Ball valves KM – General information

Description and design

Ball valves KM are characterized by robust design designed with respect to as longest as possible lifetime and durability. Rolled or forged steel is used for production of pressure-retaining components. The main parts are body, body cover with ends for connection of the ball valve to the piping, ball, seats and stem.

The ball valves are supplied in two series as a standard:
- according to European standards EN 1983
- according to American standards API 608 and API 6D (EN 13942)

Common design features of all ball valve types

The valve bore in open position conforms to EN 1983 or API 608 (for valves according to American standards). The ball valves are supplied with full bore as a standard feature or with reduced bore upon request. The stem design ensures that the stem can not be ejected from the valve body by pressure of the fluid (anti-blow-out stem), internal components are connected to provide conductivity and resistance to formation of electrostatic discharges (anti-static design).

The ball valves can be equipped with the following ends for connection to the piping:
- internal thread G or NPT or other thread type, if required
- external thread (usually metric thread for hydraulic pipe union)
- weld ends, either butt-weld ends or socket-weld ends
- flanges according to European or American standards or with special modification of raised face (Groove, Tongue, Spigot, Recess).

The standard design of the closure system is a floating ball supported by two seats which provides for tightness in the downstream seat. The ball valve can be supplied with doubled sealing effect as well, i.e. with simultaneous seal against pressure in both seats (so-called double-block-and-bleed (DBB) and double-piston (DP) effect).

The stems of ball valves for normal temperatures are sealed with a combination of O-rings and PTFE rings as a standard feature, for high temperatures a graphite packing is used, for very low temperatures a PTFE packing is used.

Special design features of selected ball valve types and optional accessories

- ball supported by carbon seats for temperatures up to +500 °C (“HT” designation, formerly “03.1”)
- fire-safe design – fire resistance in accordance with EN ISO 10497 (API 607). For ball valves according to American standards as a standard feature, for other ball valves upon request (“FS” designation).
- ball valve body with heating jacket – for keeping the fluid liquid. For fluids which are in solid state at room temperature (e.g. bitumen, sulphur, etc.). The heating fluid is usually steam or oil, the heating jacket is equipped with flanged or threaded connecting ends (“HJ” designation, formerly “06”).
- lockable handle with a padlock – for locking opened / closed position of the valve (“Z” designation)
- regulating orifice – for regulating purposes, with either PTFE seats or metal-to-metal seats (“R” designation)
- underground set – for underground service, with either constant length (“UF” designation) or telescopic design (“UA” designation)
- extended stem – e.g. for the reason of insulation of the valve and pipeline, special design for cryogenic temperatures (down to −200 °C) (“CT” designation, formerly “04”)
- metal-to-metal sealing of the ball:
  - with fixed seats, for fluids containing mechanical impurities not exceeding 0,5 mm (“MDX” designation)
  - with floating seats, for fluids containing mechanical impurities not exceeding 5 mm (“MFX” designation)
- welded body – frequently required for buried ball valves (“FW” designation)
- design according to TA-Luft or EN 15848-1,
- up-stream vent hole – for balancing pressure into up-stream pipeline
- limit switches
- special adjustments according to customer requests

Operation

The ball valves are operated manually as a standard, by turning the lever through an angle of 90°. The end positions are limited by stops. Ball valves of bigger sizes and for higher pressures are operated by a gearbox with a handwheel. If required by the customer, ball valves can be equipped with electric or pneumatic actuators. The actuator size depends on the maximum pressure drop through the ball. Dimensions of flanges for actuator installation are in accordance with ISO 5211.

Material variants

Ball valves are manufactured with the following standard materials of the body:

9xxx.1
- carbon steel for normal temperatures (from −20 °C to +300 °C),
  S355J2 (1.0577) as a standard, approximate equivalent of ČSN 11 523, ASTM A105 steels

9xxx.3
- corrosion-resistant austenitic chrome-nickel stainless steel (for temperatures from −200 °C to +500 °C),
  1.4541 as a standard, equivalent of ČSN 17 246, ASTM A182 F321, A182 F304 steels

9xxx.4
- corrosion-resistant austenitic chrome-nickel-molybdenum stainless steel
  (for temperatures from −200 °C to +500 °C),
  1.4571 as a standard, equivalent of ČSN 17 346, ČSN 17 348, ASTM A182 F316Ti steels

9xxx.5
- carbon steel for low temperatures (from −46 °C to +400 °C),
  ASTM A350 LF2 as a standard, in some cases from −60 °C to +400 °C.

