tyco
Flow Control

KEYSTONE

The HiLok high performance butterfly valves offer efficient, bi-directional sealing across a wide spectrum of service conditions.

Features

- Cast on ISO top plate.
- Long neck for insulation service.
- External travel stop, outside of the medium area.
- Accessible packing adjustment without operator removal.
- Positive sealing which is mechanically achieved and does not rely on line pressure assistance.
- Bi-directional shut-off performance (see seat options).
- Wafer and lugged body design options.
- Available in 4 seat design options: soft seated, fire-safe and metal seated (2 versions).
- Compact design, minimizes weight, installation and maintenance costs.
- Long life durability due to double offset operating principle minimizing seat wear.
- Two piece shaft for maximum flow and minimum headloss.
- Quadruple shaft bearings to ensure stability during high pressure, high cycle applications.
- Fast and simple seat replacement.
- Uninterrupted gasket surface.
- Minimum 4 locating lugs per diameter.
- TA-Luft approved (optional).
- Optional groove in accordance with DIN 2512-N (up to DN 400).
- Tangential, low stress disc pins.
- Available in both DIN and ANSI versions.
- All valves are in compliance with PED, Category III, Module H.

General application

A unique valve for chemical and general industrial applications.
Grease or silicone free valves available for special applications such as paint or oxygen systems.

Technical data

Sizes (mm)	:	50 - 900
Sizes (inch)	:	2” - 36”
Temperature (°C)	:	-50 up to +400
Design criteria	:	EN 12516 (DIN 3840)
Flange compatibility	:	DIN PN 10-40, BS 4504, NFE 29203, ASME B16.5, ASME B16.47 series A 150#
Face to face	:	EN 558-1 series 20/25, API 609 cat-A, MSS SP 68, NFE29305
Top plate	:	ISO 5211
Maximum working pressure	:	DN 50 to 400: 40 bar DN 450 to 600: 25 bar DN 700 to 900: 16 bar
Material certification	:	EN10204 3.1 (DIN 50049 3.1.b)
Pressure testing	:	EN 12266-1

Tyco reserves the right to change the contents without notice

EBPJV-0721-EN-0703

No leakage

1 Seat
Tightness is unaffected by pressure changes, or changes in flow direction as the seat can move radially in its recess.

2 Bottom end cover
Ensures lower stem tightness by its static seal.

3 Packing system
The perfect internal tightness is obtained by a conventional packing system in expanded graphite. The excellent temperature stability ensures 100% static and dynamic tightness. Optional available in PTFE which is TA-Luft VDI 2440 approved.

Easy accessible

4 Standardized top plate
The integrally cast top plate in accordance with ISO 5211. The actuator can be flush mounted, eliminating the need of brackets and couplings.

5 Twin column construction
Easy access to the packing system without removing the actuator.

6 Extended neck
Especially designed for insulated pipework allowing easy access to the gland adjustment area, which would be located outside of the insulation area due to the elongated neck.

7 Integrated locating plates
Precise centering of the valve on the pipe.

8 Retaining ring
With screws outside of flange sealing zone, facilitating easy maintenance. The uninterrupted sealing surface allows the installation of spiral wound gaskets.

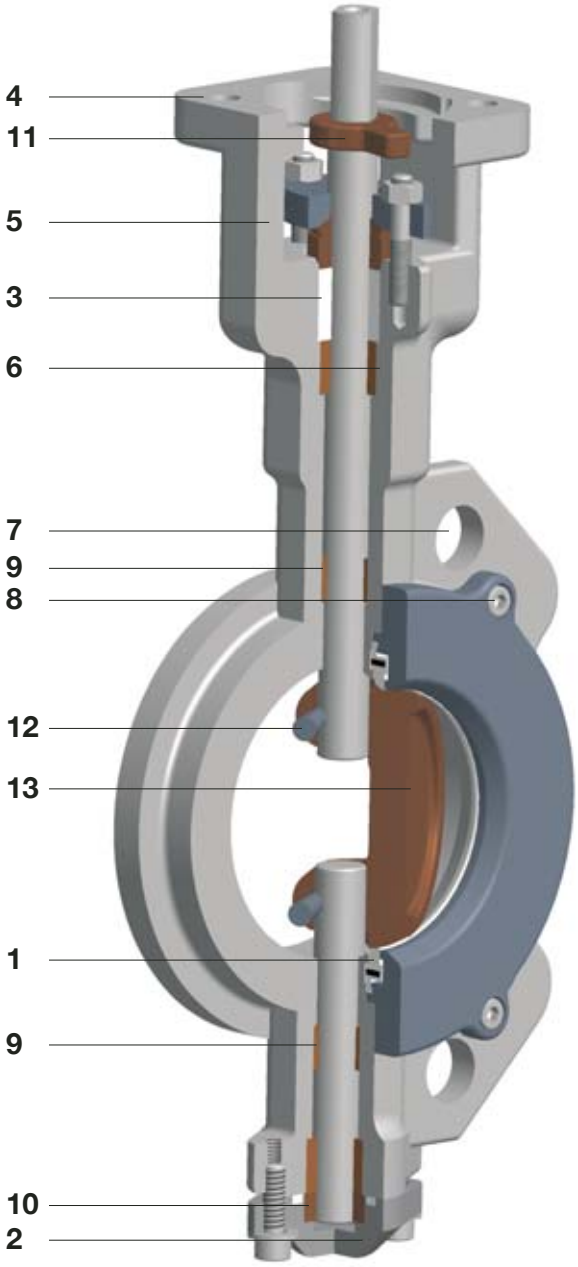
Perfect shaft guiding

9 Bearings
Two corrosion resistant bearings on upper and lower stem provide low friction coefficient and high load capacity. The bearings avoid any deflection of shaft at the packing level, ensuring perfect bidirectional tightness.

