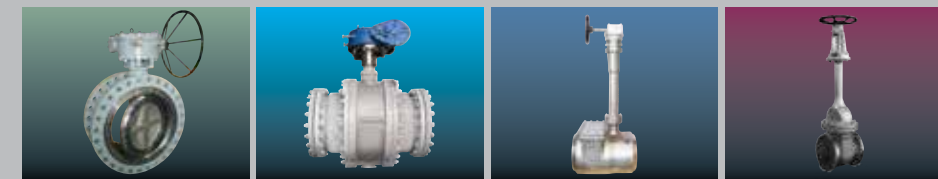



**ACE VALVE COMPANY LIMITED**  
<http://www.acevalve.co.kr>  
 1-12, Somang-gil, Juchon-myun,  
 Gimhae-si, Gyeongsangnam-do, Korea.  
 ▶ TEL +82-55-310-8000  
 ▶ FAX +82-55-329-0656~8  
 ▶ E-mail [acevalve@acevalve.co.kr](mailto:acevalve@acevalve.co.kr)  
 ▶ Homepage [www.acevalve.co.kr](http://www.acevalve.co.kr)



# Ace Valve

## COMPANY PROFILE

### Company Name

· ACE VALVE COMPANY LIMITED

### CEO & Chairman · Youn Hoe, Koo

### Head Office & Factory

· 1-12, Somang-gil, Juchon-myun, Gimhae-si,  
Gyeongsangnam-do, Korea

TEL : +82-55-310-8000 FAX : +82-55-329-0656~8

E-mail: acevalve@acevalve.co.kr

Http://www.acevalve.co.kr

## Main Products

- Triple Eccentric Metal Seated Butterfly Valve
- High-Performance Butterfly Valve
- Double Eccentric Disc Seated Butterfly Valve
- Double Eccentric Cargo Oil Butterfly Valve
- Concentric Butterfly Valve
- Vulcanized Rubber Lined Butterfly Valve
- Ball Valve
- Subsea Ball Valve
- Cryogenic Butterfly Valve
- Cryogenic Ball, Gate, Globe and Check Valve
- Gate, Globe and Check Valve (API)
- Resilient Seated Gate Valve
- Air Vacuum Relief Valve
- On-off and Control Valve
- Other Special Valves
- Hydraulic Actuators
- Valve Remote Operation System
- Pipe Couplings, Dismantling joint



# Contents

|       |                                                                         |
|-------|-------------------------------------------------------------------------|
| 3     | General Introduction                                                    |
| 4-5   | Brief History                                                           |
| 6-7   | Ace Valve Products                                                      |
| 8-10  | ▶ Triple Eccentric Metal Seated Butterfly Valves                        |
| 11-13 | ▶ High-Performance Butterfly Valves                                     |
| 14-16 | ▶ Double Eccentric Disc Seated Butterfly Valves                         |
| 17-19 | ▶ Double Eccentric Cargo Oil Butterfly Valves                           |
| 20-22 | ▶ Concentric Butterfly Valves                                           |
| 23    | ▶ Vulcanized Rubber lined Butterfly Valve                               |
| 24-25 | ▶ Ball Valves                                                           |
| 26    | ▶ Subsea Ball Valves                                                    |
| 27-29 | ▶ Cryogenic Butterfly Valves for LNG                                    |
| 30    | ▶ Cryogenic Gate, Globe, Ball & Check Valve for LNG                     |
| 31-32 | ▶ Cryogenic Butterfly valves for LPG                                    |
| 33-36 | ▶ Gate & Globe Valves                                                   |
| 37    | ▶ Combined Check Valves                                                 |
| 38    | ▶ Dual Disc Check Valves                                                |
| 39    | ▶ Damper Valves                                                         |
| 40    | ▶ Air Vacuum Relief Valves                                              |
| 41-45 | ▶ Electro-Hydraulic Control System                                      |
| 46-47 | ▶ Specification of Dismantling joint, Flange Adaptor, Flexible Coupling |



# Brief History

We make every possible effort to develop valves with technological innovation for resistant to corrosion of high quality and high efficiency ceaselessly



- 2000 Apr. Established as Ace Valve Company Limited.  
Aug. Qualified by BVQI for ISO 9001.  
Registered on AVL of Hyundai Heavy Industries Co., Ltd. in Korea.
- 2001 Aug. Registered on AVL of Hitachi Zosen Corporation in Japan.  
Sep. Registered on AVL of Samsung Heavy Industries Co., Ltd. in Korea  
Oct. Registered on AVL of Daewoo Shipbuilding & Marine Engineering Co., Ltd. in Korea.  
Nov. Registered on AVL of STX Shipbuilding Co., Ltd. in Korea.  
Dec. Registered on AVL of Great Man-Made River Authority in Libya.  
Obtain Fire Safe Type Approval Certificate by DNV for Butterfly Valves.
- 2002 Mar. Registered on AVL of Universal shipbuilding Corporation in Japan.  
Jun. Designated as an Superior Exporting Firm by Korea Authority.  
Jul. Delivered 2400mm 24Bar Butterfly Valve to GMRA.  
Designated as an Excellent Inno-Biz Firm by Korea Authority.  
Delivered LNG Cryogenic Butterfly Valve to Osaka Valve.
- 2003 Feb. Obtain Type Approval Certificate by DNV.  
May. Obtain Type Approval Certificate by ABS.  
Approved by Exxon Mobil as an Official Vendor of Butterfly Valves.
- 2004 Feb. Obtain ISO 9001 with 2000 Edition From BVQI.  
Mar. Delivered Air Vacuum Relief Valve and Fittings to GMRA.  
Jul. Obtain Type Approval Certificate by Bureau Veritas.  
Nov. Registered on AVL of Doosan Heavy Industries & Construction Co., Ltd. in Korea.
- 2005 Feb. Registered on AVL of Mitsubishi Heavy Industries in Japan.  
Mar. Qualified by BVQI for ISO 14001.  
Oct. Registered on AVL of Korea Power Co., Ltd.(KOSPO, KOWEPO, KOMIPO, EWP, KOSEP) in Korea.
- 2006 Jan. Registered on AVL of Ministry of Energy State of Kuwait (Mew) in Kuwait.  
Mar. Registered on AVL of Fisia Italimpianti S.P.A in Italy.  
Apr. Obtain official Approval for Research & Development Institute From Authority.  
Sep. Registered on AVL of Saudi Aramco in KSA  
Dec. Developed Globe Valve for LPG.
- 2007 May. Delivered Triple Eccentric Metal Seat Butterfly Valve.  
Delivered Mechanical Coupling PN25 x 2400mm for GMRA Project.  
Sep. Registered on AVL of Kuwait Oil Company in Kuwait.  
Oct. Designated as Developer Cryogenic Globe Valve for LNG by Korea Ministry.  
Nov. Approved as official Vendor by Kuwait National Petroleum Company.  
Registered on AVL of POSCO Engineering & Construction Co., Ltd. in Korea.
- 2008 Jan. Obtain CE Mark Certificate.  
Apr. Registered on AVL of Samsung Engineering Co., Ltd. in Korea.  
Jun. Obtain API Monogram for API 609.  
Jul. Technology Transfer of Valve Remote Operating System for  
Integreted Electro-Hydraulic Actuator From Hyundai Heavy Industries Co., Ltd.

- 2009 Jan. Obtain Gost-R Certificate.  
Mar. Developed Class 2500 Triple Eccentric Metal Seated Butterfly Valve.  
Registered on AVL of Hyundai Engineering & Construction Co., Ltd. in Korea.  
Apr. Registered on AVL of GS Engineering & Construction Corporation in Korea.  
Delivered 1050mm (LNG Cryogenic) / 1500mm Triple Eccentric Metal Seated Butterfly Valve.  
Jun. Delivered Butterfly Valves for U.K. Aircraft Carrier (CVF Carrier).  
Oct. Registered on AVL of Daelim Industrial Co.,Ltd. in Korea.  
Nov. Approved by Hyundai Heavy Industries as Valve Remote Operating System Manufacturer.  
Dec. Developed Valve Remote Operating System.  
Obtain ISO 9001 with 2008 Edition.
- 2010 Jan. Delivered Valve Remote Operating System with Sungdong of 158K Crude Oil Tanker for TSAKOS.  
Registered on AVL of GASCO in UAE.  
Aug. Delivered Gate, Butterfly and Swing Check Valve for GASCO Ruwais 5th Ngl Train Project.  
Dec. Delivered Ball, Gate, Check, Globe and Butterfly Valve for Takreer Seawater Intake-3 Project.
- 2011 Jun. Obtain ASME 'N' & 'NPT' Stamp.  
Obtain Ball Valve Fire Safe Type Approval Certificate.  
Jul. Contracted Shutdown Ball Valve for South Pars Gas Filed on-Shore Project.  
Sep. Contracted Motorized Ball Valve for Foroozan offshore Project.
- 2012 May. Obtain API-6D Monogram for Ball, Gate, Check Valve.  
Contracted Ball, Gate, Globe, Check and Butterfly Valve for South Pars Gas Field On-Shore Project.  
July. Designated by Korean Authority as a Developer for Subsea Valve (Sil 3 / 3000M Sea Depth) Reserch and Development Project.  
Sep. Delivered Butterfly Valve for Ras Al Khair Power and Desalination Plant in KSA(Doosan Heavy Industries).  
Dec. Awarded The Gold Tower Order of Industrial Service Merit.
- 2013 Mar. Delivered LNG Valves for Mejilones LNG Storage Tank in Chile (Tecnicas Reunidas).  
Jun. Registered on AVL of NIOEC in Iran.  
Registered on AVL of IOOC in Iran.  
Jul. Obtain Type Approval Certificate for Cryogenic Globe, Gate, Swing Check, Ball and Butterfly valves by Lloyd's  
Obtain Type Approval Certificate for Cryogenic Globe, Gate, Check, Ball and Butterfly valves by ABS  
Nov. Obtain UL Certificate for Concentric, High performance type Butterfly valves.
- 2014 Jan. Approved as Official Vendor by ADMA-OPCO in U.A.E.  
Feb. Registered on AVL of Ma'aden in KSA.  
Apr. As Offical Vendor by ZADCO in U.A.E  
Jul. Obtain UL Certificate for Post Indicator Valve.  
Aug. Registered on AVL of SABIC in KSA.  
Designated by Korean Authority as a Manufacturer for Floating Offshore LNG Bunkering System Project  
Dec. Registered on AVL of Marafiq in KSA.
- 2015 Jan. Registered on AVL of SEC(Saudi Electricity Company) in KSA.  
Aug. Registered on AVL of KOTC in Kuwait.  
Sep. Registered on AVL of Fluor in USA.  
Oct. Registered on AVL of S-Oil in Korea.  
Obtain SIL Certificate from TUV.
- 2016 Jun. Obtain Fugitive Emission Test Certificate for Ball valve.  
Obtain KC Certificate for Butterfly valves.  
Jul. Approved as Official Vendor by Petroleum Development Oman (PDO) in Oman.  
Obtain SIL Certificate for Gate Valve from TUV.  
Registered on AVL of Hanwha Total in Korea.  
Aug. Obtain SIL Certificate for Check Valve from TUV.  
Obtain TAT Certificate for High performance type Butterfly valve.  
Registered on AVL of Hanwha Techwin in Korea.  
Sep. Obtain TAT Certificate for Triple type Butterfly valve.  
Dec. Signed MOU for R&D and Educational Cooperation in the Fields of Maritime offshore Infrasturctures and Renewable Energy Technologies with TNO in Netherlands.  
Signed Technical License Agreement for LNG Transfer System with KANON in Netherlands.



# ACE VALVE PRODUCTS



▲ **AV-B Series**  
Subsea Ball Valve



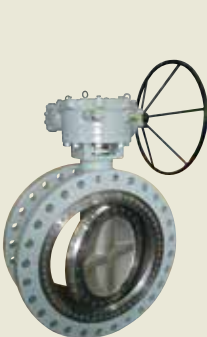
▲ **AV-B Series**  
Floating type Ball Valve



▲ **AV-B Series**  
Trunnion type Ball Valve



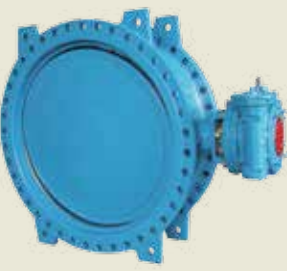
▲ **Valve Remote Operation System**  
Control Console



▲ **AV-TM Series**  
Triple Eccentric Metal Seated Butterfly Valve



▲ **AV-H, M and F Series**  
High-performance Butterfly Valve



▲ **AV-E Series**  
Disc Seated Butterfly Valve



▲ **AV-O Series**  
Double Eccentric Cargo Butterfly Valve



▲ **AV-C Series**  
Concentric Butterfly Valve



▲ **AV-L Series**  
Cryogenic LNG · LPG Butterfly Valve



▲ **AV-L Series**  
Cryogenic Ball Valve



▲ **AV-L Series**  
Cryogenic Gate Valve



▲ **AV-L Series**  
Cryogenic Globe Valve



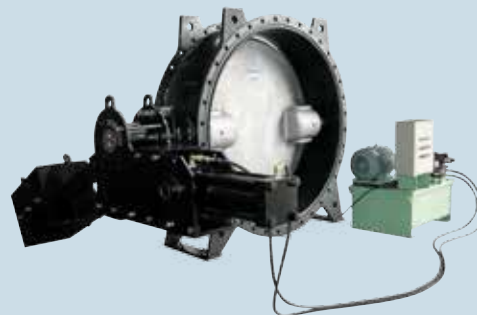
▲ **AV-L Series**  
Cryogenic Swing Check Valve



▲ **AV-S Series**  
Gate Valve



▲ **AV-G Series**  
Globe Valve



▲ **AV-CK Series**  
Combined Check Valve



▲ **AV-K Series**  
Dual Disc Check Valve



▲ **AV-D Series**  
Damper Valve



▲ **AV-A Series**  
Air Valve



▲ **AV-HA Series**  
Hydraulic Actuator (Scotch Yoke Type)

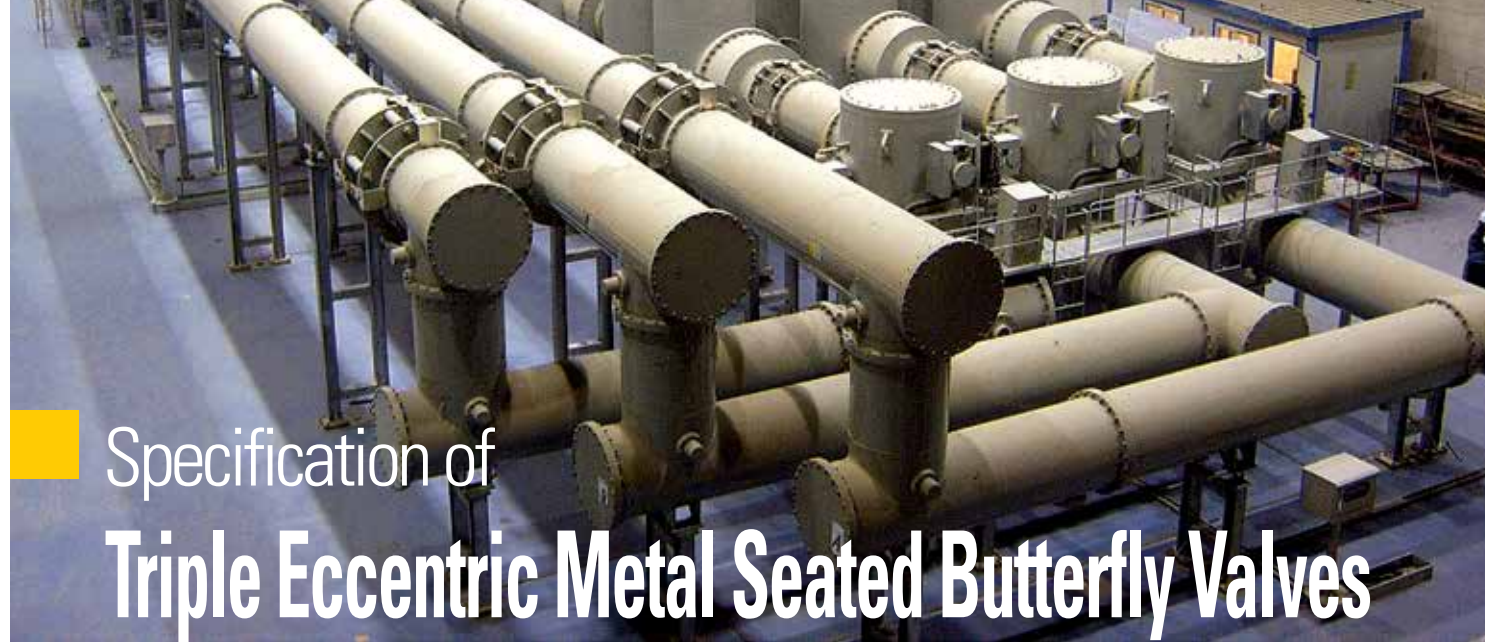


▲ **AV-RA Series**  
Hydraulic Actuator (Rack & Pinion Type)



▲ **AV-CP Series**  
Flexible Coupling





# Specification of Triple Eccentric Metal Seated Butterfly Valves



Triple eccentric metal seated butterfly valves are widely used in plant and high pressure piping system.  
The metal seat shall be consisted of laminated seat or solid seat.  
The valve shall be capable of bi-directional flow bubble tight shut-off at full rated pressure.

