

# System 6000



## Electropneumatic Converters for Direct Current Signals

### I/P Converter Type 6102

### I/P Converter Type 5288

#### Application

Instruments for conversion of a standardized direct current signal into a pneumatic control signal, in particular applicable as intermediate elements between electric controllers and pneumatic control valves.



The input is a load-independent direct current signal of 4 to 20 mA. The output is a pneumatic signal, continuously adjustable in the range of 0.05 to 6.0 bar<sup>1)</sup> or 0.7 to 90 psi. The supply air has a pressure of 0.4 bar or 6 psi above the upper control signal range value.

The I/P converters are available as rack-mounting units of the Eurocard format C, as field units (degree of protection IP 54) or as control room units. These converters have the following features:

Extremely compact design, allowing a 35 mm rack-mounting unit to be equipped with two I/P converter units.

Excellent dynamic response (limiting frequency 10 Hz for 0.1 dm<sup>3</sup> and 0.8 Hz for 1.0 dm<sup>3</sup> connected air volume), very insensitive to mechanical vibrations, for example max. effects < 0.5 % for vibrations in all directions up to 300 Hz and 4 g.

Rack-mounting units with pneumatic plug-in connections which seal the air connections when the unit is withdrawn from the rack.

#### Versions

The Type 6102-5. I/P Converters are designed for installation between electric controllers and pneumatic control valves and are available for output signals from 0.05 to 6.0 bar (0.7 to 90 psi). With these units, the operating characteristic is reversible. Versions for split-range operation are available.

**Type 6102-51** · I/P converter, rack-mounting unit with one I/P converter unit.

**Type 6102-52** · Double-I/P converter, rack-mounting unit with two I/P converter units.

**Type 6102-53** (Fig. 3) · I/P converter, field unit designed for wall and tube mounting.

**Type 5288-54** (Fig. 4) · I/P converter, control room unit designed for mounting on a top-hat rail, available with terminals or cable (approx. 3 m long).

