DATA SHEET

T 2538 EN

Self-operated Pressure Regulators · Type 2404-1

Pressure Reducing Valve with Pilot Valve for small set point ranges



Application

Pressure reducing valve for set points from 0.045 to 1.5 psi/3 to 100 mbar · Valve size NPS 1 to 6/DN 25 to 150 · Class 125, 150, 300/PN 16 to 40 · Suitable for gases at temperatures from -5 to 195 °F/-20 to +90 °C

The valve closes when the downstream pressure rises.

The pilot-operated Type 2404-1 Pressure Reducing Valve is preferably used for the precise control of inert gas in tank blanketing applications (e.g. when storing oxidation-sensitive, toxic or explosive products). The inert gas (usually nitrogen) is applied to protect the product inside the tank from reacting with the ambient atmosphere.

The Type 2404-1 Pressure Reducing Valve regulates the excess pressure of the inert gas to a constant pressure within the millibar range.

The pressure regulator ensures that the pressure in the tank remains constant during pumpout operations. Furthermore, adverse weather conditions, e.g. a sudden temperature drop, can affect the pressure inside the tank. In both cases, inert gas flows into the tank until the pressure reaches adjusted set point.

Special features

- Low-maintenance proportional regulator
- Pilot control provides excellent control accuracy
- Internal set point springs
- Soft-seat plug provides bubble-tight shut-off performance
- Meets strict fugitive emission requirements
- Suitable for sour gas service (NACE)

Versions

The Type 2404-1 Pressure Reducing Valve is a pilot-operated regulator.

The regulator consists of the following components:

Type 2406 functioning as the main valve

NPS 1 to 6/DN 25 to 150, balanced by a diaphragm

Type 2405 Pilot Valve

 $\frac{1}{2}$ NPT female thread, C_V 1.2/K_{VS} 1.0

Type 44-1 B Input Pressure Regulator

With NPT female thread; $C_V 1.2/K_{VS} 1.0$



Fig. 1: Type 2404-1

Mounting kit M 2404, consisting of:

Hook-up, needle valves etc.

Special versions

Version with FDA-compliant materials for the food processing and pharmaceutical industries · Versions for sour gas service (NACE) · Actuator of pilot valve with seal and leakage line connection (e.g. for flammable gases)

Principle of operation

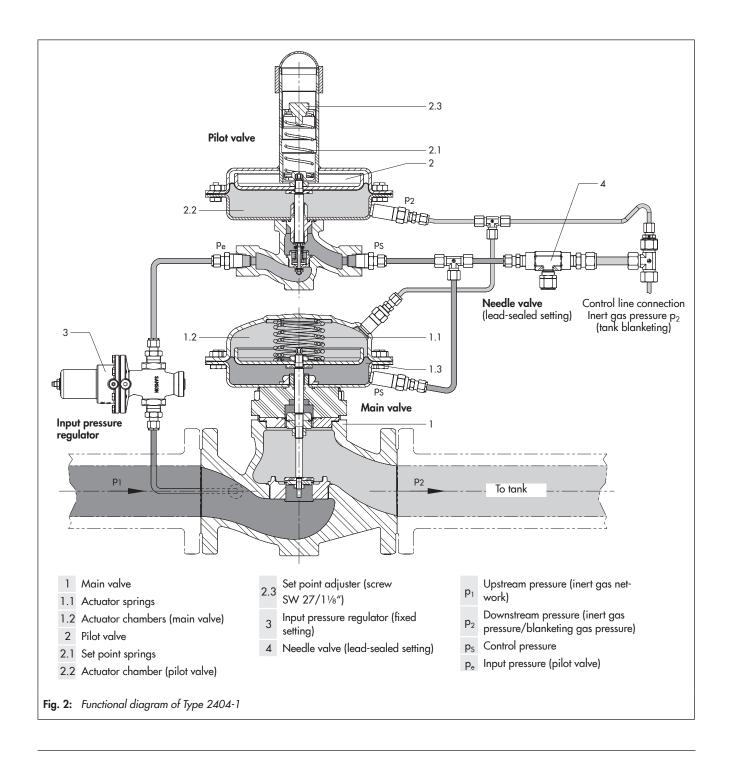
The Type 2404-1 Pressure Reducing Valve is a pilot-operated regulator. It regulates the supply pressure of the inert gas within the millibar range to a low pressure, creating a constant blanketing of the product inside the tank.