### TYPE NUMBERING SYSTEM

- AV-TMW Triple Eccentric wafer type metal seated butterfly valves.
- AV-TML Triple Eccentric lug type metal seated butterfly valves.
- AV-TMF Triple Eccentric flange type metal seated butterfly valves.

### STANDARD COMPLIANCE

- The face to face dimension shall be in accordance with API 609, ISO 5752, AWWA, BS, JIS/KS.
- Fire safe design shall be in accordance with API607.

### PRODUCTION RANGE

- SIZE : DN 50mm (2 inch) ~ DN 5000mm (200 inch)
- WORKING PRESSURE : Up to 300 bar depend on related size
- WORKING TEMPERATURE : -196°C ~ +815°C

### APPLICABLE FLANGE

- KS/JIS 5K, 10K, 16K, 20K, 30K, 40K, 63K
- ASME B 16.5, 16.47 Class 150LB, 300LB, 600LB, 900LB, 1500LB, 2500LB
- EN 1092 PN6, PN10, PN16, PN25, PN40, PN63
- ISO 7005 PN6, PN10, PN16, PN20, PN25, PN40

## Triple Eccentric Metal Seated Butterfly valves

### Application

- Petroleum refinery
- Fossil power plants
- Petrochemical plants
- Firesafe line
- Nuclear power plants
- Cryogenic services
- Exhaust gas line & Steam line

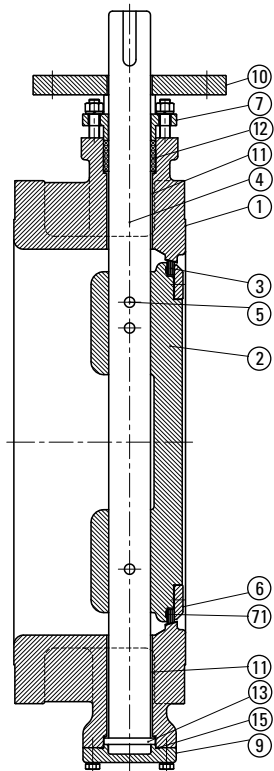
### Classification by Connection

- WAFER : The valve to be installed with long bolts between the flanges at adjacent pipe without flange on the valve.
- LUG : A pair of thread bolt holes to be provided upper and lower side in order to hold the valve.
- FLANGE : Both end with complete flange suitable to connect with general pipe flange.

### Operations

The various operator of the valve is available depend on the valve location, driving medium and dedicated service of the valve to be provided.

- Manual worm gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation



### Part List

| No | PART NAME      | METERIAL                                                        |
|----|----------------|-----------------------------------------------------------------|
| 1  | BODY           | CAST STEEL / STAINLESS STEEL / NI-AL-BRONZE                     |
| 2  | DISC           | CAST STEEL / STAINLESS STEEL / NI-AL-BRONZE                     |
| 3  | SEAT           | STAINLESS STEEL + GRAPHITE LAMINATED<br>STAINLESS STEEL / MONEL |
| 4  | STEM           | STAINLESS STEEL / MONEL                                         |
| 5  | DISC PIN       | STAINLESS STEEL / MONEL                                         |
| 6  | RETAINER       | CAST STEEL / STAINLESS STEEL / NI-AL-BRONZE                     |
| 7  | PACKING GLAND  | CAST STEEL / STAINLESS STEEL / NI-AL-BRONZE                     |
| 9  | BOTTOM COVER   | CAST STEEL / STAINLESS STEEL / NI-AL-BRONZE                     |
| 10 | ACTUATOR STAND | CARBON STEEL                                                    |
| 11 | STEM BEARING   | STAINLESS STEEL + TEFLON<br>STAINLESS STEEL / BRONZE / INCONEL  |
| 12 | PACKING        | GRAPHITE                                                        |
| 13 | THRUST PLATE   | STAINLESS STEEL + TEFLON<br>STAINLESS STEEL / BRONZE / INCONEL  |
| 15 | BOTTOM GASKET  | GRAPHITE                                                        |
| 71 | SEAT GASKET    | GRAPHITE                                                        |

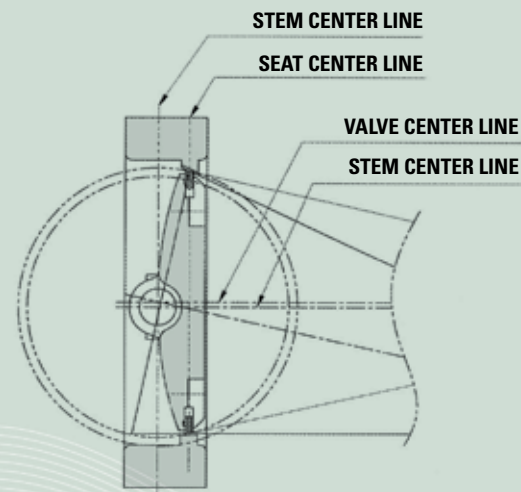


# Triple Eccentric Metal Seated Butterfly valves

## Triple eccentric design principle

Metal seated high pressure butterfly valves provide bi-directional bubble tight shut off which achieved by introducing state of the triple eccentric disc geometry.

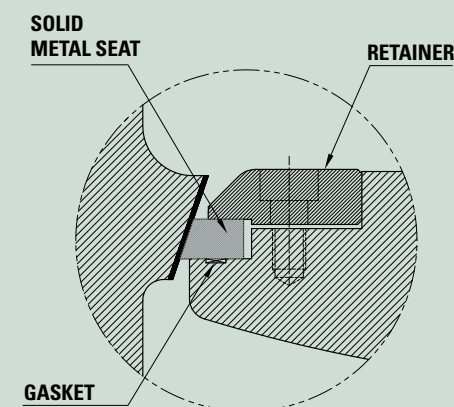
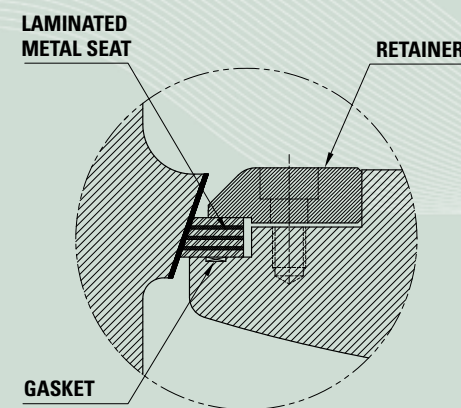
The valve shaft is off set against the seat and the centre line of the valve body respectively. The seating edges are machined with a continuously changing slope from an angle on top of the oval seat ring to an angle at the opposite side. This geometry ensures that the seat ring stays clear of the seat except at the final shut off position which results long life seat.



## Metal to metal seat

Various disc seals are available for each temperature and pressure service applications. Solid metal seals are often used for temperatures above 510°C and up to 815°C or low temperature service. The laminated metal seal consisted of stainless steel with intermediate material of graphite or ceramic fiber layers is used widely. The laminated seal is secured to the disc with a bolt-on stainless steel retainer and easily accessible for replacement. The graphite laminated seal Ring is suitable for temperatures between -40°C and 650°C in general.

The seal leakage meets API 598 or API 6D. The solid metal seating valve can be operated in a temperature range of -253°C to +815°C. Valve for cryogenic application shall be provided with extended stem.



# Specification of High-Performance Butterfly Valves



High performance butterfly valves are widely used in product and chemical tankers, offshore / on shore to NACE MR0175, oil and gas field chemical, petrochemical plants, and high pressure piping systems. The valves are complied with API 607 fire safety standards. Adoption of a spring-loaded soft PTFE seat gives flexibility and secures long life, even with frequent operation.

The soft seated valve shall be capable of bi-directional flow and provide bubble tight shut-off at full rated pressure.

## TYPE NUMBERING SYSTEM

- AV-HWR High-performance WAFER type Rubber seat Butterfly valves
- AV-HSR High-performance SEMI-LUG type Rubber seat Butterfly valves
- AV-HLR High-performance LUG type Rubber seat Butterfly valves
- AV-HFR High-performance FLANGE type Rubber seat Butterfly valves
- AV-HWT High-performance WAFER type Teflon seat Butterfly valves
- AV-HST High-performance SEMI-LUG type Teflon seat Butterfly valves
- AV-HLT High-performance LUG type Teflon seat Butterfly valves
- AV-HFT High-performance FLANGE type Teflon seat Butterfly valves
- AV-MHW High-performance WAFER type Metal seat Butterfly valves
- AV-MHS High-performance SEMI-LUG type Metal seat Butterfly valves
- AV-MHL High-performance LUG type Metal seat Butterfly valves
- AV-MHF High-performance FLANGE type Metal seat Butterfly valves
- AV-FHW High-performance WAFER type Fire safe seat Butterfly valves
- AV-FHS High-performance SEMI-LUG type Fire safe seat Butterfly valves
- AV-FHL High-performance LUG type Fire safe seat Butterfly valves
- AV-FHF High-performance FLANGE type Fire safe seat Butterfly valves

## STANDARD COMPLIANCE

- The face to face dimension shall be in accordance with API 609, ISO 5752, KSV 7490, JIS F 7480, BS 5155 or MSS SP-68.

## PRODUCTION RANGE

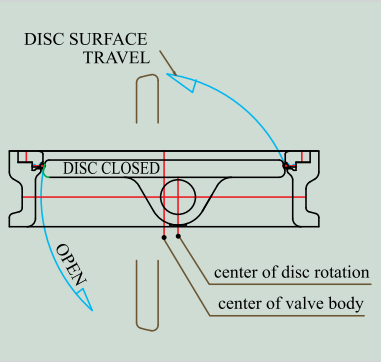
- SIZE : DN 50mm (2 inch) ~ DN 1500mm (60 inch)
- WORKING PRESSURE : Up to 50 bar
- WORKING TEMPERATURE : -55°C ~ +250°C (Soft seat)  
-100°C ~ +400°C (Metal seat)

## APPLICABLE FLANGE

- KS/JIS 5K, 10K, 16K, 20K, 30K
- ASME B 16.5 Class 150LB, 300LB
- EN 1092 PN6, PN10, PN16, PN25
- ISO 7005 PN6, PN10, PN16, PN20, PN25

# High-performance Butterfly valves

# High-performance Butterfly valves



## The High-performance Design

The axis of disc rotation is double eccentric offset to the seat ring. When the disc rotates, it unseats a small turning angle by the cam effect. This prevents seat abrasion and provides perfect seal for a long period.

## Application

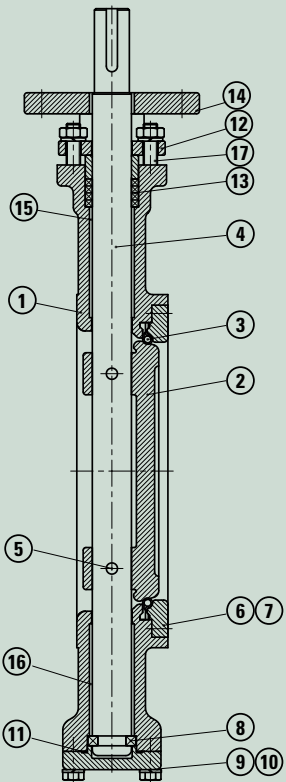
This product is of heavy load designed for high pressure flow application.

- Marine tankers-shipbuilding
- Offshore / Onshore plants, oil/gas production platform
- Chemical and petro-chemical plants
- Military application
- Fire safe piping system
- LPG

## Operations

The valve shall be operated with the following actuators which selected depending on location of valve, the type of work and service for which the valve is used.

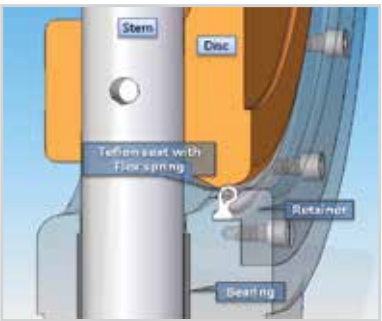
- Manual lever operation
- Manual worm gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation



## Part List

| NO | PART NAME      | MATERIAL                                                             |
|----|----------------|----------------------------------------------------------------------|
| 1  | BODY           | CAST IRON / DUCTILE IRON / CAST STEEL<br>STAINLESS STEEL / AL-BRONZE |
| 2  | DISC           | CAST STEEL / STAINLESS STEEL / AL-BRONZE                             |
| 3  | SEAT           | STAINLESS STEE / TEFLON / RUBBER                                     |
| 4  | STEM           | STAINLESS STEE (304, 316, 316L, 630, 17-4PH, Monel)                  |
| 5  | DISC PIN       | STAINLESS STEEL                                                      |
| 6  | RETAINER       | STAINLESS STEEL / AL-BRONZE / MILD STEEL                             |
| 7  | RETAINER BOLT  | STAINLESS STEEL                                                      |
| 8  | THRUST PLATE   | BRONZE / STAINLESS STEEL                                             |
| 9  | BOTTOM COVER   | STAINLESS STEEL / AL-BRONZE / MILD STEEL                             |
| 10 | BOTTOM BOLT    | STAINLESS STEEL / MILD STEEL                                         |
| 11 | BOTTOM GASKET  | TEFLON / GRAPHITE / RUBBER                                           |
| 12 | PACKING GLAND  | STAINLESS STEEL / AL-BRONZE / MILD STEEL                             |
| 13 | PACKING        | TEFLON / GRAPHITE / RUBBER                                           |
| 14 | ACTUATOR STAND | MILD STEEL                                                           |
| 15 | STEM BEARING   | TEFLON / STAINLESS / BRONZE                                          |
| 16 | STEM BEARING   | TEFLON / STAINLESS / BRONZE                                          |
| 17 | BOLT & NUT     | STAINLESS STEEL / MILD STEEL                                         |

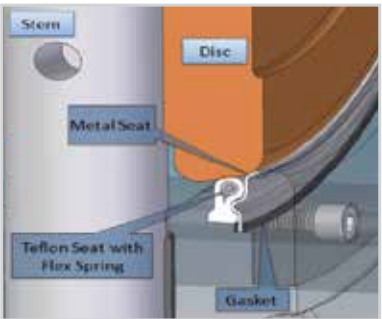
## Design Features



### SEAT RETAINER RING

Flexible teflon seat compensated by flexible spring withstand longer and can minimize the possibility of scratches by foreign article in the fluid than that of pure hard teflon.

