



•HOT LIQUID
•HOT SURFACE
•PRESSURE

Installation

- Refer to the commissioning manual
- Refer to the connection manual
- Do not use the piping & tank should be installed
- Seal installation
- Ensure seal

Pressure & Temperature
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Introduction

f4s10™ Systems

The f4s10™ system is a range of barrier fluid systems to cover most applications, offering fast and problem-free installation on-site. These are supplied with all necessary components and fittings. Where applicable an easy to fit optional polyamide hose kit is available.

Water Retention Systems

Water retention systems are connected directly to a suitable clean water supply (subject to local regulations) to form a low maintenance, high reliability barrier fluid system. In normal operation the supply pressurises the vessel, but negligible water is drawn. The 'thermosyphon' effect (natural convection) ensures the seal is kept cool. When the flow indicator eventually shows water is being drawn from the supply, this indicates the need to consider seal replacement. In the meantime the integrity of the barrier is maintained to extend seal life and prevent any loss of product.

Gas/Air Pressurised Systems

Pressure systems are partially filled with a suitable fluid, then pressurised via a connection to a factory air or nitrogen supply. Alternatively, the system can be pressurised from a mobile nitrogen cylinder. Again, the seal is cooled by the 'thermosyphon' effect.

Vessel Code

The f4s10™ is designed and manufactured in accordance with ASME VIII Div1 (not stamped) and complies with PED97/23/EC.

BARRIER & BUFFER FLUID SYSTEMS FOR USE WITH DOUBLE MECHANICAL SEALS

first4seals supplies an extensive range of barrier and buffer fluid systems for use with double mechanical seals. Wherever possible first4seals prefers to supply both the seal and the system. In addition the company will suggest suitable barrier or buffer fluids for most applications, based on extensive field experience.

first4seals accepts no responsibility for any problem associated with system design, installation, operation, or the use of an unsuitable barrier or buffer fluid, where the fluid, seal or any part of the system have not been specified and/or supplied by first4seals.



System Selection Guide

Pressure systems are usually filled with water or oil. Water/ethylene glycol mixes can be used to give frost protection. A suitable barrier oil is available from first4seals for those applications where water cannot be used (NB. most oils and other organic fluids are NOT suitable due to their poor thermosyphon action and therefore should only be used in conjunction with a pumping device). The system may be pressurised continuously from a factory air or nitrogen supply, or periodically from a nitrogen cylinder.

Water retention systems are filled and pressurised by direct connection to a clean site water supply, where water is an acceptable barrier fluid, and a suitable supply is available.

Pressure Systems

f4s10™ - Buffer System

- Comprises vessel and sight glass only. May be used unpressurised to provide cooling on medium temperature applications, to prevent crystallisation of aqueous solutions, or to provide protection from dry-running damage.

f4s10™ - Basic Pressure System

- A basic system which includes a relief valve and an air/N₂ regulator to allow pressurisation from a factory supply. Pressurising to a minimum 1 bar (14.5 psi) above stuffing box pressure prevents any abrasive particles in the product from damaging the seal faces.

f4s10™ - Pressure System Options

- As basic but with the addition of a ball valve to simplify topping up the fluid level. Cooling coil & finned tubing intended for hot applications where high cooling capacity is needed.
- Finned tubing aids heat dissipation and improves thermosyphoning. Stainless steel or copper-nickel alloy pipework is recommended (not supplied as standard). Additional cooling capacity can be achieved using the optional integral cooling coil.
- Low level and pressure sensors for applications requiring early warning of barrier fluid system problems.

Water Retention Systems

f4s10™ - Basic Water System

- A basic, low cost system for less demanding applications. Complete with pressure gauge, flow indicator and spring loaded non-return valve to prevent transient or fluctuating supply pressure affecting barrier system integrity.

