

DANAÏS CRYOGENIC:
VALVES ALL ALONG THE LNG CHAIN



DANAÏS Cryogenic: Valves all along the LNG chain

With the DANAÏS Cryogenic series, you benefit from more than 30 years of experience and constant improvements in the AMRI butterfly valve range. All over the world, several thousands of DANAÏS Cryogenic valves are operated by the most renowned companies in the gas

industry – be it in liquefaction plants, LNG tankers or LNG receiving terminals. They have proven their reliability and absolute safety in the most demanding environments.

An outstanding achievement: almost 60% of existing LNG tankers are equipped with

DANAÏS Cryogenic valves. The AMRI butterfly valves are manufactured by KSB, as well as the actuator and automation series. KSB is able to provide you with complete solutions, tailored to your specific needs.



www.ksb.com

Click on the Industry icon and find more information about our products and services for Oil & Gas and Marine applications.

Our clients

Liquefaction plants

- Sonatrach, Arzew trains GL 2Z / GL 4Z (Algeria)
- Qatar Petroleum, Qatar gas trains I, II and III (Qatar)
- Petronas, M LNG Sato, Dua and Tiga (Malaysia)
- PT Badak, Bontang trains E, F, G, and H (Indonesia)
- ADGAS, DAS island train II (Abu Dhabi)
- PDO, Oman LNG trains I and II (Oman)
- Atlantic LNG, Trinidad train I (Trinidad and Tobago)
- North West Shelf, Woodside train III (Australia)
- Statoil, Snohvit (Norway)

Constructed by Kellogg Brown & Root, J.G.C., Chiyoda, Foster Wheeler, ...



L N G T a n k e r s

- Mitsui O.S.K Lines (Japan)
- N.Y.K (Japan)
- K. Line (Japan)
- Shell (UK)
- BP (UK)
- British Gas (UK)
- Bergessen (Norway)
- Golar Osprey (Norway)
- Ap Moeller (Denmark)
- Exmar (Belgium)
- Qatar Gas (Qatar)
- Ras Gas (Qatar)
- Petronas (Malaysia)
- Sonatrach (Algeria)
- ADGAS (UAE)
- Sonatrach (Algeria)
- Gaz de France (France)
- GazOcean (France)

Built at Mitsui, Mitsubishi, Kawasaki, USC, Samsung, Daewoo, Hyundai, Hanjin, Chantiers de l'Atlantique, Fincantieri Shipyards, ...

R e c e i v i n g t e r m i n a l s

- Osaka gas, Osaka (Japan)
- Korean gas corporation, Pyong Taek, Incheon, Tong Young LNG Terminals (Korea)
- Enagas, Barcelona, Huelva and Cartagena (Spain)
- Chinese Petroleum Corporation, Yung An (Taiwan)
- Shanghai municipal natural gas, Ping Hu LNG peak shaving (China)
- Gaz De France, Montoir de Bretagne (France)
- Depa, Revithoussa (Greece)
- Transco, Isle of Grain (UK)
- CMS Trunkline, Lake Charles (USA)

Constructed by Sofregaz, Tractebel, N.W Kellogg, I.H.I., Technicas reunidas, ...

I n d u s t r y

- Air Liquide
- BOC Cryoplants

World-wide after-sales service



KSB is close to you – everywhere in the world. Our highly skilled technicians assist you at very short notice for installation, commissioning or regular maintenance – world-wide.

