

# Differential Pressure Regulator Type 45-6



*Type 45-6 (0.1 to 1 bar, DN 15)*

## **Mounting and Operating Instructions**

**EB 3226 EN**

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**Note!**

*These Mounting and Operating Instructions EB 3226 EN refer to the Type 45-6 Differential Pressure Regulator manufactured from July 2005 onward (0075, see nameplate).*

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### General safety instructions

- ▶ *The differential pressure regulator must be installed, started up and serviced by skilled or semi-skilled staff in accordance with good engineering practice so that employees and third persons are not exposed to danger. All safety instructions and warnings given in these mounting and operating instructions, particularly those concerning installation, start-up, and maintenance, must be strictly observed.*
- ▶ *The regulator complies with the requirements of the European Pressure Equipment Directive 97/23/EC. The declaration of conformity issued for a regulator bearing the CE marking includes information on the applied conformity assessment procedure and is provided on request.*
- ▶ *To ensure appropriate use, only use the regulator in applications where the operating pressure and temperatures do not exceed the operating values specified in the order.  
Note that the manufacturer does not assume any responsibility for damage caused by external forces or any other external factors. Take appropriate safety precautions to prevent hazards that may be caused by the process medium, the operating pressure, or moving parts in the regulator.*
- ▶ *Make sure the regulator is shipped and stored properly.*

### Important!

- ▶ *Depending on the field of application, allow the regulator to cool down or warm up to reach ambient temperature prior to starting any work on the regulator. Always depressurize the relevant section of the plant and, if necessary, also drain the pipeline prior to removing the regulator from the pipeline.*
- ▶ *When carrying out a pressure test on the section of the plant equipped with a pressure regulator, prevent the actuator from being damaged by the test pressure.*
- ▶ *Protect the regulator against frost if it is used to control freezing media.*

**Note!** *Non-electrical control valves, whose valve bodies are not lined with an **insulating material coating**, do not have their own potential ignition source according to the ignition risk assessment stipulated in EN 13463-1: 2001, section 5.2, even in the rare incident of an operating fault. Therefore, such valve versions **do not** fall within the scope of Directive 94/9/EC.*

