

## Hoses for high pressure gases

High pressure gases are transferred under pressure above 140 bar and therefore demand special types of flexible hoses. The most common applications of such usage are: filling up and emptying of gas tanks and cylinders, industrial installations, medical and laboratory installations. Typical gases used are: oxygen, nitrogen, hydrogen, helium, argon, carbon dioxide, acetylene and many other gases, including mixtures.

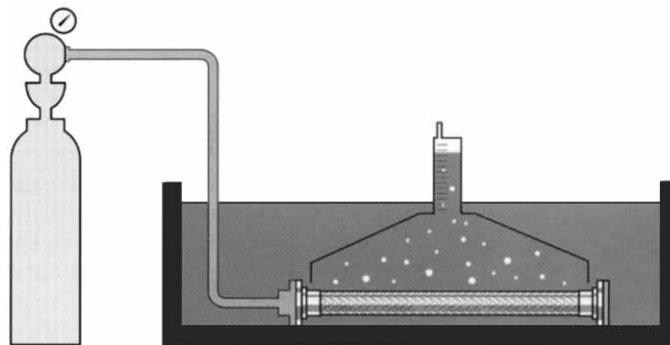
Hoses used for high pressure gas transfer:

- rubber hydraulic hoses,
- thermoplastic hoses,
- PTFE hoses,
- steel hoses,
- UHP SPIR STAR® hoses.

Before choosing a hose for high pressure gas transfer application, we need to consider the following issues:

### Permeation through the hose wall

High pressure gases exhibit a tendency to permeate - to pass through the hose walls. A phenomenon of gas permeation is highly complex and depends on such factors as: medium and its molecular structure, velocity and a type of flow (laminar or turbulent), temperature, thickness of a hose wall, its material and structure; particularly the degree of porosity of a hose material. In order to measure the precise rate of permeation, test procedures must be carried out under the actual or simulated working conditions.



The rate of permeation is higher when the particles of gases are small (helium, hydrogen) and when the hose wall is thin and with porosity. For those reasons:

- an external layer of rubber or thermoplastic hoses used for gases should be pin pricked to avoid accumulation of gas under the external layer,
- special PTFE hoses should be used for high pressure gases (HPG). Their permeability is lower because PTFE is processed in a special way,
- when dangerous gases are conveyed, consideration should be given to the issue of gas accumulation in a confined area around the hose,
- some gases or by-products of their reaction with e.g. moisture can damage the braid of the hose, its fittings or other parts of equipment.

### Working pressure

According to ISO7751 standard a safety factor (ratio of working pressure to burst pressure) for gases should be 1:4. Testing pressure should be twice as high as the working pressure.

### Working temperature

Gas expansion often causes a sudden temperature drop beyond regular working conditions. Take that process into account when choosing the material of the hose and fittings. It is generally recommended to use stainless steel fittings and brass nuts.

### Cleanliness and degreasing

If a hose is used for oxygen, its cleanliness and degreasing becomes crucial to avoid fire or explosion. Hose assemblies for oxygen must be degreased using special procedure.

# INDUSTRIAL HOSES - technical gas

## Electrostatic properties

Pure, single phase gases (gas without droplets of fluid or solid contaminants) usually do not require special, antistatic PTFE or thermoplastic material. Multiphase media (gas with fluid or solid contaminants) must not be transferred by PTFE or thermoplastic hoses because of a risk of electrostatic charges. Antistatic PTFE (with carbon additives) is not suitable for high pressure gases due to increased micro porosity of this material.

## Flow velocity and pressure pulsation

Appropriate construction of an installation should eliminate pressure pulsation. If a rise of pressure caused by pulsation occurs it must not exceed maximum working pressure. Flow velocity in corrugated steel hose assemblies should not exceed 30 m/sec - a turbulent flow can cause vibrations and damage the hose.

## Safety warning

High dynamics of a gas expansion process may contribute to a crack or tearing of a hose fitting. It causes potential risk of damage and harm to people, equipment and installation. To prevent such danger it is recommended to use e.g. steel wires fitted to the hose as a safety measure.

## Thermoplastic hoses for high pressure gases

The external layer of thermoplastic hoses must be pin-pricked (see chapter: HIGH PRESSURE, section - thermoplastic hoses). Confirm the medium being transferred to application. Use 1:4 safety factor.

## SPIR STAR hoses for high pressure gases

The external layer of SPIR STAR® hoses must be pin-pricked (see chapter: HIGH PRESSURE - UHP equipment, section - SPIR STAR® hoses). Confirm the medium being transferred to application. Use 1:6 safety factor.



# INDUSTRIAL HOSES - technical gas

## PTFE hoses for high pressure gases



### HWDB / HPG

**Material:** Smooth PTFE  
**Reinforcement:** Double AISI 304 steel wire braid  
**Working temp.:** From -70°C up to +260°C

SMOOTHBORE PTFE hose version. A heavy wall made of the uniquely processed PTFE (reduced micro porosity) and a double steel wire braid of the hose make it suitable for high pressure gas applications. Assembly - use fittings and ferrules from AF-TL series.

