

QUICK OPENING CLOSURE
BAYONET TYPE



QUICK OPENING CLOSURE BAYONET TYPE

Conceptual Design

What does "QUICK ACTUATING CLOSURE" mean?

- The CODE stipulates that: "Closures that permit substantially faster access than expected with a standard bolted flange connection". (i.e. Multi bolted closures are not quick actuating closures)
- Any closure that allows opening by a single manoeuvre.

The CODE says:

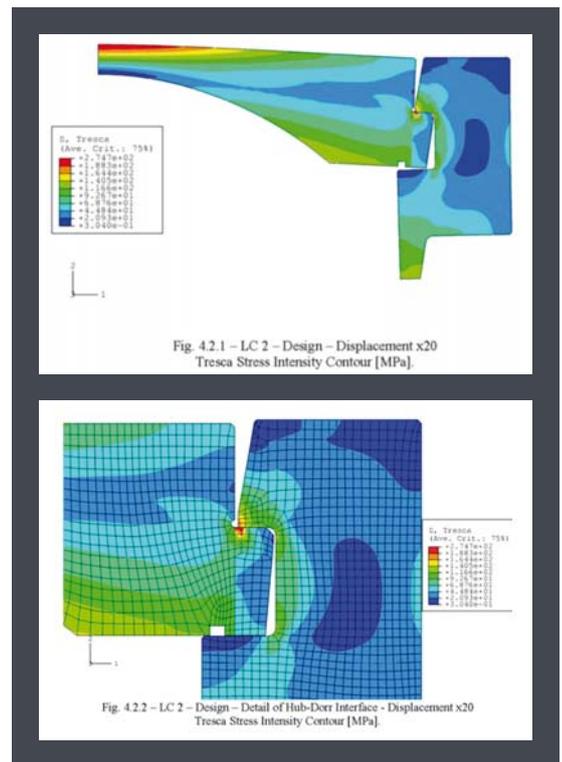
To open a **Quick Actuating Closure** safely, the system must be depressurized and isolated from any incoming flow or back flow. The quick actuating closures have to be provided with a device connected to the atmosphere. This Device, after the correct depressurization process, must be opened to release any residual pressure and enable the opening manoeuvre of the quick actuating closure.

The **FAI "Bayonet" End Closure** fulfils the code's requirements, as it has been sized and verified under code calculation; Checked by strain gauges on a prototype, is a proven design supported by finite element analysis.

The philosophy of **FAI** design is not only limited to complying with the code but it also focuses on the fatigue life of the closure assembly and its components, including the gasket.

It is a well-known fact that to reduce the stress in the closure components, it is common practice to minimize the elastic deformation. **FAI** has evaluated the distribution and localization of the stresses in each component. Based on **FAI's** knowledge and regardless of the specified steel grade, the stress parameters assumed in the calculation are significantly below the allowable limit and, as a result, each component is effectively redundant.

This approach enables **FAI** design to have a sturdy construction, suitable to properly withstand any unforeseen peaks of stresses. The shelf-life of the gasket, whichever the geometry or the type of elastomer used, is generally double lasting. Structural components, such as the hub, the door and the clamps, are made of CTOD-supported steel. The selected materials, basically forging, are characterized by "low cycle fatigue test" so that they suit fatigue cycles. The choice of the correct steel, in addition to fabrication details, secures a 30,000 life cycle.