By mutual agreement and based on service conditions, also other body materials may be used (e.g., austenitic stainless steels with low carbon content, duplex stainless steels, etc.).

Materials for all pressure-retaining components are purchased with 3.1 certificate according to EN 10 204.

Ball valve application

Ball valves described in this catalogue are isolating valves designed to be used to open or close the service fluid flow in the piping fully. The scope of application of the ball valves depends directly on their materials and type.

The ball valves are intended to be used with a wide range of fluids, especially heating gases (natural gas, lighting gas, propane-butane mixture, biogas, coke-oven gas), water, steam, oxygen, and both corrosive and non-corrosive liquids and gases in general.

The ball valves are approved in accordance with the Decree of the Government No. 219/2016 Coll., and in accordance with the Directive 2014/68/EU of the European Parliament and of the Council, as pressure equipment within the meaning of piping and pressure equipment for the use of fluids in group 1 (hazardous fluids under a special legal regulation - Regulation of the European Parliament and of the Council No 1272/2008) and in group 2 (other fluids not listed in group 1).

The following has to be investigated to determine the suitability of application of a specific ball valve type for specific parameters of the fluid:

Corrosive effects of the fluid

on components being in contact with the fluid. These are:
- materials of the body and the trim of the ball valve
- elastomer (rubber) sealing rings (if used with the type in question)
- graphite packing (if used with the type in question).

In order to assess the corrosive effects of the fluid properly, the chemical composition of the fluid (including concentrations of individual constituents) and the range of service temperatures have to be known. The company

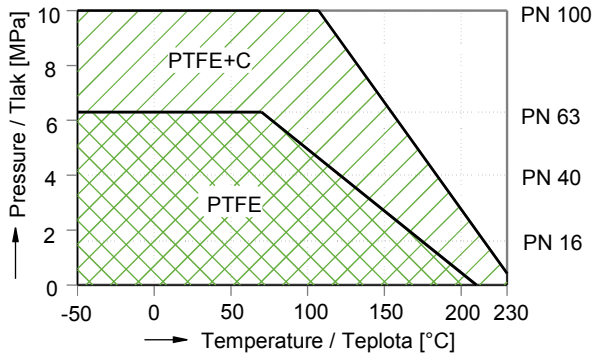
KE-ARM is in possession of an extensive database of information about corrosive effects of fluids on different materials and is able to suggest such a ball valve type to the customer which meets all specified parameters at the most favourable price.

Temperature and pressure of the service fluid

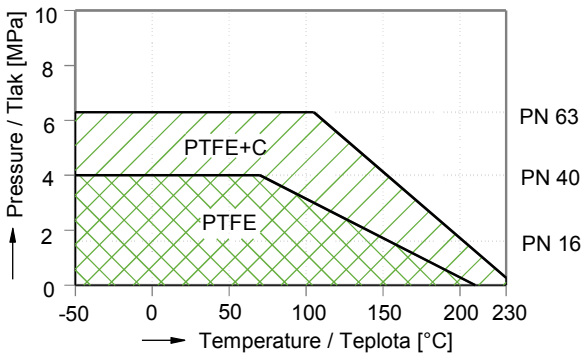
The body, the seat and the elastomer seals used in the ball valve shall simultaneously withstand the required service pressure at the service temperature.

