

# Electropneumatic Converters i/p Converter Type 3913-0001



Fig. 1 · Type 3913-0001 Electropneumatic Converter with pressure gauge and bracket

## Mounting and Operating Instructions

**EB 3913 EN**

Edition August 2011



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- ▶ *The device may only be mounted, started up or serviced by fully trained and qualified personnel, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger. All safety instructions and warnings in these mounting and operating instructions, particularly those concerning assembly, start-up and maintenance, must be observed.*
- ▶ *Any hazards which could be caused in the device by the signal pressure are to be prevented by means of the appropriate measures.*
- ▶ *Proper shipping and appropriate storage of the device are assumed.*
- ▶ *The device with the CE marking fulfills the requirements of the Directive 94/9/EC and the Directive 89/336/EEC. The declaration of conformity is available on request.*

## 1 Description

### 1.1 Application

The devices are used to convert a direct current input signal into a pneumatic signal for measuring and control. They are especially suitable as intermediate elements between electrical measuring devices and pneumatic controllers or between electrical control devices and pneumatic control valves.

The input of the converter is a load-dependent direct current from 0 to 20 mA. The output is a pneumatic signal of 0.1 to 4.0 bar (1.5 to 60 psi).

Pneumatic connection:

¼ - 18 NPT  
(Type 3913-0001-0122010110000)

or

ISO-228/1 - G ¼  
(Type 3913-0001-0222010110000)

## 1.2 Technical data

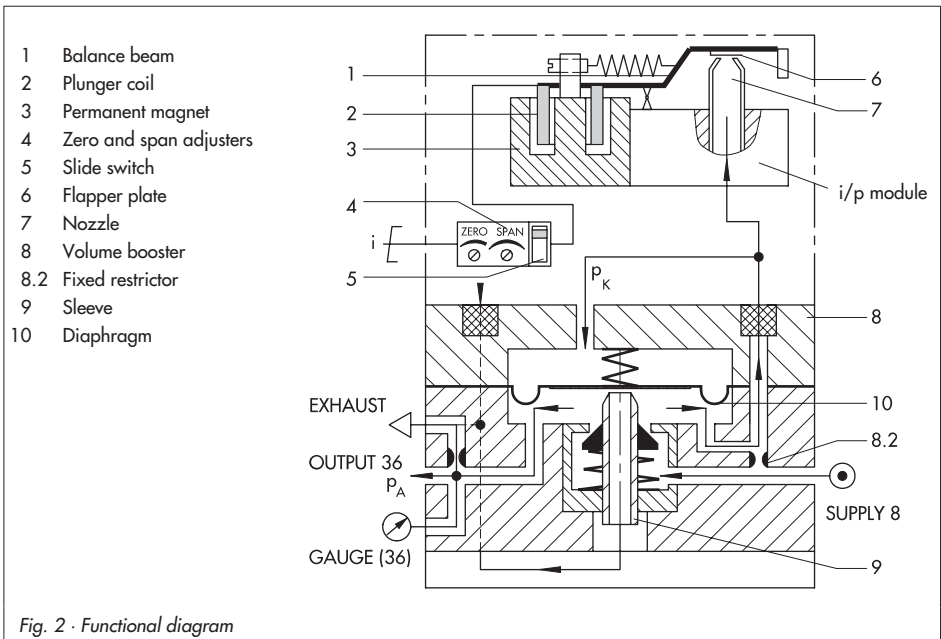
Type 3913-0001	
Input	0 to 20 mA Minimum current > 3.6 mA Load $\leq 6$ V (corresponds to $200 \Omega$ at $20 \text{ mA} \leq 4$ V)
Output	0.1 to 4.0 bar (1.5 to 60 psi)
Air output capacity (measured with 2 m hose 4 x 1)	2.0 m <sup>3</sup> /h at 0.6 bar (8.7 psi) output 2.5 m <sup>3</sup> /h at 1.2 bar (17.4 psi) output
Auxiliary power	Instrument air at least 0.4 bar (5.8 psi) above the upper signal pressure range value, maximum 4.5 bar (65 psi) without upstream pressure regulator
Air consumption	0.08 m <sup>3</sup> /h at 1.4 bar (20 psi) ; 0.1 m <sup>3</sup> /h at 2.4 bar (35 psi)
Performance	Characteristic: Output linear to the input
Hysteresis	$\leq 0.3$ % of final value, more accurate specifications on request
Deviation from terminal-based conformity	$\leq 1$ % of final value, more accurate specifications on request
Influence in % of final value	Supply air: 0.1 %/0.1 bar <sup>1)</sup> Alternating load, supply air failure, interruption of input current < 0.3 % Ambient temperature: Lower measuring range value < 0.02 %/°C, span < 0.03 %/°C
Dynamic response (acc. to IEC 60770-1)	Limiting frequency: 5.3 Hz Phase shift: $-130^\circ$
Effect of variable mounting position	Max. 1 %; $\pm 1$ % when mounted horizontally
Ambient temperature	$-25$ to $70$ °C
Degree of protection (acc. to IEC 60529)	IP 65
Materials	Enclosure: Die-cast aluminum, chromated, plastic coated, glass fiber reinforced polyamide, other parts made of corrosive-resistant material
Weight	Approx. 0.6 kg

