TOTAL COST OF OWNERSHIP

TODAY FOR TOMORROW

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KLINGER Fluid Control

OVERVIEW

- Total cost of ownership of valves
- Life cycle cost of valves
  - Easy handling
  - Turbulences and flow losses
  - Maintenance free construction
  - EN488:2019 test
  - Reliable sealing system
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  - Double block & bleed functionality
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- Examples TCO

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TOTAL COST OF OWNERSHIP

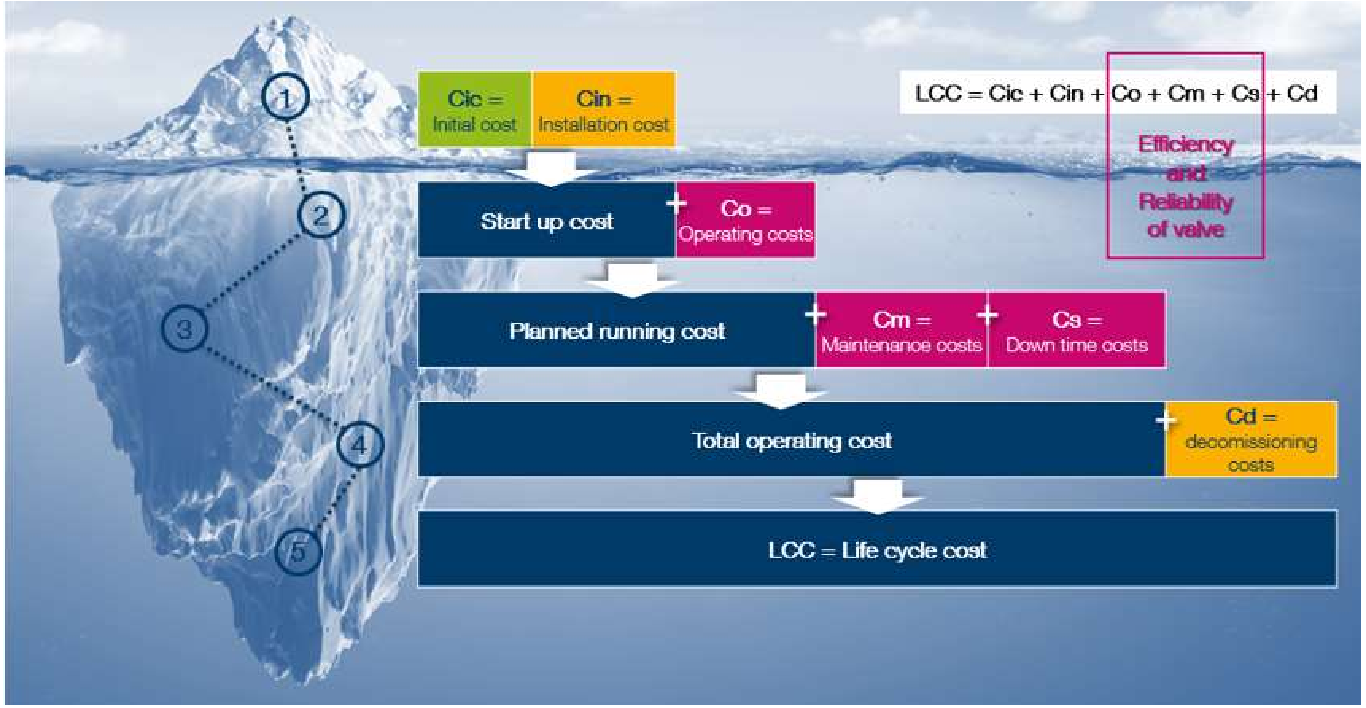
What makes our ball valve stand out?

