



Operation Manual

EE600

Differential Pressure Sensor

YOUR PARTNER IN SENSOR TECHNOLOGY



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Ges.m.b.H.

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EMC note USA (FCC):

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EMC note Canada (ICES-003):

CAN ICES-3 (A) / NMB-3 (A)

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1 General

This operation manual serves for ensuring proper handling and optimal functioning of the device. The operation manual shall be read before commissioning the equipment and it shall be provided to all staff involved in transport, installation, operation, maintenance and repair. The operation manual may not be used for the purposes of competition without the written consent of E+E Elektronik® and may not be forwarded to third parties. Copies may be made for internal purposes. All information, technical data and diagrams included in these instructions are based on the information available at the time of writing.

1.1 Explanation of symbols



This symbol indicates safety information.

It is essential that all safety information is strictly observed. Failure to comply with this information can lead to personal injuries or damage to property. E+E Elektronik® assumes no liability if this happens.



This symbol indicates instructions.

The instructions shall be observed in order to reach optimal performance of the device.

1.1.1 General safety instructions



- Avoid any unnecessary mechanical stress and inappropriate use.
- Installation, electrical connection, maintenance and commissioning shall be performed by qualified personnel only.
- Use the EE600 only as intended and observe all technical specs.
- Do not blow into the pressure connections.
- Connecting to EE600 a pressure beyond the measurement range according to the product specification may permanently damage the device.
- Do not use EE600 in explosive atmosphere or for measurement of aggressive gases.
- Do not apply the nominal voltage to the output terminals.

1.1.2 Mounting, start-up and operation

The EE600 differential pressure transmitter has been produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory fulfilling all safety criteria. The manufacturer has taken all precautions to ensure safe operation of the device. The user must ensure that the device is set up and installed in a manner that does not have a negative effect on its safe use.

The user is responsible for observing all applicable safety guidelines, local and international, with respect to safe installation and operation on the device. This operating manual contains information and warnings that must be observed by the user in order to ensure safe operation.

- Mounting, start-up, operation and maintenance of the device may be performed by qualified staff only. Such staff must be authorized by the plant operator to carry out the mentioned activities.
- The qualified staff must have read and understood this operating manual and must follow the instructions contained within.
- All process and electrical connections shall be thoroughly checked by authorized staff before putting the device into operation.
- Do not install or start-up a device supposed to be faulty. Make sure that such devices are not accidentally used by marking them clearly as faulty.
- A faulty device may only be investigated and possibly repaired by qualified, trained and authorized staff. If the fault cannot be fixed, the device shall be removed from the process.
- Service operations other than described in this operating manual may only be performed by the manufacturer.

Disclaimer

The manufacturer or his authorized agent can only be held liable in case of willful or gross negligence. In any case, the scope of liability is limited to the corresponding amount of the order issued to the manufacturer. The manufacturer assumes no liability for damages incurred due to failure to comply with the applicable regulations, operating instructions or the operating conditions. Consequential damages are excluded from the liability.

1.2 Environmental aspects



Products from E+E Elektronik® are developed and manufactured observing of all relevant requirements with respect to environment protection. Please observe local regulations for the device disposal.



For disposal, the individual components of the device must be separated according to local recycling regulations. The electronics shall be disposed of correctly as electronics waste.

2 Scope of Supply

- EE600 pressure sensor according to ordering guide
- Pressure connection kit, straight, including 2m hose
- Mounting materials
- Test report according to DIN EN 10204 – 2.2
- Quick user guide

3 Product Description

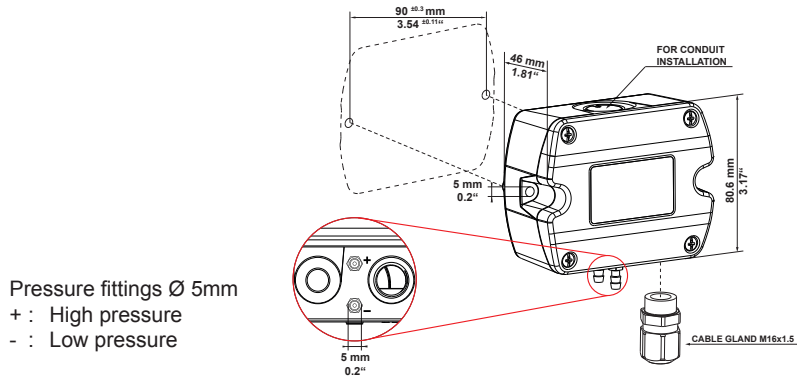
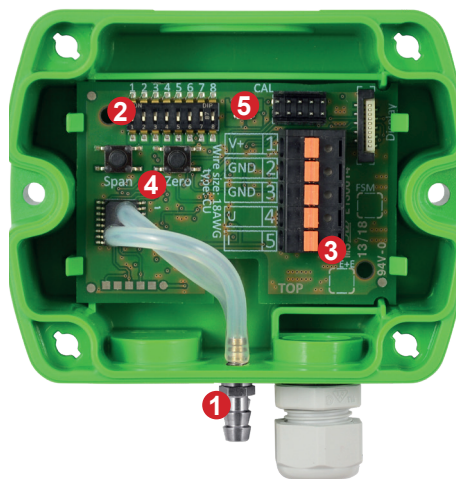