10 Axial discstem positioning
Shrunk on the shaft during assembly. It retains its position for the lifecycle of the valve and prevents displacement of disc in relation to the seat while being in service.

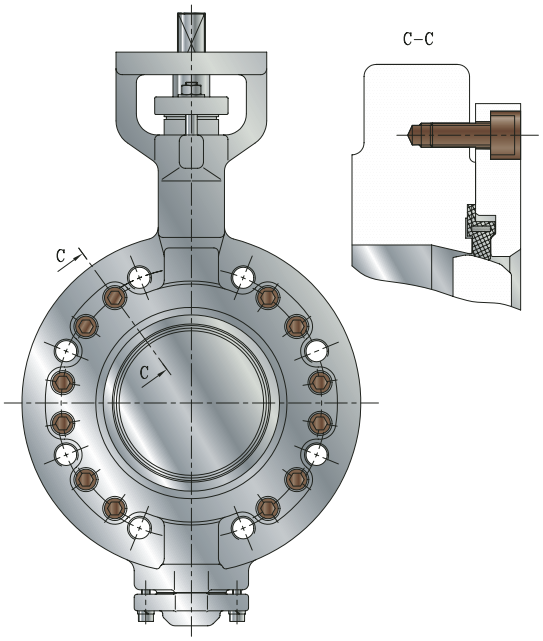
11 Travel stop
Located at the mounting plate level. The travel stop is set during assembly at 90° disc angle in order to avoid any over traveling of the disc.
- The travel stop contact against the mounting plate, thus avoiding potential over-torque of the discstem.
- When actuator has been removed and valve is in service, the position of the disc is clearly shown.

12 Disc to stem connection
The use of tangential located conical disc pins removes engagement clearance and eliminates valve hysteresis.



Optimized design

13 Disc
The double eccentric disc design is optimized via the finite element method to ensure a non-contact between the seat and disc already at small angles.



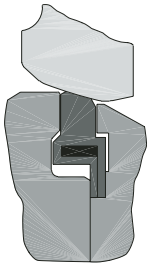
Optional end of line bidirectional feature

As standard, the lugged HiLok body design can be used as end of line unidirectional (mounted with the retaining ring upstream).
As an option, the HiLok can be provided with a reinforced retaining ring which is bolted to the valve body making the valve suitable for bidirectional end of line service.
The unique feature of this design is that the retaining ring bolts are located outside the gasket contact area. This results in an uninterrupted gasket area in both flow directions, achieving an optimum tightness at the flange connection.

Consult the sales organization for pressure/temperature rating for end of line installation.

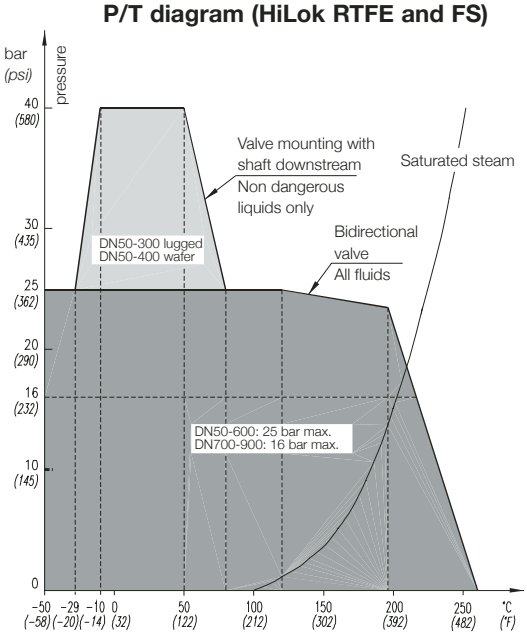
HiLok RTFE seat

The seat is made of filled RTFE in order to minimize cold flow effects at high temperatures. The combined action of seat geometry and the elastic metal insert guarantees a long lasting bidirectional tight shutoff.

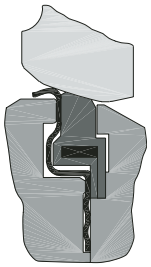


Size range DN50 - DN900.
Tightness class EN 12266-1 rate A.
Maximum pressure end of line: DN50 - DN600: 16 bar; DN700 - DN900: 10 bar.

P/T diagram (HiLok RTFE and FS)



HiLok fire safe seat

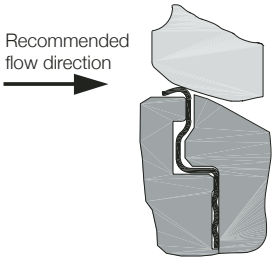


Size range DN50 - DN600.
Tightness class EN 12266-1 rate A.
Maximum pressure end of line: DN50 - DN600: 16 bar; DN700 - DN900: 10 bar.

The valve has been designed according fire test standards. The standard RTFE seat is mounted with a stainless steel ring. In the event of fire, it supersedes over the RTFE seat and provides a bidirectional back-up seal, according to API 607 / BS 6755 part 2.
PN40 not suited for dangerous media such as explosive, flammable, toxic or oxidizing media.
Note: HiLok can be used for end of line service mounted with the shaft downstream

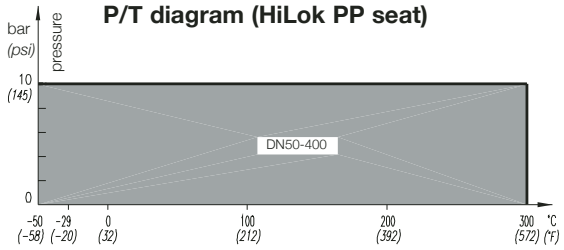
HiLok metal PP seat (Pulp and Paper)

The valve has been specifically designed for pulp and paper applications. This seat design promotes longer life span and lower maintenance.