The retainer together with spring assisted self energized seat ring shall work independently from the adjacent pipe in case of the retainer separated from the flange face of the valve as required by authority and the operating torque can be kept constant without variation by pressure from adjacent pipe flange.



### FIRE SAFETY DESIGN

In fire safe models, the energized metal seal is extended so as to form secondary sealing device in the event of soft seal destruction.

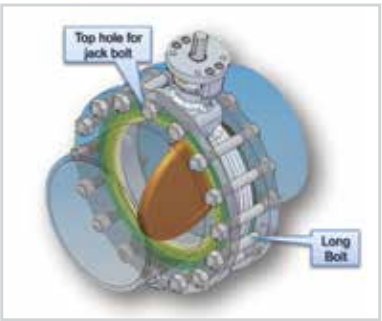
The valve shall be capable of bi-directional flow bubble tight shut-off at full rated pressure.



### TOP FLANGE (ISO 5211) For Actuator

The top flange of butterfly valve is one of most important parts for mounting of actuators.

ACE VALVE provides top flange in accordance with International Standard, ISO 5211 and easy modification works can be available for various type actuator without any special tool or equipment which the remote actuator provided by actuator makers.

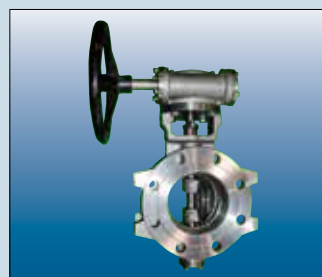


### SEMI LUG TYPE

Ace valve provides semi lug type or flange type connection end of valve in accordance with JIS F 7480 in addition to wafer type valve. Semi-lug type connection shall allow the removal of the piping downstream of the valve under the condition of keeping the closed valve with tap holes and jack bolts to avoid spilling of liquid in the upstream pipe, while wafer type valve should be released from the pipe which requires additional works such as pumping and cleaning of the spillage at bottom in addition to manpower for removing and re-installing of the valve.



# Specification of Double Eccentric Disc Seated Butterfly Valves



With a wide range of production, up to 4,000mm in size, the eccentric butterfly valves are developed for applications in waterworks, power plants, desalination plants and other similar industrial plants, with compliance to AWWA C-504, BS 5155 JIS B2064. They are available in a variety of body and disc materials. Rubber linings, epoxy coating and cathodic protection are available for installation in corrosive atmospheric conditions.

The disc seat design facilitates easy replacement of the seat and maintains seat pressure of up to 40bar. Since the disc seated butterfly valves are capable of manual or remote operation, electric and pneumatic actuators can be provided according to client's requirements.

The valve shall be capable of bi-directional flow and provide bubble tight shut-off at full rated pressure.

## TYPE NUMBERING SYSTEM

- AV-EWR Disc Seated Eccentric WAFER type Butterfly valves.
- AV-EFR Disc Seated Eccentric FLANGE type Butterfly valves.

## STANDARDS COMPLIANCE

- The face to face dimension in accordance with API, AWWA, KS/JIS, BS, ISO or other STANDARDS are available upon request.

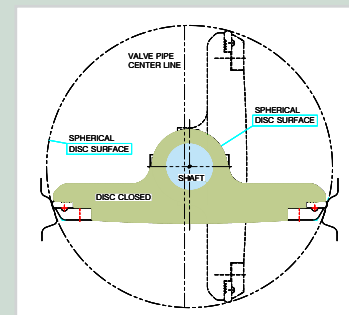
## PRODUCTION RANGE

- SIZE : DN 80mm (3 inch) ~ DN 4000mm (160 inch)
- WORKING PRESSURE : Up to 40bar
- WORKING TEMPERATURE : -20°C ~ +200°C

## APPLICABLE FLANGE

- KS/JIS 10K, 16K, 20K, 30K, 42K
- ASME B 16.1 Class 125LB, 250LB
- ASME B 16.5 Class 150LB, 300LB
- AWWA C 207 Class B, D, E
- EN 1092 PN6, PN10, PN16, PN25, PN40
- ISO 7005 PN6, PN10, PN16, PN20, PN25, PN40

# Double Eccentric Disc Seated Butterfly Valves



## The Double Eccentric Design

Applicable for butterfly valve with interchangeable soft seat.

- Circular unbroken seats on disc and in body.
- Simple maintenance.
- Change of seat ring by dismantling of the retaining ring only.
- Wide variety of seat materials available.

Suitable for installation in Medium Range Pressure System (<40kg/cm<sup>2</sup>)

No limitation on corrosiveness of medium with proper seat material.

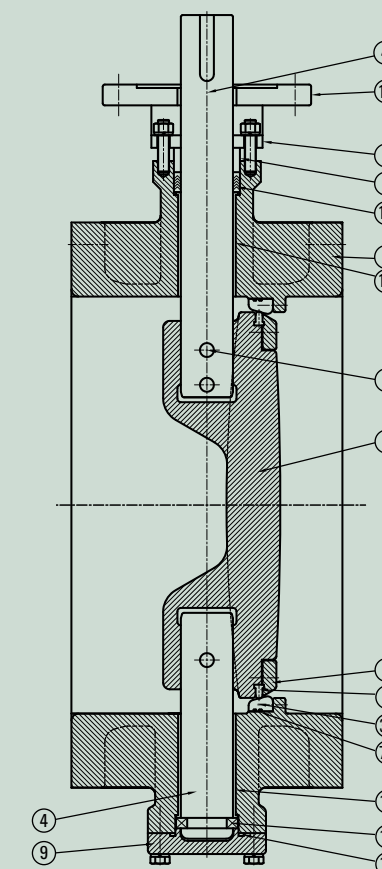
## Operations

The following operating actuator of the valve is available, depend on location and the condition of work and service for which the valve is installed.

- Manual lever operation
- Manual worm gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation

## Part List

| No  | PART NAME        | METERIAL                                                    |
|-----|------------------|-------------------------------------------------------------|
| 1   | BODY             | DUCTILE IRON / CAST STEEL<br>STAINLESS STEEL / NI-AL BRONZE |
| 2   | DISC             | DUCTILE IRON / CAST STEEL<br>STAINLESS STEEL / NI-AL BRONZE |
| 3   | SEAT             | NBR, EPDM / VITON                                           |
| 3.1 | BODY SEAT        | STAINLESS STEEL / NI-AL BRONZE                              |
| 4   | STEM             | STAINLESS STEEL / MONEL                                     |
| 5   | DISC PIN         | STAINLESS STEEL / MONEL                                     |
| 6   | RETAINER         | STAINLESS STEEL / NI-AL BRONZE                              |
| 7   | PACKING GLAND    | DUCTILE IRON / CAST STEEL<br>STAINLESS STEEL / NI-AL BRONZE |
| 8   | GLAND RING       | BRONZE / STAINLESS STEEL                                    |
| 9   | BOTTOM COVER     | DUCTILE IRON / CAST STEEL<br>STAINLESS STEEL / NI-AL BRONZE |
| 10  | STAND            | CARBON STEEL / CAST STEEL<br>DUCTILE IRON / STAINLESS STEEL |
| 11  | STEM BEARING     | STAINLESS STEEL / BRONZE / OILLESS BEARING                  |
| 12  | V-PACKING        | NBR / EPDM / VITON                                          |
| 13  | THRUST PLATE     | BRONZE / STAINLESS STEEL                                    |
| 15  | BOTTOM O-RING    | NBR / EPDM / VITON                                          |
| 71  | BODY SEAT O-RING | NBR / EPDM / VITON                                          |





# Double Eccentric Disc Seated Butterfly Valves



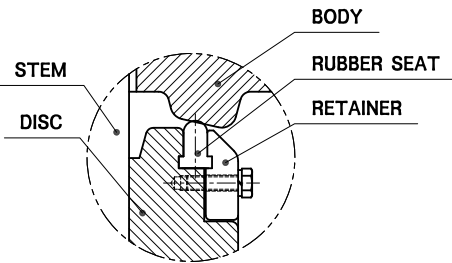
## Applications

- Desalination
- Power plant
- Others
- Salt water service
- Sea water

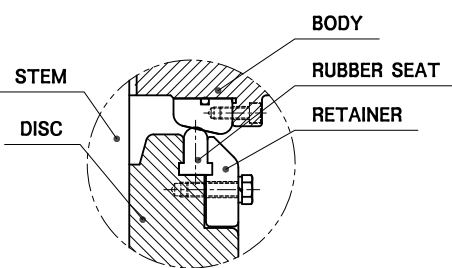
## Hydro Test Specifications

| Series                   | ISO Series                     | AWWA Series                    |
|--------------------------|--------------------------------|--------------------------------|
| "Hydrostatic Shell test" | 1.5 x maximum service pressure | 2.0 x maximum service pressure |
| "Hydrostatic Seat test"  | 1.1 x working service pressure | working service pressure       |

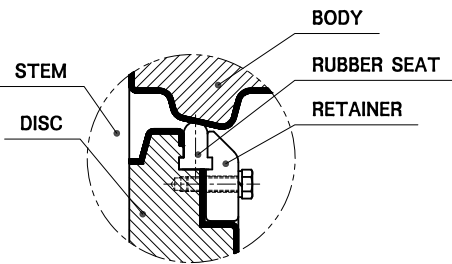
## Design Features



- It is designed rubber seat to be inserted in the disc.
- More suitable rubber seat can be adopted in accordance with characteristics of fluid.
- Rubber seat can be exchanged without dismantling of pipeline.



- It is designed rubber seat to be inserted in the disc.
- More suitable rubber seat can be adopted in accordance with characteristics of fluid.
- Rubber seat can be exchanged without dismantling of pipeline
- An additional ring is inserted in the body to replace seat ring on the contacting area between body seat and disc seat.
- The respective maintenance work is possible for seat and disc seat.



- It is designed rubber seat to be inserted in the disc.
- More suitable rubber seat can be adopted in accordance with characteristics of fluid.
- Rubber seat can be exchanged without dismantling of pipeline
- Corrosion prevention is available with special coating on the body and disc.

# Specification of

# Double Eccentric Cargo Oil Butterfly Valves



Ace Valve's rubber seated double eccentric butterfly valve feature is a heavy loaded design for high-pressure and high flow-rate applications. They have been widely adopted for oil and gas valves in oil tankers, FPSO onshore / offshore field and high flow-rate piping systems. The delicate design of the seat ring keeps the retainer free from any pressure from flanges on adjacent pipes, misaligned flanges or flexibility in the pipes. Moreover, it minimizes the foreign articles remained on the seat in order to reduce damage of seat ring. The valve shall be capable of bi-directional flow and provide bubble tight shut-off at full rated pressure.

## TYPE NUMBERING SYSTEM

- AV-OSR Double Eccentric SEMI-LUG type Butterfly valves
- AV-OLR Double Eccentric LUG type Butterfly valves
- AV-OFR Double Eccentric FLANGE type Butterfly valves

## STANDARD COMPLIANCE

- The face to face dimension shall be in accordance with KSV 7490, JIS F 7480

## PRODUCTION RANGE

- SIZE : DN50mm (2 inch) ~ DN1000mm (40 inch)
- WORKING PRESSURE : Up to 40bar
- WORKING TEMPERATURE : -20℃ ~ +250℃

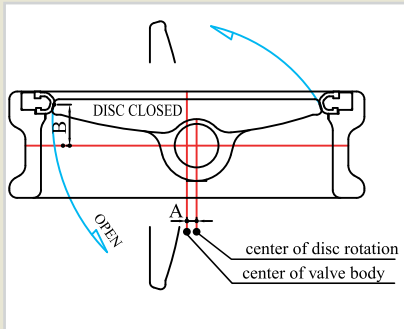
## APPLICABLE FLANGE

- KS/JIS 5K, 10K, 16K, 20K, 30K
- ASME B 16.5 Class 150LB, 300LB
- EN 1092 PN6, PN10, PN16, PN25
- ISO 7005 PN6, PN10, PN16, PN20, PN25





# Double Eccentric Cargo Oil Butterfly valves



## The Double Eccentric Design

It effects friction-free contact between disc and seat since the rotation axis(stem) of the valve disc is shifted from the center by a distance of the width of A and B, a cam effect is produced which prevents from wearing the seal surface, lessens seating torque and offers long service life and easy operation.

## Application

It is provided of heavy load designed for high pressure and high-flow rate application.

- Crude oil and product oil piping system
- Tank cleaning system
- Cargo tank Venting and Inert gas system
- Sea water system
- Fuel oil and Diesel oil system
- Other piping system where applicable

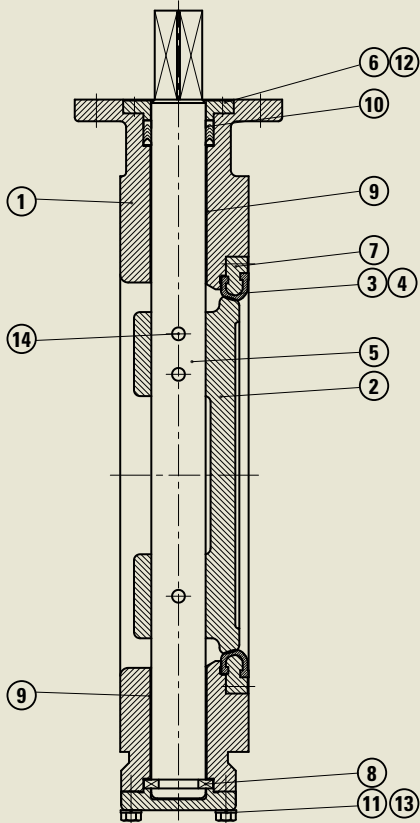
## Operations

The valve shall be operated with the following actuators which selected depending on location of valve, the type of work and service for which the valve is used.

- Manual lever operation
- Manual worm gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation

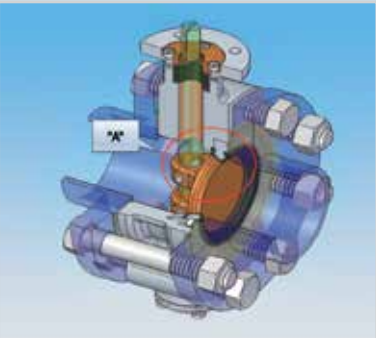
## Part List

| NO. | PART NAME     | MATERIAL                                                                      |
|-----|---------------|-------------------------------------------------------------------------------|
| 1   | BODY          | CAST IRON / DUCTILE IRON<br>STAINLESS STEEL / CARBON STEEL<br>ALUMINUM BRONZE |
| 2   | DISC          | STAINLESS STEEL / CAST STEEL<br>ALUMINUM BRONZE / ALLOY STEEL                 |
| 3   | RETAINER      | CAST IRON / DUCTILE IRON<br>STAINLESS STEEL / CARBON STEEL<br>ALUMINUM BRONZE |
| 4   | SEAT          | NBR / VITON                                                                   |
| 5   | STEM          | STAINLESS STEEL (SS304, 316, 410)                                             |
| 6   | GLAND BUSH    | STAINLESS STEEL / BRONZE                                                      |
| 7   | RETAINER BOLT | STAINLESS STEEL / GALV. STEEL                                                 |
| 8   | THRUST PLATE  | STAINLESS STEEL / BRONZE                                                      |
| 9   | STEM BARING   | STAINLESS STEEL + PTFE                                                        |
| 10  | PACKING       | NBR / VITON                                                                   |
| 11  | BOOTOM COVER  | CAST IRON / DUCTILE IRON<br>STAINLESS STEEL / CARBON STEEL<br>ALUMINUM BRONZE |
| 12  | GLAND BOLT    | STAINLESS STEEL / GALV. STEEL                                                 |
| 13  | BOOTOM BOLT   | STAINLESS STEEL / GALV. STEEL                                                 |
| 14  | DISC PIN      | STAINLESS STEEL / GALV. STEEL                                                 |



# Double Eccentric Cargo Oil Butterfly valves

## Design Features



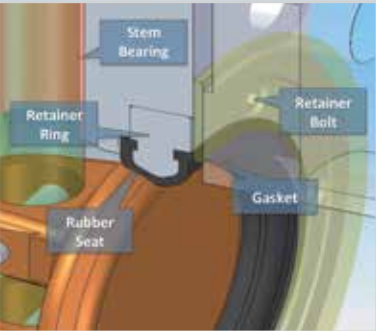
### SEAT RETAINER RING (Flange faced retainer)

The seat is designed having round shape to avoid foreign articles in the oil to be remained on the seat.

