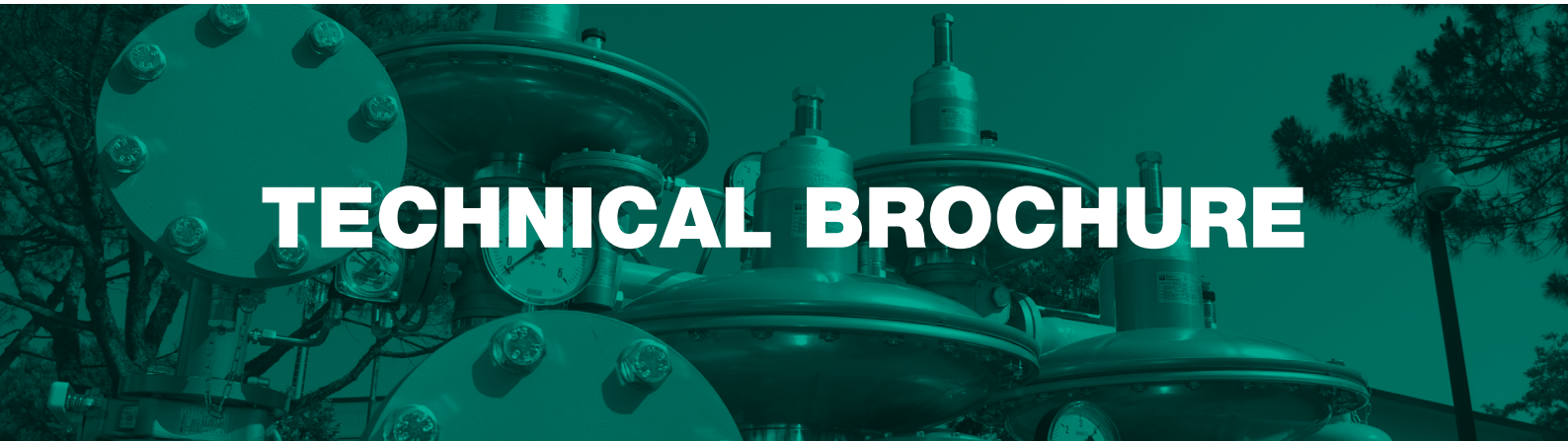
Pietro Fiorentini

Dival 500

Medium-Low Pressure Gas Regulator



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dival500_technicalbrochure_ENG_revD

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Who we are

We are a global organization that specializes in designing and manufacturing technologically advanced solutions for natural gas treatment, transmission and distribution systems.

We are the ideal partner for operators in the Oil & Gas sector, with a business solutions that span the whole natural gas chain.

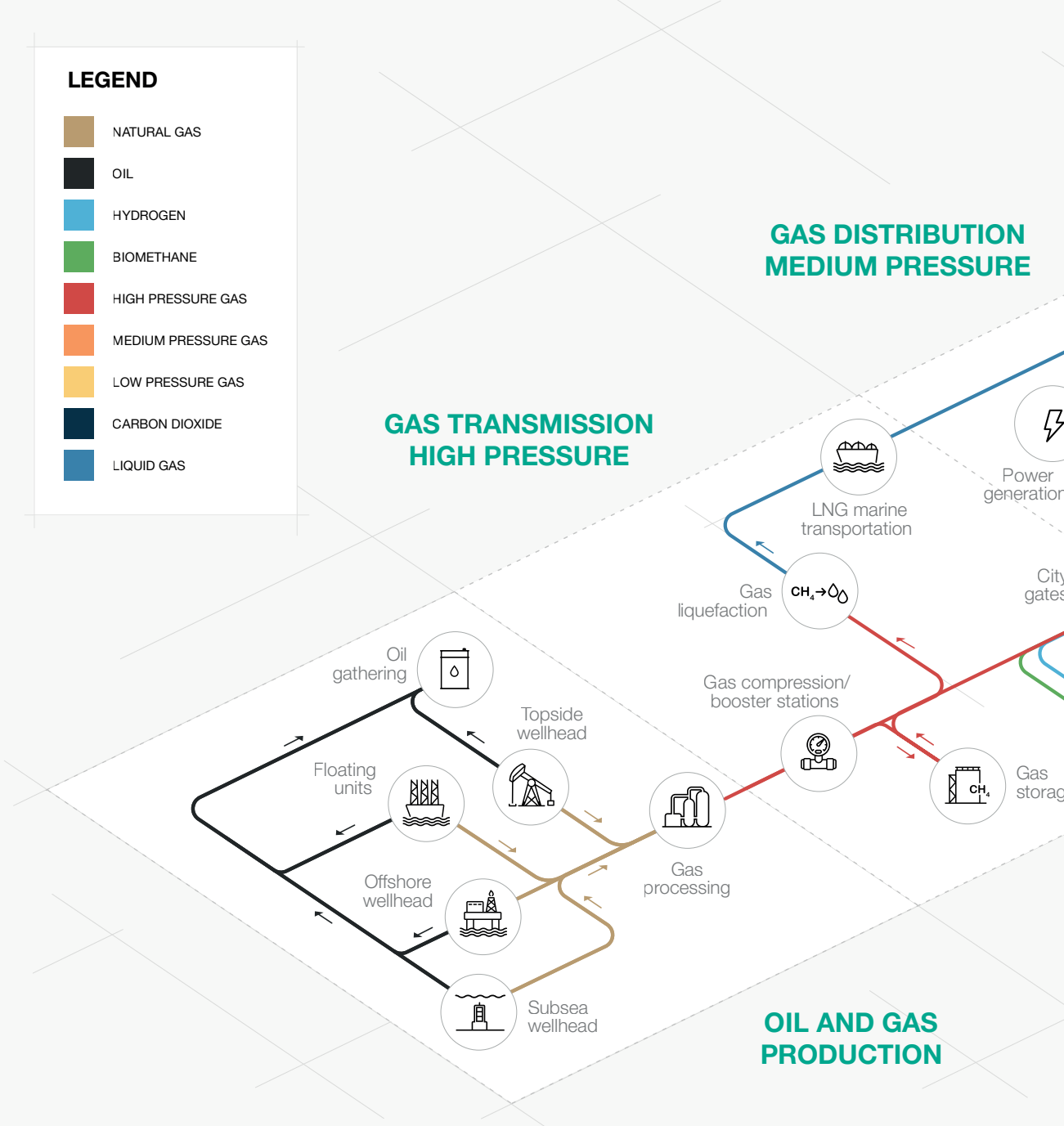
We are constantly evolving to meet our customers' highest expectations in terms of quality and reliability.