Fig. 1 Dimensions



1. Pressure connection nipples
2. DIP switches
3. Spring terminals
4. Push buttons for zero point and span point adjustment
5. Status LED

Fig. 2 Design and components

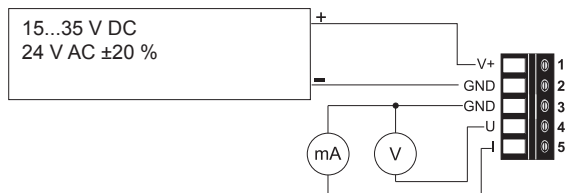


Fig. 3 Connection diagram

4 Initial Setup

Each EE600 leaves the E+E factory with the default setup (all switches on „0“):

- Measurement range: 100% of the full scale (1000 Pa or 10000 Pa)
- Output signals: 0-10V and 4-20mA
- Time constant: 50ms
- Backlight display: on



EE600 is fully configurable. Before commissioning, set the individual configuration of EE600 according to the application requirements using the DIP switches S1 to S8 as described below. The function of the DIP switches is indicated also on the interior of the EE600 front cover.

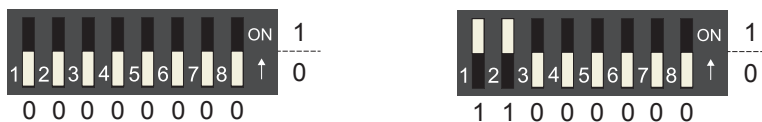


Fig. 4 DIP switches examples

4.1 Select the measurement range with S1 and S2

EE600-HV52:					
S1	S2	Pa	mbar	inch WC	kPa
0	0	1000	10	4	1
1	0	750	7.5	3	0.75
0	1	500	5	2	0.5
1	1	250	2.5	1	0.25

EE600-HV53:					
S1	S2	Pa	mbar	inch WC	kPa
0	0	10000	100	40	10
1	0	7500	75	30	7.5
0	1	5000	50	20	5
1	1	2500	25	10	2.5

Tab. 1 DIP switch settings - Measurement range

4.2 Select the response time with S3 and S4

S3	S4	Response time
0	0	50 ms
1	0	500 ms
0	1	2 s
1	1	4 s

Tab. 2 DIP switch settings - Response time

4.3 Select the display unit with S5 and S6

S5	S6	Display unit
0	0	Pa
1	0	mbar
0	1	inch WC
1	1	kPa

Tab. 3 DIP switch settings - Display unit

4.4 Select the backlight for the display

S7	Backlight
0	on
1	off

Tab. 4 DIP switch settings - Backlight

4.5 Select the Output Signal with S8

EE600 provides simultaneously a voltage and a current output signal at the spring terminals.

S8	Output signals
0	0-10 V and 4-20 mA
1	0-5 V and 0-20 mA

Tab. 5 DIP switch settings - Output signals

5 Installation



- Mount the EE600 onto a vertical, smooth surface.
- **Important:** The pressure connection nipples must point downwards.
- Avoid installation close to heaters and sources of strong electromagnetic interference.
- Insert the cable for supply voltage and output signal through the cable gland and connect it to the spring terminals according to the wiring diagram („Fig. 3 Connection diagram“).
- **Important:** Make sure that the connecting cable or wires do not impact with the push buttons in order to prevent unintentional trigger of the span or zero point adjustment.
- Close tightly the cable gland. This is essential for the compliance with the IP65 / NEMA4 protection class of the EE600 enclosure.