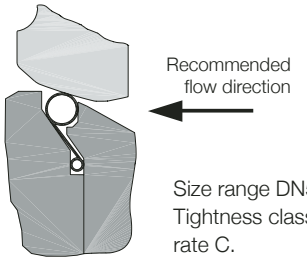
Size range DN50 - DN400.
Tightness class EN 12266-1 rate D.

P/T diagram (HiLok PP seat)



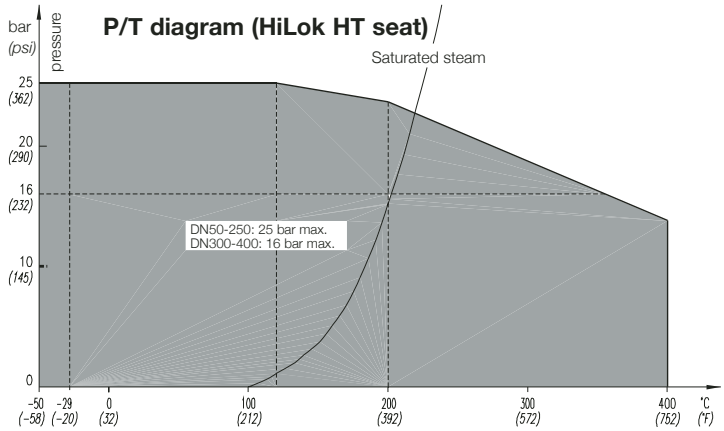
HiLok metal HT seat (High Temperature)

The valve integrates a metal seat in order to be used on all applications with high pressure and high temperature.



Size range DN50 - DN400.
Tightness class EN 12266-1 rate C.

P/T diagram (HiLok HT seat)



Kv/Cv values

	50	65	80	100	125	150	200	250	300	350	400	450	500	600	700	800	900
Kv value	115	210	320	500	820	1200	2300	3600	5200	7300	9500	12000	14800	21600	30200	40200	51200
Cv value	133	244	371	580	951	1392	2668	4176	6032	8468	11020	13900	17200	25000	35000	46500	59200

Breakaway torque values in Nm

		Valve size																
Seat	**Condition**	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**600**	**700**	**800**	**900**
RTFE	40 bar Δp (1) (shaft down stream)	36	44	60	96	150	221	416	620	920	1200	1688						
RTFE	25 bar Δp (2) (bi-directional)	27	33	45	73	115	170	320	480	720	950	1350	1700	2300	3200	4500	6000	8000
RTFE	7 bar Δp (bi-directional)	21	25	34	55	85	125	230	345	520	690	970	1225	1655	2330	3260	4350	5850
Fire safe	25 bar Δp (bi-directional)	27	33	45	73	115	170	320	480	720	950	1350	1700	2300	3200			
Metal PP	10 bar Δp (shaft down stream)	27	33	45	73	115	170	320	480	720	950	1350						
Metal HT	25 bar Δp (3) (shaft up stream)	54	66	90	146	230	340	640	910	1290	1655	2350						
RTFE	Powder applications max. 25 Δp	36	44	60	96	150	221	416	620	920	1200	1688	2110	2830	3900			

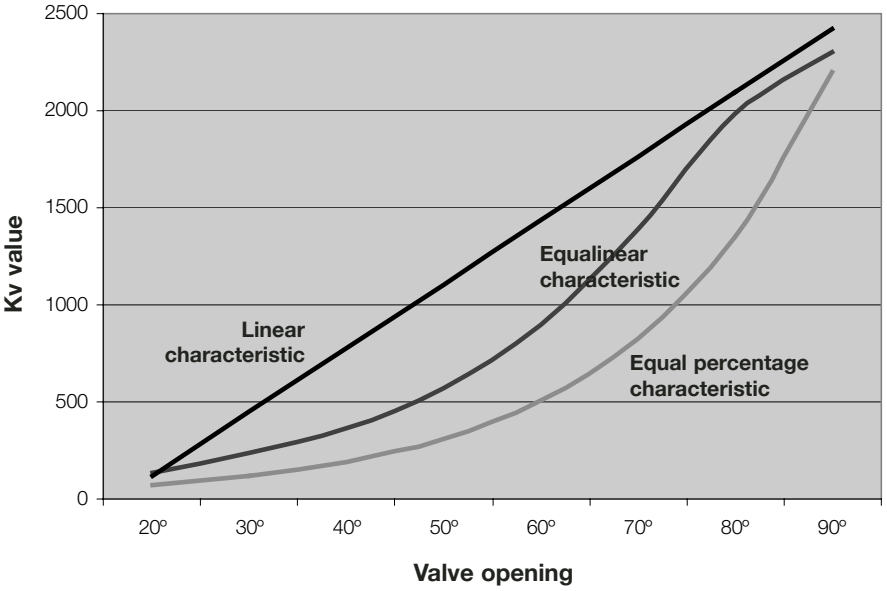
Notes

(1) PTFE torque values equal to RTFE
(2) RTFE DN50 - DN600 max pressure 25 bar, DN700-DN900 max pressure 16 bar
(3) Metal HT DN50 - DN200 max. pressure 25 bar, DN250 - DN400 max. pressure 16 bar

Maximum allowable shaft torque

Valve size																		
Shaft material	**50**	**65**	**80**	**100**	**125**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**600**	**700**	**800**	**900**
X20Cr13 shaft	122	122	122	297	297	743	743	1332	1957	1957	3108	6389	10793	10793	25948	25948	52851
X5CrNiCuNb 19-11-2	163	163	163	396	396	989	989	1772	2603	2603	4135	8497	14356	14356	34511	-	-

