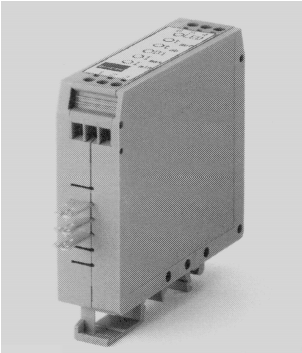
10000010/60 – Controller / Amplifier

Technical specification



Type 10000010 / 60

Controller / amplifier
for proportional solenoids

The controller / amplifier is designed to control proportional solenoids with constant current. It can be mounted on 35 mm switch panel rails.

The main components of the controller are a voltage stabilization, linear ramp generator for positive and negative ramp, dither oscillator, status LED and a chopped output stage (short circuit and earth contact proof). The dither amplitude, the initial current I_{min}, the maximum current I_{max} and the ramp times t_{up} and t_{down} can be adjusted by means of the corresponding potentiometers. An emergency Stopp function is accomplished by supplying <2 V voltage to the terminal Kl.1-6 or by shorting the terminal to GND.

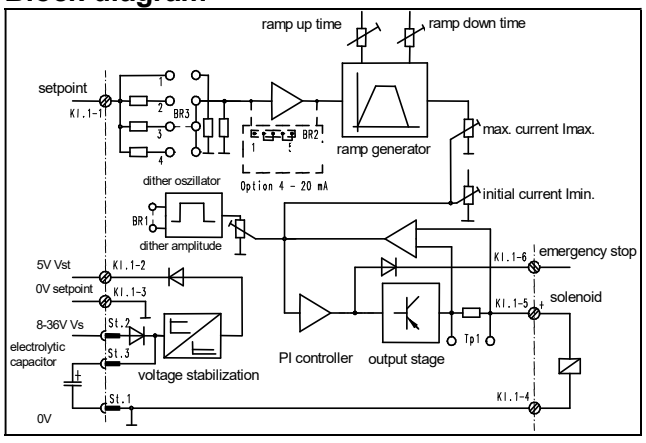
CE

These devices meet the requirements of the **EMC Directive 2014/30/EEC**. Compliance with the following standards is confirmed:
DIN EN 55011:2011-04
Gr. 1, Cl. A disturbance voltage
Gr. 1, Cl. B disturbance radiation
DIN EN 61000-4-2:2009-12 level 2
DIN EN 61000-4-3:2011-04 level 3
DIN EN 61000-4-4:2013-04 level 3
DIN EN 61000-4-5:2015-03 level 2
The products meet the requirements of the **Low Voltage Directive 2014/35/EEC.**
Compliance with the following standards is confirmed:
DIN EN 60529:2014-09
The products are considered components in the sense of the **Machinery Directive 2006/42/EEC** and are not to be used until the machine in which they are to be incorporated is declared to conform to the requirements of the EC Directives.

ROHS

The above mentioned products comply with the requirements of the **directives 2002/95/EG, 2011/65/EU** and of the **delegated directive 2015/863/EU** for change of **attachment II of directive 2011/65/EU (RoHS III)**.

