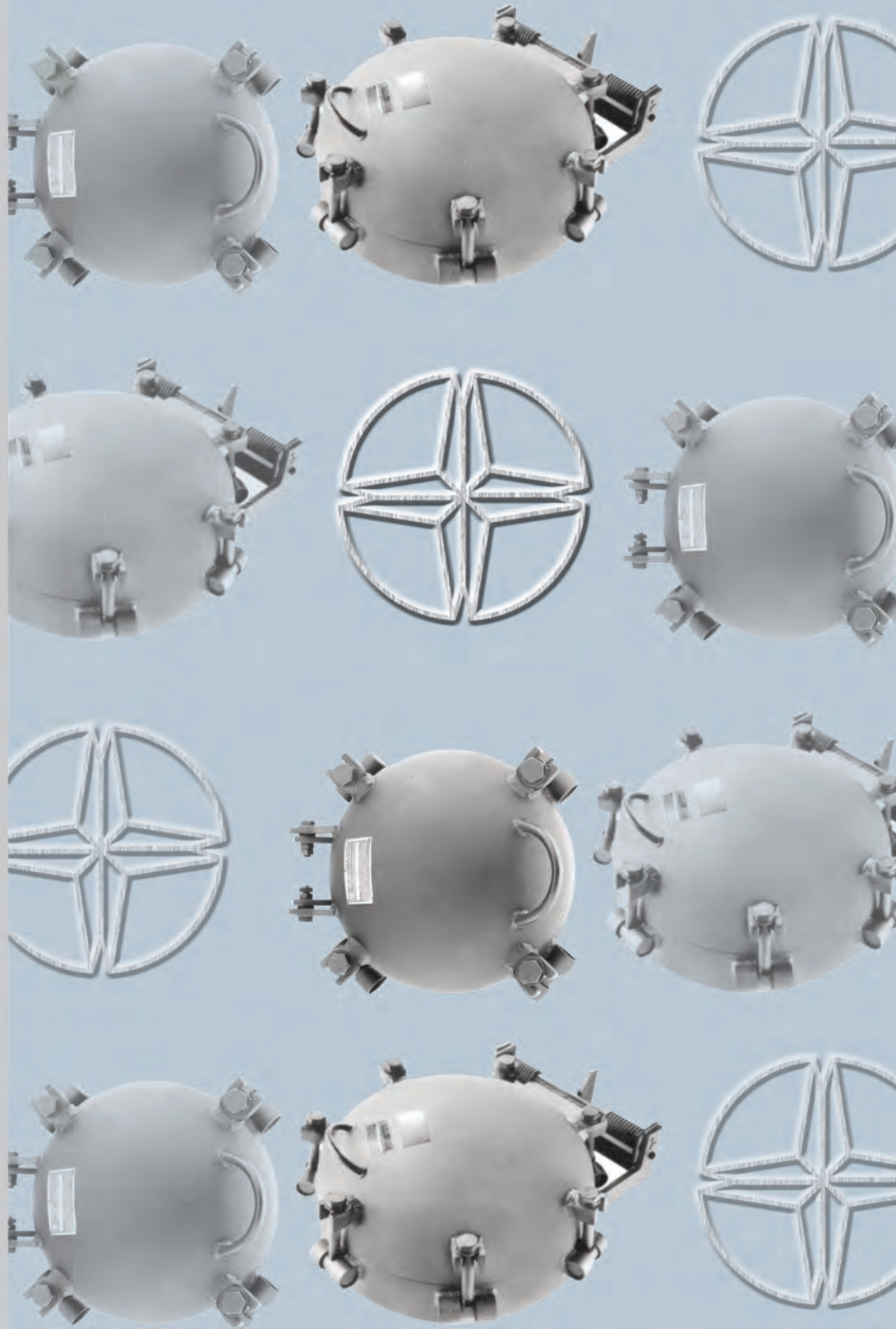


# T-BOLT STYLE CLOSURES



# T-BOLT HINGED CLOSURES

## GENERAL INFORMATION

Tube Turns' exclusive T-Bolt Closure is designed expressly for nominal pressure applications. Less expensive and much more satisfactory than blind flanges and job-fabricated closure devices, it is ideal for:

1. Manways for storage tanks, mixing vessels, filters, separators and other batch equipment.
2. Caps for inspection ports and other access openings on towers and reactors.
3. Handholes on processing equipment and medical or laboratory apparatus such as hyperbaric chambers.

## Economically Priced

Low initial cost is an especially attractive feature of the Tube Turns T-Bolt Closure. A complete unit normally costs less than the component parts for a blind and slip-on flange combination. There are no additional expenses for hinges, hoists, davits, etc., as the closure is fully assembled when shipped. Furthermore, installation and labor charges are held to a minimum; a single butt weld joins the closure to the nozzle vessel.

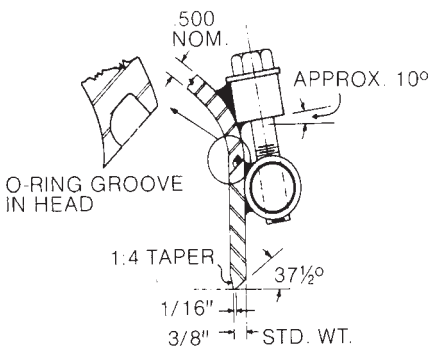
## Compact Design

Simplicity of construction and operation are keynotes of the Tube Turns T-Bolt Hinged Closure. The closure consists of a thick semi-ellipsoidal head that is hinged to a matching hub, a self energized O-ring and a suitable number of T-Bolts to effect and maintain a tight seal. For most services, the standard materials—carbon steel and a "Buna-N" O-ring are satisfactory. Other metals and elastomers are furnished on special request. The T-Bolt Hinged Closure is opened quickly and easily. The operator merely loosens the T-Bolts until they clear the head lugs and allow the head to be swung open on its hinge. Complete, unrestricted access is provided, too, since the standard hinging permits a full 180° opening.