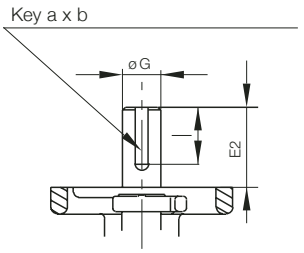
Cv/Kv table



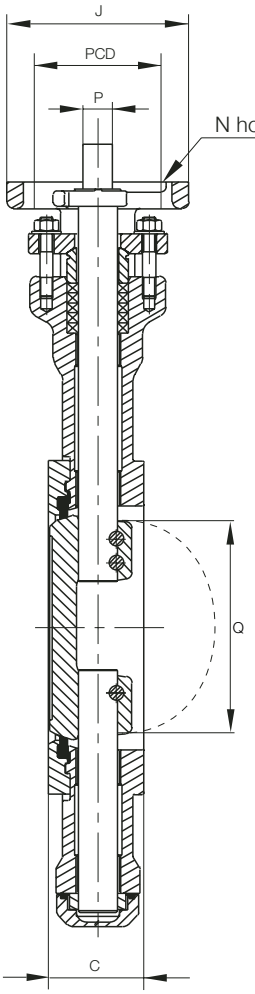
The double off set equalinear HiLok disc combines high strength, high flow capacity and excellent control characteristics with a minimum of seat wear.

The equalinear HiLok characteristic is approximately mid way between that of linear and equal percentage, making the valve suitable as a flow control valve in many industrial flow applications.

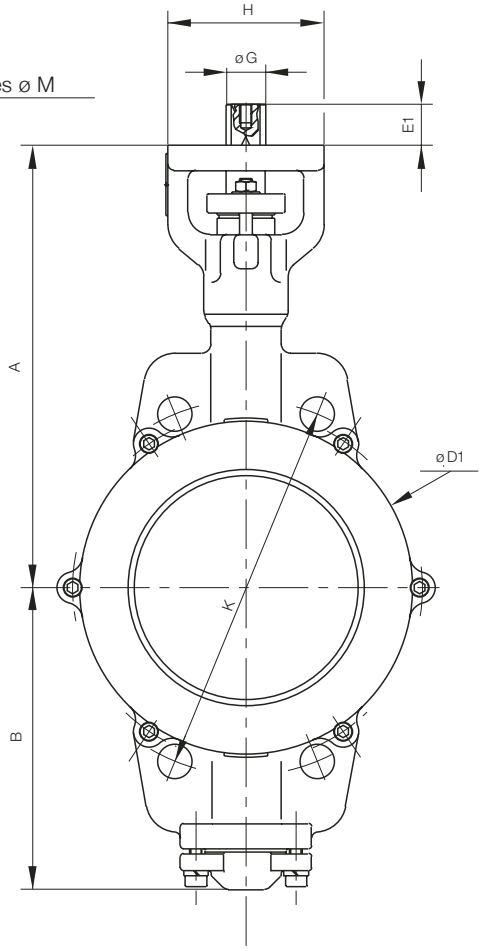
Size ≥ 250



Size ≤ 200

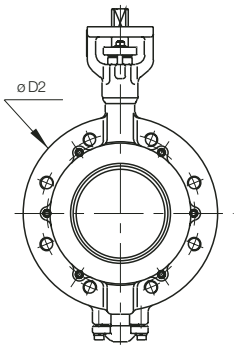


Wafer

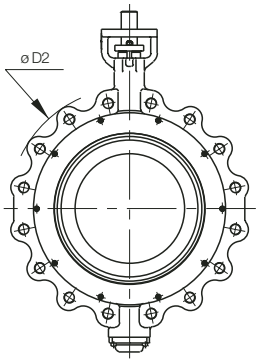


Lugged

Size ≤ 200



Size ≥ 250



Valve dimensions in mm

DN	A	B	C*	C**	ø D1	ø D2	E1	P	E2	ø G	H	J	PCD	ø M	Q	N	a	b	l	Weight wafer	Weight lugged
50	175	102	43	43	97	153	25.5	11	-	14	70	80	70	9	40	4	-	-	-	3,1	4,8
65	191	116	46	46	117	173	25.5	11	-	14	70	80	70	9	51	4	-	-	-	4,5	6,9
80	197	122	46	49	130	190	25.5	11	-	14	70	80	70	9	66	4	-	-	-	4,9	7,7
100	233	149	52	56	158	225	25.5	14	-	18	100	100	102	11	90	4	-	-	-	8,2	13,7
125	245	160	56	64	188	261	25.5	14	-	18	100	100	102	11	113	4	-	-	-	9,8	17
150	283	193	56	70	212	294	25.5	19	-	25	100	116	102	11	141	4	-	-	-	12,5	22,5
200	307	217	60	71	267	365	25.5	19	-	25	100	116	102	11	189	4	-	-	-	21,9	33,7
250	371	251	68	76	321	420	-	-	70	35	132	155	125	14	236	4	10	8	60	40,4	52,5
300	399	302	78	83	372	476	-	-	70	35	132	155	125	14	282	4	10	8	60	54,6	77,5
350	421	324	78	92	431	542	-	-	70	35	132	155	125	14	326	4	10	8	60	74,4	96,5
400	453	358	102	102	484	606	-	-	90.5	40	140	162	140	18	374	4	12	8	73	97,6	133
450	522	392	114	114	534	662	-	-	100	50	-	ø 175	140	18	418	4	14	9	60	145	206
500	550	427	127	127	590	722	-	-	100	60	-	ø 210	165	22	467	4	18	11	80	188	244
600	634	485	154	154	689	837	-	-	100	60	-	ø 210	165	22	559	4	18	11	80	224	306
700	720	547	165	165	799	947	-	-	110	80	-	ø 300	254	18	659	8	22	14	100	269	450
800	771	598	190	-	900	1070	-	-	110	80	-	ø 300	254	18	-	8	22	14	100	515	825
900	878	687	241	-	1000	-	-	-	110	100	-	ø 350	254	18	-	8	28	16	100	850	1063

Optional square top shaft connection available on request enabling direct mounting with Tyco PremiAir pneumatic actuators.