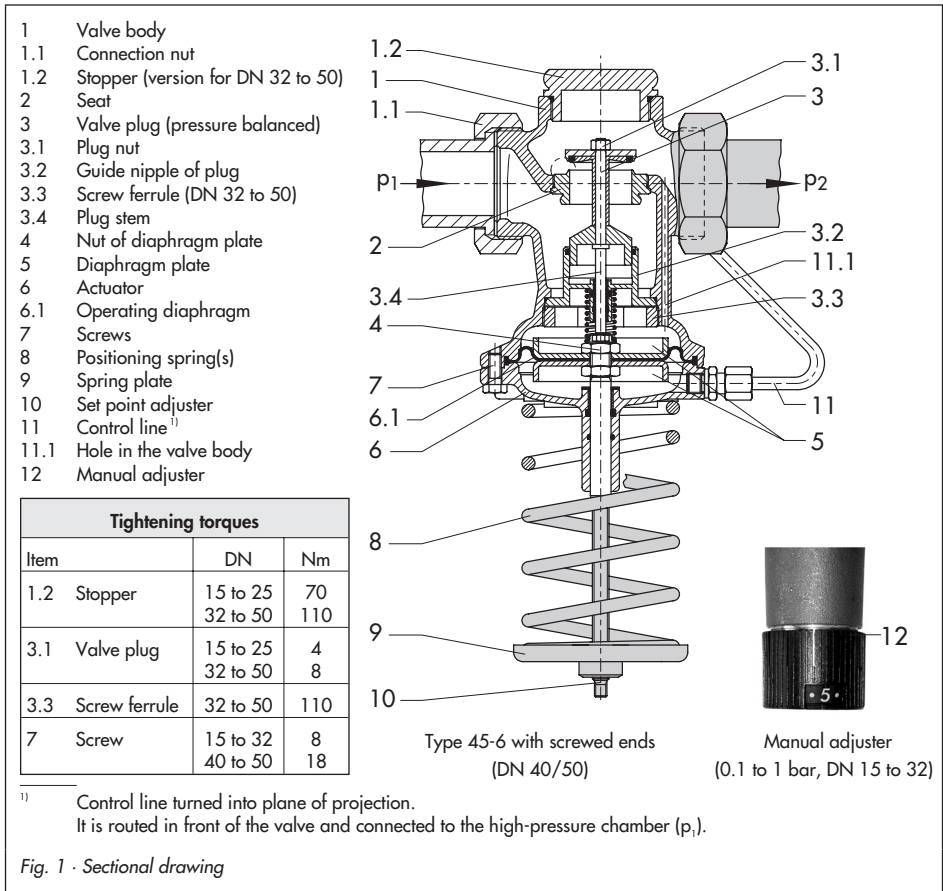
# 1 Design and principle of operation

The differential pressure regulator consists of a valve with a balanced plug and of an opening actuator with an operating diaphragm and a spring assembly.

The differential pressure regulator is designed to maintain the differential pressure

at the adjusted set point. The valve opens as the differential pressure rises.

The differential pressure to be controlled is transmitted to the operating diaphragm (6.1), where it is converted into a force. For this purpose, the downstream pressure (low pressure) is directed through the hole in the valve body (11.1) to the top (low-pressure) diaphragm chamber of the actuator. The



upstream pressure (high pressure) is routed through the attached control line (11) to act on the diaphragm in the high-pressure chamber.

The differential pressure creates a force at the operating diaphragm (6.1) which is used to position the plug depending on the force of the positioning springs (8). The force of the spring assembly is modified by turning the set point adjuster (10).

The principle of operation described above also applies to regulators with a manual adjuster (0.1 to 1 bar, DN 15 to 32). The positioning springs, however, are located in an enclosed housing. The set point is adjusted at the manual adjuster (12) using the scale.

**Note!**

For **external connection** of the control lines (special version) observe the following steps: Connect the high-pressure line of the plant to the high-pressure connection (+) of the actuator (bottom diaphragm chamber) Connect the low-pressure line of the plant to the low-pressure connection (-) of the actuator (top diaphragm chamber) as illustrated in Fig. 1 (left).

## 2 Installation

### 2.1 Mounting position

The differential pressure regulators must be installed in horizontal bypass or short-circuit pipes with the actuator suspended downward (see Fig. 2).

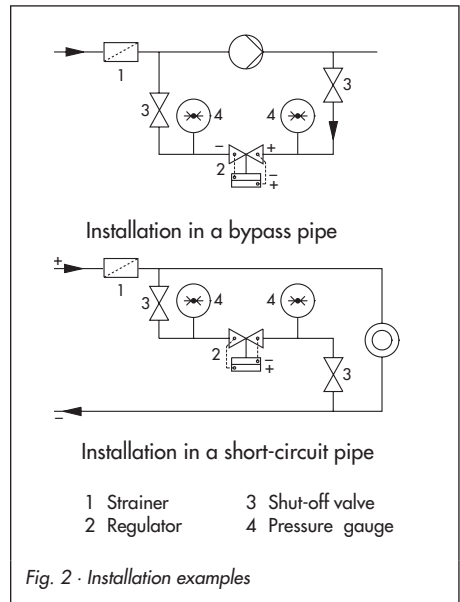
Regulators in sizes DN 15 to DN 25 can also be installed in vertical pipelines. For medium temperatures above 80 °C, the reg-

ulator must not be installed with the diaphragm actuator pointing upward. The medium must flow through the valve in the direction indicated by the arrow on the body.

### 2.2 Strainer

Since sealing parts, globules, and other impurities carried along by the medium may impair the proper functioning of the valve and especially the tight shut-off, a strainer (e.g. SAMSON Type 1NI) must be installed upstream of the differential pressure regulator.

The strainer must be installed so that the medium flows through it in the direction indicated by the arrow on the strainer body. The filter element must be suspended downward. Ensure that there is sufficient space available to remove the filter.



