

THE CYLINDER PRESSURE REGULATOR FROM MESSER — A MILLION TIMES TRIED AND TESTED

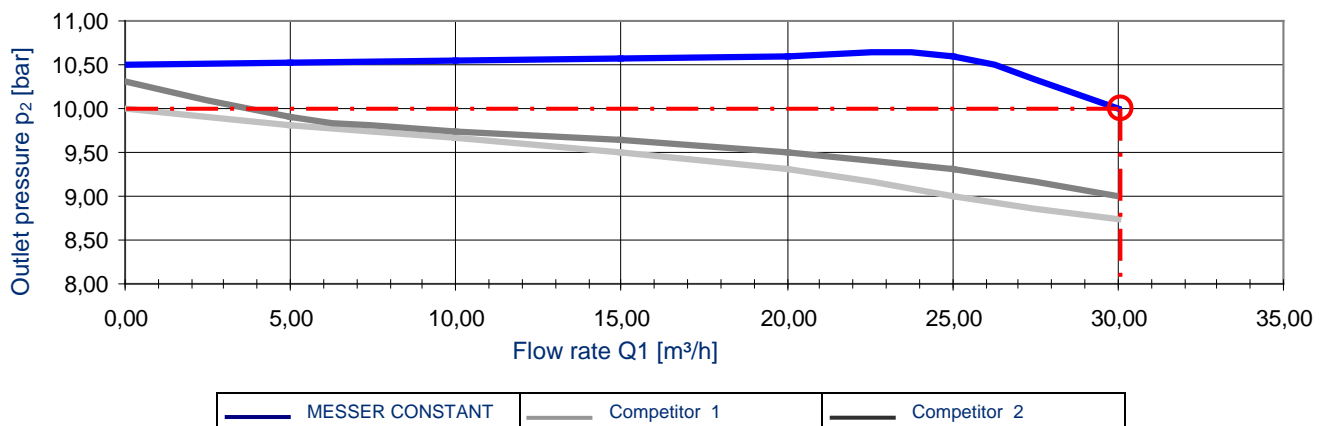
The MESSER CONSTANT 2000 cylinder pressure regulator for 200 and 300 bar, has been established on the international market for over 30 years as an absolute quality product. During this time it has been developed further and has already passed the million production units mark

The essential advantages of the CONSTANT 2000 over its competition are:

- The CONSTANT 2000 has passed the test BAM (06-BAM 0193), a product class qualification 1 BG 88 and meets the standards DIN EN ISO 2503, EN 585 as well as DIN 8546
- In contrast to competitive products, the CONSTANT 2000 has a very consistent flow performance
- The CONSTANT 2000 is characterised by a very high control accuracy even with low operating pressures and take off rates
- The CONSTANT 2000 is extremely reliable in operation through its integrated central filter
- Through the combination of a blow-off valve and ratchet stops, the CONSTANT 2000 has a double protected outlet pressure limitation
- The easy replacement of wear parts makes the CONSTANT 2000 very easy to maintain
- The specific weight of the brass housing of the CONSTANT 2000 is, at 7,9g/cm³, significantly lower than that of competitive products and makes the CONSTANT 2000 especially resistant to icing

NOMINAL FLOW RATE Q₁

Requirements according to DIN EN ISO 2503: equipment class 3 Q₁ = 30 m³/h at P₂ = 10 bar



