

## 5. Operation and maintenance

- 5.1 Make shure that seals, sealing surfaces and pressure gauges are in good status.
- 5.2 Pressure regulators are always to be protect against damage (visual inspection in regular intervals).
-  5.3 In case of malfunctions, e. g. an increase of the outlet pressure during the supply, or in case of leakage versus atmosphere or a defective pressure gauge, shut down the upstream gas supply and take the pressure regulator out of operation.

## 6. Shut-down

- 6. 1 For short-term interruption of work, it is sufficient to close the shut-off valve at the consumer unit.
- 6. 2 For longer interruptions or to end the work, close shut-off valve (1) first. After the pressure regulator has been depressurised, release the hand knob (4). Close shut-off valve at the consumer unit.
-  6. 3 Before disassembling the pressure regulator, make sure that all pressure gauges display zero.

## 7. Repair

- 7.1 Repairs may only be carried out in authorized repair workshops by expert persons.
- 7.2 Only original spare parts must be used. The materials have been adapted to the gas type in each instance. So always specify the gas type.
- 7.3 In case of independent repairs, the use of non-original spare parts or changes on the side of the user or a third party without the approval of the manufacturer, any form of liability for resulting damages will expire as well as the manufacturers warranty.
- 7.4 After being repaired, the pressure regulator must be checked with respect to proper function, leak-tightness and cleanliness of the gas-wetted surfaces. When the system is used again, a sufficient purging operation must be carried out first.

# Instructions for use TORNADO 2000 Pressure regulator for tapping points

**spectro**tec

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## 1. Application

### 1.1 Designated use

Use the pressure regulator for tapping points TORNADO 2000 with an suitable shut-off valve for gases dissolved under pressure, compressed or liquefied gases. The pressure regulator TORNADO 2000 reduces an inlet pressure to an as constant as possible outlet pressure.

### 1.2 Non-designated use



- Do not use the pressure regulator for gases in the liquid phase.
- Do not use for unsuitable types of gas or corrosive gases.
- Do not use at temperatures below -30°C or above +60°C.

*The system has to be used according to these instructions for use and especially the safety instructions!*

### 1.3 Technical data

Oxygen Inlet pressure (Pv) [bar]	Flow rate (Vn) [m³/h] at an outlet pressure (P) [bar]				
	1	2,5	4	10	20
40	15	30	40	50	60
20	15	20	25	30	--
10	15	15	15	--	--
5	10	10	10	--	--

For other gases, this flow rate is multiplied by the following factors:

Nitrogen	1,05
Hydrogen	4,00
Argon	0,90
CO <sub>2</sub>	0,85

The pressure regulator TORNADO 2000 conforms to the latest standard DIN/EN/ISO 2503 For special versions, this standard is taken into account as appropriate.

### 2. Safety instructions

- 2.1 All items of informations marked with ▲ are valid as special safety instructions.
- 2.2 These pressure regulators adhere to state-of-the-art technology and to the demands of the existing standards and regulations.
- 2.3 Changes or modifications are not allowed to be made to the pressure regulator without the prior consent of the manufacturer.
- 2.4 The equipment must be operated by suitable trained personnel only.
- 2.5 The result of improper handling and improper use as intended can involve risks for the user and other persons as well as damage to the device.
- 2.6 Regulations to be adhered to:
  - BGV A1 (VBG 1), "General Specifications"
  - BGV D1 (VBG 15), "Welding, Cutting and Related Procedures"
  - BGV B7 (VBG 62), "Oxygene"



**Special attention has to be paid to the country specific laws, regulations and procedures concerning the use of this type of equipment.**



- 2.7 Use only for gas types the pressure regulator is labelled for (see item 3).



- 2.8 Do not use at temperatures below -30°C or above +60°C.



- 2.9 The valve has always to be opened slowly!



- 2.10 All parts coming into contact with oxygen must be kept in oil-free and grease-free condition.

**Fire or explosion hazard!**



- 2.11 Smoking or open fire (e.g. candles) in the vicinity of the gas supply system is strictly prohibited.



