DEIF

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USER's MANUAL/INSTALLATION NOTE

Electronic potentiometer EPQ96-2

- Mounting
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1.   Introduction

This document provides guidelines for mounting, connection and commissioning of the EPQ96-2. The EPQ96-2 electronic potentiometer is intended for converting the relay output from a PI controller to a control voltage/current or PWM signal as input for an electronic speed governor.

The EPQ96-2 is delivered in a cardboard box. To protect the unit, it is important to store it in the box until mounting.

The EPQ96-2 is protected against ESD (electro static discharge). Therefore, in the process of mounting and wiring of the unit, no special attention to ESD is needed.

The EPQ96-2 is designed for front mounting, and two fixing clamps (included in the box) must be used to fix the unit to the switchboard. The needed cut out is 92 x 92 mm and the front size is standard 96 x 96 mm.

The cardboard box contains	EPQ96-2
User's Manual/Installation Note	1
EPQ96-2	1
Fixing clamps	2

2. Input and wiring instruction

Terminal no.	Signal	Marking	Remark
1 2	Relay contact single-pole	OK	Status output, closed when the supply is on, and the EPQ is working correctly.
3 4	Relay contact single-pole	AUTO	Status output, closed when the EPQ is set to auto mode.
5 6 7	J1939 CAN input	GND L H	To be used as interface between AGC 200 and an analogue governor. **See note 4.**
8 9	Supply	- +	Supply for the unit range 12…24V DC
10 11 12	Analogue output	+ - —▭—	Voltage output connect 11/12 Current output does not connect 11/12.
13	PWM	Droop	The droop is adjusted on the potentiometer marked PWM Duty
14		GND	Common for the 2 PWM outputs
15		Output	PWM output
16 17	Preset	+ -	9…31.2V DC will preset the output to the preset value. **See remark**
18 19	Down	+ -	9…31.2V DC will start integrating the output to min setpoint. **See remark**
20 21	Up	+ -	9…31.2V DC will start integrating the output to max setpoint. **See remark**

Remark:
The preset, down and up inputs are mutually galvanically separated.

The shown battery can also be used as supply for the EPQ96-2
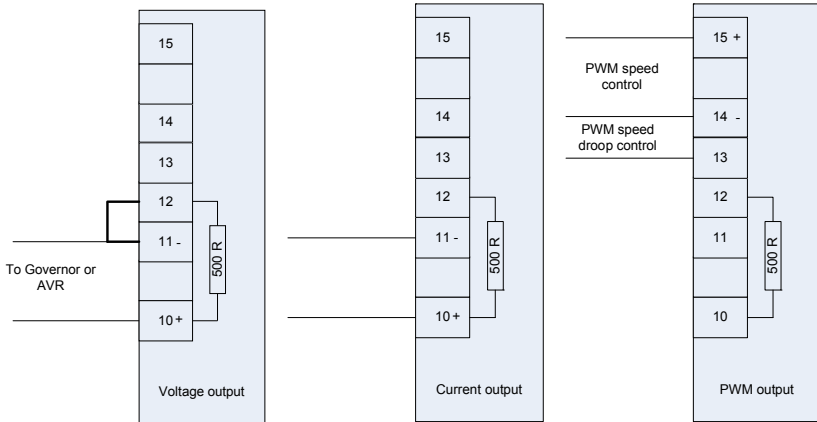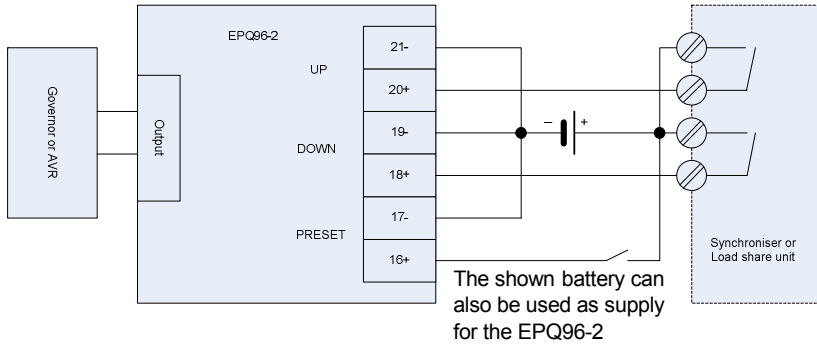
Notice that the connectors without number are not physically mounted.
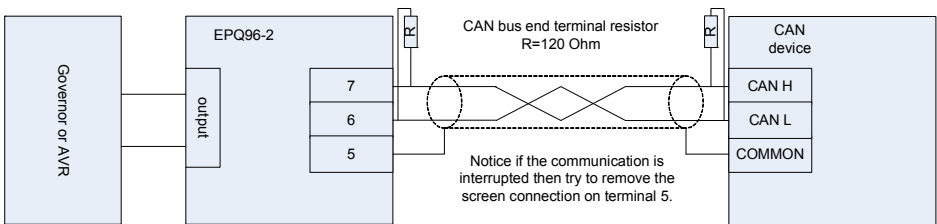
3. Potentiometer settings

