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**CONSEAL™**
Concrete Sealants INC.**CS-202**

Butyl Rubber Sealant

APPLICATIONS

For self-sealing joints in: Manholes, Concrete Vaults, Septic Tanks, Concrete Pipe, Box Culverts, Utility Vaults, Burial Vaults, and Vertical Panel Structures.

SEALING PROPERTIES

- Provides permanently flexible watertight joints.
- Low to high temperature workability: 0°F to 120°F (-12°C to 48°C)
- Rugged service temperature: -30°F to +200°F (-34°C to +93°C)
- Excellent chemical and mechanical adhesion to clean, dry surfaces.
- Sealed Joints will not shrink, harden or oxide upon aging.
- No priming normally necessary. When confronted with difficult installation conditions, such as wet concrete or temperatures below 40°F (4°C), priming the concrete will improve the bonding action. Consult Concrete Sealants for the proper primer to meet your application.

HYDROSTATIC STRENGTH

ConSeal CS-202 meets the hydrostatic performance requirement as set forth in ASTM C-990 section 10.1 (Performance requirement: 10psi for 10 minutes in straight alignment – in plant, quality control test for joint materials.)

SPECIFICATIONS

ConSeal CS-202 meets or exceeds the requirements of Federal Specification SS-S-210 (210-A), AASHTO M-198B, and ASTM C-990-91.



CONSEAL™
Concrete Sealants INC.

CS-202

Butyl Rubber Sealant

PHYSICAL PROPERTIES

	Spec	Required*	CS-202
Hydrocarbon blend content % by weight	ASTM D4 (mod.)	50% min.	52%
Inert mineral filler % by weight	AASHTO T111	30% min.	35%
Volatile Matter % by weight	ASTM D6	2% max.	1.2
Specific Gravity, 77°F	ASTM D71	1.15-1.50	1.20
Ductility, 77°F	ASTM D113	5.0 min.	12
Penetration, cone 77°F, 150 gm. 5 sec.	ASTM D217	50-100	60-65
Penetration, cone 32°F, 150 gm. 5 sec.	ASTM D217	40 mm	50-55
Flash Point, C.O.C., °F	ASTM D92	350°F min.	425°F
Fire point, C.O.C., °F	ASTM D92	375°F min.	450°F

IMMERSION TESTING

- 30-Day Immersion Testing: No visible deterioration when tested in 5% Caustic Potash, 5% Hydrochloric Acid, 5% Sulfuric Acid, and 5% saturated Hydrogen Sulfide. *
- One Year Immersion Testing: No visible deterioration when tested in 5% Formaldehyde, 5% Formic Acid, 5% Sulfuric Acid, 5% Hydrochloric Acid, 5% Sodium Hydroxide, 5% Hydrogen Sulfide and 5% Potassium Hydroxide.

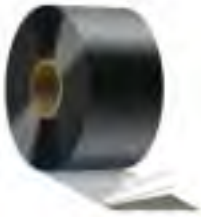
* Requirements of ASTM C-990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

LIMITED WARRANTY

This information is presented in good faith, but we cannot anticipate all conditions under which this information and our products, or the products of other manufacturers in combination with our products, may be used. We accept no responsibility for results obtained by the application of this information or the safety and suitability of our products, either alone or in combination with other products. Users are advised to make their own tests to determine the safety and suitability of each such product or product combinations for their own purposes. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for this own particular use. We sell this product without warranty, and buyers and users assume all responsibility and liability for loss or damage arising from the handling and use of this product, whether used alone or in combination with other products.

TAPECOAT® M860 PAVEMENT REPAIR COATING

Protection for Concrete and Asphalt Surfaces



Tapecoat M860 provides quick and easy repair of cracks in concrete and asphalt surfaces. This cold-applied, self-adhering tape is effective as a temporary patching material and also offers excellent bonding for repair of the substrate prior to a complete asphalt overlay. Tapecoat M860 solves maintenance problems in paving material on city streets, highways, and parking structures. This puncture-resistant coating can also protect transducer and sensor wiring from tire damage, prevent pavement deterioration due to deformation in heavy-traffic areas, and provide quick temporary repair to paved surfaces on bridges and airport runways and tarmacs. Tapecoat M860 retains its ability to bond under pressure at temperatures as low as 0° F, making this coating ideal for temporary repairs during the cold winter months.