The real cost of a valve is not just the purchase price, but includes the expenses incurred during the entire life of the valve. Whereby the costs due to pressure drops, failures, blockages and leaks, which eventually lead to production shutdowns, are often significantly higher than the original purchasing price of the valve. Do not count the purchase price of a valve without considering all relevant costs along the product life cycle.
KLINGER Fluid Control ball valves guarantee a perfect combination between technical performance and economic advantage. Initial costs, service-related costs, explicit and hidden costs that are incurred during the entire operating life of the valve are to be considered. This is the ideal way a plant owner should asses the long-term value of a valve.

The life cycle phases are defined by the following variables.

Life Cycle Cost
Initial cost (purchase price)
Installation & commissioning cost (pipe welding, crane, hoists etc.)
Operation costs (pressure losses)
Maintenance and repair costs
Down time costs (loss of production)
Decommissioning/disposal costs.

LIFE CYCLE COST



Definition of KLINGER Fluid Control Total Cost of Ownership:

An approach to maximize the return on investment of managed physical assets that includes the summation of all known and estimated costs (see below list) to include first, recurring, renewal / replacement, and end-of-useful life costs revised at critical decision points to aid in life-cycle asset management decisions.

(1) Cic = Initial cost + Cin = Installation costs
(2) Start-up costs + Co (Operating costs (Co) are costs associated with keeping the plant running (more specifically energy costs associated with pressure loss).
(3) Planned running costs + Cm + Cs
Cm = Maintenance costs for KLINGER Fluid Control ball valves are very low due to the avoidance of the following:
- Operating and checking the valve on a regular basis
- Dismantling the valve to change the sealing element
- Installation of the repaired or a new valve back in line
Cs = Down time costs can be very high. To empty the pipe, repair the valve as well as refill and test the network section can generate 20 to 30 % additional costs on top of the cost for the downtime.
(4) Total operating Costs + Cd (Decommissioning cost, which is the cost incurred by companies in reversing the modifications made to landscape when a fixed asset is used up).

LIFE CYCLE COST: (1) Cic INITIAL COST + Cin INSTALLATION COSTS

Easy handling:

The mounting direction is irrelevant for KLINGER ball valves (bi- directional sealing) and any position (vertical, horizontal, oblique…).

Extensions, gear boxes, actuators can be easily fitted for all KLINGER valves equipped with an ISO top flange.

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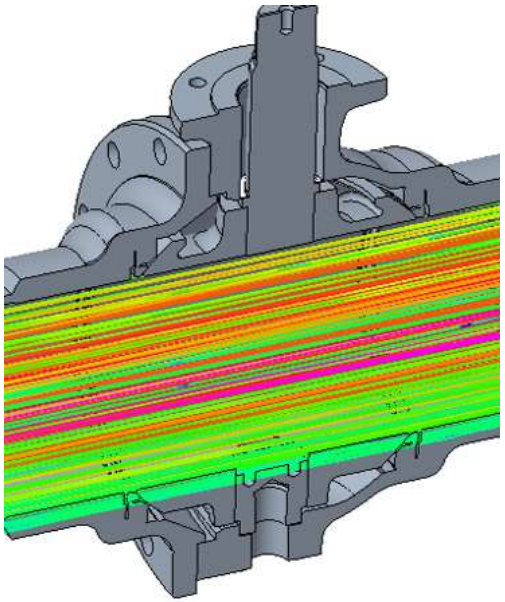
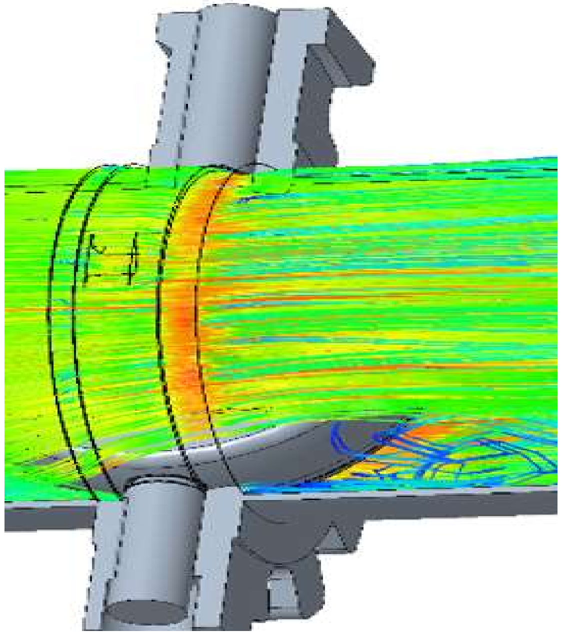
LIFE CYCLE COST: (2) START-UP COSTS + Co