## 2.3 Shut-off valves, gauges

We recommend the installation of hand-operated shut-off valves both upstream of the strainer and downstream of the regulator. This allows the plant to be shut down for cleaning and maintenance routines or when it is not operated for extended periods. Install pressure gauges upstream and downstream of the valve to monitor the pressures prevailing in the plant.

## 3 Operation

### 3.1 Start-up

Fill the plant very slowly on start-up. When pressure-testing the pipelines with the regulator installed, make sure the test pressure does not exceed 1.5 times the nominal pressure.

### 3.2 Set point adjustment

The required differential pressure is adjusted at the set point adjuster (10) or the manual adjuster (12) by loading the spring(s).

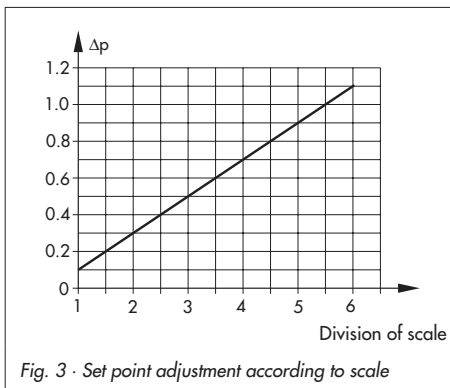


Fig. 3 · Set point adjustment according to scale

- ▶ Turn the adjuster clockwise to increase the differential pressure.
- ▶ Turn the adjuster counterclockwise to reduce the differential pressure.

In the case of regulators with set point ranges from 0.1 to 1 bar in sizes DN 15 to 32, the positioning springs are located in the actuator housing,

The set point can be adjusted directly at the manual adjuster (12) on the basis of the scale value (see Fig. 5).

One turn of the manual adjuster will change the differential pressure by 0.033 bar.

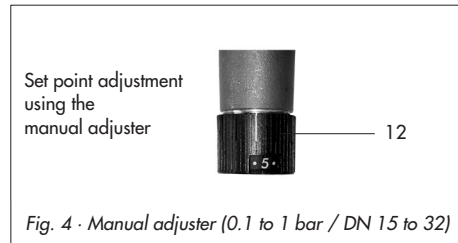


Fig. 4 · Manual adjuster (0.1 to 1 bar / DN 15 to 32)

#### Note!

*Do not adjust the set point to a scale value smaller than "1"!*

*Under certain conditions, the set point **cannot** be adjusted anymore as a result.*

*In this case, the following steps are recommended:*

- *Relieve the process pressure from both sides of the regulator.*
- *Turn the manual adjuster counterclockwise as far as it will go to its lowest position.*
- *Turn the manual adjuster back clockwise at least past the scale value "1" to "2".*
- *The regulator can now be readjusted.*

## 4 Maintenance – Replacing parts

The regulator is maintenance-free, but is subject to wear and tear, especially at the seat, plug and operating diaphragm. Depending on the application conditions that prevail, the regulator must be inspected at appropriately scheduled intervals to prevent any problems before they occur. Details on faults and the recommended action can be found in the table on page 8. If a problem cannot be solved with the help of the information specified in the table, contact SAMSON. In order to replace the plug and operating diaphragm, proceed as described in sections 4.1 and 4.2.



### **Caution!**

*To carry out any work on the differential pressure regulator, you have to remove the device from the pipeline. For this purpose, first allow the relevant section of the plant to cool down in the case of high temperatures. Then, depressurize and drain this section prior to removing the regulator.*

### 4.1 Cleaning and replacing the plug

– Refer to Fig. 1 on page 4 –

### **Caution!**

*The positioning springs are pre-loaded. Take appropriate precautionary measures: if necessary, make a disassembly tool or use SAMSON's disassembly tool 91 29-2747.*

1. Remove regulator from the pipeline. Unscrew control line (11).
2. Disassemble positioning springs (8).
3. Unscrew stopper (1.2).
4. Loosen body screws (7) and remove actuator.
5. Unscrew plug nut (3.1) and remove valve plug (3) from plug stem.
6. For valve sizes **DN 15 to 25**, unscrew and remove the guide nipple of the plug (3.2) using a socket wrench (order no. 1280-3001).  
For valve sizes **DN 32 to 50**, first remove screw ferrule (3.3) and then pull out guide nipple (3.2).
7. Clean seat and plug assembly thoroughly. Check control line, screw connections, and hole (11.1) for any blockages.  
Should the plug be damaged, replace the entire plug assembly.  
Replace the seat if it is damaged.

