

Check valves KM – General information

Description and design

Vertical lift-type check valves KM are characterized by high reliability and long service life issuing from a simple and elegant structural design and high quality of wrought semi-products used.

The main parts of the one-piece shell are: body containing a seat assembly which is usually weld-deposited with a high-quality alloy overlay and equipped with connecting ends for connection to the piping, disc made of high-quality alloyed steel or having a seat which is weld-deposited with a high-quality alloy overlay, disc guides and bearings. In addition to the above, the split design of the shell contains a body connector with connecting end, gasket and bolting components.

Additional components of the check valve with automatic relief are spring, piston, piston bushing, orifice plate insert made of hard stainless steel, and orifice plate made of hard metal.

Vertical lift-type check valves are designed in compliance with ČSN EN, ČSN and DIN standards.

Common design features of all types of vertical lift-type check valves

Vertical lift-type check valves are not designed as conventional isolating valves, but their function is protection of pumps against reverse flow of the pumped fluid. Vertical lift-type check valves are uni-directional valves only. Their operation is fully automatic.

The valves can be equipped with following connecting ends:

- flanges according to ČSN EN, ČSN or DIN standards, flanges with adapted raised faces (recess, groove)
- butt-welding ends.

A one-piece shell is preferred for check valves with flanged ends.

Check valves with welding ends have always a two-piece design of the shell (body-cover).

Material specification

Vertical lift-type check valves are manufactured with bodies made of the following main materials:

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- corrosion-resistant stainless austenitic wrought chrome-nickel steel (for temperatures from -200°C to $+550^{\circ}\text{C}$), 1.4541 as a standard, corresponding to ČSN 17 246, ASTM A182 F 321, A182 F 304 steels
- corrosion-resistant stainless austenitic wrought chrome-nickel-molybdenum steel (for temperatures from -200°C to $+550^{\circ}\text{C}$), 1.4571 as a standard, corresponding to ČSN 17 346, ČSN 17 348, ASTM A182 F 316 steels

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- alloyed steel with properties for higher temperatures (for temperatures from -10°C to $+530^{\circ}\text{C}$), 1.7335 as a standard, corresponding to ČSN 15 121, ASTM A 182 F 12b steels

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- wrought carbon steel for normal temperatures (from 0°C to $+300^{\circ}\text{C}$), S355J0 (1.0553) as a standard, corresponding approximately to ČSN 11 523, ASTM A 105 steels
- wrought carbon steel for normal temperatures (from 0°C to $+300^{\circ}\text{C}$), S355J2G3 (1.0570) or S355J2 (1.0577) as a standard, corresponding approximately to ČSN 11 523, ASTM A 105 steels
- wrought carbon steel for low temperatures (from -40°C to $+400^{\circ}\text{C}$), 1.0565 as a standard, corresponding to ČSN 11 503 steel. Depending on momentary availability, this material may be replaced with equivalent American material ASTM A 350 LF2 suitable for temperatures from -46°C to $+345^{\circ}\text{C}$.

Depending on service conditions, other body materials may be used by agreement as well.

Applications of vertical lift-type check valves

Characteristic of the valve function and classification of the service fluid

Vertical lift-type check valves described in this catalogue are designed to protect pumps against reverse flow of the pumped fluid. However, they are not designed as conventional isolating valves.

Check valves of types KM 9901 and KM 9902 are designed to be used with fluids in groups 1 and 2 according to Section 3(1)(a, b) of Decree of the Government No. 26/2003 as subsequently amended, i.e. water with the exception of potable water, non-aggressive fluids (liquids, gases, vapours, air), oil and oil products, gaseous fuels, inorganic and organic media (acc. to materials used and after an agreement with a manufacturer). This specification corresponds to Article 9 (2.1, 2.2) of the European Parliament and Council Directive 97/23/EC.

The service fluid shall not contain hard and abrasive particles as this could damage the seating surfaces and bring about heavier untightness or sticking of the disc or seizing of the piston in the bearings. The same applies to impurities in the piping system during installations, repairs or replacements.

