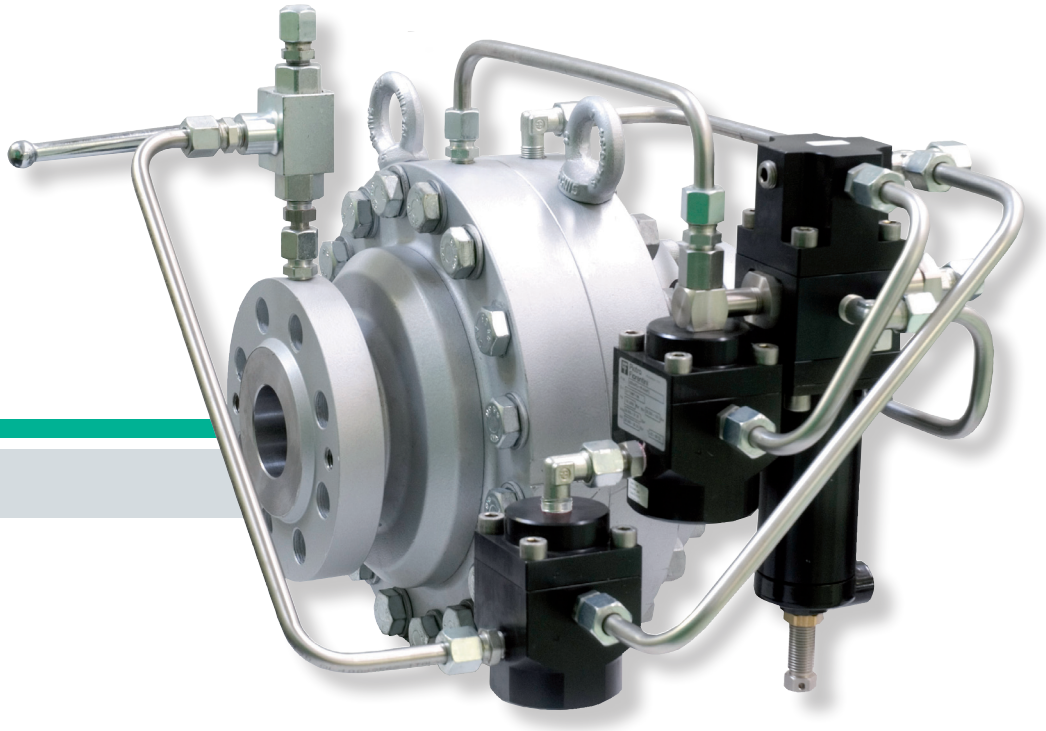
Pietro Fiorentini



ASX 176/FO

Axial Pressure regulator

Classification and Area of Application

ASX 176/FO is a downstream pressure regulator, pilot controlled, for medium and high pressure applications.

It is particularly suitable for use within the framework of installations for the distribution of natural gas, as well as for supply networks for civil and industrial use.

The accuracy of the regulated pressure, the high rangeability ratio, together with the fast adaption to changes in the operating conditions, even in the presence of abrupt changes in the flow rate, makes the Regulator **ASX 176/FO** particularly suitable for uses in gas supply installation of electric power generation stations (Turbogas).

The **ASX 176/FO** regulator is classified according to the European standard **EN334**, as a fail to open regulator.

ASX 176/FO is the Axial regulator of **Pietro Fiorentini**, with an increased capacity to allow greater flow rates compared to the other types of regulators of the same size.

