

**33 43501B00**

### Controller / amplifier

for proportional solenoids

The controller / amplifier is designed to control a proportional solenoid with constant current. The unit can be directly mounted to solenoids having DIN 43650 connectors.

The principal elements of the regulator are: voltage stabilization, linear ramp former for positive and negative ramp, dither oscillator, fuse elements and chopped power output stage ( $f \sim 2.5 \text{ kHz}$ ).

The dither amplitude can be adjusted by the potentiometer "dither signal", the base current with  $I_{\min}$ , the maximum current with  $I_{\max}$  and the ramp raise time with  $t_{\text{up}}$  and the ramp decline time  $t_{\text{down}}$ .

The emergency STOP function is achieved by interrupting the operating voltage.

### Design variants

Type 33 435 01B00

Operating voltage  $U_B$ : 18...32V

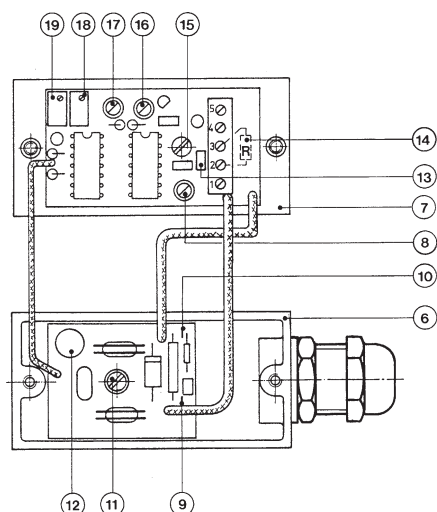
Type 33 43501B05

Operating voltage  $U_B$ : 11...18V

### Subject to alteration.

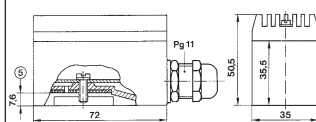
Please observe ordering data!

### Connection plan and terminal assignment



- ⑥ Casing
  - ⑦ Cover turned by 180° (folded open)
  - ⑧ Potentiometer dither amplitude
  - ⑨ TP 1 = Test point 1
  - ⑩ TP 2 = Test point 2
  - ⑪ Screw for attaching to proportional solenoid
  - ⑫ Fuse TR 5 F 2 A
  - ⑬ Setpoint
    - Device B00 with bridge B 1: 0 ... 10 V
    - without bridge B 1: 0 ... 15 V
    - Device B05 with bridge B1: 0 ... 8 v
    - without bridge B 1 0 ... 10 V
  - ⑭ Desired-value signal with  $R = 500 \text{ Ohms}$  and bridge B 1: 0 ... 20 mA
  - ⑮ Dither signal with bridge B 2: 100 Hz without bridge B 2: 50 Hz
  - ⑯ Potentiometer ramp decline time  $t_{\text{down}}$
  - ⑰ Potentiometer ramp rise time  $t_{\text{up}}$
  - ⑱ Potentiometer base current  $I_{\min}$
  - ⑲ Potentiometer maximum current  $I_{\max}$
- Terminal 1: 0V  $U_B$  (operating)  
 Terminal 2: 0V potentiometer  
 Terminal 3: Desired-value input (potentiometer slider)  
 Terminal 4: + potentiometer (device B00: + 15 V, device B05: + 8 V. Max. permissible load 5 mA)  
 Terminal 5: Operating voltage  $U_B$

