

Electro-pneumatic Signal Converter in Field Housing

IP 24

1 GENERAL

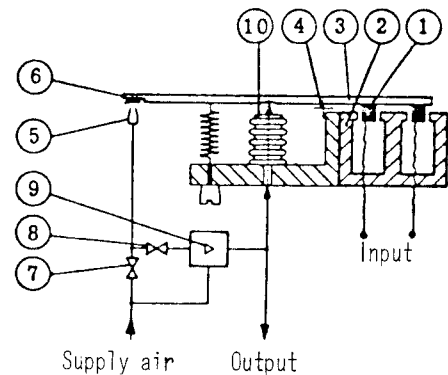
The instrument operates on force-balance principles, and converts electrical signals into pneumatic signals.

The signal converter is available in the following versions:

Input	Explosion protection	Output *	Type
0...20 mA 4...20 mA	without	normal 0.2...1 bar	6 182 422
		inverse 1...0.2 bar	6 182 427
	EEx ia IIC T6/T5 (Ex) is G5 Type BI 618	normal 0.2...1 bar	6 182 442
		inverse 1...0.2 bar	6 182 447
	(Ex) s G5 Type BE 622	normal 0.2...1 bar	6 182 452
		inverse 1...0.2 bar	6 182 457
0...10 mA 0...10 V	without	normal 0.2...4 bar	6 182 472

