Proportional amplifier type EV22K5

Assembly instructions

Card design

Supply voltage U_B:	9...32 V DC
Output current $Q_{A\ max}$:	1.8 A

B 7817/2
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HAWE HYDRAULIK

1 Parameters

1.1 General parameters

Fastening	With a card holder (accessory) on 35 mm standard support rails or 32 mm support rails according to DIN EN 60715
Installation position	Any
Protection class	IP 00 according to DIN EN 60529, VDE 0470-1 or IEC 60529
Ambient temperature	-20°C...+70°C

1.2 Electrical Data

Supply voltage	U_B	9...32 V DC
Output voltage	U_A	U_B - 1.8 V DC
Output current	I_A	Max. 1.8 A short-circuit-proof
Setting range		I_{min} = 0...0.8 A Pre-setting 0.25 A I_{max} = 0...1.8 A Pre-setting 0.6 A
Voltage ranges	U_{nom}	-10 - 0 - +10 V DC (BR open) [1)] -5 - 0 - +5 V DC (bridge set) [1)]
Reference voltage	U_{St}	At I_{st} 10 mA max. ± 10 V DC (bridge open) [1)] ± 5 V DC (bridge set) [1)] Short circuit-proof and overload protected

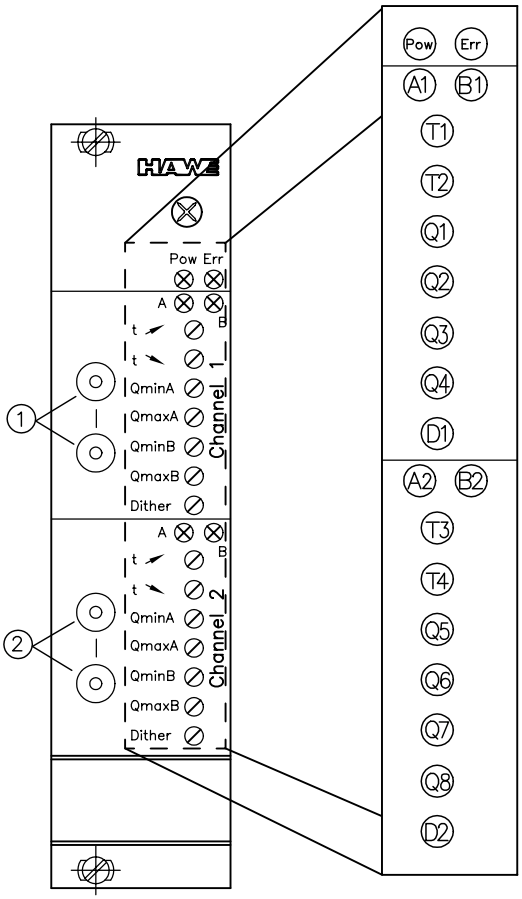
1.3 Specific parameters

Digital inputs/digital output

Input resistance	≈ 10 kΩ		
Input voltage level		**BR open**	**BR set**
	logical 0	0 V ≤ U ≤ 4.5 V	0 V ≤ U ≤ 1.3 V
	logical 1	9.5 V ≤ U ≤ U_B	6 V ≤ U ≤ U_B
Output voltage	U_A	35 V	
Max. output current	I_A	Max. 9 mA	

[1)] BR = bridge on the card for switching the target value voltage ranges (-10 to +10 V DC or -5 to +5 V DC) and the stabilised voltages.

Amplifier front plate



Amplifier front plate

1 2 x 2 mm sockets for current measurement (channel 1)

2 2 x 2 mm sockets for current measurement (channel 2)

General

Pow	Supply voltage (green LED)
Err	Fault (red LED)

Channel 1

A1	Solenoid A1 control (green LED)
B1	Solenoid B1 control (yellow LED)
T1	Ramp rise time
T2	Ramp fall time
Q1	Q_{min} (I_{min}) solenoid A1
Q2	Q_{max} (I_{max}) solenoid A1
Q3	Q_{min} (I_{min}) solenoid B1
Q4	Q_{max} (I_{max}) solenoid B1
D1	Dither amplitude

Channel 2

A2	Solenoid A2 control (green LED)
B2	Solenoid B2 control (yellow LED)
T3	Ramp rise time
T4	Ramp fall time
Q5	Q_{min} (I_{min}) solenoid A2
Q6	Q_{max} (I_{max}) solenoid A2
Q7	Q_{min} (I_{min}) solenoid B2
Q8	Q_{max} (I_{max}) solenoid B2
D2	Dither amplitude

