VIRGO

VIRGO EUROPE SpA,
Via Torino 3/5-20039, Varedo, Milano (Italy). Phone : +39 0362 589711, Fax : +39 0362 554439
Email : scalciolari@virgoeurope.com

VIRGO ENGINEERS INC.
13219, N. Promenade Blvd., Stafford, Texas 77477, USA. Phone : +1 281 491 0400, Fax : +1 281 491 0444
Email : mmalkarnekar@virgoengineers.com

VIRGO ENGINEERS LIMITED / VIRGO VALVES & CONTROLS LIMITED
277, Hinjewadi Phase II, Maan (Mulshi), Pune - 411 057, India. Phone : +91 20 66744000, Fax : +91 20 66744021
Email : sales@virgoengineers.com

VIRGO VALVES & CONTROLS LIMITED
(Warehouse & Valve Automation Centre)
Unit - FZS1 AH07, Jebel Ali Free Zone (South), P.O.Box - 18748, Dubai - UAE. Phone : +971 4 8860980, Fax : +971 4 8860981
Email : salesuae@virgoengineers.com

VIRGO VALVES & CONTROLS LIMITED
Suite 1904, 19th floor, Kenanga International, Jalan Sultan Ismail, 50250 Kuala Lumpur, Malaysia.
Phone : +60 3 2161 8260, Fax : +60 3 2166 6489 Email : ajagnade@virgoengineers.com

BRANCH OFFICES IN INDIA :
Mumbai : Tel (022) 40110700, Fax: (022) 40110701
New Delhi : Tel (011) 40729161-63, Fax : (011) 41729164
Kolkata : Tel (033) 22272269, (033) 22272533 Fax : (033) 22272279
Chennai : Tel (044) 24404119 Fax : (044) 24410664
Vadodara : Tel (0265) 2342837, (0265) 2341053, (0265) 2355133, Fax : (0265) 2314449

Specifications subject to change

TOV : 2008/12 R1

VIRGO

TRI-TORK
Triple Offset Rotary Valve

Virgo... Lifeline to Your Process.

About us

In a short period of 20 years, Virgo Engineers has gained a position of prominence in the field of process ball valves, pipeline ball valves and automation systems for a host of applications in chemical, petrochemical, oil & gas, fertilizer and pharmaceutical industries. During this period, Virgo established its presence in India, United States of America, Middle East and then Europe. Today, Virgo is a true multinational company with manufacturing plants in three countries, sales offices in seven countries and customers in over sixty countries.

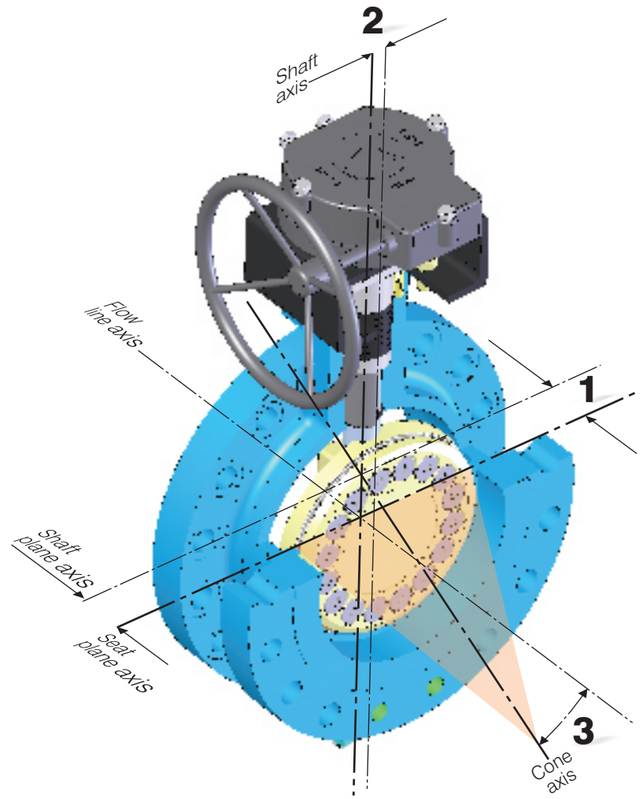
Virgo's triple offset rotary valve is a next generation high-end, quarter turn, metal to metal sealing, zero leakage valve which offers flow control solutions for varied range of applications. Available in the size range of 3" to 24" and pressure classes ASME # 150, #300 and # 600, these valves are now increasingly being used in Hydro-Carbon Processing, Power, Steam Distribution, Oil & Gas, Pulp and Paper as well as LNG liquefaction, storage and transport.