Notes

- Dimensions in mm, weights in kg.
- Dimensions and weights are given as guide.
- The maximum working capability of any valve is either the body rating or the seat shut-off capability, whichever is the lower.
- K dimension in function of the required flange drilling pattern.
- C* : Face-to-face according EN 558-1, series 20 (factory standard)
- C** : Face-to-face according EN 558-1, series 25 (optional)

Material trim table

Body	Disc	Shaft	Seat	Bearing	Shaft packing	Bottom cover packing	Trim code
General Purpose Trims							
Carbon Steel	Carbon Steel	Stainless Steel	RTFE	Carbon Steel / PTFE	Graphite	Expanded graphite	900
Carbon Steel	Stainless Steel	Stainless Steel	RTFE	Carbon Steel / PTFE	Graphite	Expanded graphite	908
Carbon Steel	Stainless Steel	Stainless Steel	Virgin PTFE	Carbon Steel / PTFE	PTFE	PTFE	907
Stainless Steel	Stainless Steel	Stainless Steel	RTFE	Stainless Steel / PTFE	Graphite	Expanded graphite	915
Stainless Steel	Stainless Steel	Stainless Steel	Virgin PTFE	Stainless Steel / PTFE	PTFE	PTFE	914
Stainless Steel	Stainless Steel	Stainless Steel	RTFE	Stainless Steel / PTFE	LATTYflon®	PTFE	935
Metal Seated HT (High Temperature) Trims							
Carbon Steel	Carbon Steel Chrome pl.	Stainless Steel	Metal HT	Stainless Steel	Graphite	Expanded graphite	901
Carbon Steel	Stainless Steel Chrome pl.	Stainless Steel	Metal HT	Stainless Steel	Graphite	Expanded graphite	909
Stainless Steel	Stainless Steel Chrome pl.	Stainless Steel	Metal HT	Stainless Steel	Graphite	Expanded graphite	916
Metal Seated PP (Pulp & Paper) Trims							
Carbon Steel	Carbon Steel Chrome pl.	Stainless Steel	Metal PP	Carbon Steel / PTFE	Graphite	Expanded graphite	902
Carbon Steel	Stainless Steel Chrome pl.	Stainless Steel	Metal PP	Carbon Steel / PTFE	Graphite	Expanded graphite	910
Stainless Steel	Stainless Steel Chrome pl.	Stainless Steel	Metal PP	Stainless Steel / PTFE	Graphite	Expanded graphite	917
Fire Safe Seated Trims							
Carbon Steel	Carbon Steel Chrome pl.	Stainless Steel	Metal PP/RTFE	Carbon Steel / PTFE	Graphite	Expanded graphite	903
Carbon Steel	Stainless Steel Chrome pl.	Stainless Steel	Metal PP/RTFE	Carbon Steel / PTFE	Graphite	Expanded graphite	911
Stainless Steel	Stainless Steel Chrome pl.	Stainless Steel	Metal PP/RTFE	Stainless Steel / PTFE	Graphite	Expanded graphite	918

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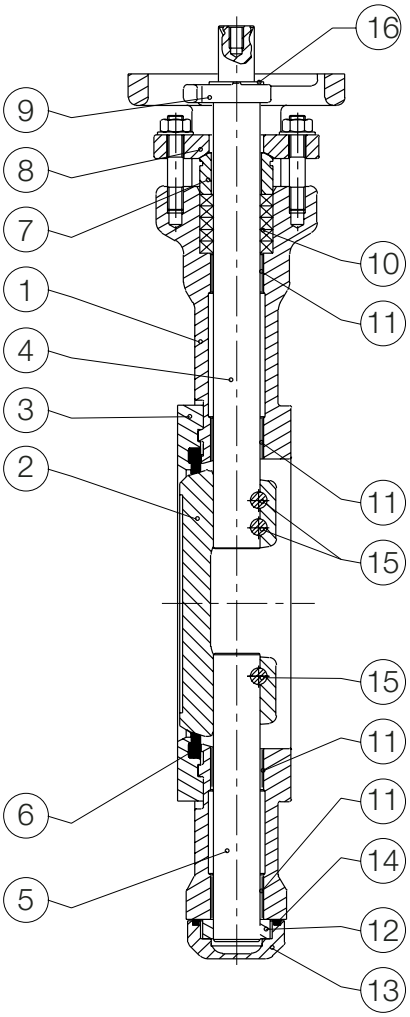
Item number clarification

Type	Size (mm)	Trim	Body style	Flange connection	Operation	Options *
HL1 = Hilok standard face to face (series 20) HL2 = Hilok f.t.f EN 558 T1 - series 25 HL3 = Hilok f.t.f EN 558 T1 - series 16	150	See material trim table	W = Wafer L = Lugged	10 = PN10 16 = PN16 25 = PN25 40 = PN40 A1 = ANSI 150 M3 = Multi drill. PN10/16 M4 = Multi drill. PN10/16/A150 M9 = Multi drill. PN10/16/25/A150 MA = Multi drill. PN10/16/25/40/A150 MB = Multi drill. PN10/16/25/40/A150/A300	B = Bare shaft	00 = Standard

