

MANUAL

for Tec Booster compressors 220/2



NRC
NITROX & REBREATHING COMPANY

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1. Function principle

The booster pump is used to fill scuba tanks with inert gas and oxygen. It may only be used for this purpose and just in line with the operating conditions described in this manual.

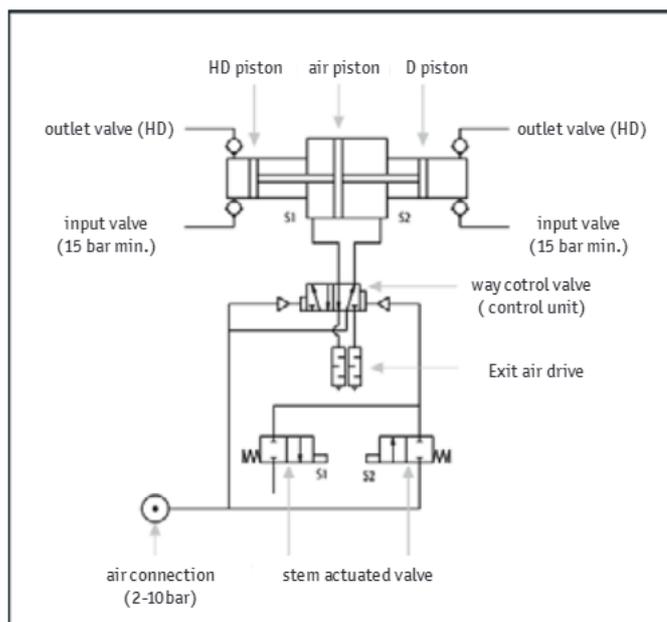
Basically the booster pump's operating principle is similar to a pressure intensifier: a large air piston is charged with low pressure and works on a small area with high pressure (HD-piston).

The continuous conveyance is achieved by a sustained pulsation. It's controlled by a 1x52 way control valve, which is switched by pneumatic impulses. The way control valve impinges alternating the upper and the lower air piston's surface with compressed air.

The way control valve is controlled by two integrated stem actuated valves, which are mechanically activated by the air piston in its end positions.

The HD-piston produce the volume flow using check valves (suction valve, pressure valve).

The outlet pressure is directly related to the set air drive pressure.



2. Intended use

The compressor may only be used for suitable media according to our list of media resistance. Other media have to be checked by us for its compatibility with the booster's materials before commissioning. The booster's drive is designed for air pressure up to 10 bar. Other gases have to be checked by us for its compatibility with the booster's materials. Rebuilds and modifications of the compressor are not permitted for reasons of safety. All maintenance, assembly and operating instructions prescribed in this manual have to be followed in order to guarantee proper function and safety.

Please note for operating with oxygen: the transmission ratio can reach 1:5 at its maximum. For example: 20 bar oxygen turn into 5x20 bar = 100 bar final oxygen pressure after compression.

2.1 Potential hazards

During operation the driving part as well as the high-pressure section is under pressure. It should be noted therefore, that all gases which escape during normal operation or due to a defect, are under pressure and shall not be collected or kept off with any objects or body parts.

It must be ensured that the compressor is depressurized immediately in case of a defect.

During all maintenance and repairing work make sure that the system is unpressurized.

2.2. Safety instructions

The TecServ-Compressors are built according to the latest technology. They also are operationally reliable. Nevertheless, operator errors or misuse present risks:

- to life and health of users
- to the compressor, its accessories and other property values
- to the efficiency and service life of the compressor and its accessories

Operation, maintenance and assembly must only be carried out by staff who are familiar with pneumatic systems and who know the risks of these systems. Please make sure to thoroughly study and observe these operation instructions.

The customer is responsible for observing the security guidelines and for installing safety devices.

2.3. Safe placement

TecServ- Compressors must not be operated in enclosed spaces as the escaping driving air can burst the tank. Even if the installation would become easier, the high-pressure screw-couplings on the suction socket must not be unscrewed. To avoid leaks and damages, the screw fitting have to be firmly fixed.

The compressor should be installed in such a way that the operating elements as well as the screw fittings are always freely accessible.

