



**Elektropneumatic Converters  
for d.c. current signals**

**i/p Converter Type 6113**

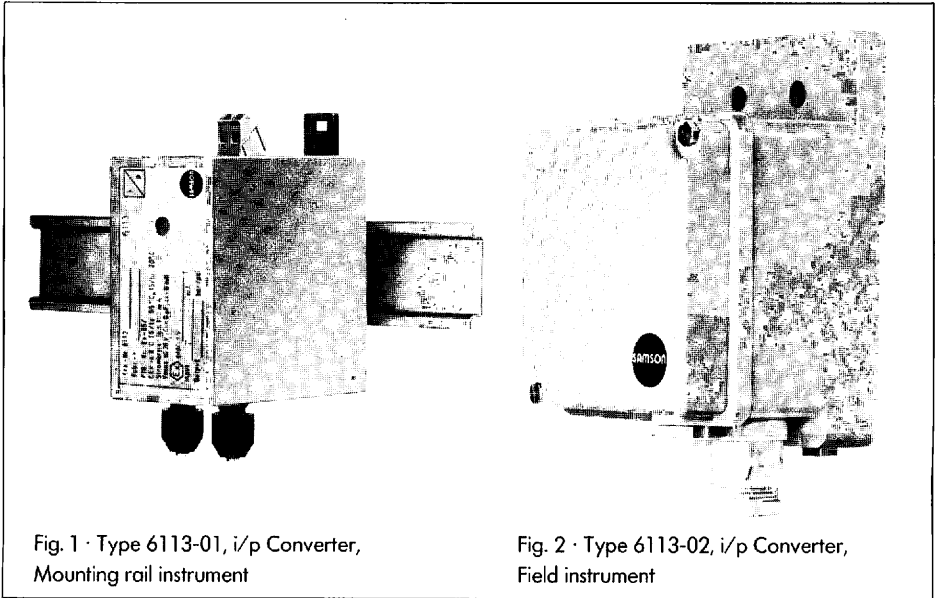
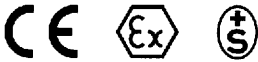


Fig. 1 · Type 6113-01, i/p Converter,  
Mounting rail instrument

Fig. 2 · Type 6113-02, i/p Converter,  
Field instrument

**1. Description**

**1.1 Application**

The instruments are used for conversion of a d.c. current signal into a pneumatic standardized signal, especially as an intermediate element between electric measuring equipment and pneumatic controllers or between electric control equipment and pneumatic control valves.

The input of the instruments is a standardized d.c. current signal of 4...20 mA (0...20 mA) or 1...5 mA. The output is a pneumatic signal of 0.2...1.0 bar (3...15 psi) or 0.4...2.0 bar (6...30 psi). The supply air has a pressure of 1.4 or 2.4 bar (20 or 36 psi).

## 1.2 Versions

### Versions for non-hazardous areas

**Type 6113-01** (Fig. 1) · i/p Converter; mounting rail instrument for mounting on a top hat rail.

**Type 6113-02** (Fig. 2) · i/p Converter; field instrument for wall or tube mounting, Air connections: tapped holes NPT 1/4".

**Type 6113-03** · Version as Type 6113-02 but with tapped holes ISO 228 G 1/4.

### Versions for hazardous areas

Input circuit of protection type EEx ia IIC.