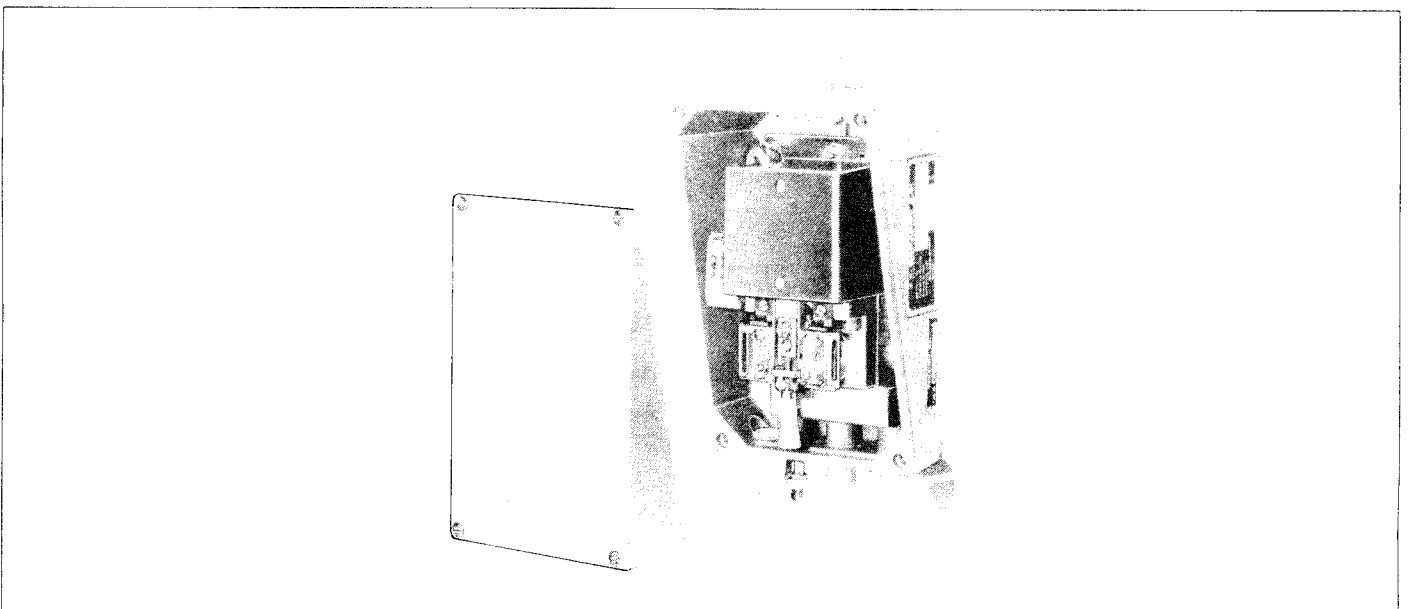
* Output in "psi" or "kPa" possible

2 METHOD OF OPERATION



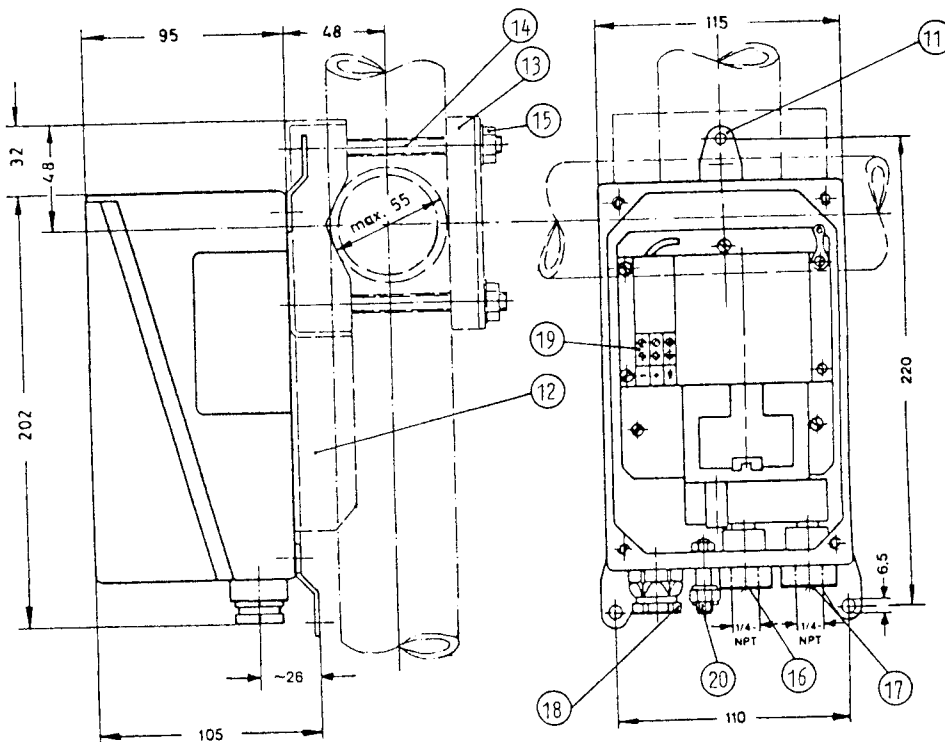
The input signal flows through the
 ① plunger coil, which creates a force in the field of the
 ② permanent magnet. This force acts with a torque on the
 ③ balance beam, which is suspended in the
 ④ flexure strips. This causes the balance beam to be
 deflected and varies the clearance between the
 ⑤ nozzle and
 ⑥ flapper.
 The cascade pressure between the nozzle and the
 ⑦ pre-restrictor varies as a function of the clearance
 between the nozzle and flapper. Via the
 ⑧ damping throttle, the cascade pressure acts on the
 ⑨ booster, which forms the proportional output signal.
 At the same time, the output signal acts on the
 ⑩ compensation bellows, and thus opposes the deflection
 of the balance beam (3).
 The balance beam thus attains a new balance relationship.

Repair and maintenance operations must be carried out by qualified personnel!



3 INSTALLATION

3.1 DIMENSIONS



3.2 MOUNTING POSITION

The instrument can be mounted in any desired position. A change in orientation has no effect on the span of the instrument.

The effect on the zero negligibly small.

In a horizontal mounting position, the instrument has protection class IP 54, and in a vertical position (connections underneath) the protection class is IP 55 or IP 65.

3.3 MOUNTING OF THE SIGNAL CONVERTER

The instrument is designed for wall or pipe mounting.

For mounting on the wall, the

①① 3 fastening lugs mounted on the inside for shipping must be turned outward.

For mounting on pipe, a parts kit, type ZGEG 407 758 026, must be ordered, which allows the signal converter to be mounted on horizontal or vertical pipes or pipe sockets up to max. 55 mm diameter. The parts kit includes

①② mounting plate,

①③ bracket,

①④ bolts and

①⑤ nuts. For this type of mounting, the mounting plate (12) is fastened to the signal converter in place of the 3 fastening lugs (11).