To reassemble the regulator, proceed in reverse order.

Make sure that the diaphragm is inserted properly in the body groove before fastening the components.

Refer to tightening torques listed in the table in Fig. 1.

## 4.2 Replacing the diaphragm

– Refer to Fig. 1 on page 4 –

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### **Caution!**

*The positioning springs are pre-loaded.  
Take appropriate precautionary measures: if  
necessary, make a disassembly tool or use  
SAMSON's disassembly tool 9129-2747.*

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1. Disassemble positioning springs (8).
2. Unscrew control line (11).
3. Loosen screws (7) and lift off actuator.
4. Unscrew nut (4) sealed with paint while holding lower nut stationary.
5. Lift off diaphragm plate (5) and replace operating diaphragm (6.1).

To reassemble, proceed in reverse order.

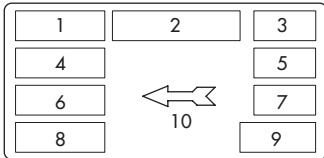
Make sure that the diaphragm is inserted properly in the body groove before fastening the components.

Refer to tightening torques listed in the table in Fig. 1.

## 5 Troubleshooting

Fault	Possible cause	Solution
Differential pressure set point is exceeded	Valve too large for control task	Recalculate the valve sizing flow coefficient, $K_{VS}$ , and contact SAMSON.
	Seat and plug untight	Remove valve, clean seat and plug. If necessary, replace plug (section 4.1). Otherwise, return the device to SAMSON for repair.
	Operating diaphragm defective	Replace diaphragm (section 4.2) or return the device to SAMSON for repair.
	Control line blocked	Remove control line and clean it.
Differential pressure set point is not reached	Valve too small for control task	Check set point range and contact SAMSON.
	Safety device, e.g. pressure limiter, has been triggered	Check plant, unlock safety device.
	Insufficient pressure drop across the plant	Compare existing differential pressure across the plant with the plant's drag.
	Strainer blocked	Drain and clean filter of the strainer.
	Wrong installation of valve	Reinstall the valve in such a way that the medium flows through the valve in the direction indicated by the arrow.
Control loop hunts	Valve too large for control task	Recalculate the valve sizing flow coefficient, $K_{VS}$ , and contact SAMSON.

## 6 Nameplate



- 1 Model number
- 2 Configuration ID
- 3 Year of manufacture
- 4 Type designation
- 5 Nominal pressure PN or ANSI Class
- 6 Flow coefficient  $K_{vs}$  or  $C_v$
- 7 Max. perm. temperature °C or °F
- 8 Set point range,  
differential pressure in bar or psi
- 9 Max. perm. differential pressure  $\Delta p$
- 10 Arrow indicating direction of flow