2.4 Emissions

Due to the expanding compressed air some noise emissions are expectable, depending on the application of the system. Furthermore, the escaping air of the silencers can be polluted by water and oil (fat). It is also possible that small ice crystals are formed and stick on the silencer and on the pipelines. These crystals release and fly off. That's why people who are in the operating compressor's environment have to wear safety glasses and if necessary hearing protections.

3. Ultimate Pressure Calculation for Booster 220/2

$$p = 24 \times pL + pA$$

p = ultimate pressure, pL = driving pressure, pA = pre-pressure

Example: $24 \times 6\text{bar (driving pressure)} + 60\text{ bar (pre-pressure)} = 204\text{bar ultimate pressure}$

3.1 Modelcode

Booster 220/2

220 = Maximum allowable inlet pressure in bar

2 = two High-pressure piston

3.2 Technical Data

Booster 220/2 : data on page 7

4. Installation

4.1. Assembly

These units can be mounted in any position. It's important that no foreign object can get into the compressor's connection during assembly. For example drilling dust during a wall mounting.

Therefore the blind plugs may only be removed immediately before attaching the appropriate connectors.

4.2. Compressed Air System

It is recommended to use one of our air control units for the compressed air connection. It consists of filter, water separator, shut-off valve, pressure regulator, manometer and, where applicable, safety valves. In case that no maintenance unit is used the quality of the compressed air has to be ensured according to our requirements.

4.2.1 Compressed Air Quality

Solid substances:

- maximum particle size: 5 micrometer
- maximum particle concentration: 5mg/m³

Dew point

- +10 degrees Celsius = water content of 9,4 g/m³
- up to +2 degrees Celsius = water content of 5,6g/m³

4.2.2 Compressed Air Oiler

A Compressed Air Oiler is usually not necessary. All moving parts of the compressor have been treated with a special grease during the assembly. If the compressor had been operated with extremely dry air for a longer period it is possible that the grease becomes resinous. In this case the usage of a Compressed Air Oiler is advisable.

Caution! As soon as an oiler has been used, the compressor can no longer be used without added oil as the oil washes out any grease from the compressor. So there is no permanent lubrication.

A re-lubrication with special grease would be a good remedy here. If an oiler is used the oil content of the air should be 1mg/m³ up to 5mg/m³.

4.2.3 Performance Averages

The HD-Pipes and accessories used need to be matched to the compressor with regard to pressure and cross section. Otherwise the compressor's efficiency as well as the safety could suffer.

4.3.1. Inlet

In order to reach economically flowrates and the given ultimate pressures the compressors have to be impinged with pre-pressure of the gas to be compressed. If there is no pre-pressure available an optimal compressor capacity can only be realized by using a suction line which is resistant to negative pressure. Otherwise the conveyed medium could be polluted by the surrounding air. Cutting ring threaded connections are unsuitable.

To avoid damages to suction and pressure valves as well as to the HD-gasket a filter with a mesh size of 5 micrometer maximum should be installed in the pipeline.

4.3.2 Pressure Line

The pressure line as well as its accessories have to resist the compressor's maximum outlet pressure. It is recommended to install an appropriate safety valve in the pressure line.

4.3.3 Conveyed Medium

The compressor may only be used for suitable media according to our list of media resistance. Other media have to be checked by us for its compatibility with the compressor's materials before using.

4.4. Start-up

The compressor starts conveying as soon as driving air at a pressure of 2 bar is available. The escaping driving air is partially used for cooling the HD-parts. If the compressor is operated continuously with high stroke frequency the compressor could heat up intensely despite cooling. This can cause increased abrasion of the gaskets. In order to avoid overheating it is recommended to control the temperature of the gas to be compressed. Any temperature above 60 degrees at the output should be avoided.

When starting up the booster always ensure that the air bottle is opened very slowly until pressure compensation is reached. Otherwise the inlet valve could be damaged.

At the booster's downtime a low pressure loss is possible and normal. That's why there is an urgent need to close the bottle after filling. We recommend to depressurize the system completely after usage.

5. Maintenance

The air drives of all compressors are pretreated with high-performance grease and requires no other kind of lubrication. Only when the air drives are refurbished the valves and air pistons should be treated with acid and silicon free special grease.

