

## Shipbuilding – Rubber seat butterfly valves

- 1. Scope** This Japanese Industrial Standard specifies marine rubber seat butterfly valves (hereinafter referred to as “angle valve”) used for piping system (water, oil, etc.) on board ships.

**Remark:** This standard makes reference to the following standards:

- JIS B 2002 – Face-to-face and end-to-end dimensions of valves
- JIS B 2004 – General rules for marking on valves
- JIS B 2210 – Basic dimensions of steel pipe flanges
- JIS F 7400 – Shipbuilding – Valves and cocks – General inspection requirement
- JIS G 4051 – Carbon steel for machine structural use
- JIS G 4303 – Stainless steel bars
- JIS G 5101 – Carbon steel castings
- JIS G 5121 – Stainless steel castings
- JIS G 5501 – Gray iron casting
- JIS G 5502 – Spheroidal graphite iron castings

## 2. Type

### 2.1

**Type and shape** The butterfly valves shall be classified into two types of ordinary piping valve and marine hull valve as given in **Table 1**.

The shape of the body shall be two types of wafer type and flange type, and the shape of the disc shall be two types of centre-pivoted disc type and eccentric-pivoted disc type.

**Table 1**

| Type                  | Nominal pressure | Shape of body | Shape of disc     | Range of nominal dia. |
|-----------------------|------------------|---------------|-------------------|-----------------------|
| Ordinary piping valve | 5 K              | Wafer         | Centre-pivoted    | 50 to 1,200           |
|                       | 16 K             |               | Eccentric-pivoted | 80 to 1,200           |
| Marine hull valve     | 5 K              | Flange        | Centre-pivoted    | 50 to 1,200           |
|                       | 16 K             |               | Eccentric-pivoted | 80 to 1,200           |

- Remarks:**
1. The wafer type signifies the valve not having ordinary flange for piping fixed with long bolts between flanges for connecting pipe. The flange type is provided with flanges integral with the body. These examples are shown in **Fig. 1**.
  2. The centre-pivoted disc type signifies a butterfly valve, in which the outer periphery of the disc is in the same plane of the centre of the valve stem, while the eccentric-pivoted type is a butterfly valves, in which the valve stem is deviated from the plane of the sealing face so that the outer periphery of the disc is not interrupted by the valve stem. **Fig. 2** shows examples of these two types.

**2.2 Nominal pressure** The nominal pressure for the butterfly valve shall be 5 K, 10 K, and 16 K.

**2.3 Nominal diameter** The nominal diameter for the butterfly valves shall be 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, (850), 900, 1000, (1100), and 1200 mm.

**Remark:** The nominal diameters in parentheses should be avoided from use, as far as possible.

### 3. Application

**3.1 Pressure and kind of fluid** The maximum working pressure, range of temperature and kind of fluid applicable for the butterfly valve shall be as given in **Table 2**.

**Table 2**

| Type                  | Nominal pressure | Maximum working pressure MPa | Kind of fluid                                                         |                                                     |
|-----------------------|------------------|------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------|
|                       |                  |                              | Water, air and gas                                                    | Oil                                                 |
| Ordinary piping valve | 5 K              | 0.5                          | Sea water, bilge, ballast, fresh water, air, inert gas, liquefied gas | Lubricating oil, fuel oil, hydraulic oil            |
|                       | 10 K             | 1.0                          | Sea water, bilge, ballast, fresh water, air                           | Lubricating oil, fuel oil, cargo oil, hydraulic oil |
|                       | 16 K             | 1.6                          | Sea water, ballast, fresh water                                       | Cargo oil                                           |
| Marine hull valve     | 5 K              | 0.5                          | Sea water,                                                            | —                                                   |
|                       | 10 K             | 1.0                          | fresh water, bilge,                                                   |                                                     |
|                       | 16 K             | 1.6                          | ballast                                                               |                                                     |

**3.2 Temperature** The relationship between the kind of rubber valve seat and the service temperature range shall be as given in **Table 3**.

**Table 3**

| Kind of rubber valve seat |                           | Service temperature range °C | Kind of fluid                                                                                              |
|---------------------------|---------------------------|------------------------------|------------------------------------------------------------------------------------------------------------|
| Symbol                    | Name                      |                              |                                                                                                            |
| NBR                       | Acrylic resin             | 0 ~ 70                       | Sea water, fresh water, bilge, ballast, liquefied gas, lubricating oil, fuel oil, cargo oil, hydraulic oil |
|                           | Nitrile Butadiene rubber  |                              |                                                                                                            |
| CR                        | Chloroprene rubber        | 0 ~ 70                       | Air                                                                                                        |
| EPDM                      | Ethylene propylene rubber | 0 ~ 120                      | Sea water, fresh water, inert gas                                                                          |
| FKM                       | Fluoro rubber             | 0 ~ 90                       | Cargo oil                                                                                                  |

**Remarks:** 1. Items other than those given in **Table 3** shall be subject to agreements between both parties concerned.