Tapecoat® M860 Pavement Repair Coating

- *Excellent bond to concrete and asphalt surfaces*
- *Applies easily in long lengths or short pieces*
- *Cold-applied tape with quick release liner*
- *Impermeable to water and salt*
- *Puncture-resistant*
- *Prefabricated to provide uniform thickness*
- *Environment-friendly*

Features/Specifications/Application

Tapecoat® M860

A pre-formed, cold-applied, self-adhering material that is impermeable to water and salt.

Composition

Tapecoat M860 is a pre-formed, cold-applied coating. The adhesive is manufactured from specially formulated elastomer and resins bonded to a woven highly puncture-resistant polymer.

Technical Data

Color:	Black
Shelf life:	Rotate stock yearly
Low temp flex:	Excellent
Bacteria resistance:	Excellent
Thickness:	.060" Nominal
Water Vapor	
Transmission Rate,	0.01 perms(grams/sq.ft.hr./in.
Permeance:	Hg) Maximum
Tensile Strength:	50 lb.in. Minimum
Puncture Resistance:	200 lb. Minimum
(Mesh)	
Pliability-1/4" Mandrel	
180° bend -30°F:	No cracks in mesh or adhesive

Surface Preparation

Tapecoat M860 should be applied over dry pavement that is free of dirt, debris or other foreign matter. Pavement cracks wider than 3/8" should be pre-filled with hot or cold crack material prior to applying Tapecoat M860 to assure longer protection of the crack filling material against surface wear.

Option

If the application is taking place in extreme cold (below 32°F/0°C) a liquid primer will enhance the immediate bond. TC Omniprime is the compatible primer for use with this product.



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KOR-N-SEAL® I & II FLEXIBLE PIPE-TO-MANHOLE CONNECTORS

SPECIFICATION SHEET



KOR-N-SEAL I - WEDGE KORBAND CONNECTOR ASSEMBLY



Install Kor-N-Seal I - Wedge Korband with Socket Wrench & Torque Limiter



Install Kor-N-Seal II - Wedge Korband with Standard Torque Wrench



Install Pipe Clamp(s) with T-Handle Torque Wrench





KOR-N-SEAL® I & II

Flexible Pipe-to-Manhole Connectors

SPECIFICATION SHEET

PERFORMANCE

Test	ASTM Method	Test Requirements	Kor-N-Seal® I & II
Head Pressure	C923 - 7.1	0° - 13 psi (30 ft) for 10 min. 7° - 10 psi (23 ft) for 10 min.	+13 psi for 10 min. +10 psi for 10 min.
Deflection Test	C923 - 7.2.2	7° in any direction	Over 7° in any direction
Load Test	C923 - 7.2.3	150 lbs/in. pipe dia.	Over 150 lbs/in. pipe dia.

Performed on all standard sizes of Kor-N-Seal Connectors.

RESILIENT EPDM OR POLYISOPRENE RUBBER

Conforms to ASTM C923

Test	ASTM Method	Test Requirements	TEST RESULTS Kor-N-Seal® I & II
Chemical Resistance	D543, at 22°C for 48 h		
1 N Sulfuric Acid		No weight loss	No weight loss
1 N Hydrochloric Acid		No weight loss	No weight loss
Tensile Strength	D412	1200 psi	1580 psi
Elongation at Break		350% min.	500%
Hardness	D2240 (shore A durometer)	± 5 from the manufacturer's specified hardness	48 ± 5
Accelerated Oven-Aging	D573 70 ± 1°C for 7 days	Decrease of 15%, max. of original tensile strength, decrease of 20% max. of elongation	10.1% tensile decrease 14.0% elongation decrease
Compression Set	D395, method B, at 70°C for 22 h	Decrease of 25%, max. of original deflection	13% decrease
Water Absorption	D471, immerse 0.75 by 2-in. specimen in distilled water at 70°C for 48 h	Increase of 10%, max. of original by weight	.8% increase
Ozone Resistance	D1171	Rating 0	Rating 0
Low-temperature Brittle Point	D746	No fracture at -40°C	No fracture at -40°C
Tear Resistance	D624, method B	200 lbf/in.	No tear at 210 lbf/in.

