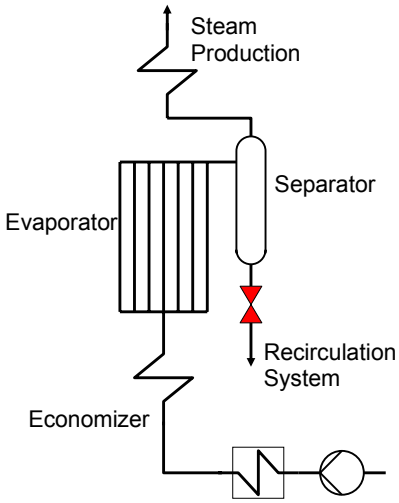
Boiler Start-up Valve Type BE

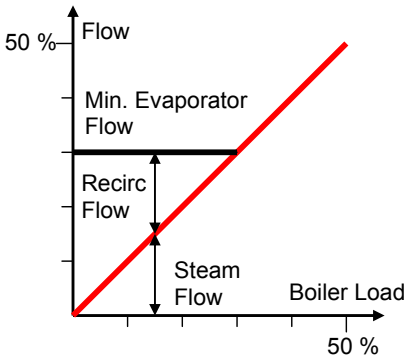
- **Compact, robust design**
- **Specifically designed as separator drain valve for supercritical boilers**
- **For operation with flashing water (saturated condition at the inlet)**
- **Quick change trim for easy maintenance**
- **Seat area purging to reduce particle damage**
- **Block tight according to MSS-SP61 or EN 12266-1 Class B**
- **Angle and Z-design available**

Application

Once-through boilers require a minimum evaporator flow for cooling of the boiler tubes during start-up (minimum evaporator flow for spiral wound evaporators is approx 30%).

A recirculation system recirculates water out of the water separator back into the feedwater tank or to the economizer/evaporator to ensure the minimum evaporator flow.





Different layouts of the recirculation system exist.

A) Recirculation of the water from the separator back to the feed water tank:

- The start up valve is in operating continuously at high differential pressure while the boiler load is below 30%. The medium at the inlet is saturated water which will immediately start to flash when pressure is reduced. The outlet condition is therefore a water steam mixture with high velocity due to the high steam amount.

B) Water recirculation from the separator to back to the economizer inlet with a recirculation pump:

- Initial start-up, with the volume expansion due to temperature increase and begin of evaporation, still requires a valve to dump saturated water from the evaporator to a flash tank. The start-up valves are for a short time in operation at high flow and high differential pressure.

In addition to the above operating modes the start-up valves are used also during boiler-filling and evaporator (air-) purging.
This operating mode requires typically high flow at low differential pressure.

Flashing conditions

Flashing water is highly erosive if it hits body or trim parts with high velocity. This must be avoided by design or the parts which are hit must be erosion resistant.
An angle over-the-plug configuration with its straight outlet for the flashing steam is therefore the most favourable configuration. A rapid increase of flow diameter at the point where the medium expands, avoids erosion downstream of the valve.
In the Z-shaped valve body an outlet cage is needed to protect the body. It is recommended to have a straight pipe run downstream of the valve because the flashing water will also erode pipe bends.

Debris

Boiler start-up Valves often experience debris, because the water separator is typically a debris collector of the boiler. On the other hand the valve has to be absolutely tight for long operating periods. If the seat is only slightly damaged by debris which has been clamped between seat and plug, then continuous leakage of flashing water will quickly erode the seat further and increase the seat leakage. This will lead to sever damage of the valve. Therefore the trim design should prevent that particles are trapped between seat and plug when the valve is closing.

Trim Design

To take into account the above described special and demanding operating conditions, the valve is designed with the following special features

- *Seat room purging*
  The trim is designed with a control edge upstream of the seat which shuts off the flow path for potentially damaging particles before the plug reaches the seat. The seat area is so through the remaining water flow purged before the plug is touching the seat

- *Vena contracta separate from the seat*
  In normal control mode the vena contracta (smallest flow area of the trim) is downstream of the seat. This is keeping potential erosion away from the seat, so that the seat area remains undamaged and tight.

- *Controlled gradual flow diversion*
  In the critical high velocity area, special care is taken to achieve a gradually controlled flow diversion.
  This makes sure that the erosive water steam mixture is not hitting trim surfaces with high velocity

- *Anti erosion coating on the control surface*
  The control surface of the plug is coated with a proven, hard anti erosion coating to ensure long life time of the trim

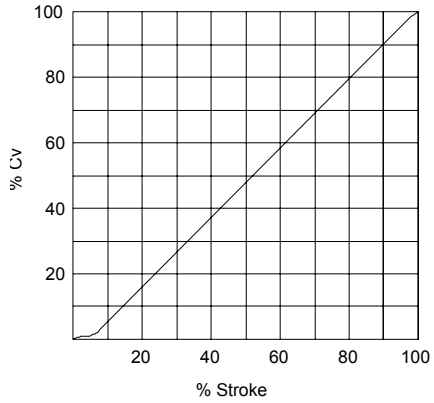
- For easy inspection and maintenance, none of the internals are welded or bolted to the body or bonnet. All trim parts can be dismantled as soon as the bonnet is opened.

- The Z-Body configuration allows access to the internal parts from the bottom of the valve. Removing the actuator to access the trim section is not required.

