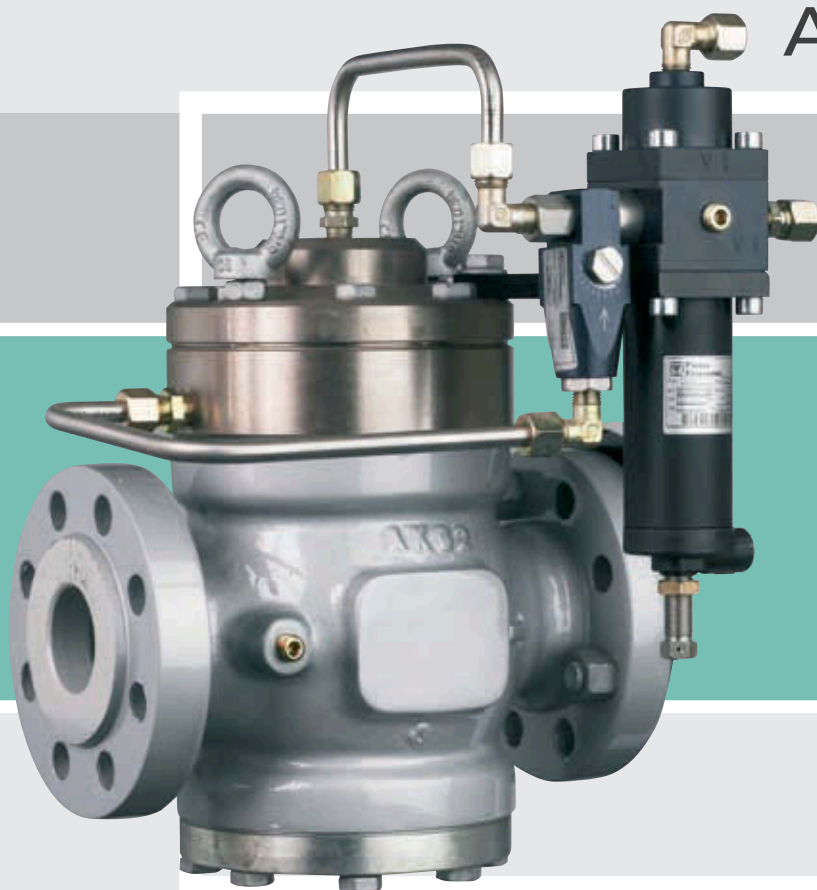




Aperflux 851

Pressure
Regulators



Aperflux 851

> Pressure regulators



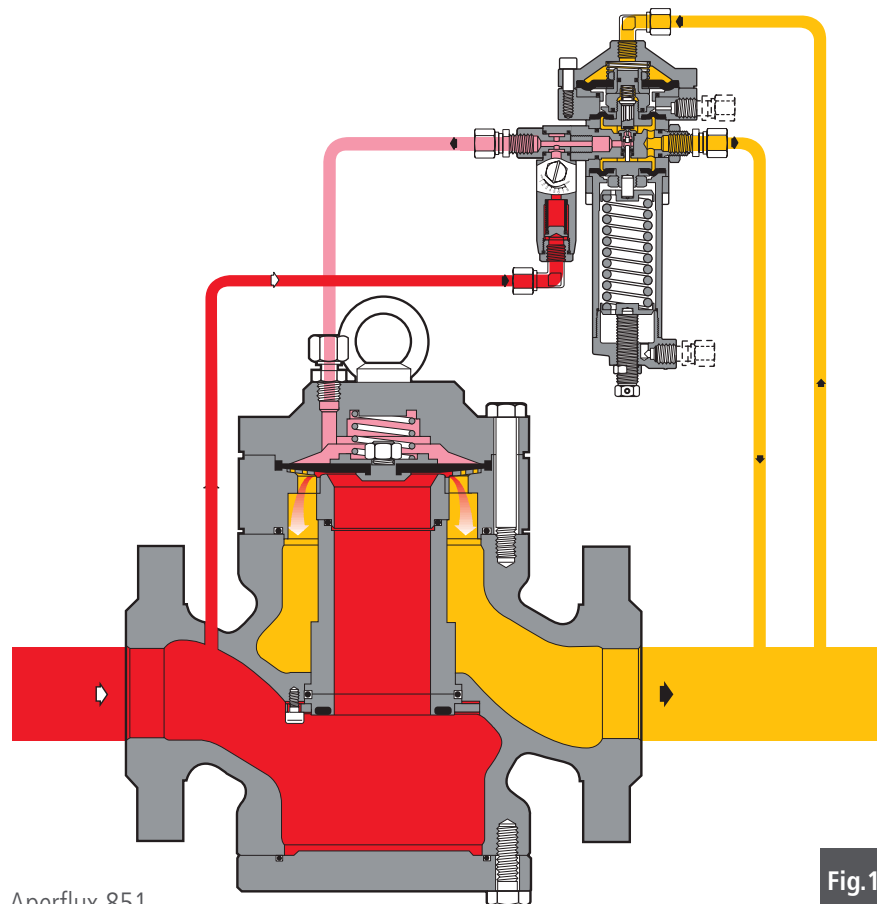
Introduction

Aperflux 851 is a boot style pilot-controlled pressure regulator for medium and high pressure applications.

Aperflux 851 is normally a failed open regulator and specifically will open under the following circumstances:

- breakage of main diaphragm;
- lack of feeding to the pilot circuit.

These regulators are suitable for use with previously filtered, non-corrosive gases.



Aperflux 851

Fig.1

Main Features

The modular design of **Aperflux 851** pressure regulators allows retrofitting of an emergency monitor **PM/819**, slam shut valve and or silencer on the same body.

The **Aperflux 851** regulator is Truly a "top entry design" which allows ease of maintenance or retrofitting options in the field. Our one piece molded diaphragm with main single orifice provides long life tight shutoff.



