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DQ41F 低温球阀

DQ41F Cryogenic Ball Valve

使用说明书

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DQ41F 低温球阀

型号：DQ41F　　规格： DN15-DN700
公称压力：PN16-250　　适用介质：燃气、液化气、液氧、液氮等气体、液态气体
适用温度：-196℃ ~-29℃　　阀体材质：低温钢、不锈钢、双向不锈钢
连接方式：法兰　　驱动方式：手动、气动、电动、涡轮
其他参数：制造标准按 BS 6364/ JB/T 7749

DQ41F Cryogenic Ball Valve

Model:DQ41F　　Specifications: DN15-DN700
Nominal Pressure:PN16-250
Applicable Media: Combustible gas, Liquefied gas, Liquid oxygen, Liquid nitrogen, Liquefied gases
Applicable Temperature: -196℃ ~-29℃
Body Material: stainless steel,Low Temperature Steel,Duplex stainless steel
End Connection :flange　　Operation:Manual, pneumatic, electric,gear
Other Parameters: Manufacturing standard according to BS 6364/ JB/T 7749.

DQ41F 低温球阀概述

DQ41F 低温球阀是一种专用于液化天然气（LNG）、液氧、液氮、液态烃等超低温介质的特种阀门，采用法兰连接和固定球或浮动球设计。阀体及关键部件采用奥氏体不锈钢或低温合金钢，并经过深冷处理，确保在-196℃及以下温度仍保持优良的韧性。阀门通过旋转球体 90 度实现启闭，采用特殊低温材料密封副，在温度剧烈变化时仍能保持可靠密封。该阀门设计有加长阀盖以隔离冷源，保护填料和操作机构，广泛应用于 LNG 接收站、空分设备、低温储运及化工等领域，是超低温管路系统中实现安全截断的关键设备。

DQ41F Cryogenic Ball Valve Overview

The DQ41F Cryogenic Ball Valve is a specialized valve designed for ultralow-temperature media such as liquefied natural gas (LNG), liquid oxygen, liquid nitrogen, and liquid hydrocarbons. It features a flanged connection and is available in either a fixed-ball or floating-ball design. The valve body and critical components are constructed from austenitic stainless steel or low-temperature alloy steel, which undergo deep cryogenic treatment to ensure excellent toughness at temperatures as low as -196°C and below.

The valve achieves opening and closing through a 90-degree rotation of the ball and incorporates a specially designed low-temperature sealing pair that maintains reliable sealing even under severe thermal cycling. An extended bonnet is integrated into the design to isolate the cold source, protecting the stem packing and actuation mechanism. Widely used in LNG terminals, air separation plants, cryogenic storage and transportation, and chemical processing, this valve serves as a critical safety isolation device in ultralow-temperature pipeline systems.

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DQ41F 低温球阀产品图
DQ41F Cryogenic Ball Valve Product Image

DQ41F 低温球阀特点

1.超低温材料与深冷处理：主体材料选用 304、316L 等奥氏体不锈钢或 LCB 等低温钢，并经过深冷处理，彻底消除低温冷脆风险，确保结构安全。

2.可靠的低温密封系统：阀座采用增强 PTFE、PCTFE 或金属密封等特殊低温材料，弹性好、收缩率低，在超低温工况下仍能实现双向零泄漏密封。

3.防冷桥与防结冰设计：采用加长型阀盖结构，有效延长了冷量传导路径，防止填料函冻结和操作机构结冰，确保阀门在低温下启闭灵活。

4.防火与安全结构：通常符合 API 607 防火标准，软密封失效后可形成金属副密封。阀杆采用防吹出和防静电设计，安全性高。

5.操作可靠维护便捷：配置加长阀杆便于地面操作，可选齿轮箱或执行机构。部分设计支持在线维护，更换密封件无需从管道上完全拆卸阀门。

DQ41F Cryogenic Ball Valve Features

1. Ultra-Low Temperature Materials and Cryogenic Treatment: The main body materials, such as 304, 316L austenitic stainless steel or LCB low-temperature steel, undergo deep cryogenic treatment to completely eliminate the risk of low-temperature embrittlement and ensure structural safety.