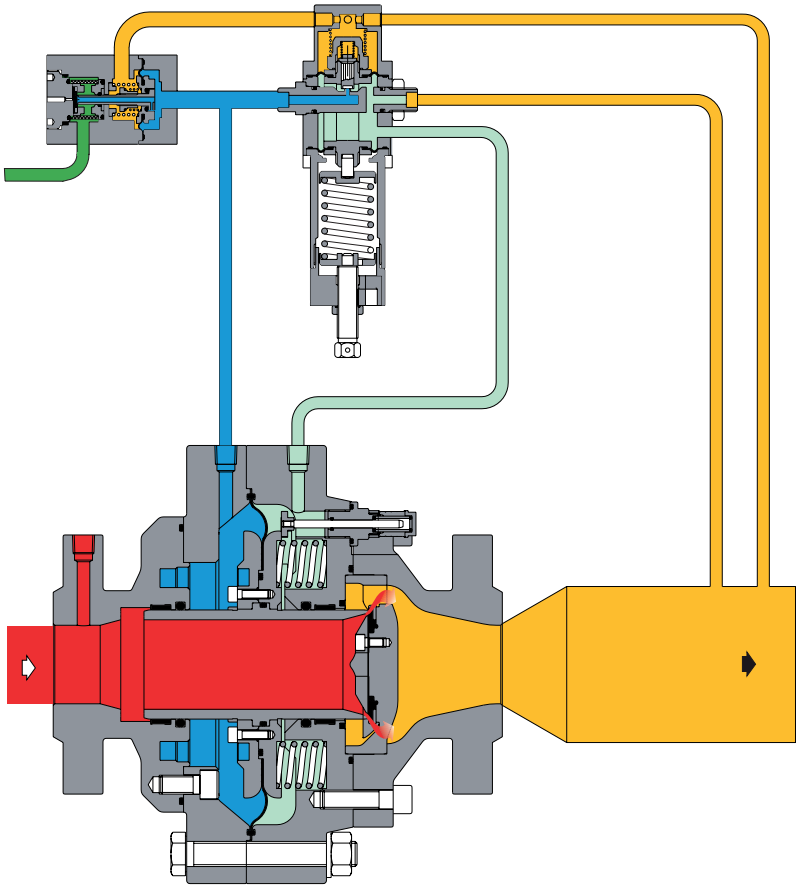


Fig.1 **ASX 176/FO** - Basic Version

FEATURES

Functional features:*

Maximum inlet pressure:	Up to 102 bar
Range of downstream pressure:	from 1 bar to 74 bar depending on installed pilot (see Pilot section).
Minimum working differential pressure:	1,9 bar
Minimum ambient temperature:	Execution up to -40°C,
Maximum ambient temperature:	+60°C
Inlet gas temperature:	Up to -20°C + 60°C,
Accuracy class AC:	Up to 2,5
Lock-up pressure class SG:	Up to 10

Design features:

Nominal dimensions DN:	25 (1”); 50 (2”); 80 (3”); 100 (4”); 150 (6”).
Flanged connections:	Class 300-600 RF or RTJ, according to ANSI B16.5.

Materials:**

Body:	Steel ASTM A 350 LF2.
Plug:	ASTM A 350 LF2 Nikel coated on sealing surface
Seat:	Polimer / Nitril rubber vulcanized on a metal support
Diaphragm:	Rubberized canvas (performed by hot-pressing process.).
Sealing ring:	Nitril rubber
Connection fittings:	In zinc-plated carbon steel according to DIN 2353; Stainless steel on request.

REMARK: * Different functional features available on request.
** The materials indicated above refer to the standard models.
Different materials can be provided according to specific needs.

Cg, KG and K1 coefficient

Nominal diameter					
Millimeters	**25**	**50**	**80**	**100**	**150**
Inches	**1"**	**2”**	**3”**	**4”**	**6”**
Cg flow coefficient	630	2300	5000	8800	19000
KG flow coefficient	663	2420	5260	9258	19988
K1 body shape factor	145	145	145	145	145

Tab.1

For sizing formulas refer to www.fiorentini.com/sizing

Pilots System

The operation of the regulator **ASX 176/FO** is assured by a piloting system consisting, as basic option, of two separate devices: the **Preregulator** and the **Pilot**.

Pre-regulator

The following models are available:

- **R14/A/FO**: Self-adjusting pre-regulator that automatically regulates the feeding pressure to the pilot depending on the desired regulation pressure. It is equipped with integral filter and supplied from the gas high pressure side.
- **Three-way valve + R14/A + R14/A/FO**: optional system for self-operation.
- **R14/A**: additional pre-regulator used to increase the regulator response.

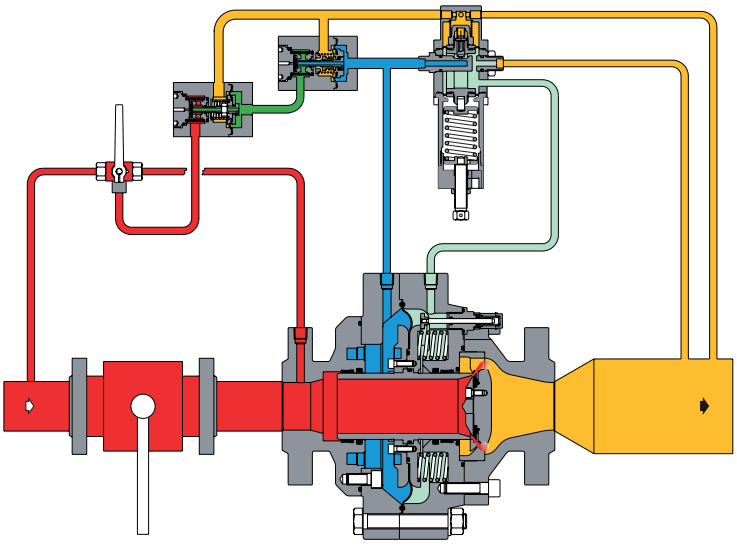


Fig. 2 **ASX 176/FO** - Regulator with 3-way valve +R14/A + R14/A/FO

Pilot

The pilots used for the **ASX 176/FO** regulators are from **series 200**.
The available models, in relation to the pressure to be regulated, are:

- **204/A/FO** Downstream pressure setting range from 1 to 33 bar (with different calibration springs),
- **205A/FO** Downstream pressure setting range 20 to 60 bar (with different calibration springs),
- **207/A/FO** Downstream pressure setting range 41 to 74 bar (with different calibration springs).

The pilots can be manually adjusted on the field or from remote.
In the different cases, in order to be identified, they are assigned the following suffixes:

- **.../A** Manual calibration on field
- **.../D** Electric/Electronic remote setting control
- **.../CS** Control with pneumatic of remote setting range
- **.../F.I.O.** SMART unit for remote adjustment that allow the indirect measurement, and the flow limitation.