INTERNAL KORBAND

Conforms to ASTM C923, ASTM A666, and A240

- Korband Assembly is manufactured of 300 series stainless steel.
- Toggle Expander is made of 300 series stainless steel.
- The 106/406 series Wedge Expander is made from reinforced nylon or 300 series stainless steel.
- The 206/306 series Wedge Expander is made from 300 series stainless steel.

EXTERNAL PIPE CLAMP

Conforms to ASTM C923, ASTM A666, and A240

External take-up clamps are manufactured of 300 series stainless steel.

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Tel: 603-673-8680 • 800-626-2180 • Fax: 603-673-7271

NPC Kor-N-Seal Pipe-to-Manhole Connector

Technical Specification

Scope:

This specification describes the function of the NPC Kor-N-Seal pipe-to-manhole connector, its principle of operation, and the component materials that constitute the Kor-N-Seal connector, and their physical properties.

Product Application:

NPC Kor-N-Seal connectors are designed and manufactured to meet or exceed the requirements of ASTM C-923 "Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals". This specification requires the connector to provide a watertight seal under the following conditions:

- 10 PSI (23 feet head) of groundwater pressure
- Minimum 7 Degrees of pipe articulation in any direction
- Radial loading test of 150 pounds per inch diameter of pipe

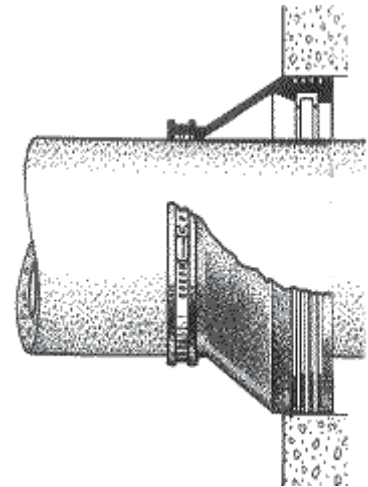
Principle of Operation:

The Kor-N-Seal connector creates a watertight seal between the pipe and manhole by first sealing to the inside of the cored or formed hole in the manhole and then sealing to the outside of the pipe. See illustration at right.

The seal at the inside of the manhole is created by the stainless steel Korband. The Korband is located inside of the end of the Kor-N-Seal connector that fits into the manhole. Once the Kor-N-Seal connector is located in the manhole, the diameter of the Korband is increased. This compresses the Kor-N-Seal connector against the inside wall of the hole in the manhole creating a watertight seal at the manhole.

The seal at the outside of the pipe is created by the stainless steel pipe clamp(s). The pipe clamp is located on the outside of the Kor-N-Seal connector. Once the pipe has been positioned in the connector the diameter of the pipe clamp is decreased. This compresses the Kor-N-Seal connector against the outside wall of the pipe creating a watertight seal at the pipe.

Reference the [Kor-N-Seal Recommended Installation Instructions](#) for a detailed explanation of the preparation and installation of the Kor-N-Seal connector.





KOR-N-SEAL – STAINLESS STEEL WEDGE

Recommended Installation Procedure

Refer to reverse side *Kor-N-Seal I - Wedge Korband Installation Chart* for Hole Size Range, Connector Dimensions, and Suggested Pipe O.D. Range.