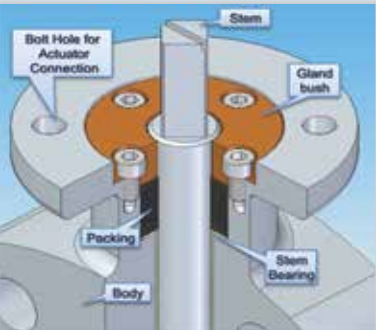
The rubber seat to be adhered on the metal retainer by heat treatment to minimize the damage of rubber by high liquid shock.

The retainer together with seat ring shall work independently from the adjacent pipe as the retainer is separated from the flange face of the valve and operating torque of the valve shall be kept constant as the pipe flange shall not presurize the retainer and seat ring.

The global standard such as ASME requires retainer separated from valve flange. The seat provides bubble tight at bi-direction full rated pressure.

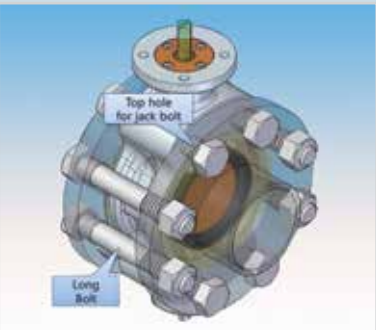


Detail "A"



### SHAFT SEALING (Gland bush with V-Packing)

V-packing with gland bush keeps the sealing in way of valve stem perfectly without additional tightening device after operating of the valve while other packing requires additional tightening work with the packing adjustment screw.



### SEMI LUG TYPE

Ace valve provides semi lug type or flange type end of valve in accordance with JIS F 7480 in addition to wafer type valve. Semi-lug type connection shall allow the removal of the piping downstream of the valve under the condition of keeping the closed valve with tap holes and jack bolts to avoid spilling of liquid in the upstream pipe, while wafer type valve should be released from the pipe which requires additional works such as pumping and cleaning of the spillage at ship's bottom in addition to manpower for removing and re-installing of the valve.





Specification of

# Concentric Butterfly Valves



The Concentric Butterfly Valve Feature is a symmetrical disc design, ensuring favorable flow-characteristics, and low pressure-drop. The concentric shaft ensures low operating torque. Concentric butterfly valve can be manufactured with the sizes up to 4,000mm, with replaceable rubber seat, with various kind of materials. The valve shall be capable of bi-directional flow with bubble tight shut-off at full rating pressure. The unique seat design with retaining points, virtually eliminates any seat movement during open / close operation of the disc. A PTFE / PFE lined body is also available for chemically high-corrosive fluid conditions.



## TYPE NUMBERING SYSTEM

- AV-CWR Concentric WAFER type Rubber lined Butterfly Valves
- AV-CSR Concentric SEMI-LUG type Rubber lined Butterfly Valves
- AV-CLR Concentric LUG type Rubber lined Butterfly Valves
- AV-CFR Concentric FLANGE type Rubber lined Butterfly Valves

## STANDARD COMPLIANCE

- ACE Concentric Butterfly valves conform to ISO 5752, KSV 7490, JIS F 7480, JIS B 2032, API 609, BS 5155, DIN2501.

## PRODUCTION RANGE

- SIZE : DN 50mm (2 inch) ~ DN 4000mm (160 inch)
- RATING PRESSURE : Up to 20 bar depend on related size
- RATING TEMPERATURE : -40°C ~ +230°C

## APPLICABLE FLANGE

- KS/JIS 5K, 10K, 16K
- ASME B 16.1 Class 125LB
- ASME B 16.5 Class 150LB
- EN 1092 PN6, PN10, PN16
- ISO 7005 PN6, PN10, PN16
- GB 2501/2506 PN6, PN10, PN16
- DIN 2501 PN6, PN10, PN16
- BS4504 PN6, PN10, PN16

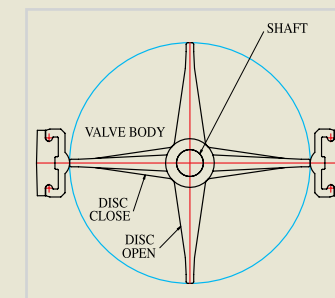


## Concentric Butterfly valves

### The Concentric Design

CENTER OF SHAFT / 'Seat in the 'Center of Valve Body'  
Applicable for BUTTERFLY VALVE WITH ELASTOMER LINING.

### Schema of Concentric type



The valve shall be a 90° turn clockwise to close, non-jamming, and resilient seated valve for zero leakage service.

The valve shall be torque seated and designed in such a manner that the disc can not be rotated freely at the closed position.

Also this valve enables the fluid perfect shut-off regardless of the flow direction.

- Symmetric disc design ensures favourable flow characteristics and low pressure drop
- Concentric shaft ensures low operating torque
- Lining gives a good protection to valve body and acts as flange gasket
  - Shaft penetrates the valve seat
  - Limited choice of seating materials(Elastomer only)



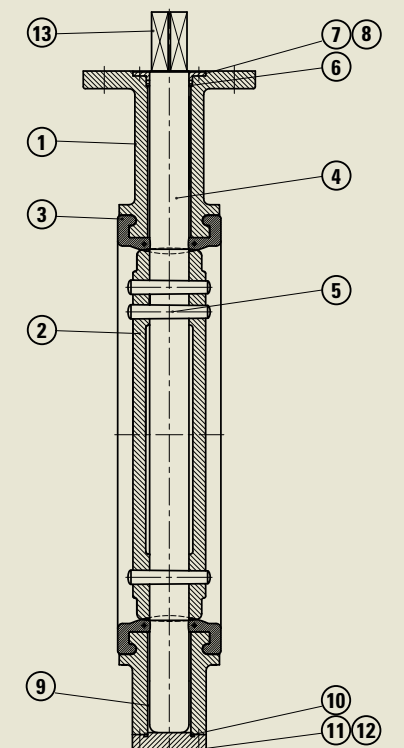
### Operations

The following operation of the valve is possible depending on the valve location, the type of work and service of the valve to be provided.

- Manual lever operation
- Manual worm gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation

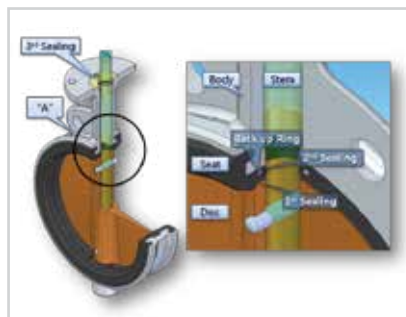
### Part List

| NO. | PART NAME     | MATERIAL                                                                               |
|-----|---------------|----------------------------------------------------------------------------------------|
| 1   | BODY          | CAST IRON / DUCTILE IRON<br>STAINLESS STEEL / CARBON STEEL<br>(NICKEL) ALUMINUM BRONZE |
| 2   | DISC          | STAINLESS STEEL / ALLOY STEEL<br>(NICKEL) ALUMINUM BRONZE                              |
| 3   | SEAT          | NBR / VITON / SILICON / EPDM                                                           |
| 4   | STEM          | STAINLESS STEEL(SS304, 316, 410, 420,<br>17-4PH) / MONEL / DUPLEX                      |
| 5   | DISC PIN      | STAINLESS STEEL OR MONEL                                                               |
| 6   | O-RING        | RUBBER SAME AS SEAT MATERIAL                                                           |
| 7   | PACKING GLAND | BRONZE / STAINLESS STEEL / STEEL(HOT DIP GALV.)                                        |
| 8   | GLAND BOLT    | STAINLESS STEEL                                                                        |
| 9   | BEARING       | PTFE + PB                                                                              |
| 10  | O-RING        | RUBBER SAME AS SEAT MATERIAL                                                           |
| 11  | BOTTOM COVER  | CARBON STEEL / STAINLESS STEEL<br>AL-BRONZE / MILD STEEL                               |
| 12  | BOLT & WASHER | STEEL / STAINLESS STEEL                                                                |
| 13  | KEY or SQUARE | MILD STEEL / IF NECESSARY                                                              |





## Design Features

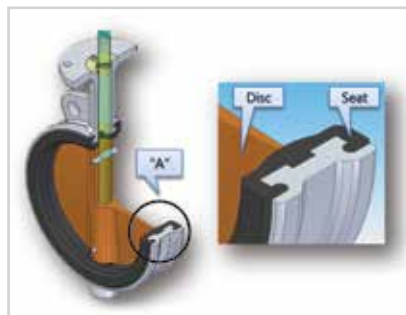


### DISC SEAT DESIGN (Triple sealing system)

Ace valve has triple sealing system on the connection part of stem and seat which is improved construction compare to that having only simple structure occurring frequent leakage problem when the body slightly deviates from central axis.

The first seal : It shows perfect sealing effect with the minimum friction by the connection with the slope and the globular shape.

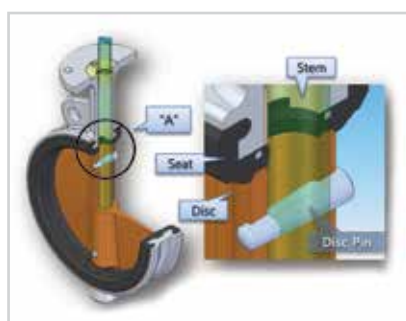
The second seal : Even if the shaft is declined by the fluid pressure to keep the position by the seal structure around shaft will be remained without collapse for perfect sealing. The third seal : Ace valve has o-ring and gland bush(top cover) independently from operating unit.



### DISC SEAT (Completely spherical shape)

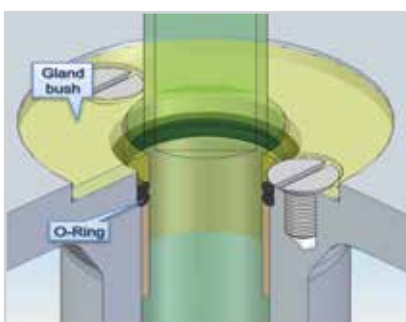
The grooves are provided in way of mid and each end part of body around to fix the seat in the body to avoid movement or detachment of rubber seat by unexpected forces.

Ball shape rubber to be provided to contact with flat shape disc which gives central position of disc because shorter distance at center line compare to longer diagonal length at disc end.



### DISC PIN DESIGN

Taper pin to be provided to fix disc in to the shaft, instead of thread bolt to avoid unexpected releasing of the thread caused by the environmental vibration.

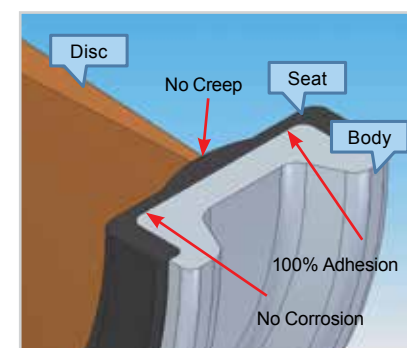
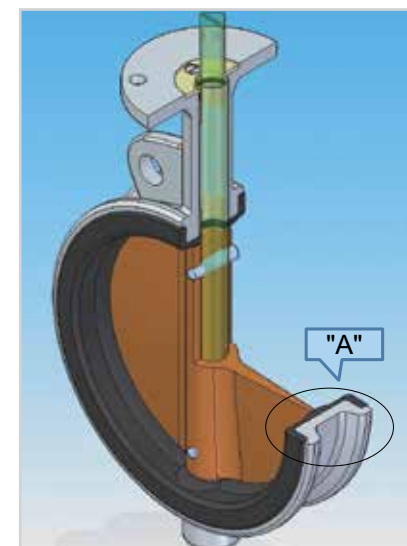


### SHAFT SEALING (Gland bush with O-ring)

An O-ring with gland bush is provided for the shaft hole in the body as a third sealing device but low torque.

The O-ring can be kept by gland bush (top cover) in any case.

Oilless bearing is provided to minimize operating torque.



Detail "A"

## STANDARD COMPLIANCE

- ACE Concentric Butterfly Valves conform to ISO 5752, KSV7490, JIS F7480, JIS B2032, JIS B2064, API 609, BS5155, DIN2501.

## PRODUCTION RANGE

- SIZE : DN 40mm(1½ Inch) ~DN 600mm(24Inch)
- RATING PRESSURE : Up to 20bar
- RATING TEMPERATURE : -40°C ~ +230°C
- AVAILABLE SEAT : NBR, EPDM, VITON, SBR, NEOPRENE, SILICON

## APPLICABLE FLANGE

- KS/JIS 5K,10K,16K
- ASME B 16.1 CLASS 125LB
- ASME B 16.5 CLASS 150LB
- ISO 7005 PN6, PN10, PN16
- BS4504 PN6, PN10, PN16
- DIN 2501 PN6, PN10, PN16
- GB2501/2506 PN6, PN10, PN16

## DESIGN FEATURES

- High accuracy molded-in seat fully vulcanized to the body.
- Suitable for vacuum and high fluid velocity.
  - Vulcanized seat type ensures that the valves are suitable for use on application having high velocities and for applications under vacuum(negative pressure) conditions.
- No corrosion between seat and body.
  - Vulcanised seat type valve body and stem are completely isolated against the contact with the medium which eliminates corrosion.
- No collapsible, blow out proof seat
  - Vulcanized seat type to the entire body interior prevents distortion (creep) during the operation of the valve.
- Low torque, Non replaceable seat design
  - Torque figures are lower with a Vulcanized seat type.
  - The contour of the rubber remains fixed.
  - The loose lining is subjected to distortion.
- Correct installation
  - Sealing face both sides of the valve ensures correct installation and compression of the rubber, this acts again to ensure no distortion of the liner as does complete vulcanized seat type
- Ball shape rubber design
  - Ball shape rubber to be provided to contact with flat shape disc which gives central position of disc because shorter distance at center line compare to longer diagonal length at disc end.





# Specification of Ball Valves



### TYPE NUMBERING SYSTEM

- AV-BFA Floating Flange Type Full Bore Ball valves
- AV-BFB Floating Flange Type Reduce Bore Ball valves
- AV-BTA Trunnion Mounted Side Entry Flange Type Full Bore Ball valves
- AV-BTB Trunnion Mounted Side Entry Flange Type Reduce Bore Ball valves
- AV-BTC Trunnion Mounted Side Entry Butt Welding Type Full Bore Ball valves
- AV-BTD Trunnion Mounted Side Entry Butt Welding Type Reduce Bore Ball valves
- AV-BOA Trunnion Mounted Top Entry Flange Type Full Bore Ball valves
- AV-BOB Trunnion Mounted Top Entry Flange Type Reduce Bore Ball valves
- AV-BOC Trunnion Mounted Top Entry Butt Welding Type Full Bore Ball valves
- AV-BOD Trunnion Mounted Top Entry Butt Welding Type Reduce Bore Ball valves

### STANDARDS COMPLIANCE

- The face to face dimension shall be in accordance with ASME B 16.10, API 6D, API 6D SS, API 6A.
- Fire safe design shall be in accordance with API 607.