Main Features

Typical Application: Pipeline pig launcher and receiver
Filters
Valves
Separators

Pipeline pig launcher and receiver
Dyeing
Strainers
Skid system

■	FABRICATED
■	DESIGN AVAILABLE
■	UNDER DEVELOPMENT

Design to any Customer and Country specification

Size range & Class rating

ANSI Class dia. (inc)	150#	300#	600#	900#	200 barg	1500#	API 5000	2500#	API 10000	API 15000	API 20000
4 to 10	■	■	■	■	■	■	■	■	■	■	■
12 to 18	■	■	■	■	■	■	■	■	■	■	■
20 to 26	■	■	■	■	■	■	■	■	■	■	■
28 to 40	■	■	■	■	■	■	■	■	■	■	■
42 to 64	■	■	■	■	■	■	■	■	■	■	■
66 to 80	■	■	■	■	■	■	■	■	■	■	■

Conditions design pressure up to 1380 barg (API 20000)
design temperature from minus 100°C to 300°C

Code ASME VIII Div. 1 (U Stamps), ASME VIII Division 2, PD 5500 / BS EN 13445
Certification ASME U1 or U2 Stamp to National Board
PED, C.E. marking, ATEX
Orientation Horizontal or Vertical

Optional Features

As standard feature, the **FAI "Bayonet" End Closure** is spark proof and vacuum duty.

In addition, through an implementation of minor modification, the **FAI** end closures suit different services such as:

- Fire safe
- Gas Sealing (cyclic gas service)
- Cryogenic service
- Fatigue life (FAI quick closure is granted for 30,000 cycles from zero to design pressure)

To demonstrate the suitability to withstand these services, dedicated tests have been developed in house under Third Party supervision for certification purposes, while capability tests are always available for:

- Pneumatic cyclic gas leaking test by nitrogen or helium up to 430 barg
- Hydrotest in cooled box under cryogenic condition
- Cyclic pressure test (continuous recorded) to simulate fatigue test over 30,000 cycles (from 0 to 250 barg) for quick closure working in dyeing sector.

Additional instrumentation can be designed and supplied in support of the closure:

- key interlock
- proximity switch
- control system

When required or due to heavy sizes, operation may be assisted and supported by:

- hydraulic or electrical opening/closing
- mobile pneumatic tool



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Safety and Environment

SAFETY is a priority: a *SAFE design means safe operations.*

SAFETY DEVICE

The safety device is "mandatory for ASME UG35". Located in the upper point of the door, to be unaffected by sediment or wax formation, the device has been improved to be self-energized and suitable to prevent opening in case of positive pressure in the system or accidental opening. This peculiarity obliges the operator to properly depressurize the system, ensuring the opening in absence of pressure and preventing any accident.

When opened the safety device is connected to the atmosphere to meet the code's requirement. For safety reasons, in the event of hydrogen sulfide in the system, the vent outlet is connected far from the operator.

The safety device body and internal are manufactured, as a standard practice, with 316 stainless steel, while the locking pin, is duplex material. The knurled hand-wheel is in bronze. Upon request internal in Alloy 625 or any other Nickel Alloy could be provided.

When the system is in the closed position, the locking pin, being self-pressure activated, lock the door closed. When the system is in the open position the locking pin is withdrawn, the door is free and the vent hole through the piston is connected to the atmosphere.

The purpose of safety device can be summarized as follows:

- to lock the door in the fully closed position
- to avoid opening if residual pressure is still present
- to warn the operators if pressure is still present

The safety device system is manufactured in six (6) different sizes to be installed on a different closure size and rating.

Additional Safety Features

The design of the **FAI "Bayonet" End Closure** has also been improved to ensure that, after the system depressurization and the safety device open, the possible presence of liquid static head cannot cause any undesirable door slam.

Upon request, a double gear system allows the door opening in two steps: the first to nullify the Gasket asset and guarantee, in the event of liquid static head, to maintain the teeth engaged. The liquid, if any, is free to drop through the drain hole located in the bottom segment of the clamp, giving a warning signal to the operator.

The second step allows the complete safe opening of the door.

Any additional monitoring device can be provided upon request.