## Warning Feature

The holding lugs are mounted on the closure head at an angle of approximately 10°. This provides a valuable feature, for the angular mounting requires that the T-bolt be backed off an extra turn or two before it will swing out of the holding position.

Thus, if there is pressure in the vessel while it is being opened, initial turns of the



bolts permit the head to lift slightly and the contained fluid escapes, alerting the operator to possible danger. Further movement of the head is restrained, since the T-bolt is confined within the holding lug.

## Operating Savings

Tube Turns T-Bolt Hinged Closures provide savings of time and labor. The semi-ellipsoidal shape of the T-Bolt Closure has greater pressure-holding capacity than a flat plate of equal thickness. This permits substantial weight reduction: the head of a 24" T-Bolt Closure, for instance, weighs only 100 pounds, as compared with 410 pounds for a comparable size 150 lb blind flange. *And the mechanical advantage afforded by the hinge arrangement further reduces the force needed to open a T-Bolt Closure.* Bolting is also simplified. A 24" T-Bolt Closure has but five bolts, while the same size 150 lb flange requires 20. Furthermore, the T-bolts remain attached to the closure when it is opened, eliminating possibilities of dropped or misplaced nuts, bolts and washers.

## Full Size Range

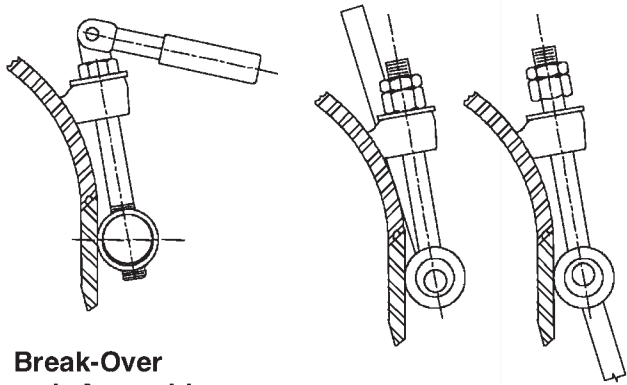
Standard Tube Turns T-Bolt Hinged Closures are furnished in carbon steel, stainless steel, & other alloys. Sizes range from 6" thru 66".



# T-BOLT HINGED CLOSURES

## T-BOLT CLOSURE OPTIONS

Break-Over Wrenches and Camlocks are optional attachments and accessories adding further to the versatility and utility of our T-Bolt Closures. Attachment of either of these options to the closure's T-Bolts provides extra convenience, speed and ease in tightening the bolts. These attachments eliminate the need for separate wrenches.



**Break-Over Wrench Assembly**

**Tightened Loosened Camlock Assembly**



The Break-Over Wrench Lug is welded to the T-Bolt (head bolt) and a handle is inserted over this lug. A pin is then inserted through the handle and the lug allowing the handle to act as a wrench and making the Break-Over Wrench an integral part of the T-Bolt Assembly.

In a Camlock Assembly, components replace the tapped swing nut (in the hub nut mount). The Camlock bolting unit consists of a high strength eye bolt that is pinned through an eccentric cam to provide the necessary clamping action. The camming action is adjustable by moving the adjustable nut at the threaded end of the eye bolt. This allows the camlock assembly to be loosened & tightened merely by lowering or raising the cam handle.

### Vertical T-Bolt Closures

T-Bolt Closures with a spring loaded head for vertical applications are furnished in sizes 10" - 42". The need for spring loading can be determined by reference to the table below. The tabulated "Force to Lift Head" is the force to lift the head **without** the springs.

Closure Size	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
Weight of Head (lbs)	7	12	19	22	32	41	53	67	74	100	112	125	139	169	184	269	295	322	346
Force to Lift Head (lbs)	4	9	12	15	20	26	32	40	44	58	62	71	76	90	106	149	168	186	231

