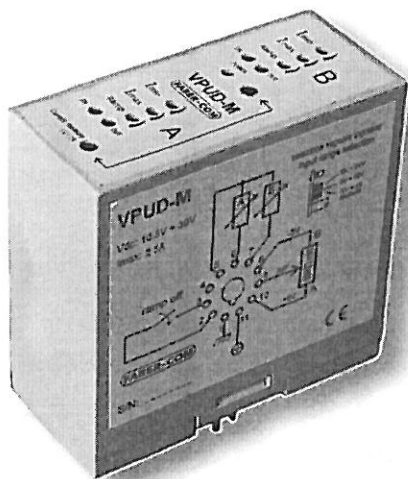


VPUD-M Electronic regulator for double solenoid proportional control valves (open loop)

FABER - COM

Supply voltage (V_{sup}): 10.5 + 30 VDC
External potentiometer supply: +5 VDC / -5 VDC - max 10 mA
Input reference signal range: -5 + +5 VDC / 0 + 10 VDC
Max output current: 2.5 A
Max power: 75 W
Ramp time adjustment: 0.1 + 5 sec
Indirect current measure: 1V = 1A
Input reference impedance: 10 kOhm
PWM frequency: 50 + 330 Hz
Ramp enable/disable optional signal: +Valim

Working temperature: -10 °C + +60 °C
Weight: 200 g
Overall dimensions: 79 x 36 x 77 mm

1 - DESCRIPTION

VPUD-M electronic regulator is designed for double solenoid proportional valve open loop control.

VPUD-M card is split in two sections; channel A and channel B. Each section is completely independent from other section. For each channel you can regulate a separate value of I_{MIN} , I_{MAX} and ramp time.

The value of solenoids current supplied from electronic regulator is proportional to VPUD-M reference input signal. Solenoid current is kept constant and it is independent from impedance variation and supply voltage variation.

Output current is PWM at presetted frequency of 120Hz, but is easily possible modify PWM frequency to improve valve performance.

Current range (offset and gain) can be modified to adapt the current to valves characteristics (see paragraph 4).

2 - WORKING CONDITIONS

2.1 Supply voltage

Correct supply voltage range is 10.5 V_{DC} to 30 V_{DC} . If you obtain card supply from 220V_{AC} you must straighten and filter this tension until voltage value is included into indicated supply voltage range.

2.2 Electric protections

Card is protected against supply overtension and polarity inversion, and the PWM output is protected against the short-circuit.

2.3 Input reference signal

Reference signal can come from a PLC (voltage signal from 0 to 10 V_{DC}) or external potentiometer. You can supply an external potentiometer directly from the card, connecting it to terminal 10 (+5V) and terminal 8 (-5V). See paragraph 5.4 for more detail on input reference signal ranges.

2.4 Solenoid type

VPUD-M card can control every type of proportional valve solenoid. You should only guarantee a supply voltage high enough to maintain the nominal current value into the solenoid.

3 - SIGNALLING LEDS

3.1 - POWER: Voltage supply

Green LED, when is ON indicate that VPUD-M is supplied.

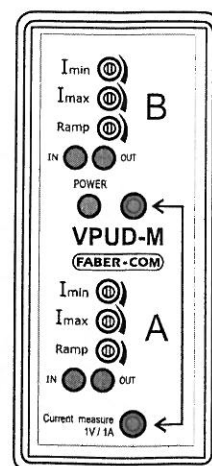
3.2 - IN: Input reference signal

Red LEDs, theirs brigh is proportional to input reference signal.

3.3 - OUT: Output current

Red LEDs, theirs brigh is inverse proportional to the output current into the solenoid. In case of circuit interruption solenoid current is zero and OUT led is completely ON.

For an optimal regulation OUT led should not be completely OFF to avoid 100% in PWM current.



4 - REGULATION COMMAND

4.1 Minimum current (I MIN or Offset)

By I MIN trimming potentiometers you can regulate solenoid polarization current. It must be regulated with reference input signal at lowest value. You must turn I MIN trimming potentiometer clockwise until the valve will be near to the opening threshold. If you set a too low I MIN value you will lose a fine regulation.

4.2 Maximun current (I MAX or Gain)

By I MAX trimming potentiometers you can regulate maximum current into the solenoid. It must be regulated with reference input signal at maximum value. You must turn I MAX trimming potentiometer clockwise until the valve will be completely opened. If you set a too high I MAX value you will lose a fine regulation.

4.3 Ramp (RAMP)

By RAMP trimming potentiometers you can regulate ramps time (ramps are symmetric). Ramps time varies from 0.1 to 5 seconds. If you connect a positive signal (available on terminal 2) on terminal 3 you can disable both ramps.