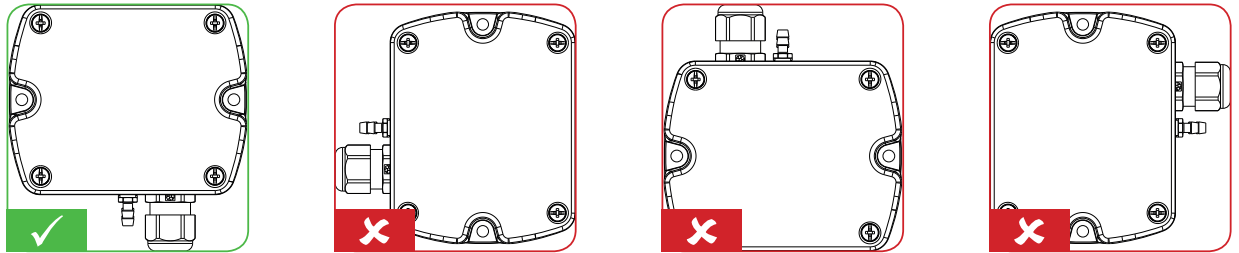


Fig. 5 Mounting orientation

5.1 Pressure connection

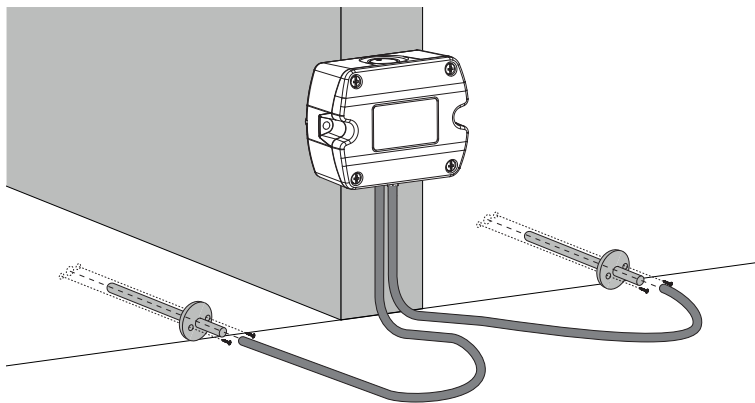
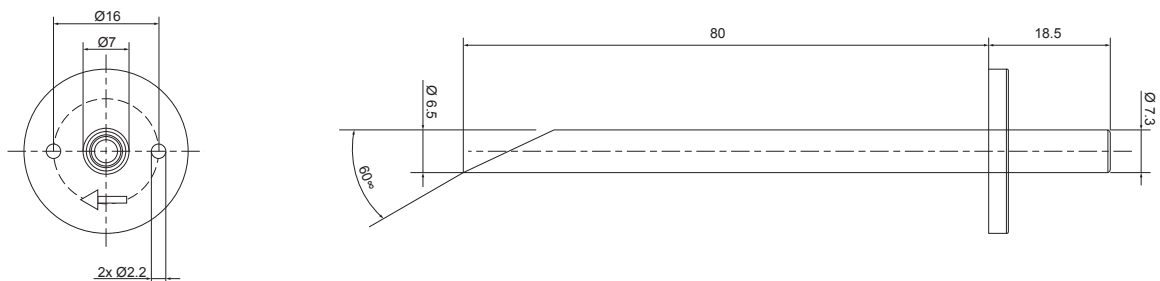


Fig. 6 Pressure connection



Tab. 6 pressure connection nipples

- Install first the pressure connection nipples (included in the scope of supply) onto the duct. Use a $\text{Ø } 7.5$ mm drill.
- Connect the pressure hose (included in the scope of supply) first to the EE600 and then to the nipples at the duct. Route the pressure hose for avoiding sharp bends which might lead to the hose obstruction („Fig. 7 Pressure hose route“).

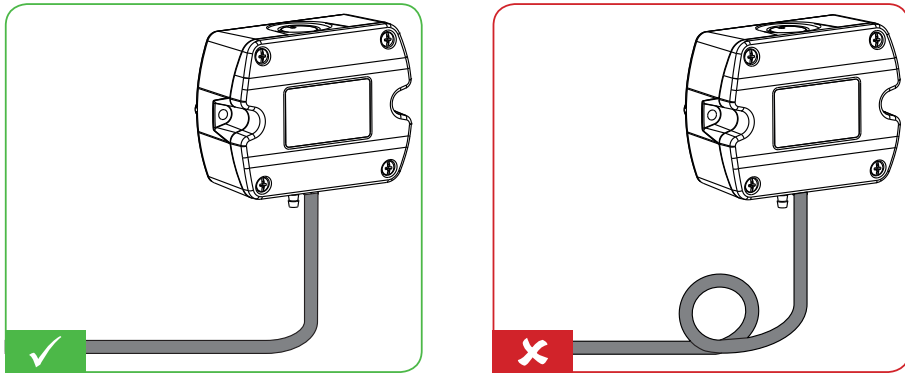


Fig. 7 Pressure hose route



Important:

Make sure to connect the higher pressure at the “+” pressure connector and the lower pressure at the “-” pressure connector. Inverted connection leads to “out of range” information on the optional display and at the analogue outputs, see 7.2 and 7.3.