CONNECTOR INSTALLATION:

1. Check to be sure Korband is properly located in Connector groove. (Fig. 1)
2. Insert Connector Assembly into hole with Wedge Expander at top of hole. (Fig. 2)
3. Position Connector so it is square to manhole both vertically and horizontally. (Fig. 3)
4. Tighten Wedge Expander using 1/2" [13 mm] socket with a preset torque limiter for each. For each size connector use torque limiter preset to proper torque. (Fig. 4) Retorquing is not required prior to shipment.

CAUTION: DO NOT USE IMPACT WRENCH.

IMPORTANT

RECOMMENDED TORQUE		TORQUE LIMITER
Connector Inches [mm]	Foot Pounds [Newton Meters]	P/N
10 – 24 [254 – 610]	12 [16]	91440-12

Fig. 4

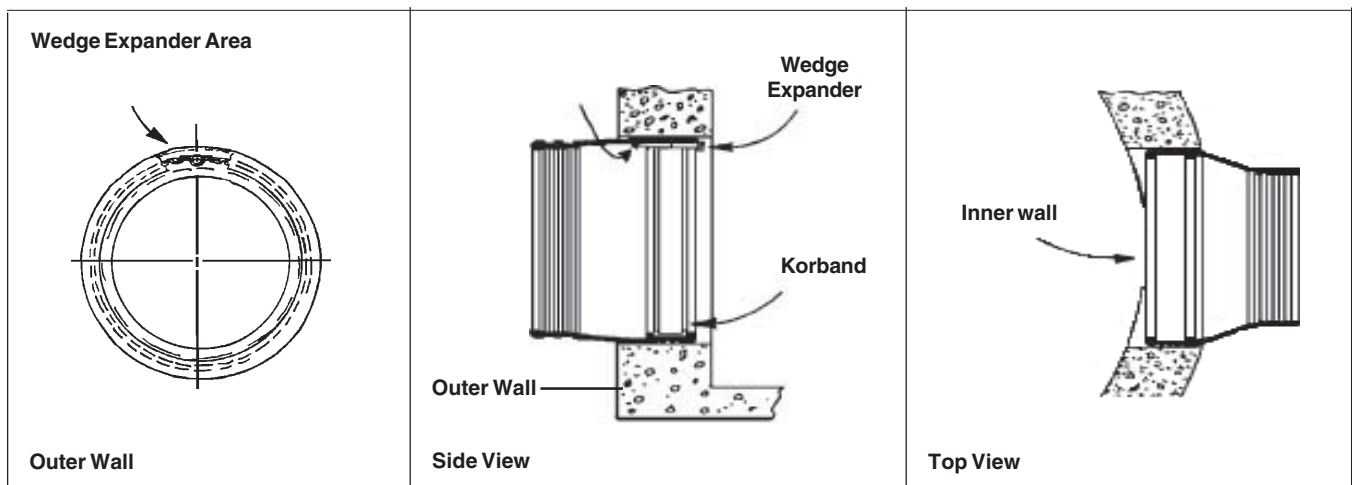


Fig. 1

Fig. 2

Fig. 3

PIPE INSTALLATION:

1. Center pipe in Connector opening.
2. On maximum pipe O.D. installations, use a pipe lubricant on the outside barrel of the pipe and/or the inside ridges of the Connector (under the Pipe Clamp area) to allow the pipe to slide into place more easily.
3. Position the Pipe Clamp in the Connector's Pipe Clamp groove with the screw at the top.
4. Tighten the Pipe Clamp screw to 60 inch pounds [7 Newton Meters] with a T-handle Torque Wrench, P/N 80090.
5. On minimum pipe O.D. installations, lift the rubber up underneath the Pipe Clamp screw so that the Connector contacts the bottom surface of the pipe while the Pipe Clamp screw is being tightened. Application of pipe lubrication on the underside of the clamp will also help assure that an even contraction of rubber is maintained throughout the clamping area.
6. After the Pipe Clamp has been tightened down firmly, move the pipe horizontally and/or vertically to bring it to grade.

CAUTION: Pipe must **NOT** rest on Connector Korband.