Resistance of the valve seat

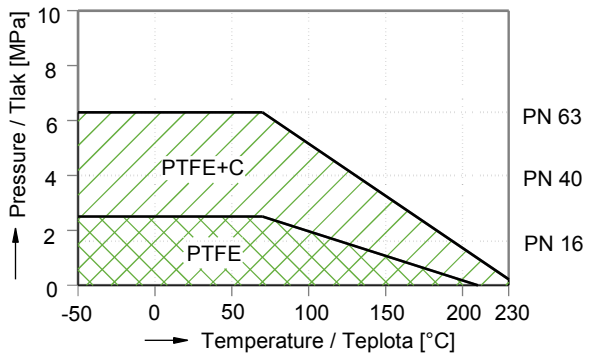
The maximum allowable pressure of the fluid on the ball in 'closed' position is shown for specific seat materials, temperatures, pressure classes PN or Class, and nominal sizes DN in the graphs below. The graphs apply to ball valves with seats made of PTFE, PTFE+C (RPTFE) and PEEK. Ball valves with carbon seats (series “HT”, formerly “03.1”) and metallic seats (series “MDX” and “MFX”) require no assessment of effects of pressure on the seats. Graph for PTFE+C applies to ball valves with metallic seats (series “MX”) as well. In case of ball valves with reduced bore, the DN values in the graphs apply to the ball. Depending on the type of valve, the values in the tables may vary slightly, therefore the required maximum working pressure of the seat at the maximum operating temperature of the valve should be given in the purchase order. This value will then be listed in the test report of the valve.



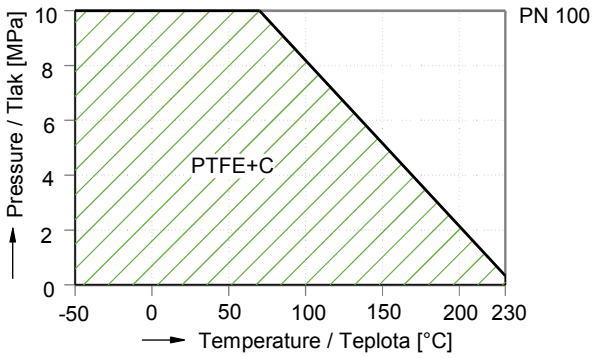
Graph S1: *DN 10–50, PN 16, 40, 63, 100*