The following components interact to regulate the pressure of the inert gas.

The input pressure regulator (3) is delivered ready-adjusted. It reduces the supply pressure $_{11}$ p to the input pressure p_e for the pilot valve (2) to approx. 1 bar (positive pressure), ensuring precise pressure control even at varying upstream pressures. The pilot valve governs the control pressure p_s for the main valve (1) and corrects the set point.

The needle valve (4) is delivered ready-adjusted and leadsealed. If the pressure in the tank drops slightly below the set point pressure, for example due to the product being withdrawn from the tank, the pilot valve (2) is opened by the preloaded set point spring (2.1). As a result, the control pressure p_S acting on the actuator diaphragm (1.3) of the main valve (1) increases. The main valve opens, causing the inert gas to flow into the tank until the inert gas blanket is re-established or the set point pressure is reached again.

When the pressure in the tank increases constantly, for example during filling, the pressure in the actuator chamber (1.2/2.2) of the pilot valve and main valve increases. The pilot valve (2) closes when the pressure increases above the pressure set point. The control pressure p_s does not have any effect in this case. The main valve is closed by the actuator springs (1.1) and the increased inert gas pressure p_2 .



Technical data

Table 1: Type 2404-1 Pressure Reducing Valve

Type 2406 as main valve, balanced by a diaphragm							
Valve size 4)	NPS 1 DN 25	NPS 1½ DN 40	NPS 2 DN 50	NPS 2½ DN 65	NPS 3 DN 80	NPS 4 DN 100	NPS 6 DN 150
Pressure rating	Class 125, 150 and 300/PN 16 to 40						
C _V coefficients K _{VS} coefficients	9.4 8.0	23 20	37 32	60 50	94 80	145 125	450 380
Reduced C _V coefficient Reduced K _{VS} coefficient	-		.4	23 20	37 32	94 80	- -
C _V with flow divider ¹⁾ K _{VS} with flow divider ¹⁾	-	- -		45 38	70 60	70 · 110 60 · 95	335 285
Actuator area	50 in ² /320 cm ²						
Leakage class according to ANSI/FCI 70-2 or IEC 60534-4	Soft-seated, minimum Class IV						
Max. permissible differential pressure	175 psi/12 bar ²⁾						
Min. differential pressure Δp_{min}	15 psi/1 bar						
Perm. temperature	−5 to +195 °F/−20 to +90 °C ³⁾						
Conformity	C € · [H[

Reduced C_{V}/K_{VS} coefficients with flow divider on request

Table 2: Type 2405 Pilot Valve

Type 2405 Pilot Valve						
Connection		1/2 NPT female thread				
Pressure rating		Class 300				
C _V coefficient		1.2				
K _{VS} coefficient		1.0				
Set point ranges	0.045 to 0.15 psi 3 to 10 mbar	0.075 to 0.45 psi 5 to 30 mbar	0.35 to 1.5 psi 25 to 100 mbar			
Actuator area	100 in²/640 cm²	50 in ² /320 cm ²	50 in ² /320 cm ²			
Input pressure p _e	Setting of the input pressure regulator fixed at approx. 15 psi/1 bar					
Perm. temperature	−5 to +195 °F/−20 to +90 °C ¹)					
Conformity	C€ [H[

 $^{^{1)}}$ Max. 175 °F (80 °C) for EPDM and NBR versions

Table 3: Materials · Material numbers according to ASTM and DIN EN

Type 2406 functioning as the main valve				
Body	A126B, A216 WCC, A351 CF8M · EN-GJL-250, 1.0619, 1.4408			
Valve seat	1.4404/316L			
Plug	1.4404/316L			
Plug seal	EPDM · NBR · FKM			
Operating diaphragm, balancing diaphragm	EPDM · NBR ²⁾ · FKM			
Internal parts, guiding parts	1.4404/316L			
Diaphragm cases	1.0332 (1.4301/stainless steel body)			
Actuator springs	1.4310 ¹⁾			