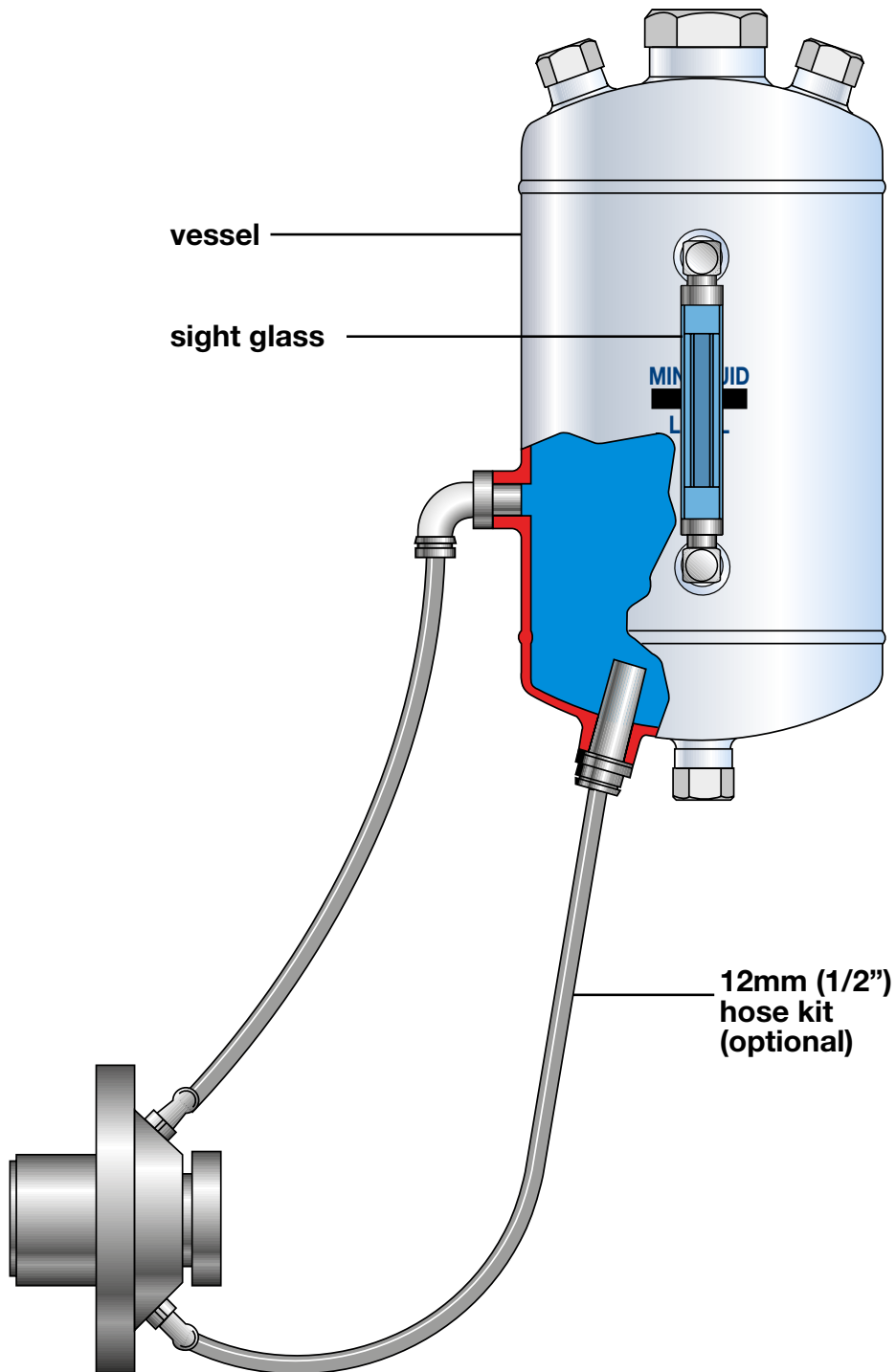
f4s10™ Water System Options

- Cooling coil and finned tubing intended for hot applications where high cooling capacity is needed. Finned tubing aids heat dissipation and improves thermosyphoning. Stainless steel or copper-nickel alloy pipework is recommended (not supplied as standard). Additional cooling capacity can be achieved using the optional integral cooling coil.
- 3 way valve
- Pressure regulator

