THREADED CLOSURES

For Blanking Off
Pipeline Ends,
Tank and Vessel Openings

SYPRIS® TECHNOLOGIES
Tube Turns Division

HISTORY

Tube Turns was founded in 1927 in Louisville, Kentucky, USA. We were the first American manufacturer of forged seamless pipe elbows and returns. Over the years, our products have evolved to exceed the ever changing market demands of the industries that we serve.

In 1959, we developed Yoke Style Hinged Closures. We then added T-Bolt Closures, Threaded Closures and Tool-less® Closures in order to satisfy customer requirements.

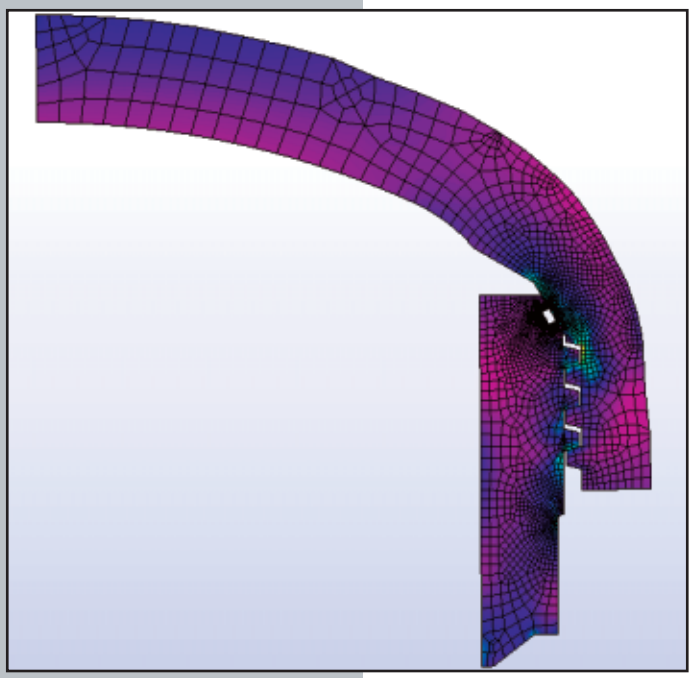
Applications include scraper traps, filters, strainers, separators/coalescers, terminal manifolds, meter provers, distillation towers, storage tanks or any pressure vessel requiring frequent access.

Tube Turns Threaded Closures are available in sizes 2" thru 24" in Class 150 thru 900 and 26" thru 36" in Classes 150 thru 600. These closures are specified by many piping engineers and designers for their economy and simple design that consists of only a Head, Welding Hub and hinging hardware.

DESIGN & CODE COMPLIANCE

All Tube Turns Threaded Closures are designed in accordance with Section VIII, Division 1 of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. Prototype testing utilizing strain gages was conducted to prove the design basis and strength requirements of the closure geometry. The strain gage results were compared to finite element analysis for theoretical agreement to meet the allowable stresses prescribed in the ASME Pressure Vessel Code. The hydrostatic testing and strain gage testing were witnessed by an independent authorized inspection agency.

ASME Code Stamping and Partial Data Reports are available at the time of order at a nominal extra cost, verifying shop inspection of the unit by a commissioned inspector of the National Board of Boiler and Pressure Vessel Inspectors. Alternatively, we can supply, at no extra charge, our Manufacturer's Statement of Code Compliance to ASME Section VIII, Division 1. We can certify D.O.T. Title 49 Part 192 or Part 195, ASME B31.3, ASME B31.4 or ASME B31.8.



Design of the Threaded Closure has been verified using the latest finite element analysis software.

24" CL900V Closure under 3350 psi Hydrostatic Test

SAFETY

Each Threaded Closure 6” and larger has a Pressure Warning Device to alert the operator of any internal pressure in the pipe or vessel before opening the Head. The Pressure Warning Device is manufactured from stainless steel to provide corrosion protection for this safety item. The Pressure Warning Device is optional on the 2” through 4” sizes and must be added if the closure requires an ASME Code Stamp. The Pressure Warning Device meets the requirements of UG-35 of ASME Section VIII, Division 1.

The Threaded Closure is designed to alert the operator of residual pressure in the event the closure is opened inadvertently.

CLOSURE MATERIALS

Threaded Closure Hubs and Heads are made from the materials listed below:

Hubs
2” - 8”: SA-106 Grade C X46
10” - 36”: SA-105/SA-350 LF2 Cl. 1/ A694-F52

Heads
2” - 6”: SA-352 Grade LCB
8” - 12”: SA-105/SA-350 LF2 Cl. 1
14” - 36”: SA-516 Grade 70N

All closure hubs have high specified yield strengths to facilitate mating to higher pipe yield strengths as provided by Figure I5 of ASME B31.8 and Figure 434.8.6(a)-(2) of ASME B31.4. Higher yield weld hub materials and hub and head materials conforming to the latest NACE Standard MR0175/ISO 15156 are available upon request.

Minimum Design Metal Temperature (MDMT) of -20 °F (-29 °C) is standard up to extra heavy walls for 2” thru 8” sizes. Lower MDMT’s or MDMT on heavier walls can be developed upon request.