**Fire and explosion hazard!**



- 2.12 Do not connect the pressure regulators for tapping points to a gas cylinder.



- 2.13 Protect gas cylinder against falling.

### 3. Labelling

1	EN ISO 2503	2	3
Tornado		Class 1	717. ...
P1: 40 bar	P2: 10 bar	Gas Type: O	09.00
4	5	6	7

- 1 Pressure regulator TORNADO 2000
- 2 Equipment class (s. list)
- 3 Article no
- 4 Max. inlet pressure
- 5 Max. outlet pressure
- 6 Gas type
- 7 Date of manufacture

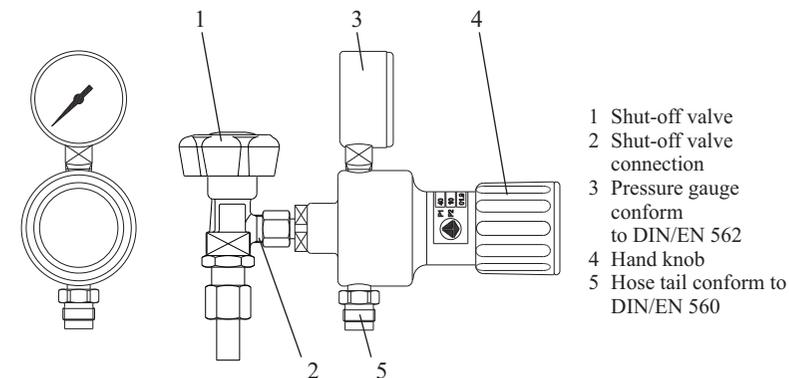
Gas type	Id. letter
Acetylene	A
Oxygen	O
Hydrogen	H
Compressed air	D
LPG	P
MPS	Y
Natural gas	M
CO <sub>2</sub> , Nitrogen, Noble gas	N

Gas type	Equipment class	Max. Inlet pressure P <sub>1</sub> / [bar] (10 <sup>-1</sup> MPa)	Max. Outlet pressure P <sub>2</sub> / [bar] (10 <sup>-1</sup> MPa)	Flow rate Q <sub>v</sub> / (m <sup>3</sup> /h)
Oxygen and other sealed gases up to 300 bar (30 Mpa)	0	0 up to 300	2	1,5
	1		4	5
	2		6	15
	3		10	30
	4		12,5	40
Acetylen	1	25	0,8	1
	2		< 1,5	5 <sup>2)</sup>
MPS	0	25 <sup>3)</sup>	1,5	1
	1		4	5
LPG	0	25 <sup>4)</sup>	1,5	1 <sup>5)</sup>
	1		4	5 <sup>5)</sup>
CO <sub>2</sub>	0	200 <sup>6)</sup>	2	2 <sup>5)</sup>
	1		4	2 <sup>5)</sup>

- 1) Cylinder pressure according to the max. cylinder filling pressure at 15°C.
- 2) General recommendations: Avoid flow rates above 1 m<sup>3</sup>/h.
- 3) Steam pressure for MPS at 65°C. This value can change, depending on the components of the gas mixture.
- 4) Steam pressure for propane at 70°C.
- 5) Depending on the environmental situations, a heating can be necessary to reach the nominal flow rate when using LPG and CO<sub>2</sub>.
- 6) Pressure for CO<sub>2</sub> at 70°C, at a filling level of 0,667

### 4. Start-up

- 4.1 Before starting read the specifications of this instruction for use and observe it while working.
- 4.2 Check, that the cylinder valve thread, the pressure regulator connector and the connection seals are without any damage (blow through if necessary). Do not use the pressure regulator if damaged.



- 4.3 Connect the pressure regulator to the closed gas cylinder valve (1). Tighten it gas-tight with a suitable spanner.
- 4.4 Release the positioning spring with hand knob (4); first close shut-off valve at the consumer unit; open shut-off valve (1) slowly (High pressure gauge 3 indicate cylinder pressure); adjust required outlet pressure with hand knob (4). Open slightly shut-off valve at the consumer unit. Correct pressure setting in case of a decrease of pressure.