3.4 PNEUMATIC CONNECTIONS

The ①⑥ output signal connection and the ①⑦ supply air connection take the form of female threads 1/4-18 NPT.

Supply air pressure: 1.4 ± 0.1 bar or 20 ± 1.4 psig.

If the instrument has an output signal of 4 bar, the supply air pressure must be $5 + 1$ bar (the instrument is adjusted at 5 bar!).

The supply air must conform to the following requirements (see also IEC 654-2):

1. The dew point of the supply air should be at least 10 K lower than the lowest ambient temperature. The dew point applies to the maximum supply air pressure.
2. Contamination:
 - The supply air must be free from significant amounts of oil vapour, oil and other liquids. ECKARDT recommendation: Max. 10^{-3} g aerosols per m^3 air at 1.01325 bar and 273.15 K; particle size of 92 % of aerosols $\leq 0.5 \mu m$.
 - The supply air must be free from significant amounts of corrosive gases or vapours and solvents.
 - Solid particles must not be present in any significant quantities, and no particles must have a diameter greater than $3 \mu m$.

3.5 ELECTRICAL CONNECTIONS

The electrical leads should be passed through the

①⑧ cable gland Pg 13.5 to the

①⑨ terminals, suitable for max. $2.5 mm^2$ leads.

The terminals are identified -/+ and \oplus .

Whether the instrument is earthed via the \oplus terminal or from the

①⑩ earth connection on the housing, depends on the safety regulations and requirements in force at the plant.

In general, the installation requirements of VDE 0100 will have to be observed, and additionally, VDE 0165 in the case of explosion protected instruments.

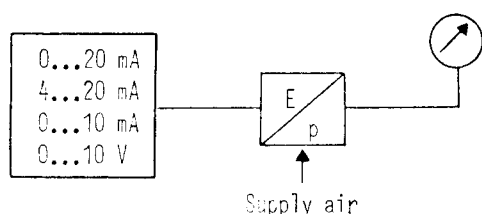
4 COMMISSIONING

Assuming that the converter has been ordered for the correct input and output signal ranges, then the instrument is ready for operation after making the necessary pneumatic and electrical connections.

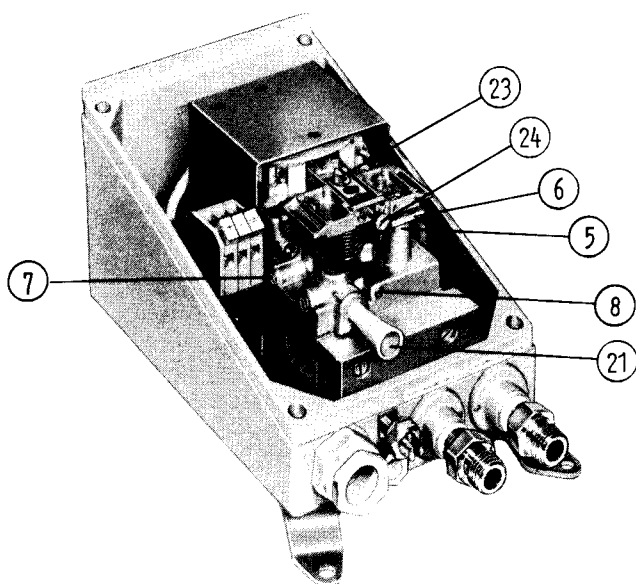
5 CALIBRATION

The signal converter is to be connected in accordance with the following test circuit at its mounting location or in the measuring laboratory, in its operating position.

Current or voltage source



The following paragraphs describe the calibration for a instrument with an input signal range of 0 to 20 mA and an output signal range of 0.2 to 1 bar. The appropriate values for the minimum and maximum inputs must be applied for other versions.



