

## Electronic Motor Potentiometer EMP500



### Application

The Electronic Motor Potentiometer (also known as an electronic reference value potentiometer) is used for speed control in the fields of diesel generators or other applications in place of a “mechanical potentiometer”. The advantage of the unit are its high precision, the low wear and the large number of possible settings. The EMP500 is able to control all customary control-units.

**By means of the new developed offset function a output-range can be chosen i.a. from +2V to +6V or from -4V to +2V or complete other ranges. With this the former needed resistors or diodes of different values can be dropped to adapt the electronic Potentiometer to the used control unit.**

The unit can be delivered with various different auxiliary voltages as AC 58 – 500V and DC 10 – 33V. The universal functionality of the EMP500 is supported by following output ranges 0-1V, 0-5V, 0-10V, 0-2mA, 0-10mA, 0-20mA, (optional feature +/-1V, +/-5V, +/-10V, +/-2mA, +/-10mA and +/-20mA). The output ranges can be trimmed to specific values with frontside analog adjusters “Offset” and “Output”. In addition the velocity of output signal changings can be set to fast or slow and a preset for a reset can be chosen by analog adjuster. The EMP500 has consistent 3-way 600V potential isolation in order to hold the input signal for the speed control unaffected.

### Function

EMP500 delivers a time-linear DC analog output signal with resolution of 12 bit (4096 steps) to the output which will be steps up or down by switching the inputs “Up” or “Down”. The velocity of signal change to output can be change by adjuster “Time” and additional rise to factor 10 by switch. With adjuster “Offset” and “Output” the maximal needed output range will be set. Also several voltage- and current output ranges can be chosen with frontside switches.

With ON switching of unit or input switching of “Reset” the output signal will be set to the value, which was fixed by the “Reset” adjuster. Here the user can choose the startpoint of his throttle valve in its idlemode to obtain same speed values for restarting of engine.

For the operators information there are two LED’s on front to show the momentary activity of “up” and “down”. The inputs “Reset”, “Down” and “Up” could be delivered from relay contacts or open-collector outputs by choice. The ground connectors of “Reset”, “Down” and “Up” are common grounded. In the input stages low pass filters are used against incoming noise voltages.

### Settings

In the standard offset setting of 50% there are following output ranges to be switched by different shift switches: **0-1V** (real 0-1.8V), **0-5V**, **0-10V**, **0-2mA**, **0-10mA** and **0-20mA**. After choosing the wanted range fine trimmimg of maximum value can be done by “output” adjuster. As remark the output range of 0-1V is as a matter of the circuitry a little bit bigger ( 0 – 1.8V ), but can be adjusted by output adjuster (appr. 60%) to 0-1V or smaller without problems. Also see grafic on Page 4.

- Shift-switch V/A:** Operating switch for output in Volt or in mA  
**Shift-switch Sec:** Time range for the complete range in “Time” x25 or “Time” x250 , while “Time” is the factor of the “Time” adjuster. Setting to x250 and “Time” to 50% says, that a complete range running has about 125 seconds.  
**Shift-switches Out:** Multiplier for Output range to 1, 5 and 10V or 2, 10 and 20mA.

For the next setting the offset must be adjusted to 50% and a multimeter should be connected to the output terminals. Then the output will be driven "Up" to the limit by short circuit the "Up"-input. Now the maximum specified value must be set with "Output"-adjuster.

After this the "Down"-input will be activated by short circuit until the output value reaches the minimum level at limit. Now the minimum specified value must be set with "Offset"-adjuster.

For better accuracy the settings must be repeat once more because the adjuster "Offset" and "Output" influence each other.

At the end of setting the "Reset"-value should be trimmed. 0% Reset means that the output value drives to the minimum output value and at 100% Reset the output value goes to the maximum. At 50% the output will be drive to the middle point of the choosen range.