Turbulences and flow losses:

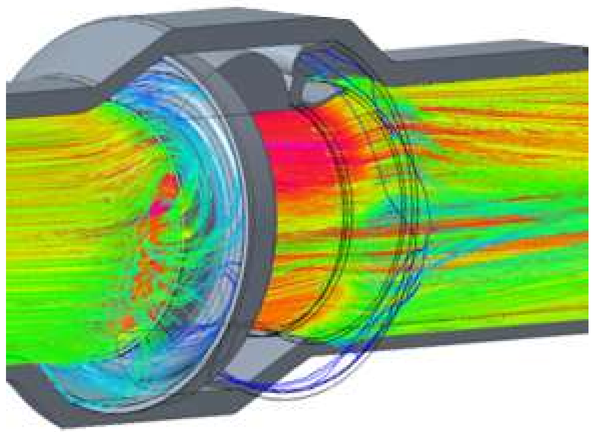
Full bore KLINGER ball valve



Butterfly valve



Reduced bore ball valve

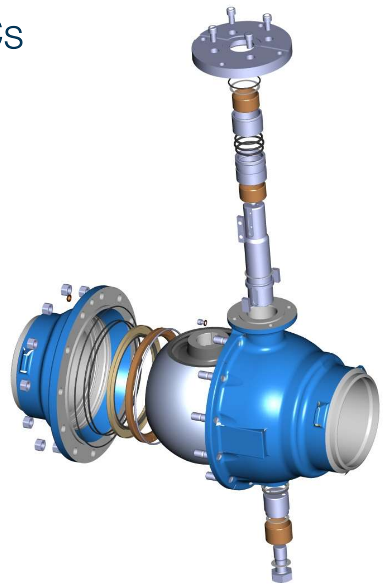


KLINGER ball valves:

There is no obstacle or reduced flow of the passage of the fluid. The flow is laminar and turbulences of the fluid are avoided due to the construction. The pressure losses are minimal and the energy cost for handling the fluid is reduced and smaller sized pumps can be used.

LIFE CYCLE COST: (3) PLANNED RUNNING COSTS + Cm + Cs

Maintenance free construction:



- » KLINGER BALLOSTAR ball valves are basically maintenance free
- » If necessary, stem o-rings can be changed inline
- » One operation per year is recommended (ball should left the seat for a few degrees only)
- » 5000 operations in one go were tested with air without any wear
- » 56 operations with different forces (tensile, compressive and bending) were tested with water 90°C and 25bar acc. EN488:2019 during 1 week
- » Estimated life time 25 to 30 years based on experience

RELIABILITY OF KLINGER VALVES – EXAMPLE:

This KHSVI was installed approx. 25 years ago in the hot water network of the Vienna district heating network. The customer operated the ball valve up to 25bar and 180°C. In summer 2019 the customer realised an increased torque. Then Vienna DH heating decided to replace the old one with an new DN800. They ordered a second one as a "spare" valve – but as a matter of trust and reliability of the product KLINGER offered them to check the old ball valves and if they are in good conditions we will do a "Retro fit" on the valves and offered them a cheaper but well working solution. This case shows the quality and reliability of our products.