**For versions for hazardous locations (zone 0 and 1),**  
see next page.

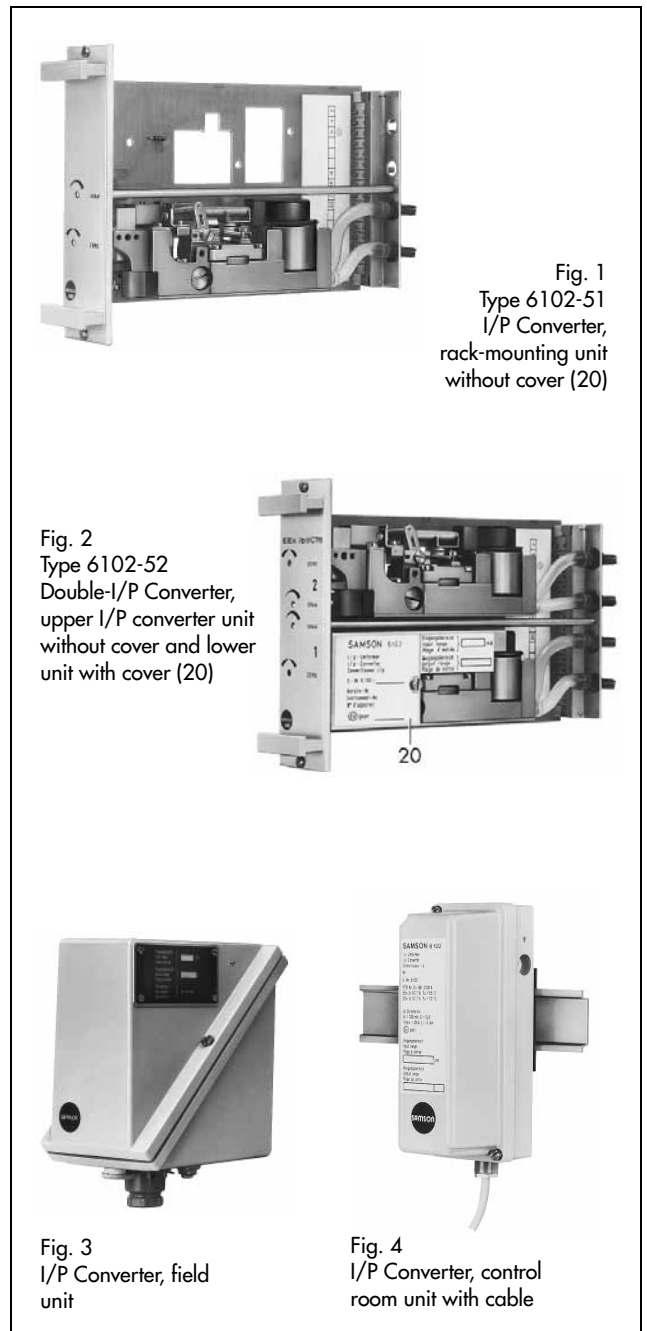


Fig. 1  
Type 6102-51  
I/P Converter,  
rack-mounting unit  
without cover (20)

Fig. 2  
Type 6102-52  
Double-I/P Converter,  
upper I/P converter unit  
without cover and lower  
unit with cover (20)

Fig. 3  
I/P Converter, field  
unit

Fig. 4  
I/P Converter, control  
room unit with cable

1) For output signals up to 2 bar, the unit Types 6113 (0.2 to 1 bar; 0.4 to 2 bar) and 6124 (0.2 to 1 bar) are available (see Data Sheet T 6101 E or T 6107 E)

### Versions for hazardous locations

The Type 6102-7./-8. I/P Converters are also available with decreasing operating characteristic and for split-range operation. In these units, the built-in diodes do not allow reversal of the operating characteristic.

### Input circuit(s), type of protection EEx ib II C (zone 1)

**Type 6102-71** · I/P converter, rack-mounting unit with one I/P converter unit.

**Type 6102-72** · Double-I/P converter, rack-mounting unit with two I/P converter units.

**Type 6102-73** (Fig. 6) · I/P converter, field unit for wall and tube mounting.

**Type 6102-74** (Fig. 7) · I/P converter, control room unit for mounting on a top-hat rail, available with terminals or cable (approx. 3 m long).

### Input circuit(s), type of protection EEx ia II C (zone 0 and 1)

**Type 6102-81** · I/P converter, rack-mounting unit with one I/P converter unit.

**Type 6102-82** · Double-I/P converter, rack-mounting unit with two I/P converter units.

**Type 6102-83** · I/P converter, field unit for wall and tube mounting.

Versions for hazardous locations according to Canadian and US regulations (CSA and FM) are available.

### I/P Converters for 19"-racks

19"-racks designed according to DIN 41 494, Parts 1 and 5, can accommodate up to 12 rack-mounting units, i.e. up to 24 I/P converter units. In the rack, one female multipoint connector according to DIN 41 612 (Style F) and one connection plate are assigned to each rack-mounting unit. The female multipoint connector provides the electrical plug-in connections. The connection plate contains the pneumatic plug-in connections. The pneumatic plug-in connections automatically seal the air connections when the unit is withdrawn from the rack.

### I/P Converters for control rooms

The cases of Type 6102-74 and Type 5288-54 are both designed to accommodate one I/P converter unit. These cases are suitable for installation in control rooms or switchgear cabinets and are mounted on 35 mm top-hat rails according to DIN EN 50 022 (on request available with attachment base for mounting on a 32 mm G-profile rail according to DIN EN 50 035). Units containing terminals correspond to degree of protection IP 00 (Fig. 7). Units provided with cable correspond to degree of protection IP 50 (Fig. 4).

### I/P Converters for field applications

The splash-proof cases of the Types 6102-3 are designed to accommodate one I/P converter unit. These cases are suitable for installation in the field.