# T-BOLT RATINGS

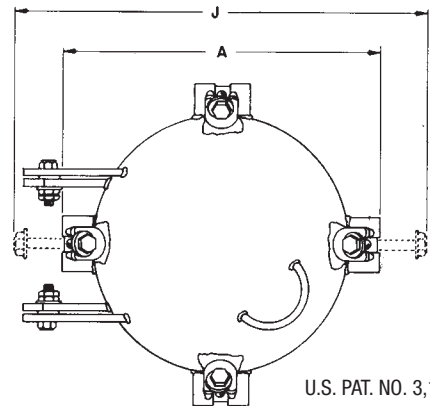
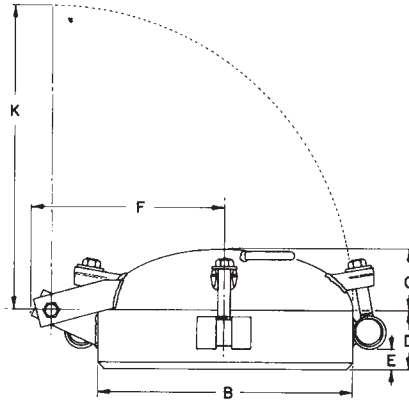
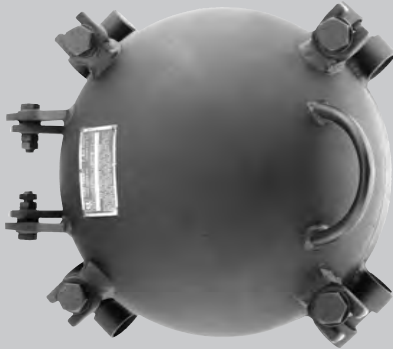
Closure Size	Class 75		Class 150		Class 300	
	Carbon Steel	Stainless Steel**	Carbon Steel	Stainless Steel**	Carbon Steel	Stainless Steel**
6	-	-	320	320	510	510
8	-	-	185	185	390	390
10	115	115	245	245	365	365
12	170	170	255	255	380	380
14	140	140	210	210	365	365
16	105	105	185	185	385	380
18	125	125	185	185	375	365
20	100	100	175	175	355	345
22	100	100	200	195	330	320
24	115	105	190	190	310	305
26	115	105	180	180	265	255
28	110	100	190	190	255	245
30	105	95	180	180	240	235
32	100	90	175	160	210	190
34	150	135	170	165	205	200
36	120	110	165	160	185	180
38	125	115	175	170	-	-
40	105	95	170	165	-	-
42	110	100	165	160	-	-
48	120	120	135	130	-	-

\*\* Ratings apply to stainless steel closures with carbon steel bolts and attachments. Closures of all stainless steel are rated lower. For temperatures higher than 450F, consult Tube Turns stating temperature, pressure, fluid and type of o-ring required. Ratings apply for closures with ASME SA325 bolts. Slightly higher ratings are available in some sizes upon application by using ASME SA193 Grade B7 bolts, resulting in a slightly higher price.

Above ratings good for 450F. "Buna-N" is the standard O-ring gasket material. For services above 250F or where special corrosive conditions are to be encountered, O-rings of "Viton", Silicone Rubber, "Neoprene" Ethylene Propylene, "Teflon Encapsulated" (Viton or Silicone Core) can be furnished at an extra charge. Refer to Page 7



# T-BOLT HORIZONTAL DIMENSIONS



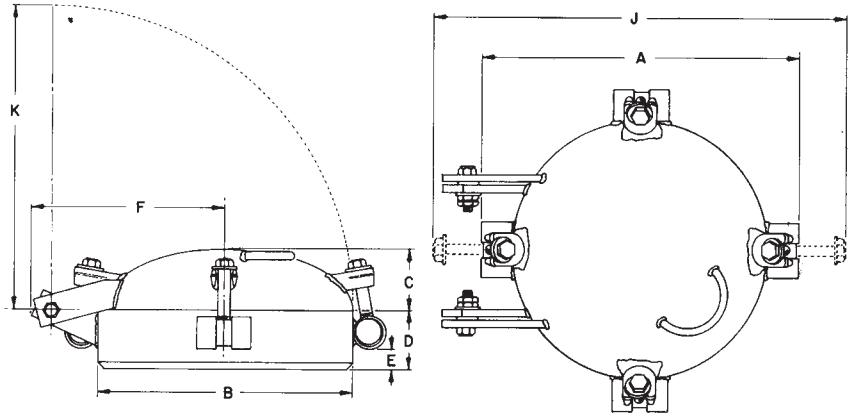
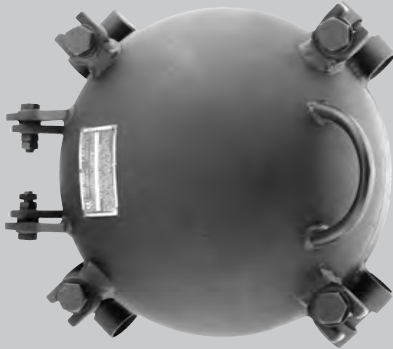
U.S. PAT. NO. 3,187,929