Marking	Function	Remark
Time	Output integrating time 2.5…25 s	Adjustment of the slope. Notice the integrating time (slope) is from -10…+10 V (-20…+20 mA). **See note 1.**
Min	Output min value 0…100%	Adjustment of the minimum output e.g. **0.5 V**…2.5 V…4.5 V.
Max	Output max value 0…100%	Adjustment of the maximum output e.g. 0.5 V…2.5 V…**4.5 V**
Preset	Output start value 0…100%	Adjustment of the output value after a reset or power up e.g. 0.5 V…**2.5 V**…4.5 V. **See note 2**
PWM Duty	Pulse width output 0…100%	Adjusted according to governor requirements for speed droop settings. **See note 3**

4. Switch settings

Marking	Function	Remark
X1 X5 Time	Output integrating time	The range on the potentiometer 2.5…25 s can be multiplied with factor 5 to cover the range 12.5…125 s
"Preset"	Output start value	The output is set to the adjusted value done on Preset after a Preset input or a power-up. **Notice: Preset is only active in auto mode. After a power-up, auto mode is selected, and preset is activated.**
Last start up	Output start value memory mode	The output is preset after power-up to the output value just before a power-down (memory mode/similar to a motor potentiometer).
Not marked	CAN mode	If the switch is set to the upper position, the EPQ96-2 is prepared for AVR control. **See appendix.**

5. Push-buttons

Marking	Function	Remark
Auto	Mode select	The output is controlled from the digital inputs 18-19/20-21
Man	Mode select	The output is controlled from the push-buttons on the front of the unit.
(▲)	Output moves towards max	The output is controlled towards max by means of the push-button
(▼)	Output moves towards min	The output is controlled towards min by means of the push-button

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6. Indicators

| Marking	Function	Remark
On	Supply indicator	Flashes if the unit is defect.
Can	Comm. on	Flashes every time a telegram is received
Auto	Illuminated when on	Illuminated if auto mode is selected. The EPQ96-2 is automatically set to auto mode after a power up.
Man	Illuminated when on	Illuminated if manual mode is selected
(▲)	Illuminated when activated	Flashes when output is equal to max settings. Flashes if min max setting is done vice versa or the span is less than 10% (2 V or 4 mA).
(▼)	Illuminated when activated	Flashes when output is equal to min settings. Flashes if min max setting is done vice versa or the span is less than 10% (2 V or 4 mA).