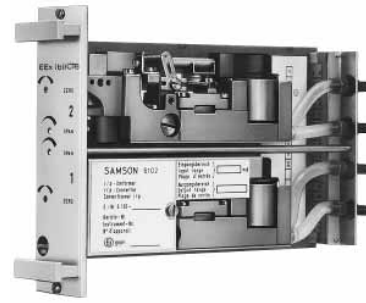


Fig. 5 · Type 6102-72 Double-I/P Converter with intrinsically safe input circuit EEx ib II C



Fig. 6 · Type 6102-73 I/P Converter with intrinsically safe input circuit EEx ib II C, field unit (cover open)



Fig. 7 · Type 6102-74 I/P Converter with intrinsically safe input circuit EEx ib II C, control room unit with terminals (case open)

### Principle of operation (Figs. 8 and 9)

Depending on the respective unit version, these are equipped with either one or two I/P converter units operating according to the force-balance principle. In case of rack-mounting units, the printed circuit board (16) is provided with the I/P converter unit, the soldering lug strip (19), the potentiometer for span adjustment (17), the front panel (E), the pneumatic connections (21) and a male multipoint connector (22).

The DC current ( $i$ ) supplied via the soldering lug strip (19) flows across a plunger-type coil (2) located in the field of a permanent magnet (1). The force of the coil, which is proportional to the current ( $i$ ), is balanced by means of a beam (3) against a force which the output pressure ( $p_A$ ) exerts on the balancing diaphragm (7).

The supply air to the amplifier (11) flows through the restriction (10) and the nozzle (9) and hits the flapper (8). If the input current ( $i$ ) increases and thus also the force of the plunger coil, the flapper (8) moves closer to the nozzle (9). As a result, the pressure in the nozzle increases and so does the output pressure of the amplifier (11), which is fed to the output of the unit and the balancing diaphragm (7). This pressure increases until a new balance state is reached and the output pressure ( $p_A$ ) is proportional to the current ( $i$ ).

Zero (15) and span (18) are adjustable.

Models for split-range operation are available having ranges of 4 to 12 mA and 12 to 20 mA.

### Legend for Figs. 8 and 9

- |                            |  |
|----------------------------|--|
| 1 Permanent magnet         | 14 Zero point spring                                 |
| 2 Plunger coil             | 15 Zero point adjuster (ZERO)                        |
| 3 Beam with balance weight | 16 Printed circuit board                             |
| 4 Cross spring pivot       | 17 Potentiometer for span adjustment                 |
| 5 Spring                   | 18 Span adjuster (SPAN)                              |
| 7 Diaphragm                | 19 Soldering lug strip for the electrical connection |
| 8 Flapper                  | 21 Pneumatic connections                             |
| 9 Nozzle                   | 22 Male multipoint connector                         |
| 10 Restriction             | E Front panel  |
| 11 Amplifier               | $p_A$ Output air pressure                            |
| 13 Cast block              | $p_z$ Supply air                                     |

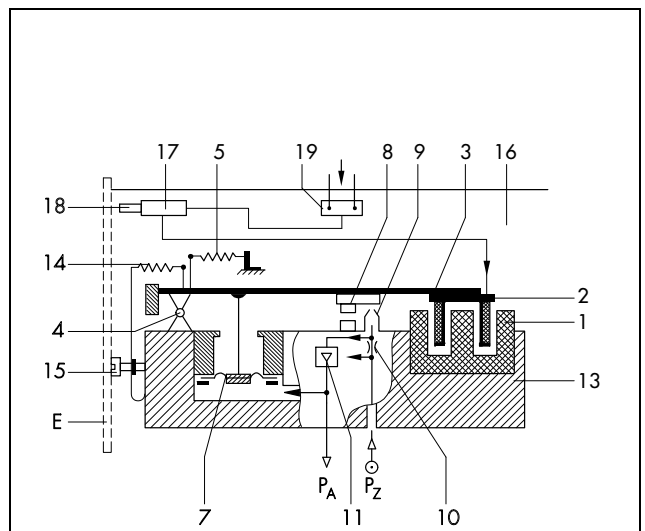


Fig. 8 · Functional diagram of the I/P converter (rack-mounting unit)