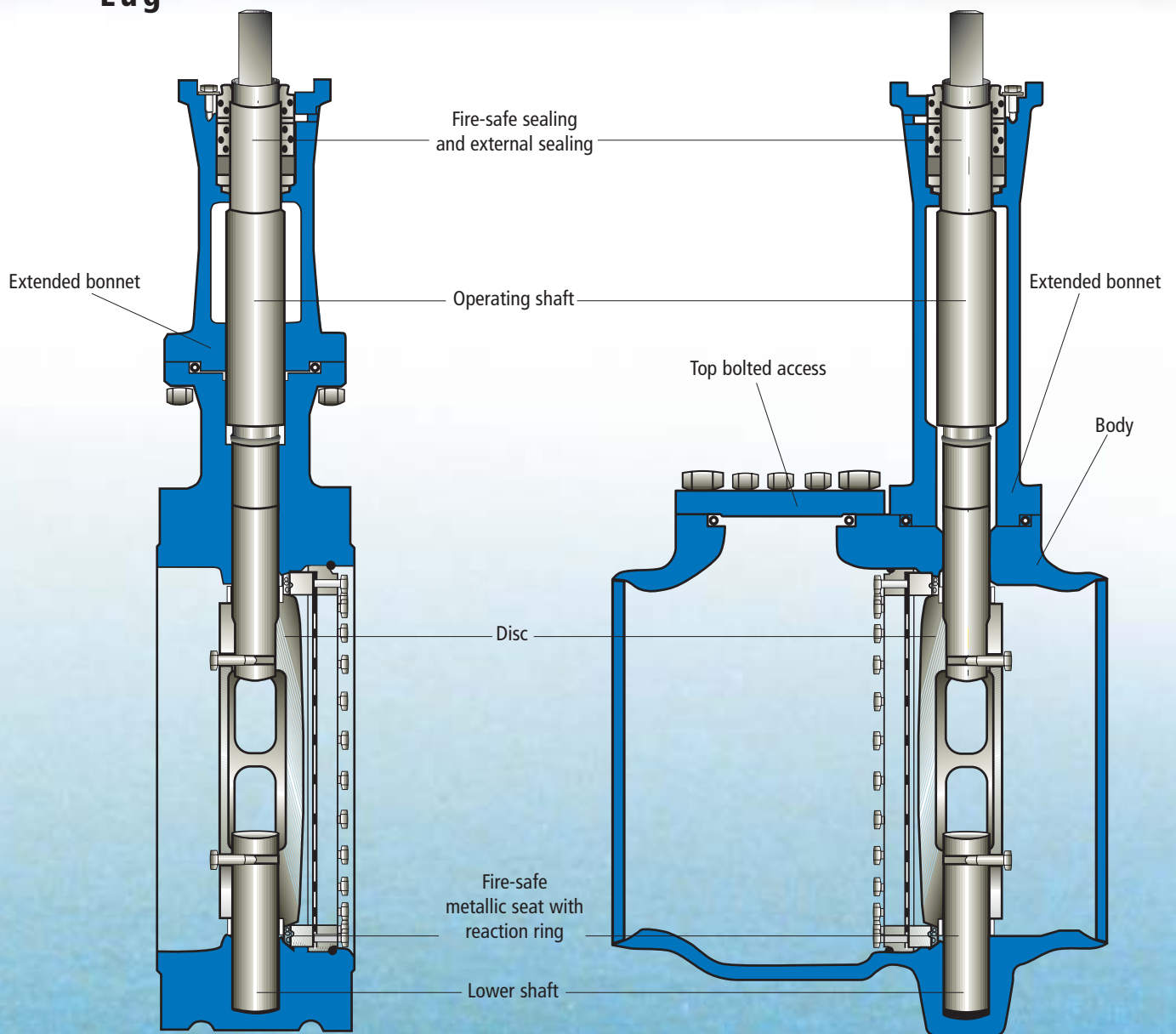
KSB's maintenance centres are located all along the main tanker routes or close to the main production or reception areas.



DANAIS Cryogenic: High quality through standardisation

**Flanged,
Wafer,
Lug**

Buttweld Side Entry



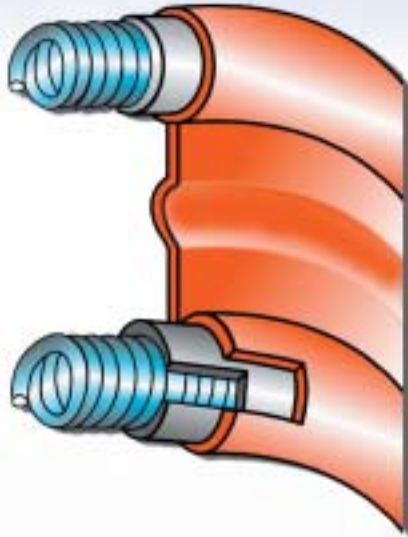
Different valve types are used on a LNG tanker or in on-shore/off-shore plants. The spare part stocks is to be kept to a mini-

mum. KSB took this into account when conceiving the DANAIS Cryogenic series. All internal parts (seat, shaft, disc,

gasket holder) are identical for a given diameter, whatever the body type.

Features

The seats



Class 150:

3 layers for unmatched tightness

1 – The external sheath (copper or nickel) is resilient even at low temperatures. It compensates for minor alterations to the disc surface.

2 – The internal sheath (stainless steel) enables the seat to resist pressure constraints.

3 – The spring (Inconel) compensates for relative displacements between seat and disc due to thermal dilation or pressure.



Class 300/Class 600:

Solid seat to resist stress

The seat is machined out of a solid plate of stainless steel or inconel. It offers a similar capacity to compensate for relative displacements between seat and disc and a better resistance to high pressures.

The reaction ring is no longer a separate part. Thus, the surface in contact with the disc is wider.