Check valves of type KM 9903 are designed to be used with fluids in group 2 according to Section 3 (1)(b) of Decree of the Government No. 26/2003 as subsequently amended, i.e. water with the exception of potable water, non-aggressive liquids. This specification corresponds to Article 9 (2.2) of the European Parliament and Council Directive 97/23/EC, but it is recommended to use this valve for demineralized water only. The service liquid shall not contain hard and abrasive particles as this could damage the seating surfaces and bring about heavier untightness or sticking of the disc or seizing of the piston in the bearings. The same applies to impurities in the piping system during installations, repairs or replacements.

Temperature and pressure of the service fluid with respect to the valve body material

The limiting values of service pressure and temperature of the fluid with respect to the material grade from which the valve body and/or cover are made are shown in the following system of pressure/ temperature ratings.

Because the split design of the valve incorporates a gasket made of expanded graphite or a combined gasket or a purely steel gasket suitable for high temperatures (recommended up to +550°C) to seal the body-cover joint, the strength of the valve body material is the main factor for determination of limiting conditions that define the area of safe use of the check valve.

Pressure / Temperature ratings of most frequently used materials

Mat.	PN	TS [°C]												
		-50	-10	50	100	150	200	250	300	350	400	450	500	550
1.4571	16	16,0	16,0	16,0	16,0	15,6	14,9	14,1	13,3	12,8	12,4	12,2	12,0	11,9
	25	25,0	25,0	25,0	25,0	24,5	23,3	22,1	20,8	20,1	19,5	19,1	18,8	18,6
	40	40,0	40,0	40,0	40,0	39,2	37,3	35,4	33,3	32,1	31,2	30,6	30,0	29,9
	63	63,0	63,0	63,0	63,0	61,8	58,8	55,8	52,5	50,7	49,2	48,3	47,4	47,1
	100	100,0	100,0	100,0	100,0	98,0	93,3	88,5	83,3	80,4	78,0	76,6	75,2	74,7
	160	160,0	160,0	160,0	160,0	156,7	149,2	141,5	133,2	128,5	124,7	122,4	120,2	119,4
	250	250,0	250,0	250,0	250,0	245,2	233,3	221,4	208,3	201,1	195,2	191,5	188,0	186,8
	320	320,0	320,0	320,0	320,0	313,9	298,8	283,4	266,7	257,4	249,8	245,2	240,7	239,2
	400	400,0	400,0	400,0	400,0	392,3	373,4	354,2	333,4	321,8	312,2	306,5	300,9	298,9
1.4541	16	16,0	16,0	16,0	15,8	14,9	14,1	13,4	12,7	12,2	11,8	11,6	11,3	10,8
	25	25,0	25,0	25,0	24,7	23,3	22,1	21,0	19,8	19,1	18,5	18,1	17,7	16,9
	40	40,0	40,0	40,0	39,6	37,3	35,4	33,7	31,8	30,6	29,7	29,0	28,3	27,0
	63	63,0	63,0	63,0	62,4	58,8	55,8	53,1	50,1	48,3	46,8	45,7	44,7	42,6
	100	100,0	100,0	100,0	99,0	93,3	88,5	84,2	79,5	76,6	74,2	72,6	70,9	67,6
	160	160,0	160,0	160,0	158,3	149,2	141,5	134,6	127,1	122,4	118,6	116,0	113,3	108,1
	250	250,0	250,0	250,0	247,4	233,2	221,2	210,4	198,6	191,3	185,4	181,3	177,1	168,9
	320	320,0	320,0	320,0	316,7	298,5	283,2	269,4	254,3	245,0	237,4	232,1	226,7	216,2
	400	400,0	400,0	400,0	396,1	373,3	354,1	336,9	318,0	306,4	296,9	290,3	283,6	270,5