### Dimensions (mm)



Type 33 43501B00  
und 33 43501B05  
⑤ Upper edge  
of proportional solenoid

### Technical data

Device 33 43501B0.	B00	B05
Operating voltage $U_B$ 1)	18...32 V	11 ... 18 V
Residual ripple	$\leq 10\%$	$\leq 10\%$
Maximum output current 2)	2.4 A	2.4 A
Temperature drift	$\leq \pm 1\%$ of $I_{\max}$	
Voltage dependency	$\leq \pm 0.5\%$ of $I_{\max}$	
Base current (adjustable) $I_{\min}$	0 ... 2 A	
Max. current (adjustable) $I_{\max}$	$I_{\min} + 0 \dots 2.4 \text{ A}$	
Fuse	TR 5 F 2 A	
Dither frequency (optional)	50/100 Hz	50/100 Hz
Dither amplitude (adjustable)	0 ... 750 mA <sub>ss</sub>	0 ... 750 mA <sub>ss</sub>
Stabilized voltage (terminal 4)	15 V $\pm 0.6 \text{ V}$	8.2 V $\pm 0.3 \text{ V}$
Maximum loadability	$\leq 5 \text{ mA}$	$\leq 5 \text{ mA}$
Setpoint signal (terminal 3)	0...15V/0...10V	0...8V/0...10V
Optional	0...20 mA	0...20 mA
Ramp rise and decline time (separately adjustable) related to desired-value signal 0...max.	0.1...7 s desired-value signal = 0...max.	0.1...6 s desired-value signal = 0...max.
Temperature range	-20°C ... +70°C	-20°C ... +70°C
Con. for series terminal (via Pg11)	5-pole	5-pole
Connecting cross-section	1.5 mm <sup>2</sup> fine wire	1.5 mm <sup>2</sup> fine wire
Type of protection	IP65	IP65
<b>Basic setting</b>		
$I_{\min}$	0A	0A
$I_{\max}$	2.4 A	2.2 A
$t_{\text{up}} = t_{\text{down}}$	< 0.1 s	< 0.1 s
Dither amplitude	0	0

1) Direct connection to battery or mains unit necessary.

2) The current can be measured at test points 1 and 2 with voltmeter ( $R_i > 100 \text{ kOhm}$ ); 100 mV  $\triangleq 0.5 \text{ A}$ .

## 1. Mounting and Connecting Instructions

- 1.1 Supply voltage  
Device B00: 18 ... 32 V.  
Device B05: 11 ... 18 V.  
Smoothed d.c. voltage with residual ripple  $\leq 10\%$ .  
This is achieved with bridge-rectified voltage and a capacitor circuited parallel to the supply voltage.  
Recommended values:  
2200  $\mu\text{F}/40\text{ V}$  to  $I_{\text{max}} = 1.2\text{ A}$   
4700  $\mu\text{F}/40\text{ V}$  to  $I_{\text{max}} = 2.6\text{ A}$   
CAUTION: Overvoltage will damage the current regulator.
- 1.2 It is necessary to connect the supply line directly to the battery or the mains.
- 1.3 Shielded cable must be used if the length exceeds 3 m. The screen must be connected at one end to terminal 2.
- 1.4 The lines must not be wired parallel to power lines.
- 1.5 The voltage at terminal 3 must not become negative. A negative voltage causes faulty reactions and destroys the current regulator.

## 2. Setting Instructions

- Before the following settings the potentiometer "dither signal" (8) must be turned to zero (anti-clockwise).  
It is recommended to measure the current as described under 3.4.
- 2.1 Adjust the base current Potentiometer  $I_{\text{min}}$  (18)
    1. Adjust desired value to zero.
    2. Turn potentiometer  $I_{\text{max}}$  clockwise until the desired magnitude (pressure or quantity) is reached.
  - 2.2 Adjust maximum current Potentiometer  $I_{\text{max}}$  (19)
    1. Adjust desired value to maximum value.
    2. Turn potentiometer  $I_{\text{max}}$  anti-clockwise until the desired hydraulic magnitude is reached.
  - 2.3 Ramp rise time and decline time potentiometer  $t_{\text{up}}$  (17) and  $t_{\text{down}}$  (16)  
Turn the potentiometer to adjust the shift time in such a manner that the desired transient response is achieved.
  - 2.4 Adjust dither amplitude by potentiometer 8.
    1. Select dither signal frequency according to solenoid and valve size with bridge B 2: 100 Hz, without bridge B 2: 50 Hz
    2. Adjust approx.  $0.4 \times I_{\text{max}}^1$  with external potentiometer (terminal 3).

3. Measure current as described in 3.4.
4. Turn potentiometer maximum counter-wise until the hydraulic system starts to oscilate or the current has increased by maximum 0.01 A.

- 1)  $I_{\text{max}}$  = equals current setting as per note 2.2.  
Note:  $I_{\text{max}}$  must not exceed current limit  $I_{\text{lim}}$  of solenoid.