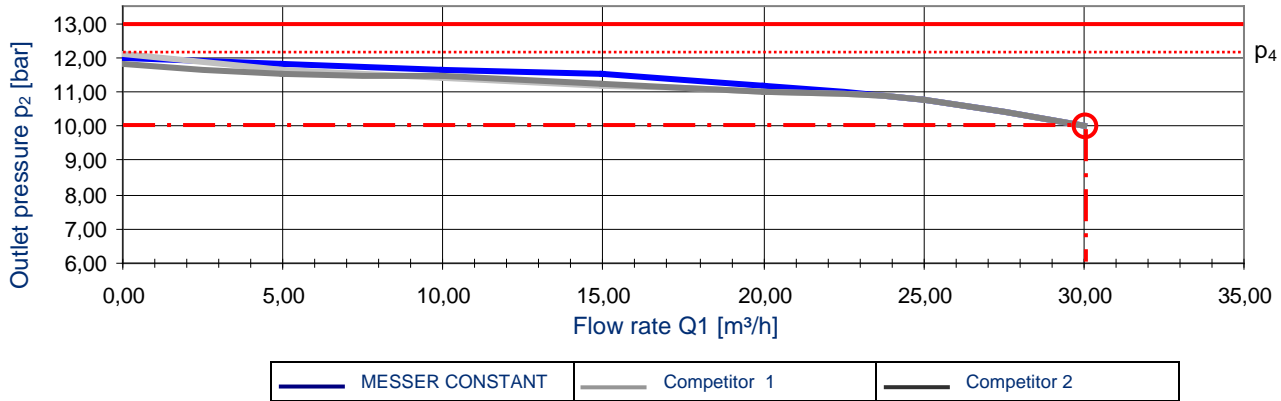
To be able to meet equipment class 3 of DIN EN ISO 2503, the cylinder pressure regulator must achieve a nominal flow rate Q₁ of 30 m³/h with an inlet pressure p₁ of 21 bar and an outlet pressure p₂ of 10 bar.

Expressions:

- p₁ = Inlet pressure
 p₂ = Outlet or operating pressure
 p₃ = Inlet pressure for the test
 p₄ = Outlet pressure for evaluation of the flow coefficient R
 p₅ = Outlet pressure for evaluation of the inconsistency coefficient i
- R = Flow rate coefficient
 i = Inconsistency coefficient
- Q₁ = Nominal flow rate

PRESSURE INCREASE COEFFICIENT R

Requirements according to DIN EN ISO 2503: $R > 0,3$

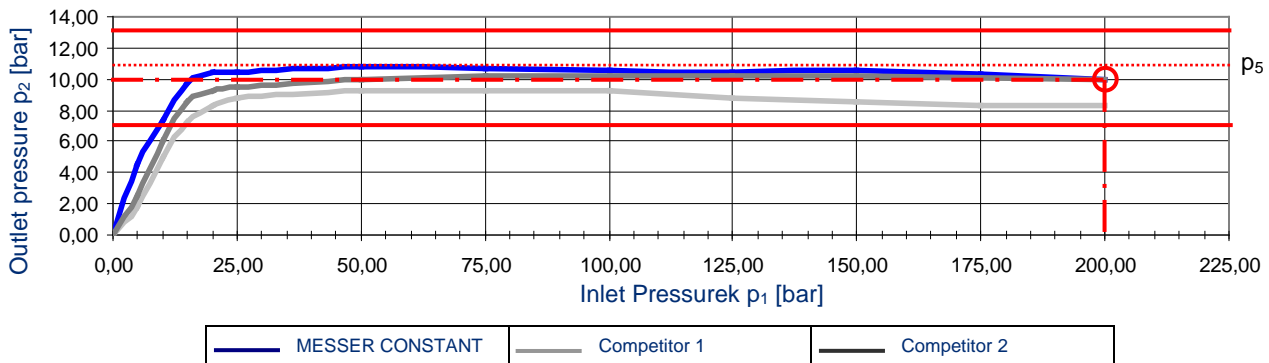


To achieve equipment class 3 to DIN EN ISO 2503, the pressure regulator is set to an inlet pressure for the test $p_3 = 2 \times p_2 + 1 \text{ bar} = 21 \text{ bar}$, with an outlet pressure $p_2 = 10 \text{ bar}$ and a nominal gas flow rate $Q_1 = 30 \text{ m}^3/\text{h}$. With these settings the flow rate of $30 \text{ m}^3/\text{h}$ is evenly and steadily reduced to $0 \text{ m}^3/\text{h}$. During this the outlet pressure may deviate by max. 30 % from the outlet pressure p_2 . This deviation pressure is defined by DIN EN ISO 2503 as the closing pressure p_4 . The pressure increase coefficient R is then calculated as follows:

$$R = \frac{p_4 - p_2}{p_2} \quad R = \frac{12 \text{ bar} - 10 \text{ bar}}{10 \text{ bar}} \quad R = 0,2$$