<sup>1)</sup> Measured at average output pressure

### 1.3 Principle of operation

The converter consists of an i/p converter module and a connected volume booster. The supplied direct current  $i$  flows through the plunger coil (2) located in the field of a permanent magnet (3). At the balance beam (1), the force of the plunger coil, which is proportional to the current, is balanced against the force of the dynamic back-pressure. The back-pressure is produced on the flapper plate (6) by the air jet leaving the nozzle (7). The air supply (SUPPLY 8) flows into the lower diaphragm chamber, during which a certain amount of air determined by the diaphragm position flows past the sleeve (9) to the output (OUTPUT 36). When the input current increases and, as a result, the

forces at the plunger coil increase as well, the flapper plate (6) moves closer to the nozzle (7). This causes the dynamic back-pressure and the cascade pressure  $p_K$  forming in front of the restrictor (8.2) to increase. The cascade pressure increases until it is equal to the input current. When the cascade pressure increases, the diaphragm (10) and the sleeve (9) are pushed downwards, causing the supply air to increase the output pressure  $p_A$  until a new state of equilibrium is reached in the diaphragm chambers. When the cascade pressure drops, the diaphragm moves upwards, releasing the sleeve and allowing the output pressure  $p_A$  to pass through the sleeve to be vented (EXHAUST port) until the forces at the diaphragm are equal again.



## 2 Installation

### 2.1 Mounting

The converter can be mounted as illustrated in Fig. 5.

The device is delivered with a stainless steel (1.4301) bracket for wall mounting.

### 2.2 Mounting position

Mount the device horizontally with the pressure gauge (or stopper plug) pointing upwards.

### 3 Connections

#### 3.1 Electrical connection



*As far as the electrical installation of the device is concerned, the relevant national regulations governing the installation of electrical equipment and the national accident prevention regulations of the country of destination must be adhered to.*

*In Germany, these are the VDE regulations and accident prevention regulations of the employer's liability insurance.*

A male angle connector conforming to DIN EN 175301-803 A is used for electrical connection.

1. Unscrew the fixing screw (1) of the connector plug and pull the plug insert (3) out of the plug base at the enclosure.
2. Pull the screw out of the plug and remove the seal (5).
3. Place a screwdriver at the recess (4) and lever the plug insert (3) out of the plug housing.
4. Run the wires for the input signal over the cable gland of the plug housing to the terminals of the insert marked 1 (+), 2 (-) and screw them down.