MDMT of -50 °F (-46 °C) is standard for 10” thru 36” sizes.

Elastomeric o-ring seals are used in Tube Turns Threaded Closures. The standard seal is 70 Durometer Buna-N which has a temperature range of -30° F to +250° F (-34 °C to 121 °C). For the higher pressure Class 900 closures a 90 Durometer Buna-N seal is standard. Other seal materials are available as described on page 5.

WALL THICKNESS			
Stock can currently match the following maximum walls:			
2” - Schedule 80	10” - 0.750” (19.1 mm)	20” – 1.031” (26.2 mm)	30” – 1.375” (34.9 mm)
3” - Schedule 80	12” – 0.843” (21.4 mm)	22” – 1.125” (28.6 mm)	32” – 1.406” (35.7 mm)
4” - Schedule 80	14” – 0.843” (21.4 mm)	24” – 1.218” (30.9 mm)	34” – 1.438” (36.5 mm)
6” - Schedule 80	16” – 0.843” (21.4 mm)	26” – 1.250” (31.8 mm)	36” – 1.500” (38.1 mm)
8” – 0.625” (15.9 mm)	18” – 0.937” (23.8 mm)	28” – 1.312” (33.3 mm)	
Closure Hub I. D. is taper bored to match lighter walls such as standard weight. Heavier wall thicknesses are available at an extra cost.			

PRESSURE RATINGS

ALLOWABLE WORKING PRESSURE RATINGS: The maximum allowable working pressures refer to those established for ANSI/ASME B16.5 Flange Ratings for carbon steel materials.

	PRESSURE RATINGS (to 450 °F)*				
Closure Pressure Class	150	300	400	600	900
Maximum Working Pressure PSI (BARS)	285 (19.6)	740 (51.1)	990 (68.1)	1,480 (102.1)	2,220 (153.2)
Hydrostatic Test Pressure PSI (BARS)	450 (30)	1125 (77)	1500 (103)	2225 (154)	3350 (230)

*ASME rating will depend on the closure weld hub thickness required to meet ASME Code design requirements. Note: Maximum service temperature for the above ratings is determined by elastomer o-rings used for seal.

QUALITY CONTROL

The Threaded Closure is manufactured in Louisville, KY, USA. The Tube Turns Division quality system meets the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, Appendix 10. The quality system is audited by an independent authorized inspection agency.

The quality system controls order analysis, calibration, drawings, documents, materials, processes, welding, nondestructive examination and inspection.

Raw materials are inspected for dimensional acceptability and proper heat code identification. Mill test reports are checked to ensure proper physical and chemical properties of all pressure retaining components. Certified material test reports are shipped with each closure.

A serial number is assigned to each Threaded Closure at order entry and is permanently stamped on the closure.

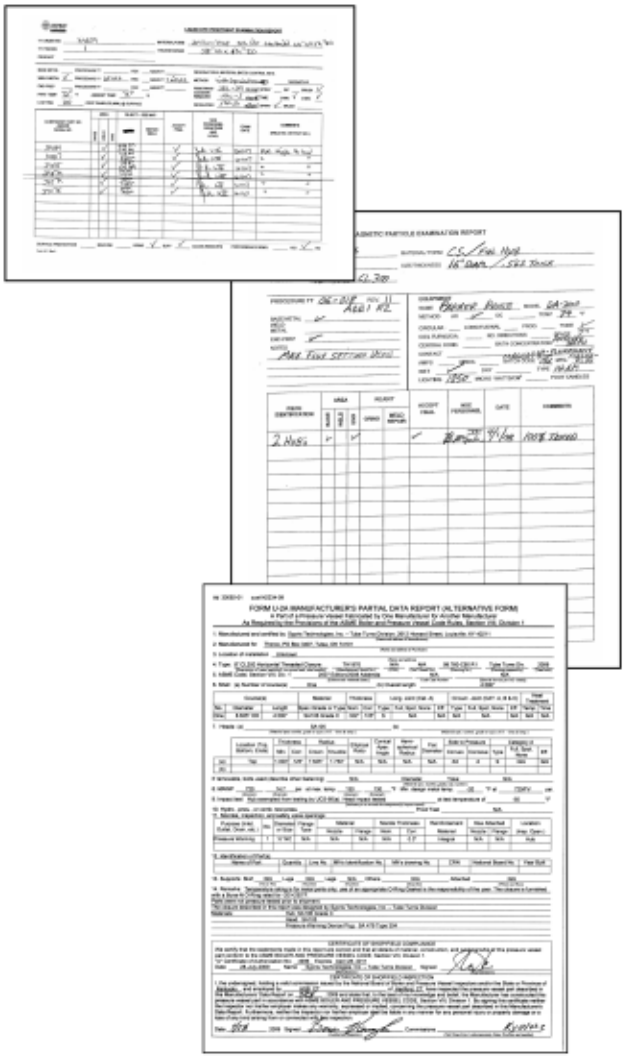
The actual heats of material used for the individual closures are permanently recorded and stamped on all pressure retaining components. This provides traceability to the material test reports for every closure.