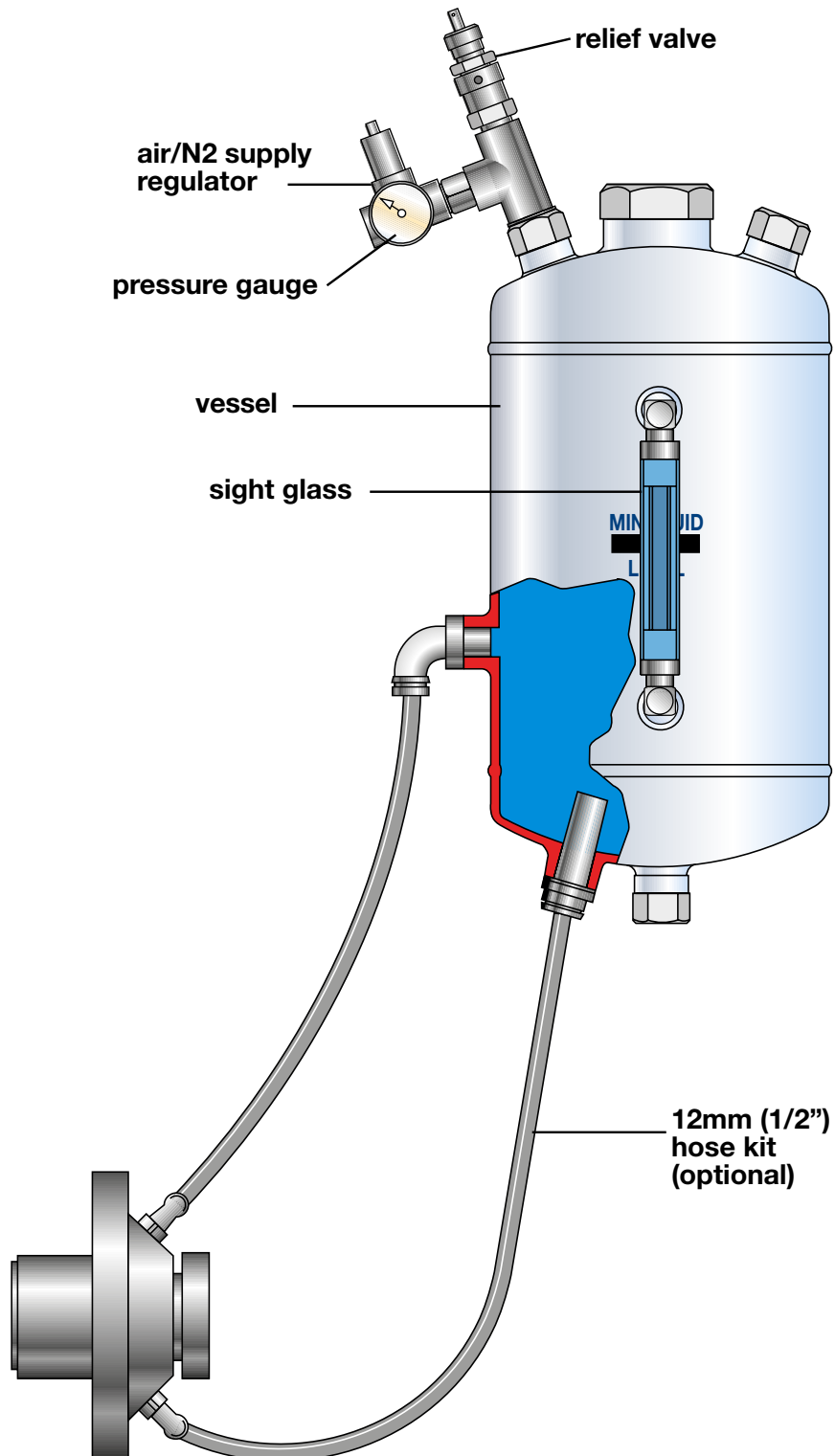
Optional Hose Kits

- A 12mm (1/2" approx) polyamide hose kit, comprising 3m (10') of cut-to-length hose and all required fittings. This is suitable for the majority of applications up to 11 barg at 80°C (160 psig at 176°F) MAX. For applications exceeding these specifications or where site requirements dictate, stainless steel pipework & fittings are available rated to 138 barg/250°C (2000 psig/482°F).
- Rigid pipework in cupro-nickel alloy or stainless steel can be supplied to order.