	Nom. Pipe Size	Nom.* Wall Thickness	Over-all A	OD at Welding Bevel B	Back to Face C	Hub Length D	Clear Hub Length E	Center to Hinge End F	Swing Bolt Clearance J	Opening Clearance K	No. Bolts	Bolt Size	Approx. Weight Lbs
<b>Class 75-TB T-Bolt Horizontal</b>	10	.500	13 3/8	10 3/4	2 13/16	2 1/2	1 1/16	7 5/8	18	12 1/4	3	1/2	30
	12	.500	16 1/8	12 3/4	3 1/8	2 5/8	3/4	8 15/16	21	14 1/4	4	5/8	50
	14	.500	17 3/8	14	3 9/16	2 7/8	1	9 9/16	22	15 1/2	4	5/8	60
	16	.500	19 3/8	16	4	2 7/8	1	10 1/2	24	17 1/2	4	5/8	70
	18	.500	21 3/8	18	4 1/2	3 3/8	1 3/8	11 11/16	30	19 1/2	4	3/4	95
	20	.500	23 3/8	20	4 15/16	3 7/8	1 7/8	12 15/16	32	21 11/16	4	3/4	115
	22	.500	25 3/8	22	5 1/4	4 3/8	2 3/8	13 15/16	34	23 11/16	5	3/4	140
	24	.500	27 7/8	24	5 3/4	4 3/8	1 13/16	15	38	25 11/16	5	7/8	165
	26	.500	29 7/8	26	6 1/4	4 3/8	1 13/16	16 1/4	40	28	6	7/8	180
	28	.500	31 7/8	28	6 3/4	4 3/8	2 1/8	17 1/4	42	30	7	7/8	200
	30	.500	33 7/8	30	7 1/4	4 3/8	1 7/8	18 5/16	45	32	8	7/8	230
	32	.500	35 7/8	32	7 3/4	4 3/8	2	19 5/8	47	34	9	7/8	265
	34	.625	38 3/4	34	8 3/16	4 3/8	1 5/16	20 5/8	51	36	9	1 1/8	325
	36	.625	40 3/4	36	8 11/16	4 1/2	1 5/8	21 9/16	53	38	9	1 1/8	410
	38	.625	42 3/4	38	9 3/16	4 1/2	1 5/8	22 9/16	55	40	10	1 1/8	450
	40	.625	44 3/4	40	9 11/16	4 1/2	1 5/8	22 3/4	57	42	10	1 1/8	480
	42	.625	46 3/4	42	10 3/16	4 1/2	1 5/8	25 5/16	61	44 3/4	11	1 1/8	550
	48	.750	52 3/4	48	11 3/4	7	4 1/8	28 1/8	67	49 1/2	14	1 1/8	830
<b>Class 150-TB T-Bolt Horizontal</b>	6	.500	9 1/4	6 5/8	2 1/8	1 11/16	1/4	5 1/2	13	8	3	1/2	15
	8	.500	11 1/4	8 5/8	2 3/16	2 1/4	13/16	6 5/8	15	10 1/8	3	1/2	20
	10	.500	14 1/8	10 3/4	2 13/16	2 1/2	3/4	7 5/8	19	12 1/4	4	5/8	35
	12	.500	16 1/8	12 3/4	3 1/8	2 5/8	3/4	9	23	14 5/16	4	3/4	55
	14	.500	17 3/8	14	3 9/16	2 7/8	1	9 9/16	24	15 1/2	4	3/4	65
	16	.500	19 3/8	16	4	2 7/8	1	10 1/2	26	17 1/2	7	5/8	80
	18	.500	21 3/8	18	4 1/2	3 3/8	1 3/8	11 11/16	30	19 1/2	6	3/4	100
	20	.500	23 3/8	20	4 15/16	3 7/8	1 7/8	12 15/16	32	21 11/16	7	3/4	125
	22	.500	25 3/4	22	5 1/4	4 3/8	1 13/16	15 1/2	36	23 3/16	7	7/8	150
	24	.500	27 7/8	24	5 3/4	4 3/8	1 7/8	15	38	25 11/16	8	7/8	180
	26	.500	29 7/8	26	6 1/4	4 3/8	1 13/16	16 1/4	40	28	9	7/8	200
	28	.500	31 7/8	28	6 3/4	4 3/8	2 1/8	17 1/4	43	30	11	7/8	225
	30	.500	33 7/8	30	7 1/4	4 3/8	1 7/8	18 5/16	45	32	12	7/8	250
	32	.500	36 3/4	32	7 3/4	4 3/8	1 5/16	19 5/8	49	34	10	1 1/8	310
	34	.625	38 3/4	34	8 3/16	4 3/8	1 5/16	20 5/8	53	36	10	1 1/8	380
	36	.625	40 3/4	36	8 11/16	4 1/2	1 5/8	21 9/16	55	38	11	1 1/8	460
	38	.625	42 3/4	38	9 3/16	4 1/2	1 5/8	22 9/16	59	40 1/16	13	1 1/8	500
	40	.625	44 3/4	40	9 11/16	4 1/2	1 5/8	26 1/16	57	44 7/16	14	1 1/8	550
42	.625	46 3/4	42	10 3/16	4 1/2	1 5/8	25	61	44 7/16	15	1 1/8	600	
48	.750	52 3/4	48	11 3/4	7	4 1/8	28	67	52	16	1 1/8	860	

All dimension are in inches. When ordering, please specify class, nominal size, bore, material and service conditions. T-Bolt Closures with longer hubs; Closures made to I.D. dimensions; or Closures equipped with Sight Glasses, Break-over Wrenches, Camlocks and other accessories are available on special order. \*Standard Closures are taper bored to match standard wall thickness.