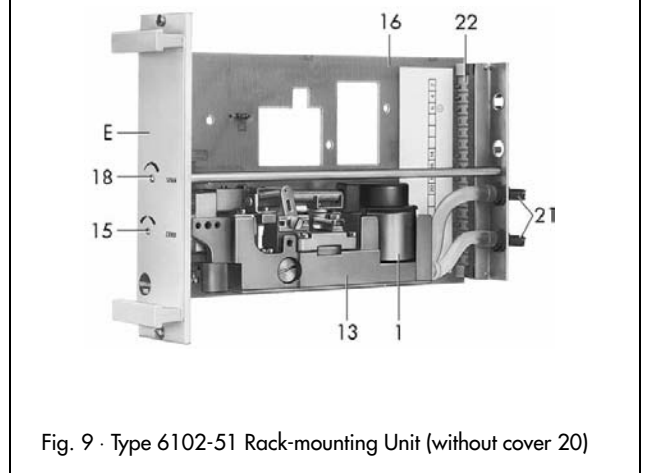


Fig. 9 · Type 6102-51 Rack-mounting Unit (without cover 20)

### Summary of the approved explosion protection certifications

Type of certificate	Certificate number	Date	Comments
Certificate of conformity	PTB-No. Ex-80/2138 X	12.09.1980	Protection type EEx ib II C T6
First addendum		27.08.1981	Control room case
Second addendum		16.12.1981	Ambient temperature
Third addendum		01.03.1984	Printed circuit board
Fourth addendum		06.12.1985	US-cable gland
Fifth addendum		01.07.1988	with I/P module 6112
Certificate of conformity	PTB-No. Ex-84/2021 X	17.02.1984	EEx ia II C T6 only version 6102-4 and 6104-8
CSA certification	LR 54227-1 LR 54227-19	31.01.1986 09.05.1994	Intrinsically Safe Class I, Groups A, B, C, D Class II, Group G
FM certification	J.I. OMO A4. AX	12.03.1986	Intrinsically Safe Class I, II, III, Div. 1, Groups A, B, C, D, E, F, + G

The test certificates are enclosed in the "Mounting and operating instructions" or are available on request.

## Technical data

I/P Converter	Type	6102-51 6102-52 6102-53 5288-54	6102-71 6102-72 6102-73 6102-74	6102-81 6102-82 6102-83
Input		4...20 mA (on option 0...20 mA) 4...12 or 12...20 mA		
Input impedance $R_i$	approx.	$200 \Omega \pm 7.5 \%$ for 20 °C	$200 \Omega \pm 7.5 \%$ for 20 °C effective inductance $\approx 0$ mH	
Input circuit	Ex	-	Intrinsically safe <sup>1)</sup>	
Output		Ranges continuously adjustable from 0.05 to 6.0 bar (0.7 to 90 psi)		
Air delivery		2.5 m <sup>3</sup> /h - min. connected volume: > 0.025 dm <sup>3</sup>		
Supply air		0.4 ± 0.1 bar above the upper control signal range value		
Air consumption <sup>2)</sup>		< 75/140/190 l/h		
Performance		Characteristic: output linear to input		
Hysteresis		< 0.2 % of upper range value		
Deviation from terminal-based linearity		< 1 % of upper range value		
Effects in % of the upper range value		Supply air: 0.2%/0.1 bar		
		Changing load, failure of supply air, interruption of input current: < 0.1 %		
Ambient temperature		Lower range value < 0.03 %/°C Span < 0.04 %/°C		
Load characteristic		± 3 % for air delivery ± 0.4 m <sup>3</sup> /h, reversing error not detectable		
Dynamic behaviour <sup>3)</sup>				
Connected air volume		0.1 dm <sup>3</sup>	1 dm <sup>3</sup>	
Limiting frequency		9 Hz	0.7 Hz	
Phase displacement		-163°	-51°	
Increase of amplitude		1.3 times/ -62°	-	
Environmental conditions, degree of protection, weights				
Perm. ambient temperature		-20 to +80 °C <sup>1)</sup>		
Perm. storage temperature		-30 to +80 °C		
Degree of protection		Rack-mounting units, control room units with terminals: IP 00 Control room units with cable: IP 50 Field units: IP 54		
Weights	(approx.)	Type 6102- .1: 0.45 kg Type 6102- .2: 0.75 kg Type 6102- .3: 1.3 kg Type 6102- .4: 0.7 kg Type 5288-54: 0.66 kg		