**Calculating example for setting:** A frequency control unit expect an input voltage of 2 – 6V.

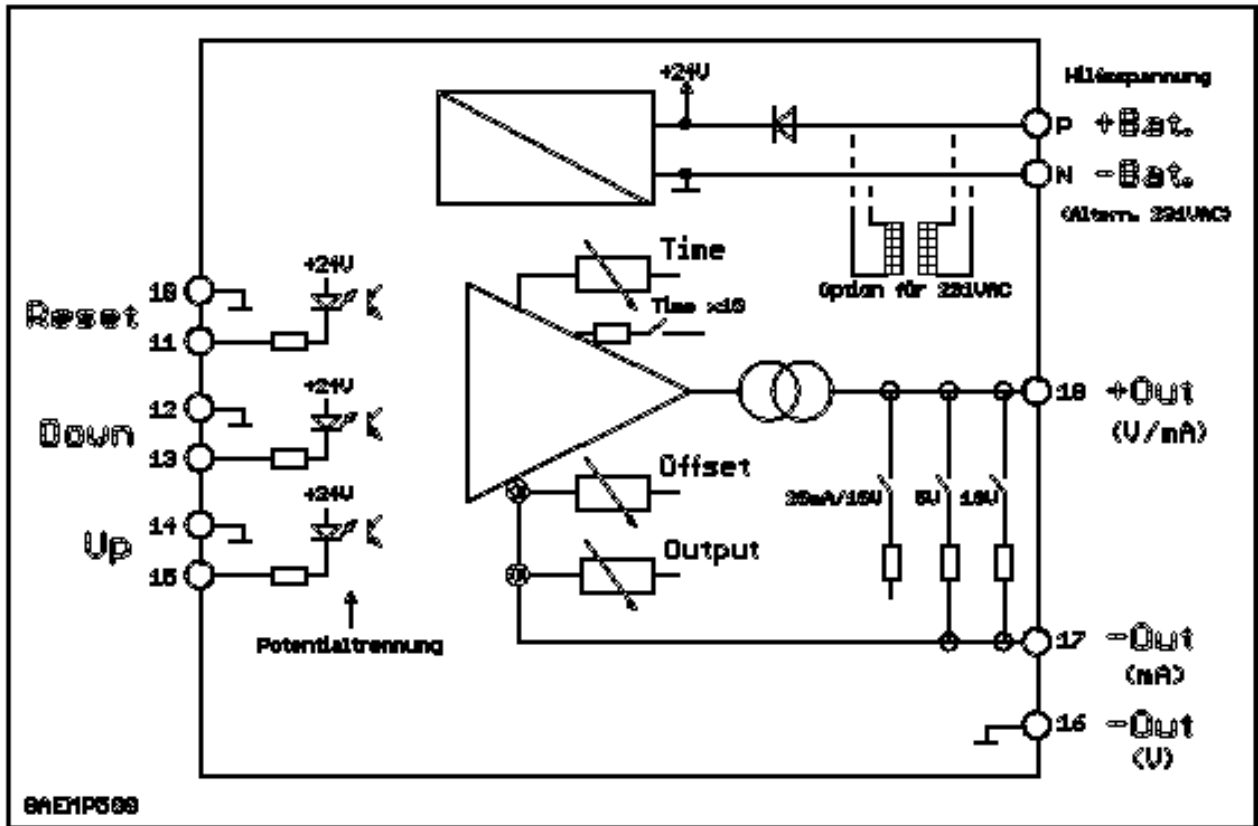
The working range is 6 – 2 = 4V. The range will be set with the left shift-switch to "V". The next to last switch will be set to "x5" and the right switch to "x1" to made the setting for 5.5V. To achieve an output range of 4V, the "Output" adjuster must now be set to appr. 75%.

For adjusting the low limit to 2V with the the "Offset" adjuster a small explanation are necessary. When the "Offset" adjuster is set to 50% no offset will be delivered. The real offset in this setting is 0% and the real range runs from 0 to 4V. Now the percentage of the "Offset"adjuster for the range of 4V must be calculated as follows:  $50 + (2V / 4V) \times 50 = 75\%$ . With this value the "Offset" adjuster has to be set. For a higher precision the "Output" and "Offset" adjuster must be adjust as described above.