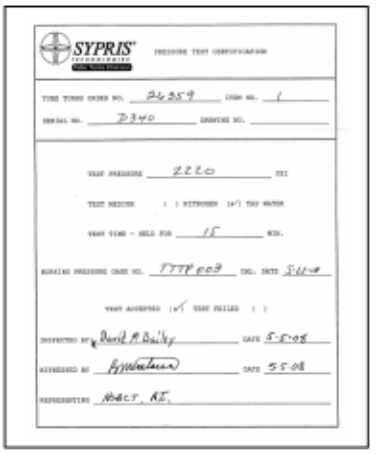
The Tube Turns Division can meet the most stringent customer material and testing requirements. Special customer requirements are evaluated by the Engineering Department.

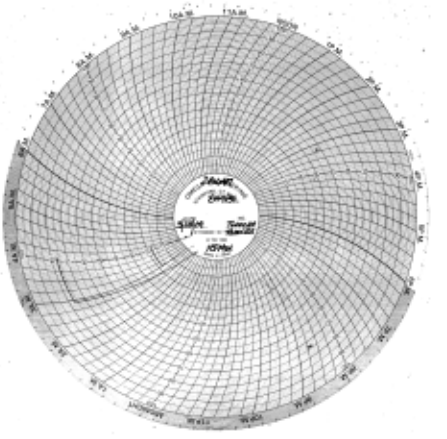
The Tube Turns Division offers optional hydrotest and helium leak test of closures. Non-destructive examination per ASME Section V is available in- house and includes radiography, ultrasound, magnetic particle, and liquid penetrant.

When specified, the following documents are furnished for each closure

- Hydrostatic test certification
- Nondestructive test reports
- ASME code stamping available upon request







O-RING MATERIALS

The materials most often used for closure O-rings are discussed below. Technical information as to properties and usages of gasket material are based on data and recommendations of the manufacturers of the materials.

Determination of the compatibility of the O-ring material is the responsibility of the purchaser.

COMMON O-RING MATERIALS

Buna-N

General service. Resistant to petroleum base hydraulic and lubricating oils; animal and vegetable oils; gases such as butane, propane, acetylene and natural gas, aromatic and nonaromatic fuels such as gasoline, kerosene, diesel fuel and fuel oils, anhydrous ammonia and water. Temperature limits -30 °F to 250 °F; (-34 °C to 121 °C) special compounds suitable to -65 °F (-54 °C).

Viton

Generally used for high temperature services. Resistant to synthetic lubricants, petroleum base products, some chlorinated solvents, benzene, toluene and many acids and alkalies. Viton is also used for sour gas and oil service. Temperature limits -15°F to 400°F (-26 °C to 204 °C).

Ethylene Propylene

Superior resistance to phosphate-ester type fluids, Skydrol, Pydrol,Cellulubes and glycol type coolants. Excellent resistance to mild acids and alkalies. Can be used in steam service. Replacing butyl rubber in most applications. Temperature limits -70 °F to 250 °F. (-57 °C to 121 °C)

Silicone Rubber

Good resistance to high and low temperature dry gases, air, oxygen and ozone. May be satisfactory in high-analine oils, but not recommended for use with most petroleum base products and steam. Temperature limits -65 °F to 450 °F. (-54 °C to 232 °C)

ORDER /INQUIRY

In order to reply promptly to inquiries and service orders, the following basic order data requirements are needed:

1. Size
2. Maximum wall thickness of pipe and yield strength
3. Maximum design pressure
4. Maximum and minimum design temperature
5. Corrosion allowance
6. Code requirements (stamp, certifications, etc)
7. Quantity
8. Maximum test pressure
9. O-ring material (Buna-N is standard)
10. Installation position: Closure centerline either horizontal or vertical
    a. Horizontal hinge requirement either left hand (standard) or right hand. See Closure Dimension table for details on hinging.

SPARE PARTS

Recommended Spare Parts

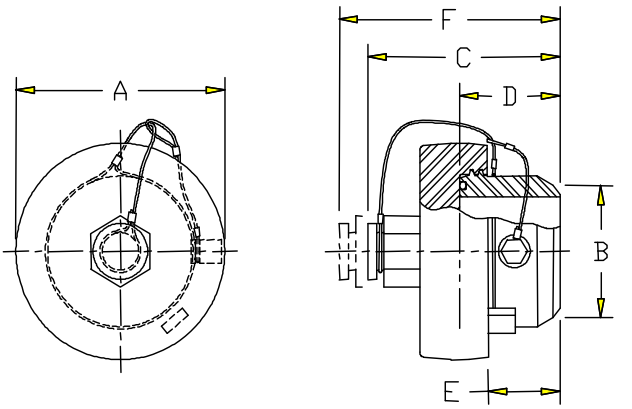
Two closure o-ring seals and two PWD o-ring seals should be stocked for each closure. If several identical closures are in operation in a given area, one closure o-ring and one PWD o-ring per closure may be stocked.