TRI-TORK Triple Offset Rotary Valve

Product Information : Valve Series | Design Features | Range | Application | Options Triple Offset Principle

Valve Series
- Double flanged (Short Pattern)
- Double flanged (Long Pattern)
- Lug
- Wafer
- Butt Weld

Design Features
- ZERO leakage
- Bi-directional, metal to metal sealing
- Low operating torque
- Inherently fire safe
- One piece shaft with blow-out proof design
- Adjustable shaft seal for low emission
- Bearing seals
- NACE compliance



Range
- 3" (DN 80) to 24" (DN 600)
- Pressure rating ASME class : 150 / 300 / 600
- Temperature range : - 46° C to +425° C

Applications
- Power plants
- Petroleum refineries
- Petrochemical plants
- Cryogenics
- Pulp and paper
- LNG storage and transportation etc.

Options
- Live loaded shaft seal
- Extended bonnet for low temperature applications
- Cryogenic and high temperature configuration
- Steam jacketing

Triple Offset Principle

Triple offset valve is a product of engineered geometry combined with modern manufacturing techniques to achieve ZERO leakage. This metal-to-metal, bi-directional sealing valve has non-rubbing design which gives less operating torque and longer service life.

Offset 1

First offset is between shaft axis plane and seat plane, which allows complete sealing contact around the seat.

Offset 2

Second offset is a distance at which shaft is displaced from the centre of the flow line, which gives camming effect & reduced rubbing rotation while opening and closing of valve.

Offset 3

The seal is a segment taken from cone where apex of the cone is offset (3rd) from the flow line axis, which eliminates rubbing completely.

Product Information : ZERO leakage | Reference Standards

ZERO leakage

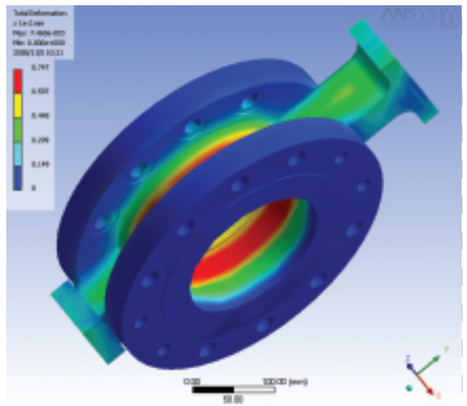
ZERO leakage is a terminology used in the API 598, which means no visible leakage during specific test duration. Following seat leakage comparison shows TRI-TORK's seat tightness capabilities.

Valve Size	TRI-TORK		Other Metal Seated Valve (Gate and Ball)	
	Liquid Test (drops per minute)	Gas Test (bubbles per minute)	Liquid Test (drops per minute)	Gas Test (bubbles per minute)
⩽2	0	0	0	0
2½ - 6	0	0	12	24
8 - 12	0	0	20	40
⩾14	0	0	2 / NPS	4 / NPS

Reference Standards

Design and Manufacturing	API 609, ASME B16.34
Face to Face / End to End	API 609, ASME B16.10, ISO 5752 Series 13
End Connection	ASME B16.5 & B16.47 for flanged end and ASME B16.25 for butt weld end
Testing	API 598 with ZERO leakage
Fire Test	API 607 Fourth Edition
Fugitive Emission Testing	MESC 77/312
Material Conformance	NACE MR 01-75