6. Repair

Repairs must only be carried out by authorized personnel with the outermost cleanliness. Even the slightest dirt can cause serious damage to the precision-machined pneumatic components.

You can receive all components of the compressors as spare parts from us.

All order numbers can be found in the technical drawing which is enclosed to each compressor. As usually more than one gasket is defect or worn, we created some different gasket kits. The technical drawing shows the compositions of the gasket kits as well as the order numbers. Make sure to state the compressor's serial number in your spare part order. The serial number is punched in the compressor's case (it is a 5-digit number). The most convenient way for you is of course to return the device to us. The repair will then be carried out by qualified personnel in clean places where no machining takes place and where therefore the highest cleanliness can be ensured. Generally we'll send you a confirmation about the device which was sent to us as well as a cost estimate.

As soon as you confirm the estimate we will repair the device as quickly as possible and send it back to you.

7. Warranty

We grant a warranty of 6 months on quality of material and manufacturing for our products from the date of the product's delivery.

We do not undertake any warranty in respect of defects due to improper handling or dysfunctions caused by using inadmissible fluids, foreign materials and other drive and conveyed media.

The warranty is also cancelled once the maximal operating pressure had been exceeded.

This warranty excludes wear parts as seals, guide elements, etc.

8. Technical Datasheet

Mechanical data: Type 220/2	
Width	425 mm
Depth	85 mm
Total Height	124 mm
Total Weight	Ca. 4,5 kg
Connection thread suction side	G ¼"
Connection thread pressure side	G ¼"
Connection thread air drive	G ¼"

Pneumatic data	
Air drive pL (bar)	2-10 bar
Medium	Filtered. Oilfree compressed air

Performane data	
Transmission ratio	1:24
Compression ratio	1:20
Gas inlet pressure pA min	15 bar
Gas inlet pressure pA max	200 bar
Max. permissible outlet pressure	300 bar
Cubic capacity	Ca. 26 cm ³
Conveying output per double stroke	0.026 L
Formula for gas outlet pressure	24 X pl + pA
Air consumption	6 l per stroke at 6 bar

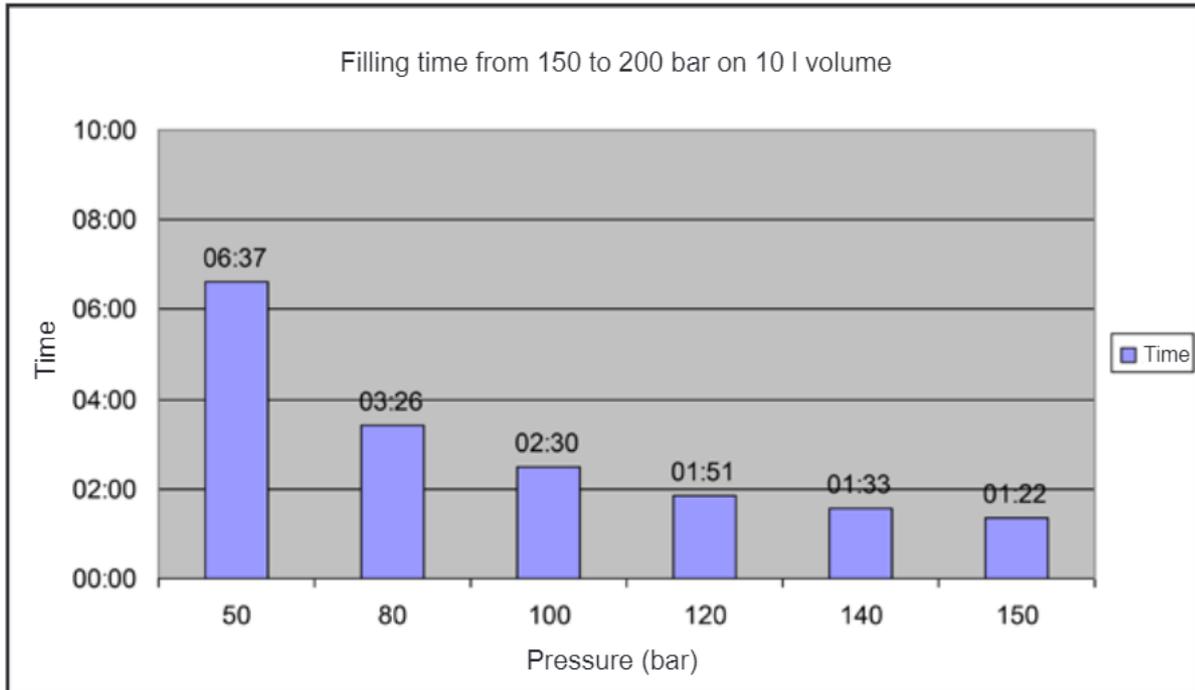
Noise Emission	
max possible sound leven :	< 78 dB (A)