Frequency of replacement will depend upon such factors as operating pressure and temperature, shrinkage and swelling caused by product absorption, the corrosiveness of the product in the system and frequency of operation.

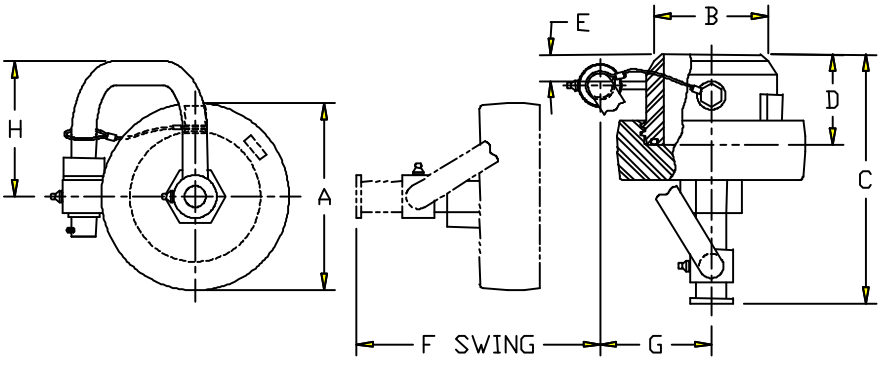
OPERATING TOOL

An OperatingTool is available for easier final closing and initial opening of the 6” and larger Threaded Closure.

CLOSURE DIMENSIONS

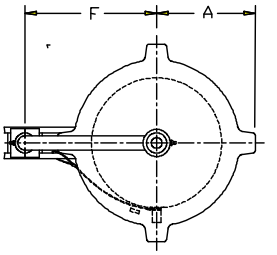


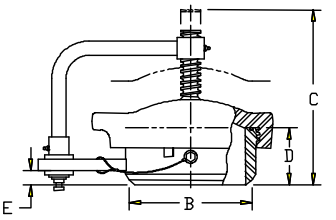
SIZES 2”-4” CLASS 150-900 HORIZONTAL OR VERTICAL							
Nominal Size	A	B	C	D	E	F	Approx. Weight
In (DN)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	Lbs (Kg)
2 (50)	4 3/4 (12.07)	2 3/8 (6.03)	5 1/16 (12.86)	2 3/4 (6.99)	2 (5.08)	5 13/16 (14.76)	9 (4)
3 (80)	5 3/4 (14.61)	3 1/2 (8.89)	5 1/16 (13.49)	2 3/4 (6.99)	2 (5.08)	6 1/16 (15.40)	15 (7)
4 (100)	6 3/4 (17.15)	4 1/2 (11.43)	5 13/16 (14.76)	3 1/8 (7.94)	2 1/8 (5.40)	6 13/16 (17.30)	22 (10)
Note – Shown with optional Pressure Warning Device							



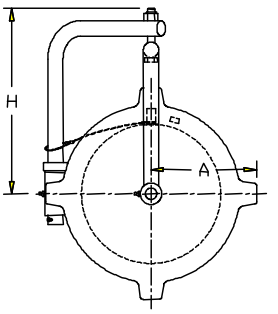
SIZES 2”-4” CLASS 150-900 HORIZONTAL WITH HINGE									
Nominal Size	A	B	C	D	E	F	G	H	Approx. Weight
In (DN)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	Lbs (Kg)
2 (50)	4 3/4 (12.07)	2 3/8 (6.03)	7 3/8 (18.73)	2 3/4 (6.99)	13/16 (2.06)	7 3/16 (18.26)	2 15/16 (7.46)	4 3/16 (10.64)	11 (5)
3 (80)	5 3/4 (14.61)	3 1/2 (8.89)	7 5/8 (19.37)	2 3/4 (6.99)	13/16 (2.06)	7 7/16 (18.89)	3 7/16 (8.73)	4 3/16 (10.64)	17 (8)
4 (100)	6 3/4 (17.15)	4 1/2 (11.43)	8 1/8 (20.64)	3 1/8 (7.94)	15/16 (2.38)	8 1/8 (20.64)	3 7/8 (9.84)	4 11/16 (11.91)	25 (11)
Hinging installed at left when facing the closure									
Note – Shown with optional Pressure Warning Device									