INCOSISTANCY COEFFICIENT I

Requirements of DIN EN ISO 2503: $-0,3 < i < +0,3$

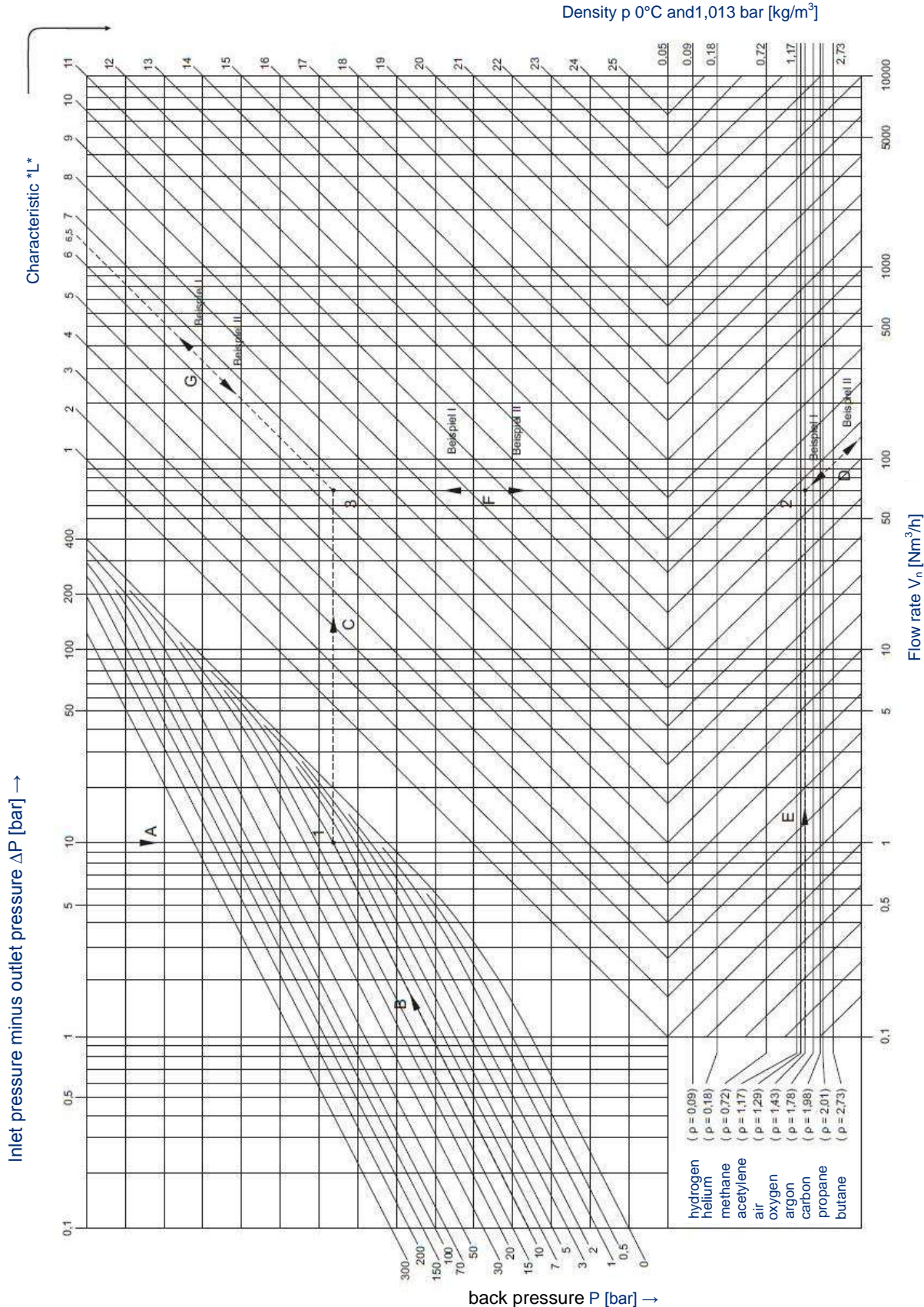


To achieve equipment class 3 to DIN EN ISO 2503, the pressure regulator is set to an inlet pressure $p_1 = 200 \text{ bar}$ with an outlet pressure p_2 of 10 bar and a nominal flow rate Q_1 of $30 \text{ m}^3/\text{h}$. With these settings the inlet pressure of $p_1 = 200 \text{ bar}$ is evenly and steadily reduced to a test pressure $p_3 = 21$. During this the outlet pressure may deviate by max. 30 % from the outlet pressure p_2 . This outlet pressure is defined by DIN EN ISO 2503 as the highest or lowest outlet pressure for establishing the inconsistency coefficient p_5 .

$$i = \frac{p_5 - p_2}{p_2} \quad i = \frac{10,5 \text{ bar} - 10 \text{ bar}}{10 \text{ bar}} \quad i = 0,05$$

CONSTANT

CYLINDER PRESSURE REGULATOR



Stand: 04/2013

EXAMPLE I DETERMINATION OF THE PERFORMANCE CHARACTERISTIC L

Inlet pressure P_V , outlet pressure P_H , flow rate V_n and gas type are known

Operating data:

- Inlet pressure varies between 30 and 20 bar
- Outlet pressure should be able to be set between 8 and 10 bar
- Flow rate required 120 m³/h
- Gas type Oxygen

The pressure regulator must be designed for the worst case, so for the minimum pressure drop.

$\Delta P = \text{Inlet pressure}_{\text{min.}} - \text{outlet pressure}_{\text{max.}}$

$\Delta P = 20 \text{ bar} - 10 \text{ bar}$

$\Delta P = 10 \text{ bar}$

Calculating the performance characteristic L

- Inlet pressure minus outlet pressure = 10 bar → vertically downwards (A)
- Outlet pressure = 10 bar → diagonally upwards (B)
- Intercept (1)