2. EPDM shall not be used for oils such as lubricating oil.

**Reference:** FKM shall be in compliance with SRIS 3606 of the Japan Synthetic Rubber Industry Association.

**Reference** Reference valves of flow rates are given in **Reference Table 1**.

**Reference Table 1**

| Unit: m/s                 |                             |           |
|---------------------------|-----------------------------|-----------|
| Fluid                     | Type of disc                | Flow rate |
| Sea water, cargo oil etc. | Centre-pivoted disc type    | 3         |
|                           | Eccentric-pivoted disc type | 6         |
| Air, inert gas etc.       | Centre-pivoted disc type    | 30        |
|                           | Eccentric-pivoted disc type | 40        |

**Remark:** The type of disc suitable for the fluid conditions shall be selected.

#### 4. Construction

**4.1 Body** The construction of the body shall be as follows:

- (1) The body shall be of wafer type for ordinary piping valve, flange type for marine hull valve, and the connection with piping shall conform to the requirements for 5 K flanges, 10 K flanges and 16 K flanges specified in **JIS B 2210**.
- (2) The body shall be provided with a pair of bearing facing in the direction of diameter, shall be so constructed as to support the stem and the end of the body, and shall have sufficient strength to fix driving gear of the valve.

**4.2 Disc** The construction of the disc shall be as follows:

- (1) The disc shall be of centre-pivoted type or eccentric-pivoted type against the stem, and shall be parallel with the direction of flow at fully opening. The applicable classification shall be as given in **Table 1**.
- (2) The disc shall have construction with sufficient strength against the maximum working pressure of the valve.

**4.3 Stem** The stem shall withstand the pressure, temperature and fluid resistance applying to the disc, and shall assure the connection with the driving gear of the valve.

**4.4 Rubber valve seat** The construction of the rubber valve seat shall be as follows:

- (1) The rubber valve seat shall be provided in the body or disc, and shall be so constructed as to be easily replaced onboard.
- (2) The rubber valve seat shall maintain proper closing ability without causing dislocation, detachment or excessive distortion due to valve motions and fluid flow.

**4.5 Connection of disc and stem** The disc shall be firmly fixed to the stem with key, taper pin, taper bolt, etc. without causing loose fit so that the valve operating power can be fully transmitted to the valve.

**4.6 Valve stem penetration through valve box** The part where the valve stem penetrates through the valve box shall be constructed so robust that it can withstand the pressure load imposed on the valve disc and stem and be air tight.

**4.7 Driving gear** The construction of the driving gear shall be as follows:

- (1) The driving gears shall be hand-operated, and the types shall, as a rule, be of lever type, gear type and centre-handle type. The service classification shall be as given in **Table 4**.

Table 4

Unit: mm

| Type                  | Nominal pressure | Type of driving gear and applicable range of nominal diameter |             |                    |
|-----------------------|------------------|---------------------------------------------------------------|-------------|--------------------|
|                       |                  | Lever type                                                    | Gear type   | Centre-handle type |
| Ordinary piping valve | 5 K              | 50 to 200                                                     | 50 to 1,200 | 50 to 600          |
|                       | 10 K             |                                                               |             |                    |
|                       | 16 K             | —                                                             | 80 to 1,200 | —                  |
| Marine hull valve     | 5 K              | 50 to 200                                                     | 50 to 1,200 | 50 to 600          |
|                       | 10 K             |                                                               |             |                    |
|                       | 16 K             | —                                                             | 80 to 1,200 | —                  |

- (2) The driving gear shall be so constructed as to be capable of readily operating by on man.
- (3) The valve opening and closing shall be effected by the hand wheel or lever, and stoppers shall be provide to prevent overshooting of the valve disc at the designed "Open" or "Close" position. In the case of the handle wheel, the construction shall be such that the clockwise turn of the handle wheel causes the valve to close, and in the case of the lever type, the motion of the stem and the lever shall, as a rule, be compatible each other.
- (4) It is recommended that the butterfly valves used in the intermediate range of opening are so locked as no loosening is caused at each position of opening by vibration, shocks and fluid flow. This recommendation is dispensed in case of the driving gear with a locking device.
- (5) The driving gears shall be provided with a device indicating the valve position of the butterfly valves.
- (6) The driving gears shall have sufficient strength against the force necessary for driving the butterfly valves.
5. **Materials** The materials for the butterfly valve shall be as follows:
- (1) The materials for the body shall, as a rule, be as given in **Table 5** taking into account the required corrosion resistance and durability.

Table 5

| Type                  | Material for body                  |
|-----------------------|------------------------------------|
| Ordinary piping valve | JIS G 5501-FC200 or the wquivalent |
| Marine hull valve     | JIS G 5101-SC450 or the equivalent |

**Reference:** The materials of the disc classified by kind of fluid and applications are given in **Reference Table 2**.