Technical Specification

Body style	Angle, flow to close Z-Design, flow to close
Pipe connection	Butt-welding acc. to customer's requirement
	Other connection types upon request
Design conditions	Pressure: 320 bar / 60 bar
	Temperature: 450 °C / 300°C
Design code	EN12516-2
Trim	Unbalanced, Quick change trim
Seat tightness	MSS-SP61 or EN 12266-1 Class B
Actuation	Double-acting hydraulic cylinder Electric actuator upon request
Serviceability	Replaceable stem/plug
	Replaceable seat
	Replaceable inlet cage (Z-Design: + outlet cage)
	Bolted bonnet
Options	Transition pieces for large pipe diameters and material compatibility
Orientation	No restrictions as for the valve operating position

Typical Flow Characteristic

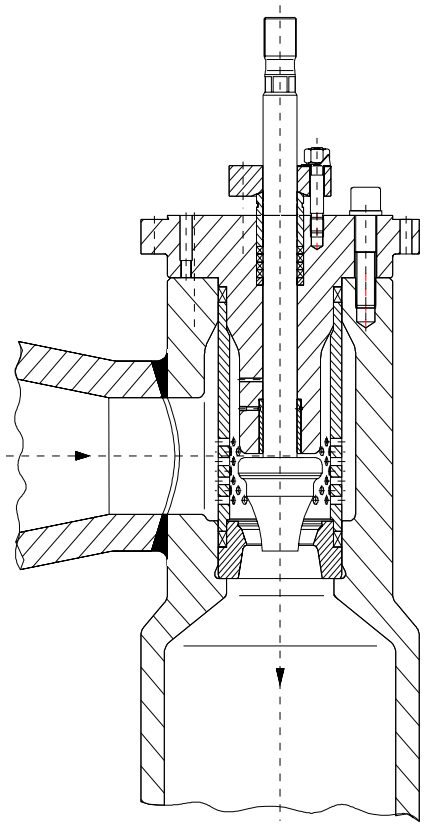
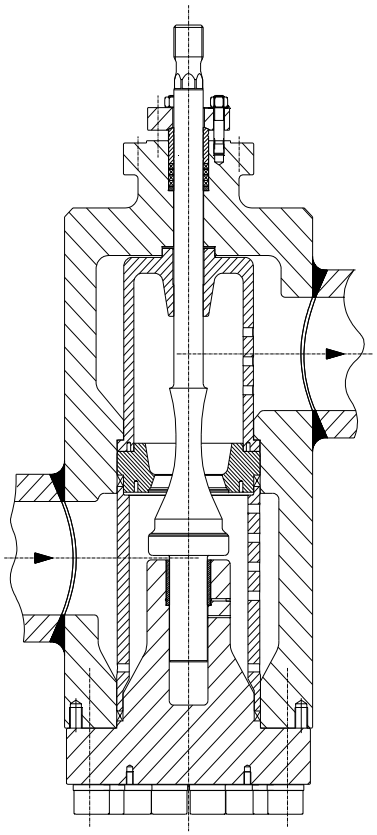


Typical Materials

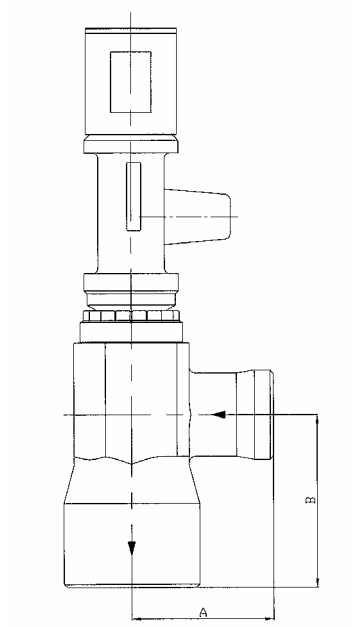
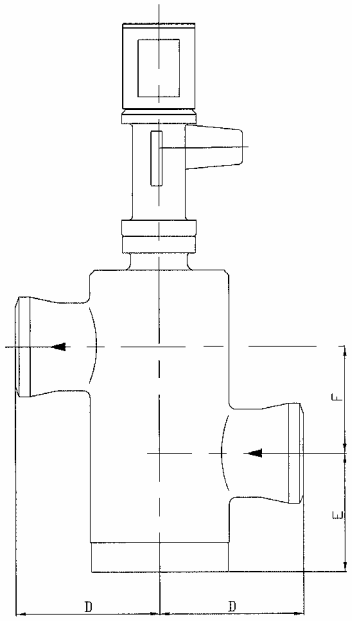
Body	A182 F12/13CrMo44 A182 F22/10CrMo910 *
Bonnet	Same as body
Cage(s)	X20CrMoV121
Stem/Plug	X19CrMoVNbN111
Seat	X20CrMoV121

*other body materials upon request

Trim design

BE Valve (Angle Design)	BE Valve (Z-Design)
	

Outline dimensions

BE Valve (Angle Design)	BE Valve (Z-Design)
	

	Angle Design				Z-Design				
	A *	B *	Weight	Flow Capacity	D *	E	F	Weight	Flow Capacity
	mm	mm	kg	Kv	mm	mm	mm	kg	Kv
BE45				43	300	250	250	530	43
BE50				48	300	250	250	530	48
BE56				60	300	250	250	530	60
BE63				81	360	280	280	700	81
BE72	340	380	660	101	360	280	280	700	101
BE80	380	420	700	129	360	280	280	700	129
BE90				162	430	330	300	910	162
BE100	410	500	810	225	430	330	300	910	225
BE112				285					285
BE125	460	550	1010	366	430	400	370	1300	366
BE140	510	600	1350	448					448
BE160				590					590
BE180	625	675	1900	778	600	470	500	2450	778
BE200				977	600	470	500	2450	977

* Dimensions are for reference only and may vary depending on inlet / outlet nozzle dimensions

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