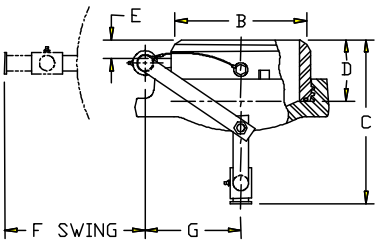
CLOSURE DIMENSIONS





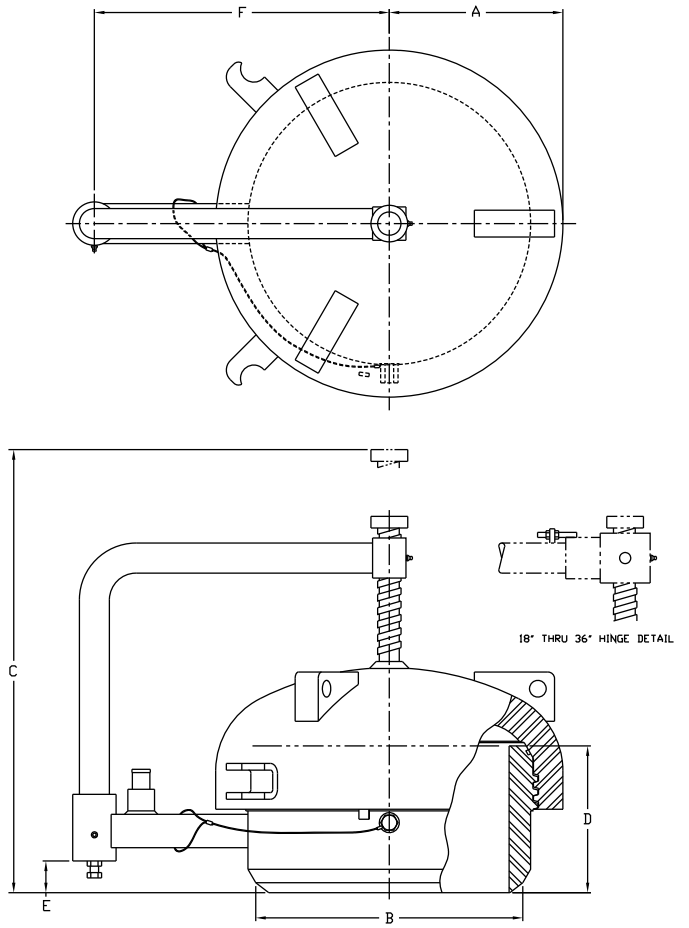
SIZES 6”-12” CLASS 150-900TV VERTICAL WITH HINGE													
Nominal Size	A		B		C		D		E		F		Approx. Weight
In (DN)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	Lbs (Kg)
6 (150)	5 15/16	(15.08)	6 5/8	(16.83)	12 3/4	(32.39)	4	(10.16)	1 1/8	(2.86)	9 1/16	(23.03)	55 (25)
8 (200)	7 5/16	(18.57)	8 5/8	(21.90)	15	(38.10)	4 1/2	(11.43)	1 1/8	(2.86)	10 3/8	(26.35)	95 (43)
10 (250)	8 5/8	(21.91)	10 3/4	(27.31)	16 1/4	(41.28)	5	(12.70)	1 1/4	(3.18)	11 ½	(29.21)	150 (68)
12 (300)	10	(25.40)	12 3/4	(32.39)	17 1/2	(44.45	5 1/2	(13.97)	1 5/16	(3.33)	12 13/16	(32.54)	240 (109)