CAUTION:

All capped stubs awaiting pipe installation at a later date must be restrained. Assure that a proper backfill material is used in adverse conditions. Prior to any critical usage, contact NPC Customer service at 1-800-626-2180.



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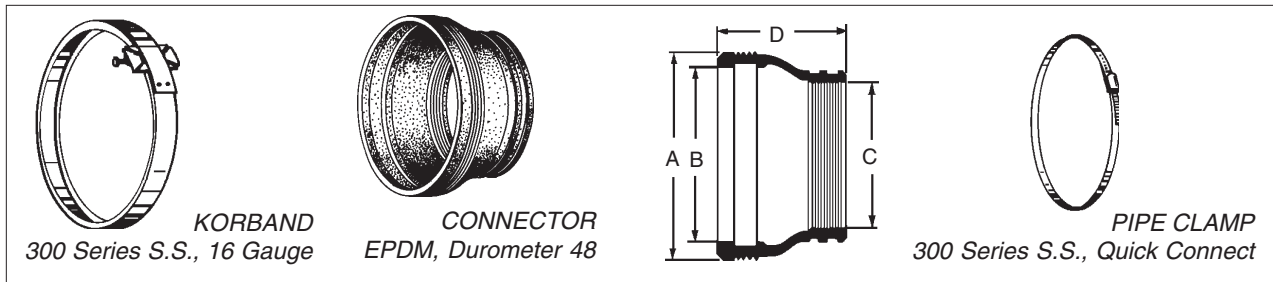
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KOR-N-SEAL – STAINLESS STEEL WEDGE

Recommended Installation Procedure



Kor-N-Seal S106 Series

Connector P/N	Suggested Pipe O.D. Range Inches	Hole Size Range Inches	Connector Dimensions Inches			Pipe Clamp P/N
		A	B	C	D	
S106-12BWS	5.75 — 7.00	12.00 — 12.20	10.30	6.50	8	I-128
S106-12AWS	7.00 — 8.50	12.00 — 12.20	10.30	8.00	8	I-180
S106-12WS	8.25 — 9.75	12.00 — 12.20	10.30	9.25	8	I-180
S106-14AWS	9.50 — 11.25	14.00 — 14.20	12.25	10.50	8	I-190
S106-16BWS	9.50 — 11.25	15.95 — 16.15	14.30	10.50	8	I-190
S106-16AWS	11.25 — 13.00	15.95 — 16.15	14.30	12.25	8	I-218
S106-16WS	13.00 — 14.20	15.95 — 16.15	14.30	14.00	8	I-242
S106-20BWS	14.00 — 15.50	19.95 — 20.10	18.25	15.00	8	I-306
S106-20AWS	15.50 — 17.00	19.95 — 20.10	18.25	16.50	8	I-306
S106-20WS	17.00 — 18.15	19.95 — 20.10	18.25	18.00	8	I-306
S106-22WS	17.75 — 19.25	21.95 — 22.10	20.25	18.75	8	I-318
S106-24WS	19.60 — 21.10	23.95 — 24.10	22.25	20.60	8	I-348

Kor-N-Seal S406 Series

S406-10AWS	6.00 — 6.75	10.00 — 10.20	8.30	6.50	6	I-128
S406-10WS	7.50 — 8.20	10.00 — 10.20	8.30	8.50	6	I-180
S406-10.5AWS	6.00 — 6.75	10.50 — 10.70	8.80	6.50	6	I-128
S406-10.5WS	7.50 — 8.70	10.50 — 10.70	8.80	8.50	6	I-180
S406-11BWS	6.00 — 7.00	11.00 — 11.20	9.30	6.00	6	I-128
S406-11AWS	7.50 — 9.00	11.00 — 11.20	9.30	8.00	6	I-180
S406-12CWS	6.00 — 7.00	12.00 — 12.20	10.30	6.50	6	I-128
S406-12BWS	6.25 — 7.50	12.00 — 12.20	10.30	7.00	6	I-128
S406-12AWS	7.50 — 9.00	12.00 — 12.20	10.30	8.50	6	I-180
S406-12WS	9.00 — 10.20	12.00 — 12.20	10.30	10.00	6	I-180

Suggested pipe O.D. range comes from field experience. Refer to *Recommended Pipe Installation Procedure*.