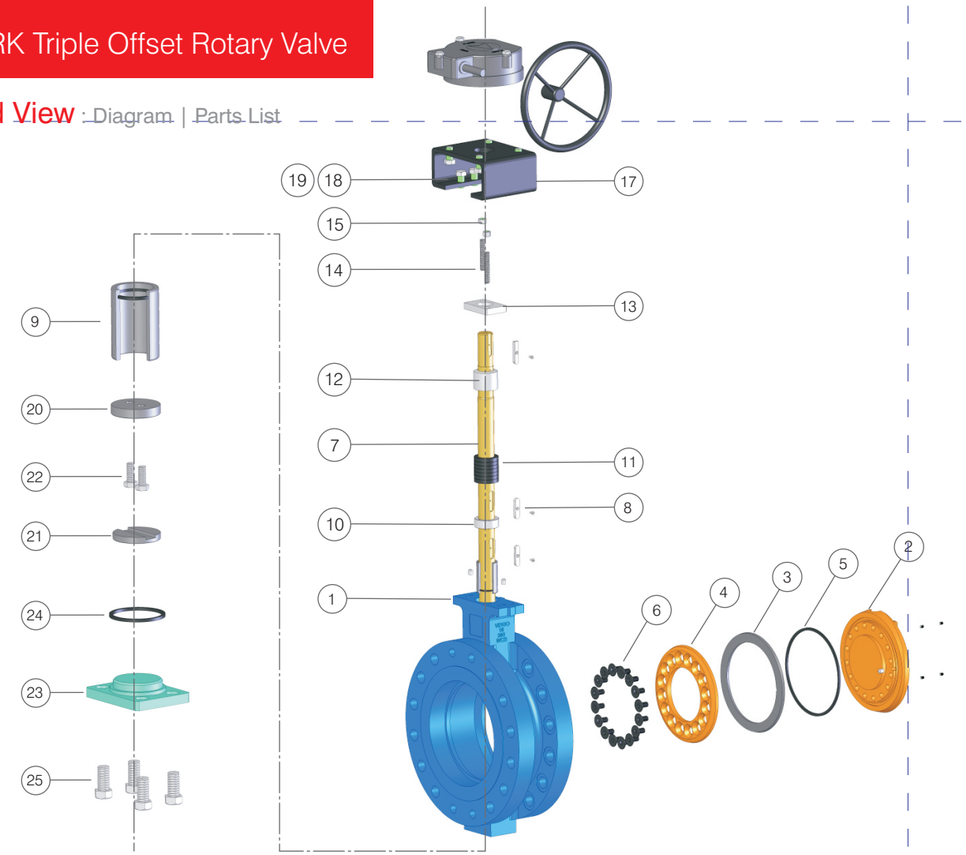
Superior manufacturing facilities



Products are developed using Finite Element Analysis

TRI-TORK Triple Offset Rotary Valve

Exploded View : Diagram | Parts List



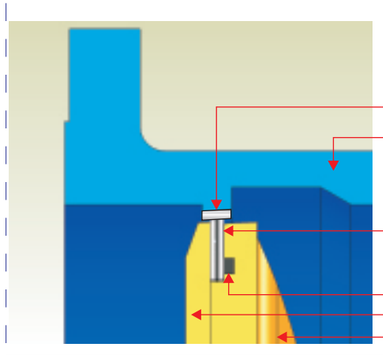
No.	Description	Carbon Steel	Stainless Steel
1	BODY	ASTM A216 Gr. WCB	ASTM A351 Gr. CF8M
1a	SEAT (INTEGRAL WITH BODY)	STELLITED	STELLITED
2	DISC	ASTM A216 Gr. WCB (with ENP)	ASTM A351 Gr. CF8M
3	SEAL RING	DUPLEX+GRAPHITE	DUPLEX+GRAPHITE
4	RETAINER RING	ASTM A516 (with ENP)	ASTM A240 TYPE 304
5	DISC GASKET	SPIRAL WOUND SS316+GRAPHITE	SPIRAL WOUND SS316+GRAPHITE
6	RETAINER SCREWS	ASTM A193 Gr. B8M	ASTM A193 Gr. B8M
7	SHAFT	ASTM A479 TYPE 410	ASTM A564 TYPE 630
8	DISC KEY	ASTM A479 TYPE 410	ASTM A564 TYPE 630
9	BEARING	ASTM A479 TYPE 316 (NITRIDED)	ASTM A479 TYPE 316 (NITRIDED)
10	SPACER	ASTM A479 TYPE 316	ASTM A479 TYPE 316
11	GLAND PACKING	GRAPHITE	GRAPHITE
12	GLAND	ASTM A479 TYPE 316	ASTM A479 TYPE 316
13	GLAND PLATE	CARBON STEEL	STAINLESS STEEL
14	STUD	ASTM A193 Gr. B7M	ASTM A193 Gr. B8M
15	NUT	ASTM A194 Gr. 2HM	ASTM A194 Gr. 8M
16	SHAFT KEY (Not Shown)	EN8	SS410