7. Notes and commissioning
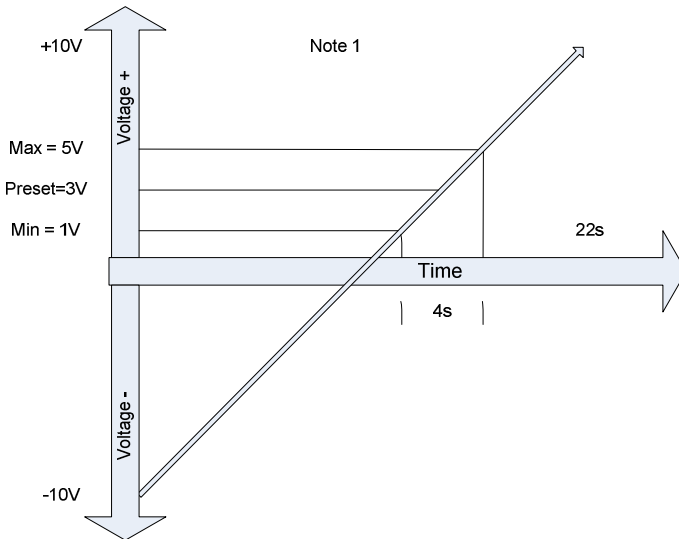
Note 1. Notice that the slope is independent of the min max settings. This is different compared to the old EP-Q96, where the slope in the above example would be 22 s from min to max if the "TIME" potentiometer was adjusted to 22 s. The method used in the EPQ96-2 is identical to a motorised potentiometer where the slope is constant independently of the span. In case a very small analogue output is needed and the "TIME" is too short, a resistor can be mounted between terminal 10 and 11 and remove the short between 11 and 12. If a 100 ohm resistor is mounted, the output can then be adjusted in the range -2…2 V using the "MIN" "MAX" potentiometers. See also commissioning.

Note 2. The preset value can be adjusted inside the min max settings. If the switch on the rear is set to "last" mode, the output value will be the value stored in memory during a power-down and restored again after a new power-up. This function is identical to a motorised potentiometer. If this mode is chosen and a generator is taken out

based on a shutdown, an overspeed situation can be the case when the generator is started again with no load connected; so the preset mode is recommended.

Note 3.
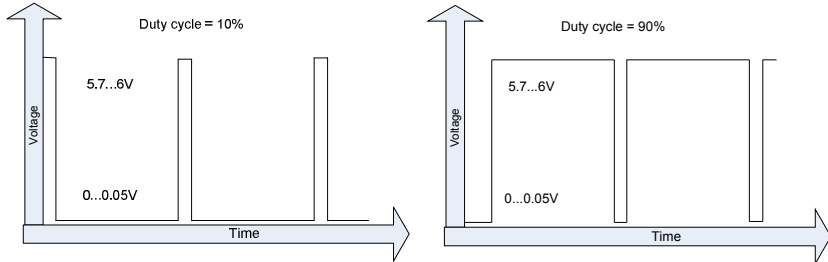
The PWM output intended for Caterpillar type ADEM or type PEEC can replace the CAT 9x9591 PWM modulator. The output on terminal 15 and 14 is controlled as illustrated above by means of the two push-buttons on the front or by means of the up/down inputs, and the min, max, preset and time settings is in full operation similarly to the analogue output. The PWM can also be controlled from the CAN J1939. The other output 13 and 14 is intended as speed droop settings on the ADEM or the PEEC and is adjusted to wanted speed droop by means of the potentiometer marked PWM Duty.

Note 4.
The input on terminals 5, 6 and 7 is a CAN J1939.
If a CAN J1939 telegrams has to be interfaced to an analogue governor or AVR, the EPQ96-2 will convert the CAN telegram into an analogue voltage signal, a current signal or a PWM signal.

When the EPQ96-2 detects a CAN telegram, the following mode will be activated:

The "TIME" settings will internally be adjusted to minimum. The min settings, the max settings and the preset settings will be identical to the settings done in manual mode. If a CAN telegram is transmitted and the preset input is activated, the preset will override the value sent by the CAN telegram. Do not activate the up/down input at the same time as a CAN J1939 telegram is received. If the transmission speed is slow (more than 200 ms), the output will fluctuate.

If the EPQ96-2 is set to manual mode, the actual output value is transmitted on the CAN line.

The EPQ96-2 is also able to convert the CAN telegram so an analogue AVR can be controlled. The EPQ96-2 can by means of the switch located to the right of the switch marked "start up", be configured for governor or AVR control. If the switch is set in the upper position, the EPQ96-2 is configured for AVR control.

See appendix.

Commissioning

As standard, the output is a -20…0…20 mA output, but can be changed into a -10…0…10 V output by adding a short between terminals 11 and 12, the built-in 500 ohm resistor will then convert the -20…0…20 mA to a -10…0…10 V output.

