IMI Z&J

# Transfer Line & Decoking Valves for Steam Cracker Ethylene Units

*Engineering GREAT Solutions*

## Double Disc Through Conduit (DDTC) Type Gate Valve Design

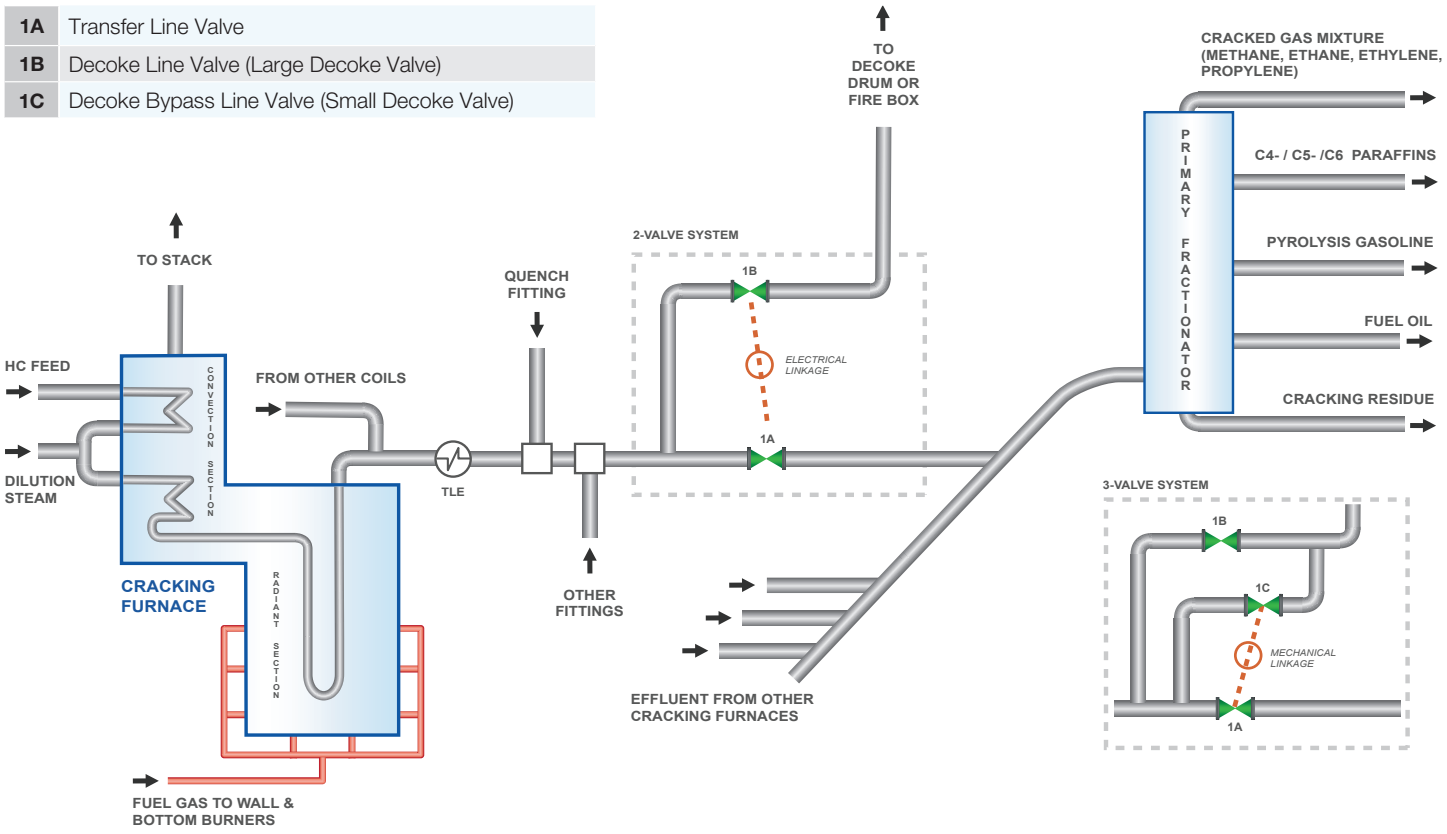
## True Double Block & Purge Technology for Furnace Isolation and Separation

IMI Critical Engineering

## Application of IMI Z&J Valves in Ethylene Units

IMI Z&J (Zimmermann & Jansen) supplies various high-quality engineered valves and is a world leader for engineering, design and fabrication of Double Disc Through Conduit (DDTC) Type Gate Valves for use in Ethylene units. To date IMI Z&J has supplied more than 3.000 DDTC Valves all over the world. Our IMI Z&J DDTC valves represent the latest stage of valve technology in Transfer Line Valve (TLV) and Decoking Valve (DV) application and provide a higher safety level than any other type of valve design.