Environmental conditions	
Permissible operating temperatur	+10 degrees up to max + 60 degrees
Permissible storage and delivery temperatur	+10 degrees up to 60 degrees

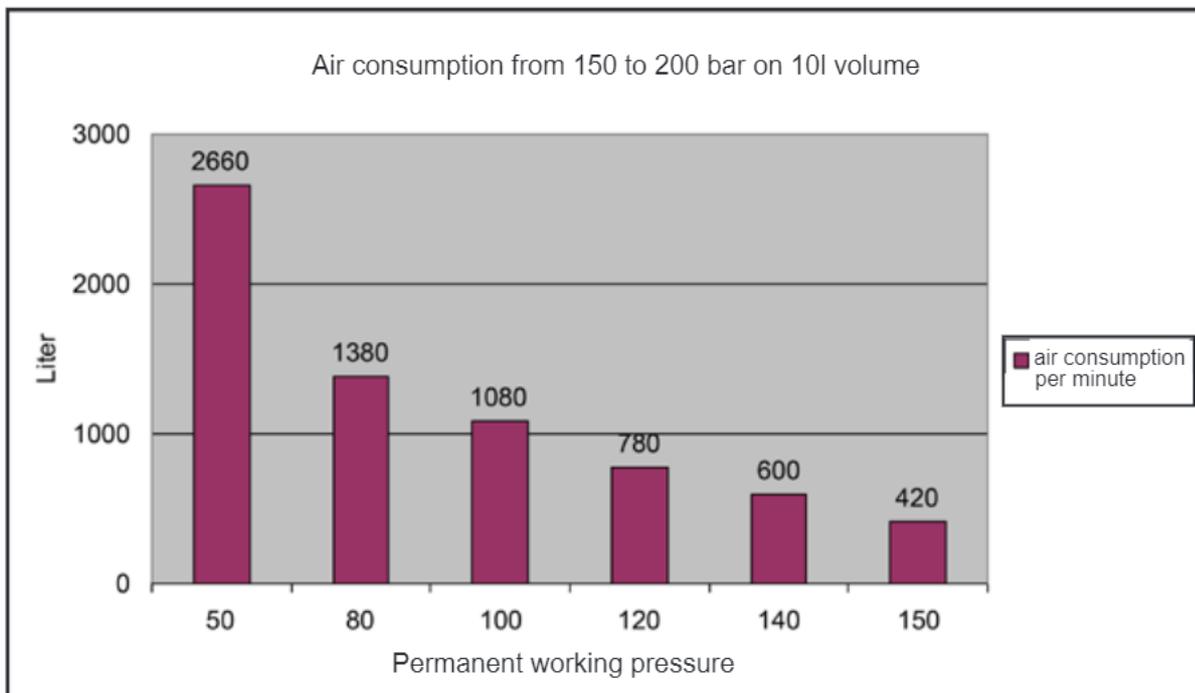
Permissible Media:	
Gas	Inert-gas
optional	oxygen

For queries and further information do not hesitate to contact us!
 As concerns the technical characteristics and performance we reserve the right to make modifications in construction and performance.
 Our general terms and conditions including our product liability apply exclusively for all products and provided services.