## Technical Data

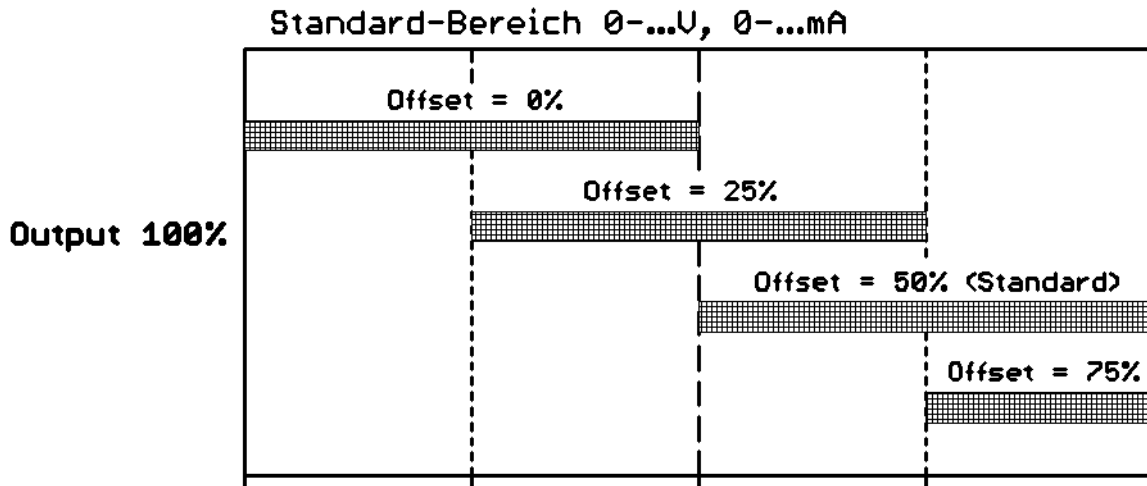
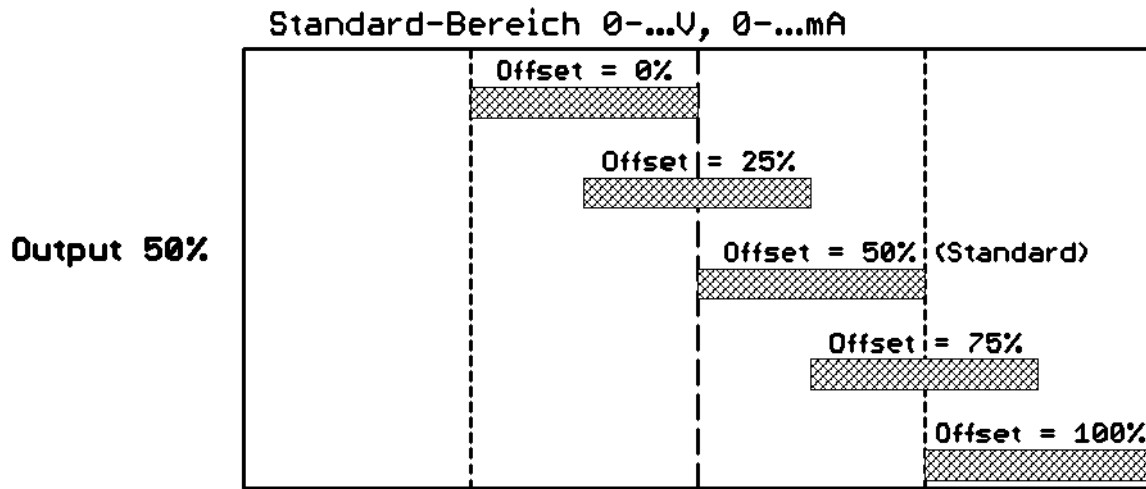
Type	Electronic Motor Potentiometer EMP500
Construction	Plastic housing on 35 mm hat rail as per DIN EN 50022
Material of housing	Bayblend FR 1439/0240 modified ABS with burning protection UL 94 VO
Dimensions, Weight	104x68x110mm (BxHxT), appr. 250 g
Auxiliary Voltage	11- 33VDC standard, other values on request
Potential Isolation	3-Way Isolation between Aux., Input and Output, 600V AC/DC
Power Consumption	< 2W ( 24VDC ), <2,5W ( 231VAC )
Running Time	5 - 250 sek. for complete range
Current Output mA Range	0-2mA, 0-10mA, 0-20mA, max. 500 Ohm, ( On request +/-2mA, +/-10mA, +/-20mA )
Voltage Output Range	0-1V (real 0-1.8V), 0-5V, 0-10V, 20mA max, no short circuit proof, ( On request +/-1V, +/-5V, +/-10V )
Resolution	Microcontroller with 12 bit resolution of output signal (i.e. for 0-1V = 0,25mV / step)
Temperature drift	< 0.05% / °C of output value
Accuracy of Front-Adjuster	Up to 20%, only useful for rough setting, fine adjust with digital multimeter to be recommended
On Period, maintenance	100 % , free of mainteneing
Output Drift	No , only drift of temperature, see above
Connecting Terminals	Potentialfree, each Terminal 2 Wires up to 2,5 mm <sup>2</sup>
Type of Protection	Housing IP 40 , Terminals IP 20 ( VDE 0106T100/VBG4 )
Environmentals	-10 °C bis +55°C, 95% Hum
Installing Position	Any
Mains Isolating	EN 60 742:1995 (Safety Transformers), Type of Class VDE 0551
General Regulations	EN 50 178 (Electrical Units in Power Current Installation)
Conducted Voltage Emission	DIN EN 55011, 2003:08, Class B
Radiated E-Field Emission	DIN EN 55011, 2003-08, Class B
Air Discharge ESD (Housing)	DIN EN 61000-4-2, 2001-12, Performance Criteria: B
Radiated Field (Housing)	DIN EN 61000-4-3, VDE 0847-4-3:2006-12 EMV, Performance Criteria: A
Transient „Burst“ (into wires)	DIN EN 61000-4-4, 2005-07 EMV, Performance Criteria: B
HF-Radiation (into wires)	DIN EN 61000-4-6, 2001-12 EMV, Performance Criteria: A

# Circuit Diagram



# Adjusting Ranges - Examples

E0EMP500.BRD



	-10V	-5V	0V	+5V	+10V
	-5V	-2,5V	0V	+2,5V	+5V
	-1V	-0,5V	0V	+0,5V	+1V
	-20mA	-10mA	0mA	+10mA	+20mA
	-10mA	-5mA	0mA	+5mA	+10mA
	-2mA	-1mA	0mA	+1mA	+2mA

↑  
Schiebeschalter für  
Ausgangs-Bereiche

Standard-Bereich  
bei 50% Offset