Block diagram



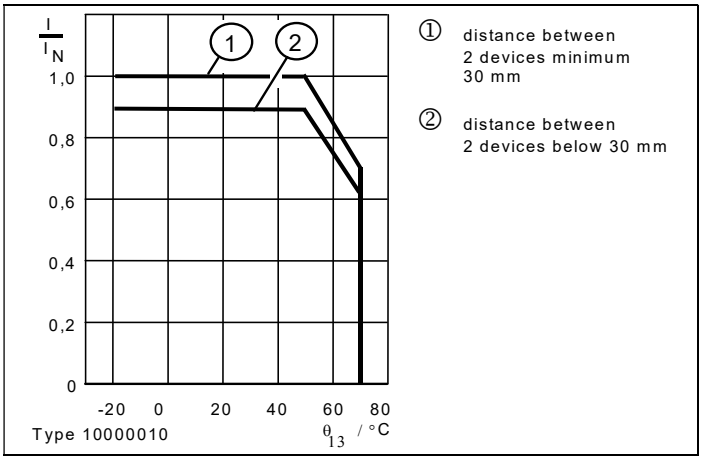
Technical data

Type	10000010	10000060
Supply voltage V_S	8 ...36 VDC	
Residual ripple	≤10 %	
max. output current I_{max}	2,4 ADC	
Chopper frequency	approx. 3 kHz	
Temperature drift	≤±1 % of I_{max}	
Voltage dependency	≤±2 % of I_{max}	
Initial current I_{min} (adjustable)	0...1,4 A	
Maximum current $I_{max.}$ (adjustable)	I_{min} + 2,4 A (max. 2,5 A)	
Dither frequency (selectable;BR1)	55 / 110 Hz	
Dither amplitude (adjustable)	0 ... 750 mA	
Stabilized voltage (Kl1.2)	5,0 ±0,3 VDC	
max. loadability	≤10 mA	
Setpoint signal (Kl1.3) selectable (BR1, BR2)	0...5 / 0...10 / 0…15 V / 0...20 / 4...20 mA	0...5 / 0...10 / 0…15 V / 0...20 mA
Ramp up time ramp down time, separate adjustable, related to setpoint signal 0...max.	0,08...4 s	
Connections Vs, 0V, Elcap current measurement terminals All other connections	flat blade connectors 6,3 x 0,8 / 2,8 x 0,8 femal 2 x Ø2,0 mm; 0,2 V / A screw terminals 2 x 3-pole, 2,5 mm² fine wire	
Ambient temperature	-20 ...+70 °C	
Protection type as per EN60529	IP 00	

Factory settings Type	10000010	10000060
Imin	0 A	
Imax	1,6 A	
Setpoint	0 – 5 V (Br.3 auf Pos. 2)	
tup = tdown	<0,1 s	
Dither amplitude	0 mA	
Dither frequency	110 Hz	

Subject to design modifications without notice.
Please observe operating instructions and ordering data!

Admissible current load at ambient temperature



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1. Mounting and connecting instructions

Attention!
Setup and start-up has to be done by qualified personnel.
Adjustment and operation is allowed only within the limits of the specified technical data.

1.1 Supply voltage
The device has to be supplied with potential-free voltage. Smoothed d.c. voltage 8 – 36 V with residual ripple ≤10 % is necessary. If bridge-rectified supply voltage is applied, the size of the capacitors used for voltage smoothing has to be adjusted to the selected maximum current. Guiding values: 2200 µF / 40 V to I_{max} = 1,2 A; 4700 µF / 40 V to I_{max} = 2,6 A.
Attention! Overvoltage will damage the controller.

1.2 It is necessary to connect the supply line directly to the battery or the mains.

1.3 If the connecting cable is longer than 3 m, a shielded cable is to be used for the signal cords. The shield has to be connected to Kl.1-3.

1.4 The cables must not be laid parallel to power cables.

1.5 The setpoint voltage must not be negative or > +15V. The current controller may be damaged by prolonged application of setpoint voltages being outside of that range.

2. Setting instructions

For all subsequent settings the dither potentiometer (Di) is to be turned to zero (counter-clockwise) at first. It is advisable to define the current flowing through the solenoid by measuring the voltage over the measuring terminals at the front of the device (see 3.4).

2.1 Adjustment of the initial current by potentiometer I_{min}.
a) Adjust nominal value to zero.
b) Turn potentiometer I_{min} clockwise until the desired magnitude (pressure or quantity) is reached.

2.2 Adjustment of the maximum current by potentiometer I_{max}.
c) Adjust nominal value to maximum.
d) Turn potentiometer I_{max} clockwise until the desired magnitude (pressure or quantity) is reached.

Note: I_{max} must not exceed the solenoids limit current I_{lim}.