**For temperatures above +130°C reduce the maximum working pressure given in the tables by 0.75% for each 1°C of temperature rise above +130°C.**

**Example: at +170°C maximum working pressure for AF-HWDB/HPG-06 hose:**  
 $225 \text{ bar} - (170^\circ\text{C} - 130^\circ\text{C}) \times 0.75 = 225 \text{ bar} - 30\% = 157.5 \text{ bar}.$

code	DN	I.D. [mm]	O.D. [mm]	working pressure [bar]	bursting pressure [bar]	bending radius [mm]	weight [kg/m]
AF-HWDB-HPG-06	6	6 ÷ 6.5	10.6 ÷ 10.9	225	900	26	0.18
AF-HWDB-HPG-08	8	7.5 ÷ 8	12.1 ÷ 12.6	217	870	35	0.21
AF-HWDB-HPG-10	10	9.1 ÷ 9.6	13.9 ÷ 14.3	180	720	50	0.24



### HWDB / HPG / HI

**Material:** Smooth PTFE  
**Reinforcement:** Aramid braid + 304 steel wire braid  
**External layer:** Micro perforated Hytrel  
**Working temp.:** From -50°C up to +70°C

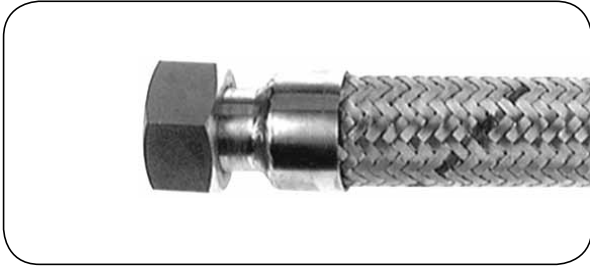
Special version of SMOOTHBORE PTFE hose designed for high pressure applications. A heavy wall made from the uniquely PTFE (reduced micro porosity), a double braid (aramid and steel braid) and an external Hytrel layer make it suitable for high pressure gas applications. The external Hytrel layer is available in several colour versions (black, red, green, blue) to distinguish hoses used for different types of gases.

Assembly - use fittings and ferrules from AF-TL series.

code	DN	I.D. [mm]	O.D. [mm]	working pressure [bar]	bursting pressure [bar]	bending radius [mm]	weight [kg/m]
AF-HWDB-HPG-HI-06	6	6 ÷ 6.3	12 ÷ 12.4	300	1200	30	0.19

# INDUSTRIAL HOSES - technical gas

## Steel hoses for high pressure gases

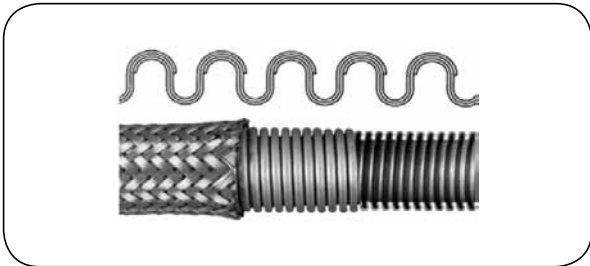


### HP / THP / THP 300

**Internal layer:** Corrugated AISI3 16L steel hose  
**Reinforcement:** Single (HP) or double (THP, THP300) AISI 304 steel braid  
**Working temp.:** From -270°C up to +800°C

Special, high pressure steel hose meets the requirements of EN ISO 10380 class 1 standard. This heavy wall hose is manufactured using hydroforming technology to achieve parallel, close pitch construction. Available with fittings for steel hoses on request. If used at high temperatures, working pressure given in the tables must be reduced by temperature correction factor according to EN ISO 10380 standard. THP300 version for gas transfer from a cylinder, qualified by CTE Air Liquide up to 250 bar. Safety factor (working / burst pressure) 1:4.

code	I.D. [mm]	O.D. [mm]	working pressure [bar]	bursting pressure [bar]	min. bending radius [mm]	
					static	dynamic
HP (single braid)						
TB-HP-006	6	11.4	180	720	25	110
TB-HP-010	10	17.8	145	580	38	150
TB-HP-012	12	20.2	140	560	45	165
THP (double braid)						
TB-THP-006	6	13	255	1020	25	110
TB-THP-010	10	19.4	195	780	38	150
TB-THP-012	12	21.8	185	740	45	165
THP 300 (double braid)						
TB-THP300-006	6.2	13.3	300	1200	25	140



### DUO UHP

**Internal layer:** Corrugated AISI 316L steel hose  
**Reinforcement:** Double AISI 304 steel braid  
**Working temp.:** From -196°C up to +600°C

Double-layer, helically corrugated hose intended for ultra high pressure application. A third layer on top of corrugations is special designed and applied using an electric resistance welding method in order to achieve top resistance to high pressure and vibration, yet to maintain excellent flexibility. Designed and made in accordance with EN ISO 10380 class 1 standard. Perfectly suitable for such applications as gas cylinder filling, connecting installation with gas cylinders or bottles, absorbing vibration and for any other applications in heavy duty operating conditions.

code	I.D. [mm]	O.D. [mm]	working pressure [bar]	bursting pressure [bar]	min. bending radius [mm]	
					static	dynamic
TB-DUOUHP-05	5.2	12.6	395	1580	20	100
TB-DUOUHP-06	6.3	13.7	350	1400	25	140