


Process gas requirements (Core, VWI, and OptiMix gas connect consoles)

As an installer or user, you must supply the process gases and supply gas plumbing for your cutting system. See *Table 7* on page 42 for supply gas quality, pressure, and flow requirements.

 CAUTION

Gas leaks or pressure and flow rates that are outside of recommended ranges can:

- Cause problems with system performance
- Result in bad cut quality
- Shorten the life of consumables

If the quality of the gas is bad, it can decrease:

- Cut quality
- Cut speed
- Cut thickness capabilities

Table 7 – Gas quality, pressure, and flow requirements

Gas*	Quality	Pressure	Flow rate
O ₂ (oxygen)	99.5% pure, clean, dry, oil-free**	Core, VWI: 7.5 bar ± 0.4 (110 psi ± 5) OptiMix: 7.9 bar ± 0.4 (115 psi ± 5)	71 slpm 150 scfh
N ₂ (nitrogen)***	99.99% pure, clean, dry, oil-free	Core, VWI: 7.5 bar ± 0.4 (110 psi ± 5) OptiMix: 8.3 bar ± 0.4 (120 psi ± 5)	181 slpm 380 scfh
Air**,†	Clean, dry, oil free consistent with 8573-1:2010 Class 1.4.2	Core, VWI: 7.5 bar ± 0.4 (110 psi ± 5) OptiMix: 7.9 bar ± 0.4 (115 psi ± 5)	118 slpm 250 scfh
H ₂ (hydrogen)	99.995% pure	Core, VWI: 7.5 bar ± 0.4 (110 psi ± 5) OptiMix: 8.3 bar ± 0.4 (120 psi ± 5)	50 slpm 105 scfh
Ar (argon)	99.99% pure; clean, dry, oil-free	Core, VWI: 7.5 bar ± 0.4 (110 psi ± 5) OptiMix: 8.3 bar ± 0.4 (120 psi ± 5)	118 slpm 250 scfh
F5 (95% nitrogen, 5% hydrogen)	99.98% pure	Core, VWI: 7.5 bar ± 0.4 (110 psi ± 5) OptiMix: 7.9 bar ± 0.4 (115 psi ± 5)	40 slpm 85 scfh

* Water can be used as a shield fluid for XPR plasma power supplies that have a VWI or OptiMix gas connect console. See *Shield water requirements (VWI and OptiMix)* on page 47 for the specifications and requirements for water that is used for shield purposes.

** Air compressors must provide air that meets the requirements of ISO Standard 8573-1 Class 1.4.2 (no more than 100 particles per cubic meter of air at a size of 0.1 – 0.5 microns in the largest dimension and 1 particle per cubic meter of air at a size of 0.5 – 5.0 microns in the largest dimension). **Important:** Any air compressors that provide air to the cutting system must extract oil prior to air delivery.

*** Nitrogen is required for all mild steel processes.

† Air is required for H₂ mix processes.

Code conformity

- All installer or user-supplied equipment must meet applicable national and local codes for supply gas and supply gas plumbing. Contact a licensed plumber for more information about the codes in your location.
- Any installation, modification, or repair of supply gas equipment or plumbing systems must be done by a licensed plumber.

Plumbing for supply gases

WARNING



If you use oxygen as the plasma gas for cutting, it can cause a potential fire hazard due to the oxygen-enriched atmosphere that collects.

Hypertherm recommends that you install an exhaust ventilation system to remove the oxygen-enriched atmosphere that can collect when oxygen is used as the plasma gas for cutting.



Flashback arrestors are **REQUIRED** to stop the spread of fire to the supply gases (unless a flashback arrestor is not available for a specific gas or pressure).

As an installer or user, you must supply the flashback arrestors for your cutting system. You can get them from your cutting machine supplier.



Hydrogen is a flammable gas that presents an explosion hazard. Keep flames away from cylinders and hoses that contain hydrogen. Keep flames and sparks away from the torch when using hydrogen as a plasma gas.

Consult your local safety, fire, and building code requirements for the storage and use of hydrogen.



Hypertherm recommends that you install an exhaust ventilation system to remove the hydrogen-enriched atmosphere that can collect when hydrogen is used as the plasma gas for cutting.

