motor current. The compensation must be adjusted to the terminal resistance of the motor which depends on temperature and load. The attainable speed precision of such a system is subject to limits in the percent range.

- Favorably priced and space-saving
- No tacho-generator or encoder required
- Less precise control when there is a load change
- Only for DC motors
- Only analog speed control possible
- Ideal for low-cost applications without high demands on speed accuracy

Principle: Encoder control



Principle: IxR compensation



Motor type
- maxon DC motor
- maxon EC motor
  with or without sensor

Type of control
- Speed
- Position
- Current

Feedback
- Encoder
- DC Tacho
- IxR compensation
- Hall sensors
- Resolver

Power amplifiers
- Linear
- Pulsed
- 1 quadrant
- 4 quadrant

Circuit technology
- Digital
- Analog

Program

maxon motor control

4-Q servoamplifiers for DC motors

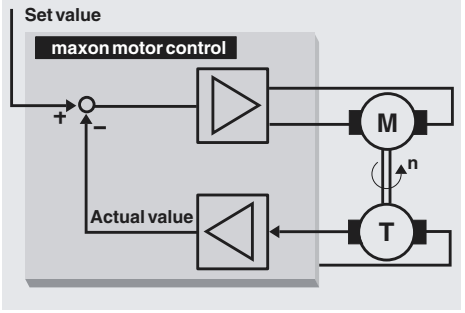
Sensorless controllers for EC motors

1-Q and 4-Q servoamplifiers for EC motors

Position controllers for DC and EC motors

DC tacho control
The motor must be equipped with a DC tachometer that provides a speed proportional signal. In the maxon modular system, the tachometer rotor is mounted directly on the through motor shaft, resulting in a high resonant frequency.
- Classical solution of a very precise control
- Limited service life of the DC tacho generator
- Not suitable for positioning tasks
- Only for analog controllers
- Only for DC motors
- Ideal for stringent demands on speed dynamics

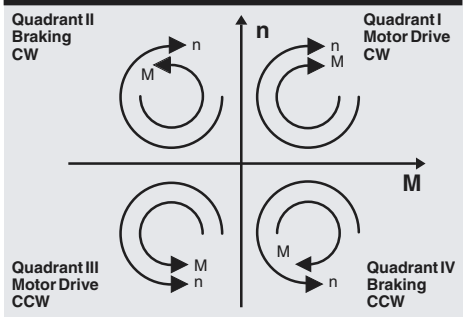
Principle: DC tachometer control



4-Q operation:
- Controlled motor operation and braking operation in both rotation directions
- A must for positioning tasks

1-Q operation:
- Only motor operation (Quadrant I or Quadrant III)
- Direction reverse via digital signal
- Typical: amplifier for EC motors

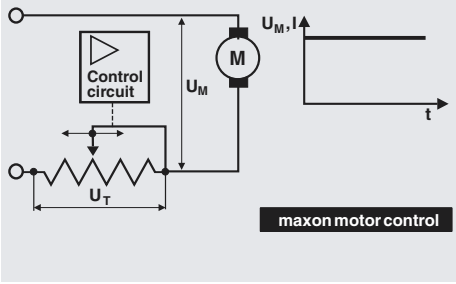
4-Q operation



Power amplifiers
One of the following two principles to control the power stage transistors is used in maxon controllers:

a) Linear power stage
The operating voltage is divided between the motor and the power amplifier. The controller changes the voltage on the motor (U_M) linearly and proportionally. The voltage applied to the power amplifier (U_T) causes power dissipation
- High currents and low motor voltages cause significant power dissipation
- Simple and favorably priced design of the power amplifier

Principle: Linear power amplifier



b) Pulsed power stage (PWM)
The controller switches the motor on and off in short intervals (pulses / cycles). If the off interval is longer, the motor loses speed. The decisive average value of the voltage changes in relation to the on-to-off time. Only little energy is converted into heat.
- More expensive power amplifier
- High efficiency

Principle: Pulsed power amplifier