17	BRACKET	CARBON STEEL	STAINLESS STEEL
18	HEXBOLT	ASTM A193 Gr. B7M	ASTM A193 Gr. B8M
19	NUT	ASTM A194 Gr. 2HM	ASTM A194 Gr. 8M
20	THRUST WASHER	ASTM A479 TYPE 316 (NITRIDED)	ASTM A479 TYPE 316 (NITRIDED)
21	STOP WASHER	ASTM A479 TYPE 316 (NITRIDED)	ASTM A479 TYPE 316 (NITRIDED)
22	ADJUSTABLE SCREW	ASTM A193 Gr. B8M	ASTM A193 Gr. B8M
23	BOTTOM FLANGE	CARBON STEEL	STAINLESS STEEL
24	BOTTOM FLANGE GASKET	SPIRAL WOUND SS316+GRAPHITE	SPIRAL WOUND SS316+GRAPHITE
25	BOTTOM FLANGE SCREWS	ASTM A193 Gr. B8M	ASTM A193 Gr. B8M

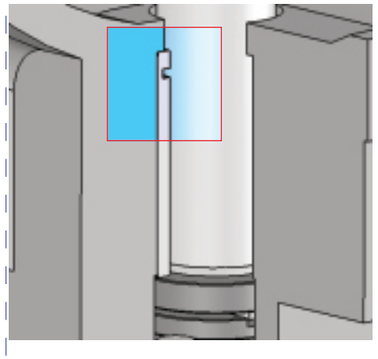
Note:- Material confirms to the requirement of NACE MR 01-75

TRI-TORK Triple Offset Rotary Valve

Design Features : Metal to Metal ZERO Leakage | Bearing Protection | One-Piece Shaft

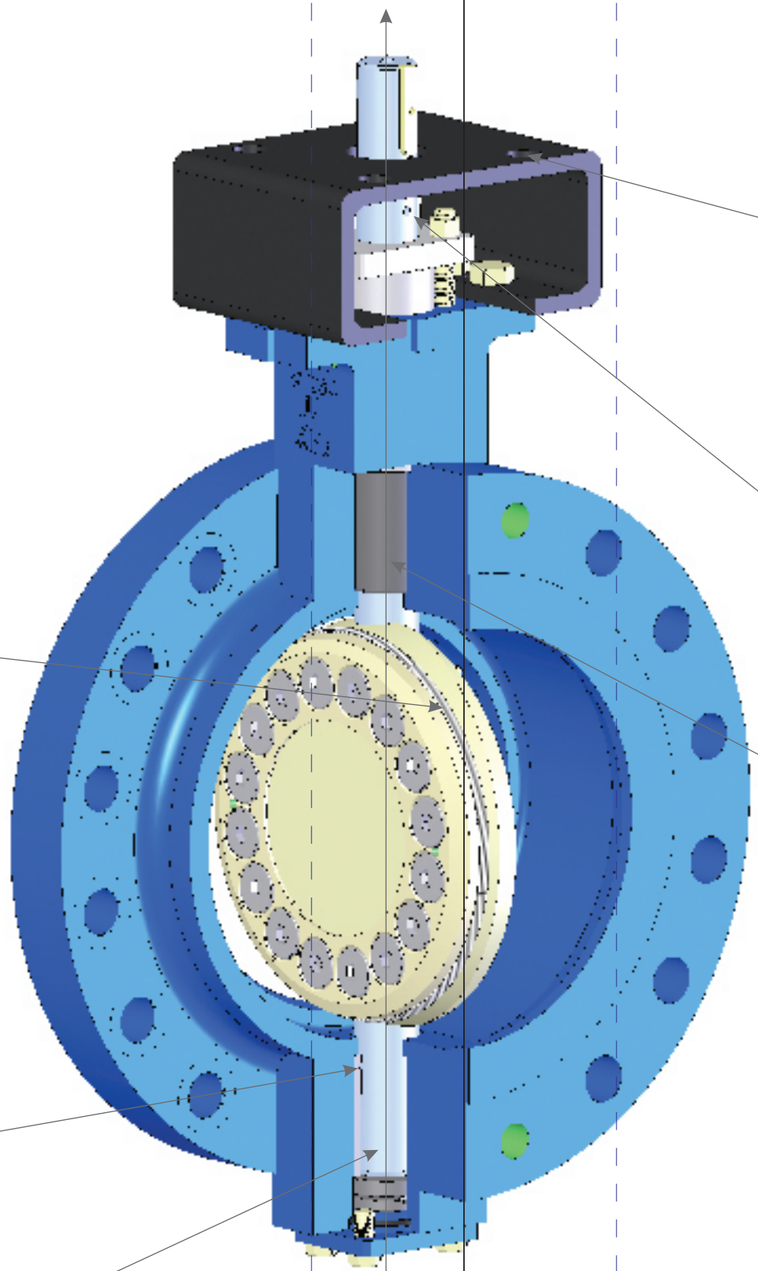
Metal to Metal ZERO leakage
Laminated resilient seal ring flexes to give uniform wedging effect and ensures ZERO leakage. Resiliency of seal ring allows small deformation in body for temperature fluctuations without risk of jamming. Seal ring is retained by retainer ring and bolting. Gasket behind seal ring ensures leak proof joint.