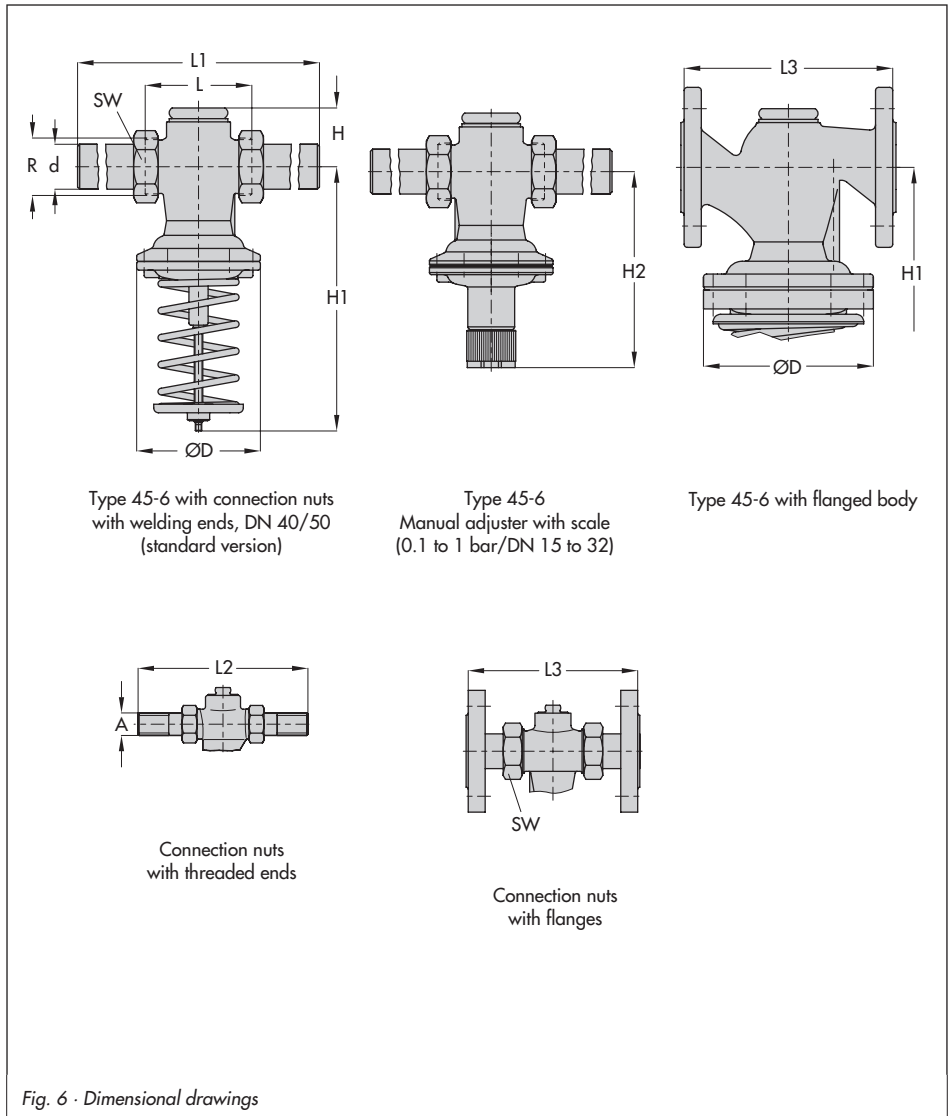
Fig. 5 · Nameplate

## 7 Customer inquiries

In case of inquiries, please submit the following details:

- ▶ Regulator type and nominal size
- ▶ Thread or flange connection
- ▶ Model number
- ▶ Upstream and downstream pressures
- ▶ Flow rate in  $m^3/h$
- ▶ Has a strainer been installed?
- ▶ Installation diagram

## 8 Dimensions and weights



## Dimensions and weights

Nominal size DN	15	20	25	32	40	50
Inside pipe diameter d	21.3	26.8	32.7	42	48	60
Connection D	G ¾	G 1	G 1¼	G 1¾	G 2	G 2½
Width across flats SW	30	36	46	59	65	82
Length L	65	70	75	100	110	130
Height H	40			58		
Height H1	230			250	380	
Height H2	160			180	-	
Height H3	85			105	140	
Diameter D	116				160	
Welding ends L1	210	234	244	268	294	330
Weight appr. kg	2.0	2.1	2.2	8.5	9	9.5
<b>Special version with threaded ends (male thread)</b>						
Length L2	129	144	159	180	196	228
Male thread A	G ½	G ¾	G 1	G 1¼	G 1½	G 2
Weight appr. kg	2.0	2.1	2.2	3.5	9	9.5
<b>Special version with flanges PN 16/25 or version with flanged body (DN 32, 40 and 50)</b>						
Length L3	130	150	160	180	200	230
Weight appr. kg	3.4	4.1	4.7	6.7	13	14.5





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