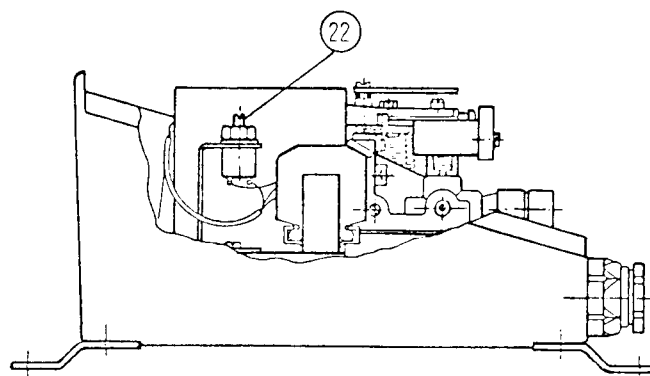
5.1 ZERO ADJUSTMENT

Apply a current signal, 0 mA true zero, to the converter. Rotate the

(21) zero screw until the pneumatic output is 0.2 bar. When the zero screw is turned in a clockwise direction, the output signal rises, and when turned in an anti-clockwise direction, the output falls.

With the reverse-acting version, the output signal should be 1 bar.

5.2 ADJUSTMENT OF THE MAXIMUM INPUT VALUE FOR VERSION WITH 10 V- INPUT



After the zero is adjusted, increase the input to 10 V=100% and adjust the output to 4 bar = 100% with (22) setting screw.

Further adjustment, as described in para. 5.3, is usually unnecessary. If the maximum input value cannot be adjusted (e.g. because of improper disassembly etc.), the instrument must first be adjusted with the setting screw (22) to $R_i = 1000 \text{ Ohms}$. Then, adjust the zero and span correspondingly 0 to 10 V input and 0.2 to 4 bar output, in accordance with paras. 5.1 and 5.3.

5.3 SPAN ADJUSTMENT

After setting the zero, raise the signal to 20 mA corresponding to the full scale value.

The output should then read 1 bar. After slackening off the (23) screw, the span can be increased by rotating the (24) span adjusting screw in a clockwise direction, or reduced by rotating in an anti-clockwise direction.

After each span adjustment screw (23) should be re-tightened before reading off the new output signal value.

Each span change requires a re-adjustment of the zero. Span and zero adjustments should be alternately repeated until the zero of 0 mA corresponds with the output of 0.2 bar, and the full scale value of 20 mA corresponds to an output of 1 bar.

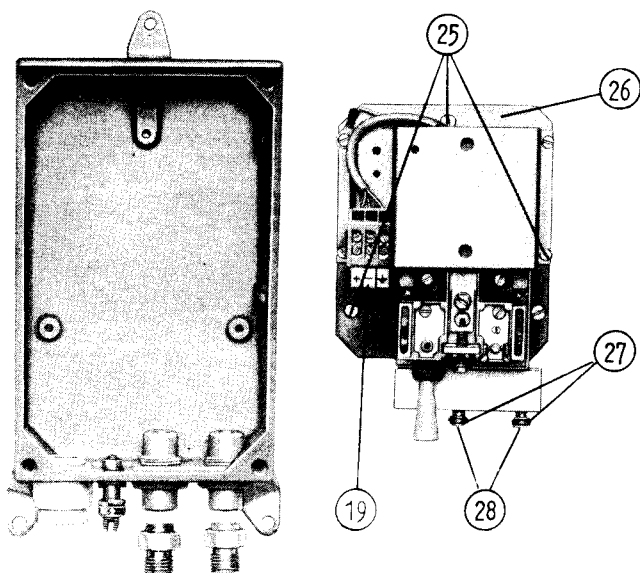
In the reverse-acting version, 1 bar corresponds to the zero, and 0.2 bar to the full scale value.

After the final span adjustment, span adjuster (24) should be backed off 1/2 turn.

6 MAINTENANCE

6.1 CLEANING THE NOZZLE/FLAPPER SYSTEM

Lift the flapper (6) from the nozzle (5) and clean the tip of the nozzle and the flapper with a small brush that was dipped in a solvent (e.g. benzine).