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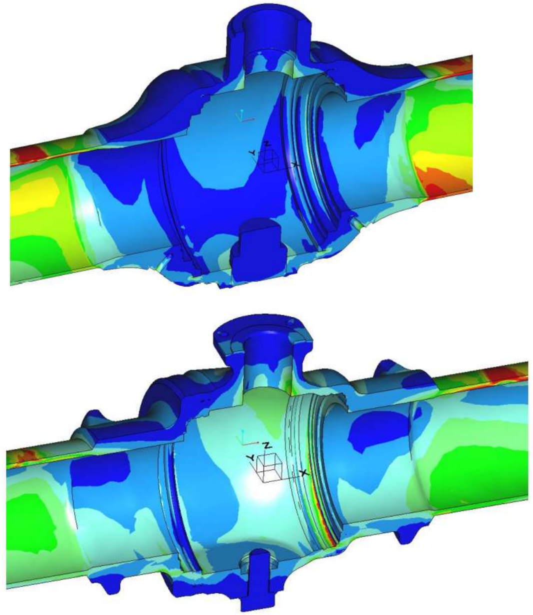
LIFE CYCLE COST: (3) PLANNED RUNNING COSTS + Cm + Cs

EN488:2019 test:



KLINGER ball valve model KHSVI and KHO fully welded consist of casted bodies and are tested acc. EN488:2019:

Plant operators are concerned of high stress, tension / compression and torsion forces in the piping network under the effect of heat.

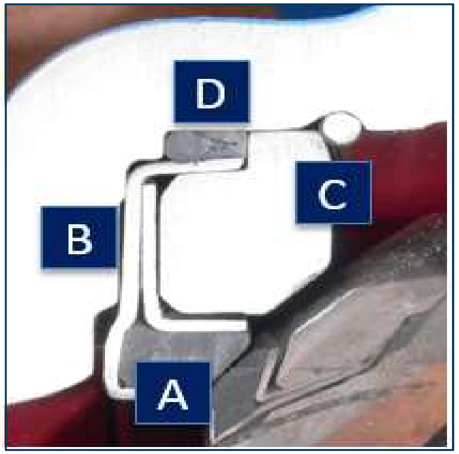
Therefore one of the main requirements is to have a particularly robust and stable body. To ensure that the valves remain operable over time, they are tested under various temperature and pressure acc. EN488.2019.

Advantages of casted material: difficult housing geometries are no problem, tension free, no complex weldings on housing are necessary, robust construction.

LIFE CYCLE COST: (3) PLANNED RUNNING COSTS + Cm + Cs

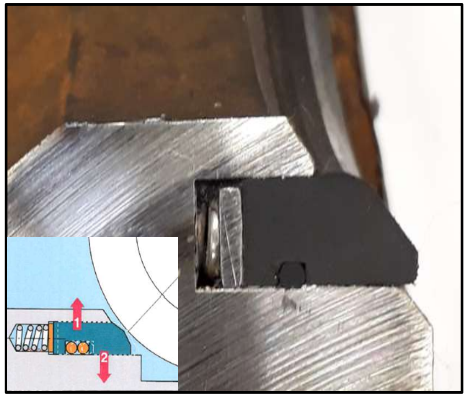
Reliable sealing system:

Sealing system KLINGER KH(SV)I valve :



- The pre-stressed diaphrgm springs (B) ensure contact of seat with the ball
- Seat (A) is fully enclosed and fixed in the housing
- Impurities can circulate easily behind the diaphrgm springs – there is no retention zone
- Support and wire ring (C) protect the sealing system against pressure hammers
- A static assembly - o ring joint and U – sleeve (D) seals between the fluid and cavity.
- Long service life due to construction