Our aim is to be a step ahead of the competition, with customized technologies and an after-sale service program undertaken with the highest level of professionalism.

Pietro Fiorentini advantages

- Localised technical support
- Experience since 1940
- Operating in over 100 countries

Area of Application



Green icon indicates the application where this product is suitable for

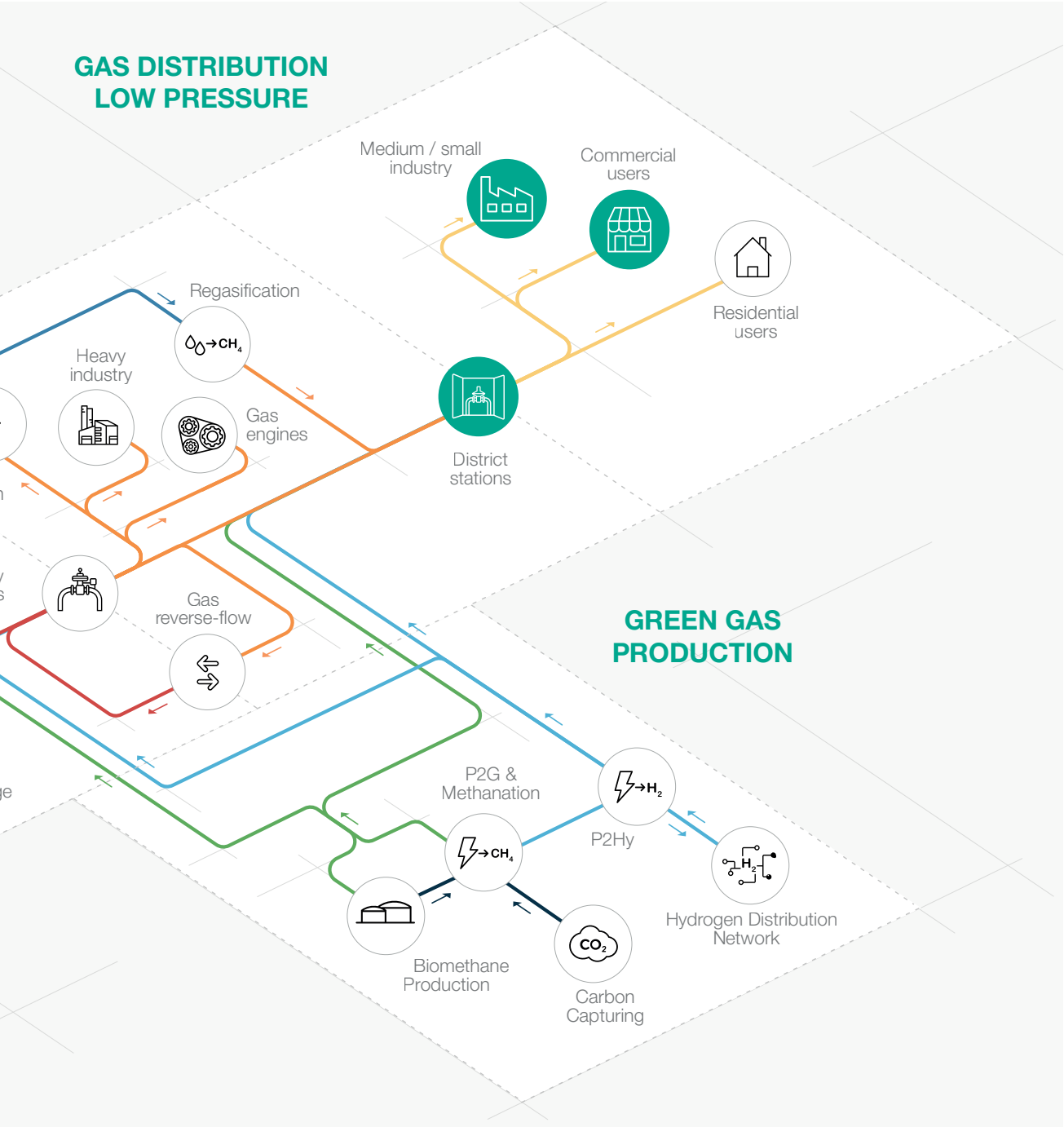


Figure 1 Area of Application Map

Introduction

The **Dival 500** by Pietro Fiorentini is a **lever-operated** gas pressure regulator controlled by a diaphragm and contrasting regulated spring action.

Mainly used for medium and low pressure natural gas distribution networks, as well as commercial and industrial applications.

It should to be used with previously filtered non-corrosive gases.

According to the European Standard EN 334, it is classified as **Fail Open**.

The Dival 500 is **Hydrogen Ready** for NG-H2 blending.