- Flow rate = 120 m³/h → parallel to the guide lines diagonally left upwards (D)
- Gas line OXYGEN → horizontally to the right (E)
- Intercept (2)
- From intercept (1) → horizontally to the right (C)
- From intercept (2) → vertically upwards (F) to line (C)
- Intercept (3)
- From intercept (3) → parallel to the guide lines diagonally upwards and right (G)
- Characteristic L = 6,5

If the pressure regulator type is to be selected then the gas type, inlet pressure, outlet pressure and flow rate is used to calculate the performance characteristic. It must be observed here that the pressure regulator has to be selected for the worst case, i.e. for the minimum pressure reduction. If there is doubt, it is advisable to determine the performance characteristic for several operating points and to select the pressure regulator for the largest characteristic value.

EXAMPLE II DETERMINATION OF THE FLOW RATE

Pressure regulator type, characteristic value and gas type are known

Operating data:

- Characteristic value 6,5
- Inlet pressure varies between 30 and 20 bar
- Outlet pressure should be able to be set between 8 and 10 bar
- Gas type Oxygen

Determining the flow rate

- Inlet pressure minus outlet pressure = 10 bar → vertically downwards (A)
- Outlet pressure = 10 bar → diagonally upwards (B)
- Intercept (1)
- From intercept (1) → horizontally to the right (C)
- Characteristic L = 6,5 → parallel to the guide lines diagonally left downwards (G)
- Intercept (3)
- From intercept (3) → vertically downwards (F)
- Gas line OXYGEN → horizontally to the right (E)
- Intercept (2)
- From intercept (2) → parallel to the guidelines diagonally right downwards (D)