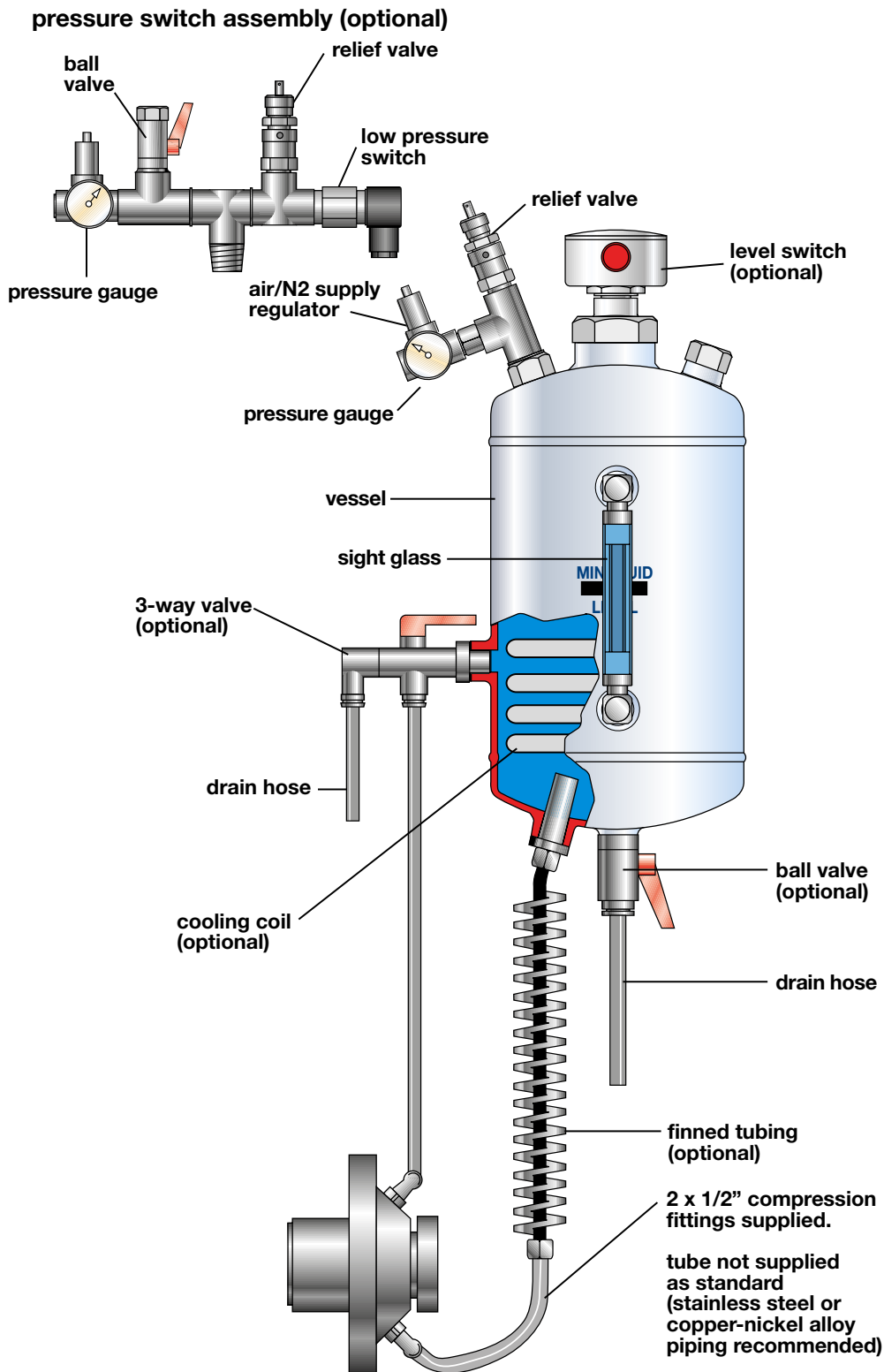
f4s10™ Buffer System



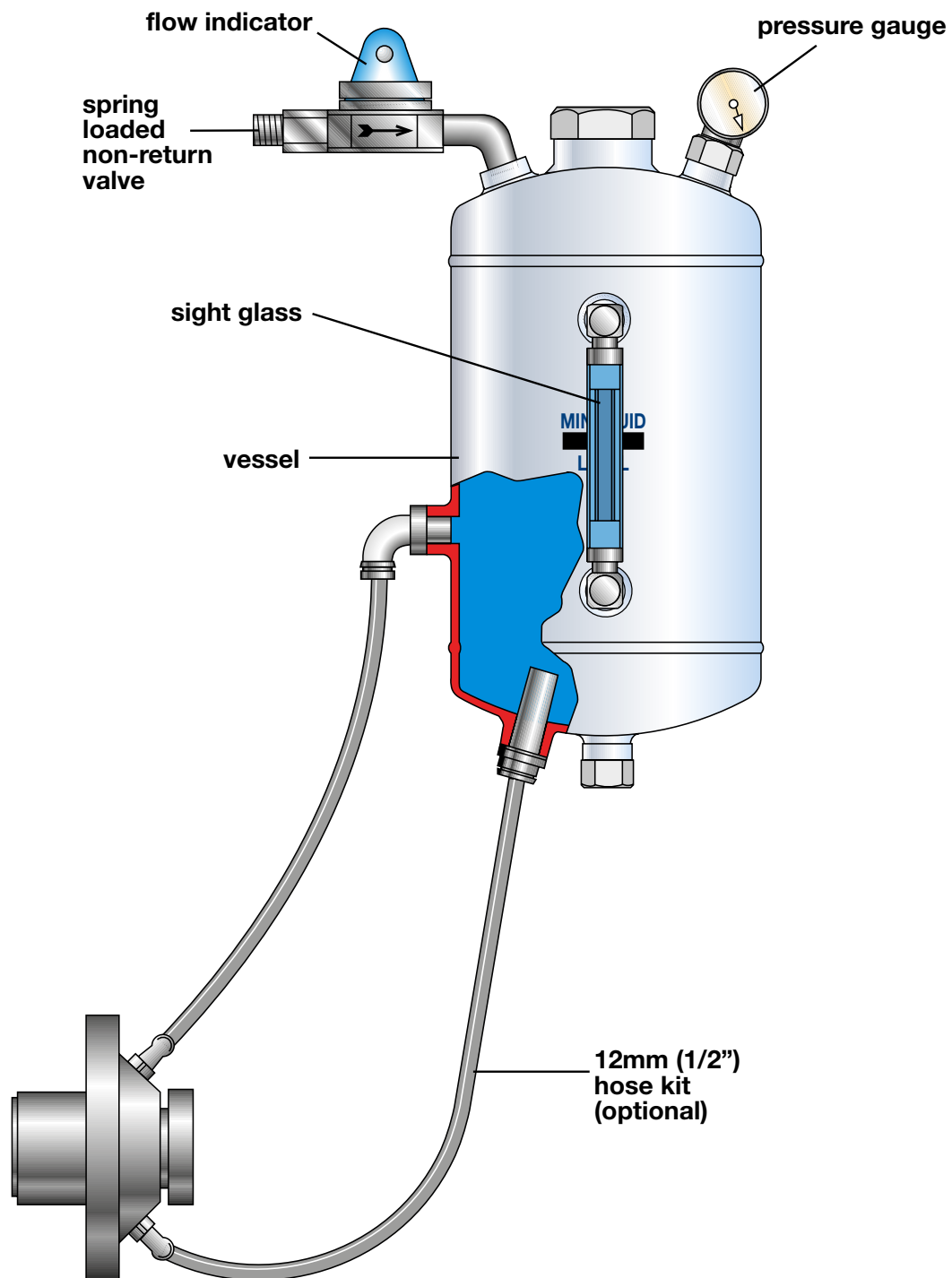
f4s10™ Basic Pressure System



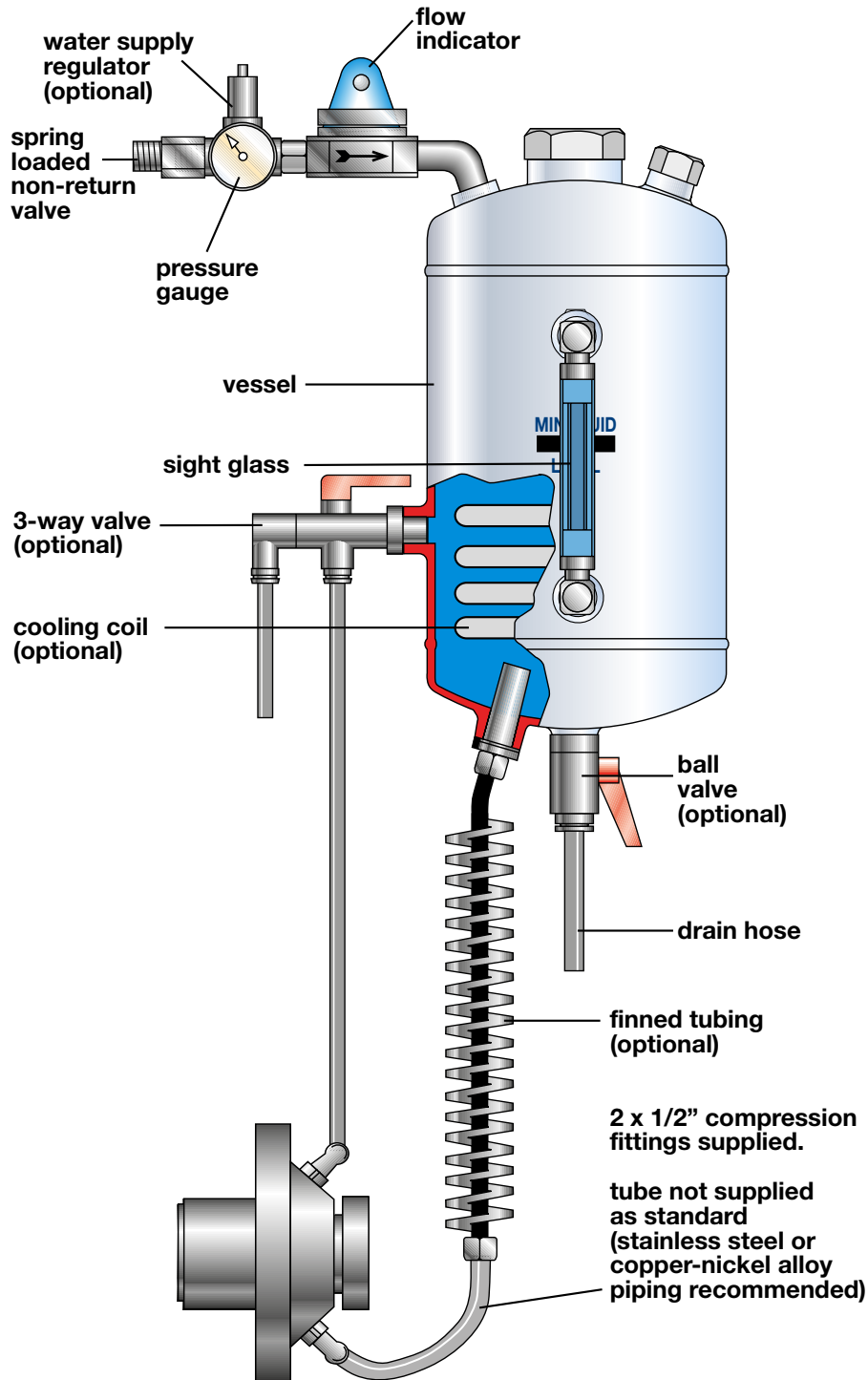
f4s10™ Pressure System Options



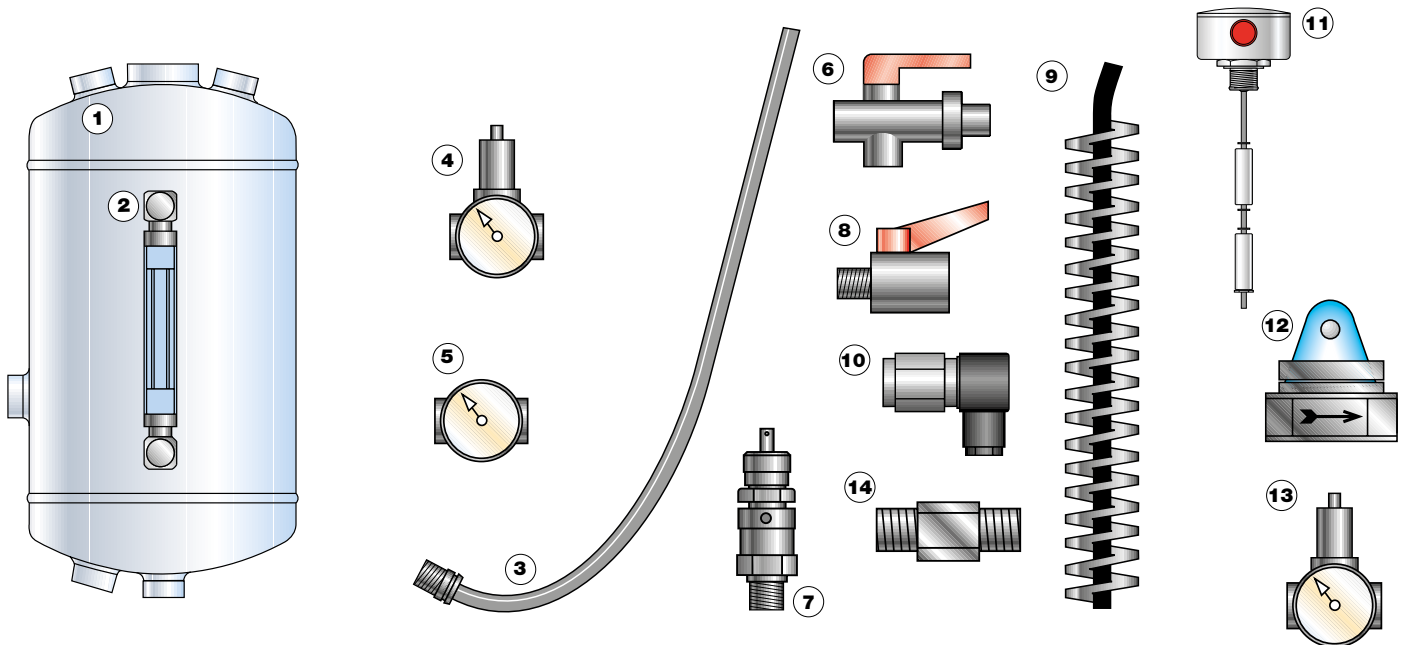
f4s10™ Basic Water Retention System



f4s10™ water retention system options



Feature Descriptions



1. f4s10™ vessel

All stainless steel welded construction designed to ASME VIII Div1 and complies with PED 97/23/6C (Pressure Equipment Directive). Designed with 1/2" NPT connection ports 1" NPT instrument connector and integral mounting brackets as standard. Includes an in-built sediment pipe to prevent seal contamination. 