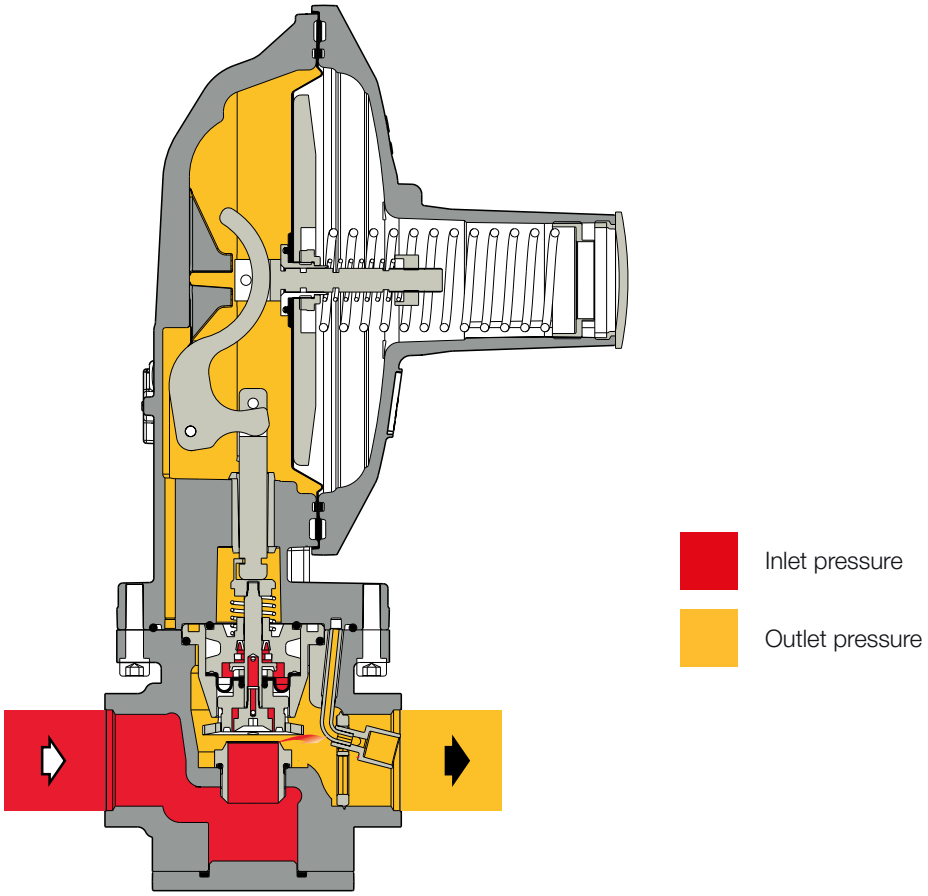


Figure 2 Dival 500

Features and Calibration ranges

The **Dival 500** is a **lever-operated** device for medium and low pressure with a unique **dynamic balancing system** which ensures an **outstanding turndown ratio** combined with an extremely **accurate outlet pressure control.**

A balanced pressure regulator it is a pressure regulator where delivery pressure accuracy is not affected by the fluctuation of the inlet pressure and flow during its operation. Therefore, a balanced pressure regulator can have a single orifice for all pressure and flow operating conditions.

This regulator is suitable for use with previously filtered, non-corrosive gases and distribution networks as well as high load industrial applications.

It is a **truly top entry design** which allows an **easy maintenance** of parts directly in the field **without removing the body from the pipework.**

Set point adjustement of the regulator is operated via a spring located in the top chamber.

The modular design of the Dival 500 pressure regulators allows to install built-in slam shut valve LA.

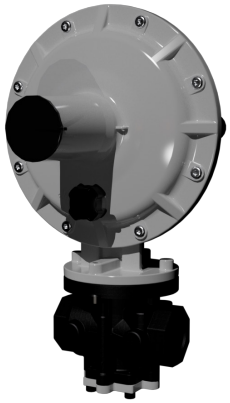


Figure 3 Dival 500

Figure 4 Dival 500 with LA

Dival 500 competitive advantages

- Balanced type
- Operates with low differential pressure
- High accuracy
- Fail Open plug and seat regulator
- Token IRV
- Internal sensing line
- Top Entry
- Easy maintenance
- Built-in accessories
- Biomethane compatible and 20% Hydrogen blending compatible. Higher blending available on request

Features

Features	Values
Design pressure* (PS[1] / DP[2])	up to 1 MPa for BP, up to 2 MPa for MP and TR up to 10 bar for BP, up to 20 bar for MP and TR
Ambient temperature* (TS[1])**	from -20 °C to +60 °C from -4 °F to +140 °F
Inlet gas temperature*,***	from -20 °C to +60 °C from -4 °F to +140 °F
Inlet pressure (MAOP / p_{umax}[1])	• from (Pd + 0.01) MPa to 1 MPa from BP from (Pd + 0.01) MPa to 2 MPa for MP and TR • from (Pd + 0.1) bar to 10 bar from BP from (Pd + 0.1) bar to 20 bar for MP and TR
Range of downstream pressure (Wd[1])	• from 1.3 to 10 kPa for BP, from 10 to 30 kPa for MP, from 30 to 250 kPa for TR • from 13 to 100 mbar for BP, from 100 to 300 mbar for MP, from 300 to 2500 mbar for TR
Available accessories	LA slam shut, relief valve, monitor version
Minimum operating differential pressure (Δp_{min}[1])	0.01 MPa | 0.1 barg
Accuracy class (AC[1])	up to 10 | up to 1% absolute (depending on working conditions)
Lock-up pressure class (SG[1])	up to 20 (depending on version and set point)
Nominal size (DN[1,2])	DN 1”x1”; DN 1”x1” 1/2
Connections	Threaded Rp EN 10226-1, NPT ASME B1.20.1

([1]) according to EN334 standard
([2]) according to ISO 23555-1 standard
(*) NOTE: Different functional features and/or extended temperature ranges may be available on request. Stated inlet gas temperature range is the maximum for which the equipment’s full performance, including accuracy is guaranteed. Product may have a different pressure or temperature ranges according to the version and/or installed accessories.
(**) NOTE: Stated temperature range is the operating range for which the equipment’s mechanical resistance and leakage rate are guaranteed. Some body materials, if multiple choices are available, may not be suitable for all the available versions shown.
(***) NOTE: Stated temperature range is the range for which the equipment’s full performance, including accuracy and lock-up are guaranteed. Some body materials, if multiple choices are available, may not be suitable for all the available versions shown.