Flow rate = 120 m³/h

Flow table for pressure regulators in accordance with DIN EN ISO 2503

Oxygen ¹⁾ Inlet P _v [bar] pressure	Flow rate Q [m ³ /h] ²⁾ at back pressure P _H [bar]					Acetylene Inlet P _v [bar]	Flow rate Q [m ³ /h] ²⁾ at back pressure P _H [bar]			
	1	2,5	4	10	20		0,5	1	1,2	
40	15	30	40	50	60	18	5	6	8	
20	15	20	25	30	--	10	4,5	5,5	6,5	
10	15	15	15	--	--	4	3	4	5	
5	10	10	10	--	--	2	1,5	2	3	

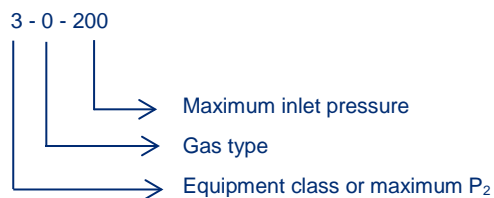
¹⁾ This flow rate is multiplied by the following factors for other types of gas: ²⁾ in normal status

Argon	0,90	Nitrogen	1,05
Compressed air	1,05	Methane	1,40
Carbon dioxide	0,85	Hydrogen	4,00

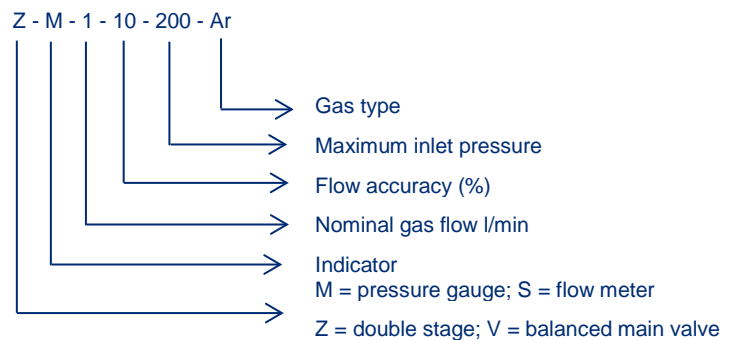
Equipment classification for pressure regulators in accordance

Gas type	Equipment	Maximum inlet pressure P ₁ [bar]	Maximum outlet pressure P ₂ [bar]	Nominal gas flow Q ₁ [m ³ /h]
Oxygen and other compressed gases up to 300 bar	0	0 to 300	2	1,5
	1		4	5
	2		6	15
	3		10	30
	4		12,5	40
	5		20	50
Dissolved acetylene	1	25	0,8	1
	2		< 1,5	5
MPS (Mapp)	0	25	1,5	1
	1		4	5
LPG	1	25	1,5	1
	2		4	5
CO ₂	0	200	2	4
	1		4	2

Identification in accordance DIN EN ISO 2503



Identification in accordance DIN EN 13918



OXYGEN

single stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
10 bar	G 3/4"	G 1/4", DN 6	717.05335	025
20 bar	G 3/4"	G 1/4", DN 6	717.05336	025
50 bar	G 3/4"	G 1/4", DN 6	717.05344	026

OXYGEN

double stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
1,5 bar	G 3/4"	G 1/4", DN 6	717.05338	026
2,5 bar	G 3/4"	G 1/4", DN 6	717.05339	026
10 bar	G 3/4"	G 1/4", DN 6	717.05340	026

single stage					ACETYLENE
Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.	
1,5 bar	Bracket	G 3/8" LH, DN 8	717.05337	025	



single stage					PROPANE
Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.	
2,5 bar	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05529	026	



single stage					MAPP
Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.	
2,5 bar	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05528 *	026	



single stage					FUEL GASES
Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.	
10 bar	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05537	026	
20 bar	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05538	026	
50 bar	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05539 *	026	



double stage					FUEL GASES
Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.	
2,5 bar	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05551	026	
10 bar	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05552	026	



for methane, hydrogen, Back-Shielding gas

HYDROGEN

single stage



<i>Maximum flow rate</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
16 l/min	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05567	023