Versions for sour gas service (NACE): Hastelloy®
Not for NPS 2½, 3 and 4/DN 65, 80 and 100

Type 2405 Pilot Valve	
Pilot valve	Type 2405 ¹⁾

Higher pressures on request

Max. 175 °F (80 °C) for EPDM and NBR versions

DN 32 and DN 125 available on request

Table 3: Materials · Material numbers according to ASTM and DIN EN

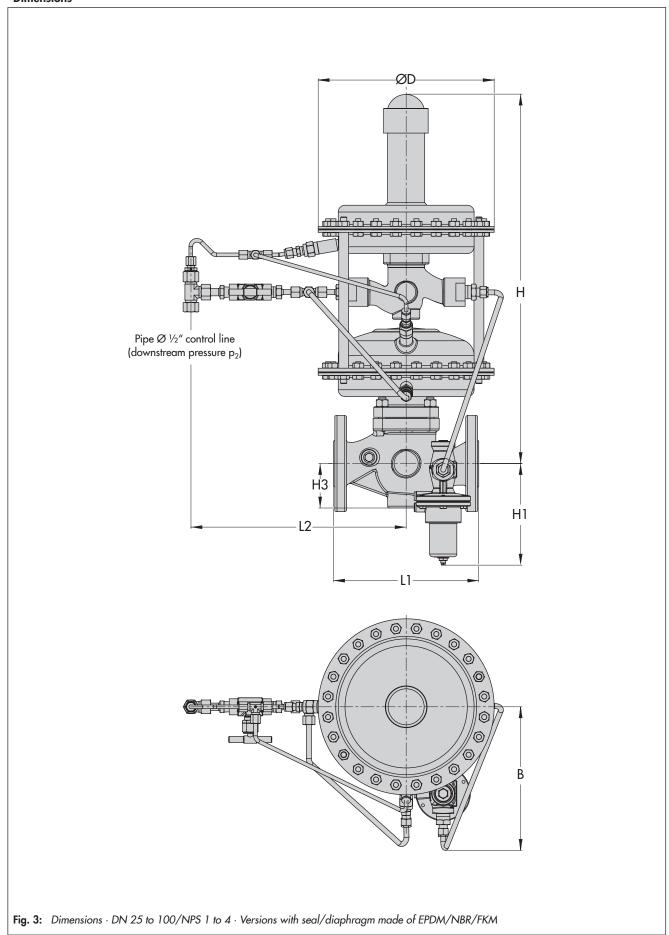
A216WCC • A351 CF8M		
1.4404/316L		
1.4404/316L		
EPDM · NBR · FKM		
EPDM · NBR · FKM		
1.4404/316L		
1.4310		
Stainless steel		
1.4404/316L		
1.4404/316L		