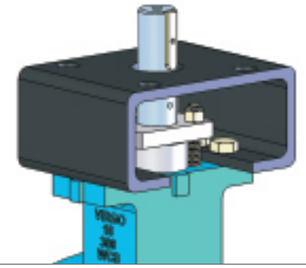
Bearing Protection
Graphite ring encased in bearing ensures protection against ingress of line media in to the bearing surface and thus avoids jamming of shaft.

One-Piece Shaft
One-piece shaft is guided by long bearings, which are placed nearer to disc for close support. Differential expansion due to temperature is taken care by key connection between shaft & disc. Bearings are super finished and nitrided for trouble free life. All portion of the shaft within the pressure boundary exceed in strength compare to the shaft portion outside the pressure boundary by minimum 10%.



Design Features : Standard Mounting | External Indicator for Disc Position | Low Emission Shaft Seal Externally Retained Blow-Out Proof Design

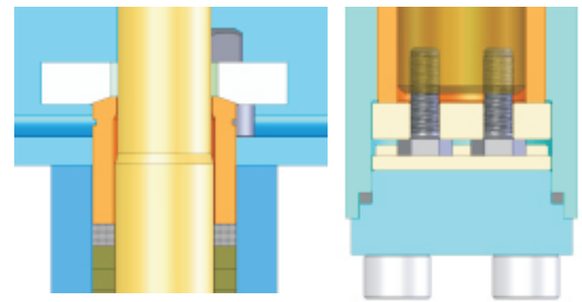
Standard Mounting
Bracket top side drilling and shaft connection as per ISO 5211.



External Indicator for Disc Position
Disc position is accomplished by dimple on shaft. When the dimple is inline with flow axis, disc is open.

Low Emission Shaft Seal
Adjustable shaft packing with multiple graphite rings sandwiched between two anti-extrusion rings control fugitive emission and gives longer packing life. Gland packing with live loading is available as an option.

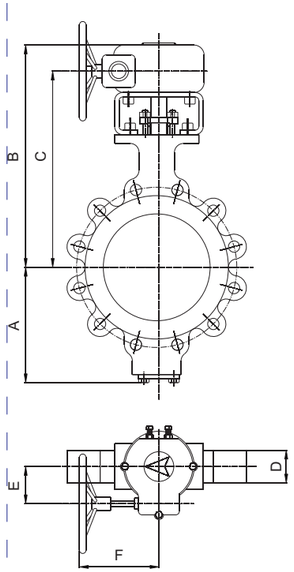
Externally Retained Blow-Out Proof Design
Engineered gland design gives shaft blow out proof protection externally, conforming to the requirements of API 609. In addition, two screws provided at the bottom retain the shaft against blowout.