4.4 Current measure

If you put voltmeter probes into the frontal pannel measure point, you can indirectly mesaure solenoid current. Current/voltage ratio is 1 Ampere every 1 Volt. This means that if you measure 0.7V the current into the solenoid is 0.7A. The precision of this measure is $\pm 3\%$. For a more precise measure use the "relative" measure on multimeter, set zero point when both are solenoid OFF.

4.5 PWM frequency

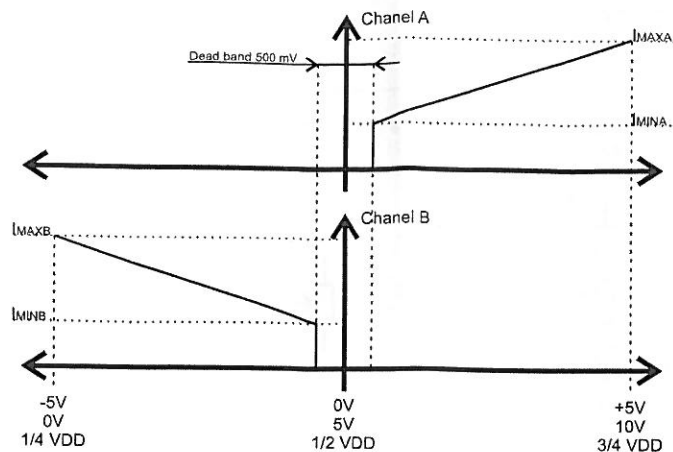
Output current is PWM; through a PWM frequency fine regulation you can reduce proportional valve hysteresis: Default PWM frequency is 120Hz. You can modify this value by an internal trimmer (you must open frontal panel). PWM frequency is adjustable from 50 Hz to 330 Hz. To know the best PWM frequency value you should ask to proportional valve manufacturer. Usually 120Hz is suitable for most valves types.

5 - CALIBRATION

For each solenoid you can regulate I MIN and I MAX. Default calibrations are I MIN at 200 mA and I MAX at 750 mA, using two proportional solenoid with 24 Ohm impedance. PWM frequency is 120 Hz and ramps time is zero, input reference signal range is from -5V to +5V with 0V as central point.

When input reference signal is at central point both solenoids are OFF. When input reference signal goes over central point channel A is ON, while when input reference signal goes under central point channel B is ON. A special interlock circuit avoids that the two outputs are at the same time ON.

If you want use VPUD-M with a MAS-010 joystick or with a PLC (input reference signal from +0V to +10V with central position at +5V) or with an equivalent device, you must modify input reference signal configuration through a jumper position. Jumper is under frontal panel (see picture below).



5.1 Minimum current and maximum current adjustment

To improve the proportional valve sensitivity, you must regulate I_{MIN} and I_{MAX} to obtain a correct solenoid current range. The proportional valve must always work from opening threshold to complete opened position. For a correct calibration follow the next instructions:

Channel A regulation

- 1) Bring I_{MIN} and I_{MAX} trimming potentiometers to lowest position (unscrew in anticlockwise sense).
- 2) Bring the input reference signal on the dead band threshold (when OUT led is switching on);
- 3) Rotate I_{MIN} trimming potentiometer clockwise to bring the proportional valve on opening threshold (at the start of actuator movement).
- 4) Bring the input reference signal at the highest value.
- 5) Rotate I_{MAX} trimmer to bring the proportional valve to maximum opening position.
- 6) Check I_{MIN} and I_{MAX} values and repeat this regulation to obtain a more precise calibration.
- 7) Repeat these operations for channel B.

5.2 Ramp regulation

Ramp function is used for soften proportional valve answer when input signal has sudden variations. "Rise ramp time" is the time of transition from zero to highest value of output signal and "fall ramp time" is the time of transition from maximum value to zero of output signal while input signal varying instantly from low to high or vice versa.

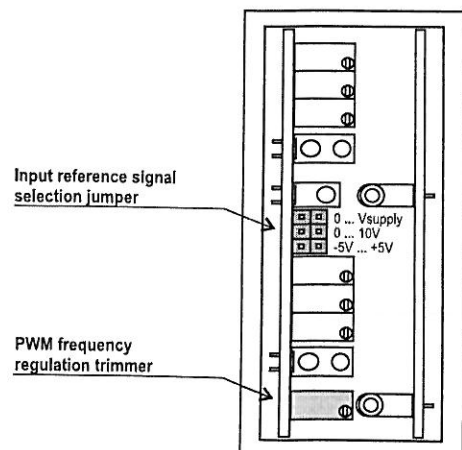
Ramp time range is from 0.1 to 5 seconds. Rise ramp time and fall ramp time have the same value. It is possible disable ramp function through terminal 3.

ATTENTION: if you use a too high time ramp you could worsen proportional valve performance.