Example set-up Hilok item number HL1150915WMAB00

Type	Size (mm)	Trim	Body style	Flange connection	Operation	Variant
HL1	150	915	W	MA	B	00

* Any option other than standard is indicated by the option code. Consult your local Tyco contact for product identification

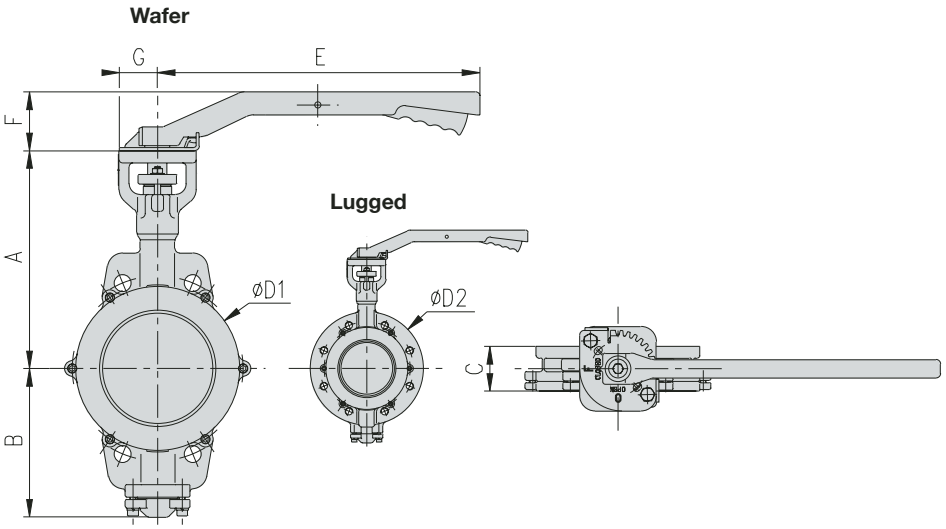


Material specifications

Part		Name	Material	Material reference	Remark
1	Body	Carbon Steel	EN GP 240 GH / A 216 Gr. WCB	DIN 1.0619	
		Stainless Steel	EN GX5CrNiMo 19-11-2 / A351 Gr. CF8M	DIN 1.4408	
2	Disc	Carbon Steel	EN GP 240 GH / A 216 Gr. WCB	DIN 1.0619	
		CS chrome plated	EN GP 240 GH / A 216 Gr. WCB	DIN 1.0619	
		Stainless Steel	EN X5CrNiMo 19-11-2 / AISI 316	DIN 1.4401	Small size range
		Stainless Steel	EN GX5CrNiMo 19-11-2 / A351 Gr. CF8M	DIN 1.4408	Large size range
		SS chrome plated	EN X5CrNiMo 19-11-2 / AISI 316	DIN 1.4401	Small size range
		SS chrome plated	EN GX5CrNiMo 19-11-2 / A351 Gr. CF8M	DIN 1.4408	Large size range
3	Retaining ring	Carbon Steel	EN GP 240 GH / A 216 Gr. WCB	DIN 1.0619	
		Stainless Steel	EN X5CrNiMo 19-11-2 / AISI 316	DIN 1.4401	Small size range
		Stainless Steel	EN GX5CrNiMo 19-11-2 / A351 Gr. CF8M	DIN 1.4408	Large size range
4-5	Stem	Stainless Steel	EN X20Cr13 / AISI 420	DIN 1.4021	In combination with a CS body
		Stainless Steel	EN X5CrNiCuNb 116-4 / A564 Gr.630	DIN 1.4542	In combination with a SS body
6	Seat	Reinforced PTFE			15% graphite filled TFE
		Metal PP/RTFE			15% graphite filled TFE
		PTFE			White virgin PTFE
		RTFE lip seat			25% Stainless Steel filled TFE
		Metal PP	ENX2CrNiMo 17-2-2 / AISI 316L	DIN 1.4404	
		Metal HT	ENX2CrNiMo 17-2-2 / AISI 316L	DIN 1.4404	
7	Packing gland	Stainless Steel	EN X12Cr13 / AISI 410	DIN 1.4406	In combination with a CS body
		Stainless Steel	EN X2CrNi 19-11 / AISI 304L	DIN 1.4306	In combination with a SS body
8	Gland bridge	Carbon Steel	EN C22E / AISI 1015	DIN 1.1149	In combination with a CS body
		Stainless Steel	EN X5CrNiMo 19-11-2 / AISI 316	DIN 1.4401	In combination with a SS body
9	Position indicator	Carbon Steel	EN C22E / AISI 1015	DIN 1.1149	In combination with a CS body
		Stainless Steel	EN X5CrNiMo 19-11-2 / AISI 316	DIN 1.4401	In combination with a SS body
10	Shaft packing	Expanded graphite			
		Braided PTFE			
		LATTYflon®		3260LM	
11	Bearing	Carbon Steel + PTFE			In combination with a CS body
		Stainless Steel + PTFE			In combination with a SS body
		Stainless Steel nitrided			In combination with a SS & CS body with metal HT seat
12	Disc locating shoulder	Stainless Steel	EN X2CrNi 19-11 / AISI 304L	DIN 1.4306	
13	Bottom end cover	Carbon Steel	EN C22E / AISI 1015	DIN 1.1149	In combination with a CS body
		Stainless Steel	EN X5CrNiMo 19-11-2 / AISI 316	DIN 1.4401	With SS body 50-200
		Stainless Steel	EN GX5CrNiMo 19-11-2 / A351 Gr. CF8M	DIN 1.4408	With SS body 250-900
14	Bottom cover packing	PTFE			
		Expanded graphite			
15	Disc pin	Stainless Steel	ENX2CrNiMo 17-2-2 / AISI 316L	DIN 1.4404	
16	Circlips	Carbon Steel			In combination with a CS body
		Stainless Steel			In combination with a SS body
17	Indication plate	Stainless Steel			
18	Key	Carbon Steel	EN C35E / AISI 1038	DIN 1.1180	
19	Bolts	Galvanized Steel			In combination with a CS body
		Stainless Steel	A2/70, A4/70, A4/80	DIN 1.4301	In combination with a SS body