2.3 Adjustment of ramp up time and ramp down time by potentiometer t_{dn} and t_{up}.
Turn the potentiometers to adjust the shift time in such a manner that the desired transient response is achieved.

2.4 Adjustment of the dither signal by potentiometer Di.
e) Select the dither frequency depending on magnet and valve size.
f) Adjust approx. 0,4 x Imax by nominal value.
g) Turn potentiometer Di clockwise, but stop before the oszillations are transmitted to the hydraulic system. The current must not change more than 10 mA (current measuring see 3.4).

3. Trouble shooting

3.1 Measuring the supply voltage 8 ... 36V between ST.1, Kl.1-3 or Kl.1-4 (0 V) and St.2.

1.2 Measuring the internal stabilized voltage 4,7 ... 5,1 V between Kl.1-2 and Kl.1-3.

3.1 Measuring the setpoint signal between Kl.1-1 and Kl.1-3 corresponding to table 1.

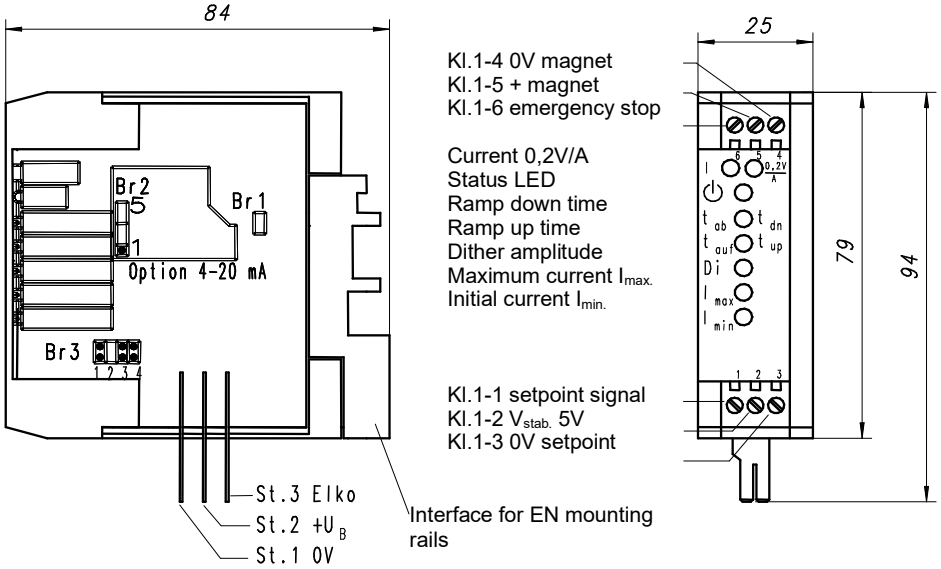
3.2 Measuring the current I_M flowing through the solenoid by measuring the voltage drop over the shunt resistor at the current measurement terminals. A voltage drop of 200 mV corresponds to a current of 1 A.
Note: The current is only measurable if the controller is connected to the solenoid correctly.

3.5 Current controlling
The desired maximum current can only be reached until the following condition is maintained: **$I_M \geq (V_S - 2\ V)/R_M$.**

I_M: Highest possible maximum current.
V_S: Momentary value of the supply voltage.
Voltage drop at the controller: max. 2 V.
R_M: Resistance of the excitation winding of the solenoid (changes with temperature!).

Attention!
When switching the emergency function off or on the ramp function is not active.
The status-LED is permanently on, if the device is ready for operation, it flashes, if there occurs a short circuit. The maximum current is internal limited to 2.5 Ampere.

Dimensions (mm) and connections



Type 10000010 / ...60*)		
Setpoint	BR2	BR3
0 – 5 V	4-5	2
0 – 10 V	and	3
0 – 15 V	2-3	4
0 – 20 mA		1 and 3
4 – 20 mA	1-2	1 and 3
*) without 4-20mA, without BR2		

Ordering data:

Proportional amplifier	with 4-20mA input	10000010
at DIN-rail-case	without 4-20mA input	10000060