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OIL & GAS INDUSTRY STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 75.180.99

E 98

Record No.: 65490-2018

SY/T 0556-2018

Replacing SY/T 0556-2010

Technical Code for Quick Opening Closure

快速开关盲板技术规范

Issued on: October 29, 2018

Implemented on: March 01, 2019

Issued by: National Energy Administration

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Technical Code for Quick Opening Closure

1 Scope

This Standard specifies the basic requirements for the structure, material, design, manufacturing, inspection and acceptance, packaging and transportation of quick opening closure.

This Standard is applicable to quick opening closure (hereinafter referred to as quick opening closure) with a design pressure less than or equal to 35MPa and a design temperature of -50°C~200°C for the onshore oil and gas industry.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this document.

GB/T 150.1~150.4 Pressure Vessels

GB/T 528 Rubber, Vulcanized or Thermoplastic - Determination of Tensile Stress-Strain Properties

GB/T 713 Steel Plates for Boilers and Pressure Vessels

GB/T 1047 Pipework Components - Definition and Selection of DN (Nominal Size)

GB/T 1048 Pipework components - Definition and Selection of PN (Nominal Pressure)

GB/T 1682 Rubber, Vulcanized - Determination of Low-temperature Brittleness - Single Test Piece Method

GB/T 3452.1 Fluid Power Systems - O-Rings - Part 1: Inside Diameters, Cross-Sections, Tolerances and Size Identification Code

GB/T 3452.3 Housing Dimensions for O-Ring Elastomer Seals in Hydraulic and Pneumatic Applications

GB/T 3512 Rubber, Vulcanized or Thermoplastic--Accelerated Ageing and Heat Resistance Tests - Air-Oven Method

Vessel

TSG Z6002 Examination Rules for Welding Operators of Special Equipment

TSG Z8001 Examination Rules for Non-Destructive Testing Inspectors of Special Equipment

3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Quick opening closure

A mechanical device that is used on the circular port of a pressure pipeline or pressure vessel and can be quickly opened or closed. It consists of a cylinder flange, head cover, hook ring or clamp, sealing ring, safety interlocking device, opening and closing mechanism, rotating arm and short section (when necessary), etc.

3.2 Quick opening closure for jaw-type (YQ-type)

A quick opening closure that realizes quick opening or closing by disengaging or meshing between the hook ring and the teeth on the head cover. Jaw-type quick-opening closure is divided into integral type (when the hook ring and cylinder flange are made into one body) and split type (the structure is shown in Figure 1).

3.3 Quick opening closure for clip-type (KG-type)

A quick-opening closure that realizes quick opening or closing by loosening or tightening the clamp (the structure is shown in Figure 2).

3.4 Quick opening closure for faucet-type (CK-type)

A quick-opening closure that realizes quick opening or closing by intermittent single-head or multi-head thread rotation between the cylinder flange and the head cover (the structure is shown in Figure 3).

3.5 Quick opening closure for ring-type (YH-type)

A quick opening closure between the cylinder flange and the head cover through the expansion or tightening of the lock ring mainly to withstand the compressive stress to achieve quick closing or opening (the structure is shown in Figure 4).

4 Basic Provisions

4.1 The nominal diameter of the quick opening closure shall comply with the provisions

of GB/T 1047. When the nominal diameter is greater than 700mm, it should be selected in integer multiples of 100mm; the nominal pressure shall comply with the provisions of GB/T 1048.

4.2 In addition to meeting the strength, sealing performance and corrosion resistance required by the working conditions, the quick opening closure shall also be opened and closed flexibly and conveniently.

4.3 The quick opening closure shall be equipped with safety interlocking devices and warning signs shall be installed in appropriate positions, which shall meet the following requirements:

- a) When the quick opening closure reaches the predetermined closing position and the safety interlock device is in place, the equipment can only operate at a boost.
- b) When the internal pressure of the equipment is completely released and the safety interlock device is disengaged, the quick opening closure can be opened.

4.4 The inner diameter of the cylinder flange of the quick opening closure shall be consistent with the inner diameter of the connected cylinder.

4.5 The seal of the quick opening closure shall have good sealing performance during the service life.

4.6 The design service life of the quick opening closure shall be no less than the design service life of the belonging equipment.

4.7 The quick opening closure shall be equipped with an operating hand wheel or a special wrench to ensure flexible and convenient opening and closing.

4.8 The design, manufacture, inspection and acceptance of the quick opening closure shall also meet the relevant requirements of the equipment design documents.