Aperflux 851 + PM/819



Aperflux 851 + DB/851 + SB/82

**Designed
With Your
Needs In Mind**

- Compact Design
- Easy Maintenance
- Top Entry
- Low Noise

- High Turn Down Ratio
- High Accuracy
- Low Operation cost
- Extreme Flexibility



Main Features

- Design pressure: up to 100 bar (1450 Psi)
- Design temperature: -20 °C to +60 °C (-4 to + 140 °F)
- Ambient temperature: -20 °C to +60°C (-4 to + 140 °F)
- Range of inlet pressure bpe: 1 to 85 bar (4,5 to 841 Psi)
- Range of outlet pressure Wh: 0,8 to 74 bar (12 to 1073 Psig) depending on installed pilot
- Minimum working differential pressure: 0,5 bar (7,25 Psi) - Recommended > 2 bar (30 Psig)
- Accuracy class AC: up to 1,5
- Closing pressure class SG: from 5 to 1,5 depending on outlet pressure
- Available size DN: 1" -2" -3" -4" -6" -8" -10"
- Flanging: class 150-300-600 RF or RTJ according to ANSI B16.5 and PN16 according to ISO 7005.

Materials

Body	Cast steel ASTM A352 LCC for rating 300 and 600 ASTM A216 WCB for rating 150 and PN16
Head covers	Rolled or forged carbon steel
Diaphragm	Vulcanized rubber
Valve seat	Stainless steel for DN ≤3 " Carbon Steel with seal edge in stainless steel for size ≥ 4 "
Seals	Nitril rubber
Compression fittings	According to DIN 2353 in zinc-plated carbon steel

The characteristics listed above are referred to standard products. Special characteristics and materials for specific applications may be supplied upon request.



Aperflux 851

Choosing the pressure regulator

Sizing of regulators is usually made on the basis of C_g valve and K_G sizing coefficients (table 1). Flow rates at fully open position and various operating conditions are related by the following formulae where:

Q = flow rate in Stm^3/h

P_u = inlet pressure in bar (abs)

P_d = outlet pressure in bar (abs).

A > When the C_g and K_G values of the regulator are known, as well as P_u and P_d , the flow rate can be calculated as follows:

A-1 in sub critical conditions: ($P_u < 2 \times P_d$)

$$Q = K_G \times \sqrt{P_d \times (P_u - P_d)} \quad Q = 0.526 \times C_g \times P_u \times \sin \left(K \times \sqrt{\frac{P_u - P_d}{P_u}} \right)$$

A-2 in critical conditions: ($P_u \geq 2 \times P_d$)

$$Q = \frac{K_G}{2} \times P_u \quad Q = 0.526 \times C_g \times P_u$$

B > Vice versa, when the values of P_u , P_d and Q are known, the C_g or K_G values, and hence the regulator size, may be calculated using:

B-1 in sub-critical conditions: ($P_u < 2 \times P_d$)

$$K_G = \frac{Q}{\sqrt{P_d \times (P_u - P_d)}} \quad C_g = \frac{Q}{0.526 \times P_u \times \sin \left(K \times \sqrt{\frac{P_u - P_d}{P_u}} \right)}$$

B-2 in critical conditions ($P_u \geq 2 \times P_d$)

$$K_G = \frac{2 \times Q}{P_u} \quad C_g = \frac{Q}{0.526 \times C_g \times P_u}$$

NOTE: The sin val is understood to be DEG.

Table 1: C_g , K_G and K_1 coefficient

Nominal diameter (mm)	25	50	80	100*	150*	200*	250*
Size (inches)	1"	2"	3"	4"	6"	8"	10"
C_g coefficient	565	1823	4400	6943	13890	21645	30685
K_G coefficient	593	1916	5194	7297	14598	22748	32250
K_1 coefficient	113,9	113,9	113,9	113,9	113,9	113,9	113,9

*Value with incorporated flow conditioner

Aperflux 851

> Pressure regulators



The formulae are applicable to natural gas having a relative density of 0.61 w.r.t. air and a regulator inlet temperature of 15 °C. For gases having a different relative density S and temperature t in °C, the value of the flow rate, calculated as above, must be multiplied by a correction factor, as follows:

$$F_c = \sqrt{\frac{175 \cdot 8}{S \times (273 \cdot 16 + t)}}$$

Table 2 lists the correction factors F_c for a number of gases at 15 °C.

Table 2: Correction factors F_c

Type of gas	Relative density	F_c Factor
Air	1.0	0.78
Propane	1.53	0.63
Butane	2.0	0.55
Nitrogen	0.97	0.79
Oxygen	1.14	0.73
Carbon dioxide	1.52	0.63

Caution:

in order to get optimal performance, to avoid premature erosion phenomena and limit noise emissions, it is recommended to check that the gas speed at the outlet flange does not exceed 150 m/sec.

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 Stm^3/h

DN = nominal size of regulator in mm

Pd = outlet pressure in barg.

Pilots System

Pilots

Aperflux 851 regulators are equipped with series 300 pilot as listed below:

- 302/. control range Wh: 0.8 to 9,5 bar; (11 to 138 psig)
- 304/. control range Wh: 7 to 43 bar; (100 to 625 psig)
- 305/. control range Wh: 20 to 60 bar; (290 to 870 psig)
- 307/. control range Wh: 41 to 74 bar; (595 to 1073 psig)

Pilots may be adjusted manually or remotely as shown in table 3:

Table 3: Pilot adjusting instructions

Pilot type .../A	Manual setting
Pilot type .../D	Electric remote setting control
Pilot type .../CS	Setting increased by pneumatic signal remote point

The pilot system comes complete with an adjustable **AR100** restrictor. The flow rate of the pilot system is controlled by the bleed rate through **AR100** restrictor.

The KG coefficients of the **AR100** adjustable restrictor for its various degrees of opening are shown on Fig. 2.

KG formula used for calculating the flow rate of regulator can be applied for adjustable restrictor **AR100**.

It is necessary to consider that pressure drop through the adjustable **AR100** restrictor should be about 2.9 PSIG (0,2) bar at the minimum opening flow of the regulator and about 14,5 PSIG (1 bar) at the maximum opening flow of regulator main diaphragm.