Mat.	PN	TS [°C]																
		-10	100	150	200	250	300	350	400	450	460	470	480	490	500	510	520	530
1.5415	16	16,0	16,0	16,0	14,8	13,7	12,1	11,2	10,1	9,4	8,9	8,5	8,0	7,5	7,0	5,6	4,4	3,5
	25	25,0	25,0	25,0	23,2	21,4	19,0	17,5	15,8	14,7	14,0	13,2	12,5	11,8	11,0	8,8	7,0	5,5
	40	40,0	40,0	40,0	37,1	34,2	30,4	28,0	25,3	23,6	22,4	21,2	20,0	18,9	17,7	14,0	11,2	8,9
	63	63,0	63,0	63,0	58,5	54,0	48,0	44,1	39,9	37,2	35,3	33,4	31,6	29,7	27,9	22,2	17,7	14,1
	100	100,0	100,0	100,0	92,8	85,7	76,1	70,0	63,3	59,0	56,0	53,1	50,2	47,2	44,2	35,2	28,0	22,3
	160	160,0	160,0	160,0	148,5	137,1	121,9	112,0	101,3	94,4	89,7	85,0	80,3	75,6	70,8	56,3	44,9	35,8
	250	250,0	250,0	250,0	232,0	214,2	190,4	170,0	158,3	147,6	140,1	132,8	125,5	118,2	110,7	88,0	70,2	55,9
	320	320,0	320,0	320,0	297,1	274,2	243,8	224,0	202,6	188,9	179,4	170,0	160,6	151,3	141,7	112,7	89,9	71,6
	400	400,0	400,0	400,0	371,4	342,8	304,7	280,0	253,3	236,1	224,2	212,5	200,8	189,1	177,1	140,9	112,3	89,5
1.7335	16	16,0	16,0	16,0	16,0	16,0	14,7	13,5	12,7	11,8	11,4	11,1	10,7	10,4	10,4	8,8	7,1	5,9
	25	25,0	25,0	25,0	25,0	25,0	22,9	21,1	19,8	18,4	17,9	17,3	16,8	16,2	16,3	13,8	11,1	9,2
	40	40,0	40,0	40,0	40,0	40,0	36,7	33,9	31,8	29,5	28,6	27,7	26,8	26,0	26,0	22,0	17,9	14,8
	63	63,0	63,0	63,0	63,0	63,0	57,9	53,4	50,1	46,5	45,1	43,7	42,3	40,9	41,1	34,8	28,2	23,4
	100	100,0	100,0	100,0	100,0	100,0	91,9	84,7	79,5	73,8	71,6	69,4	67,2	65,0	65,2	55,2	44,7	37,1
	160	160,0	160,0	160,0	160,0	160,0	146,9	135,3	127,1	118,0	114,4	110,9	107,3	103,9	104,2	88,2	71,4	59,2
	250	250,0	250,0	250,0	250,0	250,0	229,5	211,6	198,6	184,4	178,9	173,3	167,8	162,3	162,9	137,9	111,6	92,5
	320	320,0	320,0	320,0	320,0	320,0	293,9	271,0	254,3	236,1	229,0	221,9	214,8	207,9	208,5	176,5	143,0	118,5
	400	400,0	400,0	400,0	400,0	400,0	367,4	338,7	317,9	295,1	286,2	277,4	268,5	259,8	260,7	220,7	178,7	148,2

TS – limiting allowable temperature of the body [°C]; PS – limiting allowable pressure of the fluid [bar]