10 litre (2.64 galls (US) nominal capacity; 7 litres (1.8 galls (US) to nominal working level for gas pressurised systems. Maximum working pressure 14 barg at 100°C (203 psig at 212°F); each vessel pressure tested to 21 barg (304 psig). Certificate available on request.

2. sight glass

Allows liquid level to be seen on pressure systems. Borosilicate glass inner tube, polycarbonate outer guard tube. Nickel plated brass end fittings. 19 bar/180°C rating (275 psig/356°F)

3. flexible hose kit

Plastic tubing allows fast, easy and problem free installation. Alternative hose kits can be supplied to order with any system, e.g. rubber hoses, rigid tubing & fittings in cupro-nickel alloy or stainless steel, also flexible stainless steel-PTFE.

4. air/N2 supply regulator

Allows pressure systems to be pressurised from a factory air or nitrogen supply. Zinc alloy construction.

5. pressure gauge

Bourdon tube type, stainless steel case with brass mechanism 0-15 barg (0-217 psig). An all stainless steel pressure gauge 0-10 or 0-25 barg (0-362 psig) is available on request.

6. 3-way valve

Enables purging of the seal with barrier fluid.

7. relief valve

Protects a pressure system from over-pressurisation. Brass construction, adjustable pressure setting. Standard 2-6.3 barg (29-91psig). Other ranges available on request.