1.4 Electro-magnetic compatibility (EMC)

The EMC of the device was tested using an accredited testing laboratory (emitted interference DIN EN 61000-6-3 and immunity to interference according to DIN EN 61000-6-2 evaluation criterion "B"). The test set-ups only represent typical use. This EMC testing does not release the user from carrying out adequate prescribed EMC testing of their complete system (according to Directive 2014/30/EU). If the EMC of the complete system must be further amplified, the following measures can be tested and introduced:

- The required smoothing capacitor in accordance with Chapter 1.2, "Electrical Data" is not only needed to ensure the device functions correctly, but also to guarantee compliance with EMC guidelines (conducted emitted interference).
- The equipment should be installed in an metal cabinet (shielding)
- Supply lines, such as inputs and outputs to and from the device, should be as short as possible. If necessary they should be shielded and twisted in pairs (to reduce the antennae-like effect for increasing the immunity to interference).

2 Installation, operation and maintenance information

2.1 Information on setting

Note
When delivered, the proportional amplifier EV22K5-12/24 has been set up so that it can be used, without any further setting, together with the proportional spool valve type PSL or PSV according to publication D 7700 ff. More precise matching between the proportional spool valve and proportional amplifier should only be undertaken if the appropriate specialist personnel and measuring equipment are available.

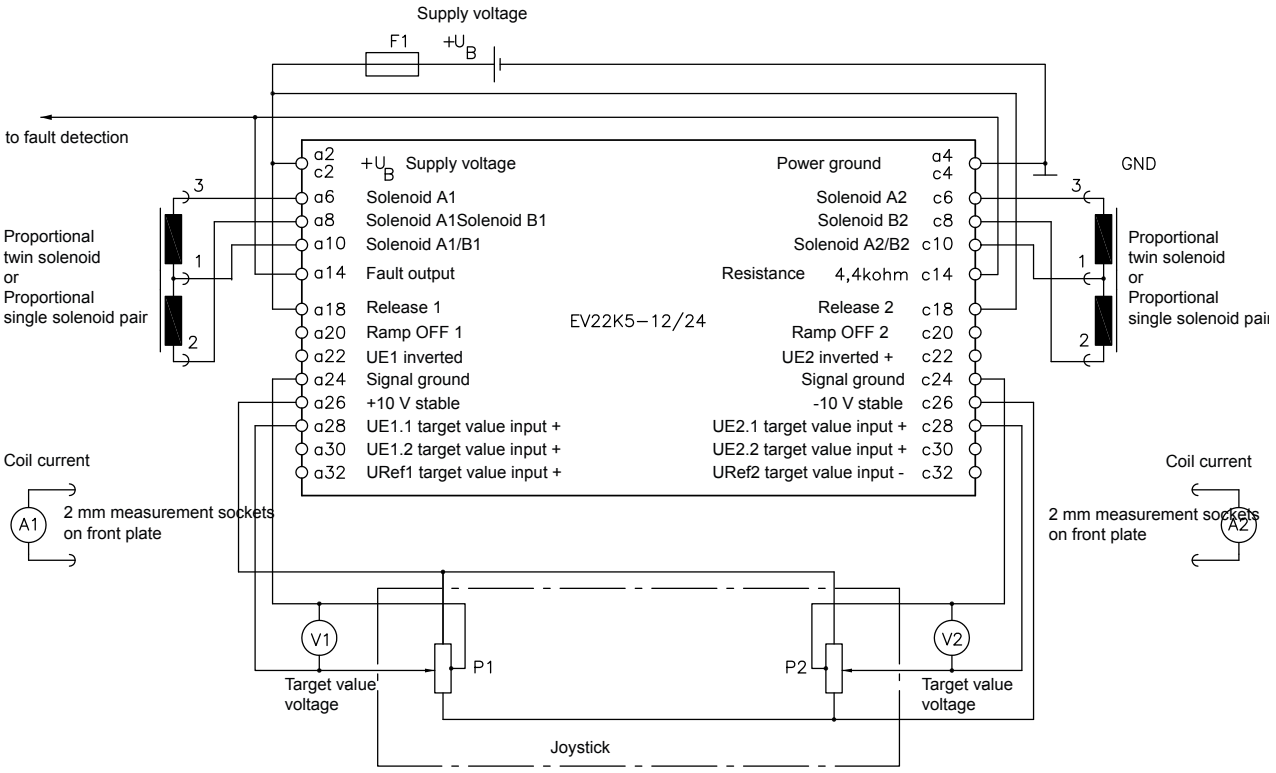
Shielded connecting lines with wires twisted in pairs should be used for connection lengths of more than 3 m to minimise emitted interference and/or to increase immunity to interference.