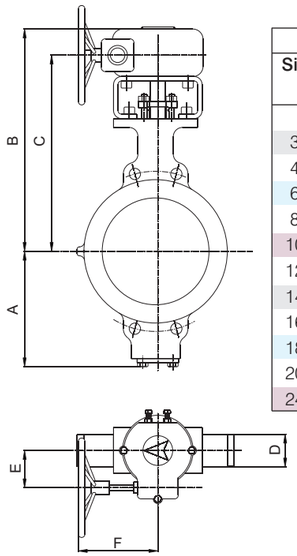
Dimensional Details

LUG (T3) & WAFER (T4)

LUG (T3)



WAFER (T4)



ANSI CLASS 150								
Size	A	B	C	D	E	F	Approximate Weight (kg)	
				T3,T4			Lug	Wafer
3"	135	275	258	48	45	180	31	28
4"	170	375	266	54	45	180	35	31
6"	185	395	310	57	54	240	49	46
8"	200	420	405	64	66	285	67	63
10"	225	465	445	71	76	305	96	88
12"	260	520	510	81	76	305	135	121
14"	315	570	565	92	92	320	177	160
16"	340	610	603	102	130	370	245	212
18"	360	680	641	114	120	395	298	265
20"	390	735	702	127	120	395	364	320
24"	500	970	746	154	130	381	588	527

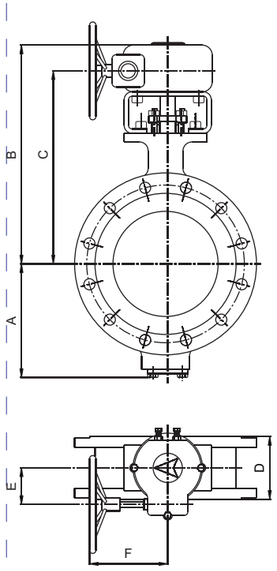
ANSI CLASS 300								
Size	A	B	C	D	E	F	Approximate Weight (kg)	
				T3,T4			Lug	Wafer
3"	135	275	258	48	45	180	36	32
4"	170	410	273	54	54	240	44	41
6"	220	445	366	59	72	300	59	56
8"	250	510	420	73	92	320	118	94
10"	270	550	465	83	130	370	193	155
12"	300	590	550	92	120	395	227	188
14"	350	700	579	117	130	381	351	269
16"	400	735	650	133	175	410	492	349
18"	425	830	735	149	175	410	597	415
20"	510	920	776	159	220	442	722	502
24"	600	1120	863	181	250	479	1206	887

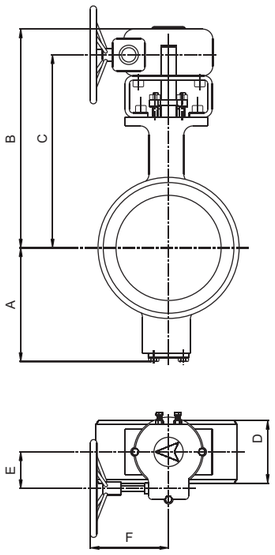
ANSI CLASS 600								
Size	A	B	C	D	E	F	Approximate Weight (kg)	
				T3,T4			Lug	Wafer
3"								
4"	175	375	295	64	72	300	61	54
6"	225	465	380	78	92	320	116	100
8"	275	610	452	102	120	395	199	172
10"	330	675	474	117	130	381	291	263
12"	350	715	575	140	175	410	459	382
14"	390	810	685	155	175	410	536	459
16"	420	870	755	178	220	442	755	568
18"								
20"								
24"								

Notes
- All dimensions are in mm
- Face to face dimensions for Wafer & lug body as per API 609 Table 2 (A)
- Above dimensions are for reference. Please consult for confirmation

Dimensional Details

Double Flanged (T1, T2) & Butt Weld (T5)