8. ball valve

Nickel plated brass construction with PTFE seals. 1/2" M 1/2" F connections.

9. finned tube

1m (3'3") length improves heat dissipation of the system. Cupro-nickel alloy 1/2" (12.4mm) tube with spiral wound wire fins. Stainless steel available on request.

10. high/low-pressure switch

Allows connection of a pressure alarm or trip. Casing sealed to IP65. Adjustable setting 1-10 bar (15-150 psig).

11. level switch

Allows connection of a level alarm or trip. Stainless steel construction on wetted parts, ABS plastic cover IP67. Factory safe, can be incorporated into an intrinsically safe circuit. 20 bar/100°C rating (300 psig/212°F).

12. flow indicator

An indicator moves in the bowl when water is being drawn from the supply, giving early warning of seal failure. Stainless steel construction with borosilicate glass bowl, 16 bar/200°C (232 psig, 392°F) rating.

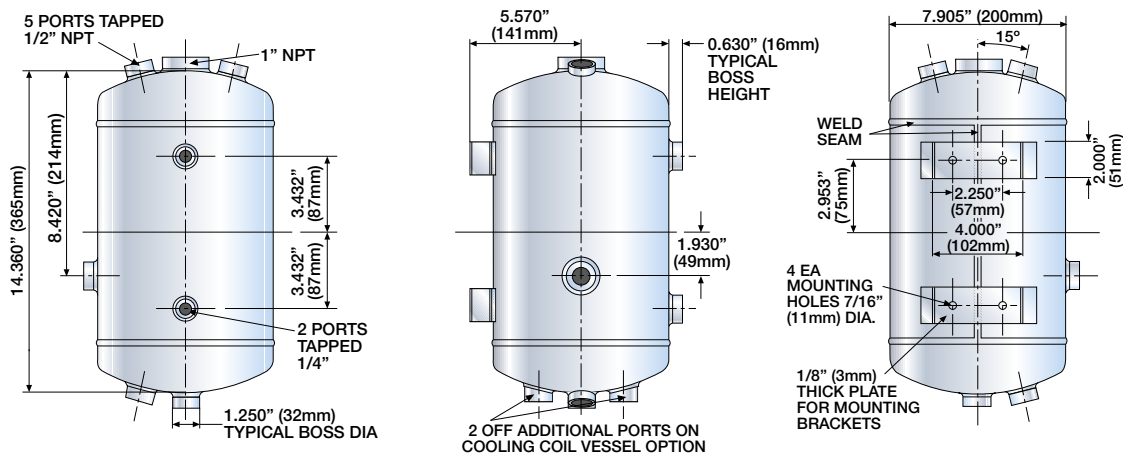
13. water pressure regulator

Prevents supply pressure fluctuations and transients from reaching the seal. Highly recommended. Brass construction, 1/4" ports, 28 barg (406 psig) max inlet pressure, 0-7 barg (100 psig) outlet. Other ranges available.

14. non-return/check valve

This is placed to maintain system set pressure in the event of plant water failure. Brass construction 0.3 bar (5 psig) crack pressure. Stainless steel option available.

Installing & Commissioning an f4s10™ System



When correctly installed, a thermosyphon barrier fluid system is simple, effective and highly reliable. These guidelines will help ensure trouble free installation and operation.

Pipework

- Use 1/2" (12mm) pipe or larger.

Fittings

- Do not use fittings with overly restricted bores, contact supplier for correct specification.

Direction of Flow

- In an ideal system the ports on the seal should be vertical and the hot fluid will emerge from the uppermost seal connection, which is then piped up to the return (side) connection on the reservoir. In practice the ports may end up being horizontal, but this should not pose a problem if the seal is correctly installed.
- When the system is first run, check the direction of flow - i.e. which pipe gets hot. The hot pipe must go to the return (side) connection on the reservoir, or flow may cease after a short while. If the flow is the wrong way round, reverse the connections at seal or vessel. This is, of course, only valid where the ports are horizontal. If the ports are vertical, we would recommend that the seal is re-installed. It should be noted that even a slight concentric misalignment would cause the barrier fluid to flow in the opposite direction.

Return Pipe Run

- The riser (hot) pipe **MUST NOT SAG**. This cannot be overemphasised; the slightest sag can prevent flow. The pipe run must always go upwards.