I_{max} must not exceed the I_{lim} value specified for the proportional solenoid for long periods. An external target value voltage must not exceed or fall below the set range of the reference voltages by more than 1 V for long periods. Otherwise this can lead to an incorrect reaction of the proportional amplifier. Application of the card as a single proportional amplifier for controlling single proportional solenoids (see Chapter 3, " Typical circuits").

Note
Check the mains supply if any faults occur during the setting procedure, or during commissioning. The ammeter used for current measurement must not have a voltage drop of more than 0.5 V, otherwise the current measurement value displayed on the front plate via the measurement sockets can be wrong.

- For bridge rectification: Is an electrolyte filter capacitor of at least 2200 µF/A coil current connected in parallel to the supply voltage?
- Is the supply voltage for the proportional amplifier high enough? Under load, the supply voltage should be at least 1.8 V DC higher than the voltage that would be required to generate the set maximum current I_{max} for a warm solenoid without proportional amplifier.

2.2 Setting instructions



F1 3.5 A fuse

Note
Max. 3 cards may be protected with one fuse (10 A)

V1, V2 Control voltmeter for measuring the target value voltage, measuring range 0 to 10 V DC

A1, A2 Control ammeter for measuring the coil currents, measuring range 0 to 2 A DC

P1, P2 Joystick e.g. 1 x type EJ2-10 according to publication D 7844

Preparing the module

1. Turn ramp potentiometer anti-clockwise
✓ The slide of the potentiometer in the transparent housing is furthest away from the front plate
2. Connect the amplifier card and measurement devices according to the circuit example
3. Check the position of the bridge BR
4. Switch on the supply voltage
✓ The green LED on the front plate lights up

Note
If the red LED (Err) lights up, there is a fault. For diagnostics and fault elimination (see Chapter 2.3, "Error management")

Setting the minimum current

1. Move Joystick P1 in one direction and hold it there until LED A1 lights up
2. Read off the voltage on voltmeter V1
3. Set the minimum current Imin A for direction A using the multi-turn potentiometer Qmin A1. Turning it clockwise increases the coil current

> **Note**
> The indicative value for a PSL or PSV proportional spool valve with 24 V solenoids is approx. 290 mA, with 12 V solenoids approx. 580 mA

4. Read off the coil current on ammeter A1.
5. Move joystick P1 in the other direction and hold it there until LED B1 lights up
6. Set the minimum current Imin B for direction B using the multi-turn potentiometer Q_{min} B1. Turning it clockwise increases the coil current

Setting the maximum current

1. Move joystick P1 in direction A as far as the stop and hold it there
2. Read off the maximum target value voltage on voltmeter V1
3. Set the maximum current Imax A for direction A using the relevant multi-turn potentiometer Qmax A1. Turning it clockwise increases the coil current.

> **Note**
> The indicative value for a PSL or PSV proportional spool valve with 24 V solenoids is approx. 600 mA, with 12 V solenoids approx. 1200 mA

4. Read off the coil current on ammeter A1.
5. Move joystick in direction B as far as the stop and hold it there
6. Set the maximum current Imax B for direction B using the relevant multi-turn potentiometer Qmax B1. Turning it clockwise increases the coil current.
7. Read off the coil current on ammeter B1.
8. Set the dither amplitude so that with the joystick moved approximately half way, vibration is clearly felt with the hand on the lever of the proportional spool valve, but no interference is caused in the hydraulic system.

> **Note**
> Indicative values for type PSL(V) according to D 7700-.. UN = 24 V and with coil current 0.4 A approx. 140 mAS-S.
> Values for the dither amplitude can only be measured with an oscilloscope.

Setting the ramp times

1. Set ramp time for ascending ramp on the multi-turn potentiometer (t-)
2. Set ramp time for descending ramp on the multi-turn potentiometer (t^-)
3. Turning it clockwise extends the ramp time

2.3 Error management

- LEDs on the front plate indicate the operating states of the amplifier card.
- Green LED (Pow): Lights up when the supply voltage is connected.
- Red LED (Err): Lights up in the event of a fault status. The faulty channel is also indicated by simultaneous flashing of the green (A) and orange (B) channel-specific LEDs.
- In parallel to the red LED, a signal output (NPN transistor, pin a14) is present. The fault indication (red LED) and the fault signal (pin a14) remain active until acknowledgement. However, the amplifier card functions once again as soon as the cause of the fault has been eliminated.

