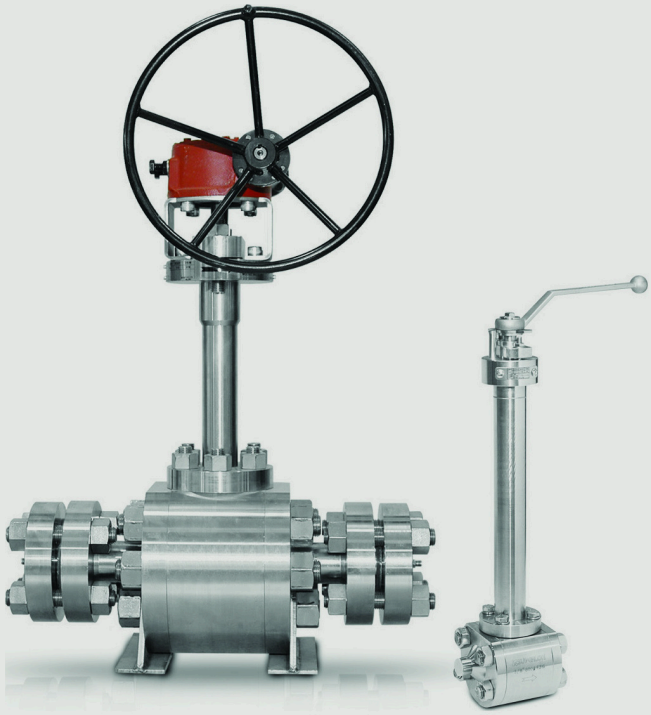
CRYOGENIC VALVES

Selecting a cryogenic valve

How the seat, stem packing, bonnet and cavity relief work together. Follow one LNG isolation duty from the sectional drawing to the cold-test report.

Tubing Supply AS | 23 November 2026



BMT SUPERLOK

Cryogenic ball valves

The extended bonnet places the stem packing farther from the cold body. BMT catalogue illustration. BMT · Cryogenic Valves, R7 · p. 5

COLD TEST EXAMPLE

−196 °C

BMT describes a helium seat-closure test and a separate shell-leak test at this temperature. Each answers a different question. Neither sets the design limit of another valve.

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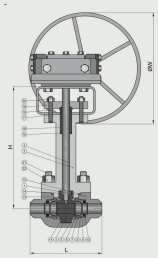
SEAT, GASKET & PACKING

Read the three sealing locations

A closed valve may pass fluid downstream while its exterior stays dry. A stem can leak to atmosphere while the valve still isolates. The sectional drawing tells you which interface a leakage requirement actually covers.



BMT R7, p. 6. Section of the illustrated top-entry design.

Read the bill of materials alongside the section

The ball seat forms the shut-off line. The stem packing surrounds a moving stem. A static gasket closes a pressure-boundary joint. A single entry called “seal material” leaves two of those decisions unspecified.

One BMT top-entry example · R7, page 6

Location	BMT material shown	Specify or verify
Ball seat · item 5	PCTFE	Required seat leak rate, test medium, cold differential and permitted isolation direction.
Static gasket · item 12	Graphite with 316 stainless steel	Joint configuration, material identity and external tightness over the thermal cycle.
Stem packing · item 16	Graphite	External leakage criterion during or after movement, packing temperature and available operating torque.

The two- and three-piece illustration on the next catalogue page has a different construction, including a PCTFE bonnet seal. Carry the selected drawing and its revision into the valve data sheet.

SOURCES BMT · Cryogenic Valves, R7 · pp. 6–7 / ISO 28921-1 · Design, manufacturing and production testing

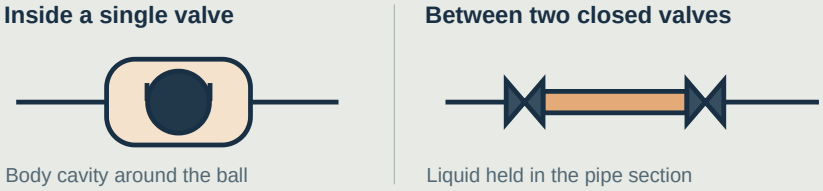
TRAPPED LIQUID

Which way can this valve isolate?

A closed ball can leave liquid in the body cavity. As the liquid warms, pressure can rise within that small volume. The cavity design determines where it can discharge and may determine the permitted isolation direction.