## 3. Trouble-shooting

- 3.1 Measuring the operating voltage  
Device B00: +18 ... 32 V.  
Device B00: +18 ... 32 V.  
Between terminal 5 and terminal 1.
- 3.2 Measuring the internal, stabilized voltage.  
Device B00: +15 V  
Device B05: +8 V.  
Between terminal 4 and terminal 2.
- 3.3 Measuring the desired input signal  
With bridge 1 (13): 0... +10V or without bridge 1 (13): 0... +15 V.  
At terminal 3 and terminal 2.  
By current measurement 0... 20 mA. In front of terminal 3.
- 3.4 Measuring the current in the excitation winding of the solenoid as voltage drop via the measuring resistance.  
Test point 1(9) negative potential; test point 2 (10) positive potential.  
A voltage drop of 100 mV equals 0.5 A.  
IMPORTANT: The current can only be measured if the voltage regulator is mounted on the solenoid.
- 3.5 Constant-current regulation. The desired maximum current can only be achieved as long as the following condition is provided:

$$I_M = \frac{U_B - U_R}{R_E}$$

$I_M$  = desired maximum current  
 $U_O$  = current root-mean-square operating voltage  
 $U_C$  = max. voltage drop on controller = 2 V  
 $R_E$  = current resistance of excitation winding

## Terminal assignment

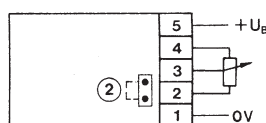
- Terminal 1: 0 V  $U_B$   
 Terminal 2: 0 V potentiometer  
 Terminal 3: Setpoint (potentiometer slider)  
 Terminal 4: + potentiometer (device B00: +15 V, device B05: +8 V.  
 Max. permissible load 5 mA)  
 Terminal 5:  $U_B$

## CE

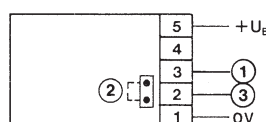
These devices meet the requirements of the EMC Directive 89/336/EEC. Compliance with the following standards is confirmed:  
 EN 55 011 (VDE 0875, part 11, 1992)  
 Group 1, class A,  
 disturbance voltage  
 Group 1, class B,

disturbance radiation  
 IEC 801-3, 1984  
 (VDE 0843, part 3, 1983)  
 Test severity level 3  
 IEC 801-4, draft  
 (VDE 0843, part 4, 1987)  
 Test severity level 2  
 IEC 801-5 (VDE 0843, part 5, 1992)  
 Test severity level 3

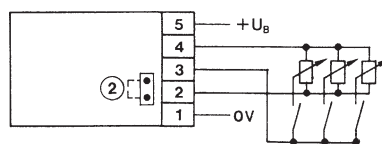
## Connection of setpoint inputs



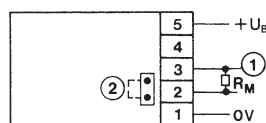
- With a potentiometer  
 5 ... 20kOhm  
 ② Device B00 without bridge  
 B05 with bridge



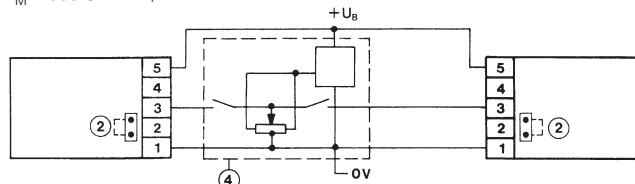
- With external setpoint signal  
 ① Setpoint  
 ② Device B00: 0...10V with bridge  
 0...15V without bridge  
 B05: 0... 8V with bridge  
 0...10V without bridge  
 ③ Desired value  $U_{\text{frame}}$  0V



- With several potentiometers  
 CAUTION: The total resistance of all connected potentiometers must be more than 5 kOhm  
 ② Device B00 without bridge, B05 with bridge



- With current input  
 ① Input current 0...20 mA  
 ② Device B00 without bridge, B05 with bridge  
 $R_M = 500\text{ Ohm} - 1/4\text{ W}$



- With 2 controllers for 4/3 way proportional valve  
 ② Device B00 without bridge, B05 with bridge  
 ④ Joy Stick Type 33 250 04D51/D52

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**Ordering data**  
 Controller / amplifier  
 Type: 33 435 Size: 01B0.  
 Operating voltage  $U_B$ : ... V  
**Ordering Example**  
 Controller / amplifier  
 33 43501B05

Ub: 11 ... 18 V  
**Spare Parts**  
 Fuse Mat.-No. 420 504  
 Short-circuiting plug  
 Mat.-No. 414 654  
 PG 11 screw joint  
 Mat.-No. 412 047  
 Flat seal Mat.-No. 604 791