4.9 The introduced quick opening closure shall meet the requirements of TSG 21 and this Standard.

5 Basic Structure and Model

5.1 Basic structure

5.1.1 The schematic diagram for the structure of quick opening closure for jaw-type is shown in Figure 1.

- b) When the design temperature is lower than $-20\text{ }^{\circ}\text{C}$, the forging grade shall be no lower than Class III.
- c) When the working medium is extremely highly hazardous, the forging grade shall be no lower than Class III.
- d) When the tensile strength (R_m) of the forging is greater than or equal to 540MPa, the forging grade shall be no lower than Class III.
- e) When the nominal diameter DN is greater than or equal to 1000mm, the forging grade shall be no lower than Class III.

6.8 The steel plates for pressure components of quick opening closure shall comply with the relevant provisions of GB/T 713, GB/T 19189, GB/T 3531, and GB/T 24511.

6.9 The length of the steel pup joints welded to the cylinder flange shall be no less than 3 times the nominal thickness of the pup joint and no less than 300mm. When the nominal diameter is greater than or equal to 400mm, the pup joint should be rolled with steel plate; when the nominal diameter is less than 400mm, the pup joint should be made of seamless steel pipe. When the design pressure is greater than or equal to 4.0MPa, the pup joints shall be selected according to the requirements of GB/T 5310, GB/T 6479, and GB/T 9948.

6.10 The main pressure components such as cylinder flange, hook ring or clip, head cover, steel pup joint, etc., can be made of materials with different strength levels; but the material is required to have good weldability and toughness, and the yield strength ratio of the material should be less than or equal to 0.8.

6.11 The standard yield strength (R_{el}) of the cylinder flange or steel pup joint shall be the same or similar to the standard yield strength (R_{el}) of the cylinder material of the connected equipment and have good weldability.

6.12 When used in a wet hydrogen sulfide environment, the material of the pressure components in contact with the working medium shall also comply with relevant provisions of SY/T 0599.

6.13 The lock ring of the quick opening closure for ring-type should be made of high alloy steel.

6.14 Suitable materials shall be selected for the seals according to factors such as the working pressure, working temperature, working medium and design service life of the quick opening closure.

6.15 The material properties of rubber seals shall meet the requirements of Table 1 in addition to satisfying the corresponding standards and design documents.

6.16 Fasteners shall meet the special grade requirements specified in HG/T 20613 or

7.3.2 When the head cover of the quick opening closure is heavy, hydraulic or electric opening and closing methods should be adopted.

7.3.3 The quick opening closure for faucet-type shall be equipped with a head cover opening and start device; and the nominal diameter shall be no greater than 600mm.

7.3.4 When the locking ring of the quick opening closure for ring-type has a large opening and closing rigidity, it should be designed into a segmented structure.

7.3.5 The main components of the safety interlocking device shall be fixed on the head cover of the quick opening closure.

7.3.6 The quick opening closure shall be provided with a positioning device that can prevent accidental movement after the head cover is opened.

7.3.7 The opening and closing mechanism, and the pivoted arm of the quick opening closure shall be fixed on the cylinder flange of closure or the pub joint rather than fixed on the equipment cylinder.

7.3.8 Lubricating oil cups shall be provided for the rotating parts of the opening and closing mechanism, the pivoted arm mechanism, and the three-part clip hinge connector.

7.3.9 For the horizontally installed quick opening closure, the bottom shall be provided with a drain hole.

7.3.10 The vertically-installed quick opening closure shall be rain-proof and dust-proof.

7.3.11 The lifting ring shall be set at the centre of gravity of the quick opening closure or close to the centre of gravity.

7.4 Design of safety interlocking mechanism

7.4.1 The safety interlocking device shall have the safety interlocking function associated with the internal pressure to realize that the quick opening closure cannot be increased pressure without closing in place; and if the internal pressure of the pressure vessel is not completely released, and the quick opening closure cannot be opened.

7.4.2 The safety function indexes of the safety interlocking device shall at least meet the following requirements:

- a) Interlock starting pressure.
- b) Interlock return pressure.
- c) The number of interlocking fatigue life is no less than 5000 times.

7.4.3 The quick opening closure manual shall stipulate the use environment, calibration period and calibration method of the safety interlocking device.

7.5 Strength calculation

7.5.1 The strength calculation of the quick opening closure should be carried out in accordance with the relevant provisions of GB/T 150.3.

7.5.2 For the quick opening closure subjected to impact load, the impact load shall be considered in the strength design calculation.

7.5.3 The main pressure components of the opening closure should be checked by the finite element method for stress analysis; if the load fluctuates, the fatigue analysis and check shall also be carried out in accordance with the provisions of JB 4732.

8 Manufacture and Inspection

8.1 General provisions

8.1.1 The manufacturing and assembly of quick opening closure shall be undertaken by organizations with the corresponding level of pressure vessel manufacturing qualification issued by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China.

8.1.2 The welding of the quick opening closure shall be completed by welders who have passed the TSG Z6002 examination and have obtained corresponding qualifications.