| | |
|---|---|
| 1A | Transfer Line Valve |
| 1B | Decoke Line Valve (Large Decoke Valve) |
| 1C | Decoke Bypass Line Valve (Small Decoke Valve) |




## IMI Z&J's Company Profile

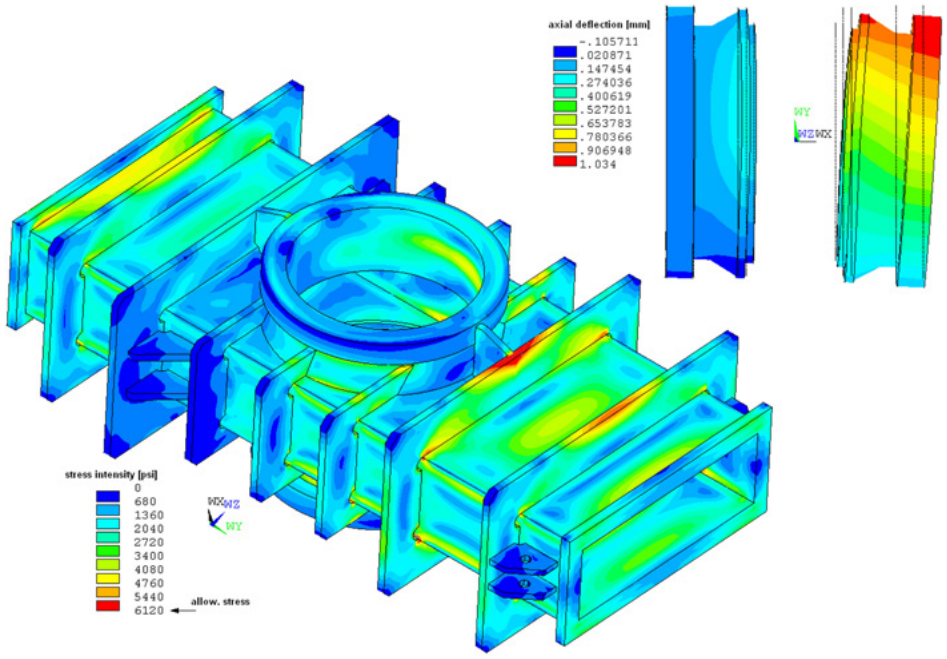
IMI Z&J is known world-wide as an outstanding manufacturer of large diameter, high temperature, severe service valves for the steel, glass, refining, chemical and petrochemical industries.

The company is based on a successful tradition and has produced valves since its foundation in the year 1877. Design & engineering, fabrication, inspection and testing are all IMI Z&J in-house capabilities.

Today, IMI Z&J's mission is to supply engineered solutions to the valve problems affecting our customers. Our many years of experience and the most advanced engineering and design methods serve as a sound basis for this activity.

IMI Z&J complies fully with customer and process licensor specifications.

Commissioning, repair and overhaul of our products, installed world-wide, also belong to our scope of supply. Our field and shop service is independent from normal production.




Finite Element Analysis (FEA) is carried out for each valve to optimize material stresses and to minimize valve body distortions and deformations.

## Key Features & Benefits

**General Information**
Engineered high performance valve design, suitable for media with extremely high solid-particle content.

Tailor-made fabricated design according to customer specification and German or International standards.

Materials selected to suit operating conditions.

Most robust and fail-safe design. Proven reliability under severe service conditions over many years in operation.

Excellent performance with extremely low maintenance and operating costs.

IMI Z&J offers an extended 3-years warranty period for installation in Ethylene units.

**Cup Spring Arrangement**
A cup spring arrangement is installed on the valve stem in order to keep the wedge pieces in place. No force is generated by the wedge pieces to the discs during actuation.

The force is generated when the goggle type gate assembly reaches the closed end position and abuts against two stops. The increasing drive torque compresses the cup spring arrangement to move the discs onto the seats.

Acc. to customer requirements different design and material options are applicable.

**Valve Body (dark grey)**
Extra heavy duty valve body designed by Finite Element Analysis (FEA) to withstand individual operating conditions and external piping loads and to minimize valve body distortions and deformations.

Fabricated, remastered, one-piece valve body design.

