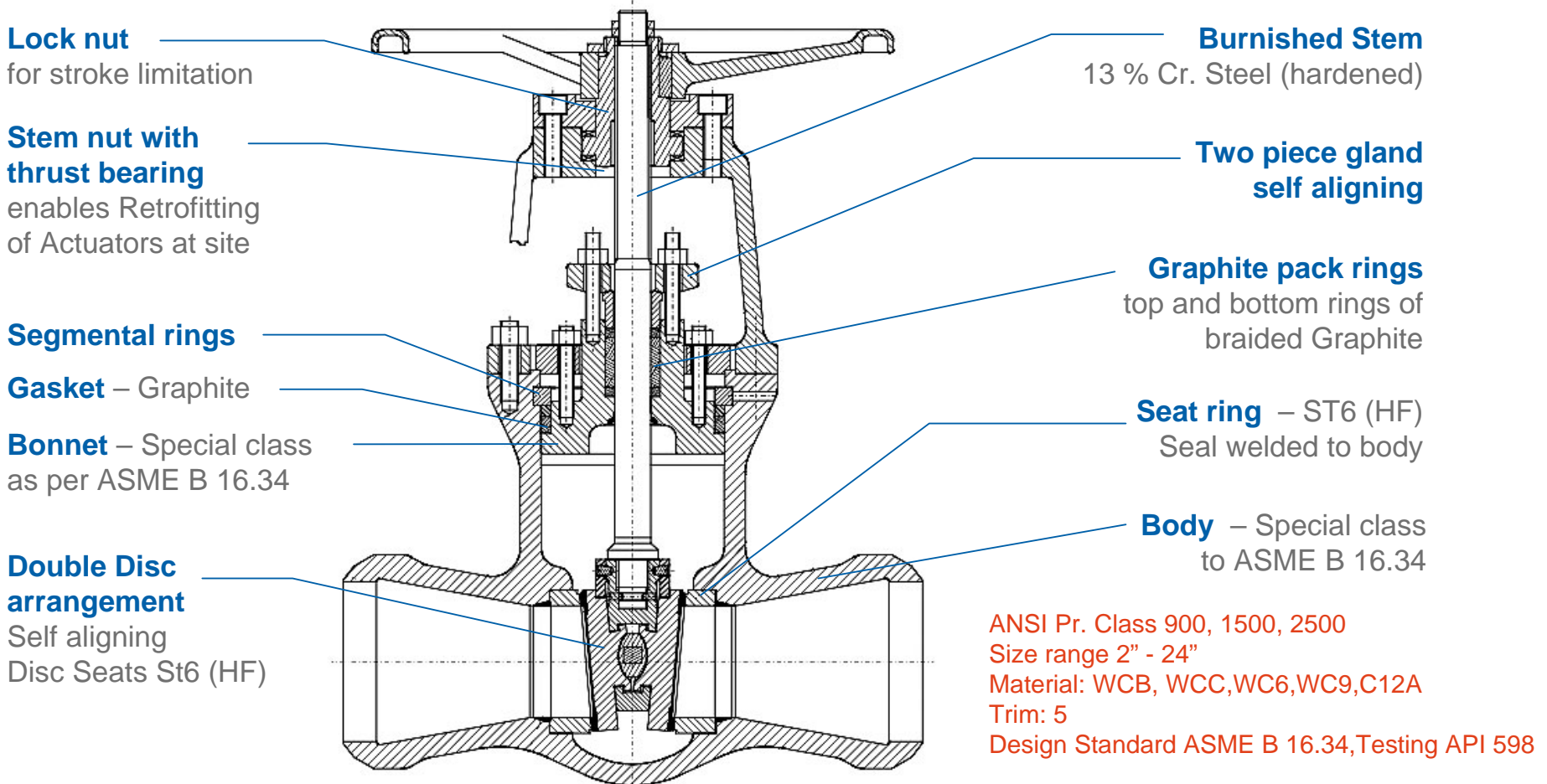


# Pressure Relief Arrangement

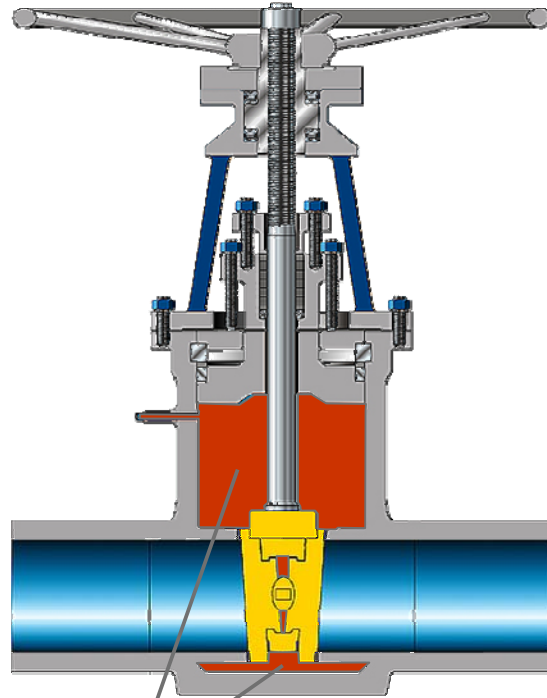
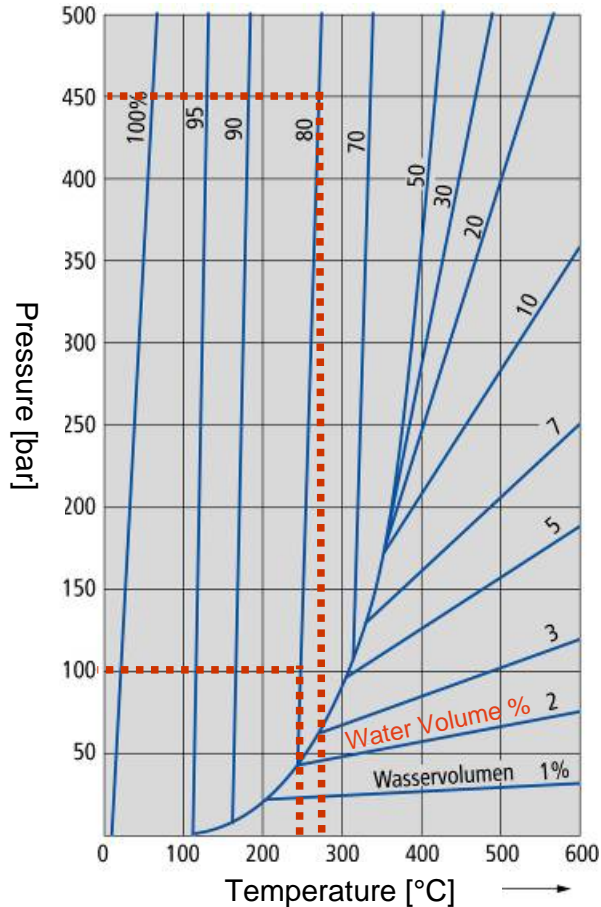
KSB SICCA Pressure Seal Gate Valves