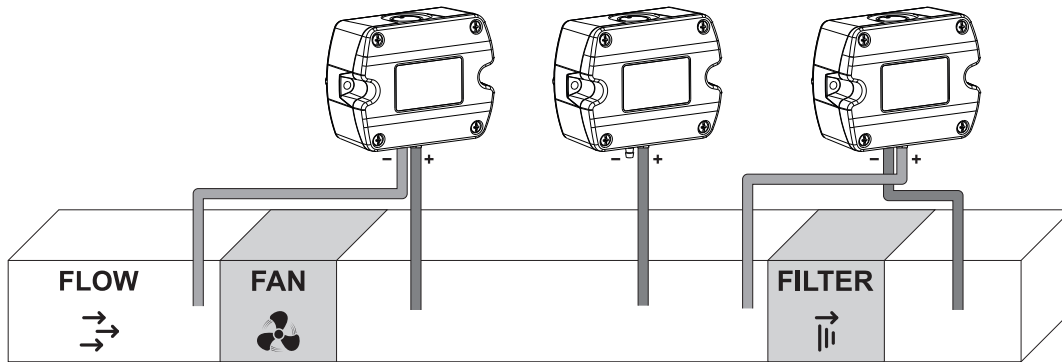


Fig. 8 Mounting examples

6 Maintenance and service

EE600 does not require any special maintenance, nevertheless it is recommended to perform a zero point adjustment every 12 month. If needed, the enclosure may be cleaned and the device may be re-adjusted as described below.

6.1 Cleaning

Use a damp soft cloth to remove deposits of dust or dirt from the exterior of the device and from the display. Do not attempt to clean the interior of the device. Do not use any solvents, alcohol or abrasive cleaning agents.

6.2 Repairs

Repairs may be carried out by the manufacturer only. The attempt of unauthorized repair excludes any warranty claims.

6.3 Readjustment of EE600

A periodical readjustment of EE600 might be required by the regulations of certain industries or by the need of best long-term measurement accuracy. The zero point and the span point can be adjusted with push buttons on the EE600 electronics board.

For adjustment the device must be powered and the enclosure cover removed. Consequently, the adjustment may be performed by authorized staff only, observing the handling of electrical sensitive devices (ESD).

6.3.1 Zero Point Adjustment

The zero point adjustment is used to correct an eventual zero point deviation.

- a. Remove the tubes from both pressure connections of the EE600. By this the pressure equal on both connections.
- b. Press "zero point" button 1-2sec. (see „3 Product Description“).
- c. The successful zero point adjustment is confirmed by the green LED turning on for 2 seconds.
- d. The red LED turning on for 2 seconds indicates that the zero point adjustment did not succeed. In this case repeat b.
- e. The zero point adjustment (b.) may not succeed because of a deviation higher than 5% of the original full scale of the device. This is 50 Pa for the 0 – 1000 Pa range and 500 Pa from the 0 – 10000 Pa range. In such a case, the zero point adjustment can be forced by pressing and holding the zero point button for min. 10 sec.
- f. The successful zero point adjustment is confirmed by the green LED turning on for 2 seconds.

6.3.2 Span Point Adjustment

The span point adjustment is used to correct an eventual deviation of the span value.



Important:

Make sure to perform a zero point adjustment as above before any span point adjustment.

- a. Connect the differential pressure reference device/calibrator to the EE600 and set it according to the EE600 span value to be adjusted.
- b. **Note:** The span value has to be set according to the selected measurement range (e.g. EE600-HV53, S1 = 0, S2 = 1, span value = 5000 Pa)



Observe the operation manual of the reference device.

- c. Press the span point adjustment button (see „3 Product Description“).
- d. The successful span point adjustment is confirmed by the green LED turning on for 2 seconds.
- e. The red LED turning on for 2 seconds indicate that the span point adjustment did not succeed. In this case repeat b.
- f. The span point adjustment (b.) may not succeed because of a deviation higher than 5% of the original full scale of the device.
This is 50 Pa for the 0 – 1000 Pa range and 500 Pa from the 0 – 10000 Pa range. In such a case, the set point adjustment can be forced by pressing and holding the span point button for 10 sec.
- g. The successful span point adjustment is confirmed by the green LED turning on for 2 seconds.