### PRODUCTION RANGE

- SIZE : DN 15mm (1/2 inch) ~ DN 1500mm (60 inch)
- FLANGE RATING : ASME 150LB, 300LB, 600LB, 900LB, 1500LB, 2500LB  
API 2000, 3000, 5000, 10000, 15000, 20000
- WORKING PRESSURE : 20000psi (1406kg/cm<sup>2</sup>)
- WORKING TEMPERATURE : -196°C ~ +815°C

### APPLICABLE FLANGE

- KS/JIS 5K, 10K, 16K, 20K, 30K, 40K, 63K
- ASME B 16.5 Class 150LB, 300LB, 600LB, 900LB, 1500LB, 2500LB
- ASME B 16.47 Class 150LB, 300LB, 600LB, 900LB
- API 2000, 3000, 5000, 10000, 15000, 20000
- EN 1092 PN6, PN10, PN16, PN25, PN40
- ISO 7005 PN6, PN10, PN16, PN20, PN25, PN40

## Ball Valves



### Design

#### Floating

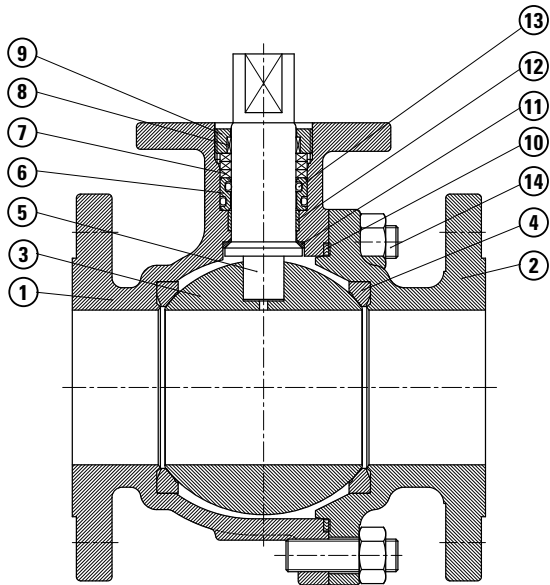
- Pressure assisted seats give tight shut-off in all valves at low line pressure or small size valve, the floating ball is in contact with the seat.

#### Trunnion

- Trunnion ball is applicable to high pressure or large size valves which reduced sealing load against the fluid pressure, with lower operational torque and long durability.

### Characteristics

- Bi-directional valve.
- Blowout-Prevent stem.
- Stem and trunnion are fitted in self lubricated bush which result low operating torques for easy operation.
- Live-loaded thrust washer prevents galling and provides a secondary stem seal.
- Stem extension is available upon requirement of clients to comply with installation condition.
- Applicable standard : ASME B16.5, 16.10 and B16.34, API 6D, API 608, API 607.
- Anti-Static Device.
- ASME Section 8 cover/body flange connection and bolting provide high sealing integrity of body gasket.



### Part List

| NO. | PART NAME          | MATERIAL                                                |
|-----|--------------------|---------------------------------------------------------|
| 1   | BODY               | CAST STEEL / STAINLESS STEEL / AL BRONZE                |
| 2   | CAP                |                                                         |
| 3   | BALL               | STAINLESS STEEL / BRONZE+Cr COATING / METAL+HARD FACING |
| 4   | SEAT               | PTFE / RTFE / DEVLON / NYLON / PEEK / METAL+HARD FACING |
| 5   | STEM               | STAINLESS STEEL                                         |
| 6   | STEM SEAL RETAINER | CARBON STEEL / STAINLESS STEEL                          |
| 7   | PACKING            | GRAPHITE / PTFE / VOC / RUBBER                          |
| 8   | GLAND BUSH         | PTFE / CARBON STEEL+PTFE / STAINLESS STEEL+PTFE         |
| 9   | GLAND RING         | CARBON STEEL / STAINLESS STEEL                          |
| 10  | CAP GASKET         | SPIRAL WOUND / GRAPHITE / PTFE / RUBBER                 |
| 11  | THRUST WASHER      | PTFE / CARBON STEEL+PTFE / STAINLESS STEEL+PTFE         |
| 12  | STEM BUSH          | PTFE / CARBON STEEL+PTFE / STAINLESS STEEL+PTFE         |
| 13  | STEM O-RING        | RUBBER                                                  |
| 14  | CAP BOLT           | CARBON STEEL / STAINLESS STEEL                          |

\* Other material can be available upon requirement.





Subsea ball valves are designed high reliability against internal and external leakage. Subsea ball valves meet performance, safety and reliability expectations in the deep water and harsh environments in the offshore oil and gas industry.

## STANDARD COMPLIANCE

- Subsea ball valves are designed based on API 6DSS.
- Metal to metal seats for non-clean services are applied tungsten carbide coating with ball and seat lapped.
- Elastomeric and thermoplastic seals prevent internal leakage.
- Subsea ball valves are met IEC 61508 Safety Integrity Level 3 (SIL3).

## PRODUCTION RANGE

- Side Entry (Bolted or Welded Body) or Top Entry Type design
- Size : DN 50mm ~ DN 600mm (2inch ~ 24inch)
- ASME Class : Up to Class 2500LB
- API Class : Up to 15000 psi
- End connection : Flanged / Butt Weld / HUB end
- Seat Material : Soft seat & Metal seat

## APPLICATION

- Pipe line subsea valve
- Subsea Manifold
- Jacket flooding valve
- SSIV for Subsea Safety Isolation valve

## OPERATIONS

- Hydraulic Double Acting Actuator
- Hydraulic Single Acting Actuator
- ROV operated

# Specification of Cryogenic Butterfly Valves for LNG



AV-LNG Series  
(Flanged)



AV-LNG Series  
(Butt-welding)

Ace cryogenic butterfly valves are widely used throughout the world, from liquefaction plants to liquefied gas carriers and receiving tank terminals, in critical and hazardous conditions and temperatures as low as -196°C.

## THE CRYOGENIC LNG BUTTERFLY VALVE DESIGN

- Bi-directional design.
- With butt-welding ends or flanged ends.
- With inspection/ maintenance access (Side entry).
- Triple offset design.
- Valve may be fitted in any orientation.
- Extended bonnet / Shaft for safe access.

## STANDARD COMPLIANCE

- BS 6364 Valves for Cryogenic service.
- Fire Safe approved in accordance with API 607.

## PRODUCTION RANGE

- SIZE : DN 100mm (4 inch) ~ DN 2000mm (80 inch)
- FLANGE RATING : ASME B 16.5 Class 150LB, 300LB
- WORKING PRESSURE : Up to 50bar
- WORKING TEMPERATURE : -196°C ~ +815°C

## APPLICATION

- Gas carrier (Liquefied Natural Gas, Acetylene, Ethylene)
- Receiving terminal
- Liquefied oxygen(-160°C) plant



Schema of Cryogenic (LNG) Butterfly valve

ACE cryogenic valves are widely used throughout the world, from liquefaction plants, to liquefied gas carries, receiving tank terminals as well as peak shaving plants, in a critical and hazardous service conditions down to the temperature as low as -196°.

The materials used throughout are of austenite stainless steel which maintains its strength at low temperature and the sealing system is metal seated provide bi-directional bubble tight shut-off which achieved by introducing state of the triple eccentric geometry.

The metal seated removable Triple eccentric design is available.

The valves are of extended bonnet design to create an insulation gas column between the stem packing and the cold fluid.

This prevents hardening and shrinking the packing and allows the external operating section of the valve remained “worm” condition.

The valve of butt-welding end has side entry maintenance system to make the replacement of sealing ring without removing the valves from the pipes.

All valves are tested at cryogenic temperature with “Manifold System” which can examine the performance as critical as in an actual service condition.

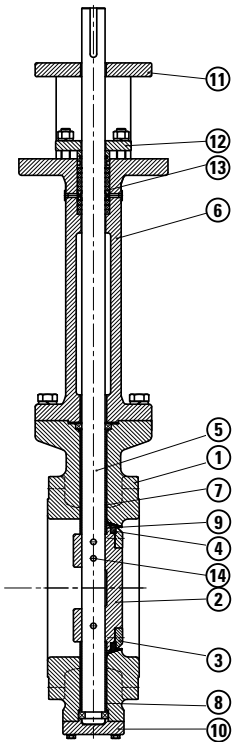
Operations

The following operation of the valve is available, the choice depends on the valve location and the type of work and service for which the valve is used.

- Manual worm gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation

Part List

| No | PART NAME     | METERIAL           |
|----|---------------|--------------------|
| 1  | BODY          | STAINLESS STEEL    |
| 2  | DISC          | STAINLESS STEEL    |
| 3  | RETAINER      | STAINLESS STEEL    |
| 4  | SEAT          | STAINLESS STEEL    |
| 5  | STEM          | STAINLESS STEEL    |
| 6  | YOKE          | STAINLESS STEEL    |
| 7  | BEARING       | STAINLESS STEEL    |
| 8  | BEARING       | STAINLESS STEEL    |
| 9  | GASKET        | SPIRAL WOUND       |
| 10 | BOTTOM COVER  | STAINLESS STEEL    |
| 11 | STAND         | STAINLESS STEEL    |
| 12 | PACKING GLAND | STAINLESS STEEL    |
| 13 | PACKING       | PTFE/RTFE/GRAPHITE |
| 14 | DISC PIN      | STAINLESS STEEL    |



Materials Specification for ACE Cryogenic Valves

All materials supplied for the valve components are suitable for operation in LNG installations.

Impact test is carried out on pressure retaining parts (body, bonnet, disc, studs and nuts) of cast material, according to ASTM Testing Procedures with Charpy V Specimen at -196°C.

Following minimum test results are required:

- average (on 3 specimen) not less than 3.5 kgm/cm<sup>2</sup>
- minimum (on 1 specimen) not less than 3 kgm/cm<sup>2</sup>

Features & Benefits

- Bi-directional bubble tight shut-off performance
- Developed Geometry results in
  - Zero seal friction
  - Low torques
  - Extended service life
- All cryogenic valves to be tested in fully equipped cryogenic testing facilities at ACE factory.
- End connection type : Double flanged, Butt-weld side entry
- One piece stem for maximum strength and safety over extended periods of time
- Gland Packing can be adjusted without actuator removal
- Inherently fire-safe by design due to metal seat
- Extended bonnet according to BS6364
- Anti-blow out stem design



# Cryogenic Gate, Globe, Ball & Check Valves for LNG

AV-L Series Cryogenic Gate Valve



AV-L Series Cryogenic Globe Valve



AV-L Series Cryogenic Ball Valve



AV-L Series Cryogenic Swing Check Valve



## PRODUCTION RANGE

- SIZE : Cryogenic Gate valve : DN 50mm (2 inch) ~ DN 1200mm (48 inch)  
Cryogenic Globe valve : DN 50mm (2 inch) ~ DN 600mm (24 inch)  
Cryogenic Ball valve : DN 50mm (2 inch) ~ DN 1500mm (60 inch)  
Cryogenic Swing Check valve : DN 50mm (2 inch) ~ DN 600mm (24 inch)
- FLANGE RATING : ASME B 16.5 Class 150LB, 300LB
- WORKING PRESSURE : Up to 50bar
- WORKING TEMPERATURE : -196°C ~ +815°C

# Specification of Cryogenic Butterfly Valves for LPG



Ace cryogenic LPG butterfly valves are widely used throughout the world, from liquefaction plants to liquefied gas carriers and receiving tank terminals, in critical and hazardous conditions and temperatures as low as -55°C.

## THE CRYOGENIC LPG BUTTERFLY VALVE DESIGN

- Bi-directional design.
- End connection : Flanged, Wafer and lug.
- Double offset shaft.
- Valve may be fitted in any orientation.
- Extended bonnet / Shaft for safe access.

## STANDARD COMPLIANCE

- API 609 Valves for Cryogenic service.
- Fire Safe approved in accordance with API 607.

## PRODUCTION RANGE

- SIZE : DN 25mm (1 inch) ~ DN 1200mm (48 inch)
- FLANGE RAITNG : ASME B 16.5 150LB, 300LB
- WORKING PRESSURE : Up to 50bar
- WORKING TEMPERATURE : -46°C ~ +250°C

## APPLICABLE FLANGE

- KS/JIS 5K, 10K, 16K, 20K, 30K
- ASME B 16.5 Class 150LB, 300LB
- EN 1092 PN6, PN10, PN16, PN25
- ISO 7005 PN6, PN10, PN16, PN20, PN25



# Cryogenic Butterfly Valves for LPG



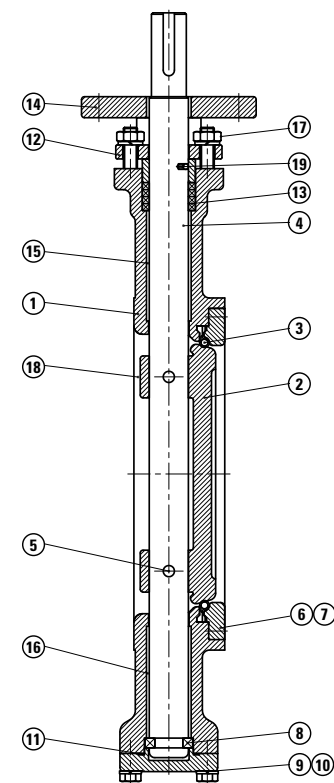
## Application

- Gas carrier ( Liquefied Propane Gas etc.)
- Receiving terminal

## Operations

The following operation of the valve is available, the choic depends on the valve location and the type of work and service for which the valve is used.

- Manual lever operation
- Manual worm gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation



## Part List

| NO | PART NAME          | MATERIAL                                 |
|----|--------------------|------------------------------------------|
| 1  | BODY               | LOW TEMP.CAST STEEL / STAINLESS STEEL    |
| 2  | DISC               | LOW TEMP.CAST STEEL / STAINLESS STEEL    |
| 3  | SEAT               | STAINLESS STEEL + PTFE / RTFE            |
| 4  | STEM               | STAINLESS STEEL / DUPLEX / ALLOY STEEL   |
| 5  | DISC PIN           | STAINLESS STEEL / DUPLEX / ALLOY STEEL   |
| 6  | RETAINER           | LOW TEMP.CARBON STEEL / STAINLESS STEEL  |
| 7  | RETAINER BOLT      | STAINLESS STEEL                          |
| 8  | THRUST PLATE       | STAINLESS STEEL                          |
| 9  | BOTTOM COVER       | LOW TEMP. CARBON STEEL / STAINLESS STEEL |
| 10 | BOTTOM BOLT        | STAINLESS STEEL                          |
| 11 | BOTTOM GASKET      | PTFE / GRAPHITE                          |
| 12 | PACKING GLAND      | STAINLESS STEEL / LOW TEMP. CARBON STEEL |
| 13 | PACKING            | PTFE / GRAPHITE                          |
| 14 | ACTUATOR STAND     | MILD STEEL / STAINLESS STEEL             |
| 15 | UPPER STEM BEARING | STAINLESS STEEL + PTFE                   |
| 16 | LOWER STEM BEARING | STAINLESS STEEL + PTFE                   |
| 17 | BOLT & NUT         | STAINLESS STEEL                          |
| 18 | SET BOLT           | STAINLESS STEEL                          |
| 19 | ANTI-STATIC DEVICE | STAINLESS STEEL                          |



# Specification of Gate & Globe Valves

Bolted Bonnet metal seated gate & globe valves are widely used on piping system and for industrial plants.

## TYPE NUMBERING SYSTEM

- AV-S Bolted Bonnet Gate Valves.
- AV-G Bolted Bonnet Outside Screw & Yoke Globe Valves.

## STANDARD COMPLIANCE

- The face to face dimension shall be in accordance with ASME B 16.10.
- The body is designed to API 600, ASME B 16.34, BS 1873.



## PRODUCTION RANGE

- SIZE : DN 50mm (2 inch) ~ DN 1500mm (60 inch)
- WORKING PRESSURE : Up to 430 bar
- WORKING TEMPERATURE : -196°C ~ +815°C

## APPLICABLE FLANGE

- ASME Class 150LB ~ 2500LB
- EN 1092 PN6 ~ PN63
- ISO 7005 PN6 ~ PN40

Features

It is the valve which shut off at a right angle with flow direction of fluid by vertical movement of wedge.

- 1. Gate valve is suitable for simple opening / closing.
- 2. It is recommended to avoid control of flow due to resist of fluid in the back of wedge and cavitations which may cause corrosion on wedge.
- 3. It has double locking effectiveness because the seat has both sides.
- 4. When wedge is fully opened, it minimizes fluid flow disturbance by deviating from inside diameter.