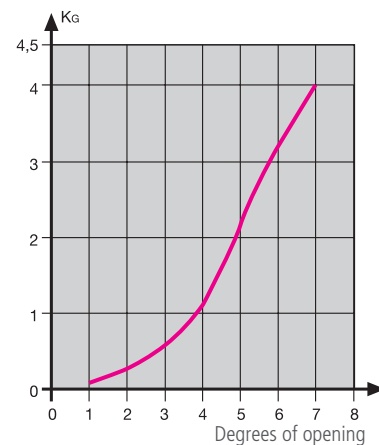


Fig.2

Accessories on request

For Regulator

- stroke limiter
- flow-limiting devices
- limit switches
- position transmitters
- stainless steel fittings, single or dual sealing

For Pilot

- supplementary filter **CF 14**
- dehydrating filter **CF 14/D**

Aperflux 851

> Pressure regulators

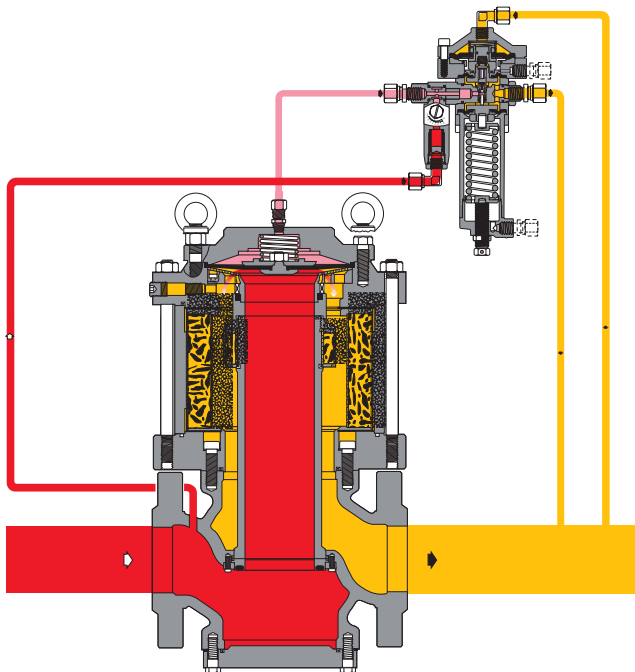


Incorporated silencer DB/819

Whenever specific noise limits are required, the silencer allows you to considerably reduce the decibel (dBA) noise emissions during the gas pressure regulators operation as in example (Fig. 3). The diagram in Fig.4 demonstrates the silencers efficiency at specified working conditions.

The **Aperflux 851** pressure regulator can be supplied with an incorporated silencer in either the standard version, with incorporated slam-shut or incorporated monitor regulator.

With the built-in silencer the Cg and KG valve coefficients are 5% lower than the corresponding version without the silencer. Given the modular arrangement of the regulator, the silencer may be retrofitted to both standard **Aperflux 851** version as well as those with incorporated slam-shut or monitor, without any need to piping modification. Pressure reduction and control operate the same manner as in standard version.



Aperflux 851 + DB/851

Fig.3

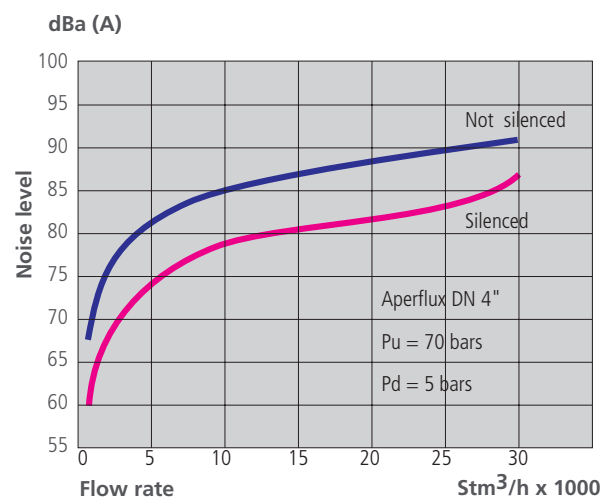


Fig.4

Monitor

The monitor regulator is used for over pressure protection either as a single unit or in conjunction with a relief or a slam shut valve. It is an emergency regulator that comes into operation when the main control regulators downstream operating pressure increases until reaching the monitor set-point pressure. The Monitor regulator is then available to take over the pressure control. The Monitor regulator is available in two versions, incorporated in the same regulator body as the control regulator or installed as a separate regulator.

PM/819 Incorporated

This emergency regulator (monitor) is directly integrated to the body of the main regulator. Both pressure regulators, therefore, use the same valve body with the following exceptions:

- are governed by two different independent pilots and by separate regulator valve seats.
- the operational characteristics of the **PM/819** monitor are the same as for the **Reflux 819** regulator (refer to specific catalogue).
- the Cg and KG coefficients of regulator having an incorporated monitor are 8% lower than those for standard version.

Another great advantage offered by the incorporated monitor regulator is that it can be installed at any time, even on an already existing **Aperflux 851**, without piping modifications. This solution consent the construction of reduction

Aperflux 851+ PM/819

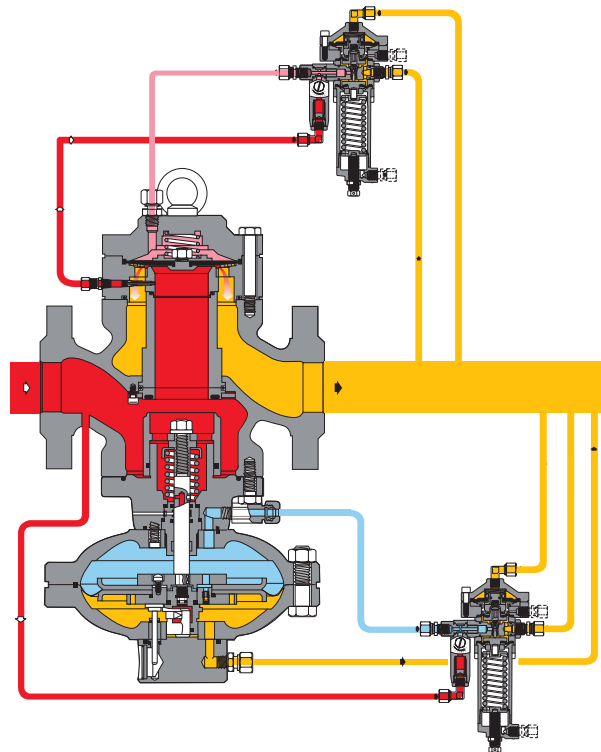


Fig.5

Aperflux 851

> Pressure regulators



In-line monitor

The monitor is generally installed upstream of the main regulator. Although the function of the monitor regulator is different, the two regulators are virtually identical from the point of view of their mechanical components. The only difference is that monitor is set at a higher pressure than the main regulator. The Cg and KG coefficients of the regulator plus in-line monitor system are about 20% lower than those of the regulator alone.