5.3 - Frequency regulation

Default frequency setting is 120Hz, but it is possible modify this value. Frequency range is from 50 Hz to 330 Hz.

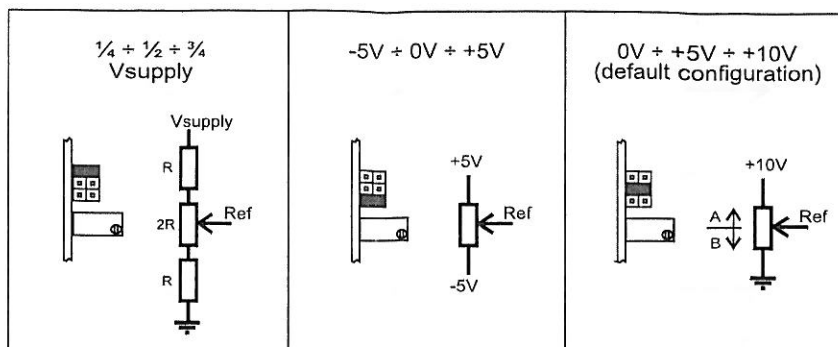
For modify PWM frequency open frontal panel and rotate frequency trimmer, attention, this modification must be done from an skilled technician.



5.4 - Input reference signal range

You can modify input reference signal range through an appropriate jumper, that is under frontal panel. You have three range possibility:

- from $\frac{1}{4}$ to $\frac{3}{4}$ of supply voltage with central point at $\frac{1}{2}$ of supply voltage;
- from 0V to +10V with central point at +5V;
- from -5V to +5V with central point at 0V (default configuration);



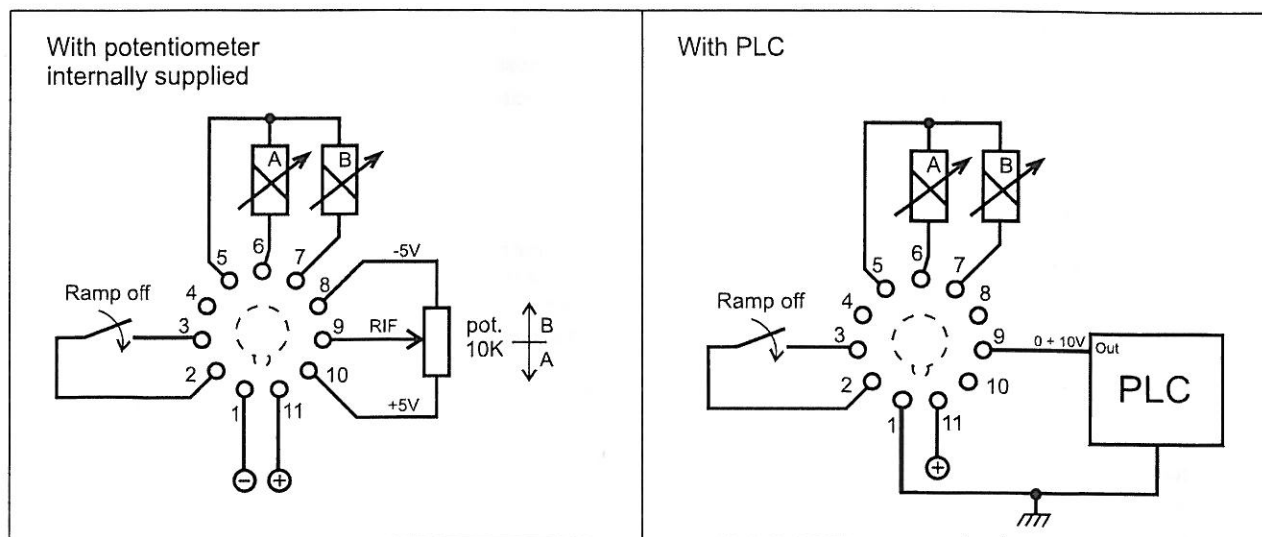
6 - WARNING

If you want turn OFF the solenoid or disable the card, you should never interrupt the connection from card to solenoid, but you must disconnect input reference signal, by this way VPUD-M regulator goes automatically in stand by mode and both channels are OFF. Solenoids must be always directly connected to VPUD-M card.

If you want completely turn off the solenoid outputs, you must turn off the card interrupting the supply.

ATTENTION: when you turn on the VPUD-M, the card is not immediately ready to work, because answer time on card switching on is proportional to ramps time.

EXAMPLES OF CONNECTION



ORDINATION CODE

PVPUMA	-5V ÷ +5V input range
PVPUMB	0V ÷ 10V input range
PVPUMC	0V ÷ VDD input range
A2007700040	UNDECAL connector