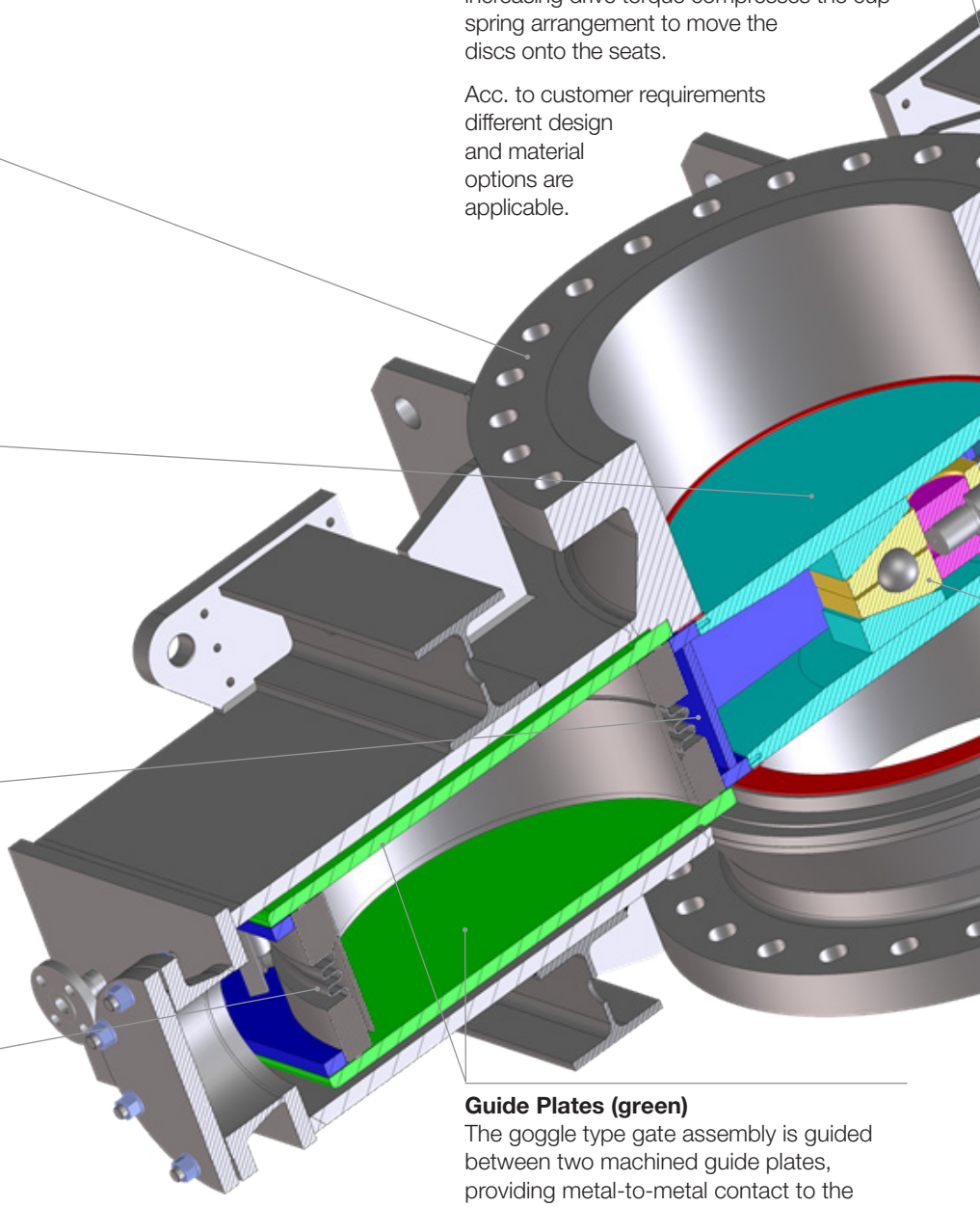
**Shut-off Discs (light blue)**
True double block & purge performance within one valve body by means of two separate shut-off discs.

Safe and reliable tight shut-off by two independent closure elements.

Active mechanical seating force by means of split-wedge-ball mechanism and actuator high seating thrust.

**Goggle Type Gate Assembly (dark blue)**
The goggle type gate assembly is equipped with two independent shut-off discs (closed position) and a special pre-stressed expansion bellow device (open position).

The assembly runs smoothly (no blockage) between the two guide plates.



**Expansion Bellow Device (grey)**
Movable seat rings are connected by an expansion bellow and pressed against the body seats in valve open position, respectively against the guide plates during operation.

The straight tubular passage with clear throughway minimizes pressure losses in valve open position.