L o n g s e r v i c e l i f e

The double-eccentric kinematics and the spherical machining of the disc edge eliminate friction during operation. The disc is hardened with stellite, reducing wear and resulting in a long service life.

Q u a n t i t a t i v e R i s k A s s e s s m e n t

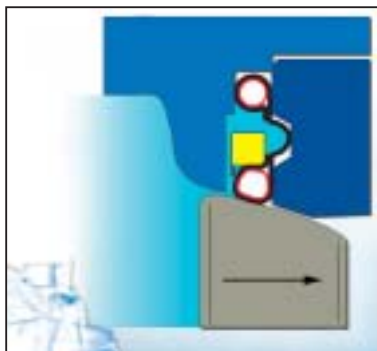
The butt-welded valves provide a strongest connection to the pipe, especially in case of shock or explosion. They provide no leaks at joints even during temperature variations. They are mandatory in LNG terminals in Japan, South Korea, Taiwan, Spain and France, i.e. 80% of world LNG trade.

M a i n t e n a n c e

The butt-welded valve design (with Side Entry) allow seat or replacement without dismantling the valve from the pipe. The maintenance is easier especially for heavy and large size valves. The flanged valves need to be dismantled from the pipe in case of maintenance. In case of severe failure, flanged valves can be replaced by another valve with same face-to-face dimension.

Full bi-directional tightness

The flexible seat offers the same high tightness level in both pressure directions. The seat tightness is pressure energised.



Pressure shaft side (preferred flow direction): The fluid pressure compresses the seat between the disc edge and the retaining flange.



Pressure disc side: The fluid pressure compresses the seat between the disc edge and the reaction ring.

For its AMRI butterfly valves, KSB has designed self-centring metallic seats. They feature a unique balance of strength to resist pressure and give flexibility to compensate for relative dilation by temperature changes.

Low maintenance.
Very high cost savings.
Long service life

| | | Flanged, Wafer, Lug | Buttweld Side Entry |
|---|---------------|--|---|
| | |  |  |
| Sizes | | | |
| Class 150 | up to 20 bar | 50 to 2000 mm (2 to 80") | 150 to 1200 mm (6 to 48") |
| Class 300 | up to 50 bar | 50 to 1500 mm (2 to 60") | 150 to 1200 mm (6 to 48") |
| Class 600 | up to 100 bar | 100 to 1050 mm (4 to 42") | — |
| Materials | | | |
| Body | | Stainless steel A 351 gr CF8M | Stainless steel A 351 gr CF3M |
| Extension bonnet | | Stainless steel A 351 gr CF8M | |
| Disc (<i>other materials on request</i>) | | Stainless steel A 351 gr CF8M with stellite overlay | |
| Shaft (<i>other materials on request</i>) | | Stainless steel A 638 gr 660 Stainless steel A 479 gr 316L | Stainless steel A 638 gr 660 |
| Seat | Class 150 | Copper (<i>Nickel on request</i>) | |
| | Class 300 | Stainless steel A 638 gr 660 | |
| | Class 600 | Inconel | — |
| Performances | | | |
| Temperature range | | -250 to +260 °C (-420 to +500 °F) | |
| Tightness at ambient temperature | | BS 6755 rate A, API 598, ISO 5211 rate A | |
| Tightness at cryogenic temperature | | BS 6364, Shell specifications. Also in accordance with specifications of major gas producers or LNG tankers ship owners. | |
| Fire resistance | | DANAIS Cryogenic valves have been successfully tested in accordance with BS 6755 part II and API 6 FA standards. | |

Complete solutions with the actuator and accessory ranges

KSB offers a complete range of AMRI gear boxes and electric, pneumatic and hydraulic actuators, with torques up to 16,000 Nm. When mounted onto an AMRI valve, you benefit from

an optimised and complete solution. With its complete AMRI accessory range, KSB offers standard solutions to almost any requirement as far as remote control, valve command or

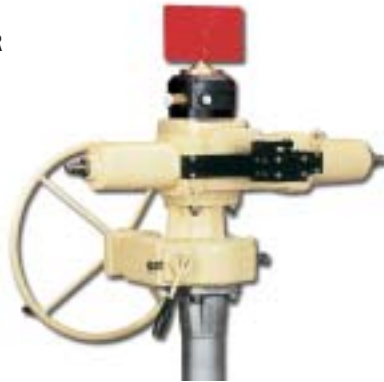
regulation are concerned. We are in a position to design and implement solutions tailored to your needs.



Gear box MR



**Hydraulic actuator
ENNACTO**



**Hydraulic actuator ACTO
with manual over-ride**



**Pneumatic actuator
DYNACTAIR**