# Pressure Seal Gate Valve



# The need for Pressure Relieving arrangement in Pressure Seal Gate



Trapped fluid in a closed gate valve

- Pressure seal bonnet gate valves, in particular, may be subject to impermissible pressure increase when fluids are trapped in the body (red sections in the drawing).
- The trapped fluid may heat up as a result of temperature increases in the gate valve or piping, leading to thermal expansion and a rise in pressure inside the valve body. The level of pressure increase depends on the temperature and the proportion of water inside the body. This results in: excessive stress on either the valve body, graphite gaskets or seat/disc interface.
- Example:
  - A proportion of water of 80 % inside the body will lead to a pressure of 100 bar at a temperature of 250°C.
  - The same water proportion will lead to a pressure of 450 bar in the valve at a temperature of 275°C regardless of the pressure in the piping.

## Pressure Relief Arrangement-What ASME Says ?

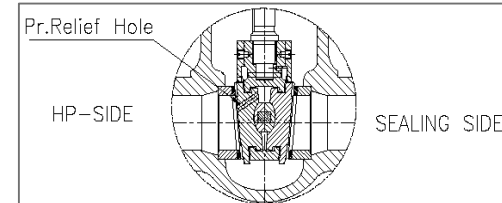
ASME B 16.34 CI 2.3.3 cautions Users of the potential hazard due fluid entrapment in the center cavity of double seated valves.

ASME B 16.34 CI 2.3.3 – Fluid Thermal Expansion. “..... A certain circumstance in which the center cavity is filled or partially filled with liquid and subjected to an increase in temperature can result in an excessive buildup of pressure in the center cavity that may lead to pressure boundary failure. An example is a piping system in which liquid from the condensing, cleaning, or testing fluids accumulates in the center cavity of a closed valve. Such accumulation may result from leakage past the upstream seat of the valve. If during subsequent start-up, the valve is not relieved of the liquid by partial opening of the valve or by some other method, the retained liquid may be heated during warm-up of the system. Where such a condition is possible, it is the responsibility of the user to provide, or require to provide, means in design, installation, or operation procedure to ensure that the pressure in the valve will not exceed that allowed by this standard for attained temperature.

i.e., upon certain conditions, fluid can get accumulated in the center cavity, which, on subsequent start-up & rise in temp, would increase the PRESSURE at the cavity, very much higher than what is allowed as per standard.

KSB has standardized on a default design in the absence of customer specification by way of a drilled hole on the disc, which relieves the pressure on the upstream side. The Valve becomes Uni-Directional.

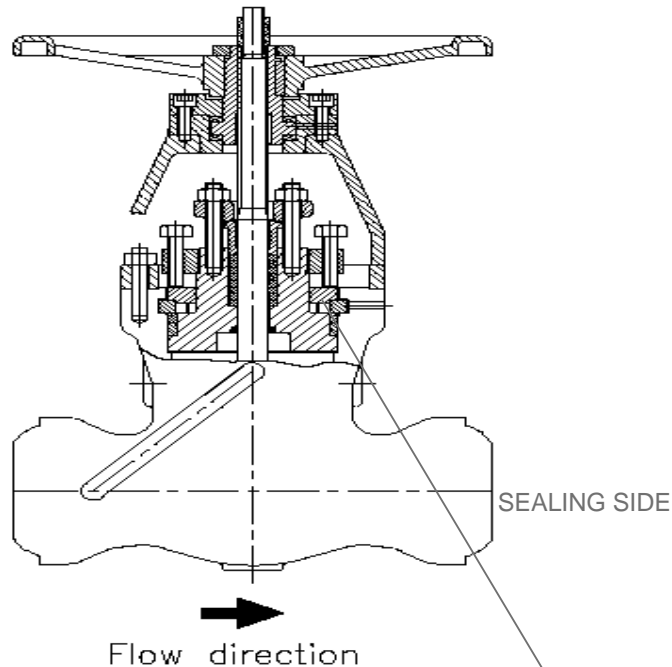
However KSB advises the user to select a suitable pressure relieving option.



# Body Safety Arrangement in Pressure Seal Gate– Options / Implication

External Pipe Connecting Bonnet cavity – at “K” side- Valve Unidirectional.

Execution Ref. : PR-01



Arrow Plate on Body



Safety Pr. Relief pipe connecting upstream Valve is unidirectional.