1) Input circuit of protection type "Intrinsically safe EEx ib II C or EEx ia II C", see PTB certificates of conformity for details

2) Air consumption per I/P converter unit for a supply air pressure of 2.4/4.4/6.4 bar

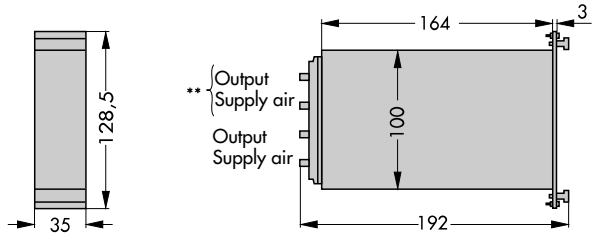
3) For  $Q_{max}$  adjustment

**Dimensions in mm**

**Type 6102-.1 and Type 6102-.2  
Rack-mounting Units**

Air connections  
for hose 4 x 1

\*\*Only for Types 6102-52/-72  
for 2nd I/P converter unit

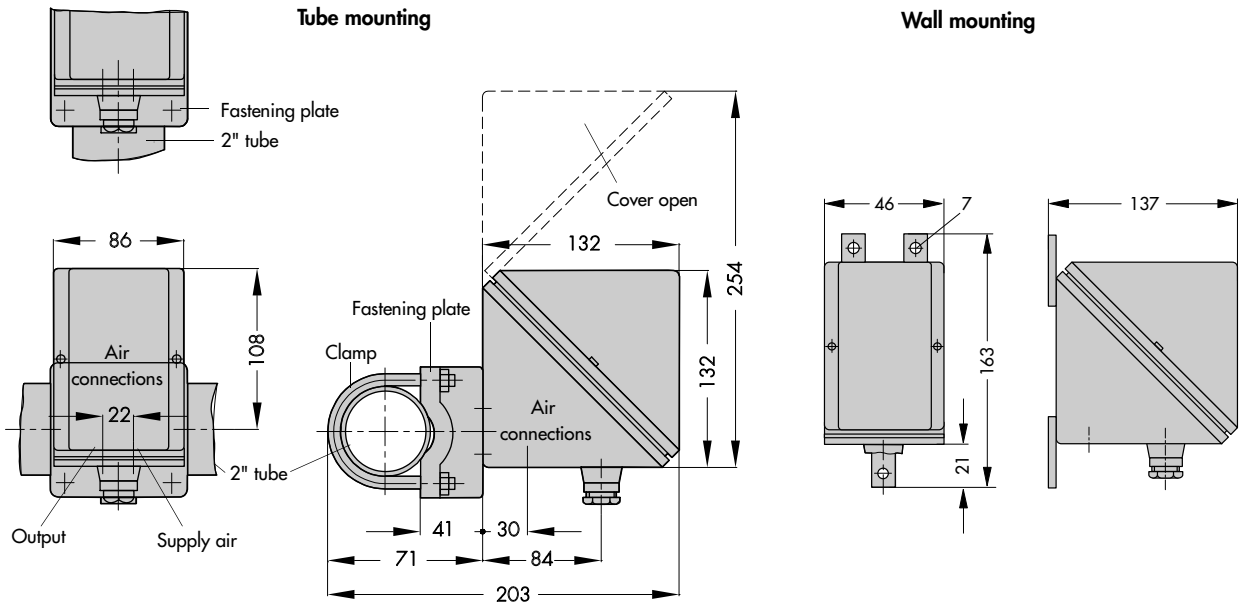


**Type 6102-.3 Field Unit**

Electrical connection via a Pg 13.5 screw gland – Terminals for wires 0.5 to 2.5 mm<sup>2</sup>.