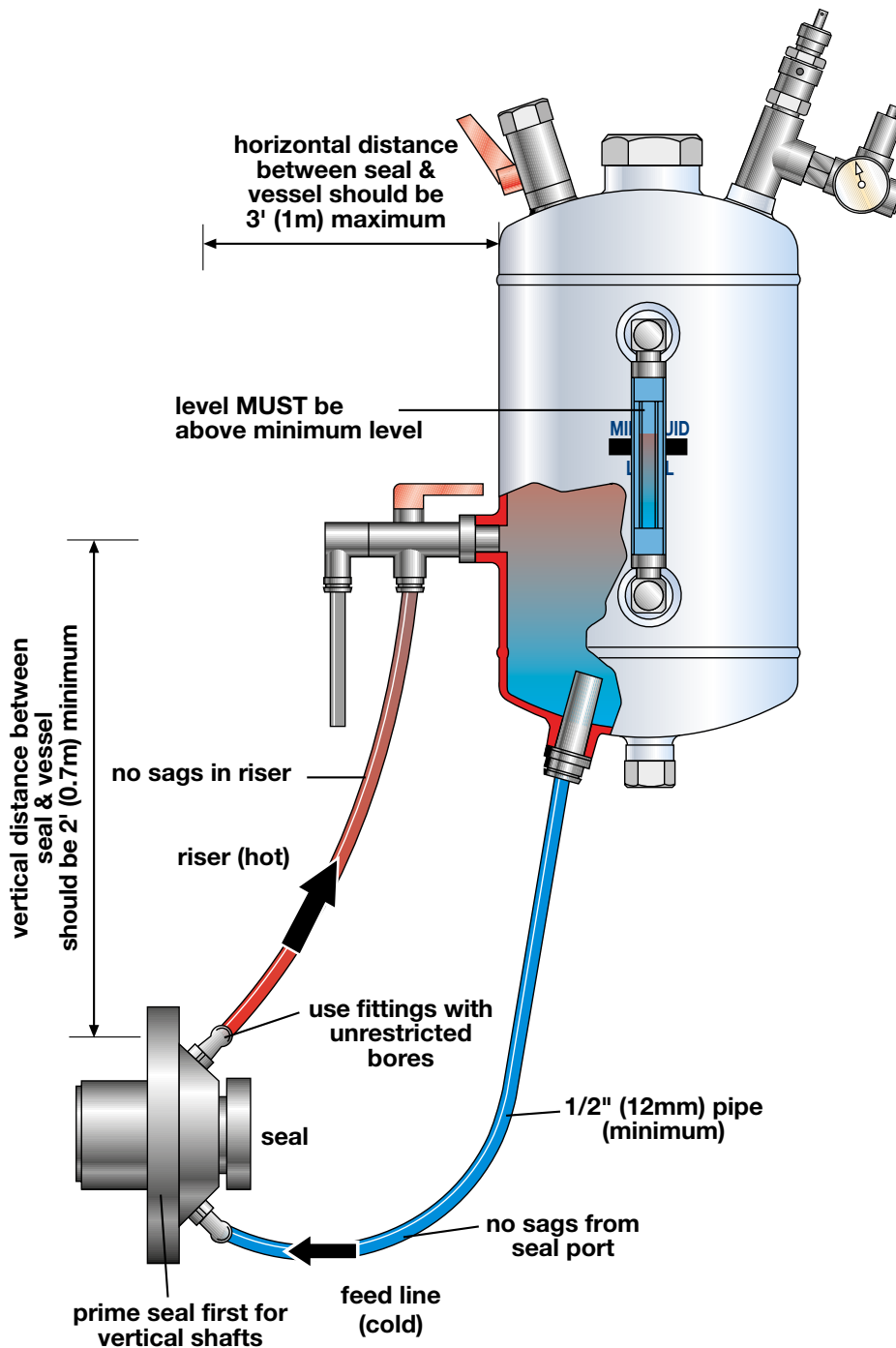
Priming the Seal

- Before filling the vessel, disconnect the return pipe at the vessel. Slowly fill the vessel until barrier fluid is seen at the end of the return pipe. Re-connect the pipe to the vessel and continue to fill until the desired level is reached (above the minimum barrier fluid level mark).
- On vertical pumps, there is a danger that when the system is filled a pocket of air may be trapped in the seal. When this happens, the outboard faces will run dry and may be irreversibly damaged.

Commissioning Checks

- Fill and pressurise the system, check for and eliminate any leaks.
- Run the pump (or mixer etc.), and check which pipe gets hot. Reverse pipe connections if necessary on horizontal porting - reset seal on vertical porting.
- Run the system normally for several hours to reach equilibrium temperatures, periodically checking seal inlet and outlet temperatures. The riser temperature must not exceed 70°C (158°F), and also the feed/riser temperature difference should not exceed 25°C (77°F). Above 70°C (158°F) site safety code may dictate guarding.
- With pressure systems, check the fluid level does not fall during operation.

f4s10™ System Installation



f4s10™ Range



Today's environmental issues demand that industry commits to a reduction in energy consumption. The balanced mechanical seal design absorbs less power than both unbalanced seal designs and traditional pump packing.

As leakage is eliminated, corrosion problems to pumps and bearings are substantially reduced, as are costs associated with expensive product loss.

Most packing must leak to survive, whereas seals should be leak free. This reduces environmental contaminants and disposal costs.

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