Incorporated Silencer DB/176

The silencer **DB/176** allows absorbing the noise that is generated in the pressure regulator during the lamination process.
Its great efficiency is due to the fact that noise absorption takes place at the same point where it is generated, thus preventing its propagation.

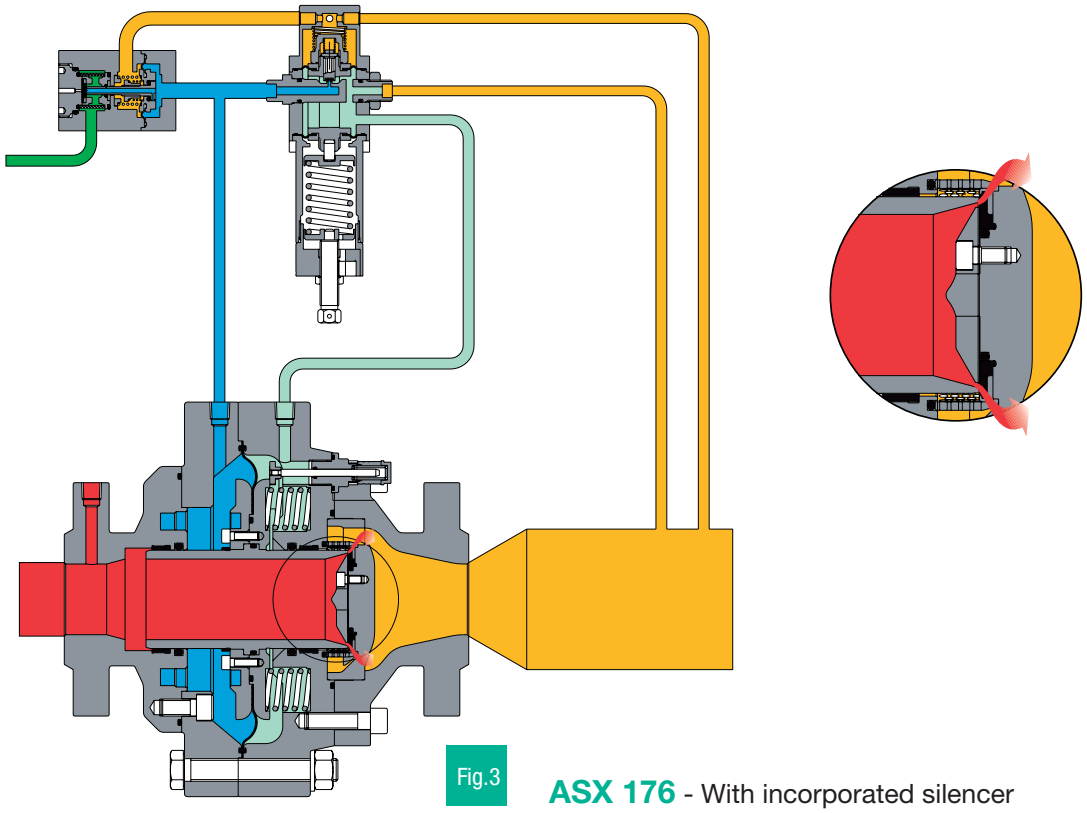


Fig.3 **ASX 176** - With incorporated silencer

This mechanical solution allows to still have the possibility of incorporating in the basic regulator, besides the silencer, also the slam-shut valve or the monitor.
With the application of the silencer **DB/176** the Cg and KG valve coefficients are 10% lower than the corresponding basic regulator.

Monitor incorporated PM/176

The **MONITOR REGULATOR** is a safety accessory whose task is that of performing the functions of the service regulator in case of failure of the main regulator.
This is a regulator that is normally in fully open position during normal operation of the operating regulator.
It is generally installed following the gas flow direction, upstream of another pressure regulator that acts as OPERATING regulator