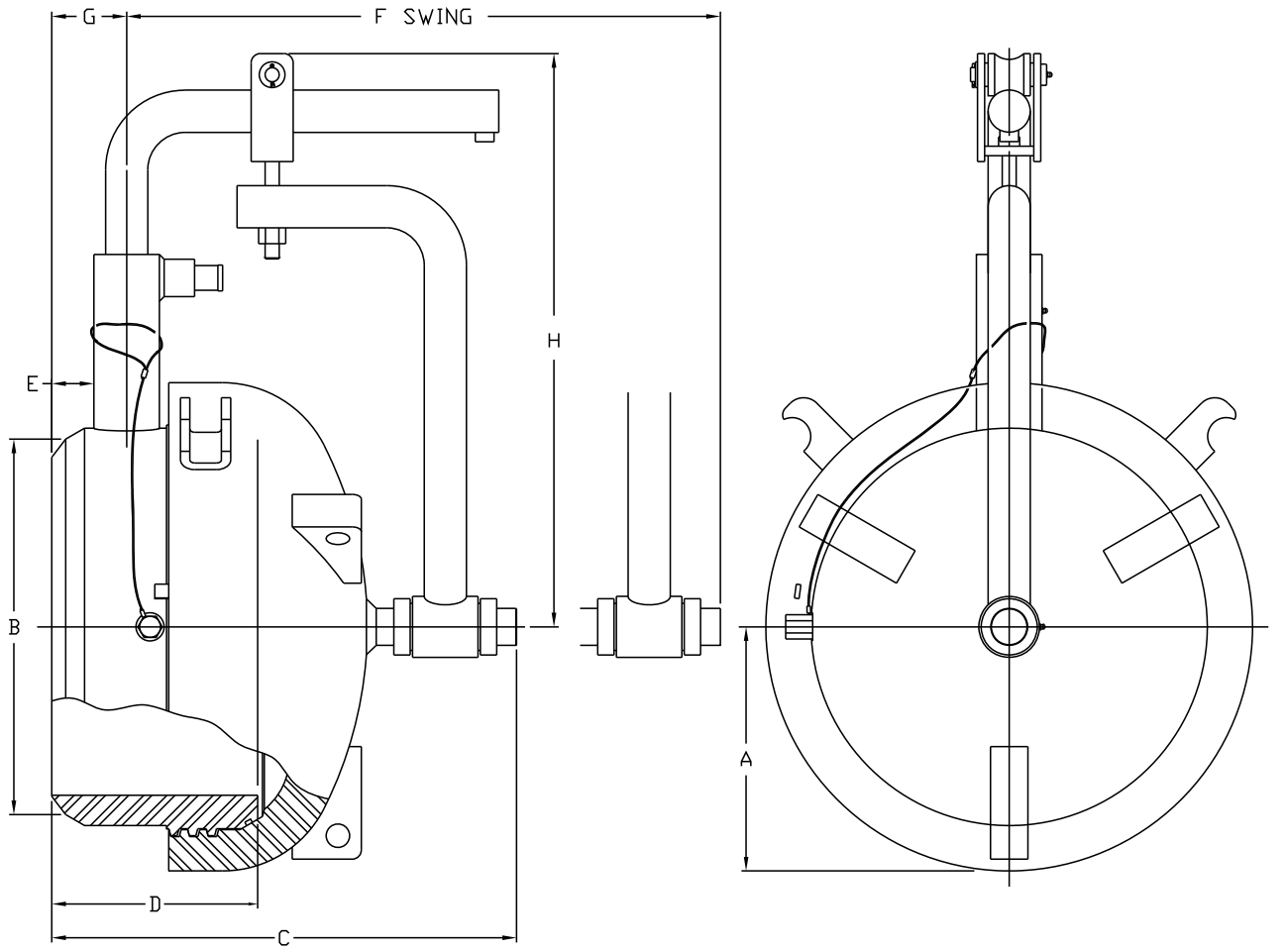
SIZES 6”-12” CLASS 150-900 TH HORIZONTAL WITH HINGE																
Nominal Size	A		B		C		D		E		F		G		H		Approx. Weight
In (DN)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	Lbs (Kg)
6 (150)	5 15/16	(15.08)	6 5/8	(16.83)	10 1/8	(25.72)	4	(10.16)	1 3/8	(3.49)	9 3/4	(24.77)	5 7/16	(13.81)	14 3/8	(36.51)	55 (25)
8 (200)	7 5/16	(18.57)	8 5/8	(21.90)	11	(27.94)	4 1/2	(11.43)	1 7/16	(3.65)	11	(27.94)	6 7/16	(16.35)	14 3/8	(36.51)	95 (43)
10 (250)	8 5/8	(21.91)	10 3/4	(27.31)	13 3/8	(33.97)	5	(12.70)	1 1/2	(3.81)	13 1/4	(33.66)	7 13/16	(19.84)	17 1/8	(43.50)	155 (70)
12 (300)	10	(25.40)	12 3/4	(32.39)	14 3/8	(36.51)	5 1/2	(13.97)	1 5/8	(4.13)	14 1/2	(36.83)	8 13/16	(22.38)	17 1/8	(43.50)	250 (113)
Hinging installed at left when facing the closure																	