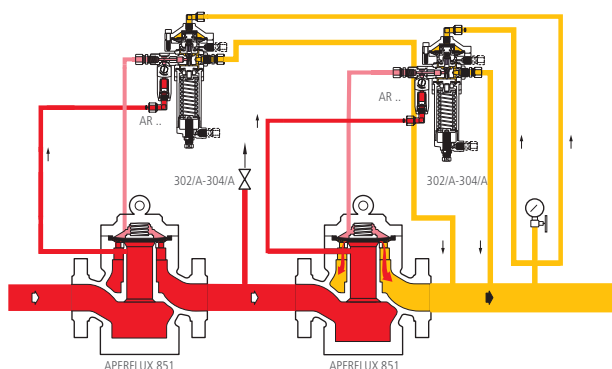


Fig.6

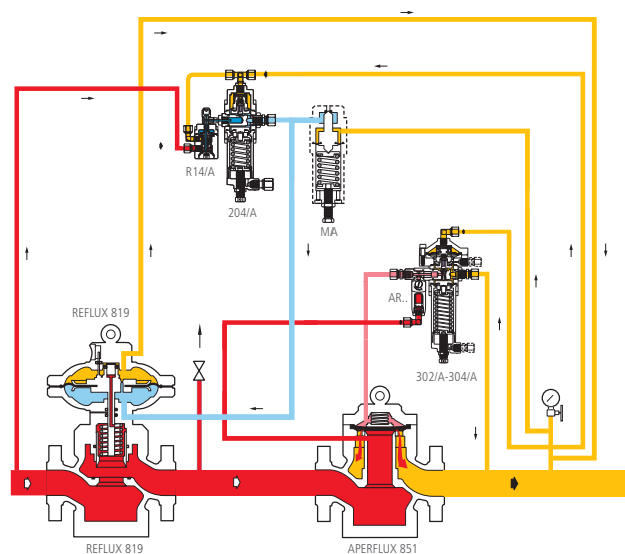


Fig.7

M/A Accelerator

When the monitor is required to take over more rapidly in the event of a main regulator failure, an **M/A** accelerator pilot is installed on the monitor (Fig. 7). Installation of the accelerator is mandatory when monitor is used on safety accessory according to PED directive. Depending on a downstream pressure signal, this device discharges the gas enclosed in the motorisation chamber of the monitor regulator, allowing the monitor to take over faster.

The set point of **M/A** accelerator may be usually set higher than set point of the monitor by 0.3 to 0.5 bar.

In case of monitor override configuration (two stage cut) the accelerator may be necessary.

Slam shut

This device immediately stops gas flow (SAV) whenever a failure causes downstream pressure to rise reaching the set point of the slam-shut itself.

The slam-shut device can also be closed manually.

Incorporated Slam shut

The **Aperflux 851** pressure regulator offers the possibility of installing an incorporated slam shut valve **SB/82** (fig. 8) or **HB/97** valve (fig.9), either from the factory or retrofit in the field.

The Cg and KG coefficients of a regulator plus incorporated slam-shut system are 2,5% lower than those for standard versions.

The incorporated slam shut can also be retrofitted to **Aperflux 851** regulators without modifying the pressure regulator assembly.

The main characteristics of this device are:

- overpressure and underpressure pressure shut off;
- manual push-button control;
- option for pneumatic or electromagnetic remote control;
- manual re-setting with internal by-pass activated by the lever mechanism;
- compact dimensions;
- easy maintenance;
- possibility of installing remote signal devices (contact switches or proximity switches).