Output span is normally adjusted using the "MIN" and "MAX" settings on the rear, but a more precise and at the same time better resolution can be obtained by adding an external resistor. E.g. if a 0.5…2.5…4.5 V output is requested, an alternative method is: disconnect the short between terminals 11 and 12 and mount a 250 ohm resistor across terminals 10 and 11. This arrangement will reduce the max span to -5…0…5 V. The formula is ± span = external resistor value x 20 mA.

Adjust the "TIME" to minimum.

Connect the "PRESET" input to the supply or to another 9…32V DC source, notice the polarity must be correct, and set the EPQ96-2 to AUTO mode. Note: the "PRESET" can only be adjusted in "AUTO" mode. "PRESET" is the start value of the output after a power-up or after the "PRESET" input has been activated. Notice that as long as the preset input is activated, the preset value is present on the output.

Notice that if the function "LAST" is selected, the preset value will be loaded into the output if the preset input is activated.

Connect the "DOWN" input to the supply and set the EPQ96-2 to "AUTO" mode or as an alternative set the EPQ96-2 to "MAN" mode and activate and hold the down button.
Then by means of the "MIN", adjust the starting point of the output, e.g. to 0.5 V.

Then connect the "UP" input to the supply while the EPQ96-2 is in "AUTO" mode or as an alternative set the EPQ96-2 to "MAN" mode, activate and hold the "UP" button.
Then by means of the "MAX", adjust the ending point of the output, e.g. to 4.5 V.

The next adjustment is better performed while the EPQ96-2 is controlling the generator. Adjust the "TIME" until a stable frequency regulation of the generator or the AVR is obtained; notice the "TIME" can be prolonged with x5.
If the EPQ96-2 is connected to our FAS or LSU, then adjust the Tn and Xp to minimum on these units before the "TIME" is adjusted on the EPQ96-2. Finally, Xp may need some extra adjustment on the FAS/LSU.

Notice that if readjustment is needed on the span, it will not influence the "TIME" settings. The slope is entirely depending on the "TIME" settings and is not affected by the span settings.
The "TIME" is defined over the entire span from -20…0…20 mA/-10…0…10 V. See note 1.

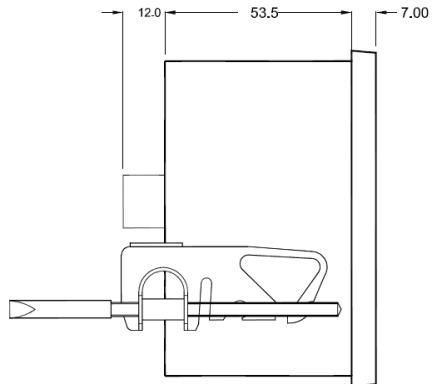# 8. Dimensions and layouts
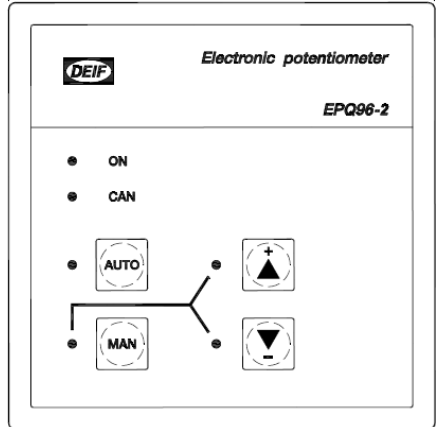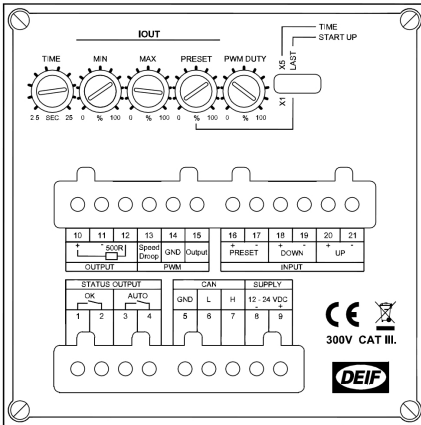
Panel cut-out 92 x 92 -0/+0.5 mm

See also the document "Interfacing DEIF equipment, application notes 4189340670 UK".