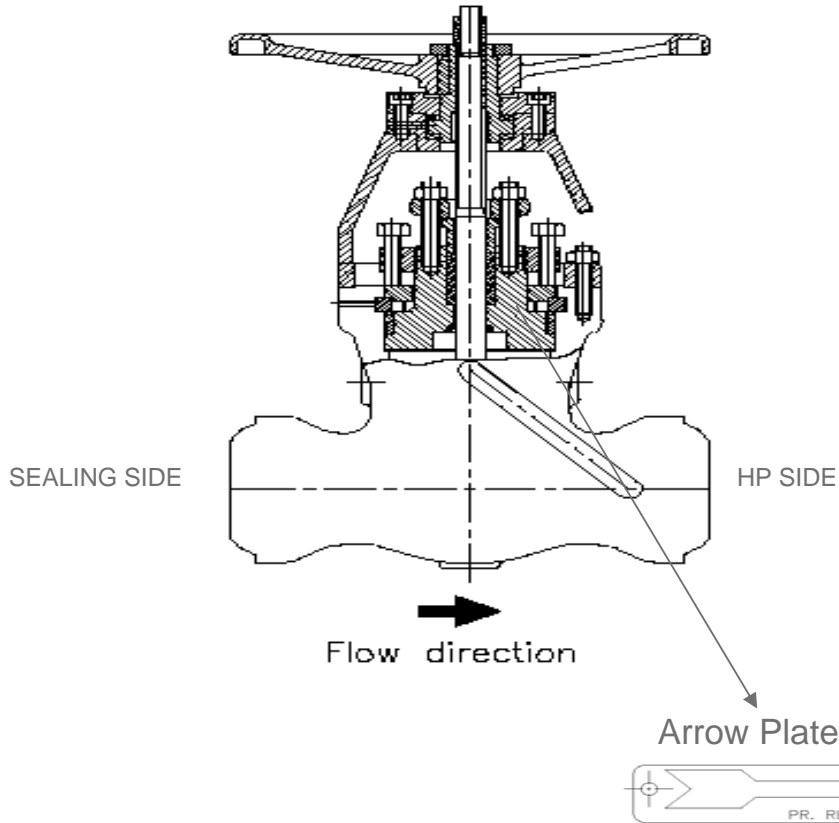
Installation – Where upstream side of flow is the High pressure side. In Closed Position, High Pressure side shall be the upstream side.

NOTE: PR-01, shall be provided only on specific request. In the absence of any requirement being spelt out, PR-03 will be KSB's default Option.

# Body Safety Arrangement in Pressure Seal Gate– Options / Implication

External Pipe connecting Bonnet cavity – at “B” side- Valve Unidirectional.

Execution Ref. : PR-02



Safety Pr. Relief Pipe connecting downstream Valve is unidirectional.

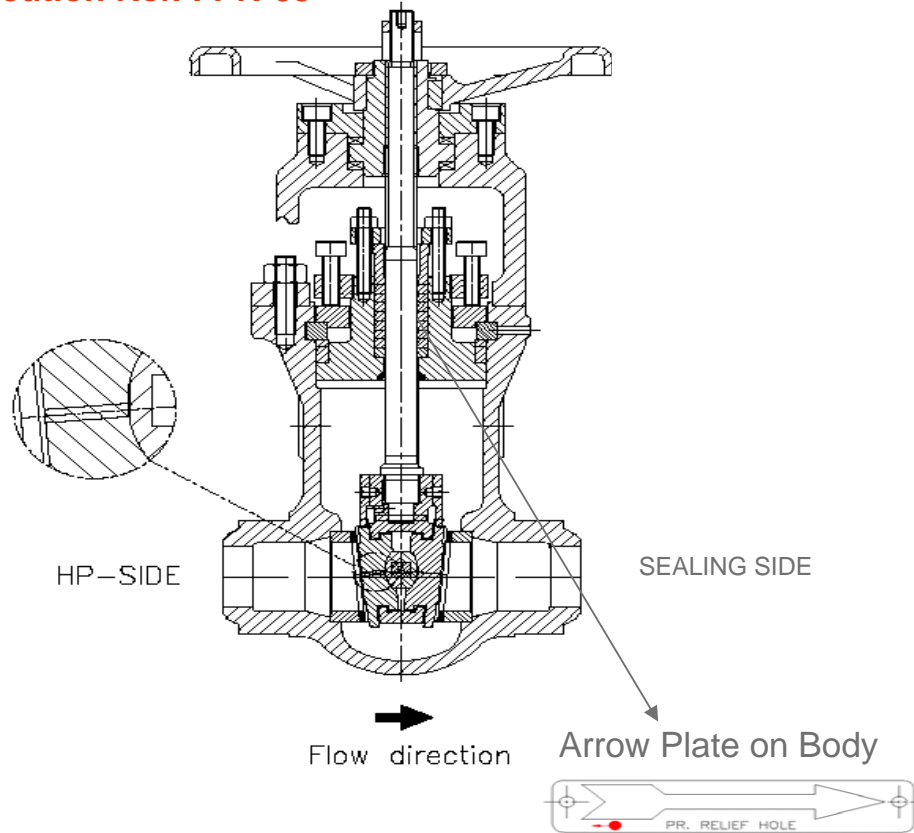
Installation – Where downstream side of flow is the High pressure side. In Closed Position, High Pressure side shall be Down Stream side.

NOTE: PR-02, provided only on specific request. In the absence of any requirement being spelt out, PR-03 is KSB's default option.

# Body Safety Arrangement in Pressure Seal Gate– Options / Implication

Internal Pr. Relief Arrangement – Pr. Relief Hole on Disc at “K” side, Valve – Unidirectional.

Execution Ref. : PR-03



Safety Pr. Relief Hole through Disc Valve is unidirectional.