Mat.	PN	TS [°C]													
		-50	-46	-40	-20	-10	0	50	100	150	200	250	300	350	400
		PS [bar]													
1.0565 P355NH	16	-	-	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	14,9	13,4	11,2
	25	-	-	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	23,3	21,0	17,5
	40	-	-	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	37,3	33,7	28,0
	63	-	-	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	58,8	53,1	44,1
	100	-	-	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	93,3	84,2	70,0
	160	-	-	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	149,2	134,6	112,0
	250	-	-	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	233,2	210,4	175,0
	320	-	-	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	298,5	269,4	224,0
	400	-	-	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	373,1	336,8	280,0
ČSN 11 503.1	16	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	13,9
	25	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	21,7
	40	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	34,8
	63	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	54,8
	100	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	87,0
	160	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	139,0
	250	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	217,0
	320	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	278,1
	400	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	347,6
A 350 LF2	16	-	16,0	16,0	16,0	16,0	16,0	16,0	15,6	14,1	12,7	11,2	8,9	7,4	-
	25	-	25,0	25,0	25,0	25,0	25,0	25,0	24,4	22,1	19,8	17,5	14,0	11,6	-
	40	-	40,0	40,0	40,0	40,0	40,0	40,0	39,0	35,4	31,8	28,0	22,4	18,6	-
	63	-	63,0	63,0	63,0	63,0	63,0	63,0	61,5	55,8	50,1	44,1	35,4	29,4	-
	100	-	100,0	100,0	100,0	100,0	100,0	100,0	97,6	88,5	79,5	70,0	56,1	46,6	-
	160	-	160,0	160,0	160,0	160,0	160,0	160,0	156,1	141,5	127,1	112,0	89,6	74,4	-
	250	-	250,0	250,0	250,0	250,0	250,0	250,0	244,0	221,2	198,6	175,0	140,2	116,4	-
	320	-	320,0	320,0	320,0	320,0	320,0	320,0	312,3	283,2	254,4	224,1	179,5	149,0	-
	400	-	400,0	400,0	400,0	400,0	400,0	400,0	390,4	354,0	317,9	280,0	224,3	186,3	-
1.0546 S355NL	16	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	-	-	-	-	-	-
	25	25,0	25,0	25,0	25,0	25,0	25,0	25,0	25,0	-	-	-	-	-	-
	40	40,0	40,0	40,0	40,0	40,0	40,0	40,0	40,0	-	-	-	-	-	-
	63	63,0	63,0	63,0	63,0	63,0	63,0	63,0	63,0	-	-	-	-	-	-
	100	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	-	-	-	-	-	-
	160	160,0	160,0	160,0	160,0	160,0	160,0	160,0	160,0	-	-	-	-	-	-
	250	250,0	250,0	250,0	250,0	250,0	250,0	250,0	250,0	-	-	-	-	-	-
	320	320,0	320,0	320,0	320,0	320,0	320,0	320,0	320,0	-	-	-	-	-	-
	400	400,0	400,0	400,0	400,0	400,0	400,0	400,0	400,0	-	-	-	-	-	-
1.0570 (S355J2G3) 1.0577 (S355J2, S355J2G4)	16	-	-	-	16,0	16,0	16,0	16,0	12,8	11,9	11,0	9,7	8,3	-	-
	25	-	-	-	25,0	25,0	25,0	25,0	20,0	18,7	17,2	15,1	13,0	-	-
	40	-	-	-	40,0	40,0	40,0	40,0	32,0	29,9	27,6	24,2	20,8	-	-
	63	-	-	-	63,0	63,0	63,0	63,0	50,4	47,0	43,4	38,1	32,8	-	-
	100	-	-	-	100,0	100,0	100,0	100,0	80,0	74,7	68,9	60,4	52,0	-	-
	160	-	-	-	160,0	160,0	160,0	160,0	128,0	119,4	110,2	96,8	83,2	-	-
	250	-	-	-	250,0	250,0	250,0	250,0	200,0	186,7	172,2	151,1	130,0	-	-
	320	-	-	-	320,0	320,0	320,0	320,0	256,0	239,0	220,5	193,5	166,4	-	-
	400	-	-	-	400,0	400,0	400,0	400,0	320,0	298,7	275,6	241,8	208,1	-	-

TS – limiting allowable temperature of the body [°C]; PS – limiting allowable pressure of the fluid [bar]

Type number composition

KM 990A.B CDEF - GHHH, where:

- A – symbol for valve type
 - 1 – lift-type check valve
 - 2 – lift-type check valve with branch piece
 - 3 – lift-type check valve with automatic relief
- B – symbol for shell design
 - 1 – one-piece body
 - 2 – all-welded body
 - 3 – two-piece shell consisting of body and cover
- C – symbol for flow pattern
 - 1 – straight
- D – symbol for connection to the piping
 - 1 – flanged ends
 - 2 – welding ends
- E – symbol for operation
 - 7 – automatic
- F – symbol of spring over plug (mention 'P', only for variation with spring)
- G – symbol for material of body and body connector
 - 0 – wrought stainless steel
 - 3 – wrought alloyed steel
 - 4 – wrought carbon steel
- HHH – symbol for PN (16, 25, 40, ..., 400)

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.

Vertical lift-type check valves are in compliance with the Pressure Equipment Directive 97/23/EC (Decree of the Government No. 26/2003), have been certified by Strojirenský zkušební ústav (Engineering Testing Institute) in Brno, and can bear the CE marking.

Inspection and testing

All vertical lift-type check valves are subject to tests according to EN 12 266-1 as a standard, i.e. shell strength test P10, P11, seat tightness test P12 (water pressure $1,1 \times PN$ and air pressure 0,6 MPa), leakage rate A – zero leakage, operability test F20. Standard ČSN EN 13709 specifies that a seat leakage corresponding to leakage rate C according to ČSN EN 12266-1 is allowed in case of test P12.

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

Documentation

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

- test report
- dimensional sketch with list of materials used
- material test certificate (if required)
- installation and operation instructions

Additional documents as required by the customer (i.e. certificate according to EN 10 204 3.1 or 3.2).

Spare parts

Spare parts can be supplied according to an agreement with the customer.

Guarantee

Standard guarantee period is 24 months from receipt of goods.

Installation, service and maintenance

Vertical lift-type check valve shall be installed in vertical position. As it is a uni-directional valve, the fluid flow shall correspond to the arrow marked on the valve body. If the values of temperature and pressure of the fluid and quantity of the fluid flowing through the branch piece as specified on the valve label are adhered to, the check valve operation is fully automatic. More detailed instructions for use of the check valves are given in a document titled Installation and operation instructions which is enclosed to each valve shipment

Ordering

The following data shall be specified in the purchase order:

- nominal size
- nominal pressure
- valve type with reference to this document
- material specification required (No. 0, 3, 4)
- in case of types KM 9902 and KM 9903, the nominal size, the nominal pressure and the required type of connection of the branch piece to the piping (flange or dimensions and type of welding end) shall be specified also and the enclosed questionnaire shall be completed according to dimensional sketches in the relevant catalogue sheets
- particulars of service conditions (fluid type, service pressure and temperature)
- specification of testing (in case of special requirements)
- requirements for documentation
- requirements for packaging
- required quantity
- number of offer, if the valves are ordered in reaction to an offer.

Questionnaire

for lift-type check valves KM 9902 and KM 9903.

1. Connection of valve to piping:

- inlet flange.....DN = _____ PN = _____
- outlet flange.....DN = _____ PN = _____
- relief (bypass) flange.....DN_o = _____ PN_o = _____
- piping used.....material _____ up to _____ °C

In case of non-standard connection specify your requirements below.

2. Parameters of feed pump and water:

- flow rate of water (from the duty point of the characteristic).....Q_v = _____ m³ / h
- at service temperature.....t = _____ °C
- at service pressure.....p = _____ MPa
- pressure in the shut-off point.....p₂ = _____ MPa

The customer is obliged to attach this questionnaire a graph of pump characteristics showing the operating range.

3. Relief (bypass) parameters:

- pressure in the tank into which the relief pipe mouths.....p_n = _____ MPa
- vertical distance between the axis of the relief branch
 and the axis of the tank inlet.....H = _____ m
- position of the relief branch of the check valve with respect to the tank..... below / above ¹⁾
- required minimum quantity of relieved water.....Q_o = _____ m³ / h

4. Notes and requirements:

_____ dated _____

Signature and stamp of customer's representative

¹⁾ Delete what is not applicable.