9. Appendix

CAN Receive

J1939 GOVERNOR/AVR

Priority 1 for GOVERNOR (Speed - TSC1)

CAN-ID	BYTE0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE7
0x0C000003	-	LSB	MSB	-	-	-	-	-

GOV 50 Hz

GOVERNOR max output   B1:B2 - 0xA0:0x32   (12960dec)
GOVERNOR "0v" output B1:B2 - 0xE0:0x2E   (12000dec)
GOVERNOR min output B1:B2 - 0x20:0x2B   (11040dec)

GOV 60 Hz

GOVERNOR max output   B1:B2 - 0x00:0x3C   (15360dec)
GOVERNOR "0v" output B1:B2 - 0x40:0x38   (14400dec)
GOVERNOR min output B1:B2 - 0x80:0x34   (13440dec)

AVR and priority 2 for GOVERNOR

CAN-ID	BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
0x0CFFD103	GOVERNOR		AVR		-	-	-	-

GOVERNOR

GOVERNOR max output   B0:B1 - 0xFF:0xFA   (64255dec)
GOVERNOR "0v" output B0:B1 - 0x80:0x7D   (32128dec)
GOVERNOR min output B0:B1 - 0x00:0x00   (0dec)

AVR

AVR max output   B2:B3 - 0xFF:0xFA   (64255dec)
AVR "0v" output   B2:B3 - 0x80:0x7D   (32128dec)
AVR min output   B2:B3 - 0x00:0x00   (0dec)

CAN Transmit

PGN number with PDU FF is proprietary. DEIF uses D0-DF for our
telegrams.
IOM use D0-D2

Frame

CAN-ID	BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE7
0x18FFD300	Status	GOV		-	-	-	-	-

CAN-ID	BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
0x18FFD400	Status	AVR		-	-	-	-	-

Status

BYTE 0									
	Bit	7	6	5	4	3	2	1	0
GOV/ AVR	Manual	-	-	-	-	-	-	0	0
	Auto	-	-	-	-	-	-	0	1
	Error	-	-	-	-	-	-	1	0
	N/A	-	-	-	-	-	-	1	1
	Watchdog toggle	-	-	-	-	0	0	-	-
	Watchdog toggle	-	-	-	-	0	1	-	-
	ERROR	-	-	-	-	1	0	-	-
	N/A	-	-	-	-	1	1	-	-
	N/A	-	-	-	-	-	-	-	-
	N/A	-	-	-	-	-	-	-	-
	N/A	-	-	-	-	-	-	-	-
	N/A	-	-	-	-	-	-	-	-
	N/A	-	-	-	-	-	-	-	-
	N/A	-	-	-	-	-	-	-	-
	N/A	-	-	-	-	-	-	-	-
	N/A	-	-	-	-	-	-	-	-

Governor

16 bit analogue register

BYTE1	BYTE2
LSB	MSB

max output   0xFFFF
"0v" output   0x7FFF
min output   0x0000

AVR

16 bit analogue register

BYTE3	BYTE4
LSB	MSB

max output   0xFFFF
"0v" output   0x7FFF
min output   0x0000

The below example shows the relationship between the min and max adjustment and the CAN telegram.
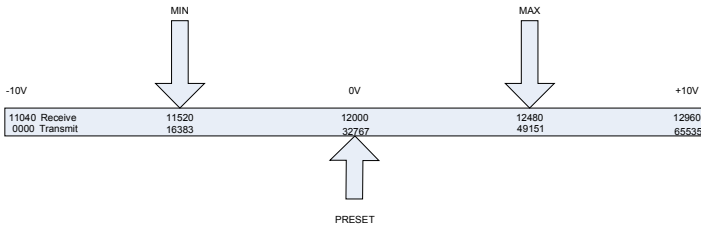
The resolution from 12000 to 12001 is 5 V/(12480-12000)=10.4 mV.
Example:
Can telegram receives 12480 dec, 30C0 hex
CAN-Report: 1314702352.0   201326595/0xc000003: xD : 00 c0 30 00 00 00 00 00
Can telegram transmitted
CAN-Report: 22256.615253 419418880/0x18ffd300: xD: f1 ff bf
BFFF hex = 49151dec.
Related to the above example, if the received telegram is higher than 12480, the output will be fixed at 5 V and the transmitted value will be **ffbf.**

DEIF A/S reserves the right to change any of the above.