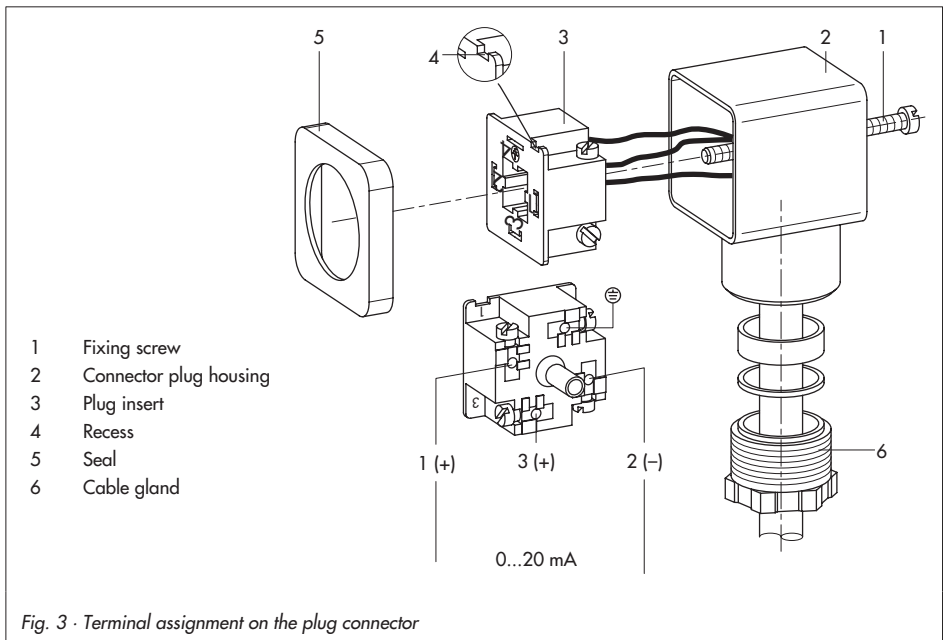


Fig. 3 · Terminal assignment on the plug connector

5. Push the insert into the plug housing, making sure that the cable gland points in the correct direction after the connector plug has been reassembled (the plug housing can be mounted in all four directions, turned at 90° angles around the insert).
6. Plug the connector plug on the device and screw tight the screw (1).

### 3.2 Pneumatic connection

The connections for supply air (SUPPLY 8) and output air (OUTPUT 36) are designed as bores with G 1/4 or 1/4-18 NPT thread.

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#### **Note!**

*Customary screw glands for metal pipes or plastic hoses can be used. When extending the exhaust by connecting a pipe either to the exhaust angle piece or directly to the G or NPT connection, make sure that no water can enter at the end of the pipe. The pipe must have a sufficiently large cross-section area of at least  $28 \text{ mm}^2 = 6 \text{ mm}$  inside diameter.*

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## 4 Operation

The device converts the input signal proportionally into the output signal.

The signal ranges are specified on the nameplate.

The zero and span can be corrected by approx. 10 % using the electronics. To do this, proceed as follows:

### Example:

The output signal 0.1 to 4.0 bar is to be assigned an input signal of 0 to 20 mA.

1. Unscrew the enclosure cover to access the **ZERO** and **SPAN** potentiometers on the printed circuit board.

### Zero:

2. Connect a pressure gauge (minimum accuracy class 1) to the output of the device.
3. Set the supply air to at least 0.4 bar above the upper range value of the output signal and apply it to the device.
4. Set the input signal to the lower range value 0 mA using a suitable current source.

The output signal at the test pressure gauge should indicate a lower range value of 0.1 bar.

Should another value be indicated, readjust the zero point accordingly with the ZERO potentiometer.

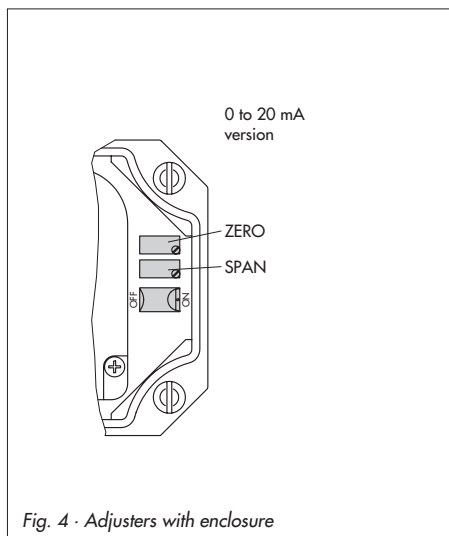
### Span:

5. Set the input signal to 20 mA using a suitable current source. The output signal at the test pressure gauge should indicate the upper range value of 4.0 bar.