**Type 6113-21** · i/p Converter; mounting rail instrument for mounting on a top hat rail.

**Type 6113-22** · i/p Converter; field instrument for wall or tube mounting. Air connections: tapped holes NPT 1/4".

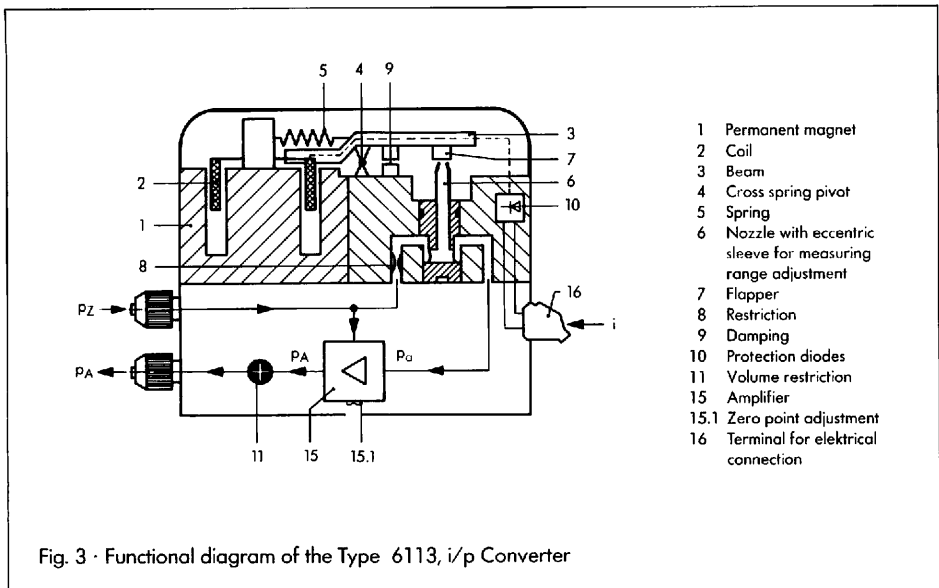
**Type 6113-23** · Version as Type 6113-22 but with tapped holes ISO 228 G 1/4.

## 1.3 Principle of operation (Fig. 3)

The instrument consists of an i/p conversion unit operating according to the force balance principle and a connected volume amplifier.

The d.c. current  $i$ , fed to the instrument via the terminals (16), flows through a coil (2) located in the field of a permanent magnet (1). The magnetic force of the coil, which is proportional to the current  $i$ , is balanced at the beam (3) by the dynamic back pressure. This back pressure is generated by the jet stream coming out of the nozzle (6), which is directed onto the flapper (7).

The amplifier (15) is supplied with the supply air ( $P_z$ ). It flows through the restriction (8) and the nozzle (6) against the flapper (7). When the input current  $i$  increases, and thus also the magnetic force of the coil, the flapper will move closer to the nozzle (6). Due to this, the dynamic back pressure  $P_a$  is fed to the amplifier (15). This pressure increases until a new balance state is obtained and  $P_a$  becomes proportional to the current  $i$ . The connected volume amplifier (15) increases the air delivery of the i/p conversion unit. Depending on the instrument version, this amplifier has an output pressure (PA) of 0.2...1.0 bar, 0.4...2bar, 3...15 psi or 6...30 psi.



## 1.4 Technical Data

<b>Type</b>	without explosion protection	6113-01 6113-02 6113-03 Input impedance 200 Ω ±7,5% for R <sub>1</sub> <sup>2)</sup> (with input 1...5 mA 880 Ω, and ≈26,5 mH)	
	with explosion protection	6113-21 6113-22 6113-23 Input circuit intrinsically safe* Input impedance 200 Ω, ±7,5% for R <sub>1</sub> <sup>2)</sup> effect. inductivity ≈0 mH*	
<b>Input</b>		4...20 mA, for split-range operation 4...12 of 12...20 mA 0...20 mA, for split-range operation 0...10 or...20 mA 1...5 mA	
<b>Output</b>		0.2...1 bar 3...15 psi	0.4...2 bar <sup>1)</sup> 6...30 psi <sup>1)</sup>
	Air supply adjustable	with Q <sub>max</sub> : with Q <sub>min</sub> :	2.2 m <sub>n</sub> <sup>3</sup> /h - min. connected volume: >0.05 dm <sup>3</sup> 0.6 m <sub>n</sub> <sup>3</sup> /h - min. connected volume: >0.012 dm <sup>3</sup>   3.2 m <sub>n</sub> <sup>3</sup> /h - min. connected volume: >0.05 dm <sup>3</sup> 0.9 m <sub>n</sub> <sup>3</sup> /h - min. connected volume: >0.012 dm <sup>3</sup>
<b>Supply</b>		1.4 ± 0.1 bar (20 ± 1.5 psi)   2.4 ± 0.1 bar (36 ± 1.5 psi)	
	Power consumption	0.15 m <sub>n</sub> <sup>3</sup> /h   0.22 m <sub>n</sub> <sup>3</sup> /h	
<b>Characteristic</b>		linear	
	Hysteresis	<0.1% of span	
	Deviation from terminal-based linearity	<0.3% of span	
	Effects in % of span	Supply: 0.2%/0.1 bar	
		Changing load, failure of supply air, interruption of input current: <0.1%	
		Ambient temperature: lower range value <0.02%/°C, measuring span <0.03%/°C	
Load characteristic	±3% with air supply ±0.4 m <sub>n</sub> <sup>3</sup> /h   ±3% with air supply ±1.1 m <sub>n</sub> <sup>3</sup> /h		
	Reversing errors not detectable		
<b>Dynamic response</b>		for a connected volume 0.1 dm <sup>3</sup>	for a connected volume 1 dm <sup>3</sup>
	Critical frequency	9 Hz   0.8 Hz	
	Phase displacement	-110°   -55°	
<b>Environmental conditions, protection type, weights</b>			
	Admissible ambient temperature	-20 to +70 °C*	
	Admissible storage temperature	-40 to 80 °C	
	Protection type	Mounting rail instruments: IP 20 Field instruments: IP 54	
<b>Weight</b>	approx.	Type 6113-1: 0.32 kg	Type 6113-2 and Type 6113-3: 0.86 kg