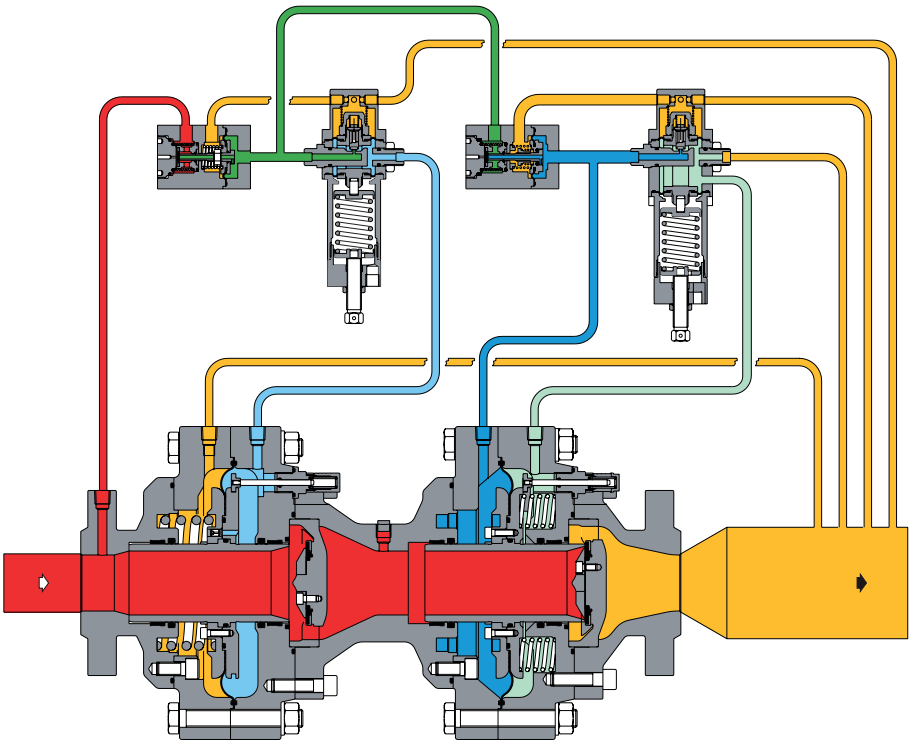


Fig.4 **ASX 176/FO** - With monitor incorporated

In this specific case, the Monitor **PM/176** is mounted on the same body of the operating regulator but it is provided with its own sealing seat, piloting system and an independent motorization.
The functional characteristics of the **Monitor PM/176** are the same of the basic regulator **ASX 176/FO.**
The assembly **ASX 176/FO** with **Monitor PM/176** is characterized by equivalent coefficients Cg and KG reduced by **16%** compared to those of the basic regulator.
This solution allows creating reduction lines featuring very small overall dimensions and lower pressure drops compared to the traditional solution of the two regulators installed in line.

In-line Monitor

In this solution, the Monitor regulator and Operating one are installed in series.
Fig. 4 represents the traditional solution where the monitor is usually installed upstream and the operating regulator is installed downstream (following the gas flow direction).
The Monitor regulator is set at a value that is slightly higher than the calibration set-point of the Operating regulator.