Environment

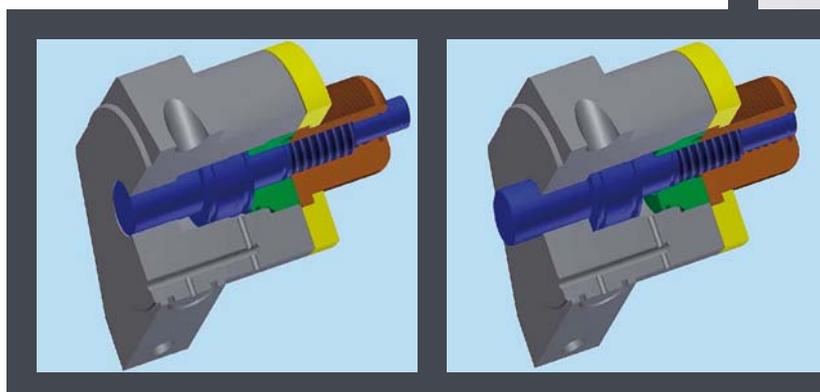
FAI's care in the design of the end closure looks at the **ENVIRONMENT** where the closure is generally working.

FAI's engineers are skilled and have direct field experience in Onshore, Offshore, Deserts environments at every latitude.

This experience is transferred to the **FAI "Bayonet" End Closure**, designed with the aim of minimizing maintenance and make all operations easy under any condition/circumstance.

This is also evident looking at the choice of the materials extensively used (stainless, duplex, aluminum bronze, alloy 625, etc...) to reduce the atmospheric corrosion.

This, in a few words, is the reason why the lifetime of the FAI "Bayonet" End Closure is over thirty-five years.



MAIN COMPONENTS

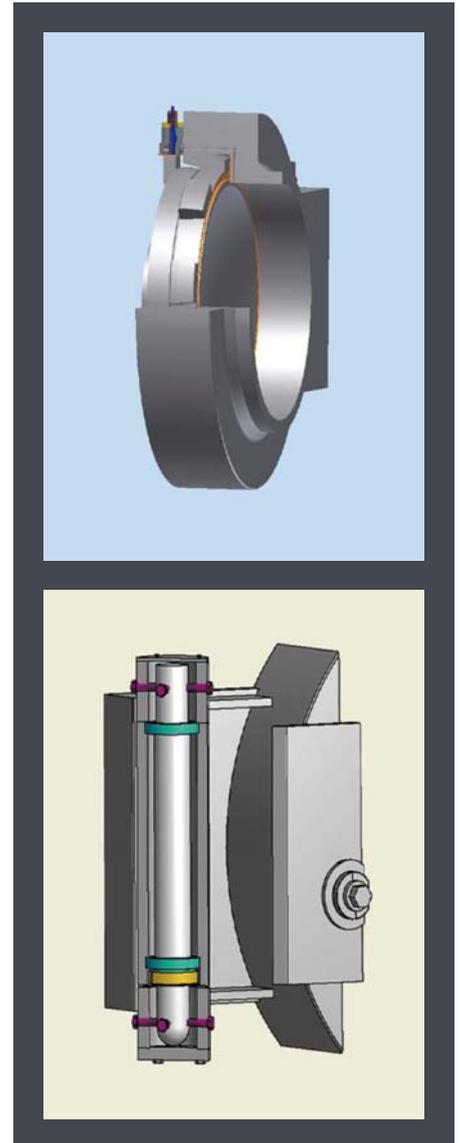
Hub And Door

SAFETY DEVICE

The Hub and Door are manufactured from forged materials or to any Customer's specification. Both CNC machined, the sealing faces and gasket groove are weld overlaid with AWS ER 316 as standard practice. Alternatively AWS ER 625 weld overlay can be provided. Any other welding consumables available upon request.

Hinge

The Hinge is directly connected to the hub and designed to assist the door opening. All Hinge components are basically made in structural painted carbon steel while the hinge pivot is hot dip galvanized carbon steel, fitted on a self-lubricated bearing. Alignment and realignment is always possible using stainless steel screws. When required, the Door is provided with a retainer screw to prevent door slamming.