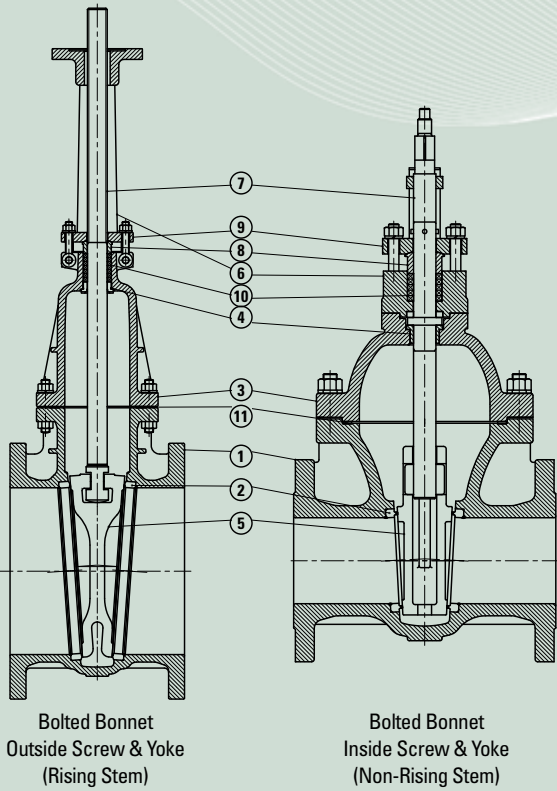
Operations

The following operation of the valve is available and the choice depends on the valve location, the type of work and service for each the valve is used.

- Manual hand wheel Operation
- Manual bevel gear Operation
- Hydraulic actuator Operation
- Electric actuator Operation
- Pneumatic actuator Operation

Part List

| NO | PART NAME      | MATERIAL                                 |
|----|----------------|------------------------------------------|
| 1  | BODY           | CAST STEEL / STAINLESS STEEL             |
| 2  | BODY SEAT RING | STEEL WITH 13CR. FACED / STAINLESS STEEL |
| 3  | BONNET         | CAST STEEL / STAINLESS STEEL             |
| 4  | BUSH RING      | STEEL With 13CR. FACED / STAINLESS STEEL |
| 5  | DISC           | STEEL With 13CR. FACED / STAINLESS STEEL |
| 6  | YOKE           | CAST STEEL / STAINLESS STEEL             |
| 7  | STEM           | STAINLESS STEEL                          |
| 8  | GLAND RING     | STAINLESS STEEL                          |
| 9  | PACKING GLAND  | CAST STEEL / STAINLESS STEEL             |
| 10 | PACKING        | NON-ASBESTOS                             |
| 11 | GASKET         | NON-ASBESTOS                             |



Features

- Ductile iron body and bonnet for high strength and impact resistance.
- Ductile iron disc fully encapsulated in EPDM rubber to ensure tight shut-off sealing.
- Stainless steel shaft for high strength and corrosion resistance.
- Fusion Bonded Epoxy coating for long life corrosion protection.
- Straight through full bore to avoid debris traps.

Specification

- Design standard : BS 5163, AWWA C509, DIN 3202
- Design Temperature : Up to 120°C
- Size : DN 50mm (2inch) ~ DN 600mm (24 inch)
- Flange Rating : ASME Class 150LB  
EN/ISO PN10, PN16

Application

- Water works
- Water treatment plants
- Plumbing and Sanitary system
- Drainage system
- HVAC system
- Fire protection system
- Manual hand wheel Operation
- Manual spur or bevel gear Operation
- Electric actuator Operation

Operations

- Manual hand wheel Operation
- Manual spur or bevel gear Operation
- Electric actuator Operation

Part List

| No | PART NAME     | MATERIAL                   |
|----|---------------|----------------------------|
| 1  | BODY          | DUCTILE IRON               |
| 2  | BONNET        | DUCTILE IRON               |
| 4  | DISC          | DUCTILE IRON + EPDM LINING |
| 10 | STEM          | STAINLESS STEEL            |
| 11 | CAP           | DUCTILE IRON               |
| 12 | BONNET BOLT   | STAINLESS STEEL            |
| 20 | GASKET        | EPDM                       |
| 63 | SCREWED PIECE | BRASS                      |
| 65 | GUIDE BUSH    | BRASS                      |
| 66 | GUIDE BUSH    | BRASS                      |





Feature

The valve shut off flow direction of fluid by vertical movement of plug type disc.

- 1. Globe valve is suitable for the use of flow control and opening / closing fluid in uni-direction.
- 2. Short stroke of valve brings shorter operating.
- 3. As linear movement valve, long face to face dimension is featured for adopting long flow passage which is required to ensure smooth flow by valve without sudden revolution.

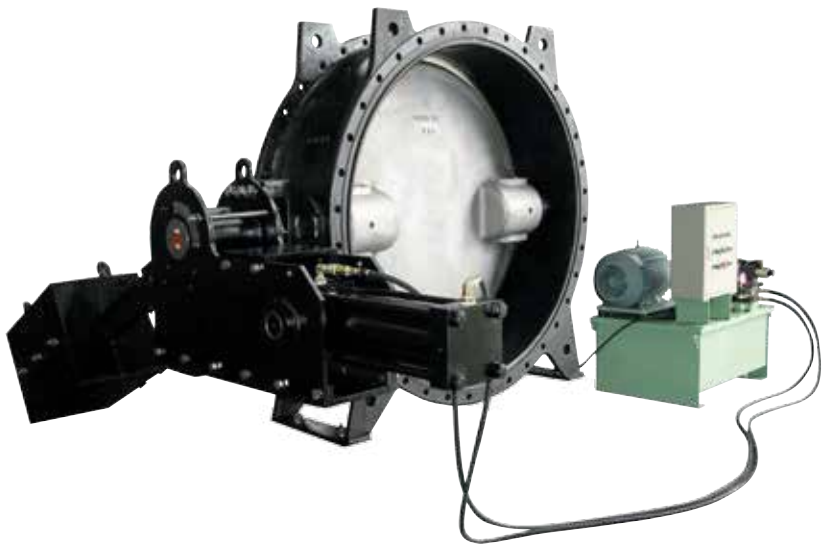
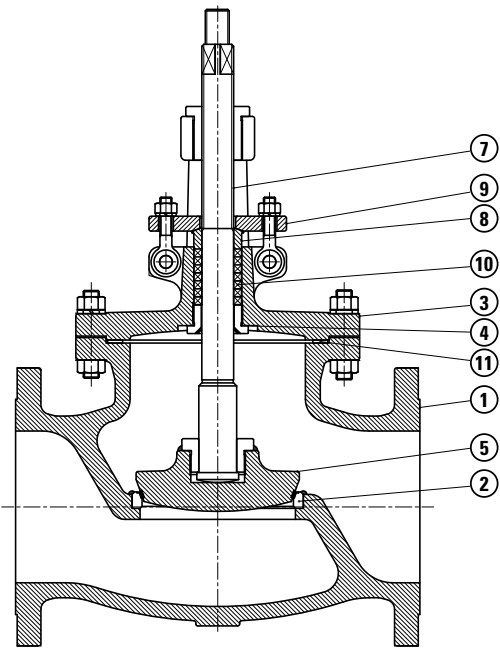
Operations

The following operation of the valve is available and the choice depends on the valve location, the type of work and service for each the valve is used.

- Manual hand wheel Operation.
- Manual bevel gear Operation.
- Pneumatic actuator Operation.
- Hydraulic actuator Operation.
- Electric actuator Operation.

Part List

| NO | PART NAME      | MATERIAL                                 |
|----|----------------|------------------------------------------|
| 1  | BODY           | CAST STEEL / STAINLESS STEEL             |
| 2  | BODY SEAT RING | STEEL WITH 13CR. FACED / STAINLESS STEEL |
| 3  | BONNET         | CAST STEEL / STAINLESS STEEL             |
| 4  | BUSH RING      | STEEL WITH 13CR. FACED / STAINLESS STEEL |
| 5  | DISC           | STEEL WITH 13CR. FACED / STAINLESS STEEL |
| 7  | STEM           | STAINLESS STEEL                          |
| 8  | GLAND RING     | STAINLESS STEEL                          |
| 9  | PACKING GLAND  | CAST STEEL / STAINLESS STEEL             |
| 10 | PACKING        | NON-ASBESTOS                             |
| 11 | GASKET         | NON-ASBESTOS                             |



Outline of Combined Check Valves

This valve is consisted of hydraulic cylinder, counter weight for emergency shut-off and hydraulic generator unit, etc. In normal condition, it is used as a general valve. However, in emergency condition, (e.g.a power failure, in a words, a state of quick closing the valve when there are no other operating sources) all hydraulic circuits are converted to shut-off circuits which can close the valve by operation of weight for emergency shut-off and a lever. Shut off speed can be adjusted by a relief valve on hydraulic generator unit.

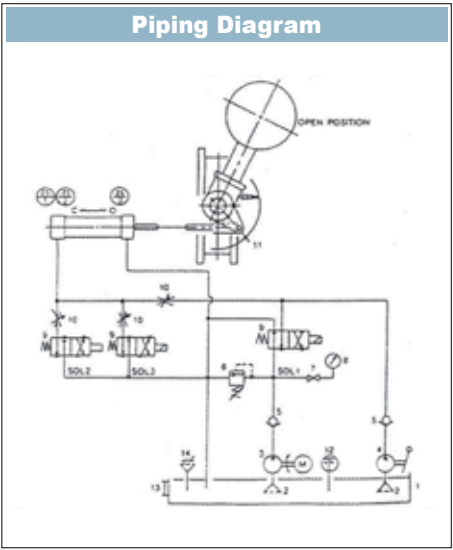
Feature

This valve has function as follows :

- 1. Open in normal position
- 2. Closed in normal position
- 3. Shut-off in case of emergency (Valve shut-off speed can be adjusted by two steps at site)
- 4. Intermediate open / close control

Part List

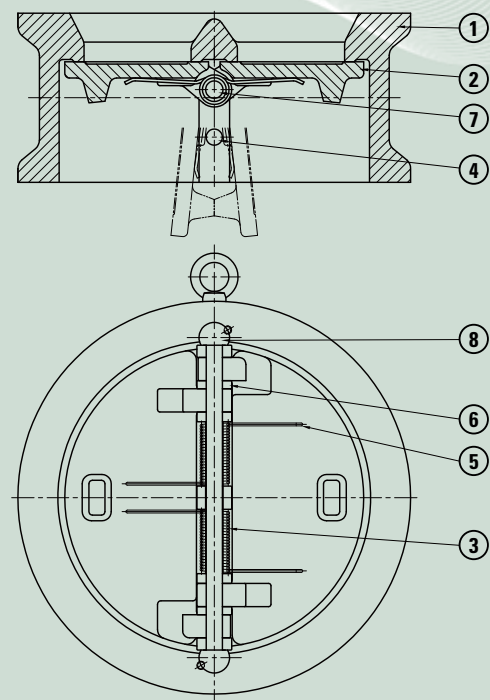
| No | MATERIAL           |
|----|--------------------|
| 1  | OIL RESERVER       |
| 2  | SUCTION FILTER     |
| 3  | HYDRAULIC PUMP     |
| 4  | MANUAL PUMP        |
| 5  | CHECK VALVE        |
| 6  | RELIEF VALVE       |
| 7  | GAUGE COCK         |
| 8  | PRESSURE GAUGE     |
| 9  | SOLENOID VALVE     |
| 10 | THROTTLING VALVE   |
| 11 | HYDRAULIC CYLINDER |
| 12 | LEVEL SWITCH       |
| 13 | LEVEL GAUGE        |
| 14 | OIL FILLING PORT   |
| 15 | ARM                |
| 16 | WEIGHT             |





Dual Disc Check Valves are available for your process conditions:

- A complete range of sizes from 2 to 48 inches.
- A wide variety of cast fabricated materials for bodies, disc and trim for all types of service and temperature conditions.
- Designed and rated in accordance with API 594.
- For operational temperatures from -29°C to 815°C (depends on materials of construction).



1. One-piece body casting for maximum corrosion resistance.
2. Dual-Disc design for lightweight, small size, and strength.
3. Spring action closes each plate independently.
4. Stop pin.
5. Long-leg spring action eliminates seat scrubbing.
6. Hinge sleeve provides independent plate suspension.
7. Hinge pin.
8. Pin retainer.

Part List

| No | PART NAME    | MATERIAL                                                            |
|----|--------------|---------------------------------------------------------------------|
| 1  | BODY         | CAST IRON / DUCTILE IRON / CARBON STEEL<br>SS. STEEL / NI-AL BRONZE |
| 2  | DUAL-DISC    | STAINLESS STEEL / BRONZE / NI-AL BRONZE                             |
| 3  | SPRING       | STAINLESS STEEL                                                     |
| 4  | STOP PIN     | STAINLESS STEEL                                                     |
| 5  | SPRING-LONG  | STAINLESS STEEL                                                     |
| 6  | LUG BEARING  | TEFLON / STAINLESS STEEL                                            |
| 7  | HINGE PIN    | STAINLESS STEEL                                                     |
| 8  | PIN RETAINER | STAINLESS STEEL / MILD STEEL                                        |



Specification

1. STANDARD MATERIALS

Body : Mild steel, Stainless steel  
Disc : Mild steel, Stainless steel  
Stem : Mild steel, Stainless steel  
Stopper : Mild steel, Stainless steel

2. THE BODY AND DISC

Materials are available in wide choice of steel or cast alloy options depending on customer's request.

3. SIZE : DN 50mm (2 inch) ~ DN 1500mm (60 inch)

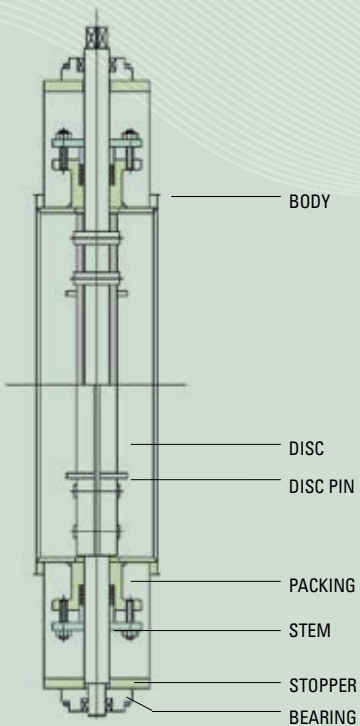
4. WORKING TEMPERATURE : 0°C ~ 500°C

5. FLANGE RATING

KS/JIS 5K, 10K  
ASME Class 125LB, 150LB  
EN/ISO PN10, PN16  
Other flange available upon request

6. OPERATIONS

- Manual lever operation
- Manual gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation

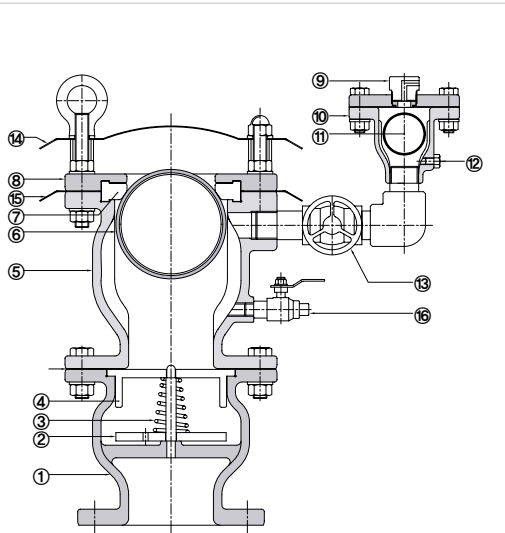






Air Valves for Water Works (Single Orifice & Double Orifice)

- Ace valve provides an automatic air exhaust function on the valve so as to avoid creating water hammer in the pipeline.
- Automatic exhaust of air in the pipeline will prevent the pipeline to be damaged by air pocket and ensure smooth water flowing.
- In order to perform good quality, strong abrasion-resistant bronze/ stainless steel / ductile iron coated with suitable paint for intended service etc. are used as shown on the material table.