6.2 REMOVAL OF THE I-p ASSEMBLY

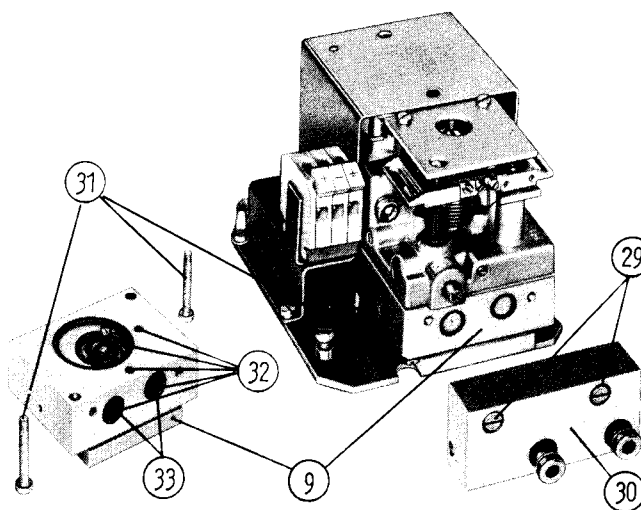
Remove the electrical leads at the terminals (19). Loosen the (25) 3 captive screws used to fasten the complete (26) assembly. Gently lift the assembly from behind and pull out.

Before re-installing the assembly, lightly coat the (27) O-rings on the (28) couplings with Vaseline.

6.3 REPLACEMENT OF THE SINTERED METAL FILTER

Remove the I-p assembly (see para. 6.2). After detaching the connection block (30) and removing the O-rings, the sintered metal filter (33) can be replaced (see illustration in para. 6.4).

Upon reassembly, ensure that the O-rings are properly seated.

6.4 REPLACEMENT OF THE BOOSTER

Remove I-p assembly (see para. 6.2). Remove (29) 2 screws and lift off the (30) connection block. After removing the two (31) booster retaining screws, the booster (9) can be taken out.

When reassembling, ensure that the (32) O-rings and (33) sintered metal filter are correctly installed in the booster.

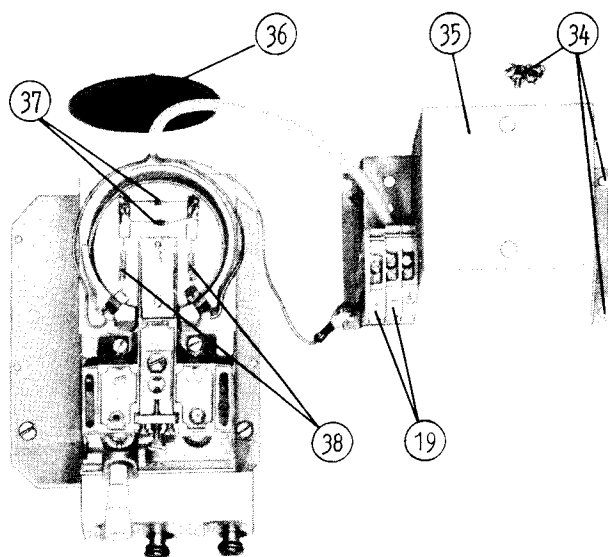
Check the zero (see para. 5.1).

7 REVERSING THE METHOD OF OPERATION FROM "NORMAL" TO "INVERSE"

The method of operation can be altered by changing the coil connecting lead at the terminals. It is also necessary to change the connections of the quenching diodes connected in parallel with the plunger coil; otherwise, they would limit the control range of the converter.

A reversal of the method of operation is not recommended for instruments designed in the degree of protection (Ex) s G5.

The method of operation cannot be changed for instruments with an output of 0.2 to 4 bar.



Remove I-p assembly (see para. 6.2). Remove

- ③④ 4 screws and lift off the
- ③⑤ cover plate.

Caution! Do not break off the coil connection leads.

Remove the

- ③⑥ plastic cap. Unsolder the
- ③⑦ diodes, turn them around by 180° and solder them back in; do not unsolder the
- ③⑧ current leads to the plunger coil!

Change the coil connecting leads at "+" and "-" terminals (19).

Reassemble the instrument.

Connect it up.

Preset the minimum value of the input signal, e.g. 4 mA. Mark the position of the weight and release it from the lever.