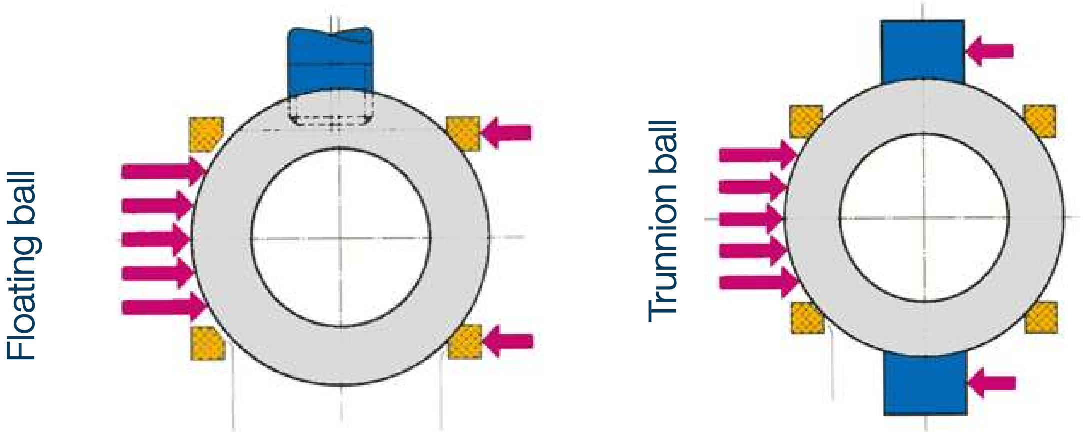
Spring loaded sealing system:

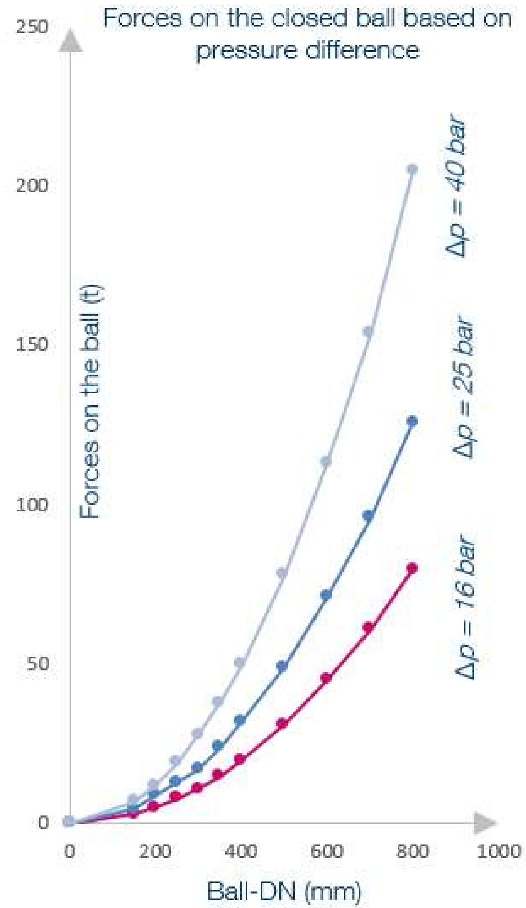


- The seat may creep as it is maintained on 2 sides only.
- The seat moves inside the housing. The seat get jammed because of thermal expansion. The spring system design do not prevent abrasive particles from getting inside the spring housing.
- The O-ring moves during every operation. Erosion and direct contact with media will damage the O-ring in short period of time.
- Lower service life due to spring loaded sealing construction

LIFE CYCLE COST: (3) PLANNED RUNNING COSTS + Cm + Cs

Trunnion mounted ball:

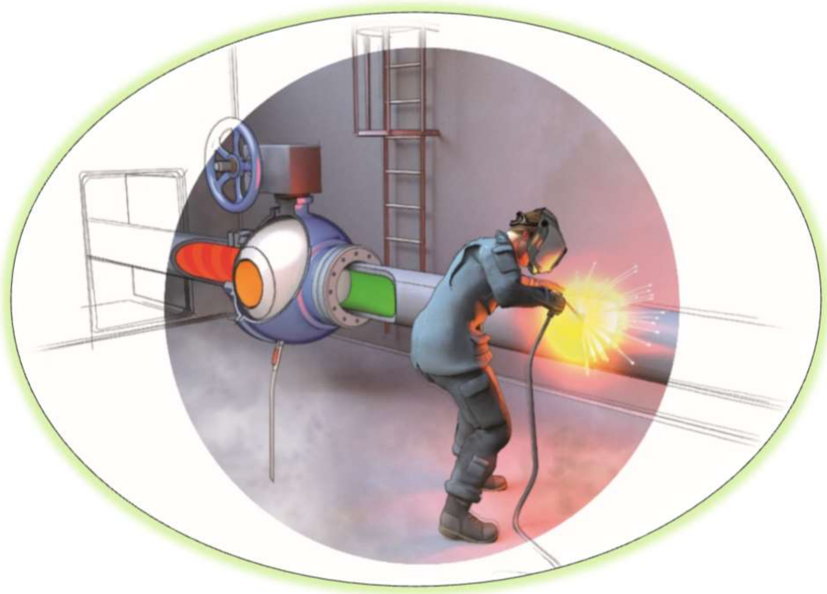




- The principle of a floating ball is suitable for small diameters. As the nominal diameter increases, the disadvantages due to the principle of the floating ball are: with increasing diameter and constant pressure, the force with which the ball is applied against the sealing element increases in square pressure. The ball is supported by the sealing elements – this can cause permanent deformation and malfunctions. Only the downstream sealing element ensures inline sealing.
- In order to avoid any deformation of the sealing elements and a risk of blocking of the ball, the sealing and guiding functions must be disassociated and trunnion mounted ball valves must be installed.

LIFE CYCLE COST: (3) PLANNED RUNNING COSTS + Cm + Cs

Double block & bleed functionality & safety:



- » During maintenance operations on the pipework, most serious or fatal accidents are related to a lack of energy control. In the majority of cases, safety was found to be incomplete. For fluids such as steam, superheated water and hot water, the risks are mainly related to pressure and temperature.
- » Safest solution for maintenance.
- » Smallest installation space.
- » TÜV certified shut-off valve with pressure relief.
- » After pressure relieve → the test valve allows to check the seat tightness.