Flashback arrestors are **REQUIRED** to stop the spread of fire to the supply gases (unless a flashback arrestor is not available for a specific gas or pressure).

As an installer or user, you must supply the flashback arrestors for your cutting system. You can get them from your cutting machine supplier.

As an installer or user, you must install the supply gases and supply gas plumbing for your cutting system.

- You can use flexible hoses that are designed to carry the appropriate gas and are rated for the correct pressure. Other hoses can crack and leak.
- For the best results, use the recommended torque specifications for plumbing and hose fittings. (See *Table 11* on page 48.)
- You can use rigid copper pipes.
- Do not use steel or aluminum.



Supply-gas hoses are available from Hypertherm. (See *Supply hoses* on page 370.)



All installer or user-supplied equipment must meet applicable national and local codes for supply gas and supply gas plumbing. Contact a licensed plumber for more information about the codes in your location.

Hypertherm recommends an internal diameter of 10 mm (0.375 inch) for supply-gas hoses that are 76 m (250 feet) or less. *Table 8* on page 45 describes the recommended sizes for gas fittings.

Table 8 – Recommended gas fitting sizes

Fitting type	Size
N ₂ / Ar	5/8 inch – 18 RH, internal (inert gas) “B”
Air	9/16 inch – 19, JIC, #6
F5 / H ₂	9/16 inch – 18, LH (fuel gas) “B”
O ₂	9/16 inch – RH (oxygen)



The location of regulators and the number of elbow fittings can have an effect on inlet pressure. If the inlet pressure for your cutting system is not within recommended specifications, contact your cutting machine supplier or regional Hypertherm Technical Service team.

⚠ CAUTION

Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male thread ends.

⚠ CAUTION

All hoses, hose connections, and hose fittings used for supply gas plumbing must be designed for use with the appropriate gas and pressure rating. Other hoses, hose connections, or hose fittings can crack or leak.

NEVER connect a supply gas to a hose, connection, or fitting that is not designed for that gas type or pressure.

Any replacement hose, connection, or fitting must satisfy all applicable regulations and codes.

Non-compliant hoses, hose connections, or hose fittings can crack or leak.

If you replace any fittings on the consoles, or if you use the wrong fittings, it can cause the internal valves to malfunction because contaminants can get into the valves.

⚠ CAUTION

Some air compressors use synthetic lubricants that contain esters. Esters will damage the polycarbonates in the air filter bowl.

Regulators for supply gases

CAUTION

Do not use low-quality gas regulators. They do not provide consistent supply gas pressure. Low-quality gas regulators can also cause problems with system performance and decrease cut quality.

CAUTION

Some air compressors use synthetic lubricants that contain esters. Esters will damage the polycarbonates in the air filter bowl.

The installer or user must supply the gas regulator (regulators) for the cutting system.

It is important to choose the correct gas regulator (regulators) for the conditions at the installation site. A gas regulator must be compatible with the gases used and appropriate for the environmental conditions. For example, certain regulators are recommended for specific temperature ranges. The type of gas (cylinder gas, line gas, or liquefied gas), and the gas-delivery pressure and flow, can also influence regulator selection.

Single-stage gas regulation

- Reduces source gas pressure to the necessary delivery pressure in 1 step.
- Delivery pressure is **not** tightly controlled with this type of gas regulation.
- Good choice for generic applications and where fluctuations in source gas pressure are small.

Dual-stage gas regulations

- Reduces source gas pressure to the necessary delivery pressure in 2 steps. Dual-stage regulation uses 2 single-stage regulators. The first regulator reduces the pressure to approximately 3 times the maximum delivery pressure. The second regulator reduces pressure to the necessary delivery pressure.
- Good choice for applications that require consistent delivery pressure and where fluctuations in source gas pressure are large.
- Dual-stage gas regulation can restrict gas flow and give bad results if the choice of regulator is bad or if the regulator settings are not correct.

Your gas supplier can recommend the best gas regulator (regulators) for the conditions at your site.



Local regulations and the type of gas that is used can influence the recommended inlet gas fittings for your gas connect console. (See *Table 8 – Recommended gas fitting sizes* on page 45.)

Shield water requirements (VWI and OptiMix)

If you use water as a shield fluid, see *Table 9* for water pressure and flow requirements and *Table 10* for water-purity guidelines.