Notched lever "LC"

Material: Aluminium



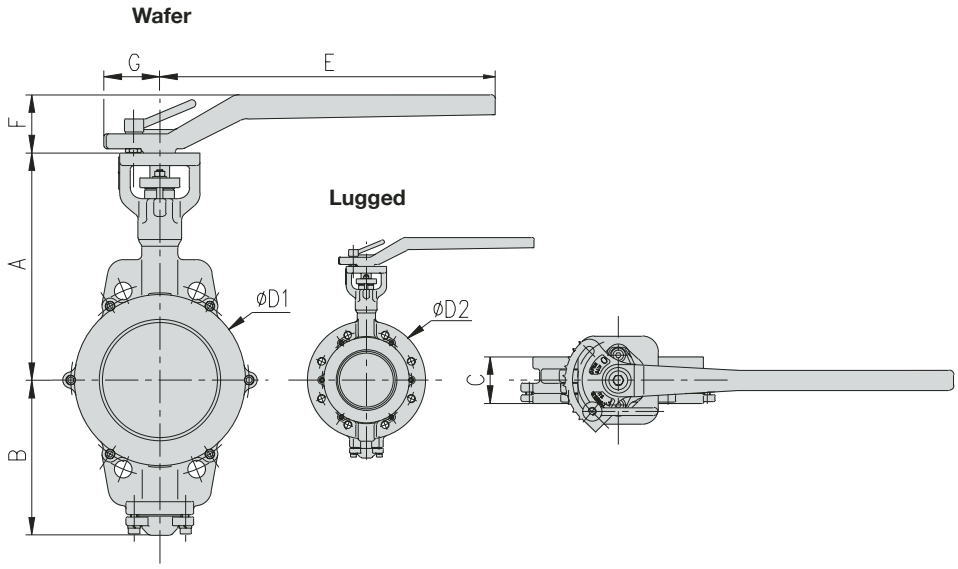
Dimensions

DN (mm)	DN (inch)	Lever	A	B	C	øD1	øD2	E	F	G	Weights Wafer	Weights Lugged
50	2"	LC 4	175	102	43	97	153	230	69	45	3.6	5.3
65	2 1/2"	LC 4	191	116	46	117	173	230	69	45	5	7.4
80	3"	LC 4	197	122	46	130	190	230	69	45	5.4	8.2
100	4"	LC 12	233	149	52	158	225	320	75	52	8.9	14.4
125	5"	LC 12	245	160	56	188	261	320	75	52	10.5	17.7
150	6"	LC 20	283	193	56	212	294	420	75	52	13.5	23.5

Size	Number of locking positions
DIN 50-80	9
DIN 100-125	9
DIN 150	7

Lockable lever "LF"

Material: Ductile Iron



Dimensions

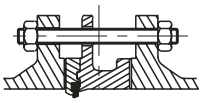
DN (mm)	DN (inch)	Lever	A	B	C	øD1	øD2	E	F	G	Weights Wafer	Weights Lugged
50	2"	LF 4	175	102	43	97	153	230	69	45	4.1	5.8
65	2 1/2"	LF 4	191	116	46	117	173	230	69	45	5.5	7.9
80	3"	LF 4	197	122	46	130	190	230	69	45	5.9	8.7
100	4"	LF 12	233	149	52	158	225	320	75	63	9.8	15.3
125	5"	LF 12	245	160	56	188	261	320	75	63	11.5	18.6
150	6"	LF 20	283	193	56	212	294	420	75	65	14.5	24.5
200	8"	LF 20	307	217	60	267	365	420	75	65	24	35.7

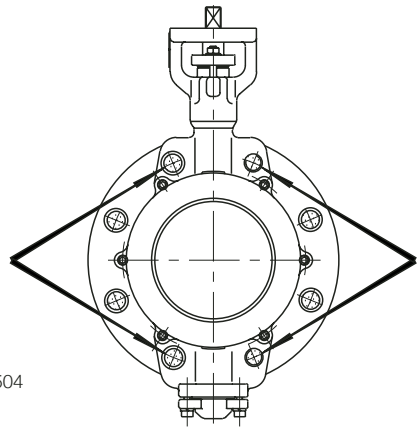
Notes

- Dimensions in mm, weights in kg.
- Dimensions and weights are given as guide.
- C*: Face-to-face according EN 558-1, series 20 indicated.