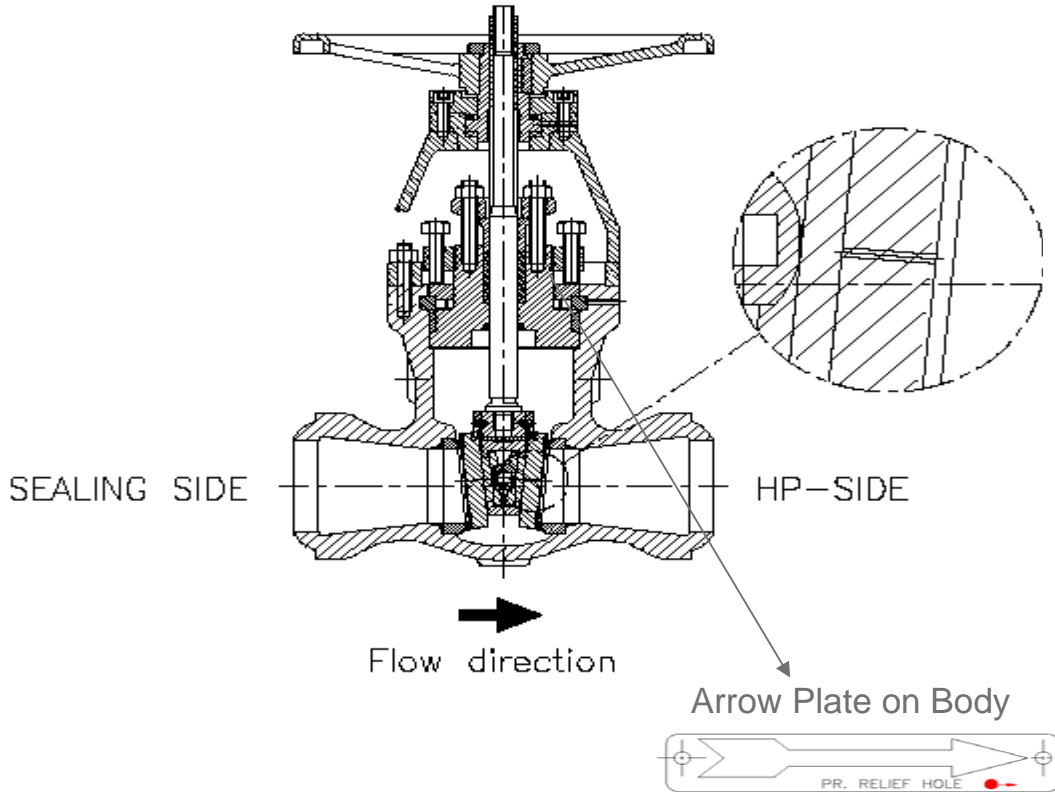
Installation – Where upstream side of flow is the High pressure side. In Closed Position, High Pressure side shall be Up Stream Side.

**NOTE: PR-03, shall be provided as a standard feature, in the absence of any requirement being spelt out, PR-03 will be KSB's default option**

# Body Safety Arrangement in Pressure Seal Gate– Options / Implication

Internal Pr. Relief Arrangement – Pr.Relief Hole on Disc at “B” side Valve – Unidirectional.

Execution Ref. : PR-04



Safety Pr. Relief Hole through Disc Valve is unidirectional.

Installation – Where downstream side of flow is the High pressure side. In Closed Position, High Pressure side shall be Down Stream Side

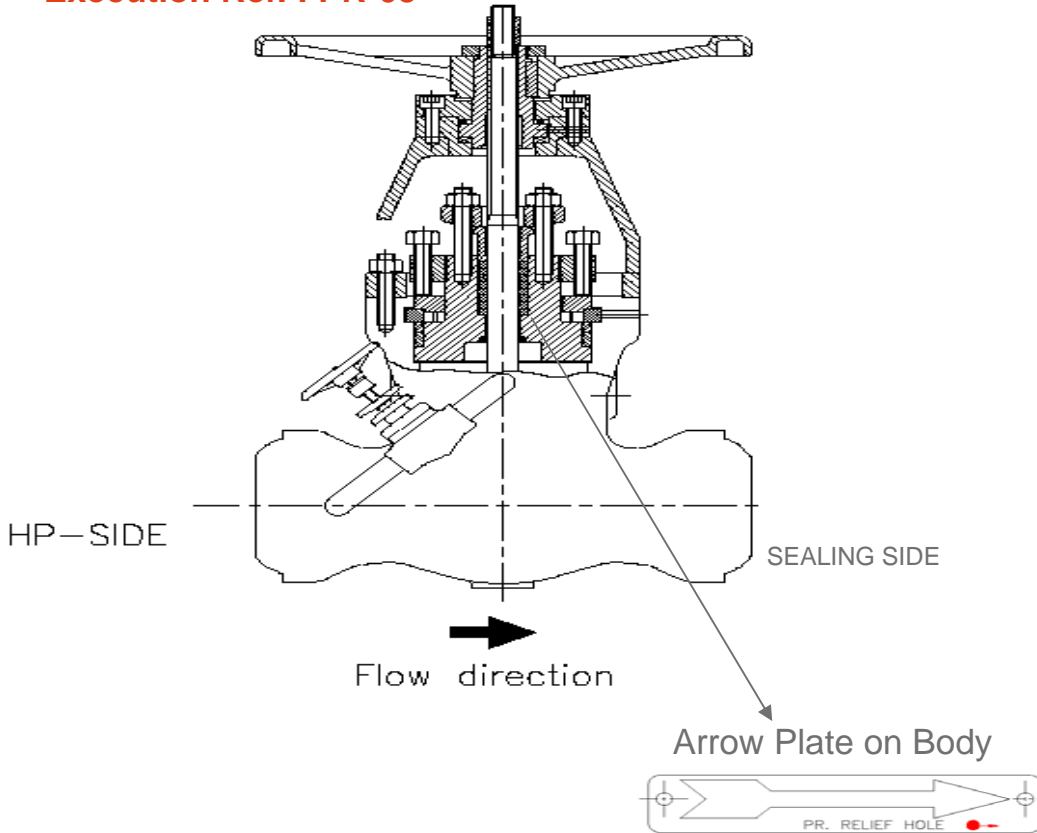
NOTE: PR-04, provided only on specific request. In the absence of any requirement being spelt out, PR-03 is KSB's default option.