\* Input circuit with protection type "Intrinsic safety EEx is IIC": Details (also admissible temperature, capacitance and inductance) see PTB Certificate on page 2.

<sup>1)</sup> not valid for input 1...5 mA

<sup>2)</sup> coil material Cu, T<sub>K</sub> = 4%/10 K

## 2. Installation

### 2.1 Mounting

The Type 6113-1 mounting rail instrument is mounted on a top hat rail. The Type 6113-2 and 6113-3 field instruments are fastened on a wall or onto a 2" tube. See figures in section 5.

### 2.2 Electrical connection

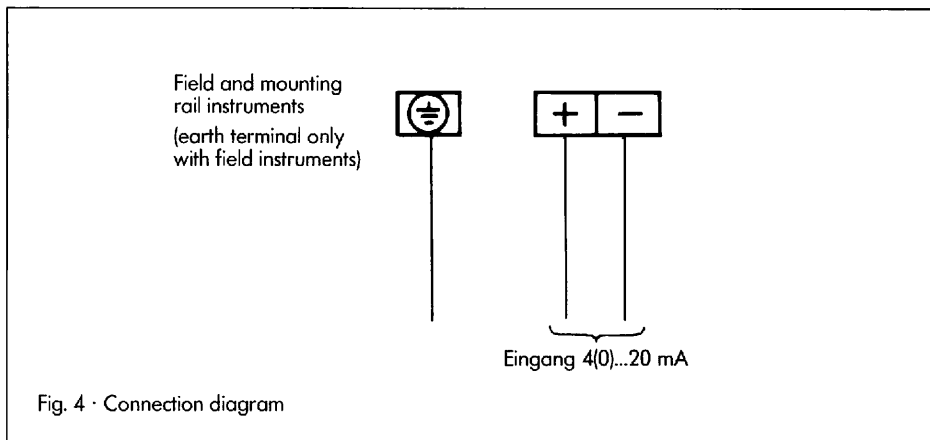
Connect wires to the terminals of the instrument as depicted in Fig. 4. With field instruments, they must be connected via a PG screw gland. The terminals are designed for 0.5...2.5 mm<sup>2</sup> wires.

### 2.3 Pneumatic connection

In case of a mounting rail instrument, the air connections supply (8) and output (36) are designed as hose connections for a 4 x 1 mm hose. The field instrument is provided with tapped holes NPT 1/4" or ISO 228 G 1/4. Here, the usual male couplings for metal tubes or plastic hoses can be used.

The supply air must be dry and free of oil and dust. The supply air pressure must be set to 1.4 or 2.4 ± 0.1 bar respectively.

Maintenance instructions for connected reducing stations must be strictly observed. Before connecting the hoses, clear them by blowing.



### 3. Operation

#### 3.1 Checking of zero point and span

The range of the instrument was adjusted by the manufacturer as specified on the type plate. The instrument is ready for operation. The adjusted range cannot be changed.

In case of any discrepancies at the instrument, we recommend to check the i/p converter as follows:

##### Zero point

With the mounting rail instrument, the zero point adjuster (15.1) is located above the electric terminal. With the field instrument, this adjuster is inside the instrument on top of the amplifier of the i/p component (unscrew cover).

Connect a pressure gauge (at least class 1) at the output of the instrument.

Set supply air pressure to  $1.4 \pm 0.1$  bar (2.4bar). Then, supply instrument with air.

Adjust input signal to the lower value of the input span using an appropriate current source (with a range of e.g.  $4 \dots 20$  mA =  $0.2 \dots 1$  bar, set to 4 mA). The output of the pressure gauge must be 0.2 bar.

If this pressure is not obtained, readjust zero point adjuster (15.1).