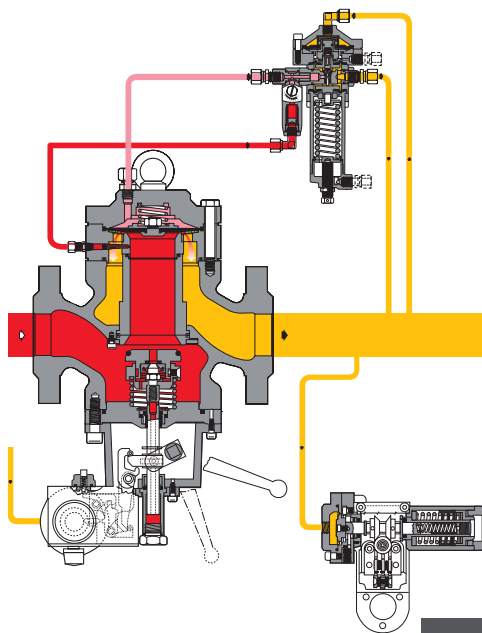


Fig.8

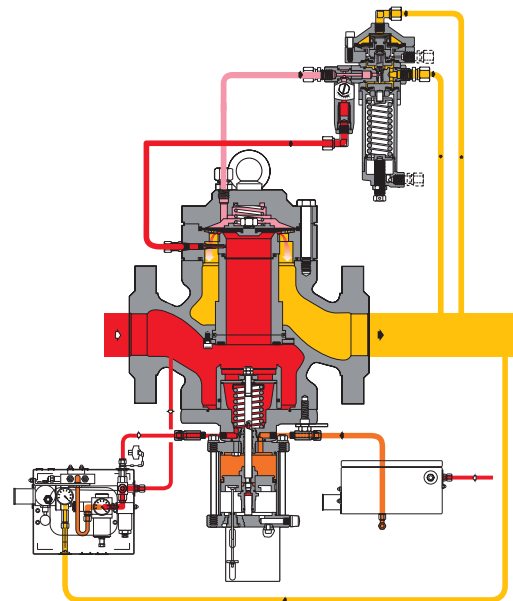


Fig.9

Aperflux 851

> Pressure regulators



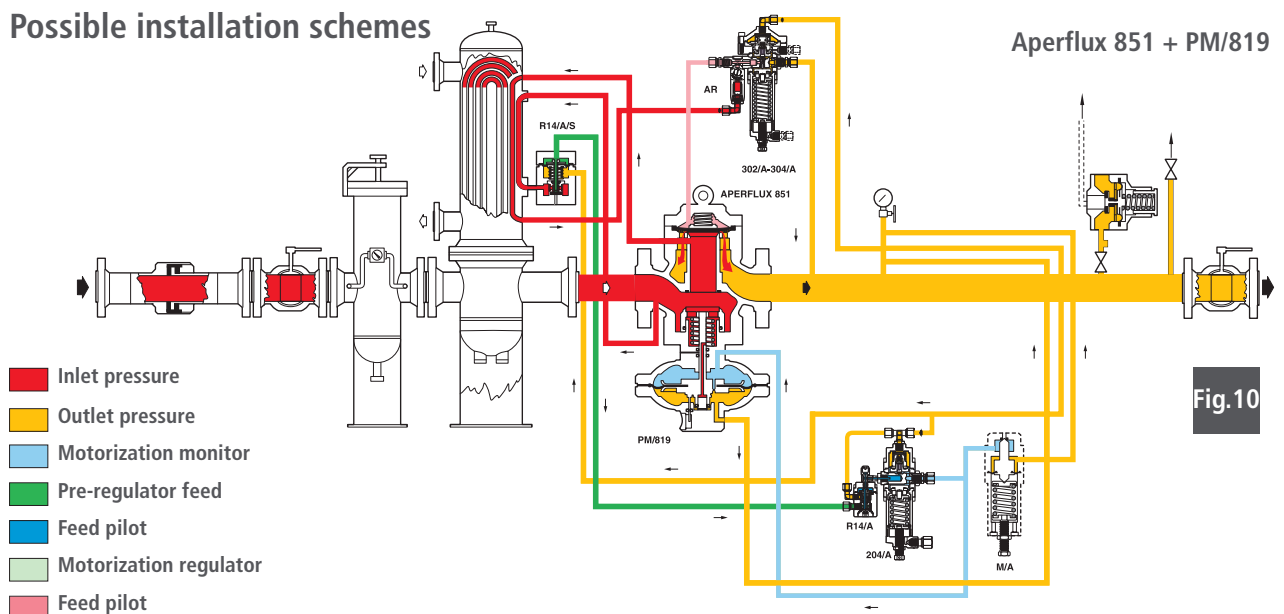
Installation

Whenever **Aperflux 851** pressure regulator is being installed, it is essential to follow a few basic rules in order to ensure the achievement equipment's operational and performance characteristics.

These rules may be summarised as follows:

- filtering: the gas arriving from the main pipeline must be adequately filtered; it is also advisable to make sure that the pipe upstream of the regulator is perfectly clean and void of residual impurities;
- pre-heating: whenever the pressure drop at the regulator is considerable, the gas must be pre-heated enough to avoid the formation of ice during decompression (for reference natural gas the temperature drop is about 0,4°C to 0,5°C for every bar of pressure reduction);
- condensate collector: natural gas sometimes contain traces of vapour-state hydrocarbons that can interfere with the functioning of the pilot. It is therefore necessary to install a condensate collector, complete with drainage system, upstream of the pilot circuit;
- Outlet pipe size must also be sized correctly so the velocity is not too high. High velocity will result in improper pressure control.
- impulse take-off: for correct operation, the impulse take-off must be located in the right position. Between the regulator and the downstream take-off there must be a straight length of, pipe ≥ 4 times the diameter of the outlet pipe and downstream the take-off, there must be a further length of pipe ≥ 2 times the same diameter (example below).