Air connections (supply air and output): Tapped hole NPT 1/8 (on request, tapped hole ISO 228 G 1/8).

The mounting position of the unit is shown in the figures below.  
The following ways of mounting are optional:  
Tube mounting – with clamp to a horizontal or vertical 2"- tube.  
Wall mounting – with screws to a wall.

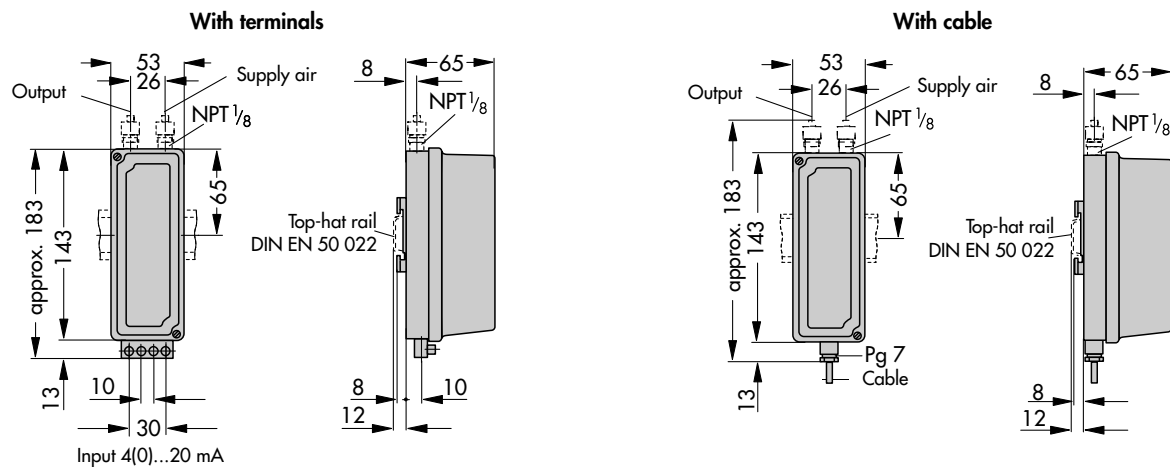


**Type 6102-.4 Control Room Unit (Type 5288-54)**

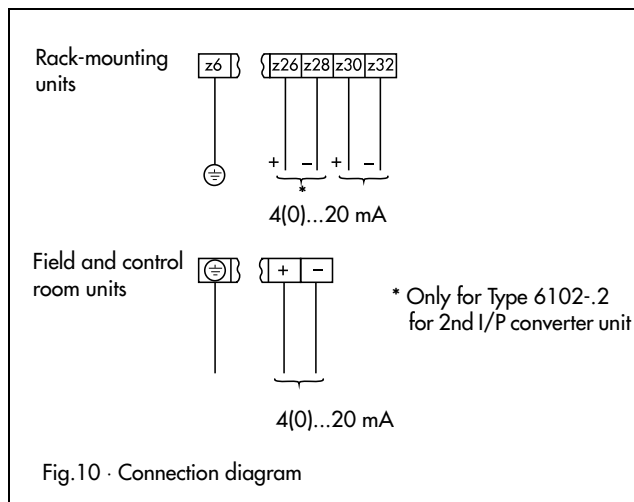
For mounting on a top-hat rail, 35 mm wide, DIN EN 50 022 (on request, attachment base for G-profile rail, 32 mm wide, DIN EN 50 035).

Air connections (supply air and output): Tapped hole NPT 1/8.

Electrical connection:  
Terminals for wires 0.5 to 2.5 mm<sup>2</sup>  
or  
Cable: PVC hoses HO3VV-F, 2 x 0.75-ws according to VDE 0281 (approx. 3 m long).



## Electrical connection



## Ordering text

I/P Converter Type 6102-.. / 5288-54

Input...mA, output...bar / psi,

Supply air...bar / psi,

For control room cases with terminals / cable,

On option special version: operating direction increasing / decreasing,...

Specifications subject to change without notice.



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