Additional seating force is provided by means of circumferentially located cup spring units (if applicable).

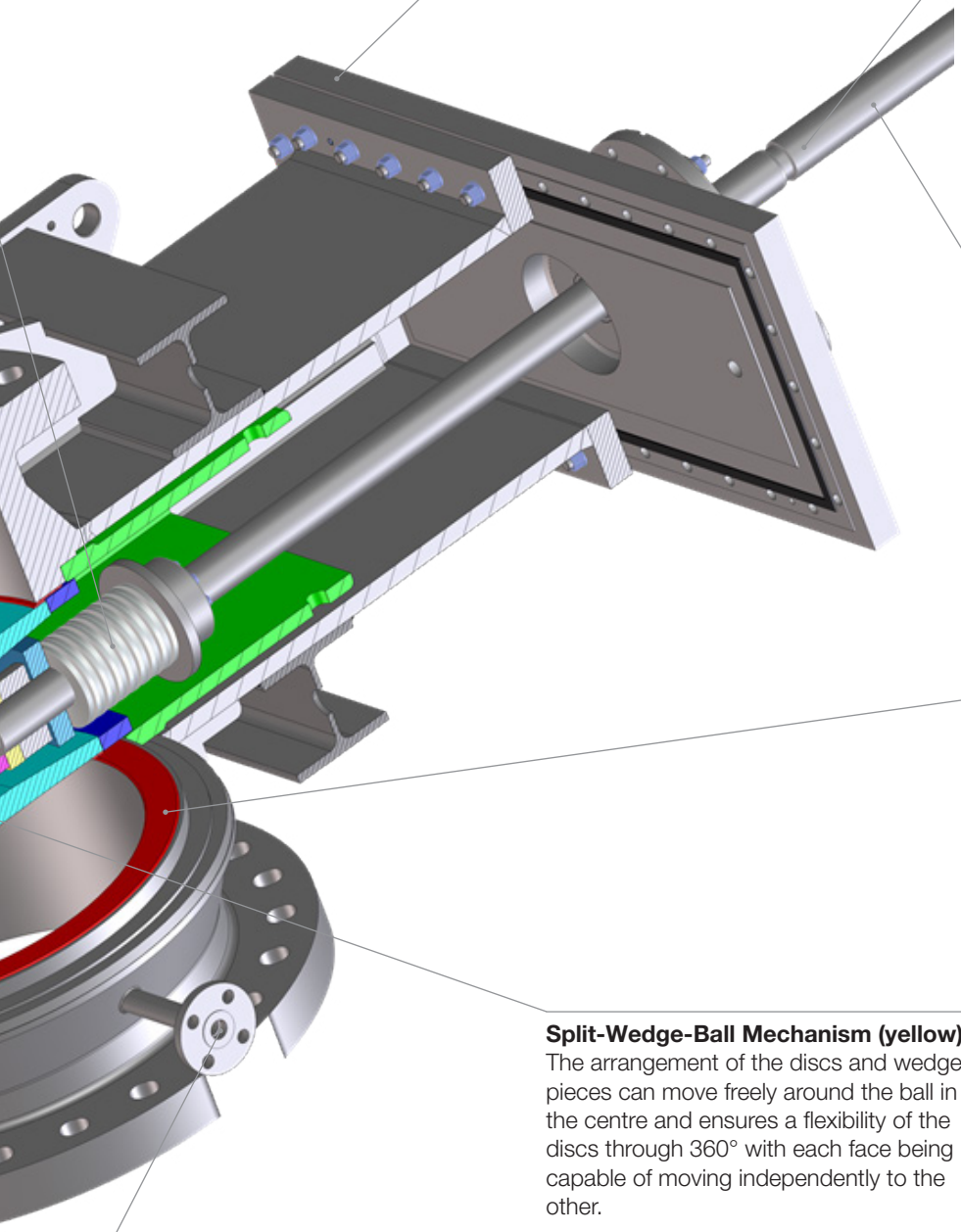
Bellow expansion joint is selected as single or multi-wave type and with or without inner pipe sleeve, acc. to the individual operating conditions on site.

**Guide Plates (green)**
The goggle type gate assembly is guided between two machined guide plates, providing metal-to-metal contact to the expansion bellow seat ring surfaces during full gate stroking.

This internal design minimizes the potential of solid particles entering into or depositing in the valve body.

Purge pressure within the valve body ensures effective purging at minimum purge steam consumption during stroking.

No build-up of coke particles inside the valve body.