Table 1 Features

Materials and Approvals

Part	Material
Body	Cast iron GS 400–18 UNI EN 1083 Aluminium EN AC 43300 UNI EN 1706
Cover	Aluminium
Seat	Brass
Diaphragm	Fabric finish rubber
O-ring	Nitrile rubber
NOTE: The materials indicated above refer to the standard models. Different materials can be provided according to specific needs.	

Table 2 Materials

Construction Standards and Approvals

The **Dival 500** regulator is designed according to the European standard EN 334.
The regulator reacts in opening (Fail Open) according to EN 334.

The product is certified according to European Directive 2014/68/EU (PED).
Leakage class: bubble tight, better than class VIII according to ANSI/FCI 70-3.

EN 334

PED-CE

Springs ranges and control heads

Control heads pressure ranges				
	Control head BP	Control head MP	Control head TR	Spring Table web link
Model	kPa mbar	kPa mbar	kPa mbar	
Dival 500	1.3 ÷ 10 13 ÷ 100	10 ÷ 30 100 ÷ 300	30 ÷ 250 300 ÷ 2500	TT 00280

Table 3 Control heads calibration range

General link to the calibration tables: **PRESS HERE** or use the QR code:

Maximum allowable operating pressure

Design pressure (p_s according to EN334)				
Version	Body		Slam shut	
	MPa	barg	MPa	barg
Cast Iron Body 1"x1" and 1" x 1" 1/2	2.00	20	2.00	20
Aluminum Body 1"x1" and 1" x 1" 1/2	2.00	20	2.00	20

Table 4 Design pressure of body and slam shut

Design pressure (p_s according to EN334)						
Parts	Control head					
	BP		MP		TR	
	MPa	barg	MPa	barg	MPa	barg
Cover	2.00	20	2.00	20	2.00	20
Diaphragm	0.03	0.3	0.06	0.6	0.50	5
Max Diaphragm Δp	0.02	0.2	0.03	0.399	0.33	3.325

Table 5 Design pressure of control heads

MAOP Maximum Allowable Operating Pressure (p_{umax} according to EN334)							
Version		Control head					
		BP		MP		TR	
		MPa	barg	MPa	barg	MPa	barg
WITH / WITHOUT CE MARKING	All version (all body materials)	1.00	10	2.00	20	2.00	20
	All version (all body materials) + SSV	1.00	10	2.00	20	2.00	20

Table 6 MAOP Maximum Allowable Operating Pressure with/without CE marking

Recommended installations

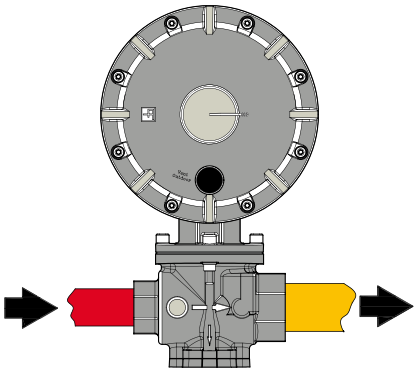


Figure 5 Dival 500 basic position

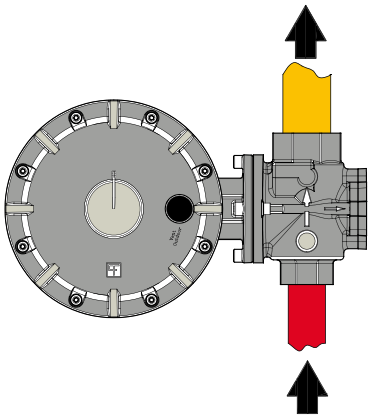


Figure 6 Dival 500 vertical installation 1

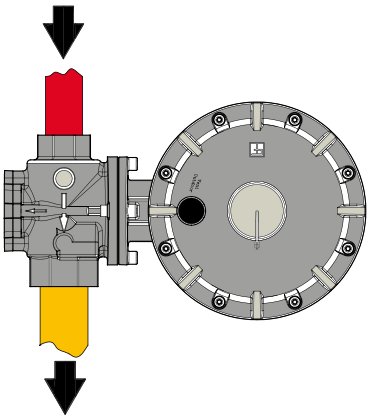


Figure 7 Dival 500 vertical installation 2

Accessories

For the pressure regulators:

- Slam shut valve
- Relief valve

Monitor configuration

The in-line monitor is generally installed upstream of the active 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 active regulator. The Cg coefficients of the worker regulator with an in-line monitor is the same, but during worker regulator sizing it shall be considered the differential pressure drop generated by the fully open in-line monitor. As a practice, to incorporate this effect a Cg reduction of 20% of the worker regulator can be applied.