# Body Safety Arrangement in Pressure Seal Gate– Options / Implication

External Pr. Relief pipe with interconnection Valve – at “K” side- Valve Unidirectional.

Execution Ref. : PR-05



Safety Pr. Relief pipe with interconnecting valve at Up Stream  
Valve is unidirectional.

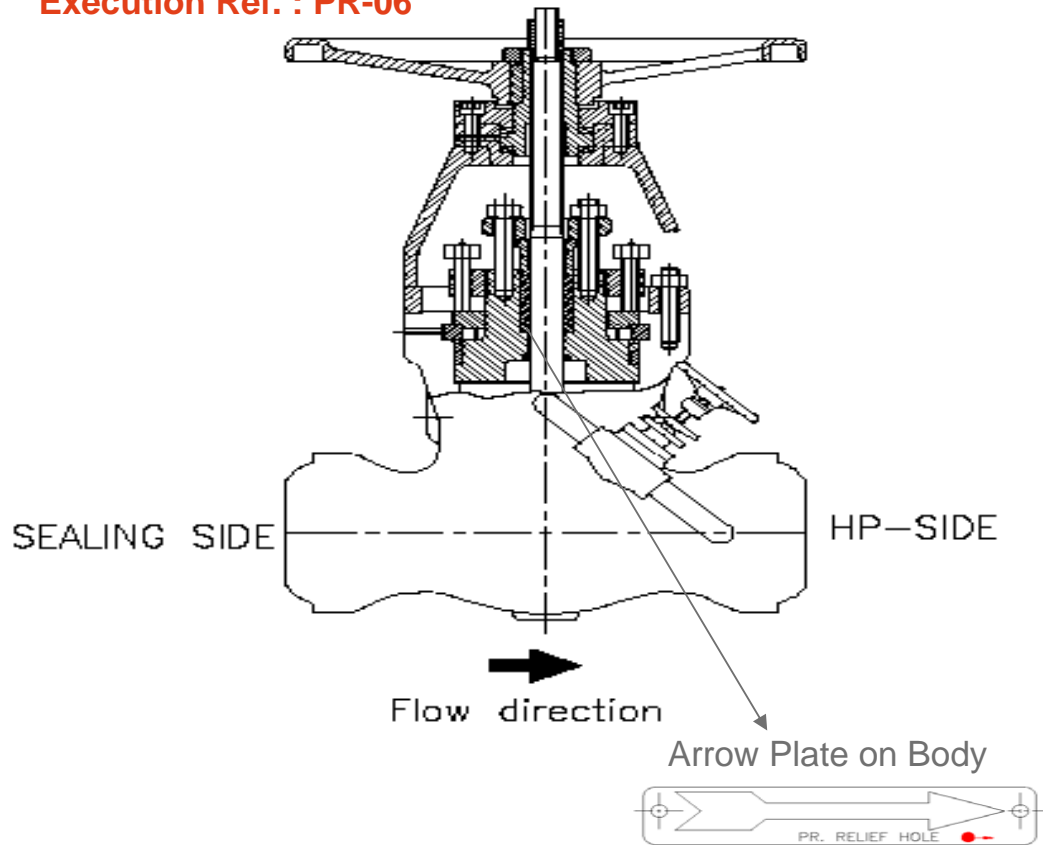
Installation – Where upstream side of flow is the High pressure side. In Closed Position, High Pressure side shall be Up Stream Side. For Hydro test with Up Stream Side Seat as pressure boundary, inter-connection valve to be closed.

**NOTE:** PR-05, shall be provided only on specific request. In the absence of any requirement being spelt out, PR-03 is KSB's default option

# Body Safety Arrangement in Pressure Seal Gate– Options / Implication

External Pr. Relief pipe with interconnection Valve – at “B” side- Valve Unidirectional.

Execution Ref. : PR-06



Safety Pr. Relief pipe with interconnecting valve at Down Stream.  
Valve is unidirectional.

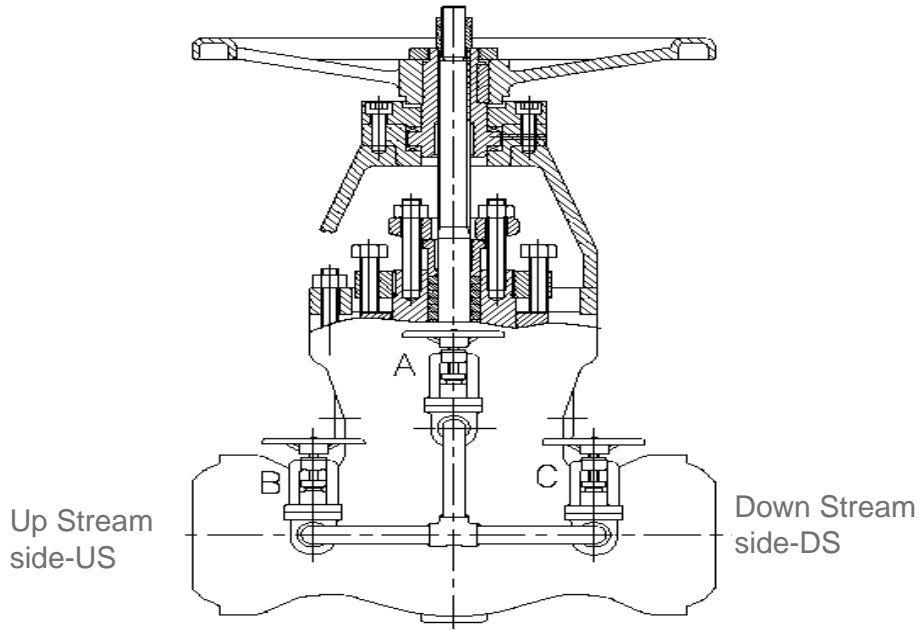
Installation – Where downstream side of flow is the High pressure side. In Closed Position, High Pressure side shall be Down Stream Side.  
For Hydro test with Down Stream Side Seat as pressure boundary, inter-connection valve to be closed.