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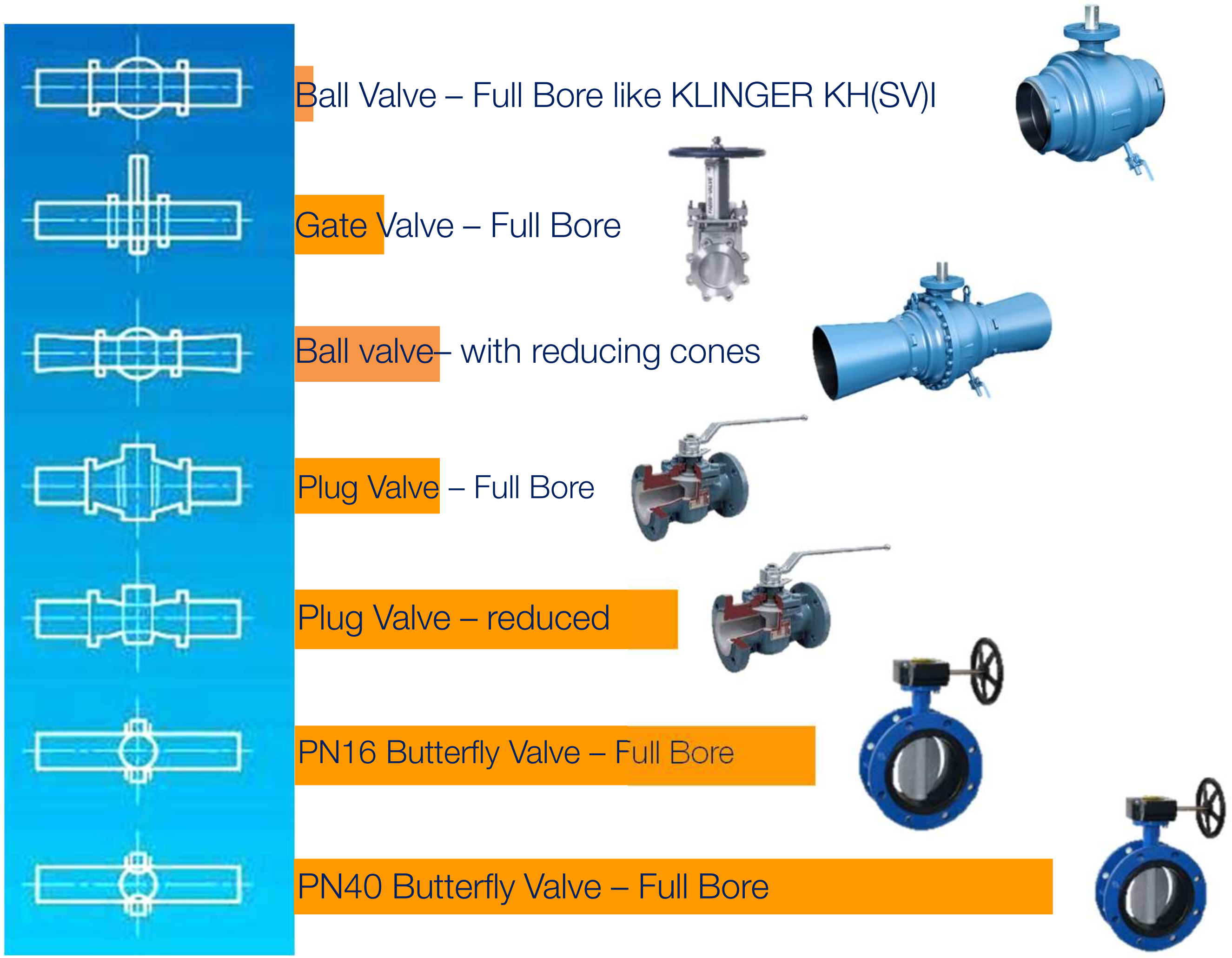
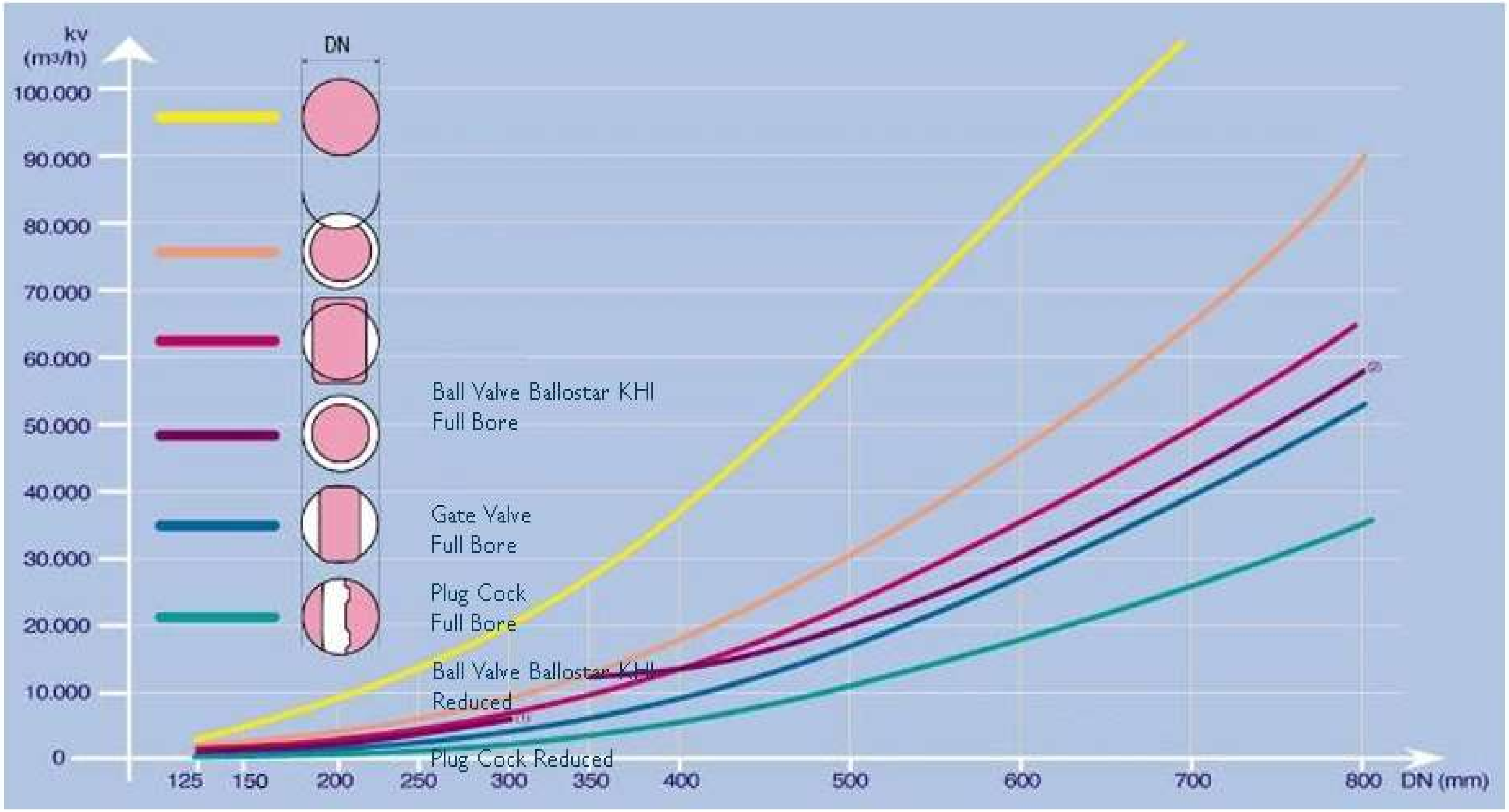
PRESSURE LOSS OF DIFFERENT VALVES:



FLOW RATE COMPARISON DIFFERENT VALVES:



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EXAMPLE TCO – ENERGY COSTS

Comparison pumping energy → Ball valve against butterfly valve

Calculation of the necessary pumping energy under these conditions:

» DN1000 hot water 150°C, 16bar, 3m/s

KV VALUE BALL VALVE KH(SV)I

g	150	200	250	300	350	400	500	600	700	80		1000
Kv	4.203	8.131	13.630	20.590	29.540	38.582	59.978					242.900
ξ	0,045	0,038	0,033	0,030	0,027	0,027	0,025	0,025	0,025	0,0		0,025

242900 m3/h

KV VALUE BUTTERFLY VALVE

800	32	30883	35910	0,69	25835	30041	0,98	24471	28455	1,09
900	36	39087	45450	0,69	32573	38224	0,97	30387	35334	1,14
1000	40	48255			40736	47367	0,96	37413	43503	1,14

48225 m3/h

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EXAMPLE TCO – ENERGY COSTS

		Ball valve Ballostar DN 1000	Butterfly valve DN 1000
Flow	m^3/h	8.482	8.482
KV value	m^3/h	242.900	48.255
Pressure drop	Pa	121	3.090
Energy	KW /h/ year	2.517	63.776
Elektro - Energy	KW/h in pounds	0.191	0.191
Annual costs	Pounds / year	480	12.181

EXAMPLE TCO - MAINTENANCE

Durability:

» Proofed long-term reliability
» Determined double life time compared to competitive products
» Maintenance cycles (6 to 8 years) and planned shutdowns can be extended twice as long as with competitor valves (2 to 3 years)