Undo the nut of the zero spring and tension the spring until an output value of 1.0 bar is obtained.

Tauten the spring again, making sure that no torque acts on it when the nuts are tightened.

Secure the weight to the marked point again.

Then set the zero and check the span (see also Paras. 5.1 and 5.3).

Caution!

If modifications to explosion-protective instruments were not made by manufacturer, the instruments must be checked by an authorized inspector. § 6 Ex VO.

8 SAFETY REQUIREMENTS

8.1 GENERAL REQUIREMENTS

This device fulfils the requirements of IEC Publ. 348* for protection class I.

Work may only be carried out on electrical components by qualified personnel, if any voltage sources are connected to the device.

The device contains no built-in fuses. Protection against electric shock must be provided on the system side.

8.2 CONNECTION REQUIREMENTS

The device is to be used and to be connected in accordance with the relevant connection diagram (see 3.5) and the application intended.

Local regulations valid for such installations, in Germany DIN VDE 0100 resp. DIN VDE 0800, are to be observed.

The device may be connected to low-voltage circuits, providing the insulation of these circuits against hazardous voltages (e.g. 220 V mains) meets at least the requirements for basic insulation.

The ground conductor must be connected to the corresponding terminal prior to connection of other leads and during operation of the device.

If the connected circuits meet the requirements laid down in IEC 348 for protective low voltages, the device can be operated without a ground conductor (protection class III).

* See DIN IEC 348/VDE 0411, Part 1/...81
(Draft March 1981)

9 FAULT FINDING

The required test instrumentation is:

- a) Current or voltage source
- b) Ammeter and voltmeter or ohmmeter
- c) Pressure test gauge for the output signal (class corresponding to the desired accuracy).

Malfunction	Cause	Rectification									
Input current rises, output signal falls	Incorrect polarity at electrical terminals	Reverse leads at terminals (19)									
	Reverse-acting version fitted in place of direct-acting										
Output pressure does not reach full scale value	Supply air pressure too low	Check supply air pressure									
	Span or zero incorrectly set	Check out converter in accordance with para. 5 "CALIBRATION"									
	Pre-restrictor (7) or damping throttle (8) stopped up (see illustration, page 3)	Unscrew and replace restrictor and throttle									
	Nozzle/flapper system dirty	Clean the nozzle and flapper, see para. 6.1									
	Sintered metal filter stopped up	Replace filter, see para. 6.3									
	Coil defective (shorted windings)	<p>Measure the resistance of the coil.</p> <p>Coil resistances of the individual versions at 20 °C:</p> <table style="margin-left: 20px;"> <tr> <td>Type 6 182 422</td> <td rowspan="3">} 220 Ohms - 50 Ohms</td> </tr> <tr> <td>6 182 427</td> </tr> <tr> <td>6 182 442</td> </tr> <tr> <td>6 182 447</td> <td rowspan="2">} 350 Ohms - 50 Ohms</td> </tr> <tr> <td>6 182 452</td> </tr> <tr> <td>6 182 457</td> <td rowspan="2">} 1000 Ohms - 50 Ohms</td> </tr> <tr> <td>6 182 472</td> </tr> </table> <p>If not within these limits, the coil must be replaced.</p> <p><u>Note:</u> Protective diodes are connected in parallel with the plunger coil. If the measuring instrument is not connected properly, these diodes can cause the resistance reading to be too low. After reversing the polarity, the coil resistance is indicated.</p>	Type 6 182 422	} 220 Ohms - 50 Ohms	6 182 427	6 182 442	6 182 447	} 350 Ohms - 50 Ohms	6 182 452	6 182 457	} 1000 Ohms - 50 Ohms
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The pneumatic pick-up system is functioning correctly when the output signal rises to 1.3 bar (with 1.4 bar supply air) or to 4.5 bar (with 5 bar supply air) when the flapper is pressed against the nozzle.