Part List

| NO. | PART NAME              | MATERIAL                                           |
|-----|------------------------|----------------------------------------------------|
| 1   | SURGE CHECK VALVE BODY | DUCTILE IRON / CAST IRON<br>CAST STEEL / AL-BRONZE |
| 2   | DISC                   | BRONZE / STAINLESS STEEL                           |
| 3   | SPRING                 | MONEL / STAINLESS STEEL                            |
| 4   | SEAT                   | BRONZE / STAINLESS STEEL                           |
| 5   | AIR VACUUM VALVE BODY  | DUCTILE IRON / CAST IRON<br>CAST STEEL / AL-BRONZE |
| 6   | BALL                   | STAINLESS STEEL                                    |
| 7   | SEAT GASKET            | NBR / EPDM / VITON                                 |
| 8   | COVER                  | DUCTILE IRON / CAST IRON<br>CAST STEEL / AL-BRONZE |
| 9   | CAP                    | STAINLESS STEEL                                    |
| 10  | AIR RELEASE VALVE BODY | DUCTILE IRON / CAST IRON<br>CAST STEEL / AL-BRONZE |
| 11  | BALL                   | STAINLESS STEEL                                    |
| 12  | DRAIN PLUG             | BRONZE / STAINLESS STEEL                           |
| 13  | ISOLATING VALVE        | BRONZE / STAINLESS STEEL                           |
| 14  | TOP COVER              | STAINLESS STEEL                                    |
| 15  | DRIP PAN               | STAINLESS STEEL                                    |
| 16  | BALL VALVE             | BRONZE / STAINLESS STEEL                           |

Specification of Electro-Hydraulic Control System

The system is designed for electro-hydraulic remote control of cargo and ballast system valves with valve position indication such as open/shut, intermediate position and memory lamps. The valves shall be operated with hydraulic pressure.

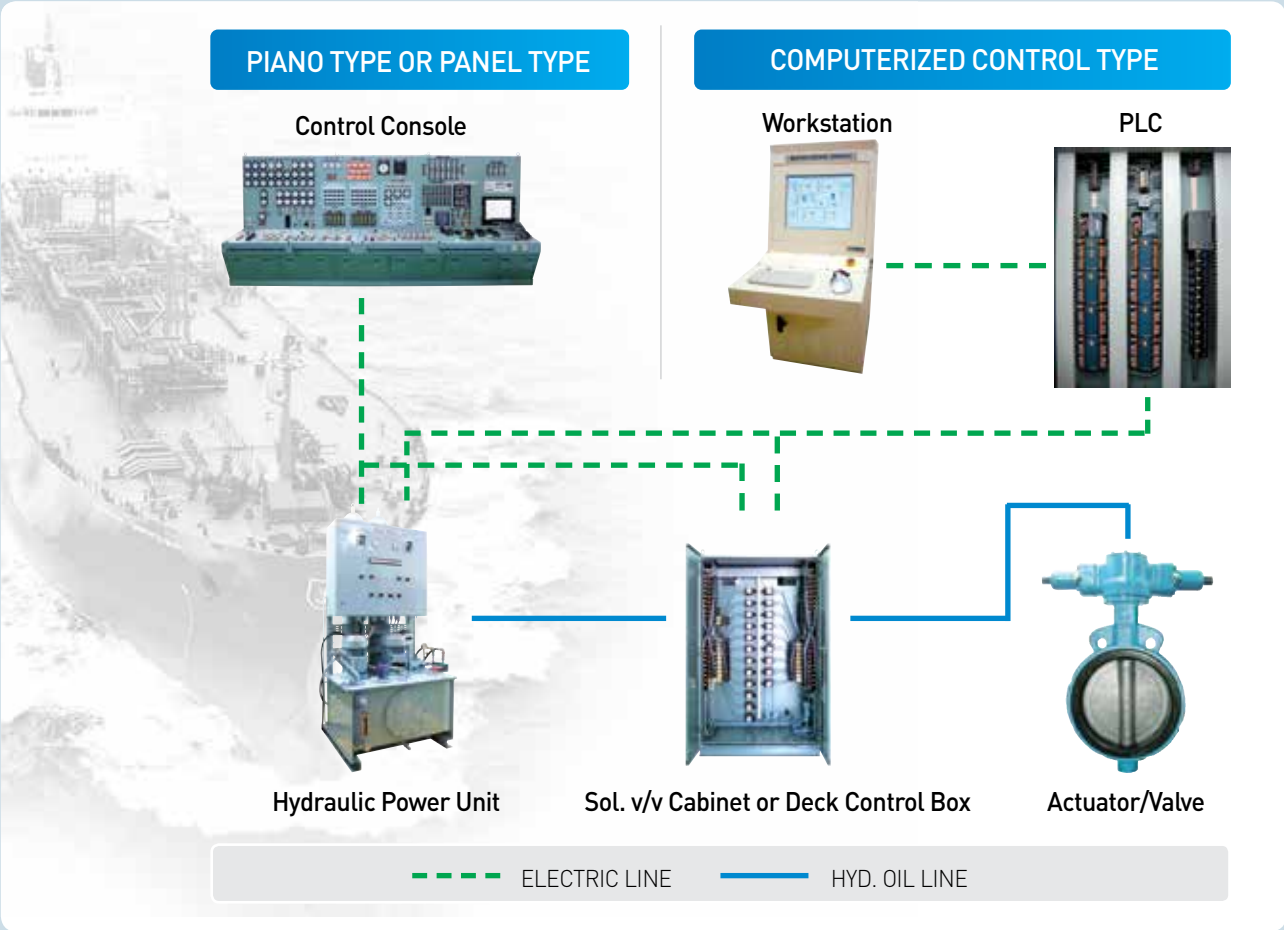
We provide for both manual remote control type and computerized control type.

1) Manual remote control type

This system is provided to control the valves with a mimic board on the control console which has control switches, position indicators and etc.

2) Computerized remote control type

This system is provided to control the valves with the computerized operating system that consists of the workstation, PLC and related accessories.  
The unit communicate each other through communication lines.



# Hydraulic Actuator(Scotch Yoke Type)

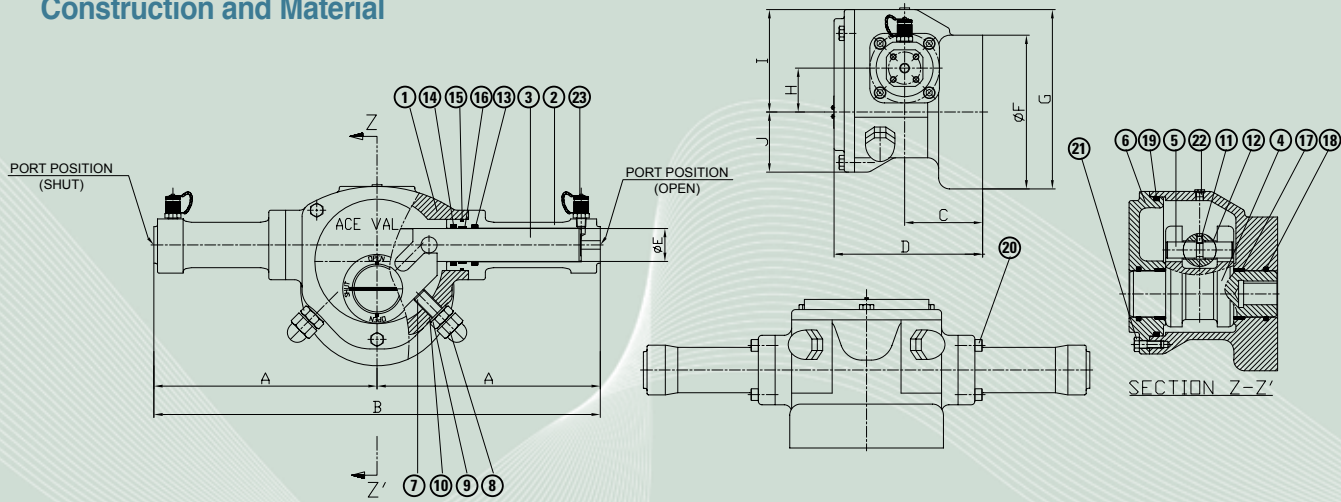
# Hydraulic Actuator(Rack & Pinion Type)

### Specifications

- The standard is designed for hydraulically operated double acting actuator and covers torque requirement up to 1,842kgf.m
- For operation of any quarter turn application.
- Hydraulic Double Acting Actuator (Scotch yoke design)

| Actuator Model                                              | AV-HA20                                             | AV-HA28  | AV-HA32  | AV-HA36     | AV-HA45     | AV-HA50   | AV-HA56   | AV-HA63   | AV-HA70   | AV-HA80   | AV-HA90    | AV-HA100   |
|-------------------------------------------------------------|-----------------------------------------------------|----------|----------|-------------|-------------|-----------|-----------|-----------|-----------|-----------|------------|------------|
| Output Torque<br>(for working pre. 130kgf/cm <sup>2</sup> ) | 17 kgf.m                                            | 45 kgf.m | 66 kgf.m | 93 kgf.m    | 178 kgf.m   | 257 kgf.m | 346 kgf.m | 466 kgf.m | 650 kgf.m | 941 kgf.m | 1285 kgf.m | 1842 kgf.m |
| Working Temperature                                         | -20°C / 80°C                                        |          |          |             |             |           |           |           |           |           |            |            |
| Design Pressure                                             | 210 kgf/cm <sup>2</sup>                             |          |          |             |             |           |           |           |           |           |            |            |
| Rotation Angle                                              | 90°                                                 |          |          |             |             |           |           |           |           |           |            |            |
| Valve Connection Flange (ISO 5211)                          | F07                                                 | F07/F10  | F10      | F10/F14/F16 | F10/F14/F16 | F14/F16   | F14/F16   | F14/F16   | F16/F25   | F16/F25   | F25/F30    | F30/F35    |
| Spindle dimensions                                          | As standard with key dimension according to ISO 773 |          |          |             |             |           |           |           |           |           |            |            |

### Construction and Material



#### Parts List

| NO. | PART NAME   | MATEIAL               | NO. | PART NAME       | MATEIAL          |
|-----|-------------|-----------------------|-----|-----------------|------------------|
| 1   | HOUSING     | NODULAR CAST IRON     | 13  | ROD SEAL        | POL YURE THANE   |
| 2   | CYLINDER    | NODULAR CAST IRON     | 14  | ROD O-RING      | NBR              |
| 3   | RDD         | CARBON STEEL          | 15  | CYLINDER O-RING | NBR              |
| 4   | FORK        | CAST STEEL            | 16  | WEAR RING (R)   | POLYMER / FABRIC |
| 5   | FORK PIN    | CARBON STEEL          | 17  | WEAR RING (Y)   | POLYMER / FABRIC |
| 6   | GLAND       | NODULAR CAST IRON     | 18  | FORK SEAL       | NBR              |
| 7   | STOPPER     | ALLOY STEEL           | 19  | GLAND O-RING    | NBR              |
| 8   | CAP NUT     | STAINLESS STEEL       | 20  | CYLINDER BOLT   | ALLOY STEEL      |
| 9   | HEX NUT     | STAINLESS STEEL       | 21  | GAND BOLT       | ALLOY STEEL      |
| 10  | BONDED SEAL | STAINLESS STEEL / NBR | 22  | PLUG            | SS400            |
| 11  | SET SCREW   | ALLOY STEEL           | 23  | QUICK COUPLING  | STAINLESS STEEL  |
| 12  | DU BUSH     | CARBON STEEL          |     |                 |                  |



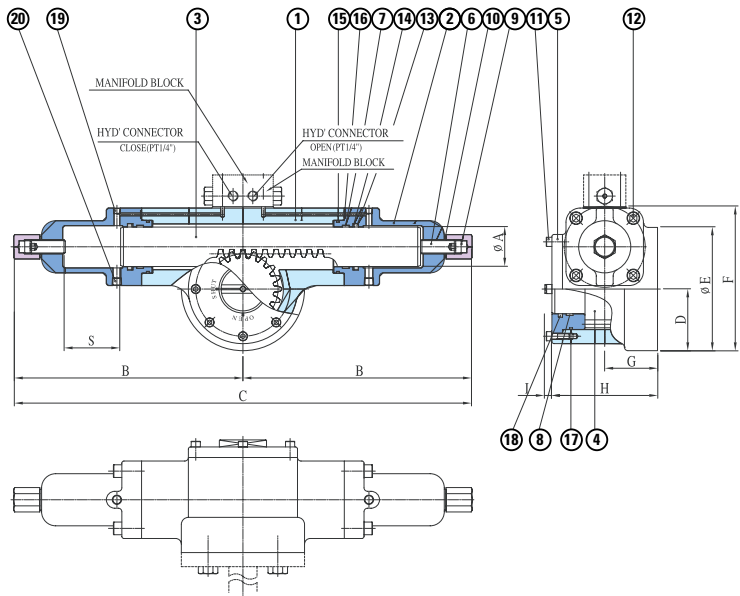
| ACTUATOR DIMENSION(mm) |     |      |     |     |      |      |     |     |     |     |
|------------------------|-----|------|-----|-----|------|------|-----|-----|-----|-----|
| Actuator Model         | A   | B    | C   | D   | øE   | øF   | G   | H   | I   | J   |
| AV-HA20                | 160 | 320  | 56  | 116 | ø20  | ø125 | 133 | 30  | 71  | 42  |
| AV-HA28                | 205 | 410  | 64  | 133 | ø28  | ø125 | 161 | 40  | 98  | 50  |
| AV-HA32                | 242 | 484  | 74  | 147 | ø32  | ø150 | 183 | 45  | 109 | 61  |
| AV-HA36                | 261 | 522  | 85  | 174 | ø36  | ø175 | 209 | 50  | 122 | 66  |
| AV-HA45                | 305 | 610  | 107 | 210 | ø45  | ø210 | 245 | 60  | 140 | 82  |
| AV-HA50                | 358 | 716  | 110 | 219 | ø50  | ø210 | 277 | 70  | 168 | 88  |
| AV-HA56                | 389 | 778  | 118 | 245 | ø56  | ø210 | 284 | 75  | 179 | 95  |
| AV-HA63                | 415 | 830  | 126 | 260 | ø63  | ø210 | 296 | 80  | 191 | 105 |
| AV-HA70                | 447 | 894  | 135 | 281 | ø70  | ø300 | 365 | 90  | 215 | 115 |
| AV-HA80                | 494 | 988  | 147 | 305 | ø80  | ø300 | 388 | 100 | 238 | 130 |
| AV-HA90                | 550 | 1100 | 160 | 340 | ø90  | ø350 | 433 | 110 | 258 | 145 |
| AV-HA100               | 615 | 1230 | 193 | 385 | ø100 | ø415 | 493 | 110 | 285 | 165 |

### Specifications

- The standard is designed for hydraulically operated double acting actuator and covers torque requirement up to 1,842kgf.m
- For operation of any quarter turn application.
- Hydraulic Double Acting Actuator(Rack & Pinion design)

| Actuator Model                                              | AV-RA28                                             | AV-RA36  | AV-RA45  | AV-RA56     | AV-RA70   | AV-RA90   | AV-RA110   |
|-------------------------------------------------------------|-----------------------------------------------------|----------|----------|-------------|-----------|-----------|------------|
| Output Torque<br>(for working pre. 130kgf/cm <sup>2</sup> ) | 19 kgf.m                                            | 39 kgf.m | 82 kgf.m | 159 kgf.m   | 299 kgf.m | 661 kgf.m | 1235 kgf.m |
| Working Temperature                                         | -20°C / 80°C                                        |          |          |             |           |           |            |
| Design Pressure                                             | 160 kgf/cm <sup>2</sup>                             |          |          |             |           |           |            |
| Rotation Angle                                              | 90° ± 1                                             |          |          |             |           |           |            |
| End Adjustment                                              | ± 3°                                                |          |          |             |           |           |            |
| Valve Connection Flange (ISO5211)                           | F07                                                 | F07/F10  | F10/F12  | F10/F12/F14 | F14/F16   | F16/F25   | F25/F30    |
| Spindle Dimensions                                          | As standard with key dimension according to ISO 773 |          |          |             |           |           |            |