ANSI CLASS 150								
Size	A	B	C	D		E	F	Approximate Weight (kg)
				T1,T5	T2			DF / Butt Weld
3"	135	275	258	114	203	45	180	30 / 25
4"	170	375	266	127	229	45	180	36 / 28
6"	185	395	310	140	267	54	240	49 / 38
8"	200	420	405	152	292	66	285	69 / 52
10"	225	465	445	165	330	76	305	110 / 83
12"	260	520	510	178	356	76	305	143 / 101
14"	315	570	565	190	381	92	320	193 / 138
16"	340	610	603	216	406	130	370	256 / 190
18"	360	680	641	222	432	120	395	309 / 232
20"	390	735	702	229	457	120	395	364 / 271
24"	500	970	746	267	508	130	381	538 / 417

ANSI CLASS 300								
Size	A	B	C	D		E	F	Approximate Weight (kg)
				T1,T5	T2			DF / Butt Weld
3"	135	275	258	114	282	45	180	41 / 34
4"	170	410	273	127	305	45	180	49 / 40
6"	220	445	366	140	403	54	240	76 / 59
8"	250	510	420	152	418	66	285	116 / 89
10"	270	550	465	165	457	76	305	185 / 141
12"	300	590	550	178	502	76	305	254 / 188
14"	350	700	579	190	762	92	320	346 / 252
16"	400	735	650	216	838	130	370	448 / 338
18"	425	830	735	222	914	120	395	569 / 426
20"	510	920	776	229	991	120	395	832 / 645
24"	600	1120	863	267	1143	130	381	1140 / 887

ANSI CLASS 600								
Size	A	B	C	D		E	F	Approximate Weight (kg)
				T1,T5	T2			DF / Butt Weld
3"								
4"	175	375	295	190	432	72	300	65 / 49
6"	225	465	380	210	559	92	320	122 / 89
8"	275	610	452	230	660	120	395	210 / 155
10"	330	675	474	250	787	130	381	285 / 203
12"	350	715	575	270	838	175	410	448 / 338
14"	390	810	685	290	889	175	410	514 / 404
16"	420	870	755	310	991	220	442	722 / 546
18"								
20"								
24"								

Notes
- All dimensions are in mm
- Face to face dimensions for Double Flanged (T1) & End to end for butt weld (T5) are as per ISO 5752 Basic series 13
- Face to face dimensions for Double Flanged (T2) are as per ASME B16.10 Gate Valves
- Above dimensions are for reference. Please consult for confirmation.

Technical Details : Torque Values | Pressure Temperature Rating

Torque Values

		3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
ANSI #150 ΔP 20 bar	BTO	Nm	85	117	293	487	886	1321	1763	2418	3199	3753	6167
		in-lbs	756	1038	2592	4311	7839	11690	15602	21399	28310	33213	54584
	ETC	Nm	85	117	254	406	738	1101	1469	2015	2665	3127	5139
		in-lbs	750	1031	2245	3596	6533	9744	13003	17830	23586	27677	45487
	Running	Nm	32	40	33	78	119	162	268	268	331	334	477
		in-lbs	282	351	296	688	1052	1437	2372	2372	2929	2957	4222

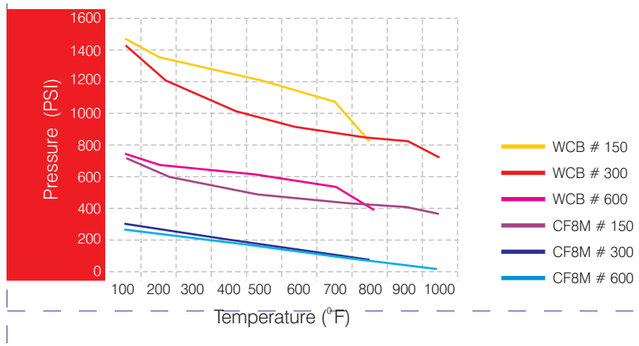
		3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
ANSI #300 ΔP 50 bar	BTO	Nm	164	244	620	1142	1969	2920	3747	6231	7207	9201	14200
		in-lbs	1451	2163	5486	10104	17431	25847	33160	55146	63792	81437	125680
	ETC	Nm	137	212	517	952	1625	2410	3091	5141	5948	7592	11718
		in-lbs	1215	1875	4576	8424	14378	21330	27361	45501	52645	67196	103709
	Running	Nm	50	61	120	249	326	413	510	733	861	998	1304
		in-lbs	440	543	1059	2207	2888	3651	4511	6491	7619	8836	11545