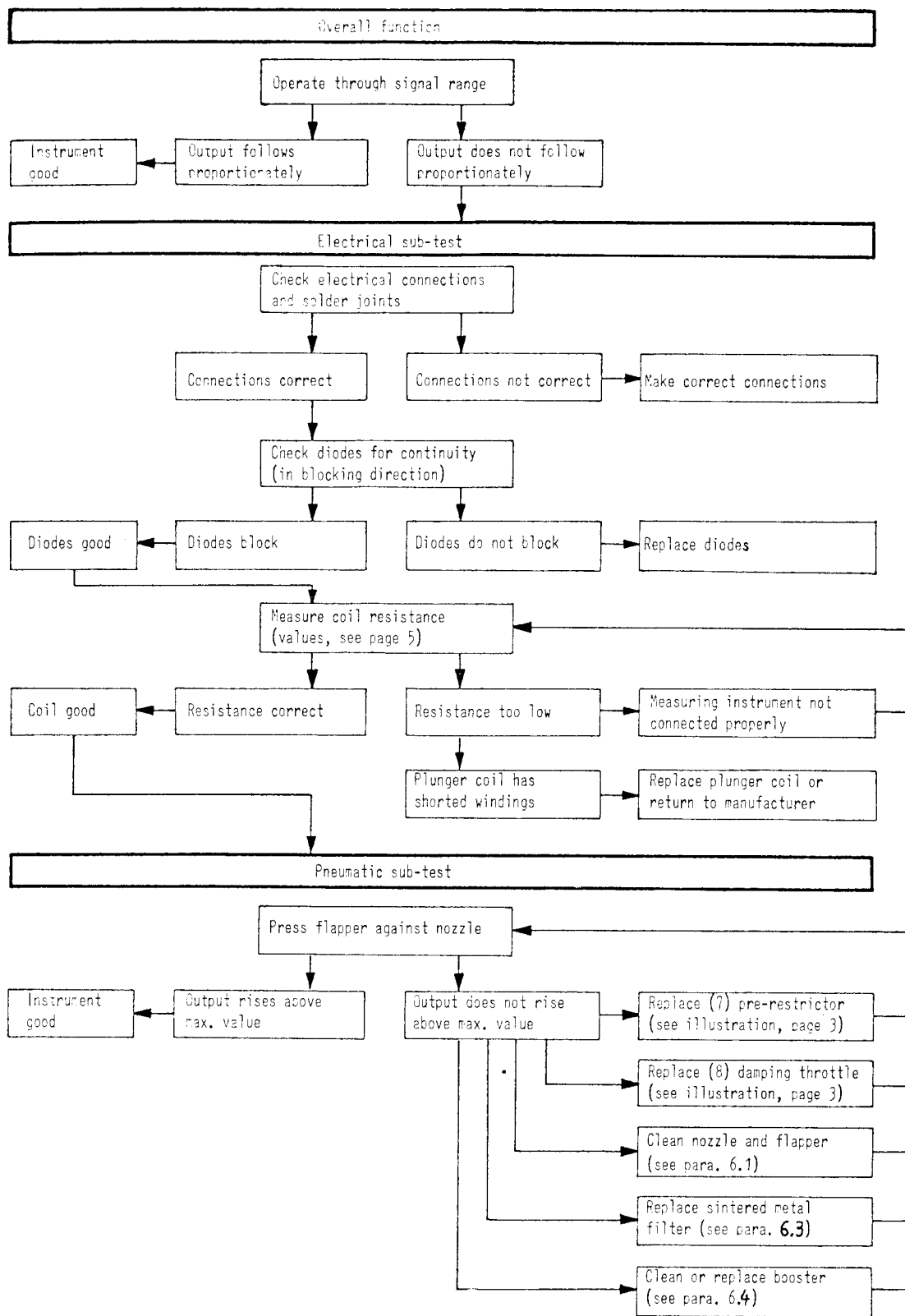
Note:

If (Ex) - type instruments are repaired by others than the manufacturer, then the instrument must be checked after repair by approved specialist staff, § 6 Ex VO.

All repair work outside that described under "FAULT FINDING" must be carried out by the manufacturer, as otherwise trouble-free operation of the converter cannot be guaranteed.

10 FUNCTIONAL TEST

It is a prerequisite that the instrument is properly adjusted and connected



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