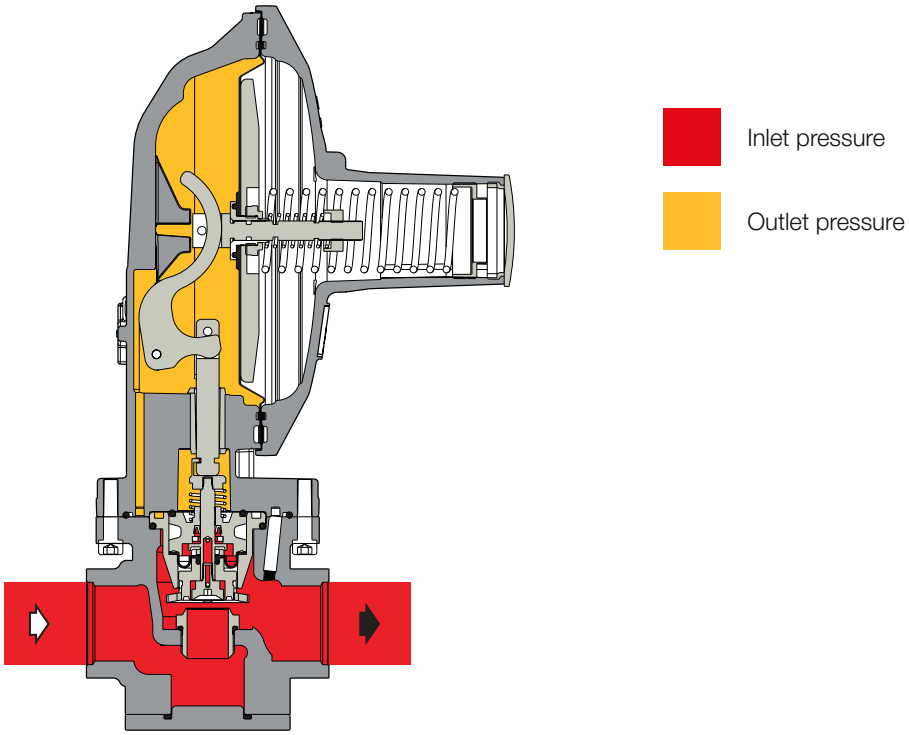


Figure 8 Dival 500 in-line monitor

Relief valve

The Dival 500 series can be equipped with an incorporated internal relief valve (IRV) that discharges a limited amount of gas into the atmosphere when the regulator outlet pressure exceeds the set value. The typical triggering events are:

- Thermal expansion of the downstream gas at zero flow condition (during lock-up).
- Pressure peaks caused by sudden closing of downstream appliances or in the event of small downstream buffer volume.

When the outlet pressure returns below the set value, the relief valve closes again.

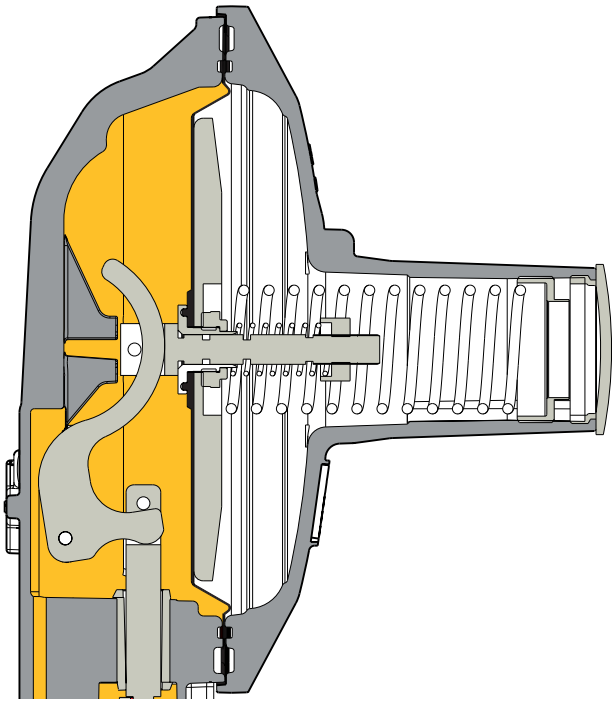


Figure 9 Dival 500 relief valve

Slam Shut LA

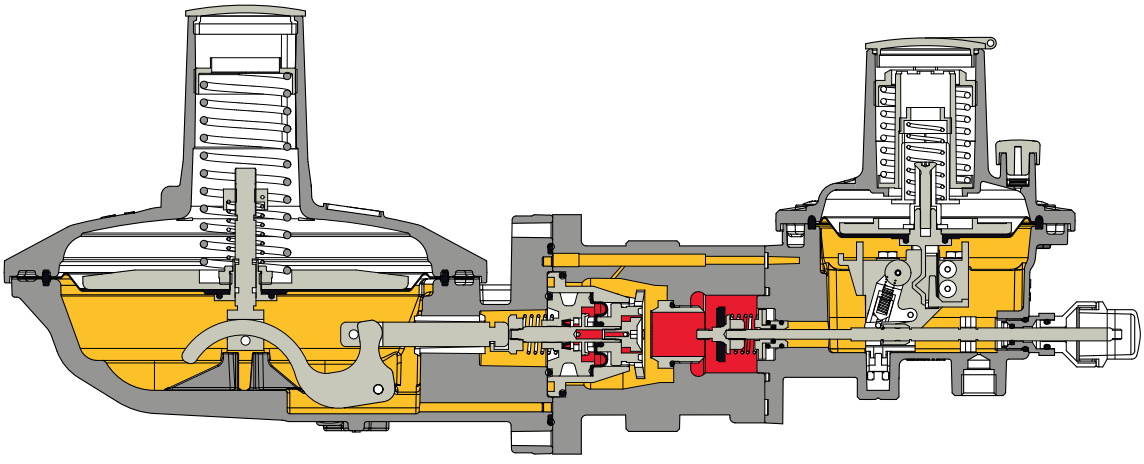
The Dival 500 pressure regulator offers the possibility of installing an **incorporated LA slam shut valve**, depending on the regulator size, and this can be done either during the manufacturing process or be retrofited in the field.