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08/06

Kor-N-Seal® II

306 Series Pipe-to-Manhole Connector



- *Allows you to fit large diameter pipe into the smallest possible manhole structures*
- *Can be used in cored or formed holes*



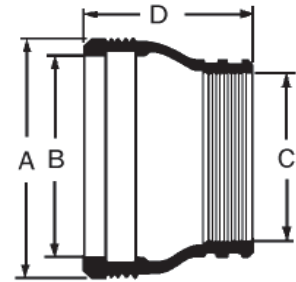
The Patented 4" wide Stainless Steel Korbond is able to overcome the curvature of smaller sized manholes



306 Series Connector Sizing Chart



P/N	Suggested Pipe O.D. Range	Hole Size Range	Connector Dimensions				Pipe Clamp		Minimum Manhole Size
		A	B	C	D	Qty	P/N		
S306-22	17.625 - 18.500	21.98 - 22.13	19.875	19	10.5	2	I-318	36/4	
S306-22L	18.500 - 19.625			20		2	I-348		
S306-24	19.625 - 20.500	23.98 - 24.13	21.875	21	10.5	4	I-180	36/4	
S306-24L	20.500 - 21.625			22		4			
S306-26	21.625 - 22.500	26.00 - 26.20	23.875	23	10.5	4	I-190	36/4	
S306-26L	22.500 - 23.625			24		4	I-218		
S306-28	23.625 - 24.500	28.00 - 28.20	25.875	25	10.5	4	I-218	48/5	
S306-28L	24.500 - 25.625			26		4			
S306-30	25.625 - 26.500	30.00 - 30.20	27.875	27	10.5	4	I-218	48/5	
S306-30L	26.500 - 27.625			28		4	I-242		
S306-32	27.625 - 28.500	32.00 - 32.20	29.875	29	10.5	4	I-242	48/5	
S306-32L	28.500 - 29.625			30		4			
S306-34	29.625 - 30.500	34.00 - 34.20	31.875	31	10.5	4	I-258	48/5	
S306-34L	30.500 - 31.625			32		4			
S306-36	31.625 - 32.500	36.00 - 36.20	33.875	33	10.5	4	80667 Power Gear	60/6	
S306-36L	32.500 - 33.000			34		4			
S306-36-STORM	31.625 - 32.500	36.00 - 36.20	33.875	33	10.5	4	I-282	60/6	
S306-36L-STORM	32.500 - 33.625			34		4			
S306-38	33.625 - 34.500	38.00 - 38.20	35.875	35	10.5	4	80667 Power Gear	60/6	
S306-38L	34.500 - 35.000			36		4			
S306-38-STORM	33.625 - 34.500	38.00 - 38.20	35.875	35	10.5	4	I-282	60/6	
S306-38L-STORM	34.500 - 35.625			36		4	I-306		
S306-40	35.625 - 36.500	40.00 - 40.20	37.875	37	10.5	4	80667 Power Gear	60/6	
S306-40L	36.500 - 37.000			38		4			
S306-40-STORM	35.625 - 36.500	40.00 - 40.20	37.875	37	10.5	4	I-306	60/6	
S306-40L-STORM	36.500 - 37.625			38		4			
S306-42	37.625 - 38.500	42.00 - 42.20	39.875	39	10.5	4	80667 Power Gear	72/7	
S306-42L	38.500 - 39.000			40		6			
S306-42-STORM	37.625 - 38.500	42.00 - 42.20	39.875	39	10.5	4	I-318	72/7	
S306-42L-STORM	38.500 - 39.625			40		4	I-348		
S306-44	39.625 - 40.500	44.00 - 44.20	41.875	41	10.5	6	80667 Power Gear	72/7	
S306-44L	40.500 - 41.000			42		6			
S306-44-STORM	39.625 - 40.500	44.00 - 44.20	41.875	41	10.5	4	I-348	72/7	
S306-44L-STORM	40.500 - 41.625			42		4			
S306-46	41.625 - 42.500	46.00 - 46.20	43.875	43	10.5	6	80667 Power Gear	72/7	
S306-46L	42.500 - 43.000			44		6			
S306-46-STORM	41.625 - 42.500	46.00 - 46.20	43.875	43	10.5	4	I-348	72/7	
S306-46L-STORM	42.500 - 43.625			44		4			
S306-48	43.625 - 44.500	48.00 - 48.20	45.875	45	10.5	6	80667 Power Gear	72/7	
S306-48L	44.500 - 45.000			46		6			
S306-48-STORM	43.625 - 44.500	48.00 - 48.20	45.875	45	10.5	6	I-242	72/7	
S306-48L-STORM	44.500 - 45.625			46		6	I-258		