		3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
ANSI #600 ΔP 100 bar	BTO	Nm	--	581	1366	3404	4275	6228	7442	10827	--	--	--
		in-lbs	--	5140	12089	30124	37838	55123	65868	95828	--	--	–
	ETC	Nm	--	309	565	1346	2163	2802	3657	4029	--	--	--
		in-lbs	--	2731	5004	11910	19145	24799	32369	35658	--	--	–
	Running	Nm	--	137	214	472	705	839	1142	1311	--	--	--
		in-lbs	--	1216	1894	4175	6241	7428	10108	11603	--	--	--

Notes

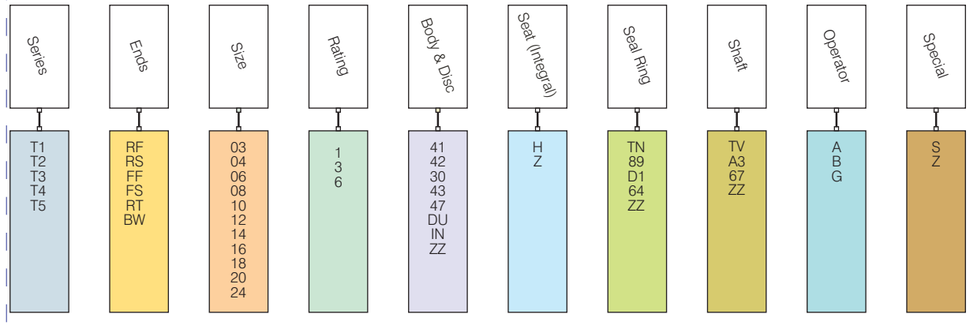
- BTO - Break to Open, ETC - End to Close
- Torque values are for laminated duplex + graphite seal ring and stellited seat
- Torque values are at ambient temperature with media being clear water and without factor of safety
- Suggested factor of safety is 1.3.
- Factor of safety should not be applied to ETC values
- Torque details for balance sizes can be provided on request

Pressure Temperature Rating



TRI-TORK Triple Offset Rotary Valve

Product Selection Code



Series

T1	Double Flanged (Short Pattern)
T2	Double Flanged (Long Pattern)
T3	Lug (End connection as per B16.5)
T4	Wafer (End connection as per B16.5)
T5	Butt Weld (Ends as per B16.25)

Rating

1	#150
3	#300
6	#600

Shaft

TV	SS 410
A3	17 - 4 PH
67	SS 420
ZZ	Other

Ends

RF	Raised Face Serrated
RS	Raised Face Smooth
FF	Flat Face Serrated
FS	Flat Face Smooth
RT	Ring Type Joint
BW	Butt Weld

Body & Disc

41 / 44	WCB / WCC
42 / D9	LCB / LCC
30 / 31	WC6 / Wc9
43 / 45	CF8 / CF8M
47 / 46	CF3 / CF3M
DU	Duplex
IN	Inconel
ZZ	Other than above

Operator

A	Actuator
B	Bare Shaft
G	Gear

Size

03	3"
04	4"
06	6"
08	8"
10	10"
12	12"
14	14"
16	16"
18	18"
20	20"
24	24"

Seat (Integral)

H	Hard Faced(Stellited)
Z	Other

Special

S	Special Requirement
Z	No Special Requirement

Seal Ring

TN	Duplex + Graphite
89	SS 316 + Graphite
D1	Duplex
64	SS 316
ZZ	Other

Example

T1	RF	08	1	41	H	TN	TV	G	Z

This code stands for double flanged (short pattern), raised face serrated, 8"#150, body & disc WCB, seat hard faced (stellited), seal laminated duplex + graphite, shaft SS 410, gear operated without special requirements