Flow rate indication with flow-meter

BACK-SHIELDING GAS

single stage



<i>Maximum flow rate</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
50 l/min	W 21,80 x 1/14" LH	G 3/8" LH, DN 8	717.05563	023

Flow rate indication with flow gauges

SHIELDING GASES

single stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
10 bar	W 21,80 x 1/14"	G 1/4", DN 6	717.05522	026
20 bar	W 21,80 x 1/14"	G 1/4", DN 6	717.05523	026
50 bar	W 21,80 x 1/14"	G 1/4", DN 6	717.05524	026

for argon and other natural gases, Co2 (carbon dioxide), Mixed gases



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
100 bar	W 21,80 x 1/14"	G 1/2"	717.05525 *	004
200 bar	W 21,80 x 1/14"	G 1/2"	717.05527 *	004

for argon and other natural gases, CO₂ (carbon dioxide), Mixed gases

SHIELDING GASES

double stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
1,5 bar	W 21,80 x 1/14"	G 1/4", DN 6	717.05544 *	026
2,5 bar	W 21,80 x 1/14"	G 1/4", DN 6	717.05545	026
10 bar	W 21,80 x 1/14"	G 1/4", DN 6	717.05546	026

for argon and other natural gases, CO₂ (carbon dioxide), Mixed gases

single stage

ARGON / CO₂

Maximum flow rate	Cylinder connection	Hose connection	Art. No.	Cat. No.
16 l/min	W 21,80 x 1/14"	G 1/4", DN 6	717.05354	025
32 l/min	W 21,80 x 1/14"	G 1/4", DN 6	717.05562	023



Flow rate indication with flow gauges

Maximum flow rate	Cylinder connection	Hose connection	Art. No.	Cat. No.
16 l/min	W 21,80 x 1/14"	G 1/4", DN 6	717.05564	023
30 l/min	W 21,80 x 1/14"	G 1/4", DN 6	717.05568	023



Flow rate indication with flow-meter

Maximum flow rate	Cylinder connection	Hose connection	Art. No.	Cat. No.
16 l/min	W 21,80 x 1/14" LH	G 3/8" LH, DN 6	717.05565	023



for argon / hydrogen (97% / 3%)

Maximum flow rate	Cylinder connection	Hose connection	Art. No.	Cat. No.
16 l/min	W 21,80 x 1/14"	G 1/4", DN 6	717.08452 *	023
30 l/min	W 21,80 x 1/14"	G 1/4", DN 6	717.08453 *	023



Flow rate indication with double flow-meter

double stage

ARGON / CO₂

Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.
1 l/min	W 21,80 x 1/14"	G 1/4", DN 6	717.05569 *	023
5 l/min	W 21,80 x 1/14"	G 1/4", DN 6	717.05570 *	023



Flow rate indication with flow-meter

NITROGEN

single stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
10 bar	W 24,32 x 1/14"	G 1/4", DN 6	717.05531	026
20 bar	W 24,32 x 1/14"	G 1/4", DN 6	717.05532	026
50 bar	W 24,32 x 1/14"	G 1/4", DN 6	717.05533	026



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
100 bar	W 24,32 x 1/14"	G 1/2"	717.05534	004
150 bar	W 24,32 x 1/14"	G 1/2"	717.05535	004
200 bar	W 24,32 x 1/14"	G 1/2"	717.05536	004



<i>Maximum flow rate</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
16 l/min	W 24,32 x 1/14"	G 1/4", DN 6	717.05566	023