Possible installation schemes



APERFLUX 851 + SB/82 + APERFLUX 851

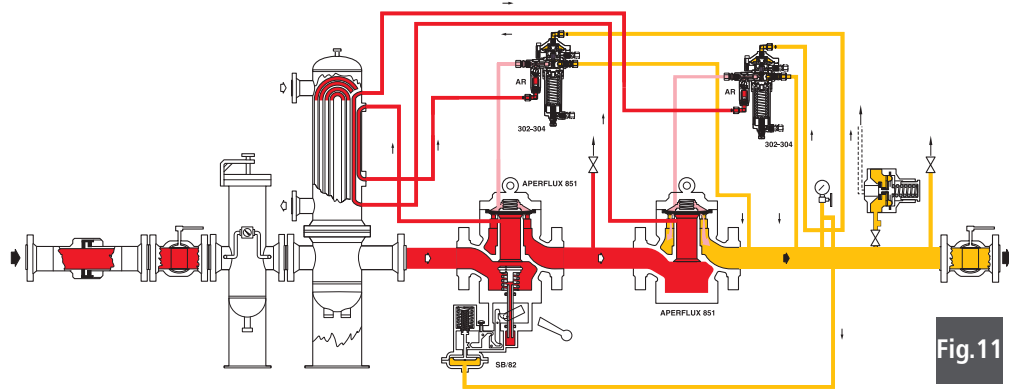


Fig.11

REFLUX 819 + SB/82 + APERFLUX 851

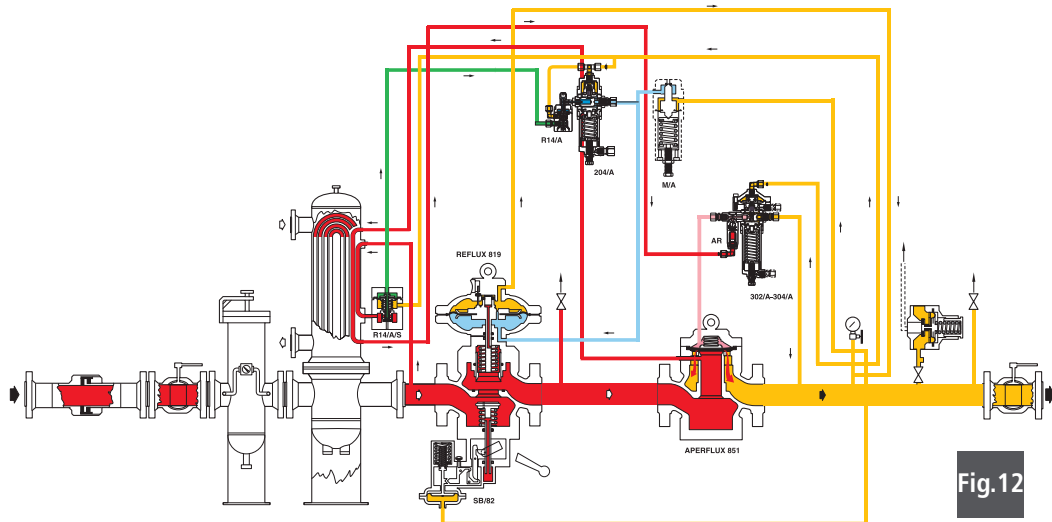


Fig.12

REFLUX 819/MO +SB82 + APERFLUX 851

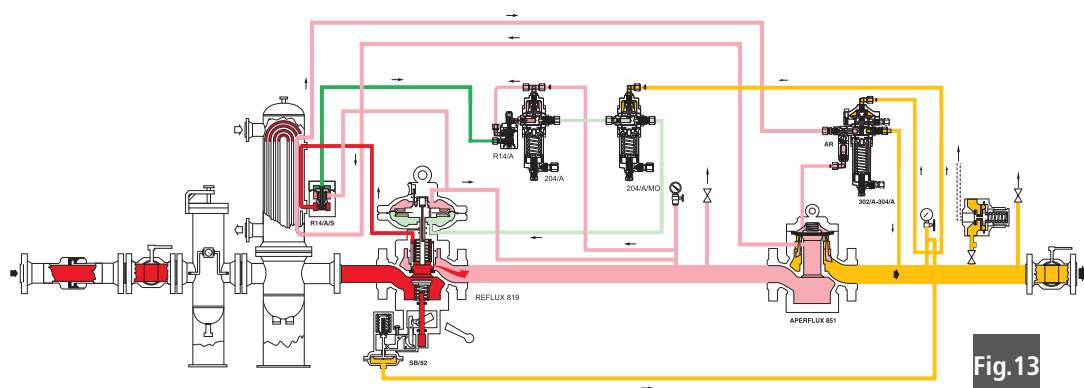


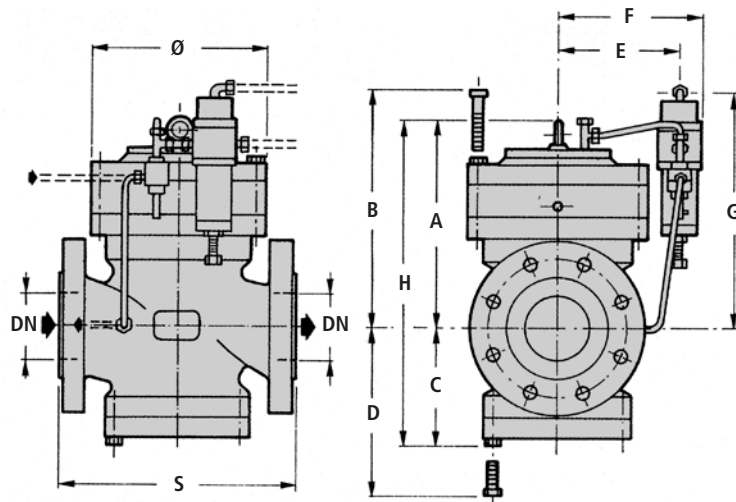
Fig.13

Aperflux 851

> Pressure regulators



Aperflux 851



Overall dimensions in mm

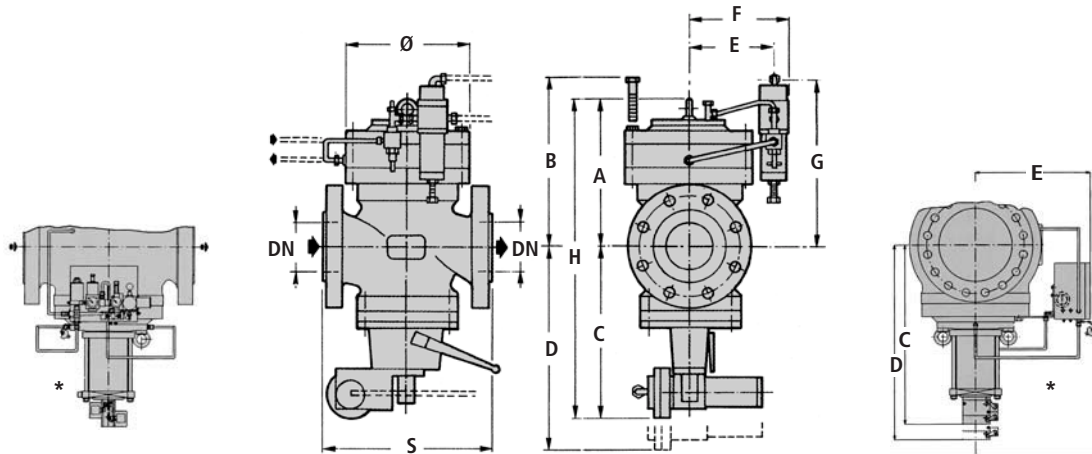
Size (mm)	25	50	80	100	150	200	250
Inches	1"	2"	3"	4"	6"	8"	10"
S - Ansi 150/PN 16	184	254	298	352	451	543	673
S - Ansi 300	197	267	317	368	473	568	708
S - Ansi 600	210	286	336	394	508	609	752
Ø	125	160	245	290	385	490	615
A	200	230	300	340	420	455	580
B	230	260	340	380	470	510	520
C	100	130	150	190	240	265	340
D	130	160	200	250	300	320	440
E	140	145	190	210	260	315	370
F	160	175	220	240	290	345	415
G	260	280	350	380	450	490	380
H	300	360	450	530	660	720	920
Tubing Connections	øe10 x øi 8						

Weights in Kg

ANSI 150/PN16	20	35	76	115	235	335	700
ANSI 300	21	36	82	128	257	395	750
ANSI 600	22	38	85	138	290	435	850

Face to face dimensions S according to IEC 534-3 and EN 334

**Aperflux 851 + SB/82
+ HB/97**



Overall dimensions in mm

Size (mm)	25	50	80	100	150	200	250
Inches	1"	2"	3"	4"	6"	8"	10"
S - Ansi 150/PN 16	184	254	298	352	451	543	673
S - Ansi 300	197	267	317	368	473	568	708
S - Ansi 600	210	286	336	394	508	609	752
Ø	125	160	245	290	385	490	615
A	200	230	300	340	420	455	580
B	230	260	340	380	470	510	520
C	215	240	270	300	375	450	580
D	320	370	420	480	600	665	900
E	140	145	190	210	260	315	370
F	160	175	220	240	290	345	415
G	260	280	350	380	450	490	580
H	415	470	570	640	795	905	1260