SEALING

Sealing Type

FAI "Bayonet" End Closure is designed to suit different types of gaskets of either shape and elastomer grade. The gasket groove is designed to fit CHEVRON gaskets. The sealing face and gasket groove is corrosion resistant alloy (CRA) weld overlay.

Sealing Material

The gasket material is normally selected to withstand the fluid and corrosion inhibitor (if any), but could be to any other Customer's specification. Standard gasket elastomers are HNBR / FKM both explosion decompression grade. The gasket elastomer whatever is the grade, could be reinforced by a TEX or POM ring. Standard temperature range is minus 45°C to 150°C. Upon request, gasket suitable to minus 100°C to 250°C could be provided.

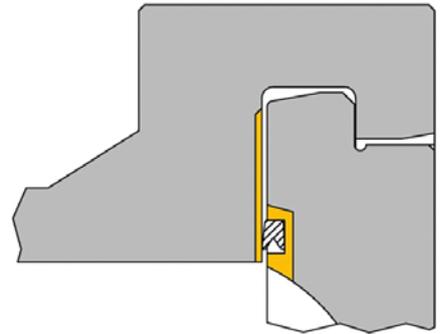
Gasket Pre-Asset

Turning the drive gear by key, the door's tapered teeth slide under the hub teeth, the sealing faces come in contact, the initial gap is nullified and the gasket pre-compression granted. Sealing under low pressure and vacuum is ensured.

Sealing Floating Pack

FAI, based on the large experience acquired in more than a hundred different applications, has developed a floating self-engineered pack to ensure sealing even when the gap between the seal faces under the steel elastic deformation (severe pressurization, cyclic service etc.) is high and reduces the life of conventional gasket.

The floating pack consists of two gaskets: the first works on diameter allowing the pack under the pressure to slide toward the seal face, absorbing the gap of the steel elastic deformation. The second, working between the seal faces, allows the gasket (O-ring) to work whatever is the pressure value in the same condition, since the two seal faces are always in contact granting the tight sealing of closure.



GASKET GROOVE



UNCLOSED REST GASKET



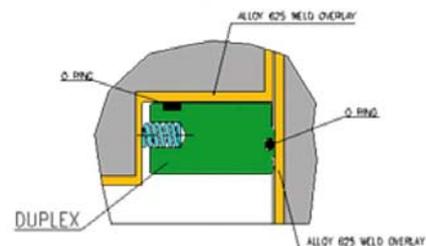
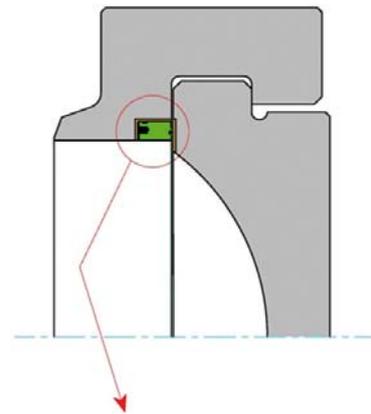
CLOSED COMPRESSED GASKET



CHEVRON TEX REINFORCED



CHEVRON POM REINFORCED



FLOATING SEAT



OPERATION & MAINTENANCE

Operational safety has been developed into FAI "Bayonet" End Closure at every stage.

Before attempting to open the Closure, ensure that:

- the vessel isolating valve is fully closed
- the system is depressurized
- the vessel is fully drained and isolated from any source.

Operation

Turn the safety device knurled hand wheel clockwise to withdraw the locking pin. Without this operation the clamps cannot be opened. If some residual pressure is present, the same will be vented to the atmosphere. If an indication of residual pressure is given, close the safety device and re-check the isolation of vessel.

When the safety device is fully opened, the End Closure will be safe and can be opened.

Engage the operating key in the support.

Turn the operating key until the gear has completed the rotation and the teeth of the door are fully disengaged. At this stage the operating key could be removed. Open the door using the handle.