9. Performance Booster 220/2



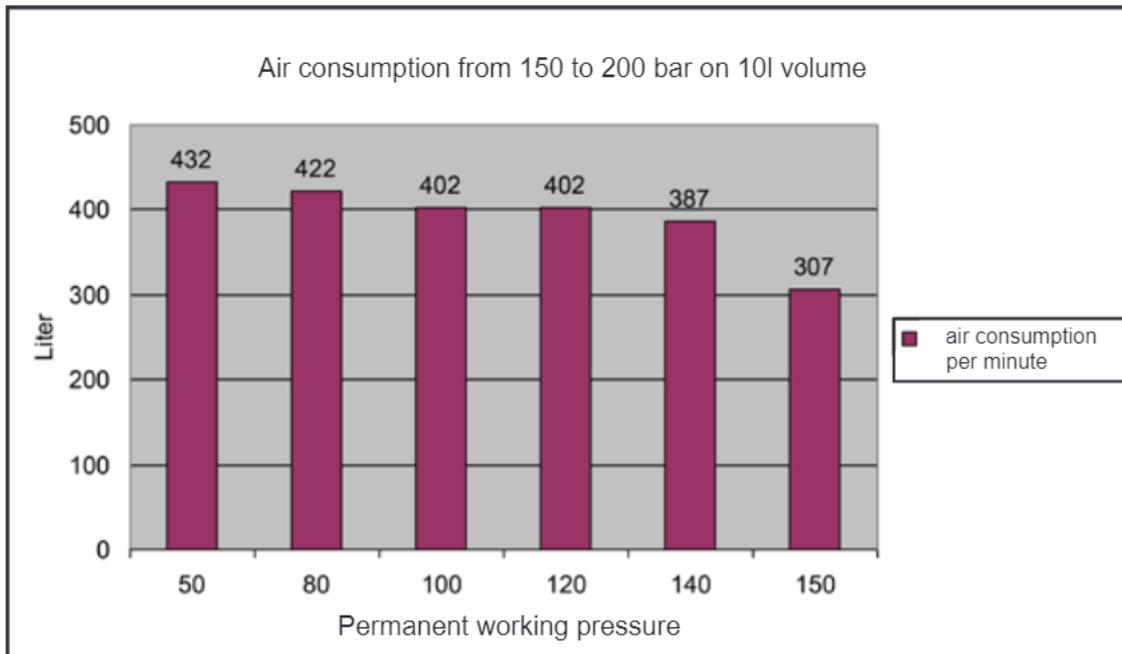
Permanent working pressure 8 bar (temp is not considered)



Permanent working pressure 8 bar (temp is not considered)

Please note that the information given may differ slightly!