NOTE: PR-06, provided only on specific request. In the absence of any requirement being spelt out, PR-003 is KSB's default option

# Body Safety Arrangement in Pressure Seal Gate– Options / Implication

## External PR. Relief Arrangement – Decompression system – Valve Bi-directional.

Execution Ref. : PR-07



Safety Pr. Relief system with three valves. One each at both ends and one connected to bonnet cavity.

Valve is Bi-directional.

Installation & Function – Valve Bi-directional, no constraint on installation.

**NOTE:** PR-07, provided only on specific request. In the absence of any requirement being spelt out, PR-003 is KSB's default option

VALVE A to be kept Open - Always.

IF US side is the HP Side, Valve B to be kept fully open & Valve C to be kept closed

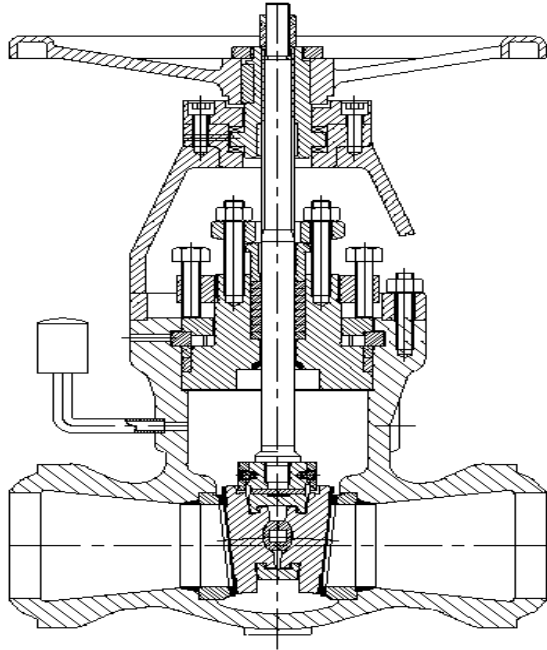
IF DS side is the HP Side, Valve C to be kept fully open & Valve B to be kept closed

For Preheating / pressure equalization – upstream / downstream, close valve A and keep valve B & C open

# Body Safety Arrangement in Pressure Seal Gate– Options / Implication

External PR. Relief Arrangement with a Stub pipe at bonnet cavity for Mounting Safety valve

Execution Ref. : PR-08



Valve will be supplied with welded stub.

Safety valve to be welded on the STUB at appropriate position / orientation, at SITE

Stub pipe welded to the bonnet cavity which is suitable for mounting safety relief valve

Valve is Bi-directional.

Installation & Function – Valve Bi-directional with safety valve installed.

**NOTE:** PR-08, provided only on specific request. In the absence of any requirement being spelt out, PR-003 is KSB's default option.

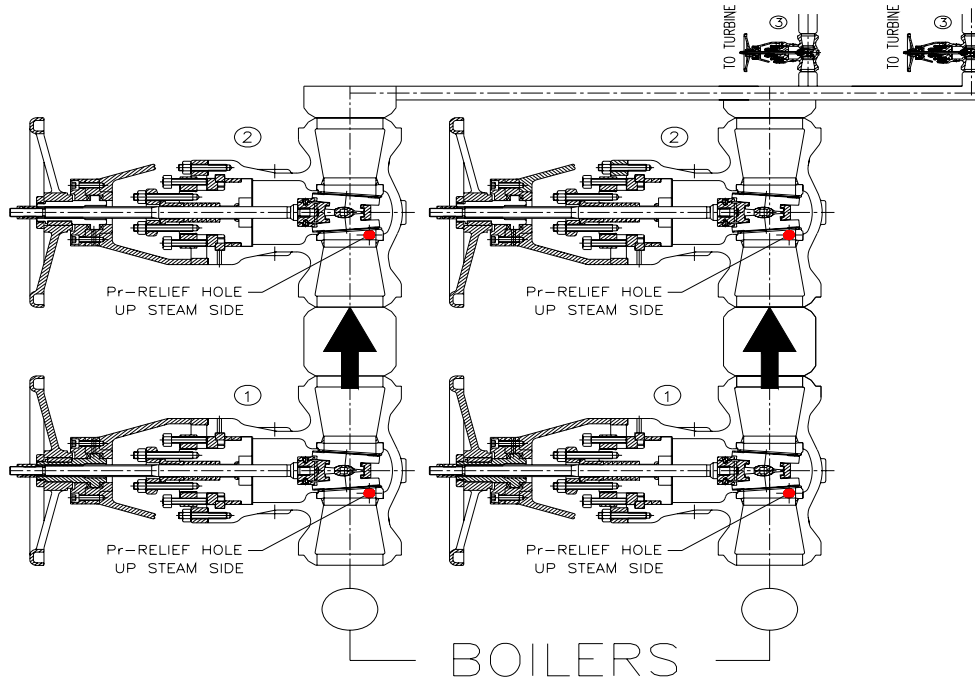
# Body Safety Arrangement in Pressure Seal Gate– Summary of Options