Lock the door in the opening position using the retainer system provided

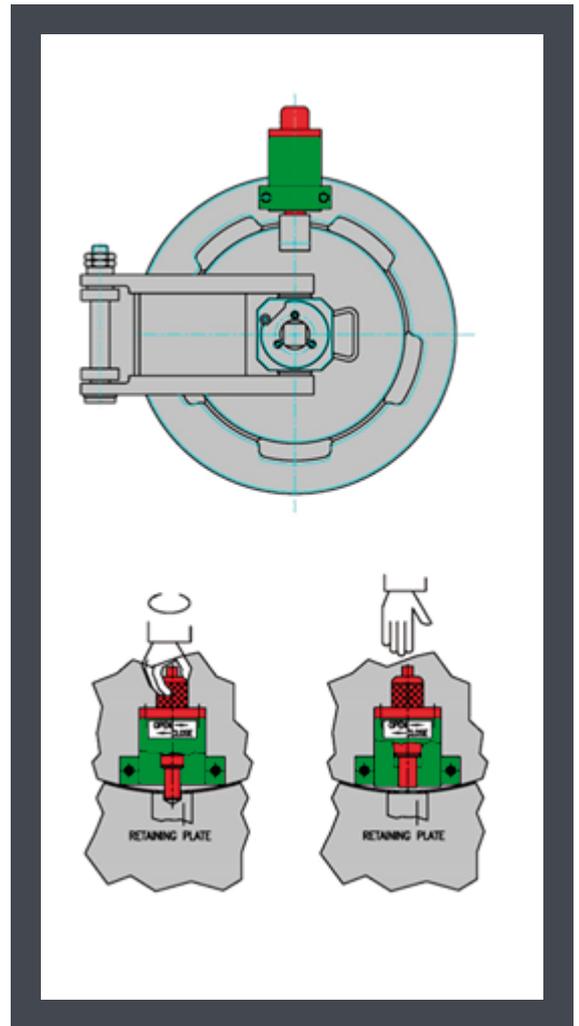
To close **FAI "Bayonet" End Closure** simply repeat the operations in the reverse sequence.

Maintenance

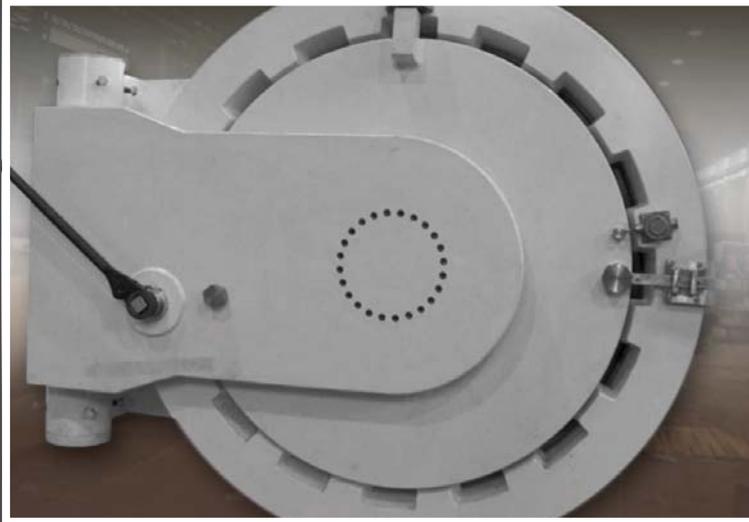
FAI "Bayonet" End Closure is designed to minimize maintenance operations, However preventive maintenance could be arranged to extend service life and efficiency.

ROUTINE MAINTENANCE (each time the End closure is operated) includes:

- visual check of all sealing faces
- replacement of gasket if damaged or in presence of cuts or abrasions
- lightly smearing with a thin film of oil: gasket, sealing face and all teeth surfaces for corrosion protection and lubrication.



END CLOSURE



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