Should another value be indicated, readjust the span accordingly with the SPAN potentiometer.

6. Change the input signal abruptly from the upper range value 20 mA to 0 mA (or gently tap the device) and check whether the output signal assumes the upper range value, e.g. 4.0 bar.

Since the adjustments of zero point and span influence each other, check both values again and correct them, if necessary.



## 5 Maintenance

No particular maintenance steps are prescribed.

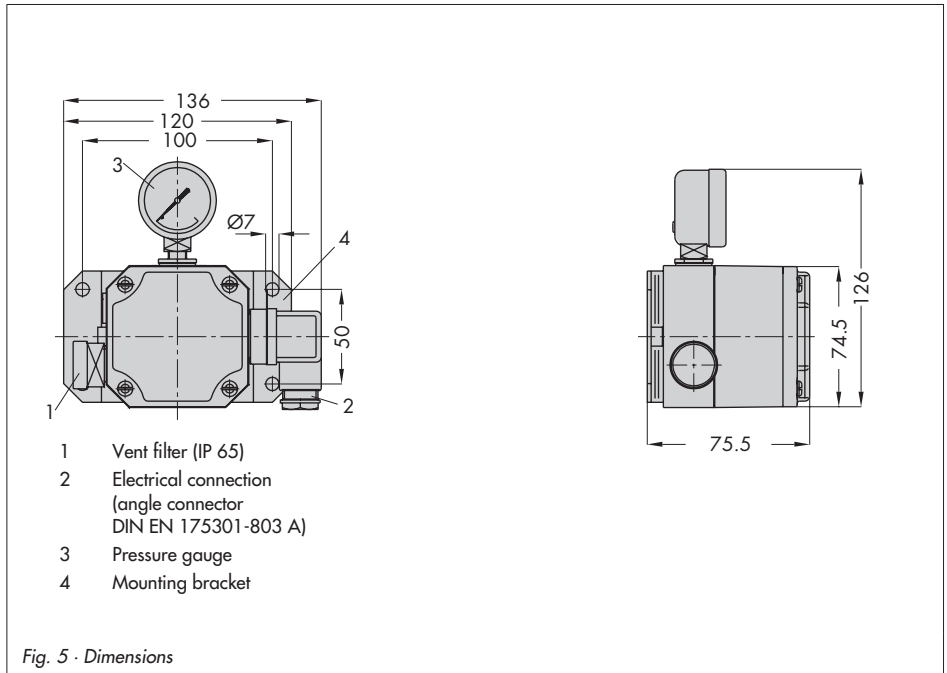
Proper functioning of the converter can only be guaranteed when the instrument air applied to the device is always clean. The air filter and separator of the pressure reducing station should be checked at regular intervals.

The pneumatic connections have filters with plastic rims (order no. 0550-0213) which can be unscrewed and changed or cleaned.

### 5.1 Troubleshooting

Problem	Possible cause	Countermeasure	Comments
No output signal despite changing the input signal	Supply air not connected	Check supply air connection, see section 3.2	
	Incorrect terminal assignment	Connect + and – terminals correctly, see section 3.1	<b>Caution!</b> Converter does not need any extra voltage! <b>Do not connect 24 V DC!</b>
	Incorrect input signal	Connect correct signal	See nameplate: 0 – 20 mA
Converter constantly vents off air loudly	Connections for supply air and output at the converter mixed up	Check pneumatic connection, see section 3.2	
Converter does not reach 100 % output e.g. 20 mA input: Output only 70 % instead of 100 %	Supply air is too low	Supply air must be 0.4 bar greater than the max. output signal (supply air = 0.4 bar)	See nameplate: Output 0.1 – 4.0 bar → Supply air at least 1.4 bar; max. 4.5 bar
	Input signal faulty	Check whether the input signal at the terminals reaches 100 % (100 % is in standard version, e.g. 20 mA, with split-range 12 mA)	<b>Caution!</b> Converter has a load of max. 6 V. Check specification concerning control.

## 6 Dimensions in mm



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**EB 3913 EN**

S/Z/2011-09