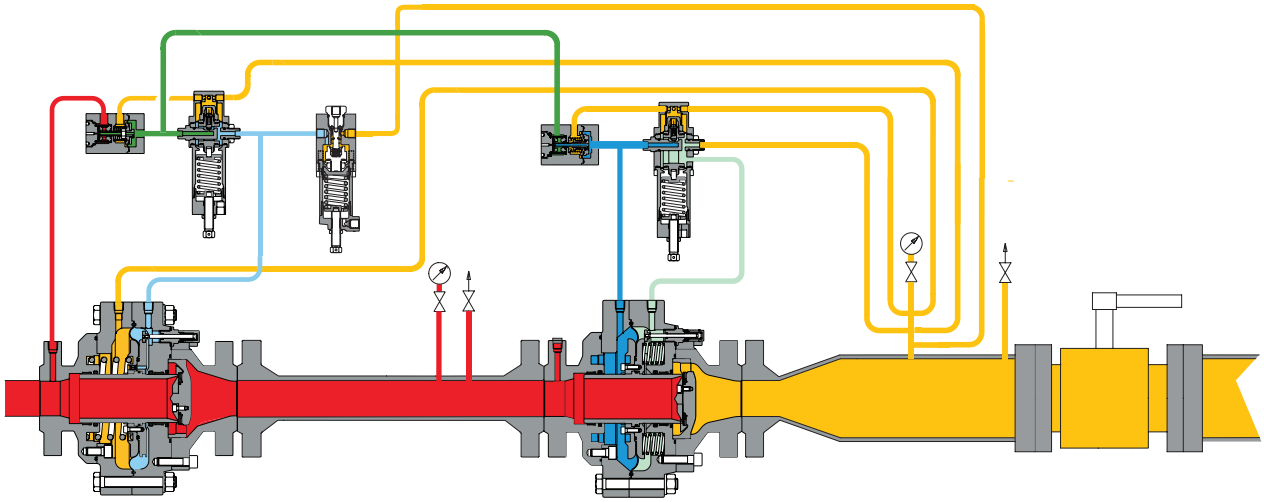


Fig.5 **ASX 176/FO** - Solution with in-line monitor ASX 176

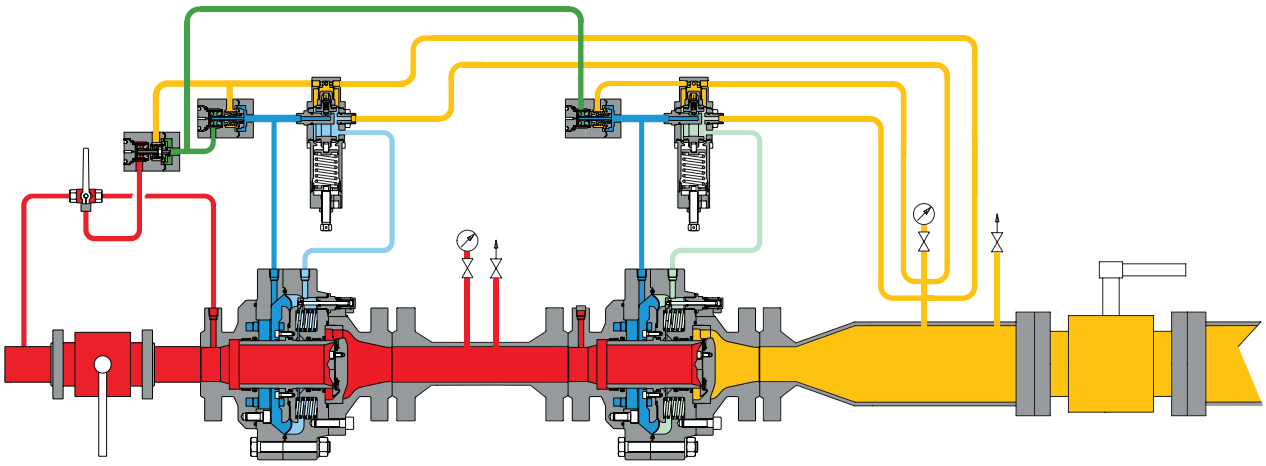


Fig.6 **ASX 176/FO** - Solution with in-line monitor ASX 176/FO

Optional

For the pressure regulators:

- Stroke limiters
- Devices for flow rate limitation
- Limit switches
- Position transmitters
- Steel fittings, single or dual sealing

For the pilot circuit

- R14/A/S Preregulator for the high pressure circuit (P > 12 bar)
- Heating cable for preheating pilot circuit
- Electrical Heater
- Supplementary Filter CF 14
- Dehydrating Filter CF 14/D
- Fluid Control 896, Pilots for modulation of pressure adjustment
- …/F.I.O. SMART unit for remote adjustment

Sizing of pressure Regulator

In general, the choice of a regulator is made based on the calculation of the flow rate determined by the use of formulas and on the flow rate coefficients (Cg or KG) as indicated by the EN 334 standard.
For the sizing of the involved regulators, kindly refer to our website: www.fiorentini.com/sizing.

For different gases and for natural gas with a different density than 0.61 shall be applied the correction coefficients resulting from the following formula:

$$Fc = \sqrt{\frac{175.8}{S \times (273.16 + t)}}$$

S = relative density to air
t = gas temperature [°C]

Correction factors FC		
Type of gas	**Relative density (S)**	**Fc factor**
Air	1.00	0.78
Propane	1.53	0.63
Butane	2.00	0.55
Nitrogen	0.97	0.79
Oxygen	1.14	0.73
Carbon dioxide	1.52	0.63

Tab.2

The chart shows the correction factors FC valid for above mentioned gas at 15 °C and to the declared relative density.

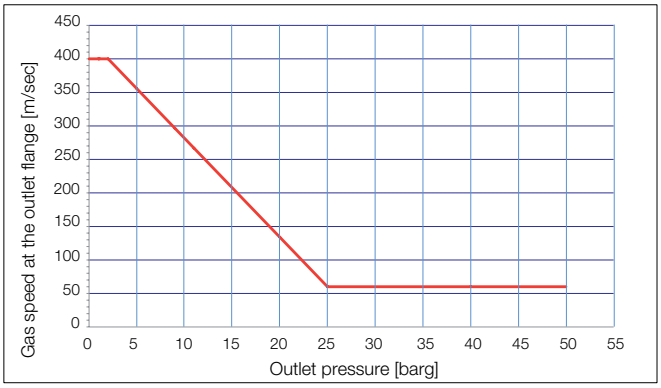
Flow rate conversion				
Stm^3/h	**x**	**0,94795**	**=**	**Nm^3/h**

Tab.3

CAUTION:
In order to get optimal performance, to avoid premature erosion phenomena and to limit noise emissions, it is recommended to check that gas speed at the outlet flange does not exceed the values of the graph below.
The gas speed at the outlet flange may be calculated by means of the following formula:

$$V = 345.92 \times \frac{Q}{DN^2} \times \frac{1 - 0.002 \times Pd}{1 + Pd}$$

where:
V = gas speed in m/sec
Q = gas flow rate in Stm3/h
DN = nominal size of regulator in mm
Pd = outlet pressure in barg.



TYPICAL CONNECTION DIAGRAMS

The following examples are provided as a recommendation to get the best performance from the regulator **ASX 176/FO**.