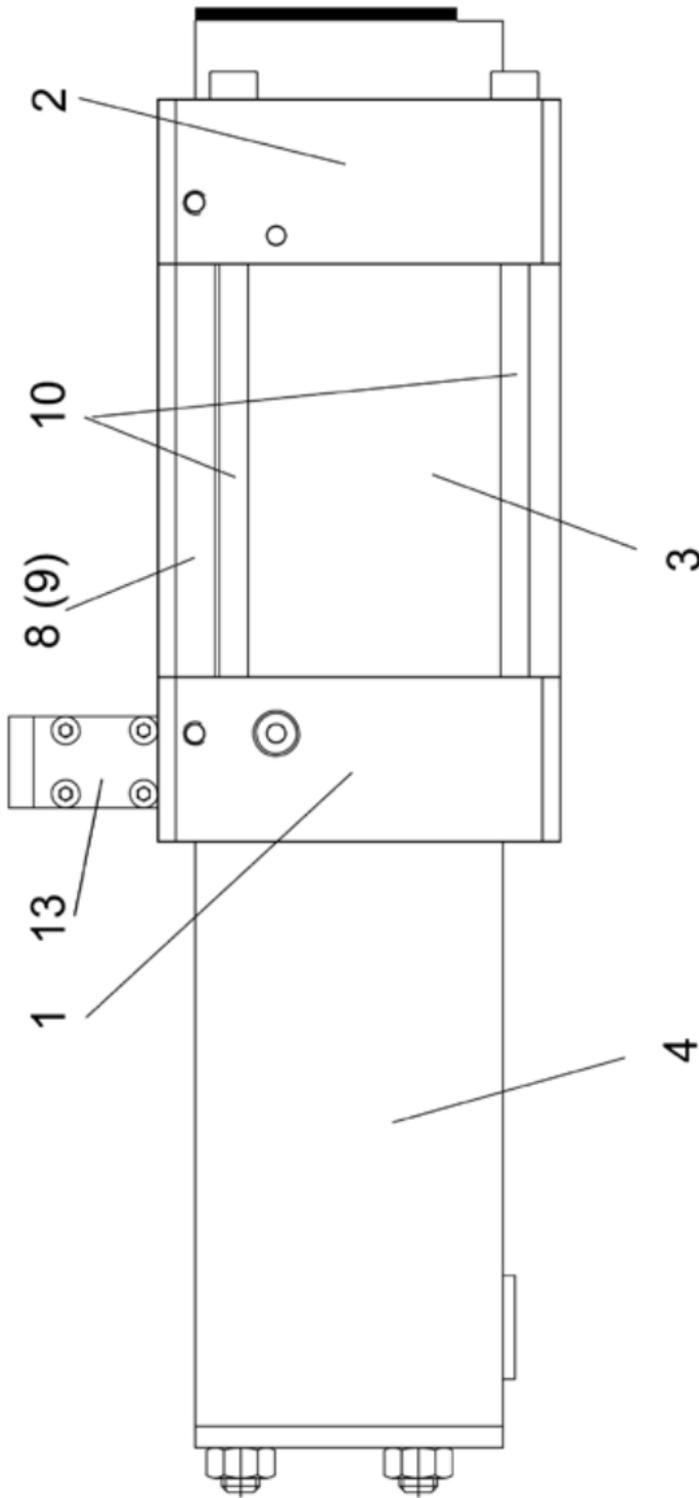
9. Performance Booster 220/2



Permanent working pressure 8 bar (temp is not considered)

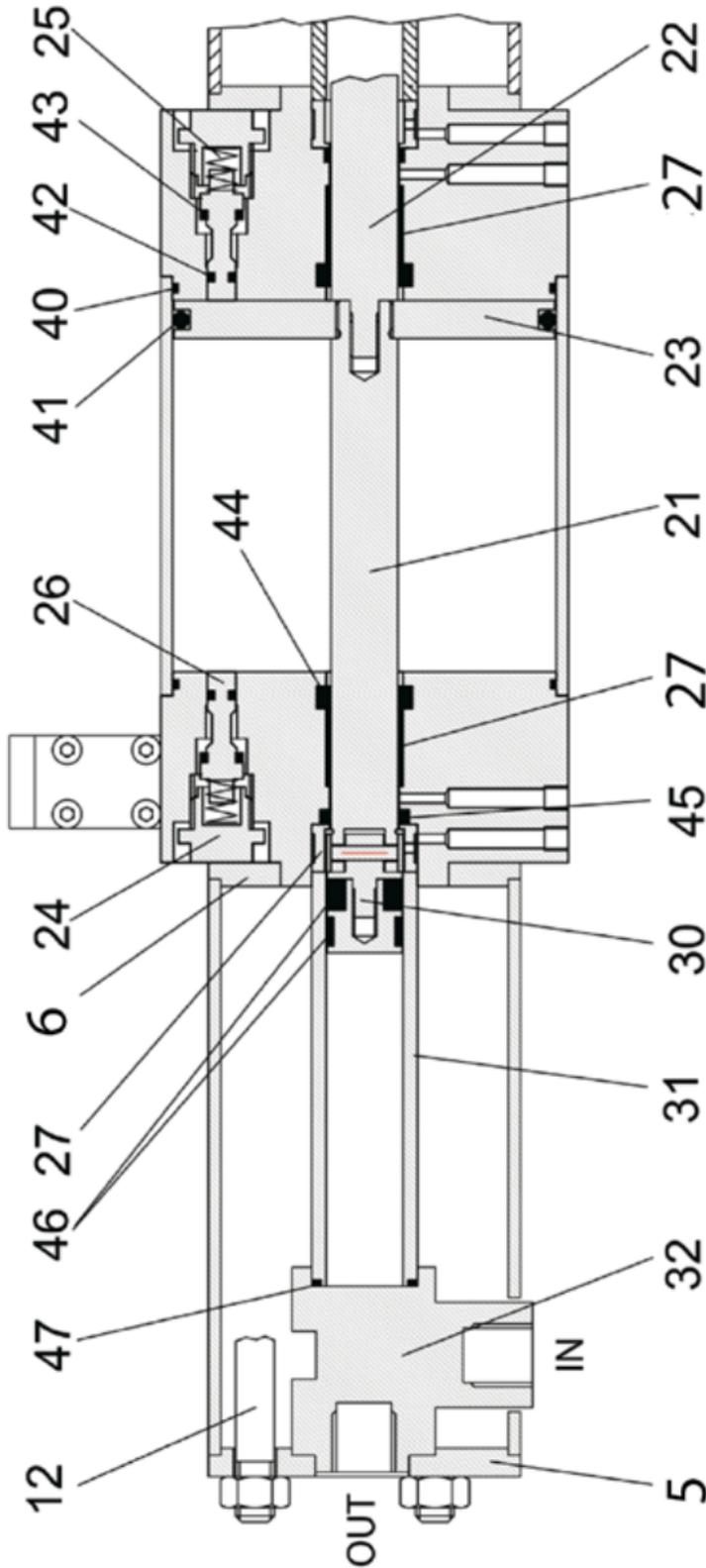
Please note that the information given may differ slightly!