# T-BOLT HORIZONTAL DIMENSIONS



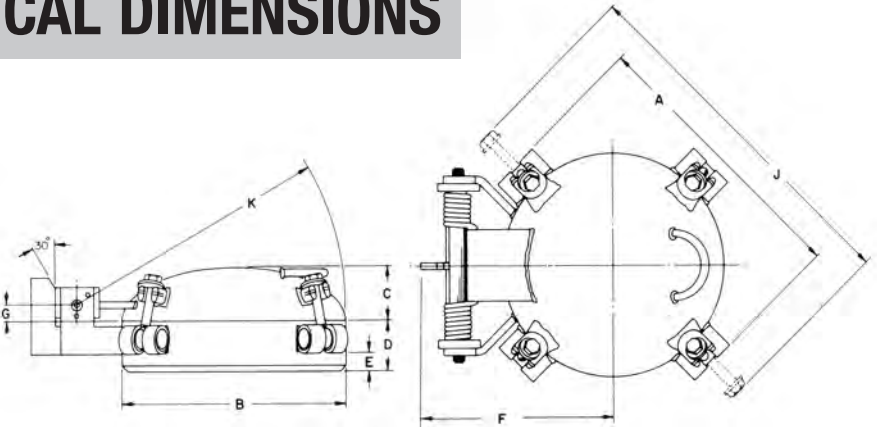
	Nom. Pipe Size	Nom.* Wall Thickness	Over-all A	OD at Welding Bevel B	Back to Face C	Hub Length D	Clear Hub Length E	Center to Hinge End F	Swing Bolt Clearance J	Opening Clearance K	No. Bolts	Bolt Size	Approx. Weight Lbs
<b>Class 300-TB T-Bolt Horizontal</b>	6	.500	9 7/8	6 5/8	2 1/8	2 1/16	5/16	5 5/8	16	8 1/8	3	5/8	18
	8	.500	11 7/8	8 5/8	2 3/16	2 1/4	7/16	6 9/16	19	10 1/8	4	5/8	27
	10	.500	14 1/8	10 3/4	2 13/16	2 1/2	5/8	7 5/8	20	12 1/4	4	3/4	35
	12	.500	16 1/8	12 3/4	3 1/8	2 5/8	3/4	9 3/4	23	15 3/16	6	3/4	55
	14	.500	17 3/8	14	3 9/16	2 7/8	1	9 1/2	25	15 7/8	7	3/4	70
	16	.500	19 7/8	16	4	2 7/8	3/8	10 1/8	29	17 1/2	7	7/8	85
	18	.500	22 3/4	18	4 1/2	3 3/8	5/8	11 3/4	33	20	6	1 1/8	130
	20	.500	24 3/4	20	4 15/16	3 7/8	1 1/8	12 5/16	36	21 9/16	7	1 1/8	175
	22	.500	26 3/4	22	5 1/4	4 3/8	1 5/8	13 15/16	38	23 11/16	8	1 1/8	200
	24	.500	28 3/4	24	5 3/4	4 3/8	1 5/8	16	40	26 11/16	9	1 1/8	230
	26	.500	30 3/4	26	6 1/4	4 3/8	1 1/4	16 5/8	42	28 5/8	9	1 1/8	250
	28	.500	32 3/4	28	6 3/4	4 3/8	1 5/8	17 5/16	45	30	10	1 1/8	275
	30	.500	34 3/4	30	7 1/4	4 3/8	1 11/16	18 5/16	47	32	11	1 1/8	300
	32	.500	36 3/4	32	7 3/4	4 3/8	1 5/16	19 11/16	49	34 7/16	11	1 1/8	360
	34	.625	38 3/4	34	8 3/16	4 3/8	1 5/16	21 1/8	53	36 1/2	12	1 1/8	440
	36	.625	40 3/4	36	8 11/16	4 1/2	1 5/8	25 5/16	55	38 3/4	12	1 1/8	510

All dimension are in inches. When ordering, please specify class, nominal size, bore, material and service conditions. T-Bolt Closures with longer hubs; Closures made to I.D. dimensions; or Closures equipped with Sight Glasses, Break-over Wrenches, Camlocks and other accessories are available on special order. \*Standard Closures are taper bored to match standard wall thickness.



We stock T-Bolt Closures in many sizes, pressure classes and materials.