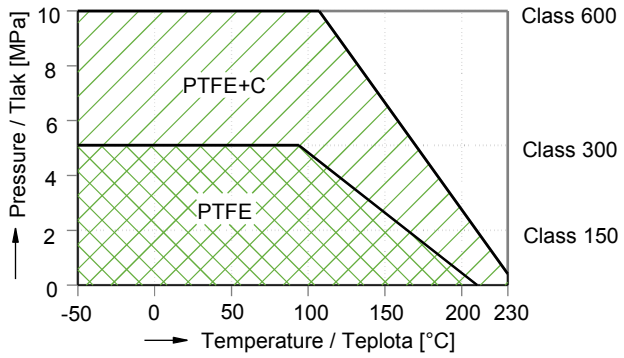
Graph S2: *DN 65–100, PN 16, 40, 63*



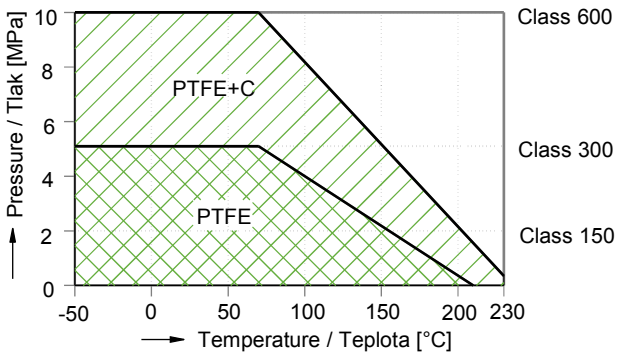
Graph S3: *DN 125–300, PN 16, 40, 63*



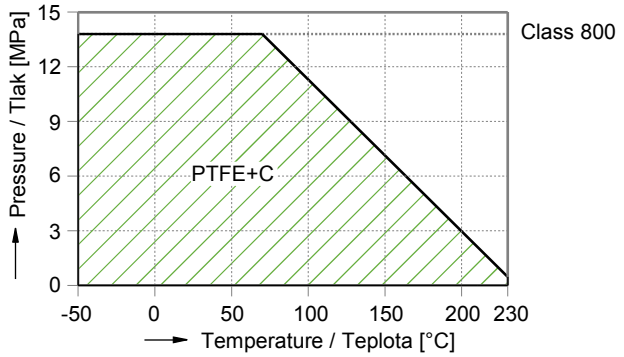
Graph S4: *DN 65–150, PN 100*



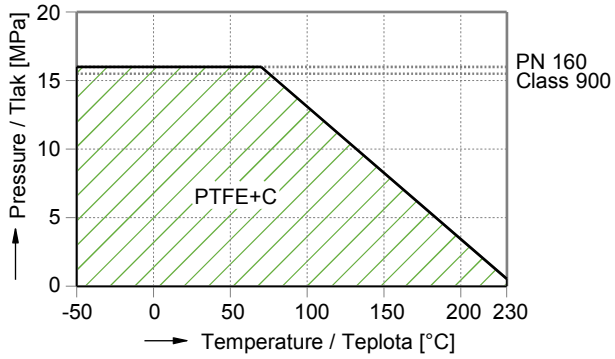
Graph S8: *NPS ½"–1 ¼", Class 150, 300, 600*



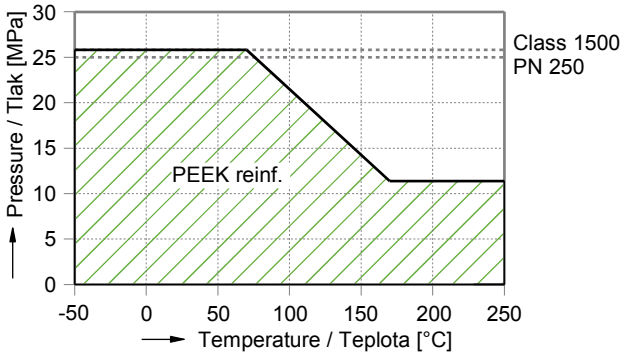
Graph S9: *NPS 1 ½"–3", Class 150, 300, 600*



Graph S12: *NPS ½"–3", Class 800*



Graph S14: *DN 10–100, PN 160*
Graph S14: *NPS ½"–4", Class 900*



Graph S15: *DN 10–65, PN 250*
Graph S15: *NPS ½"–2 ½", Class 1500*

Resistance of elastomer sealing rings

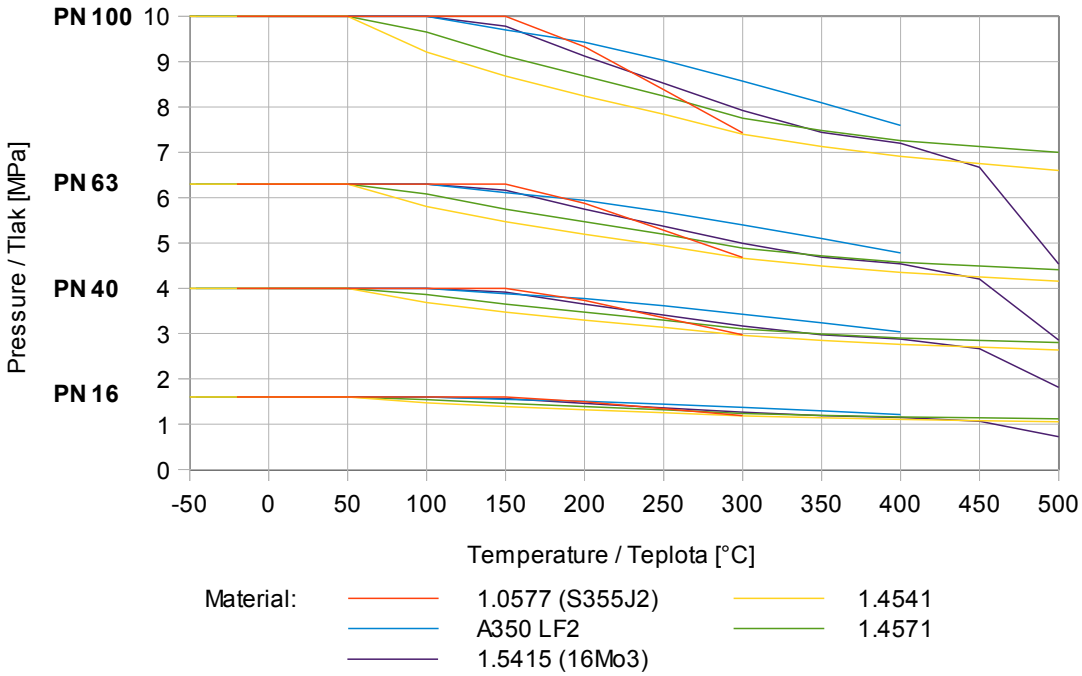
In case of application of elastomer sealing rings we supply these materials:

- NBR – most widely used and most price-favourable material, temperature range from −30 °C to +100 °C
- EPDM – temperature range from −45 °C to +130 °C
- FPM – temperature range from −20 °C to +200 °C.

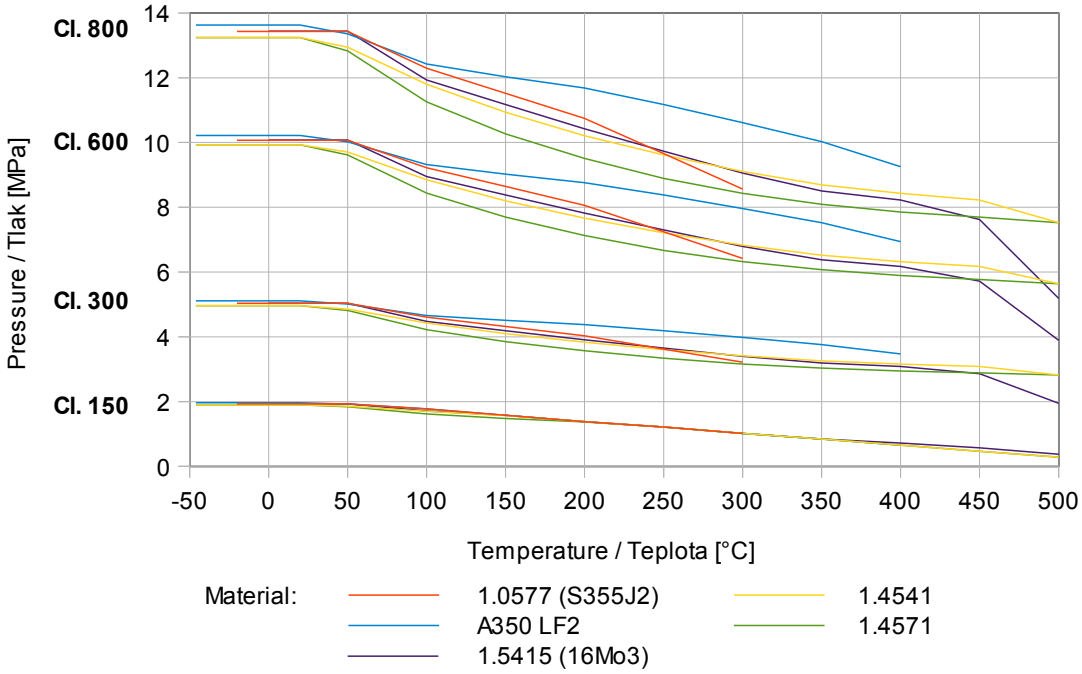
In case of large orders, also special materials can be supplied, e.g. HNBR, EPDM, FPM, FFKM for different limit temperatures (e.g. −50 °C, + 280 °C).

Resistance of the valve body as to strength

The maximum allowable service pressure of the fluid in the ball valve is shown for specific materials, temperatures and pressure classes PN or Class in the graphs below.