8.1.3 The non-destructive testing of quick opening closure shall be completed by non-destructive testing technicians who have passed the TSG Z8001 examination and have obtained corresponding qualifications.

8.1.4 The manufacturer of the quick opening closure shall have processing equipment, process equipment, testing equipment, test equipment and corresponding technical force that are compatible with the type and specifications of the manufactured quick opening closure.

8.1.5 The manufacturer of the quick opening closure shall prepare the finalizing process of the quick opening closure before production. The finalizing process shall cover the whole process from the entry-factory and acceptance of the material to the product coating.

8.2 Parts processing

8.2.1 When the main pressure components of the quick opening closure are processed by free forging blanks, the machining allowances and tolerances of the blanks shall

8.3.4 All welding joints of the pressure components of the quick opening closure shall adopt the full penetration joint and full penetration welding process.

8.3.5 If the welding deformation of the quick opening closure occurs, it shall not be transferred to the next process.

8.3.6 When welding forgings or other parts with the lowest value of material tensile strength (R_m) greater than or equal to 540MPa, preheating before welding and heat preservation after welding shall be adopted in accordance with the provisions of NB/T 47015.

8.4 Non-destructive testing

8.4.1 Non-destructive testing can only be carried out on welded joints that have passed the visual inspection.

8.4.2 Non-destructive testing shall be carried out in accordance with the provisions of NB/T 47013.1 ~ NBJ 47013.6. 100% radiographic testing, the testing technology level is Level-AB, which is qualified for no less than Level-II; 100% ultrasonic testing, the testing technology level is Level-B, which is qualified for Level-I; magnetic particle or penetrant testing is qualified for Level-I.

8.4.3 All butt-welded joints (including the welded joints butted to the cylinder of external equipment) shall be subjected to 100% radiographic testing, and 100% ultrasonic re-testing shall be added, if necessary.

8.4.4 The welded joints between the hinge plate, the opening and closing nut support plate and the clip of the quick opening closure for clip-type shall be subjected to 100% ultrasonic testing and 100% magnetic particle or penetrant testing.

8.4.5 After rough machining of the cylinder flange, head cover, hook ring or clip of the quick opening closure, the root of the tooth and the root of the flange shall be subjected to magnetic particle or penetrant testing.

8.4.6 The connecting feed screw that is used for the opening and closing mechanism of the quick opening closure shall be subjected to magnetic particle testing after quenching and tempering heat treatment.

8.4.7 The bevel at the end of the steel pup joint shall be subjected to magnetic particle, penetrating or ultrasonic testing.

8.5 Heat treatment

8.5.1 For the forgings that are used for the head cover, hook ring or clip of the quick opening closure, when selecting the low-alloy steel forgings with the lowest tensile strength (R_m) greater than or equal to 540MPa, if the original quenching and tempering state is damaged after rough machining, the quenched and tempered heat treatment

shall be performed again.

8.5.2 For the connecting feed screw with the lowest tensile strength (R_m) greater than or equal to 540MPa that is used for the opening and closing mechanism of quick opening closure shall be subjected to quenching and tempering heat treatment after rough machining; and the hardness (HB) after quenching and tempering shall be 235~285.

8.5.3 After the welding of the quick opening closure is completed, a heat treatment for eliminating welding stress shall be carried out. The support or tooling to prevent welding deformation shall be removed after heat treatment. Hinge shaft holes, pivoted arm shaft holes and other parts with high co-axiality requirements shall be subjected to secondary finishing after heat treatment.

8.5.4 For quick opening closure to eliminate welding stress heat treatment, the heat treatment process shall be compiled and implemented in strict accordance with the heat treatment process.

8.5.5 For the quick opening closure working in a wet hydrogen sulfide environment, after heat treatment, the hardness of the head cover, the cylinder flange and the circumferential welding joint of the cylinder flange and the external equipment shall be checked, and the hardness value (HB) shall be all less than or equal to 200.

8.5.6 Except for the welded joints connected with external equipment, the quick opening closure shall not be welded after heat treatment.

8.5.7 The local heat treatment of the welding joint between the quick opening closure and the external equipment shall be carried out in accordance with relevant regulations. The sealing surface of the quick opening closure shall be insulated before heat treatment.

8.6 Assembly

8.6.1 Before assembling the quick opening closure, all parts shall be inspected, and they can be assembled only after they are qualified.

8.6.2 The assembled quick opening closure shall have no bumps, scratches, hammer marks, rust and other defects on the outer surface.

8.6.3 After the horizontal quick opening closure is assembled, the head cover is not allowed to sink during opening and closing.

8.6.4 Before assembling, the teeth on head cover and the hook ring of the quick opening closure for jaw-type shall use the colouring method to check the contact surface; and make a mark; and then assemble it after meeting the requirements of 8.2.6.

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