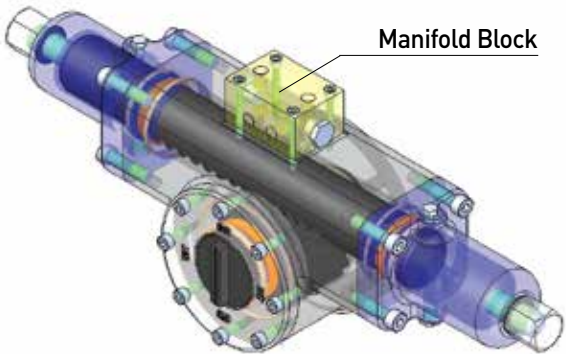
### Construction and Material



#### Parts List

| No. | PART NAME       | MATERIAL           |
|-----|-----------------|--------------------|
| 1   | HOUSING         | NODULAR CAST IRON  |
| 2   | CYLINDER        | NODULAR CAST IRON  |
| 3   | RACK            | ALLOY STEEL        |
| 4   | PINION          | ALLOY STEEL        |
| 5   | GLAND           | NODULAR CAST IRON  |
| 6   | ADJUSTING BLOT  | ALLOY STEEL        |
| 7   | WEAR RING(R)    | POLYMER / FABRIC   |
| 8   | WEAR RING(P)    | POLYMER / FABRIC   |
| 9   | CAP NUT         | CARBON STEEL       |
| 10  | BONDED SEAL     | CARBON STEEL / NBR |
| 11  | GLAND BOLT      | ALLOY STEEL        |
| 12  | CYLINDER BOLT   | ALLOY STEEL        |
| 13  | ROD SEAL        | NBR                |
| 14  | BACK UP-RING    | PTFE               |
| 15  | HOUSING O-RING  | NBR                |
| 16  | CYLINDER O-RING | NBR                |
| 17  | GLAND O-RING    | NBR                |
| 18  | PINION SEAL     | NBR                |
| 19  | CYLINDER PLUG   | STAINLESS STEEL    |
| 20  | VENT PLUG       | STAINLESS STEEL    |

| ACTUATOR DIMENSION(mm) |      |      |       |      |      |      |       |     |     |    |
|------------------------|------|------|-------|------|------|------|-------|-----|-----|----|
| Actuator Model         | øA   | S    | B     | C    | D    | øE   | F     | G   | H   | I  |
| AV-RA28                | ø28  | 39.3 | 169   | 338  | 45   | ø90  | 114   | 45  | 90  | 5  |
| AV-RA36                | ø36  | 47   | 204.5 | 409  | 62.5 | ø125 | 146.5 | 55  | 110 | 10 |
| AV-RA45                | ø45  | 62.8 | 266   | 532  | 75   | ø150 | 177   | 60  | 120 | 10 |
| AV-RA56                | ø56  | 78.5 | 322.5 | 645  | 87.5 | ø175 | 204.5 | 75  | 150 | 10 |
| AV-RA70                | ø70  | 94   | 380   | 760  | 105  | ø210 | 247   | 85  | 170 | 10 |
| AV-RA90                | ø90  | 131  | 480   | 960  | 150  | ø300 | 332   | 105 | 210 | 15 |
| AV-RA110               | ø110 | 157  | 590   | 1180 | 175  | ø350 | 402   | 140 | 280 | 15 |

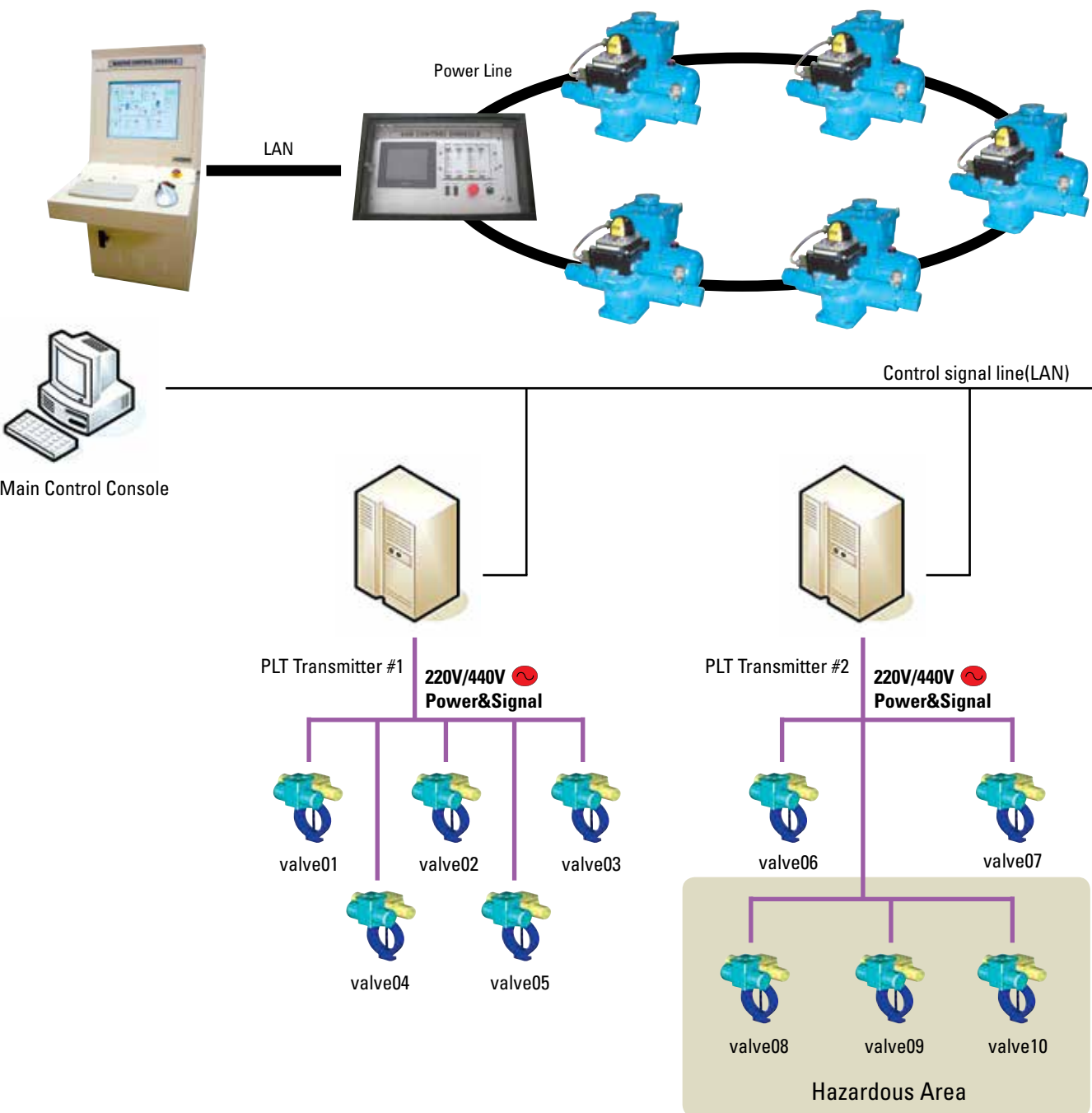




# Intergrated Electro-Hydraulic Actuator System

Innovative application of advanced Techonlogy makes possible many of the MHPU s(Micro Hydraulic Powerpack Unit) new features. In addition to easy installation and maintenance, the system offers economical commuincation and control methods between actuators throughout the power line communication Techonlogy.

The MHPU is an integrated electro-hydraulic unit for remote control of valve actuators, designed primarily for use on ships. The only connection needed between the control station and the valve actuator is electrical wiring for the power supply. Additional wiring for control and indication signals is unnecessary. Designed from the ground up with leading edge technology, the MHPU is essential to completing projects faster and more efficiently.



# Intergrated Electro-Hydraulic Actuator System

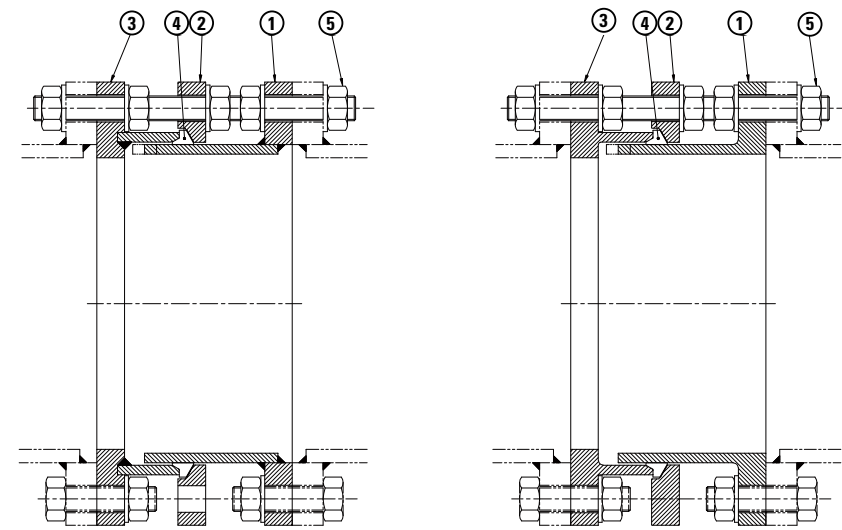


## Application Actuator Models

| Actuator Model | Working Pres.(Bar) | Torque(N-m) |
|----------------|--------------------|-------------|
| AV-RA 28       | 110                | 165         |
| AV-RA 36       | 110                | 329         |
| AV-RA 45       | 110                | 685         |
| AV-RA 56       | 110                | 1327        |
| AV-RA 70       | 110                | 2489        |
| AV-RA 90       | 110                | 5486        |

# Specification of Dismantling joint, Flange Adaptor, Flexible Coupling

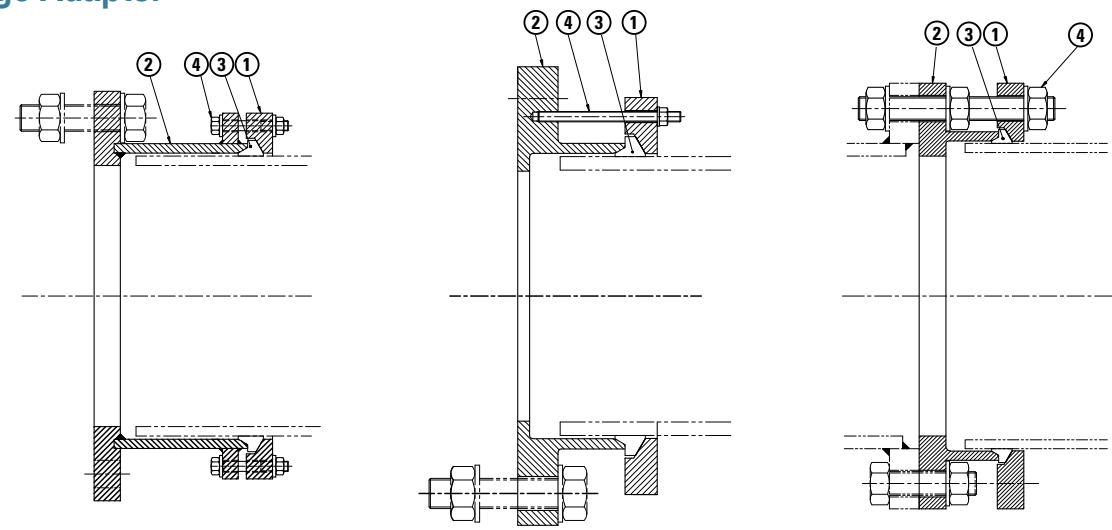
## Dismantling Joint



### Part List

| NO | PART NAME           | METERIAL                                            |
|----|---------------------|-----------------------------------------------------|
| 1  | SPIGOT PIPE         | DUCTILE IRON / CAST STEEL / STAINLESS STEEL / STEEL |
| 2  | MIDDLE RING         | DUCTILE IRON / CAST STEEL / STAINLESS STEEL / STEEL |
| 3  | FLANGE ADAPTOR BODY | DUCTILE IRON / CAST STEEL / STAINLESS STEEL / STEEL |
| 4  | GASKET              | EPDM / NBR / VITON                                  |
| 5  | BOLT / NUT          | STAINLESS STEEL / CARBON STEEL / MILD STEEL         |

## Flange Adaptor

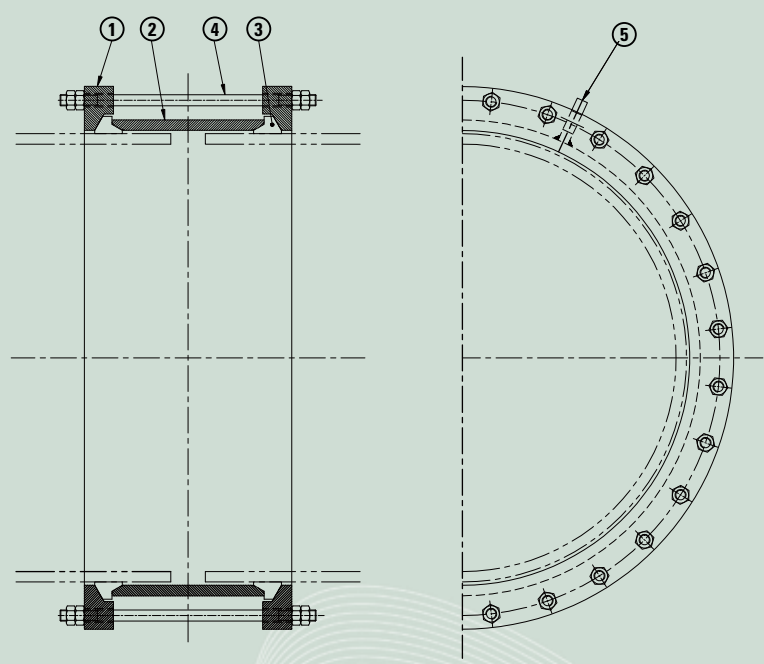


### Part List

| NO | PART NAME           | METERIAL                                            |
|----|---------------------|-----------------------------------------------------|
| 1  | MIDDLE RING         | DUCTILE IRON / CAST STEEL / STAINLESS STEEL / STEEL |
| 2  | FLANGE ADAPTOR BODY | DUCTILE IRON / CAST STEEL / STAINLESS STEEL / STEEL |
| 3  | GASKET              | EPDM / NBR / VITON                                  |
| 4  | BOLT / NUT          | STAINLESS STEEL / CARBON STEEL / MILD STEEL         |

# Specification of Dismantling joint, Flange Adaptor, Flexible Coupling

## Flexible Coupling



### Part List

| NO | PART NAME       | METERIAL                                            |
|----|-----------------|-----------------------------------------------------|
| 1  | END RING FLANGE | DUCTILE IRON / CAST STEEL / STAINLESS STEEL / STEEL |
| 2  | SLEEVE          | DUCTILE IRON / CAST STEEL / STAINLESS STEEL / STEEL |
| 3  | GASKET          | EPDM / NBR / VITON                                  |
| 4  | BOLT / NUT      | STAINLESS STEEL / CARBON STEEL / MILD STEEL         |
| 5  | LIFTING LUG     | DUCTILE IRON / CAST STEEL / STAINLESS STEEL / STEEL |

## Flexible Coupling is available for your process conditions :

- Size : 50mm ~ 4000 mm
- Coupling Spec : ASME/AWWA C219-01
- Flange Rating : KS, JIS, ASME, BS, DIN, AWWA, ISO
- Coupling Design Pressure : Up to 40bar