# T-BOLT VERTICAL DIMENSIONS



	Nom. Pipe Size	Nom.* Wall Thickness	Over-all A	OD at Welding Bevel B	Back to Face C	Hub Length D	Clear Hub Length E	Center to Hinge End F	Face to Hinge G	Swing Bolt Clearance J	Opening Clearance K	No. Bolts	Bolt Size	Approx. Weight Lbs
<b>Class 75-TBV T-Bolt Vertical</b>	10	.500	13 3/8	10 3/4	2 13/16	2 1/2	1 1/16	8 1/4	1 3/8	18	1 11/16	3	1/2	35
	12	.500	16 1/8	12 3/4	3 1/8	2 5/8	3/4	9 7/8	1 1/2	21	13 15/16	4	5/8	55
	14	.500	17 3/8	14	3 9/16	2 7/8	1	10 1/4	1 1/2	22	15 1/16	4	5/8	65
	16	.500	19 3/8	16	4	2 7/8	1	11 1/4	1 1/2	24	17 1/16	4	5/8	75
	18	.500	21 3/8	18	4 1/2	3 3/8	1 3/8	13 5/8	1 7/16	30	20 1/16	4	3/4	105
	20	.500	23 3/8	20	4 15/16	3 7/8	1 7/8	14 3/4	1 11/16	32	22 1/16	4	3/4	130
	22	.500	25 3/8	22	5 1/4	4 3/8	2 3/8	17 1/4	2 1/4	34	25 9/16	5	3/4	160
	24	.500	27 7/8	24	5 3/4	4 3/8	1 13/16	19 3/8	1 3/4	38	28 5/16	5	7/8	190
	26	.500	29 7/8	26	6 1/4	4 3/8	1 13/16	21 1/4	1 7/8	40	31 1/4	6	7/8	200
	28	.500	31 7/8	28	6 3/4	4 3/8	2 1/8	23	2 1/8	42	33 13/16	7	7/8	225
	30	.500	33 7/8	30	7 1/4	4 3/8	1 7/8	23	1 7/8	45	35 1/16	8	7/8	260
	32	.500	35 7/8	32	7 3/4	4 3/8	2	23	2	47	36 1/16	9	7/8	295
	34	.625	38 3/4	34	8 3/16	4 3/8	1 5/16	25 1/4	2 5/16	51	38 9/16	9	1 1/8	365
	36	.625	40 3/4	36	8 11/16	4 1/2	1 5/8	27	2 1/2	53	41 1/16	9	1 1/8	480
38	.625	42 3/4	38	9 3/16	4 1/2	1 5/8	28	2 1/2	55	43 1/16	10	1 1/8	515	
40	.625	44 3/4	40	9 11/16	4 1/2	1 5/8	28 13/16	2 7/8	57	45 1/16	10	1 1/8	550	
42	.625	46 3/4	42	10 3/16	4 1/2	1 5/8	30 7/16	2 7/8	61	47 1/16	11	1 1/8	630	
<b>Class 150-TBV T-Bolt Vertical</b>	10	.500	14 1/8	10 3/4	2 13/16	2 1/2	3/4	9 7/8	1 1/8	19	13 1/2	4	5/8	35
	12	.500	16 1/8	12 3/4	3 1/8	2 5/8	3/4	10 7/8	1 1/2	23	14 7/8	4	3/4	60
	14	.500	17 3/8	14	3 9/16	2 7/8	1	10 1/4	1 1/2	24	15	4	3/4	70
	16	.500	19 3/8	16	4	2 7/8	1	13 13/16	1 1/2	26	19 3/16	7	5/8	85
	18	.500	21 3/8	18	4 1/2	3 3/8	1 3/8	14 3/8	1 5/8	30	20 1/2	6	3/4	110
	20	.500	23 3/8	20	4 15/16	3 7/8	1 7/8	15 7/8	1 1/8	32	22 1/2	7	3/4	140
	22	.500	25 3/4	22	5 1/4	4 3/8	1 13/16	19 3/8	1 1/4*	36	25 1/2	7	7/8	170
	24	.500	27 7/8	24	5 3/4	4 3/8	1 7/8	19 3/8	2	38	28 1/4	8	7/8	205
	26	.500	29 7/8	26	6 1/4	4 3/8	1 13/16	22 1/4	2 1/8	40	31 5/8	9	7/8	225
	28	.500	31 7/8	28	6 3/4	4 3/8	2 1/8	23	2 1/8	43	33 3/4	11	7/8	250
	30	.500	33 7/8	30	7 1/4	4 3/8	1 7/8	27	1 3/8*	45	35	12	7/8	280
	32	.500	36 3/4	32	7 3/4	4 3/8	1 5/16	25	2	49	37	10	1 1/8	340
34	.625	38 3/4	34	8 3/16	4 3/8	1 5/16	27 7/8	1 3/4*	53	38 1/2	10	1 1/8	420	
36	.625	40 3/4	36	8 11/16	4 1/2	1 5/8	29 1/2	1 3/4*	55	41	11	1 1/8	530	
<b>Class 300-TBV T-Bolt Vertical</b>	10	.500	14 1/8	10 3/4	2 13/16	2 1/2	5/8	9 7/8	1 1/8	20	13 1/2	4	3/4	40
	12	.500	16 1/8	12 3/4	3 1/8	2 5/8	3/4	12 5/8	1 3/8	23	16 3/8	6	3/4	65
	14	.500	17 3/8	14	3 9/16	2 7/8	1	12 3/8	1 1/2	25	17 1/4	7	3/4	75
	16	.500	19 7/8	16	4	2 7/8	3/8	13 7/8	1 1/2	29	19 1/2	7	7/8	90
	18	.500	22 3/4	18	4 1/2	3 3/8	5/8	16 3/4	1	33	23	6	1 1/8	120
	20	.500	24 3/4	20	4 15/16	3 7/8	1 1/8	18 5/8	1 1/2	36	26	7	1 1/8	145
	22	.500	26 3/4	22	5 1/4	4 3/8	1 5/8	20	2 3/8	38	27 5/8	8	1 1/8	180
	24	.500	28 3/4	24	5 3/4	4 3/8	1 5/8	20 1/4	1 7/8	40	28 7/8	9	1 1/8	210
	26	.500	30 3/4	26	6 1/4	4 3/8	1 1/4	20 3/4	2 1/8	42	31 1/2	9	1 1/8	230
	28	.500	32 3/4	28	6 3/4	4 3/8	1 5/8	22 3/4	2 1/8	45	33 3/4	10	1 1/8	260
	30	.500	34 3/4	30	7 1/4	4 3/8	1 11/16	23 5/8	1 3/8	47	35 1/4	11	1 1/8	290
	32	.500	36 3/4	32	7 3/4	4 3/8	1 5/16	25	1 5/8	49	37 1/4	11	1 1/8	350
34	.625	38 3/4	34	8 3/16	4 3/8	1 5/16	26 1/2	1 1/2	53	39 1/2	12	1 1/8	435	
36	.625	40 3/4	36	8 11/16	4 1/2	1 5/8	27 1/2	2 1/8	55	41 1/2	12	1 1/8	540	

All dimension are in inches. When ordering, please specify class, nominal size, bore, material and service conditions. T-Bolt Closures with longer hubs; Closures made to I.D. dimensions; or Closures equipped with Sight Glasses, Break-over Wrenches, Camlocks and other accessories are available on special order. \*Standard Closures are taper bored to match standard wall thickness.