IN-LINE INSTALLATION

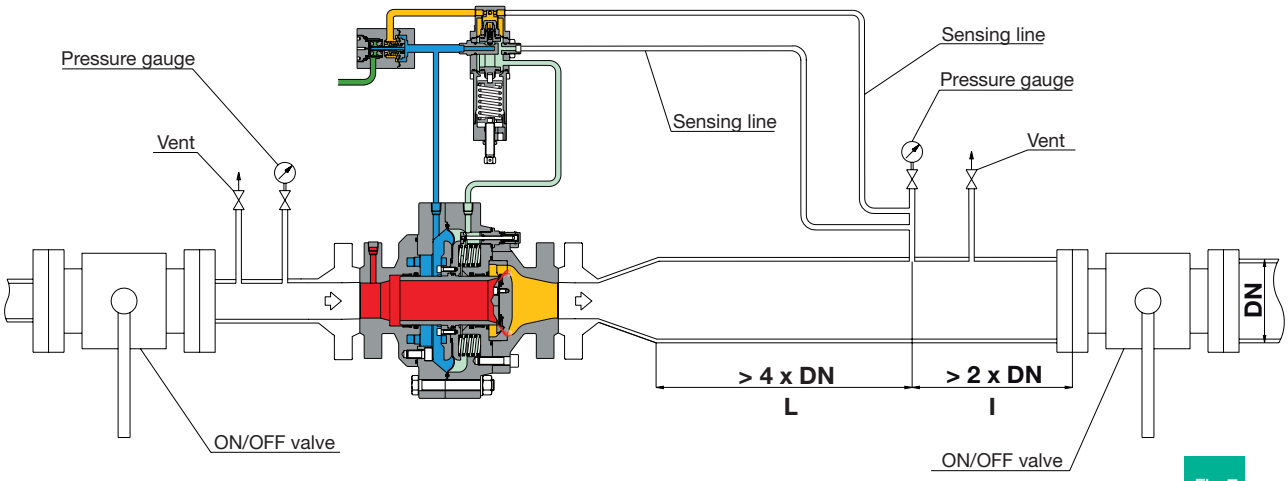
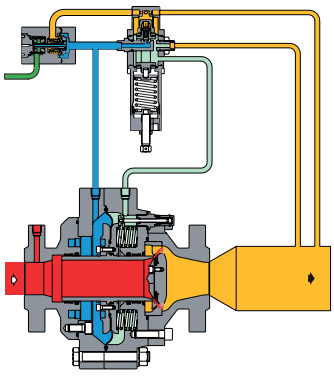


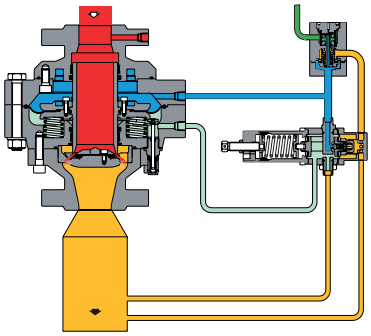
Fig.7

RECOMMENDED INSTALLATIONS



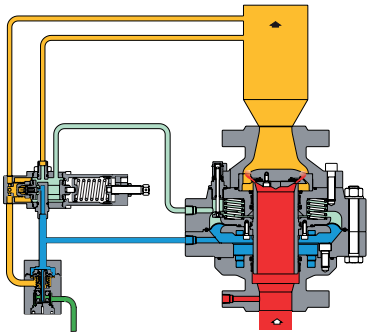
Standard position
(horizontal)

Fig.8



Vertical position
(Flow: Top-down)

Fig.9



Vertical position
(Flow:Bottom-up))