LA is available for all sizes.

Retrofitting the LA can be done without modifying the pressure regulator assembly. With the built-in slam shut, the Cg valve coefficients is 5% lower than the corresponding version without.

The main characteristics of this device are:

- OPSO — Overpressure Shut-Off
- UPSO — Underpressure Shut-Off
- Internal by-pass
- Push button for tripping test (optional)
- Compact dimensions
- Easy maintenance
- Remote tripping option
- Limit switch option



Inlet pressure Outlet pressure

Figure 10 Dival 500 with LA

Pressure switch types and ranges					
SSV model	**Type**	**Operation**	**Range Wh**		**Spring Table web link**
			KPa	**mbarg**	
LA	BP	OPSO	3 - 18	30 - 180	TT 00214
		UPSO	0.6 - 6	6 - 60	
LA	MP	OPSO	14 - 45	140 - 450	TT 00214
		UPSO	1 - 24	10 - 240	
LA	TR	OPSO	25 - 550	250 - 5500	TT 00214
		UPSO	10 - 350	100 - 3500	

Table 7 Settings table

Weights and Dimensions

Dival 500

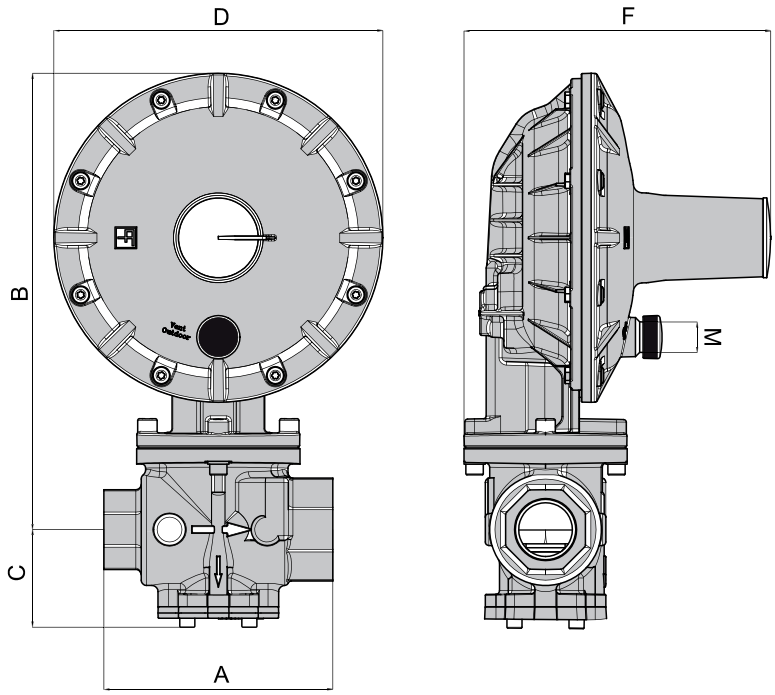


Figure 11 Dival 500 dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)				
Size (DN) - [mm] **Size (DN)** - inches	**25** **1" x 1"**		**40** **1" x 1" 1/2**	
	[mm]	inches	[mm]	inches
A	100	3.9"	129	5.1"
B	255	10.0"	257	10.1"
C	44	1.7"	55	2.2"
D	185.5	7.3"	185.5	7.3"
F	173	6.8"	173	6.8"
DNE	1" ISO 7/1		1" ISO 7/1	
DNU	1" ISO 7/1		1" 1/2 ISO 7/1	
Tubing Connections	Øe 10 x Øi 8 (on request imperial sizing)			
Weight	Kg	lbs	Kg	lbs
	3.6	7.9	3.8	8.4