Flow rate indication with flow-meter

NITROGEN

double stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
1,5 bar	W 24,32 x 1/14"	G 1/4", DN 6	717.05547	026
2,5 bar	W 24,32 x 1/14"	G 1/4", DN 6	717.05548	026
10 bar	W 24,32 x 1/14"	G 1/4", DN 6	717.05549	026

single stage

COMPRESSED AIR

<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
10 bar	G 5/8 außen	G 1/4", DN 6	717.05515	026
20 bar	G 5/8 außen	G 1/4", DN 6	717.05516	026
50 bar	G 5/8 außen	G 1/4", DN 6	717.05517	026



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
100 bar	G 5/8 außen	G 1/2"	717.05518 *	004
200 bar	G 5/8 außen	G 1/2"	717.05520 *	004



double stage

COMPRESSED AIR

<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
10 bar	G 5/8 außen	G 1/4", DN 6	717.05543	026



TEST GAS

single stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
10 bar	M 19 x 1,5 LH	G 3/8", DN 8	717.05530	026

for test gas without corrosive components

NITROUS OXIDE

single stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
10 bar	G 3/8"	G 1/4", DN 6	717.05571 *	004

Inlet pressure up to 50 bar

single stage

OXYGEN

Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.
10 bar	W30x2 - Ø 17.3/18.3	G 1/2"	717.06901 *	004
20 bar	W30x2 - Ø 17.3/18.3	G 1/2"	717.06902	004



High-efficiency pressure regulator for large withdrawal quantities up to 200 m³/h

double stage

OXYGEN

Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.
10 bar	W30x2 - Ø 17.3/18.3	G 1/4", DN 6	717.06716	026
20 bar	W30x2 - Ø 17.3/18.3	G 1/4", DN 6	717.06717	026



single stage

FUEL GASES

Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.
10 bar	W30x2 - Ø 15.2/20.2	G 3/8", DN 8	717.06732	026
20 bar	W30x2 - Ø 15.2/20.2	G 3/8", DN 8	717.06733 *	026



for methane, hydrogen, back-shielding gas

single stage

HYDROGEN

Maximum flow rate	Cylinder connection	Hose connection	Art. No.	Cat. No.
16 l/min	W30x2LH - Ø 15.2/20.2	G 3/8", DN 8	717.07424	026



Flow rate indication with flow-meter

BACK-SHIELDING GAS

single stage



<i>Maximum flow rate</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
50 l/min	W30x2LH - Ø 15.2/20.2	G 3/8", DN 8	717.07433	026

Flow rate indication with flow gauge

NITROGEN / SHIELDING GASES

single stage



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
10 bar	W30x2 - Ø 15.9/20.1	G 1/4", DN 8	717.06707	026
20 bar	W30x2 - Ø 15.9/20.1	G 1/4", DN 8	717.06708	026
50 bar	W30x2 - Ø 15.9/20.1	G 1/4", DN 8	717.06709	026

for nitrogen or argon and other inert gases, CO₂ (carbon dioxide), mixed gases



<i>Maximum working pressure</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
100 bar	W30x2 - Ø 15.9/20.1	G 1/2"	717.06710	026
200 bar	W30x2 - Ø 15.9/20.1	G 1/2"	717.06712	026

for nitrogen or argon and other inert gases, CO₂ (carbon dioxide), mixed gases



<i>Maximum flow rate</i>	<i>Cylinder connection</i>	<i>Hose connection</i>	<i>Art. No.</i>	<i>Cat. No.</i>
30 l/min	W30x2 - Ø 15.9/20.1	G 1/4", DN 6	717.07429	026

single stage ARGON / CO₂

Maximum flow rate	Cylinder connection	Hose connection	Art. No.	Cat. No.
16 l/min	W30x2 - Ø 15.9/20.1	G 1/4", DN 6	717.07419	026
32 l/min	W30x2 - Ø 15.9/20.1	G 1/4", DN 6	717.07420	026