Graph B1: *Dependence of the maximum service pressure of the fluid on temperature and pressure class of the ball valve, ball valves according to European standards*



Graph B2: *Dependence of the maximum service pressure of the fluid on temperature and pressure class of the ball valve, ball valves according to American and British standards*

Type number composition

KM 9ABC.D-EF..., where:

A – character of flow profile
- 1 – straight pattern ball valve
- 3 – three-way ball valve
- 4 – four-way ball valve

B – character of operation
- 0 – operation by lever
- 3 – operation by gearbox or actuator (or only ready for installation of gearbox or actuator)

C – character of connection to the piping
- 1 – internal thread
- 2 – external thread
- 3 – weld end
- 7 – wafer type
- 8 – flanges

D – character of material variant
- 1 – carbon steel for normal temperatures
- 3 – corrosion-resisting austenitic chrome-nickel stainless steel
- 4 – corrosion-resisting austenitic chrome-nickel-molybdenum stainless steel
- 5 – carbon steel for low temperatures
- 8 – alloyed steel for high temperatures
- 9 – steels or alloys with specific properties

EF... – additional characters for more detailed specification of the type.

Quality and certification

The company has been applying a quality management system according to EN ISO 9001 since 2004, which is being regularly tested, thus demonstrating the ability to meet customer requirements and achieve high quality products and services.

The company owns a complex of certificates required for the development, manufacture, export and service of valves in harsh operating conditions in the domestic and foreign markets:
- Quality Management System EN ISO 9001
- Declaration of Conformity with PED 2014/68/EU (CE marking)
- Fire resistance approval according to ČSN EN ISO 10497 (API 607)
- Certificate ATEX (Ex) for potentially explosive atmospheres according to EN 13463–1
- Certificate for use of valves with Oxygen
- Certificates for the Eurasian Customs Union – EAC
- Certificate SIL 2 – Safety Integrity Level of technical system

Inspection and testing

All ball valves are subject to the following tests as a standard:
- ball valves according to European standards are tested according to EN 12 266-1, i.e. shell strength test P10, P11, seat tightness test P12 (water pressure 1,1×PN and air pressure 0,6 MPa), leakage rate A – zero leakage.
- ball valves according to American standards are tested according to API 598 or API 6D – zero leakage.

If required by the customer, additional tests may be performed as well.

Documentation

The following documentation is delivered together with the ball valve as a standard:

- test report
- dimensional sketch with list of materials used
- certificate according to EN 10 204 3.1
- installation and operation instructions
- declaration of conformity

Additional documents as required by the customer (i.e. certificate according to EN 10 204 3.2).

Spare parts

Spare parts can be supplied according to an agreement with the customer (i.e. sealing material).

Guarantee

Standard guarantee period is 24 months from receipt of goods.

Installation, service and maintenance

The ball valves may be installed into the piping in any arbitrary position. They require no special adjustments or maintenance. They are operable at the full pressure drop which equals to PN (or the corresponding pressure Class). The operability depends essentially on the service life of the ball sealing system and the stem sealing system, it means that of the seats and the rubber O-rings (if used). The service life of metal parts of the body, the ball and the stem is at least 20 years. The service life (functional ability) of PTFE seats and rubber O-rings is at least 5000 cycles of 'open-close'; if the ball is operated infrequently, their service life (to the first leakage) is given by the service life of the rubber, i.e. at least 3 years. However, the parameters of the fluid as confirmed in the purchase contract (temperature, pressure, chemical composition, concentration, purity) have to be maintained.

Welding to piping

When welding the ball valves type KM 9103.X-01 into the pipeline, the following procedure must be followed:

1. Prior to welding, open the ball valve fully.
2. Do not release and do not remove the sockets from the body!
3. Use a welding procedure with which the temperature around rubber O-rings and seats in the body does not exceed 120 °C. It is possible to limit the temperature, for instance, with a heat absorbing paste.

Ordering

The following information shall be supplied in the purchase order:

- nominal size
- nominal pressure
- ball valve type with reference to this document
- service conditions (fluid type, service pressure, service temperature)
- required material variant
- specification for closure tightness test (in case of special requirements)
- requirements for documentation
- requirements for packaging
- required quantity
- quotation number, if the goods are ordered on the basis of a quotation.