<b>Execution Reference</b>	<b>Type of Pr.Relief</b>	<b>Direction of Pr.Relief</b>
PR-001	External Pipe connection to Bonnet cavity	Upstream side - Valve Unidirectional
PR-002	External Pipe connection to Bonnet cavity	Downstream side - Valve Unidirectional
PR-003	Hole in the Disc	Upstream side - Valve Unidirectional
PR-004	Hole in the Disc	Downstream side - Valve Unidirectional
PR-005	External Pipe with valve connected to the Bonnet cavity	Upstream side - Valve Unidirectional
PR-006	External Pipe with valve connected to the Bonnet cavity	Downstream side - Valve Unidirectional
PR-007	Decompression system with 3 valves	Upstream / Downstream- Valve Bi-directional
PR-008	Pr.Relief Stub on Bonnet cavity (for fitting Pr.Relef valve.)	Upstream / Downstream- Valve Bi-directional

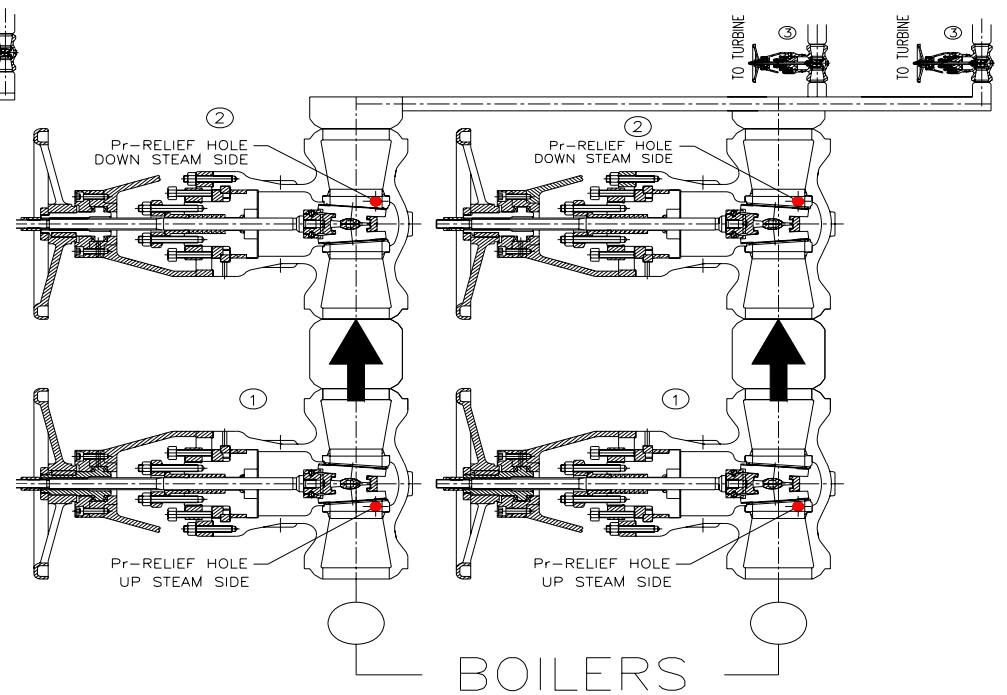
# Body Safety Arrangement in Pressure Seal Gate—How to Choose ?