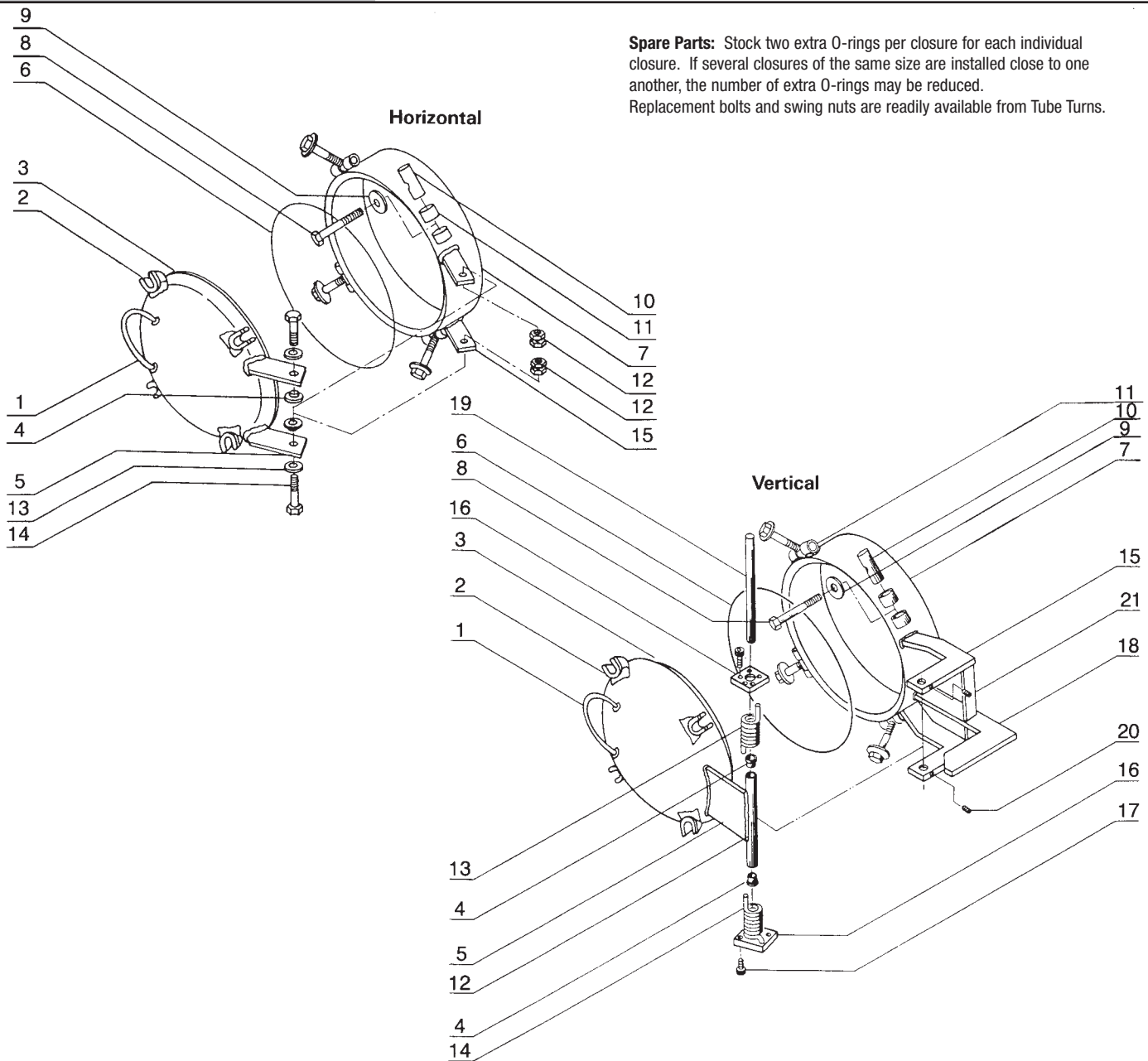
# T-BOLT CLOSURE PARTS

## T-Bolt Closure Horizontal Parts List

1. Head Handle	4. Hinge Bushings	7. Hub	10. Tapped Swing Nut	13. Hinge Bolt Washer
2. Head Bolt Lug	5. Head Hinge Arm	8. Head Bolt	11. Hub Nut Mounts	14. Hinge Bolt
3. Head	6. O-Ring	9. Head Bolt Washer	12. Hinge Bolt Nut	15. Hub Hinge Arms

## T-Bolt Closure Vertical Parts List

1. Head Handle	6. O-ring	11. Hub Nut Mounts	16. Adjusting Plate	21. Hinge Brace
2. Head Bolt Lug	7. Hub	12. Hinge Tube	17. Lock Screw	
3. Head	8. Head Bolt	13. Spring (R.H.)	18. Head Stop	
4. Hinge Bushing	9. Head Bolt Washer	14. Spring (L.H.)	19. Hinge Rod	
5. Head Hinge Arm	10. Tapped Swing Nut	15. Hub Hinge Arms	20. Hinge Rod Set Screw	



# TERMS AND CONDITIONS

1. Seller offers to sell to Buyer, or accepts Buyer's offer to purchase, on the condition that Buyer assents to the terms contained herein. Buyer's failure to provide seller with notification of any objection to these terms within a period of five days after receipt of this instrument or Buyer's acceptance of any product shipped hereunder constitutes assent by the Buyer to these terms. Seller's acceptance of Buyer's offer to purchase, or Buyer's acceptance hereof, is limited and restricted to these terms. Seller objects to and refuses to be bound by any terms additional to or different from those contained herein.