6.3.3 Return to Factory Adjustment

- a. Press and hold simultaneously both “zero” and “span” buttons for 5 sec.
- b. The successful return to factory adjustment is confirmed by the green LED turning on for 2 seconds.
- c. The red LED turning on for 2 seconds indicates that the return to factory adjustment did not succeed. In this case repeat b.



Important:

Return to factory adjustment affects both zero and span.

7 User Interface

7.1 LED indication

Green LED

flashing (1s interval) = EE600 operates normally, the measured data is within the selected measuring range

one flash (2s) = confirms adjustment or return to factory settings (see 6.3)

off = no power supply or electronics failure

Red LED

flashing (1s interval) = the measured data is out of the selected range (overload or reversed pressure connection)

one flash (2s) = indicates the failure of the attempt to adjust zero point or span point, or to return to factory adjustment (see 6.3)

7.2 Display

The display shows the measured differential pressure and the selected unit (see 4.3).

Additionally, the bar graph indicates the actual pressure within the selected range (see 4.1).



Fig. 9 Display units

In case of differential pressure out of the selected measuring range (MR) selected according 4.1 or negative pressure due to inverse pressure connection the display indicates:



$\Delta p <$ scale value low, -5 % of span



$\Delta p >$ scale value high, +5 % of span

Fig. 10 Failure indication

7.3 Analogue Outputs

The measured data is available at the spring terminals as 0-10 V and 4-20 mA or as 0-5 V and 0-20 mA signals (see 4.5).

Additionally, the analogue outputs indicate measurement out of range as follows.

Indication of $\Delta p < -5$ % MR and of negative difference pressure due to inverted pressure connection:

Output signal	Indication of negative differential pressure
0-10V	-0.5 V
0-5 V	-0.25 V
4-20 mA	3.2 mA
0-20 mA	-1 mA

Indication of $\Delta p > 105\%$ MR.

Output signal	Indication of overload
0-10V	10.5 V
0-5 V	5.25 V
4-20 mA	20.8 mA
0-20 mA	21 mA

8 Technical Data

Measured Value

Differential Pressure (Δp)

Measurement principle	Piezoresistive, no flow-through	
Measurement range	I: 0...250 / 500 / 750 / 1000 Pa (0...1 / 2 / 3 / 4 inch WC)	
selectable with DIP switches	II: 0...2500 / 5000 / 7500 / 10000 Pa (0...10 / 20 / 30 / 40 inch WC)	
Accuracy at 20 °C (68 °F)	$\pm 0.5\%$ FS	
(incl. hysteresis, non-linearity and repeatability)	FS = full scale (1000 Pa or 10000 Pa)	
Response time t_{90}	50 ms / 500 ms / 2 s / 4s selectable with DIP switches ¹⁾	
Temperature dependency	typ. < 0.03 % from FS/K	
Long-term stability	< 0.5 % from FS/year	
Overload limits		
0...1000 Pa (4 inch WC)	± 10000 Pa (± 40 inch WC)	
0...10000 Pa (40 inch WC)	± 80000 Pa (± 320 inch WC)	

Outputs

Analogue outputs	0-5 V or 0-10 V	-1 mA < I_L < 1 mA
selectable with	and ²⁾	
DIP switches ¹⁾	0-20 mA or 4-20 mA (3-wire)	$R_L \leq 500$ Ohm

General

Power supply	15-35 V DC or 24 V AC $\pm 20\%$
Current consumption	typ. 18 mA (without display)
at 0 Pa / 24 V DC	typ. 43 mA (with display and backlight)
Display	Graphic, with backlight
Display units	Pa, mbar, inch WC, kPa selectable with DIP switches ¹⁾
Connection	Spring terminals, max. 1.5 mm ²
Housing material	Polycarbonate, UL94V-0 (with display UL94HB) approved
Protection class	IP65 / NEMA 4
Cable gland	M16 x 1.5
Electromagnetic compatibility	EN61326-1 EN61326-2-3
Humidity range	0...95 % RH (non condensing)
Temperature ranges	Operation: -20...60 °C (-4...140 °F) Storage: -40...70 °C (-40...158 °F)



¹⁾ Factory setup: Measurement range 0...100%; Response time t_{90} : 50 ms; Display unit: Pa; Display backlight: on; Analogue outputs: 0-10 V and 4-20 mA
²⁾ Voltage and current output signals available simultaneously at the spring loaded terminals.



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