Fig.10

Inlet pressure

Outlet pressure

Motorization

Motorization Monitor

Pilot power supply

FO pilot power supply

Slam Shut SBC 782 and operating pressure regulator ASX 176/FO

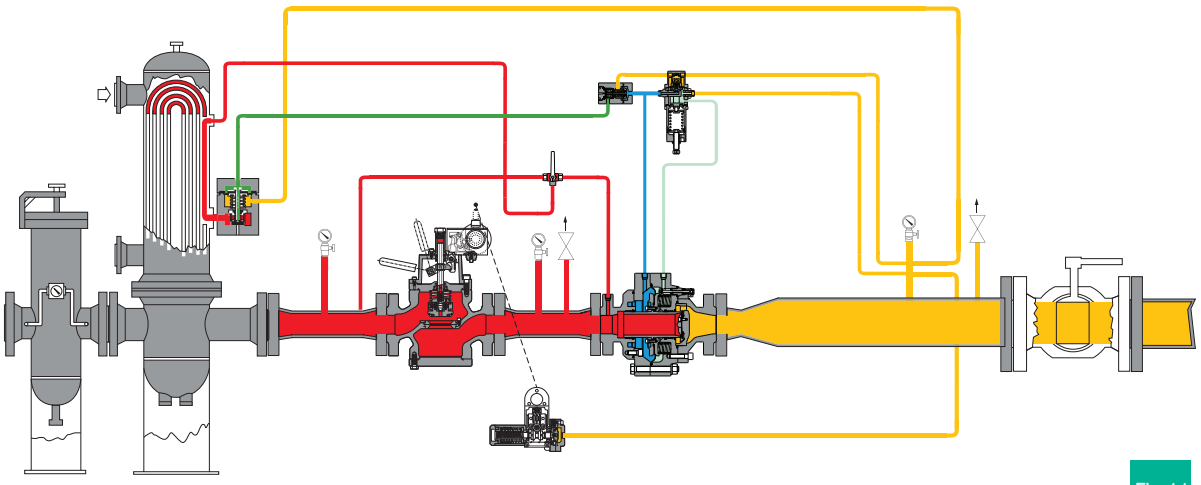


Fig.11

Slam Shut HBC 975 and operating pressure regulator ASX 176/FO

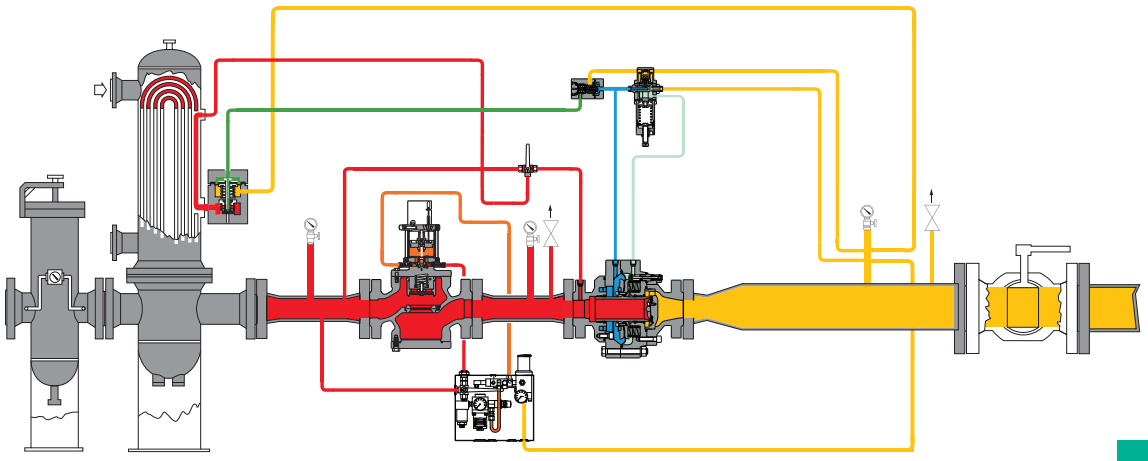


Fig.12

RECOMMENDED INSTALLATIONS

Slam Shut SBC 782 and Monitor ASX 176 and operating pressure regulator ASX 176/FO

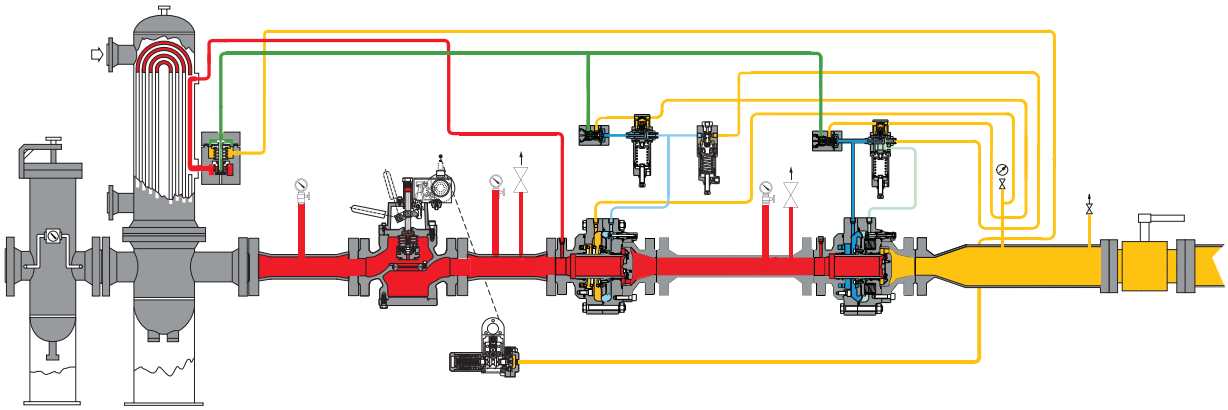


Fig.13

Slam Shut HBC 975 and Monitor ASX 176 and operating pressure regulator ASX 176/FO