If using shield water, the temperature range for cutting system operation and storage is reduced to above 0°C to 40°C (32°F to 104°F).

Table 9 – Quality, pressure, and flow requirements for shield water

Quality*	Minimum and maximum pressure	Flow rate required
Deionized water is not recommended to use as shield water. Deionized water will react with the copper components in the system and result in decreased life of components and consumables. Hypertherm recommends: <ul style="list-style-type: none"> ▪ A water softener if the water has high particulate or mineral content (see <i>Table 10</i> on page 47). ▪ Treatment of incoming shield water with a filter rated to 50 microns or less. 	Core, VWI, OptiMix: 2.76 bar (40 psi) minimum Core, VWI: 7.92 bar (115 psi) maximum OptiMix: 8.27 bar (120 psi) maximum	35 L/h (9.4 US gal/h)

Table 10 – Purity requirements for shield water

Particulate type	Purity requirement
Total dissolved solids	< 61 PPM
Calcium + magnesium	< 40 PPM
Silica	< 5 PPM
pH	6.5 – 8.0



A TDS meter indicates the Total Dissolved Solids (TDS) of a solution. Dissolved ionized solids (such as salts and minerals) increase the electrical conductivity of a solution. Total dissolved solids can be tested with a TDS meter (13897) available from Hypertherm.

* Water that does not meet minimum purity specifications can cause excessive deposits on the torch nozzle and shield. These deposits can alter the water flow and produce an unstable arc. See *Shield water requirements (VWI and OptiMix)* on page 47.

Plumbing and hose requirements for shield water

The installer or user must supply the plumbing and hoses for the shield water.

- You can use flexible hoses that are designed to carry water.
- For the best results, use the recommended torque specifications for plumbing and hose fittings. (See *Table 11* on page 48.)
- You can use rigid copper pipes.
- Do not use steel or aluminum pipes.

Install the plumbing and hoses consistent with all local and national codes. After installation, pressurize the entire system and test it for leaks.

To decrease the risk of leaks in the cutting system, make sure to tighten all connections to the recommended torque specifications in *Table 11* on page 48.



Hoses are available from Hypertherm. (See *Water (optional shield fluid)* (*blue*) on page 371 of the *Parts List*.)

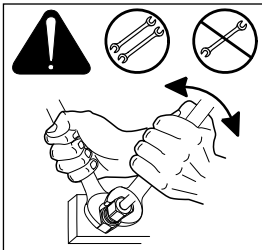
Additional regulator requirement for shield water (optional)

Water pressure regulators are built into the VWI and OptiMix gas connect consoles. Additional water pressure regulators are only required when the water pressure is above 7.92 bar (115 psi).

Torque requirements for gas or water plumbing and hose connections

For the best results, use the recommended torque specifications for plumbing and hose fittings.

Table 11 – Torque specifications

	Torque Specifications			
	Gas or water hose size	N·m	in·lbf	ft·lbf
	Up to 10 mm (3/8 inch)	8.5 – 9.5	75 – 84	6.25 – 7
	12 mm (1/2 inch)	16.3 – 19.0	144 – 168	12 – 14
	25 mm (1 inch)	54.2 – 88.1	480 – 780	40 – 65

Requirements for shield water removal for freezing-ambient temperatures

If your XPR cutting system uses shield water and is stored in ambient temperatures at or below 0°C (32°F), Hypertherm recommends shield water removal.

Follow these steps to remove shield water from the gas connect console (VWI or OptiMix):

1. Remove the shield water supply line to the gas connect console.
2. Access a source of compressed air that is clean and dry. Use a regulator to adjust the compressed air to 5.52 bar (80 psi).
3. Connect the compressed air hose to the water inlet on the gas connect console.



The air hose needs to adapt to a JIC 6 male fitting on the gas connect console.

4. Use the XPR web interface or CNC to select a process ID for a water process (such as 2028).
5. Select **Preflow** from the Plasma Process Selection menu.



During preflow, water mist will exit the torch nozzle for approximately 45 – 50 seconds.

6. Repeat *step 5* until shield water mist is no longer visible exiting the torch nozzle.



It can take 7 – 10 preflow cycles for the shield water mist to stop.