**Valve Bonnet**
All valve internals can be removed from the one-piece body through the bolted bonnet opening.

**Linkage Systems**
Mechanical or electrical linkage systems control the valve positions of the associated TLV and DV to maintain a positive pressure between the steam cracker and the transfer line at all times.

The mechanical linkage system (link lever mechanism) is available for the common operation of a TLV with a small DV.

The electrical linkage system mimics the actions of a mechanical linkage and allows the TLV and DV to be located in more flexible positions.

**Actuator**
Valve design accommodates any desired type of actuator. Typically electric motor actuators are used.

Valve closed position is controlled by torque, not by position.

A constant seating force in valve closed position is ensured by the self-locking spindle thread.

**Sealing Surfaces (red)**
Long-lasting metal-to-metal seats due to corrosion and wear resistant hard-facing (weld overlay) on all seats.

In both valve end positions the sealing surfaces are completely covered from the flow to minimize erosion effects, as well as coke deposit build-up on the seat surfaces.

IMI Z&J developed in-house a special technique for hard-facing free from cracks.

Long-term maintenance-free service due to minimized wear, even when frequently actuated.

Design with removable seat rings is available, acc. to customer requirements.

**Split-Wedge-Ball Mechanism (yellow)**
The arrangement of the discs and wedge pieces can move freely around the ball in the centre and ensures a flexibility of the discs through 360° with each face being capable of moving independently to the other.

Active, controlled and constant mechanical seating force guarantees safe and reliable tight shut-off when valve is in seated position.

Centered and non-self-locking wedge mechanism releases shut-off discs from the seats without any risk of jamming at high temperature or temperature changes.

Minimized seat-to-seat friction because device gives discs clearance to move and releases the mechanical force prior to gate movement (minimized wear).

**Purge Nozzles**
Valve is equipped with purge connections for continuous purge steam supply.

Effective purging at minimum purge steam consumption due to the valve design.

Furthermore the positive valve body purge pressure generates additional sealing load on each shut-off disc in valve closed position.

## Optional Features

Depending on the process requirements and upon customer requests many additional features/modules are available. Please contact us for details.

## Evaluation Matrix for Valves in Ethylene Units

Many different valve designs for Ethylene service are available on the market, but the performance features are different, too.

The below evaluation matrix provides a summary of field experience and feedback data inferred from end users, process licensors and EPC-contractors.

Since its introduction to the market in 1987, the IMI Z&J Double Disc Through Conduit (DDTC) Type Gate Valve design has been mostly selected for Ethylene service due to its excellent performance.

| | Evaluation Criteria Index |
|---|---|
| + | Advantage |
| | Average |
| – | Disadvantage |
| N/A | Not applicable |

| Valve Type | | | Evaluation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **IMI Z&J Double Disc Through Conduit Gate Valve (DDTC)** | **(Metal Seating)** | + | + | + | + | + | + | + | + | + | + | | – | 36 |
| | Single Disc Through Conduit Gate Valve | (Metal Seating) | | + | + | + | + | – | | | | + | | – | 12 |
| | Single Disc Through Conduit Gate Valve | (Soft Seating) | – | + | – | | | – | – | – | – | + | | – | 12 |
| | Parallel Seated Double Disc Gate Valve | (Metal Seating) | + | – | + | + | – | – | + | + | | | | | 12 |
| | Wedge-Within-Wedge Gate Valve | (Metal Seating) | + | – | + | + | – | – | + | + | | | | | 12 |
| | Flexible Wedge Gate Valve | (Metal Seating) | | – | + | + | – | – | | | | | + | | 12 |
| | Shut-off Butterfly Valve | (Metal Seating) | – | – | | N/A | N/A | N/A | | | – | – | + | + | 12 |
| | Tilting Disc Valve (Shut-off Butterfly Valve with Check Valve Function) | (Metal Seating) | – | – | | N/A | N/A | N/A | | | – | – | | + | 12 |

| Criteria |
|---|
| True double block & purge performance within one valve body |
| Seal seats completely protected in valve open & closed position |
| Corrosion and wear resistant hard-faced seats (maintenance free) |
| Solids cannot enter the valve body in closed position |
| Solids cannot enter the valve body in open position |
| Solids cannot enter the valve body during gate movement |
| Operable under severe temperature conditions |
| Active mech. sealing force in closed position (tight shut-off capability) |
| Low operating & maintenance cost (OPEX) |
| Full bore design (low pressure loss) |
| Low price (CAPEX) |
| Compact design |
| Standard warranty period after plant start-up (in months) |

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