Maximum working pressure	Cylinder connection	Hose connection	Art. No.	Cat. No.
16 l/min	W30x2 - Ø 15.9/20.1	G 1/4", DN 6	717.07421	026
30 l/min	W30x2 - Ø 15.9/20.1	G 1/4", DN 6	717.07425	026



Flow rate indication with flow-meter

Maximum flow rate	Cylinder connection	Hose connection	Art. No.	Cat. No.
30 l/min	W30x2 - Ø 15.9/20.1	G 1/4", DN 6	717.07429	026



single stage COMPRESSED AIR

Maximum flow rate	Cylinder connection	Hose connection	Art. No.	Cat. No.
20 bar	W30x2 - Ø 16.6/19.4	G 1/4", DN 6	717.06724 *	026



CONSTANT

CYLINDER PRESSURE REGULATOR

GAUGES

Ø 63 mm, G 1/4" , neutral version, without gas imprint



Medium	Scale end value	Pressure limitation	Art. No.	Cat. No.
Oxygen	2,5 bar	1,5 bar	0.640.114	004
	4 bar	2,5 bar	0.640.113	008
	16 bar	10 bar	0.640.477	008
	25 bar	16 bar	0.640.109	008
	40 bar	20 bar	0.640.108	008
	100 bar	50 bar	0.640.105	004
	315 bar	200 bar	0.640.476	008
Acetylene	400 bar	300 bar	0.640.576	008
	2,5 bar	1,5 bar	0.640.479	008
	40 bar	without	0.640.478	008
Fuel gases / neutral gases	2,5 bar	1,5 bar	0.640.070	004
	4 bar	2,5 bar	0.640.069	004
	16 bar	10 bar	0.640.066	008
	25 bar	16 bar	0.640.065 *	008
	40 bar	20 bar	0.640.064	008
	100 bar	50 bar	0.640.061	004
	160 bar	100 bar	0.640.060 *	004
	220 bar	150 bar	0.640.315	004
	315 bar	200 bar	0.640.059	008
400 bar	300 bar	0.640.321 *	008	

with flow indication

GAUGES

Gas type	Scale end value	Maximum flow rate	Art. No.	Cat. No.
Argon / CO ₂	25 l/min	16 l/min	0.640.141	004
	50 l/min	32 l/min	0.640.139	004
Back-Shielding gas	70 l/min	50 l/min	0.640.142	004



for gauges with flow indication

ORIFICES

Gas type	Indication range	Bore diameter	Art. No.	Cat. No.
Argon / CO ₂	0 - 16 l/min	0,55 mm	717.00753	004
Argon / CO ₂	0 - 30 l/min	0,75 mm	717.00787	004



with flowmeter

MEASURING GLASSES

Gas type	Indication range	Art. No.	Cat. No.
Argon / CO ₂	1 l/min	717.00725	004
	16 l/min	717.00724	004
Hydrogen	16 l/min	717.00726	004



to protect gauges against damages

GAUGES PROTECTING

	Art. No.	Cat. No.
for fuel gas, yellow design	0.462.571	043
for oxygen, blue design	0.462.572	043

GAUGE PROTECTION



<i>Description</i>	<i>Art. No.</i>	<i>Cat. No.</i>
Rubber protection caps for gauges, grey	0.647.614	008

DOUBLE OUTLET VALVE for oxygen and compressed gases



<i>Description</i>	<i>Art. No.</i>	<i>Cat. No.</i>
for oxygen and compressed gases		
Connection G 1/4", with union nut	512.11653	038
for fuel gas		
Connecting G 3/8" LH, with union nut	512.11602	038

GAS FLOW TESTER



<i>Description</i>	<i>Art. No.</i>	<i>Cat. No.</i>
Gas flow tester	0.445.464	004

SPARE PARTS

<i>Description</i>	<i>Art. No.</i>	<i>Cat. No.</i>
Gauge sealing	452.08020	008