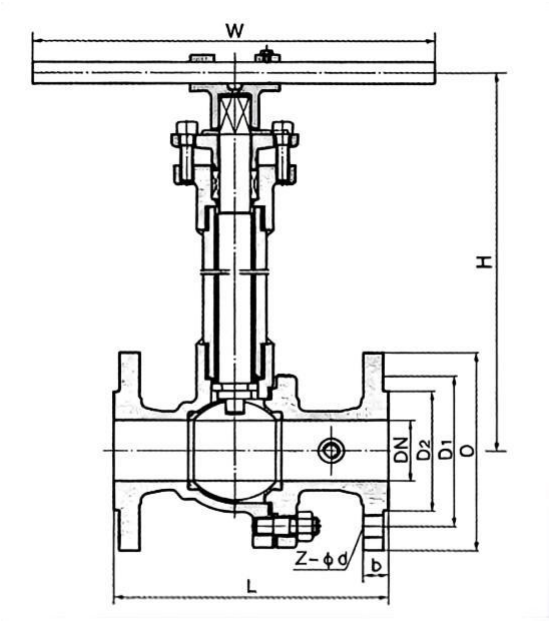
2. Reliable Low-Temperature Sealing System: The valve seats utilize specialized low-temperature materials such as reinforced PTFE, PCTFE, or metal seals, offering good elasticity and low shrinkage rates to achieve bidirectional zero-leakage sealing even under ultra-low temperature conditions.

3. Anti-Cold Bridge and Anti-Freezing Design: An extended bonnet structure effectively lengthens the heat conduction path, preventing the packing gland from freezing and the actuation mechanism from icing

up, ensuring flexible valve operation at low temperatures.

4. Fire-Safe and Secure Construction: Typically complies with API 607 fire safety standards, providing a secondary metal-to-metal seal in case of soft seal failure. The stem features anti-blowout and anti-static designs for enhanced safety.

5. Reliable Operation and Easy Maintenance: An extended stem is provided for convenient above-ground operation, with options for gearboxes or actuators. Some designs support in-line maintenance, allowing for seal replacement without complete removal of the valve from the pipeline.



DQ41F 低温球阀结构图

DQ41F Cryogenic Ball Valve Structure Diagram

零部件名称材料表

Parts Name Material List

序号NO.	名称 Name	材料 Material
1	阀体 body	304、316、LCB
2	球体 ball	304、316、LCB
3	密封垫 seal gasket	PTFE
4	填料 packing	PTFE+O 型圈 PTFE + O ring
5	阀杆 stem	304、316、LCB

性能规范表 Performance Specification		
公称压力 Nominal Pressure	1.6-25	Mpa
强度试验压力 Shell Test	2.4-37.5	
密封试验压力 Seal Test	1.76-27.5	
适用温度 Suitable Temp.	-196~-29	℃

外形尺寸标准要求

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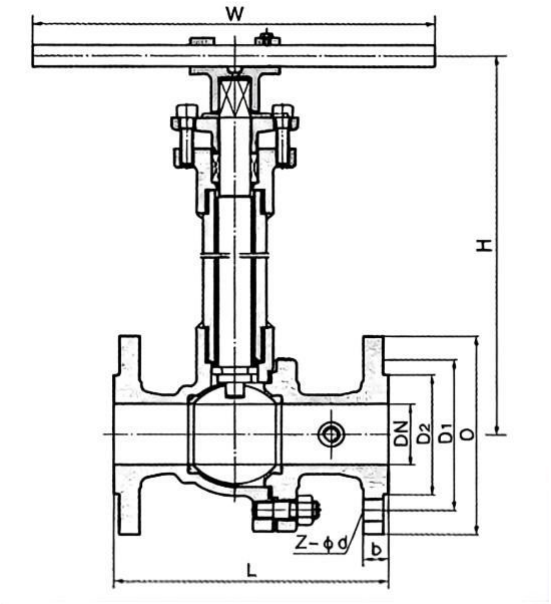
1、阀门的结构长度按 ASME16.10 的标准

2、连接法兰按 ASME16.50 的标准

Dimensions Standard Requirements

1. The structural length of the valve shall conform to the standard ASME16.10.

2. The connecting flange shall conform to the standard ASME16.50.



DQ41F 低温球阀外形图

DQ41F Cryogenic Ball Valve View Drawing

DQ41F 低温球阀外形尺寸表

DQ41F Cryogenic Ball Valve Dimensions Table

锻钢低温球阀主要外形和连接尺寸 1.6Mpa 单位:mm

Main Outline and Connection Dimensions of Forged Steel Cryogenic Ball Valve - 1.6 MPa (Unit: mm)