2. Prices are subject to change without notice, and all orders are to be invoiced at Seller's prices prevailing at time of shipment.

3. Any taxes which Seller may be required to pay or collect under existing or future law upon or with respect to the sale, purchase, delivery, transportation, storage, processing, use, or consumption of any of the products or services covered hereby, including all taxes upon or measured by receipts from sales or services, shall be for the account of Buyer, who shall promptly pay the amount thereof to Seller upon demand.

4. All accounts are payable in United States funds, free of exchange, collection or other charges. If Buyer fails to fulfill the terms of payment or if Seller shall have any doubt at any time as to Buyer's financial responsibility, Seller may suspend production and decline to make shipment or delivery except upon receipt of cash or security satisfactory to Seller.

5. Unless otherwise specifically provided herein, delivery will be made f.o.b. point of shipment, all risk of loss shall pass to Buyer upon delivery to carrier, and Buyer shall be responsible for obtaining insurance if desired. The method and agency of transportation and the routing, unless specified on the face hereof, will be selected by Seller, and Seller reserves the right to ship freight collect. Shipping dates are approximate and are based on prompt receipt of all necessary information.

6. Seller shall not be liable for any delay in performance due to fire, explosion, casualty, strike or other labor difficulties, shortage of material, utility, facility or labor, delay in transportation, breakdown or accident, compliance with or other action taken to carry out the intent or purpose of any law or regulation, or any cause whether similar or dissimilar beyond Seller's reasonable control, and Seller shall have such additional time for performance as may reasonably necessary under the circumstances and the right to apportion its production among its customers in any manner it sees fit.

7. Any claims for shortages, damaged products, or non-conformance of products with the order must be made in writing within ten (10) days after receipt of shipment, and Seller must be afforded an opportunity to investigate.

8. Cancellation or alteration of an order or

return of any product by Buyer may not be made without advance written consent by Seller and, at Seller's option, shall be subject to a cancellation, alteration or return charge acceptable to Seller.

9. Seller warrants that its products are free from defects in material and workmanship.

10. In the event of breach of any warranty hereunder, Seller's sole and exclusive liability shall be at its option either to repair or replace, f.o.b. point of shipment, any defective product, or to accept return, transportation prepaid, of such product and refund the purchase price; in either case provided that such product within 12 months from date of shipment to Buyer is found by Seller to have been defective at the time of such shipment, that the product has been installed and operated in accordance with generally approved practice and in accordance with Seller's instructions, that no repairs, alterations or replacements have been made by others without Seller's written approval, and that Buyer notifies Seller in writing within 15 days after the defect becomes apparent and promptly furnishes full particulars in connection therewith; and provided further that in no event shall the aggregate liability of Seller in connection with breach of any warranty or warranties exceed the purchase price paid for the products purchased hereunder. Seller, may, at its option, require the return of any product, transportation and duties prepaid, to establish any claim of defect made by Buyer. EXCEPT AS EXPRESSLY STATED IN THIS INSTRUMENT, SELLER MAKES NO WARRANTIES, EXPRESS OR IMPLIED, AND DOES NOT WARRANT THAT THE PRODUCTS SOLD HEREUNDER ARE MERCHANTABILITY OR FIT FOR ANY PARTICULAR PURPOSE.

11. Seller will defend at its own expense any suit or legal proceeding instituted against Buyer, and will pay any damages and costs awarded therein against Buyer, insofar as the same are based on a claim that any product furnished hereunder, except as excluded below, in itself constitutes an infringement of any United States patent, provided Buyer gives Seller prompt written notice of such infringement claim and of the institution of such suit or proceeding and also gives Seller all necessary authority, information and reasonable assistance to enable Seller, at Seller's option, to settle or defend the same. In case any said product is held in such suit to constitute an infringement and its use is enjoined, Seller at its own expense will either procure for Buyer the right to continue using said product, or modify same so that it becomes non-infringing, or replace it with a non-infringing product, or remove the product and refund the purchase price paid therefor by Buyer. The foregoing provisions state Seller's entire obligation and liability for patent infringement; and it is understood and agreed that there shall be excluded from the operation of said provisions any and all products

furnished in accordance with particular designs, specifications or instructions furnished or expressly or impliedly prescribed by Buyer and not customarily followed by Seller in the course of its general business, and Buyer will indemnify and hold harmless Seller from and against all loss, cost, expense, damage and liability of any nature or kind for or on account of any patented or unpatented invention or trade secret which in compliance with any such designs, specifications or instructions is embodied in any product furnished hereunder.

12. Seller shall not, except as set forth above, be otherwise liable to Buyer or to any person who shall purchase from Buyer, or use, any products supplied hereunder for damages of any kind, including, but not limited to, direct, indirect, special or consequential damages or loss of production or loss of profits resulting from any cause whatsoever, including, but not limited to, any delay, act, error or omission of Seller.

13. Technical information, recommendations and advice as to properties and usages of materials, design, installation and use of products, engineering and other matters are provided as an accommodation and are intended only as suggestions. Although they are believed to be accurate, based on Seller's best knowledge and experience, Seller assumes no obligation or liability for any results obtained in their use or application, and they are not to be construed as establishing any warranty, express or implied.

14. This agreement shall inure to the benefit of and be binding upon the successors and assigns of the parties hereto.



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