*Adapters are required when using corrugated pipe. Refer to the Corrugated Pipe Adapter Data Sheet for details.

Covered under U.S. Patent No. 6,641,176



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RFCA (Restrained Flanged Coupling Adapter)

Material Specifications

Flange Body: Ductile (nodular) iron, meeting or exceeding ASTM A 536, Grade 65-45-12. Flange meets the dimensional requirements of ANSI Class 125 and 150 bolt circles.

Gaskets: Compounded for water and sewer service in accordance with ASTM D 2000 (Sizes 3 - 12" have flange O-Ring gasket). Other compounds available for petroleum, chemical, or high temperature service.

Gland: Romac RomaGrip™. See page 7-6.

Restraining Bolts: 7/8 -9 roll thread, Ductile (nodular) iron, meeting or exceeding ASTM A 536.

Restraining Lugs: Ductile (nodular) iron, meeting or exceeding ASTM A 536. Heat treated using a proprietary process.

Lug Locators: Polyurethane, a thermal plastic.

T-bolts and Nuts: High strength low alloy steel T-head bolt. National coarse rolled thread and heavy hex nut. Steel meets AWWA C111 composition specifications. **Stainless steel bolts and nuts** available on request.

Coatings: Shop coat applied to cast parts for corrosion protection in transit. **Fusion bonded epoxy** available on request.

Use: Ductile Iron Pipe 3 - 24", cast iron pipe 3" - 24" (same OD's as ductile iron) and IPS size STD steel pipe 3 - 12".

To Order: Specify catalog number. **Example:** For a 12" RFCA Order: **RFCA - 13.20**

NOTE: 3" - 12" special Romac gasket works on both steel and D.I. ODs.



Not for use on PVC, HDPE pipe or plain-end mechanical joint fittings. For applications on PVC, please contact your Romac representative.

NOM. PIPE SIZE	GASKET RANGE	LENGTH	GLAND BOLTS QTY: SIZE	CATALOG NUMBER	LIST PRICE				WEIGHT (lbs.)
					Shopcoat w/Std. B&N	Shopcoat w/304 SS B&N	Fusion Epoxy w/Std. B&N	Fusion Epoxy w/304SS B&N	
3"	3.50-3.96	8.00"	4: 5/8" x 3"	RFCA - 3.96	\$145.45	\$157.56	\$165.10	\$177.20	21
4"	4.50-4.80	9.00"	4: 3/4" x 3 1/2"	RFCA - 4.80	183.32	209.43	207.88	233.99	29
6"	6.63-6.90	9.25"	6: 3/4" x 4"	RFCA - 6.90	233.85	273.01	267.10	306.26	40
8"	8.63-9.05	9.25"	6: 3/4" x 4"	RFCA - 9.05	315.59	354.75	355.82	394.98	53
10"	10.75-11.10	10.25"	8: 3/4" x 4"	RFCA - 11.10	581.96	634.17	669.69	721.91	83
12"	12.75-13.20	10.25"	8: 3/4" x 4"	RFCA - 13.20	632.13	684.34	739.86	792.07	110
14"	15.30	11.70"	10: 3/4" x 4 1/2"	RFCA - 15.30	882.79	947.37	1,020.54	1,085.12	170
16"	17.40	11.70"	12: 3/4" x 4 1/2"	RFCA - 17.40	1,225.93	1,302.91	1,410.23	1,487.21	200
18"	19.50	11.80"	12: 3/4" x 4 1/2"	RFCA - 19.50	1,346.63	1,423.60	1,546.13	1,623.10	217
20"	21.60	11.80"	14: 3/4" x 4 1/2"	RFCA - 21.60	1,521.19	1,611.94	1,772.94	1,863.69	256
24"	25.80	12.00"	16: 3/4" x 5"	RFCA - 25.80	1,845.38	1,959.61	2,130.38	2,244.61	305