Valves connected to a common Header in main Steam line

## TYPICAL INSTALLATION AT SITE



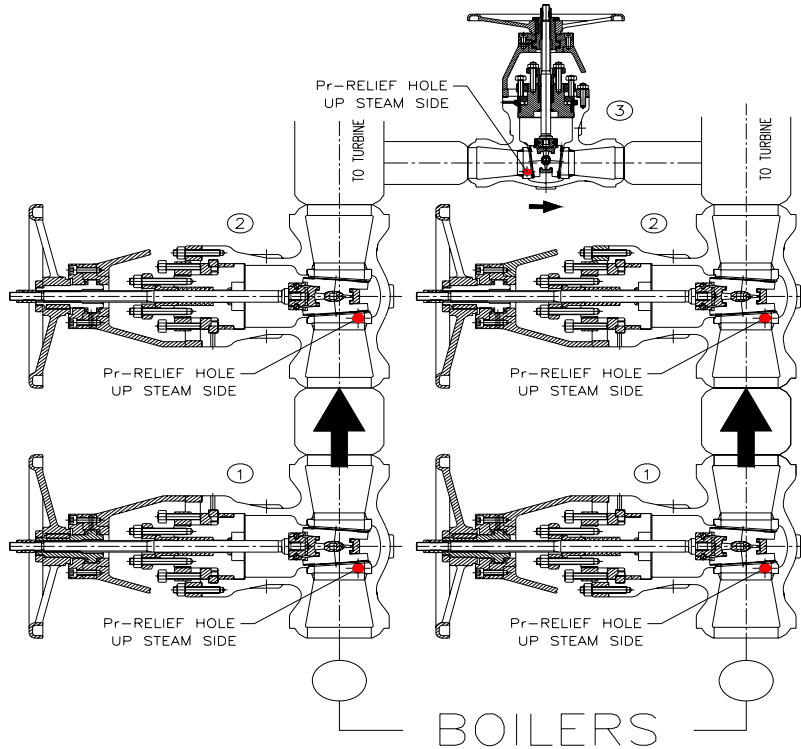
## CORRECT INSTALLATION



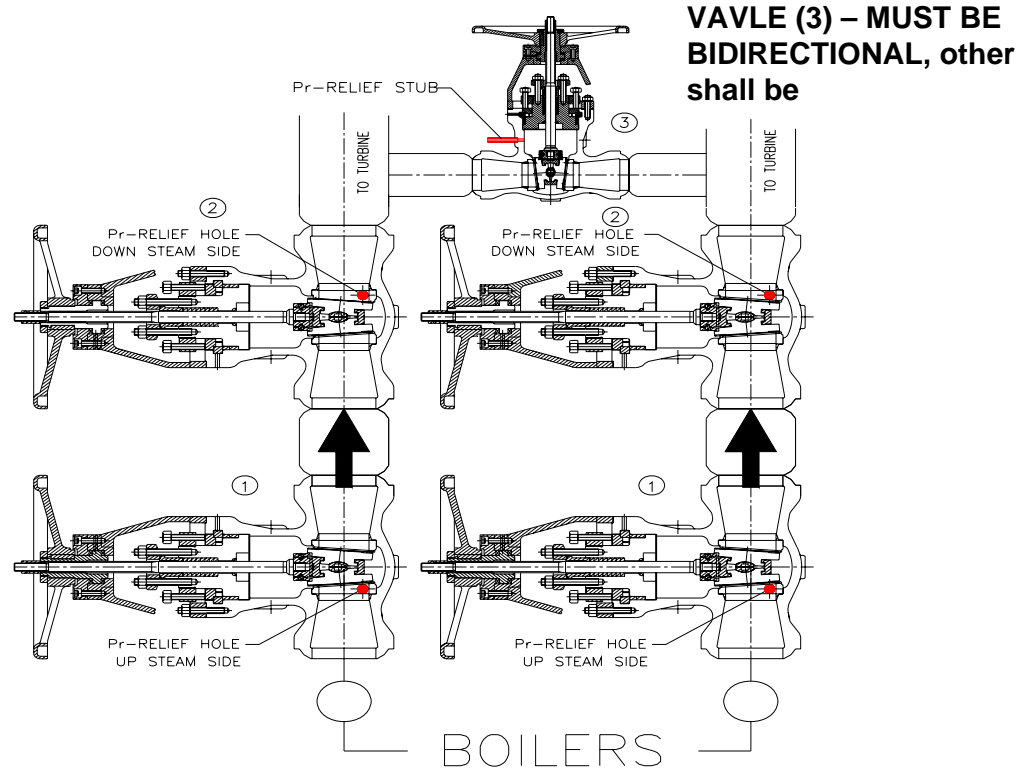
# Body Safety Arrangement in Pressure Seal Gate—How to Choose ?

Valves inter-connecting two Steam header lines

## TYPICAL INSTALLATION AT SITE



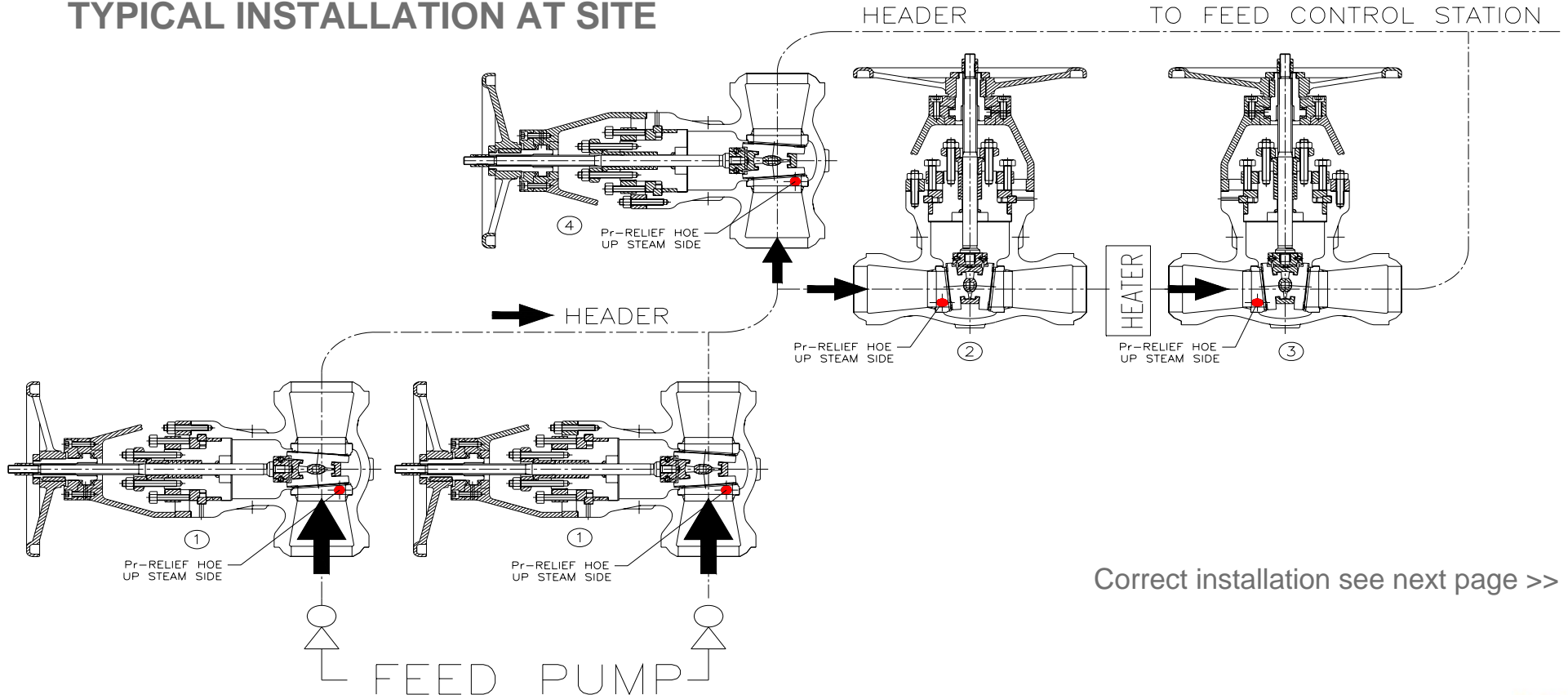
## CORRECT INSTALLATION



# Body Safety Arrangement in Pressure Seal Gate—How to Choose ?

## Valves Inter-connecting BFP to Feed control Station / Thru heater

### TYPICAL INSTALLATION AT SITE



Correct installation see next page >>



# Body Safety Arrangement in Pressure Seal Gate—How to Choose ?

## Valves inter-connecting BFP to Feed control Station / Thru Heater

### CORRECT INSTALLATION