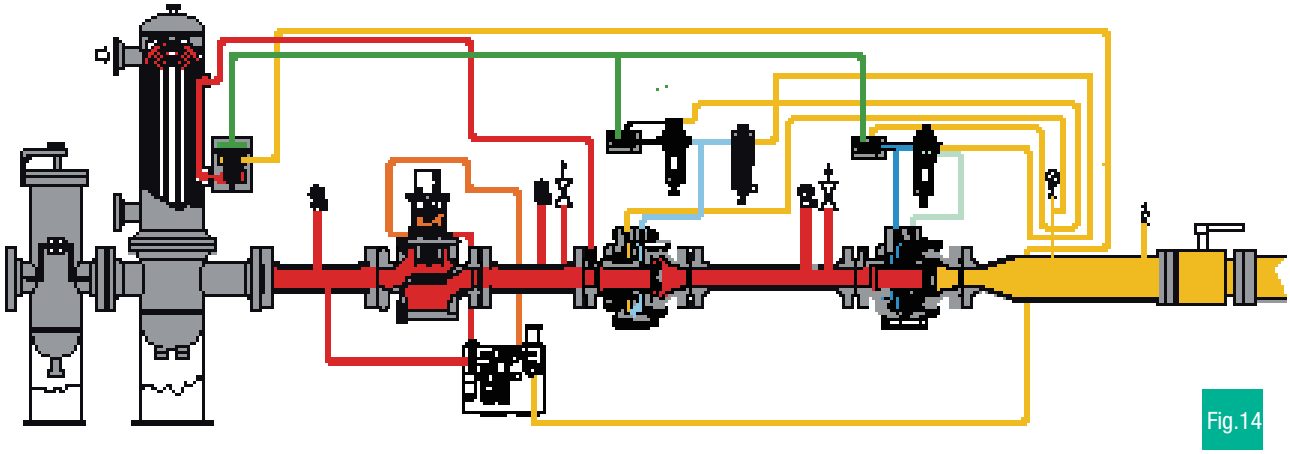


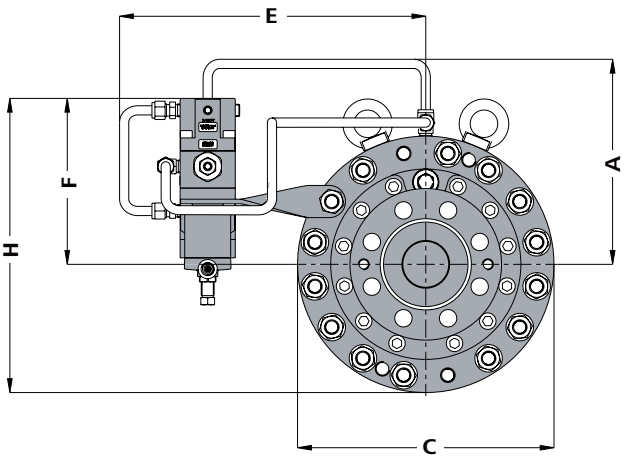
Fig.14

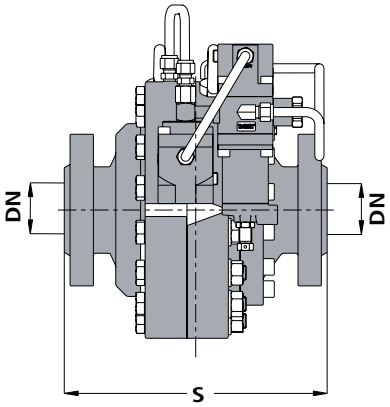
DIMENSIONS and WEIGHT ASX 176/FO

Dimensions					
Millimeters	**25**	**50**	**80**	**100**	**150**
Inches	**1"**	**2”**	**3”**	**4”**	**6”**
S - Ansi 300	197,4	267	317	368	473
S - Ansi 600	210	286	336	394	508
A	180	180	223	263	318
C	279	279	359	440	550
E	335	335	375	409	465
F	181	181	186	203	201
H	321	321	365	425	476
					Tab.4

Pneumatic fittings; 10x8mm
Dimensions S according to EN 334 and IEC 534-3

Weight in Kg					
Ansi 300	55	72	123	214	333
Ansi 600	55	74	126	225	365
					Tab.5



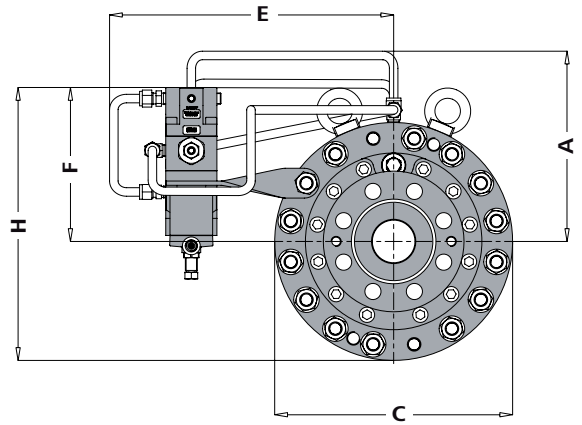


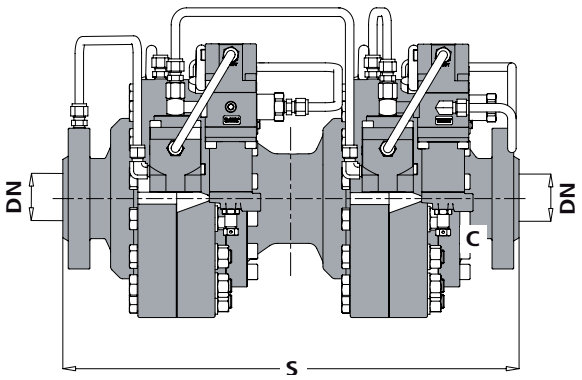
DIMENSIONS and WEIGHT PM/176

Dimensions				
Millimeters	**25**	**50**	**80**	**100**
Inches	**1"**	**2”**	**3”**	**4”**
S - Ansi 300	372,4	516	581	694
S - Ansi 600	385	535	600	720
A	180	180	223	263
C	279	279	359	440
E	335	335	375	409
F	181	181	186	203
H	321	321	365	425
				Tab.6

Pneumatic fittings; 10x8mm
Dimensions S according to EN 334 and IEC 534-3

Weight in Kg				
Ansi 300	110	137	239	425
Ansi 600	110	139	242	445
				Tab.7





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CT-s 653-E May 18