公称通径 DN	PN1.6MPa								WT (kg)
	L	D	D1	D2	b	Z-Φd	H	W	
15	130	95	65	45	14	4-Φ14	178	140	3
20	140	105	75	55	14	4-Φ14	184	160	4
25	150	115	85	65	14	4-Φ14	195	180	5
32	165	135	100	78	16	4-Φ18	280	250	9
40	180	145	110	85	16	4-Φ18	280	300	11
50	203	160	125	100	16	4-Φ18	300	350	15
65	222	180	145	120	18	4-Φ18	330	350	19

80	241	195	160	135	20	8-Φ18	360	400	27
100	305	215	180	155	20	8-Φ18	400	500	38
125	356	245	210	185	22	8-Φ18	430	600	58
150	394	280	240	210	24	8-Φ23	500	800	81
200	457	335	295	265	26	12-Φ23	680	800	95
250	533	405	355	320	30	12-Φ25	790	1300	140

锻钢低温球阀主要外形和连接尺寸 2.5Mpa 单位:mm

Main Outline and Connection Dimensions of Forged Steel Cryogenic Ball Valve - 2.5 MPa (Unit: mm)

公称通径 DN	PN2.5MPa								WT (kg)
	L	D	D1	D2	b	Z-Φd	H	W	
15	140	95	65	45	16	4-Φ14	178	140	3
20	152	105	75	55	16	4-Φ14	184	160	4
25	165	115	85	65	16	4-Φ14	195	180	6
32	178	135	100	78	18	4-Φ18	280	250	10
40	190	145	110	85	18	4-Φ18	280	300	14
50	216	160	125	100	20	4-Φ18	300	350	20
65	241	180	145	120	22	8-Φ18	330	350	25
80	283	195	160	135	22	8-Φ18	360	400	30
100	305	230	190	160	24	8-Φ23	400	500	40
125	381	270	220	188	28	8-Φ25	430	600	65
150	403	300	250	218	30	8-Φ25	500	800	85
200	502	360	310	278	34	12-Φ25	680	800	100
250	568	425	370	332	36	12-Φ30	790	1300	165

DQ41F 低温球阀安装、使用与维护说明

安装指南

1. 安装前准备：核对阀门型号、压力等级、材料（通常为不锈钢或低温钢）及适用温度是否符合液化气体等低温介质的设计要求。清洁阀门内腔及管道端口，确保无水分、油脂等杂质。

2. 安装方向与位置：阀门可安装在管路任意位置，但阀杆垂直向上为推荐方向，以利于填料密封和操作。阀体上的流向箭头需与介质流向一致。

3. 法兰连接与紧固：使用符合低温要求的垫片（如不锈钢缠绕垫）。按对角线顺序分步均匀紧固螺栓至规定扭矩，确保密封面平行受压，防止泄漏。

4. 阀体保冷施工：阀门安装后，应对阀体（除阀杆加长颈部及操作机构外）进行保冷层施工，保冷材料需防潮且满足低温要求，防止外部热量传入。

5. 系统测试：安装完成后参与系统压力试验与低温密封试验。试验介质宜用干燥惰性气体，并严格按低温操作规程执行。

使用操作

1. 低温工况启用：首次通入低温介质前，应先少量流通对阀门进行预冷，待阀门温度稳定后再逐步增加流量，避免热冲击。

2. 启闭操作：通过加长阀杆顶部的操作机构（手动或执行器）平稳旋转 90 度实现启闭。操作时若感觉扭矩异常增大，应立即停止并检查是否因内部结冰或润滑失效。

3. 运行监控：正常运行期间，观察阀杆填料处有无泄漏，检查保冷层是否完好、有无结霜异常。定期记录阀门操作状态。

4. 停机操作：短期停机可保持阀门位置不变；长期停机需将阀门内低温介质排空并恢复至常温，或保持少量干燥气体微正压密封。

维护保养

1. 定期检查：定期检查阀杆密封处、法兰连接处有无泄漏。检查保冷层是否破损、有无潮气侵入。检查外部紧固件是否松动。

2. 密封件维护：若阀杆处出现轻微外漏，可尝试均匀拧紧填料压盖螺栓。若无效或泄漏严重，需在阀门恢复常温并泄压后更换低温填料。

3. 内部检修：如阀门出现内漏或操作故障，需将阀门从管道上拆下，使其缓慢恢复至常温后方可解体检修。重点检查球体与阀座密封面是否损坏，低温密封圈是否老化失效，并进行更换。