CLOSURE DIMENSIONS



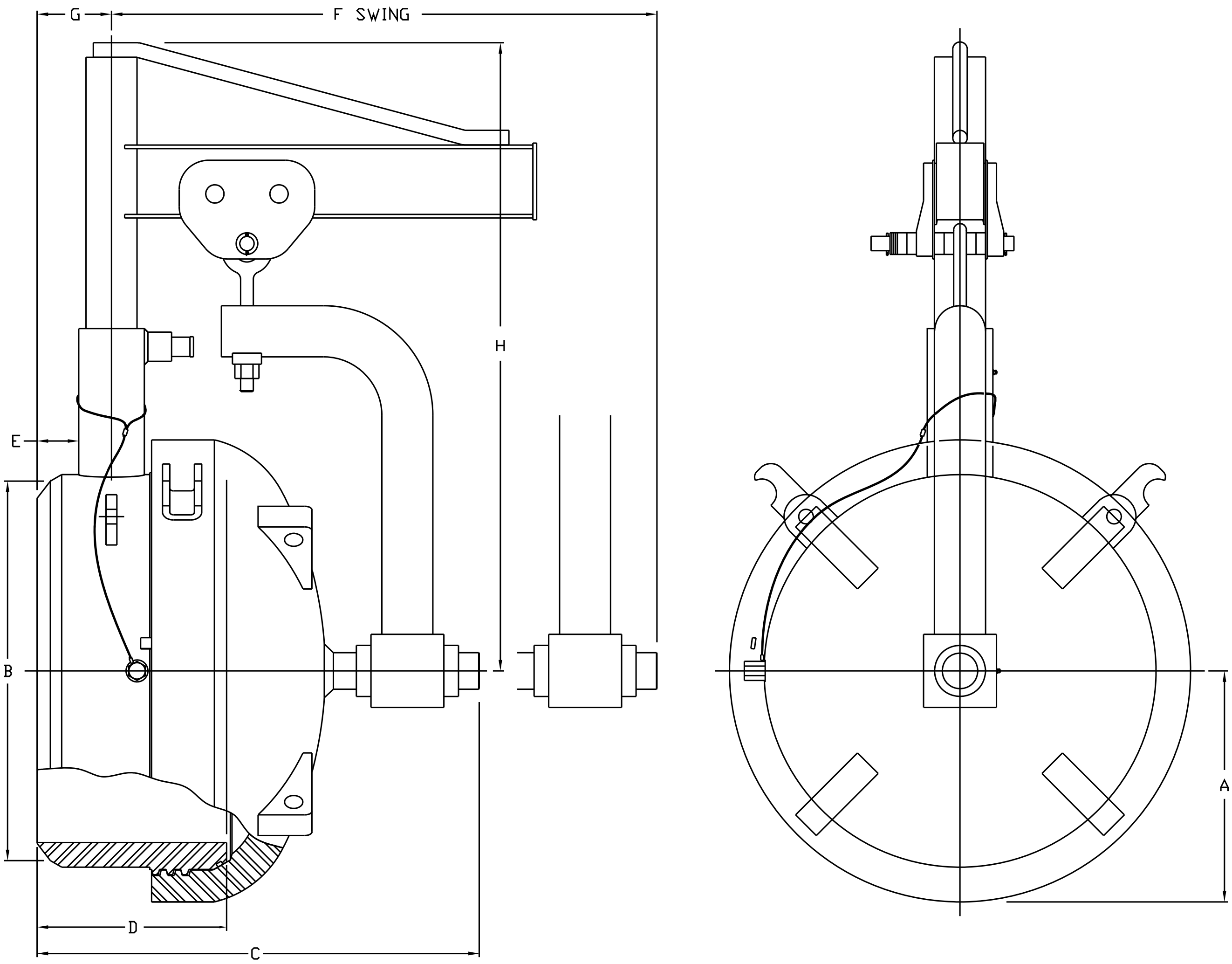
SIZES 14"-24" CLASS 150-900, SIZES 26"-36" CLASS 150-600 TV VERTICAL WITH HINGE													
Nominal Size		A		B		C		D		E		F		Approximate Weight	
In	(DN)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	Lbs	(Kg)
14	(350)	8 7/8	(22.56)	14	(35.56)	30	(76.20)	9 3/4	(24.77)	1 5/8	(4.14)	18 13/16	(47.85)	480	(218)
16	(400)	10 3/8	(26.37)	16	(40.64)	31 3/16	(79.22)	10 1/4	(26.04)	2 1/8	(5.41)	20	(50.80)	655	(297)
18	(450)	11 3/8	(28.91)	18	(45.72)	32 3/16	(81.76)	10 1/2	(26.67)	2 3/8	(6.05)	20 13/16	(52.91)	780	(354)
20	(500)	12 7/8	(32.72)	20	(50.80)	33 5/16	(84.61)	11	(27.94)	2 3/8	(6.05)	22 1/16	(56.08)	1030	(467)
22	(550)	13 7/8	(35.26)	22	(55.88)	33 15/16	(86.21)	11 1/4	(28.58)	2 5/8	(6.68)	23 1/16	(58.62)	1170	(531)
24	(600)	14 7/8	(37.80)	24	(60.96)	34 11/16	(88.11)	11 1/2	(29.21)	2 7/8	(7.32)	24 1/16	(61.16)	1305	(592)
26	(650)	15.81	(40.16)	26	(66.04)	40 13/16	(103.68)	13	(33.02)	3 1/2	(8.89)	26 11/16	(67.79)	1663	(755)
28	(700)	16.81	(42.70)	28	(71.12)	41 5/16	(104.95)	13	(33.02)	3 1/2	(8.89)	27 11/16	(70.31)	1783	(809)
30	(750)	17.81	(45.24)	30	(76.20)	42 5/16	(107.49)	13 1/2	(34.29)	4	(10.16)	28 15/16	(73.50)	1947	(883)
32	(800)	18.81	(47.78)	32	(81.28)	42 13/16	(108.74)	13 1/2	(34.29)	4	(10.16)	29 15/16	(76.04)	2127	(965)
34	(850)	19.81	(50.32)	34	(86.36)	43 5/16	(110.03)	13 1/2	(34.29)	4	(10.16)	30 15/16	(78.58)	2299	(1043)
36	(900)	20.81	(52.86)	36	(91.44)	43 13/16	(111.30)	13 1/2	(34.29)	4	(10.16)	31 15/16	(81.12)	2480	(1125)