10. Schematic diagram: Booster 80 DW 220/2



(Verwendungsbereich)		Allgemeintoleranz ISO 2768-m		Werkstückkanten DIN 6784		Maßstab		(Gewicht)
		Datum		Name		Werkstoff:		
		Bearb. 20.10.07		Bauer		Booster 80 DW		
		Gepr.		Führmann				
		Norm						
								Blatt
								Blätter
Zust.	Anderung	Datum		Name		Ursprung		Ersatz durch:

11. Profile: Booster 80 DW 220/2



(Verwendungsbereich)	Maßstab		(Gewicht)
	Werkstückkanten DIN 6784		Werkstoff:
	Allgemeintoleranz ISO 2768-m		Booster 80 DW
	Bearb.	Datum	
Gepr.	Name		
		Führmann	
		Norm	
Zust.	Änderung	Datum	Name
			Ursprung
		Ersatz für:	Ersatz durch:
			Blatt
			Blätter

a) Gas Leak here:
seal 44,45 is broken

b) gas leak here:
seal 46 is broken

12. Parts list : Booster 80 DW 220/2

Pos	pcs	description	material	Order Number
1	1	Cylinder Head A	AL F51	B22011
2	1	Cylinder Head B	AL F51	B22012
3	2	Cylinder	3.1645 AlCuMgPb	B22013
4	1	Pipe	3.1645 AlCuMgPb	B22014
5	2	Pipe head	VA 1.4571	B22015
6	2	lock ring	AL F51	B22016
8	1	pipe control air	VA 1.4571	B22017
9	1	pipe control air	VA 1.4571	B22018
10	4	cylinder screws	Standard	B22019
12	6	cylinder screws incl nut	Standard	B22020
13	1	guiding Valve	5/2 valve	B22021
21	1	piston rod A	Standard	B22022
22	1	piston rod B	Standard	B22023
23	1	guiding Piston	VA 1.4571	B22024
24	2	plug screw	CuZn39 Pb 3	B22025
25	2	plunger spring	VA 1.4301	B22026
26	2	plunger	CuZn39 Pb 3	B22027
27	2	bush bearing	Standard	B22028
30	2	HP Cylinder	CuZn39 Pb 3 /VA 1.4571/ Standard	B22029
31	2	HP Valve Complete	VA Spezial	B22030
32	2	HP Piston Complete	Messing Spezial	B22031
40	2	HP Cylinder	NBR Shore 70	B22032
41	1	HP Valve Head complete	NBR Shore 70	B22033
42	2	O-Ring Plunger	NBR Shore 70	B22034
43	2	plunger gasket	Standard	B22035
44	2	rod seal	Standard	B22036
45	2	rod seal	Standard	B22037
46	2	HP Gasket Kit	Spezial	B22038
47	2	O-Ring HP Cylinder	Viton	B22039



NRC International GmbH

Stentenbergr. 63
51702 Bergneustadt, Germany

Tel: +49 22 61 / 500 414
Fax: +49 22 61 / 500 415

info@nrc-international.com