Table 8 Weights and dimensions

Dival 500 + LA

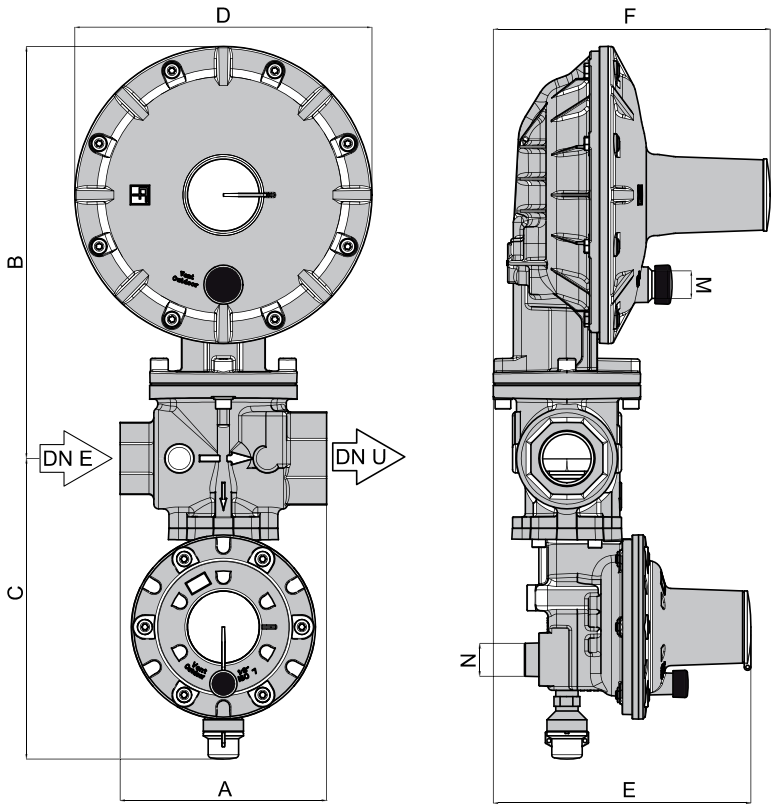


Figure 12 Dival 500 + LA dimensions

Weights and Dimensions (for other connections please contact your closest Pietro Fiorentini representative)				
Size (DN) - [mm] **Size (DN)** - inches	**25** **1" x 1"**		**40** **1" x 1" 1/2**	
	[mm]	inches	[mm]	inches
A	100	3.9"	129	5.1"
B	255	10.0"	257	10.1"
C	182	7.2"	182	7.2"
D	185.5	7.3"	185.5	7.3"
E	161	6.3"	161	6.3"
F	173	6.8"	173	6.8"
G	1/4"		1/4"	
H	1/4"		1/4"	
DNE	1" ISO 7/1		1" ISO 7/1	
DNU	1" ISO 7/1		1" 1/2 ISO 7/1	
Tubing Connections	Øe 10 x Øi 8 (on request imperial sizing)			
Weight	Kg	lbs	Kg	lbs
	4.2	9.3	4.4	9.7

Table 9 Weights and dimensions

Sizing and Cg

In general, the choice of a regulator is made based on the calculation of the flow rate determined by the use of formulae using the flow rate coefficients (Cg) and the form factor (K1) as indicated by the EN 334 standard. Sizing is available through the on-line Pietro Fiorentini sizing program.

Flow rate coefficient		
Nominal size	25	40
Inches	1”	1” 1/2
Cg	195	245
K1	97	96

Table 10 Flow rate coefficient

For sizing **PRESS HERE** or use the QR code:

Note: In case you do not have the proper credentials to access, feel free to contact your closest Pietro Fiorentini representative.

In general the on-line sizing considers multiple variables as the regulator is installed in a system, enabling a better and multiperspective approach to the sizing.

For different gases, and for natural gas with a different relative density other than 0.61 (compared to air), the correction coefficients from the following formula shall be applied.

$$F_c = \sqrt{\frac{175.8}{S \times (273.16 + T)}}$$

S = relative density (refer to Table 11)
T = gas temperature (°C)

$$F_c = \sqrt{\frac{316.44}{S \times (459.67 + T)}}$$

S = relative density (refer to Table 11)
T = gas temperature (°F)

Correction Factor Fc		
Gas Type	**Relative Density S**	**Correction Factor Fc**
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
Note: the table shows the Fc correction factors valid for Gas, calculated at a temperature of 15°C and at the declared relative density.		

Table 11 Correction Factor Fc

Flow rate conversion
Stm^3/h x 0.94795 = Nm^3/h

Nm^3/h reference conditions:
T= 0 °C; P= 1 bar | T= 32 °F; P= 14.5 psig
Stm^3/h reference conditions:
T= 15 °C; P= 1 bar | T= 59 °F; P= 14.5 psig

Table 12 Flow rate conversion

CAUTION:
In order to get optimal performance, to avoid premature wear on the regulators components, and to limit noise emissions, it is recommended to check the gas speed and its compliance with local practice and regulations. The gas speed at the outlet flange of the regulator which may be calculated by the following formula:

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

V = gas speed in m/s
Q = gas flow rate in Stm^3/h
DN = nominal size of regular in mm
Pd = outlet pressure in barg

$$V = 0.0498 \times \frac{Q}{DN^2} \times \frac{14.504 - 0.002 \times Pd}{14.504 + Pd}$$

V = gas speed in ft/s
Q = gas flow rate in Scfh
DN = nominal size of regular in inches
Pd = outlet pressure in psi

Flow capacity tables

Dival 500 BP - DN 1”

From 2 kPa [20 mbarg] to 10 kPa [100 mbarg]

Dival 500 BP - (accuracy 10% ; AC10 according to EN334)											
Inlet pressure		**Outlet pressure**									
		2 kPa / 20 mbarg		2.5 kPa / 25 mbarg		5 kPa / 50 mbarg		7.5 kPa / 75 mbarg		10 kPa / 100 mbarg	
MPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
0.05	0.5	44	1600	65	2300	75	2700	77	2800	70	2500
0.10	1.0	54	2000	75	2700	105	3800	116	4100	113	4000
0.20	2.0	63	2300	80	2900	120	4300	154	5500	153	5500
0.25	2.5	61	2200	80	2900	120	4300	173	6200	171	6100
0.50	5.0	56	2000	80	2900	119	4300	156	5600	156	5600
0.75	7.5	56	2000	79	2800	119	4300	156	5600	156	5600
1.00	10.0	56	2000	79	2800	119	4300	155	5500	155	5500
Cg = 195 K1= 97											

Table 13 Dival 500 BP flow rate with outlet pressure from 2 kPa | 20 mbarg up to 10 kPa | 100 mbarg

Dival 500 BP - DN 1”x1”1/2

Dival 500 BP - (accuracy 10% ; AC10 according to EN334)											
Inlet pressure		**Outlet pressure**									
		2 kPa / 20 mbarg		2.5 kPa / 25 mbarg		5 kPa / 50 mbarg		7.5 kPa / 75 mbarg		10 kPa / 100 mbarg	
MPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
0.05	0.5	125	4500	115	4100	115	4100	111	4000	102	3700
0.10	1.0	186	6600	188	6700	189	6700	188	6700	178	6300
0.20	2.0	302	10700	297	10500	319	11300	327	11600	317	11200
0.25	2.5	230	8200	303	10700	324	11500	373	13200	367	13000
0.50	5.0	157	5600	199	7100	398	14100	398	14100	398	14100
0.75	7.5	156	5600	198	7000	397	14100	397	14100	397	14100
1.00	10.0	156	5600	198	7000	396	14000	396	14000	396	14000
Cg = 245 K1= 96											

Table 14 Dival 500 BP flow rate with outlet pressure from 2 kPa | 20 mbarg up to 10 kPa | 100 mbarg

Note: Recommended max flow rate are considering multiple factors such as: extend the regulator’s life, mitigate the erosion/vibrations for high velocity and to minimize the noise emission.
Remark: all capacity stated are considering a stand alone regulator. In case of incorporated accessories a reduction of flow shall be considered.