Tubing Connections

Øe10 x Øi 8

*indicated Dimensions with the MODEL **HB/97**

Weights in Kgf

ANSI 150/PN16	27	44	86	130	260	400	750
ANSI 300	27	46	92	145	290	470	800
ANSI 600	30	48	96	155	320	510	900

Face to face dimensions S according to IEC 534-3 and EN 334

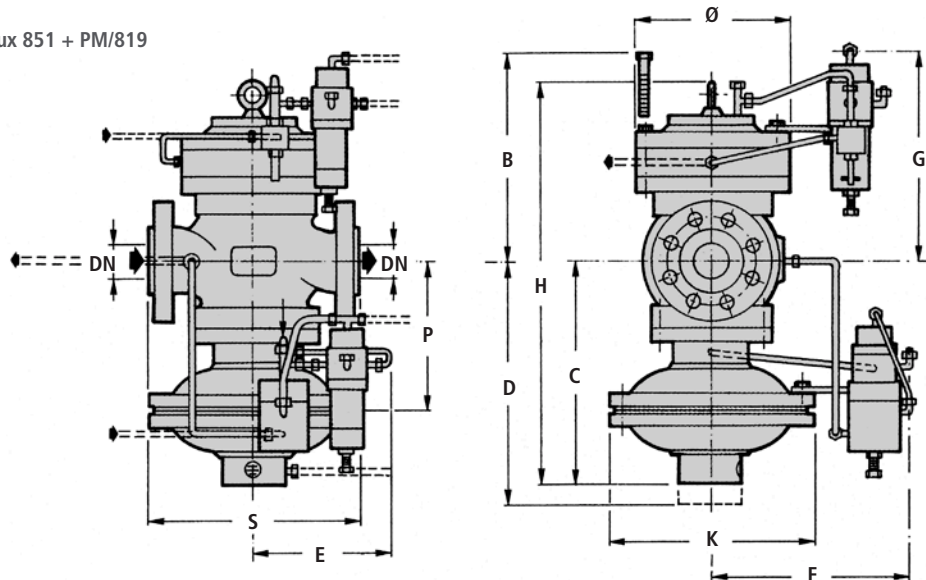
Note: Connections for tubing diameter 12mm or 3/8" available on request.

Aperflux 851

> Pressure regulators



Aperflux 851 + PM/819



Overall dimensions in mm

Size (mm)	25	50	80	100	150	200	250
Inches	1"	2"	3"	4"	6"	8"	10"
S - Ansi 150/PN 16	184	254	298	352	451	543	673
S - Ansi 300	197	267	317	368	473	568	708
S - Ansi 600	210	286	336	394	508	609	752
Ø	125	160	245	290	385	490	615
B	230	260	340	380	470	510	520
C	320	350	430	490	650	750	680
D	410	430	530	600	735	850	900
E	370	370	410	410	485	485	370
F	270	270	310	310	385	385	415
G	260	280	350	380	450	490	380
H	520	580	730	830	1070	1205	1380
K	278	278	360	360	510	510	610
P	170	200	260	290	320	370	500

Tubing Connections

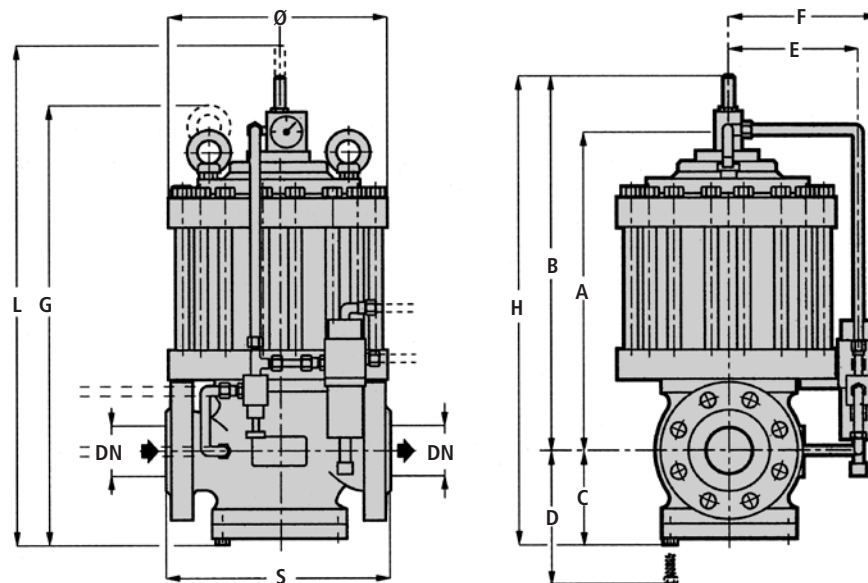
øe10 x øi 8

Weights in Kg

ANSI 150/PN16	33	68	135	160	370	525	1100
ANSI 300	34	70	138	165	390	585	1150
ANSI 600	35	72	148	190	420	625	1250

Face to face dimensions S according to IEC 534-3 and EN 334

Aperflux 851 + DB/851



Overall dimensions in mm

Size (mm)	25	50	80	100	150	200	250
Inches	1"	2"	3"	4"	6"	8"	10"
S - Ansi 150/PN 16	184	254	298	352	451	543	673
S - Ansi 300	197	267	317	368	473	568	708
S - Ansi 600	210	286	336	394	508	609	752
Ø	220	300	330	390	480	645	740
A	355	420	500	570	715	910	1025
B	465	530	625	695	850	1045	1085
C	100	130	150	190	240	265	340
D	130	160	200	250	300	320	440
E	162	196	216	241	234	237	262
F	192	226	246	271	264	267	292
G	370	440	525	595	745	950	1396
H	455	550	650	760	980	1175	1215
L	560	673	792	897	1081	1332	1372