Cavity arrangements described by BMT

Arrangement	Implication for the drawing
A relief hole in the ball connects the cavity to the designated upstream side.	BMT describes this design as unidirectional. Mark the required pressure side for shut-off, confirm it on the approved drawing and match it to the body marking.
A separate cavity relief valve is fitted.	Confirm where the cavity vents, which side can stay pressurised and whether isolation is permitted in each direction. State the expected reverse differential during shutdown.
Self-relieving seats provide the cavity path.	Confirm which seat relieves, where pressure goes and which seat maintains isolation under the stated differential. Bidirectional service depends on the exact design.



A valve cavity and a liquid-filled pipe section are separate trapped volumes.

The valve’s cavity relief feature serves its internal volume. Identify each liquid-filled pipe section between closed valves separately and provide thermal overpressure protection where the piping design requires it.

A drawing review that changes the order

Suppose LNG normally travels from tank to vaporiser, but the maintenance case calls for isolation against pressure from the vaporiser side. Give the valve supplier both differentials and the cavity discharge side. A normal-flow arrow on the P&ID leaves the reverse isolation duty unresolved.

SOURCES BMT · Cryogenic Valves, R7 · p. 4 / ISO 28921-1 · Design, manufacturing and production testing

CONSTRUCTION & ACCESS

Choose the seat and body for the duty

Low temperature can change dimensions and seat contact as metal and nonmetal parts contract. Repeated operation adds wear. Set the required operating and leakage performance before selecting the seat material or entry style.

Decisions to make together

Design detail	What makes the choice defensible
Soft or metal seat	A PCTFE seat is documented for the illustrated BMT valve. Solids or erosive duty can justify evaluating a metal seat. Specify the achievable leak rate at the stated differential and temperature for the actual seat design.
Extended bonnet and stem	The extension separates the packing from the cold body. Agree on mounting orientation, insulation termination, available height and access to the gland with the manufacturer.
Top-entry or split-body	Top entry can allow internal access from above when there is removal space and the design supports it. A split body has different joint and removal requirements. Check dismantling clearance against the installed pipework.
Bore, ends and actuator	Check actual port and pressure loss, flange or weld-end details, face-to-face length, and actuator breakaway torque at maximum specified differential and minimum temperature. Confirm the demanded fail position.

When ammonia is mentioned

Liquid ammonia can be refrigerated or kept liquid under pressure around ambient temperature. Record minimum design metal temperature and toxic-containment requirements before selecting a cryogenic construction. The word “ammonia” cannot supply either value.

A flange class is a designation with pressure–temperature ratings tied to materials and standards. For a specific assembly, verify the valve’s complete rating and the lower limiting part across the duty envelope.

SOURCES BMT · Cryogenic Valves, R7 · pp. 4–7 / NIOSH · Ammonia / ISO 28921-1 · Design, manufacturing and production testing

EVIDENCE & TESTING

What should the cold-test report prove?

For an LNG isolation valve, define two events before reviewing any certificate. The valve must hold the specified differential when cold, and its pressure boundary must stay tight as the assembly cools, operates and warms again.



Industrial photograph from BMT's cryogenic test facility, R7, p. 3.

Three different observations

Seat leakage measures flow through the closed valve. Shell leakage concerns release across the pressure boundary. Torque measurements show whether the valve can move under the stated test conditions. An external packing-emissions requirement needs its own acceptance basis.

Type evidence

ISO 28921-2 addresses type testing. Check the representative valve's design, size, class, material, seat, direction and how far the evidence extends to the valve being purchased.

Production evidence

ISO 28921-1 covers design, manufacture and production testing in its scope from −50 °C down to −196 °C. Agree which results must identify the supplied serial number. Record test medium, metal temperature, applied differential and direction, permitted leak rate and measured result.

Where the temperature evidence stops

BMT specifies helium as the leak-test medium at −196 °C and checks again after returning to ambient. The test medium and test temperature describe separate conditions. Liquid hydrogen is near −253 °C at atmospheric pressure. An LNG or liquid-nitrogen-temperature test leaves that colder service unqualified.

For the worked LNG duty, release the valve specification when the seat and external leak criteria, approved isolation arrow, cavity relief route, cold operating torque and applicable test report all point to the same configuration.

SOURCES BMT · Cryogenic Valves, R7 · p. 3 / ISO 28921-1 · Design, manufacturing and production testing / ISO 28921-2 · Type testing / US DOE · Liquid Hydrogen Delivery

Tubing Supply catalogue · Process ball valves