Dival 500 MP - DN 1”

From 10 kPa [100 mbarg] to 30 kPa [300 mbarg]

Dival 500 MP - (accuracy 10% ; AC10 according to EN334)

Inlet pressure		Outlet pressure									
		10 kPa / 100 mbarg		15 kPa / 150 mbarg		20 kPa / 200 mbarg		25 kPa / 250 mbarg		30 kPa / 300 mbarg	
MPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
0.05	0.5	78	2800	77	2800	74	2700	75	2700	74	2700
0.10	1.0	106	3800	116	4100	116	4100	125	4500	128	4600
0.20	2.0	146	5200	176	6300	160	5700	197	7000	211	7500
0.50	5.0	208	7400	222	7900	215	7600	279	9900	297	10500
1.00	10.0	207	7400	222	7900	215	7600	280	9900	300	10600
1.50	15.0	206	7300	221	7900	214	7600	279	9900	299	10600
2.00	20.0	205	7300	220	7800	213	7600	278	9900	298	10600

Cg = 195 K1= 97

Table 15 Dival 500 MP flow rate with outlet pressure from 10 kPa | 100 mbarg up to 30 kPa | 300 mbarg

Dival 500 MP - DN 1”x1”1/2

Dival 500 MP - (accuracy 10% ; AC10 according to EN334)

Inlet pressure		Outlet pressure									
		10 kPa / 100 mbarg		15 kPa / 150 mbarg		20 kPa / 200 mbarg		25 kPa / 250 mbarg		30 kPa / 300 mbarg	
MPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
0.05	0.5	117	4200	113	4000	94	3400	91	3300	93	3300
0.10	1.0	183	6500	182	6500	161	5700	156	5600	154	5500
0.20	2.0	302	10700	301	10700	290	10300	286	10100	293	10400
0.25	2.5	448	15900	448	15900	448	15900	448	15900	448	15900
0.50	5.0	446	15800	446	15800	446	15800	446	15800	446	15800
0.75	7.5	444	15700	444	15700	444	15700	444	15700	444	15700
1.00	10.0	442	15700	442	15700	442	15700	442	15700	442	15700

Cg = 245 K1= 96

Table 16 Dival 500 MP flow rate with outlet pressure from 10 kPa | 100 mbarg up to 30 kPa | 300 mbarg

Note: Recommended max flow rate are considering multiple factors such as: extend the regulator’s life, mitigate the erosion/vibrations for high velocity and to minimize the noise emission.
Remark: all capacity stated are considering a stand alone regulator. In case of incorporated accessories a reduction of flow shall be considered.

Dival 500 TR - DN 1”

From 0.03 MPa [0.3 barg] to 0.25 MPa [2.5 barg]

Dival 500 TR - (accuracy 10% ; AC10 according to EN334)

Inlet pressure		Outlet pressure									
		0.03 MPa / 0.3 barg		0.05 MPa / 0.5 barg		0.1 MPa / 1 barg		0.2 MPa / 2 barg		0.25 MPa / 2.5 barg	
MPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
0.05	0.5	55	2000	-	-	-	-	-	-	-	-
0.10	1.0	101	3600	108	3900	-	-	-	-	-	-
0.20	2.0	167	5900	188	6700	160	5700	-	-	-	-
0.50	5.0	295	10500	336	11900	368	13000	367	13000	394	14000
1.00	10.0	306	10900	359	12700	396	14000	397	14100	397	14100
1.50	15.0	305	10800	357	12700	395	14000	395	14000	395	14000
2.00	20.0	304	10800	356	12600	393	13900	394	14000	394	14000

Cg = 195 K1= 97

Table 17 Dival 500 TR flow rate with outlet pressure from 0.03 MPa | 0.3 barg up to 0.25 MPa | 2.5 barg

Dival 500 TR - DN 1”x1”1/2

Dival 500 TR - (accuracy 10% ; AC10 according to EN334)

Inlet pressure		Outlet pressure									
		0.03 MPa / 0.3 barg		0.05 MPa / 0.5 barg		0.1 MPa / 1 barg		0.2 MPa / 2 barg		0.25 MPa / 2.5 barg	
MPa	barg	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh	Stm³/h	Scfh
0.05	0.5	66	2400	-	-	-	-	-	-	-	-
0.10	1.0	123	4400	135	4800	-	-	-	-	-	-
0.20	2.0	206	7300	255	9100	200	7100	-	-	-	-
0.25	2.5	444	15700	498	17600	498	17600	449	15900	459	16300
0.50	5.0	458	16200	495	17500	496	17600	496	17600	496	17600
0.75	7.5	456	16200	493	17500	494	17500	494	17500	494	17500
1.00	10.0	454	16100	491	17400	492	17400	492	17400	492	17400

Cg = 245 K1= 96

Table 18 Dival 500 TR flow rate with outlet pressure from 0.03 MPa | 0.3 barg up to 0.25 MPa | 2.5 barg

Note: Recommended max flow rate are considering multiple factors such as: extend the regulator’s life, mitigate the erosion/vibrations for high velocity and to minimize the noise emission.
Remark: all capacity stated are considering a stand alone regulator. In case of incorporated accessories a reduction of flow shall be considered.

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