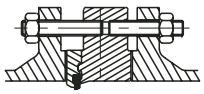
Wafer type

DN 50 to 400





DN 450 to 900



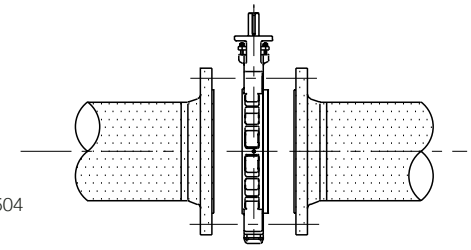
Drilled flanges according to:
NF E.29 - DIN 2501 - BS 4504
ISO 2084, ANSI B16.5

DN	Nb.	Length PN10	PN16	PN20	PN25
450	4x2	140	140	160	150
500	4x2	140	160	160	160
600	4x2	160	175	185	185
700	4x2	140	175	185	185

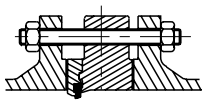
		50	65	80	100	125	150	200	250	300	350	400	450	500	600	700
nr of thru bolts	PN10	4	4	8	8	8	8	8	12	12	16	16	16 *	16 *	16 *	20 *
	PN16	4	4	8	8	8	8	12	12	12	16	16	16 *	16 *	16 *	20 *
	PN20	4	4	4	8	8	8	8	12	12	12	16	12 *	16 *	16 *	24 *
	PN25	4	8	8	8	8	8	12	12	16	16	16	16 *	16 *	16 *	20 *
	PN40	4	8	8	8	8	8	12	12	16	16	16	16 *	16 *	16 *	20 *
	PN50	8	8	8	8	8	12	12	16	16	20	20	20 *	20 *	20 *	24 *
	ANSI 150	4	4	4	8	8	8	8	12	12	12	16	12 *	16 *	16 *	24 *
	ANSI 300	8	8	8	8	8	12	12	16	16	20	20	20 *	20 *	20 *	24 *
ø of thru bolts	PN10	M16	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24	M24	M24	M27	M27
	PN16	M16	M16	M16	M16	M16	M20	M20	M24	M24	M24	M27	M27	M30	M33	M33
	PN20	M16	M16	M16	M16	M20	M20	M20	M24	M24	M27	M27	M30	M30	M33	M33
	PN25	M16	M16	M16	M20	M24	M24	M24	M27	M27	M30	M33	M33	M33	M36	M39
	PN40	M16	M16	M16	M20	M24	M24	M27	M30	M30	M33	M36	M36	M39	M45	M45
	PN50	M16	M20	M20	M20	M20	M20	M24	M27	M30	M30	M33	M33	M33	M39	M42
	ANSI 150 (UNC)	5/8"	5/8"	5/8"	5/8"	3/4"	3/4"	3/4"	7/8"	7/8"	1"	1"	1 1/8" **	1 1/8" **	1 1/4" **	-
	ANSI 300 (UNC)	5/8"	3/4"	3/4"	3/4"	3/8"	3/8"	7/8"	1"	1 1/8"	1 1/8"	1 1/4"	1 1/4" **	1 1/4" **	1 1/2" **	-
length of thru bolts	PN10	120	120	120	130	130	150	150	170	170	190	230	265	265	310	310
	PN16	120	120	120	130	130	150	150	170	190	235	250	270	290	340	340
	PN20	120	120	130	130	150	150	170	180	180	200	235	290	320	360	390
	PN25	120	120	130	150	150	170	170	200	200	240	250	280	310	360	360
	PN40	120	120	130	150	150	170	180	240	240	250	300	310	360	400	400
	PN50	120	130	150	150	170	170	190	220	240	240	280	310	340	390	435
	ANSI 150	120	120	130	130	150	150	170	180	180	200	235	290	320	360	390
	ANSI 300	120	130	150	150	170	170	190	220	240	240	280	310	340	390	435

* in the 4 lugs / in addition to these thru bolts
** 7 or 8 UNC / to be defined

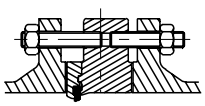
Lugged type



Drilled flanges according to:
NF E.29 - DIN 2501 - BS 4504
ISO 2084, ANSI B16.5



Size 50 to 400



Size 450 to 900

		50	65	80	100	125	150	200	250	300	350	400	450	500	600	700
nr of thru bolts	PN10	4	4	8	8	8	8	8	12	12	16	16	20x2	20x2	20x2	24x2
	PN16	4	4	8	8	8	8	12	12	12	16	16	20x2	20x2	20x2	24x2
	PN20	4	4	4	8	8	8	8	12	12	12	16	16x2	20x2	20x2	28x2
	PN25	4	8	8	8	8	8	12	12	16	16	16	20x2	20x2	20x2	24x2
	PN40	4	8	8	8	8	8	-	-	-	-	-	-	-	-	-
	ANSI 150	4	4	4	8	8	8	8	12	12	12	16	16x2	20x2	20x2	28x2
ø of thru bolts	PN10	M16	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24	M24	M24	M27	M27
	PN16	M16	M16	M16	M16	M16	M20	M20	M24	M24	M24	M27	M27	M30	M33	M33
	PN20	M16	M16	M16	M16	M20	M20	M20	M24	M24	M27	M27	M30	M30	M33	M33
	PN25	M16	M16	M16	M20	M24	M24	M24	M27	M27	M30	M33	M33	M33	M36	M39
	PN40	M16	M16	M16	M20	M24	M24	-	-	-	-	-	-	-	-	-
	ANSI 150 (UNC)	5/8"	5/8"	5/8"	5/8"	3/4"	3/4"	3/4"	7/8"	7/8"	1"	1"	1 1/8" **	1 1/8" **	1 1/4" **	-
length of thru bolts	PN10	120	120	120	130	130	150	150	170	170	190	230	140	140	160	170
	PN16	120	120	120	130	130	150	150	170	190	235	250	140	160	175	175
	PN20	120	120	130	130	150	150	170	180	180	200	235	160	160	185	210
	PN25	120	120	130	150	150	170	170	200	200	240	250	150	160	185	185
	PN40	120	120	130	150	150	170	-	-	-	-	-	-	-	-	-
	ANSI 150	120	120	130	130	150	150	170	180	180	200	235	160	160	185	210

** 7 or 8 UNC / to be defined