Possible faults

LED error code				Possible cause	Possible cause
Pow (green)	Err (red)	A (green)	B (yellow)		
				Supply voltage too low U_B < 9.1 V	⇨ Increase supply voltage ⇨ Check smoothing and improve if necessary **Resetting the fault display** ⇨ Automatic reset
				Cable break or short-circuit at the output (coil side)	⇨ Check connected solenoids and supply lines for short-circuits ⇨ Check interruptions **Resetting the fault display** ⇨ After fault elimination ⇨ Switch supply voltage on again OR produce a positive flank on PIN 18 [1] (release) of the relevant amplifier

 = LED remains off

 = LED lights up

 = LED flashes

Note
A fault status can only be detected by the electronics if the coil currents have exceeded the permissible limits on actuation. Therefore, one cannot predict a short-circuit or cable break at the output if the TARGET VALUE VOLTAGE = 0 or with the RELEASE BLOCKED (PIN 18) Such faults will only be reported shortly after actuation of the relevant side (end stage).

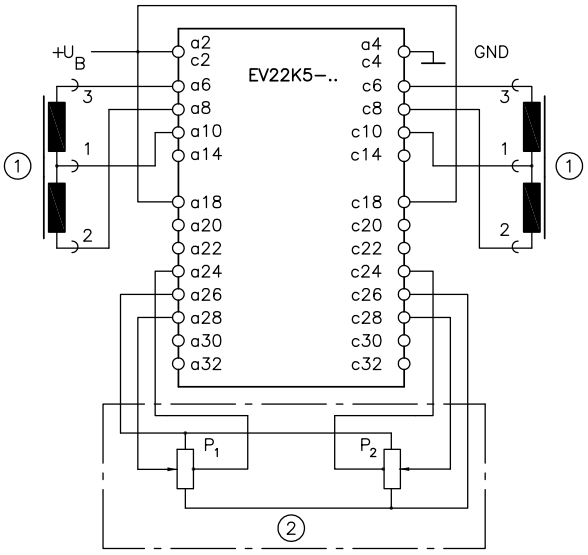
[1] When the RELEASE is blocked (PIN 18), the solenoid current is switched off without delay, but switched back on when released again via the set ramp function.

3 Typical circuits

Actuation of hydraulic valves using one proportional twin solenoid each or two proportional single solenoids

For a description of the connections, see Chapter 1.3, "Specific parameters".

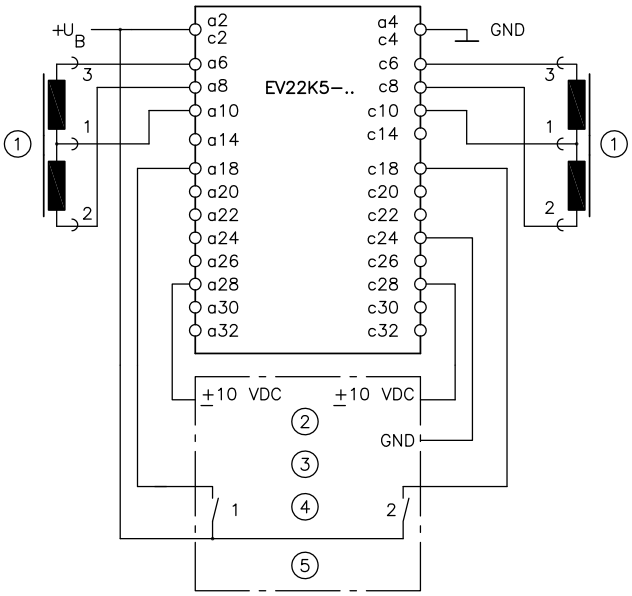
Example 1



The signal emitter connected consists of two potentiometers with centre tap, e.g. two single-axis joysticks or one dual-axis joystick. The target value voltage is bipolar.
This basic circuit is protected against malfunction of the non-activated proportional twin solenoid in the event of a wire break at the input (target value potentiometer). In the event of such a wire break, the non-activated proportional valve remains in the neutral position, as the target value voltage at the input of the proportional amplifier remains zero.

1 Proportional twin solenoid or proportional single solenoid
2 Joystick

Example 2



Connection to a PLC, CNC or PC, target value voltage bipolar

1 Proportional twin solenoid or proportional single solenoid
2 Analogue outputs
3 PLC, CNC and PC
4 Release
5 Relay outputs