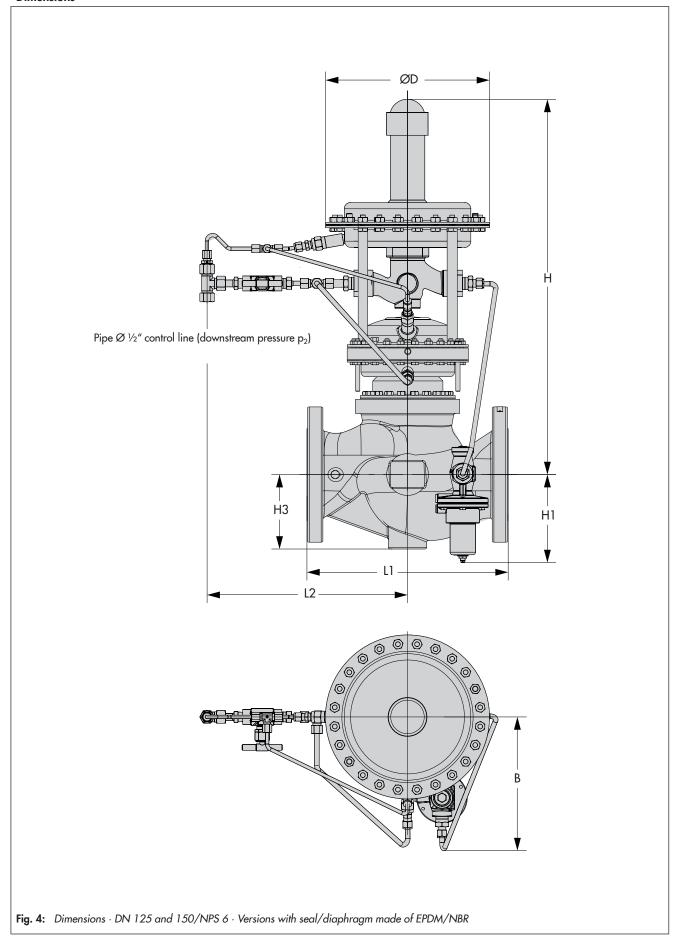
¹⁾ Version for sour gas service (NACE) possible