Tubing Connections

øe10 x øi 8

Weights in Kgf

ANSI 150/PN16	47	100	168	240	391	760	1240
ANSI 300	49	102	177	268	433	834	1292
ANSI 600	50	104	180	278	466	874	1392

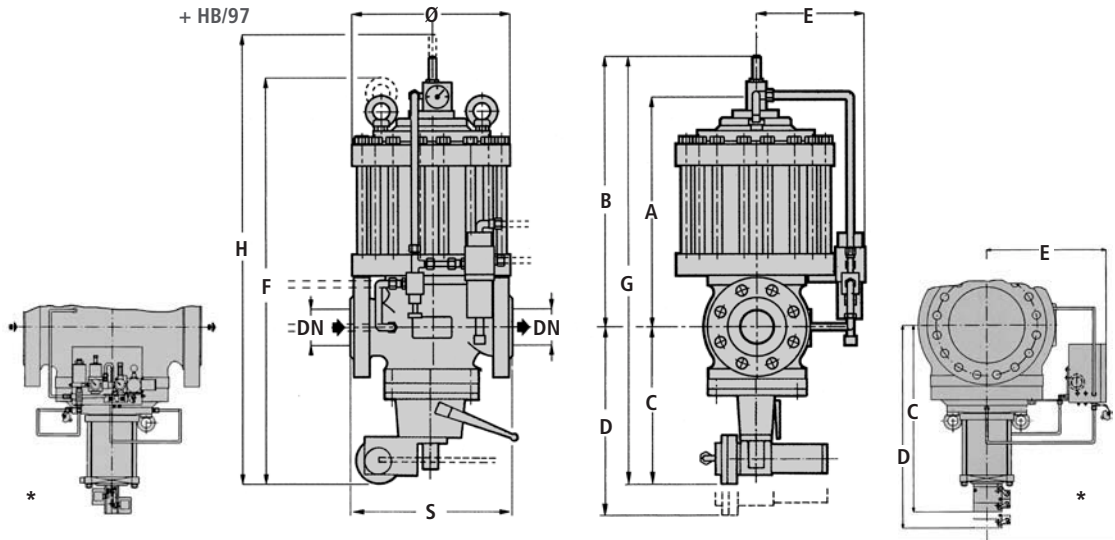
Face to face dimensions S according to IEC 534-3 and EN 334

Aperflux 851

> Pressure regulators



Aperflux 851 + DB/851 + SB/82
+ HB/97



Overall dimensions in mm

Size (mm)	25	50	80	100	150	200	250
Inches	1"	2"	3"	4"	6"	8"	10"
S - Ansi 150/PN 16	184	254	298	352	451	543	673
S - Ansi 300	197	267	317	368	473	568	708
S - Ansi 600	210	286	336	394	508	609	752
Ø	220	300	330	390	480	645	740
A	335	420	500	570	715	910	1025
B	465	530	625	695	850	1045	1085
C	215	240	270	300	375	450	687*
D	320	370	420	480	650*	835*	900*
E	192	226	246	271	358*	264	410*
F	485	550	645	705	880	1135	1736
G	570	660	770	870	1115	1360	1555
H	675	783	912	1007	1216	1517	1712

Tubing Connections

øe10 x øi 8

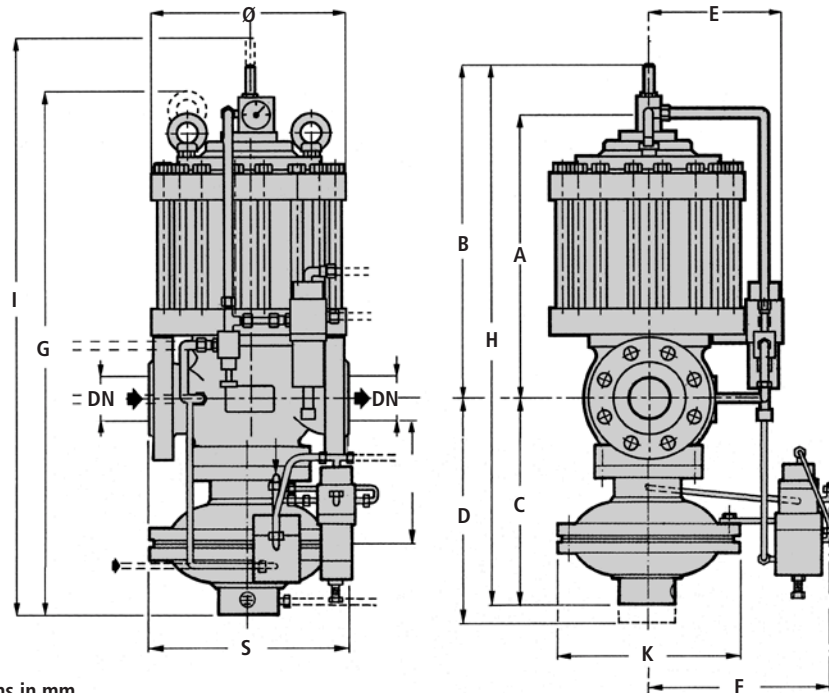
*indicated Dimensions with the MODEL HB/97

Weights in Kgf

ANSI 150/PN16	54	109	178	255	416	825	1290
ANSI 300	56	112	187	283	466	909	1342
ANSI 600	58	114	191	294	499	949	1442

Face to face dimensions S according to IEC 534-3 and EN 334

Aperflux 851 + DB/851 + PM/819



Overall dimensions in mm

Size (mm)	25	50	80	100	150	200	250
Inches	1"	2"	3"	4"	6"	8"	10"
S - Ansi 150/PN 16	184	254	298	352	451	543	673
S - Ansi 300	197	267	317	368	473	568	708
S - Ansi 600	210	286	336	394	508	609	752
Ø	220	300	330	390	480	645	740
A	355	420	500	570	715	910	1025
B	465	530	625	695	850	1045	1085
C	320	350	430	490	650	750	800
D	410	430	530	600	735	850	900
E	192	226	246	271	264	267	292
F	270	270	310	310	385	385	415
G	590	660	805	895	1155	1435	1856
H	685	750	905	995	1260	1530	1545
I	905	970	1185	1295	1670	2015	2005

Tubing Connections

øe10 x øi 8

Weights in Kgf

ANSI 150/PN16	60	133	223	295	526	950	1640
ANSI 300	62	135	232	325	568	1024	1692
ANSI 600	63	137	235	335	601	1064	1792

Face to face dimensions S according to IEC 534-3 and EN 334



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