##### Span (upper range value)

The span adjuster is not marked. Access to it can be obtained as follows: Mounting rail instrument. Remove plastic plug on the label on top of the instrument. For adjustment, put screwdriver through bore hole. Field instrument. Unscrew cover. For adjustment, put screwdriver through the bore hole in the housing at a right angle to the zero point adjusting screw.

Set input signal to 20 mA (upper range value) using an appropriate current source. The pressure gauge output must be 1.0 bar. If this pressure is not obtained, readjust span adjuster (6) merely a little. Then, rapidly change the input signal from 20 to 0 mA (it is also possible to tap the component briefly) and check whether the output signal will become exactly 1.0 bar (upper range value).

Since zero point and span depend on one another, check both values again and correct, if necessary.

#### 3.2 Adjustment of air supply

The air supply must be adjusted at the volume restrictor (11). With the mounting rail instrument, this restriction is located at the side of the instrument adjacent to the pneumatic connections. With the field instrument, it is inside the housing on the base plate.

Depending on the operating conditions, the Q-restriction can be adjusted to minimum or maximum air supply (see technical data) by turning it by  $90^\circ$  (when provided by the manufacturer,  $Q_{max}$ . is adjusted).

### 4. Maintenance

#### 4.1 Supply air

Proper functioning of the converter is only ensured when the supply air is well cleaned before being supplied to the unit. Air filter and separator of the reducing station must be checked at regular intervals.

# Certificate of Conformity for Type 6113-2.

## Physikalisch-Technische Bundesanstalt



### KONFORMITÄTSBESCHEINIGUNG

- (1) KONFORMITÄTSBESCHEINIGUNG
- (2) PTB Nr. Ex-86.B.2106
- (3) Diese Bescheinigung gilt für das elektrische Betriebsmittel  
 1/p-Heizform (Typ 6113) + ....
- (4) der Firma NEMSA AG  
 32500 FRIEDLAND
- (5) Die Daten dieses elektrischen Betriebsmittels sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Konformitätsbescheinigung festgelegt.
- (6) Die Physikalisch-Technische Bundesanstalt bescheinigt als Prüfstelle nach Artikel 14 der Richtlinie der Europäischen Gemeinschaften vom 18. Dezember 1975 (75/111/EWG) die Übereinstimmung dieses elektrischen Betriebsmittels mit den harmonisierten Europäischen Normen  
**Elektrische Betriebsmittel für Hochspannungsbereiche**  
 IEC 90:1977 - Annex I (IEC 6170/011) Teil 1 Allgemeine Bestimmungen  
 IEC 90:1977 - Annex I (IEC 6170/011) Teil 2 Besondere Eigenschaften
- nachdem die Bescheinigung für die neue Bauartprüfung erstellt wurde. Die Einhaltung dieser Bauartprüfung wird technisch durch die PTB bescheinigt.
- (7) Das Betriebsmittel ist mit dem folgenden Kennzeichen zu versehen:  
 Ex-86 B.2106 bzw. 15 bzw. 16
- (8) Der Hersteller ist dafür verantwortlich, daß jedes daran gekennzeichnete Betriebsmittel in seiner Bauart mit den in der Anlage dieser Bescheinigung festgelegten Anforderungen übereinstimmt und daß die vorgeschriebenen Kennzeichnungen angebracht sind.
- (9) Das elektrische Betriebsmittel muß mit dem hier abgedruckten gemeinschaftlichen Unterscheidungszeichen gemäß Anhang I der Richtlinie des Rates vom 6. Februar 1975 (75/196/EWG) gekennzeichnet werden.

Im Auftrag

*Johannmeyer*  
 (Dr.-Ing. Johannmeyer)



Braunschweig, 6.6.1986

Prüfungsausschüsse über die Herstell- und die Überwachungsstellen sowie Lieferanten  
 Die Herstellerangaben sind zu überprüfen und zu bestätigen  
 Anträge über Änderungen bedürfen der Genehmigung der Prüfstelle  
 Technische Bundesanstalt, Bundesamt für Fernstudien 1244, D-3300 Braunschweig

## Physikalisch-Technische Bundesanstalt

### ANLAGE

zur Konformitätsbescheinigung PTB Nr. Ex-86.B.2106

Der 1/p-Heizform Typ 6113-2.... dient zur Umformung eines elektrischen Signals in ein pneumatisches Drucksignal.

Als Druckmedien dürfen nur nichtzündbare Stoffe verwendet werden.