CLOSURE DIMENSIONS



SIZES 14”-22” CLASS 150-900 TH HORIZONTAL WITH HINGE									
Nominal Size	A	B	C	D	E	F	G	H	Approx. Weight
In (DN)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	In (cm)	Lbs (Kg)
14 (350)	8 7/8 (22.56)	14 (35.56)	21 1/2 (54.61)	9 3/4 (24.77)	1 1/2 (3.81)	25 3/16 (64.06)	3 (7.62)	27 1/4 (69.29)	460 (209)
16 (400)	10 3/8 (26.37)	16 (40.64)	22 11/16 (57.63)	10 1/4 (26.04)	2 (5.08)	27 5/16 (69.39)	3 1/2 (8.89)	28 7/16 (72.16)	635 (288)
18 (450)	11 3/8 (28.91)	18 (45.72)	23 11/16 (60.17)	10 1/2 (26.67)	2 1/4 (5.72)	28 7/8 (73.28)	3 3/4 (9.53)	29 1/4 (74.37)	760 (345)
20 (500)	12 7/8 (32.72)	20 (50.80)	24 13/16 (63.04)	11 (27.94)	2 1/4 (5.72)	30 11/16 (77.98)	3 7/8 (9.86)	30 1/2 (77.55)	1020 (463)
22 (500)	13 7/8 (35.26)	22 (55.88)	25 7/16 (64.47)	11 1/4 (28.58)	2 1/2 (6.35)	32 1/16 (81.48)	4 1/4 (10.80)	31 1/2 (80.09)	1150 (522)

CLOSURE DIMENSIONS



SIZE 24" CLASS 150-900, 26" -36" CLASS 150-600 TH HORIZONTAL WITH HINGE																			
Nominal Size		A		B		C		D		E		F		G		H		Approx. Weight	
In	(DN)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	In	(cm)	Lbs	(Kg)
24	(600)	$14\,^{7}/_{8}$	(37.78)	24	(60.96)	$26^{3}/_{16}$	(66.52)	$11^{1}/_{2}$	(29.21)	$2^{3}/_{4}$	(6.99)	$33^{9}/_{16}$	(85.24)	$4^{1}/_{2}$	(11.43)	$40^{1}/_{4}$	(102.24)	1330	603
26	(650)	$15^{13}/_{16}$	(40.16)	26	(66.04)	$30^{5}/_{16}$	(76.99)	13	(33.02)	$2^{7}/_{8}$	(7.30)	$37^{7}/_{16}$	(97.07)	$5^{3}/_{32}$	(12.95)	43	(109.22)	1685	764
28	(700)	$16^{13}/_{16}$	(42.70)	28	(71.12)	$30^{13}/_{16}$	(78.26)	13	(33.02)	$2^{13}/_{16}$	(7.14)	$38^{15}/_{16}$	(98.88)	$5^{3}/_{32}$	(12.95)	44	(111.76)	1808	820
30	(750)	$17^{13}/_{16}$	(45.24)	30	(76.20)	$31^{13}/_{16}$	(80.80)	$13^{1}/_{2}$	(34.29)	$2^{13}/_{16}$	(7.14)	$40^{7}/_{16}$	(102.69)	$5^{11}/_{32}$	(13.59)	$46^{5}/_{16}$	(117.65)	1998	906
32	(800)	$18^{13}/_{16}$	(47.78)	32	(81.28)	$32^{5}/_{16}$	(82.07)	$13^{1}/_{2}$	(34.29)	$2^{13}/_{16}$	(7.14)	$41^{15}/_{16}$	(106.50)	$5^{11}/_{32}$	(13.59)	$47^{5}/_{16}$	(120.19)	2179	988
34	(850)	$19^{13}/_{16}$	(50.32)	34	(86.36)	$32^{13}/_{16}$	(83.34)	$13^{1}/_{2}$	(34.29)	$2^{13}/_{16}$	(7.14)	$43^{7}/_{16}$	(110.31)	$5^{11}/_{32}$	(13.59)	$48^{5}/_{16}$	(122.73)	2351	1066
36	(900)	$20^{13}/_{16}$	(52.86)	36	(91.44)	$33^{5}/_{16}$	(84.61)	$13^{1}/_{2}$	(34.29)	$2^{13}/_{16}$	(7.14)	$45^{15}/_{16}$	(114.12)	$5^{11}/_{32}$	(13.59)	$49^{5}/_{16}$	(125.27)	2632	1194

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 MERCHANTABLE 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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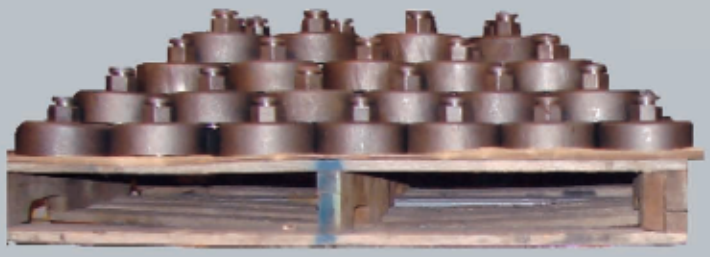

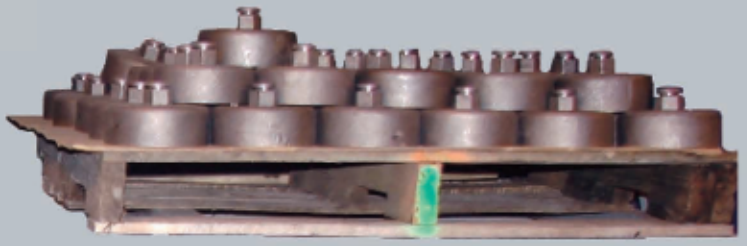

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