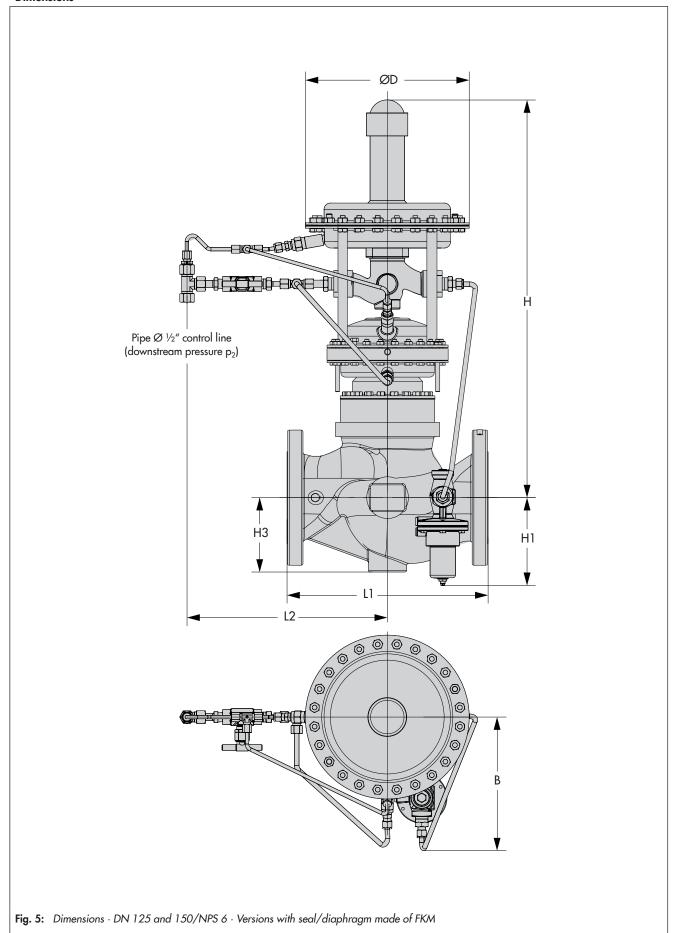
Table 4: Dimensions and weights

Type 2	2404-1	NPS 1/DN 25	-/DN 32	NPS 11/2/	'DN 40	NPS 2/DN 50	NPS 2½/DN 65	
	Class 125 and 150	7.25"/184 mm	-	8.75"/2	22 mm	10"/254 mm	10.9"/276 mm	
L1	Class 300	7.75"/197 mm	-	9.25"/23	35 mm	10.5"/267 mm	n 11.5"/292 mm	
L1	PN 16/40	6.3"/160 mm	7.1"/180 mm	7.9"/20	00 mm	9.1"/230 mm	11.4"/290 mm	
L2		13.8″/350 mm						
	0.045 to 0.15 psi 3 to 10 mbar	Ø15"/380 mm, A = 100 in²/640 cm²						
ØD	0.075 to 0.45 psi 5 to 30 mbar	Ø11.2"/285 mm, A = 50 in²/320 cm²						
	0.35 to 1.5 psi 25 to 100 mbar	Ø11.2"/285 mm, A = 50 in²/320 cm²						
H 1)	EPDM/NBR/FKM	22.1"/560 mm	23.4"/595 mm			24.6"/625 mm		
H1		6.5"/165 mm	6.5″/165 mm				6.5"/165 mm	
НЗ		1.73"/44 mm	2.8"/72 mm			3.8"/98 mm		
В		8.5"/215 mm	8.6"/225 mm	9.25"/23	9.25"/235 mm 9.6"/245 mm		10.2"/260 mm	
Weight, approx.		55 lb/25 kg	64 lb/29 kg	71 lb/32 kg 77 lb/3		77 lb/35 kg	132 lb/60 kg	
Туре 2	2404-1	NPS 3/DN 80	NPS 4/DN	1 100	-/DN 125		NPS 6/DN 150	
	Class 125 and 150	11.7"/298 mm	13.8″/352	13.8"/352 mm		-	17.75"/451 mm	
L1	Class 300	12.5"/318 mm	14.5"/368	14.5"/368 mm		-	18.6"/473 mm	
L1	PN 16/40	12.2"/310 mm	13.8"/350	13.8"/350 mm		75"/400 mm	18.9"/480 mm	
L2		13.8″/350 mm						
	0.045 to 0.15 psi 3 to 10 mbar	Ø15"/380 mm, A = 100 in²/640 cm²						
ØD	0.075 to 0.45 psi 5 to 30 mbar	Ø11.2"/285 mm, A = 50 in ² /320 cm ²						
	0.35 to 1.5 psi 25 to 100 mbar	Ø11.2"/285 mm, A = 50 in²/320 cm²						
11	EPDM/NBR	05"//05	2 / 1 / 1 / 2	2 (2"/715 mm	29.1"/740 mm	
H 1)	FKM	- 25"/635 mm	26"/660	mm	31.7"/805 mm		32.7"/830 mm	
H1	1			6.1″/155 mm				
НЗ	3.9"/100 mm		4.7"/120	4.7"/120 mm 5.8"/145 mm		"/145 mm	6.9"/175 mm	
В		10.8"/275 mm		11"/28			13"/330 mm	
Weigh	nt, approx.	146 lb/66 kg	165 lb/7	5 kg	16	5 lb/75 kg	309 lb/140 kg	

 $^{^{1)}}$ $\,$ For actuator with A = 100 in^2/640 cm^2: height H +0.32"/8 mm $\,$







Installation

The regulator is delivered as a ready-toinstall unit.

 Install the main valve in the pipeline at the site of installation and connect the control line (inert gas pressure p₂) to the pilot valve (pipe Ø ½").



Install the regulator in such a way that it is still easily accessible after the plant is completed to facilitate maintenance or revision work.

Allow enough space for set point adjustment at the pilot valve using a socket wrench.

The following points must be observed:

- Installation in horizontal pipelines
- Install the valve assembly with the pilot valve pointing up
- The direction of flow must match the arrow on the body of the main valve

More details in ► EB 2538.

Ordering text

Type 2404-1 Pressure Reducing Valve consisting of:

Type 2406 functioning as the main valve:

Body material ... Material: diaphragm ..., plug stem ... NPS/DN ..., C_V/K_{VS} coefficient ...

Type 2405 Pilot Valve:

Set point range 0.045 to 0.15 psi · 0.075 to 0.45 psi · 0.35 to 1.5 psi/3 to 10 mbar · 5 to 30 mbar · 25 to 100 mbar

Type 44-1 B Input Pressure Regulator

Mounting kit M2404