#### Elektrische Daten

Längsstromkreis.... in Zweipolbauart  
 Eigensicherheit EEx in III  
 nur zur Anschluß an beschriebene eigensichere Stromkreise mit folgenden Nennwerten:

$$U_n = 26 \text{ V}$$

$$I_n = 100 \text{ mA bzw. 25 mA}$$

Die wirksame innere Induktivität und Kapazität sind vernachlässigbar klein.

Die Zuordnung von maximaler Kurzschlussdauer ( $I_{sc}$ ) des eigensicheren Stromkreises und maximal zulässiger Umgebungstemperatur ( $T_U$ ) zur Kennzeichnungsreihe ist folgender Tabelle zu entnehmen:

I <sub>sc</sub>	Temperaturklasse	
	T <sub>1</sub>	T <sub>2</sub>
05 mA	60 °C	76
100 mA	55 °C	70
	70 °C	75
	80 °C	76

#### Prüfungswertelegen

1. Beschreibung (5 Blatt)

2. Zeichnung Nr. 6113-21.... 1

2  
 6113-21... 2

4

1500-3433 1-4

1200-2619 1-1

0230-1678 1-2

Beschreibung und Zeichnungen sind unterschrieben am 6.6.1986.

Im Auftrag

*Johannmeyer*  
 (Dr.-Ing. Johannmeyer)



Braunschweig, 6.6.1986

Blatt 1/1

The text of the certificate is valid for electric connection, for mounting, for commissioning and for operation in hazardous areas. The following translation is only some short information on the design of the converters.

### Technical Data

Translation from "Anlage zur Konformitätsbescheinigung" PTB Nr. Ex-86.B.2106 Sheet 1/1

### Electrical Data

Measuring input circuit...

in protection type "Intrinsic safety" EEx ia IIC.

Only for connection to a certified intrinsically-safe circuit with the following maximum values

$$U_o = 28 \text{ V}$$

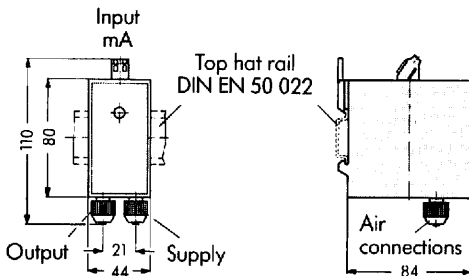
$$I_k = 100 \text{ mA or } 85 \text{ mA}$$

The effective internal inductance and capacitance are negligible.

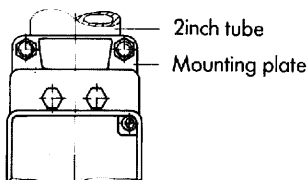
Correlation of the maximum short-circuit current ( $I_k$ ) of the intrinsically safe circuit with the max. permissible ambient temperature ( $T_U$ ) and the temperature class according to the following table:

$I_k$	$T_U$	Temperature class
85 mA	60°C	T6
100 mA	55°C	T6
	70°C	T5
	80°C	T4

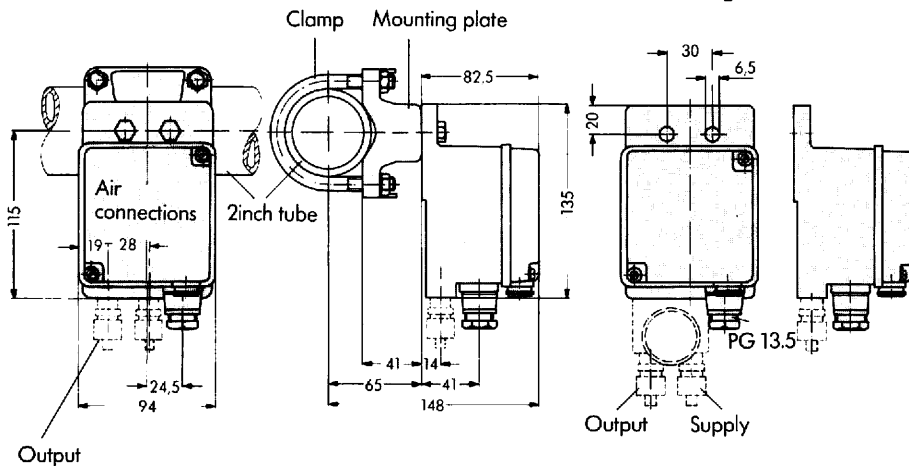
5. Dimensions in mm



Tube mounting



Wall mounting



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