4. 长期停用保养：阀门长期停用时应处于全开或全关位置，排净内部介质并用干燥氮气吹扫。对阀杆等外露金属涂抹防冻油脂，保持保冷层干燥完好。

5. 注意事项：所有维护工作必须在阀门完全泄压并恢复至安全温度后进行。严禁在低温状态下强行拆卸或敲击阀门。重新安装后需按规定进行压力与密封测试。

DQ41F Cryogenic Ball Valve Installation, Operation & Maintenance Instructions

Installation Guide

1. Pre-Installation Preparation: Verify that the valve model, pressure rating, material (typically stainless steel or low-temperature steel), and applicable temperature range comply with the design requirements for cryogenic media such as liquefied gases. Thoroughly clean the valve's internal cavity and pipe ends to

ensure they are free from moisture, oil, grease, and other contaminants.

2. Installation Orientation and Position: The valve can be installed in any pipeline orientation, but the recommended position is with the stem vertical and upward to benefit packing sealing and ease of operation. Ensure the flow direction arrow on the valve body matches the actual media flow.

3. Flange Connection and Tightening: Use gaskets suitable for low-temperature service (e.g., stainless steel spiral-wound gaskets). Tighten bolts in a crisscross pattern gradually and evenly to the specified torque, ensuring parallel compression of sealing faces to prevent leakage.

4. Valve Body Insulation: After installation, apply thermal insulation to the valve body (excluding the extended stem neck and the actuation mechanism). The insulation material must be moisture-resistant and suitable for low-temperature service to prevent external heat ingress.

5. System Testing: After installation, the valve shall participate in the system pressure test and low-temperature seal test. Use a dry inert gas as the test medium and strictly follow cryogenic operating procedures.

Operation

1. Commissioning in Cryogenic Service: Before introducing cryogenic media for the first time, pre-cool the valve by allowing a small flow to circulate until the valve temperature stabilizes. Then gradually increase the flow rate to avoid thermal shock.

2. Opening/Closing Operation: Operate the valve via a smooth 90-degree rotation using the actuation mechanism (manual or actuator) at the top of the extended stem. If an abnormal increase in operating torque is felt, stop immediately and check for internal icing or lubrication failure.

3. Operational Monitoring: During normal operation, observe the stem packing area for leaks, and inspect the insulation for integrity and any abnormal frost formation. Regularly record the valve's operational status.

4. Shutdown Procedure: For short-term shutdowns, the valve position can remain unchanged. For long-term shutdowns, drain the cryogenic media from the valve and allow it to return to ambient temperature, or maintain a slight positive pressure with a dry gas for sealing.

Maintenance

1. Periodic Inspection: Regularly inspect the stem seal area and flange connections for leaks. Check the insulation for damage or moisture ingress. Inspect external fasteners for looseness.

2. Seal Maintenance: If minor external leakage occurs at the stem, attempt to correct it by evenly tightening the gland bolts. If unsuccessful or if leakage is severe, the valve must be warmed to ambient temperature, depressurized, and the low-temperature stem packing replaced.

3. Internal Repair: If internal leakage or operational failure occurs, remove the valve from the pipeline and allow it to warm to ambient temperature slowly before disassembly and repair. Focus on inspecting

the ball and seat sealing surfaces for damage and checking low-temperature sealing rings for aging or failure, replacing them as necessary.

4. Long-Term Out-of-Service Storage: When storing the valve for extended periods, it should be in the fully open or fully closed position. Drain all internal media and purge with dry nitrogen. Apply anti-freeze grease to exposed metal parts like the stem, and keep the insulation dry and intact.

5. Important Notes: All maintenance work must be performed only after the valve is completely depressurized and returned to a safe temperature. Never force disassembly or strike the valve while it is at cryogenic temperatures. After reinstallation, perform pressure and seal tests according to specifications.

非常感谢您的阅读！

Thank you very much for reading!

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