Some initial axial movement may occur in lug style restraints as the lugs seat. Movement is directly related to the size of the piping system and the system pressure. In general terms movement of approximately 0.25" can be expected in restraints under 16". For larger sizes, movement of approximately 0.4" may be seen. If this is critical to your application please contact Romac Engineering for additional information.

INSTALLATION INSTRUCTIONS

Read installation instructions first before installing. Check parts to ensure that no damage has occurred during transit and that no parts are missing. Also check the diameter of the pipe and the size marked on the coupling to ensure you have the proper size.



RFCA Restrained Flange Coupling Adapter

NOT FOR USE ON PVC PIPE OR PLAIN END MECHANICAL JOINT FITTINGS

NOTE: Not for use on polyethylene pipe, plain end mechanical joint fittings or PVC pipe.

The "Stab-Fit" installation technique may also be employed on 3"-10" sizes.

Step 1 • Check the RFCA parts to insure that no damage has occurred during transit and that no parts are missing.

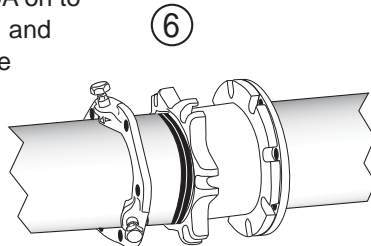
Step 2 • Clean pipe end for a distance of 2" greater than length of the RFCA.

Step 3 • Place RomaGrip gland on pipe end.

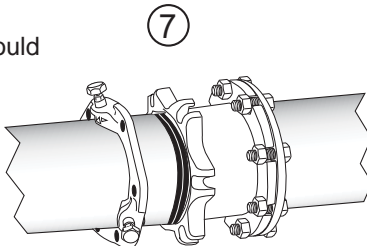
Step 4 • Lubricate the gasket and pipe surface with soapy water or other suitable gasket lubricant.

Step 5 • Place gasket over pipe with beveled edge toward the flange adapter.

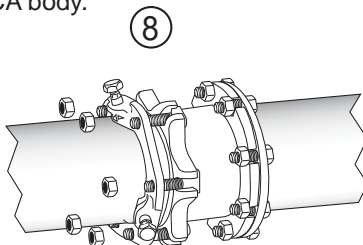
Step 6 • Slide the RFCA on to the pipe. Position the pipe and flanged coupling against the mating flange, inserting flange gasket (14" and larger) between the flange faces. Assemble the flange joint using flange bolts.



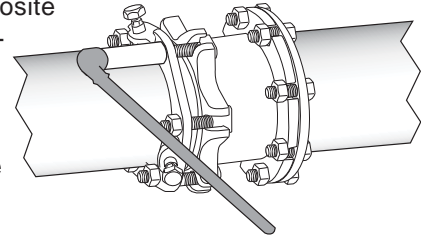
Step 7 • The pipe should be centered such that the space between the OD of the pipe and the ID of the RFCA is even all around the pipe. Slide the RFCA gasket into position with the beveled edge engaging the beveled end of the RFCA body.



Step 8 • Slide the RomaGrip into position against the gasket, and insert T-bolts.



Step 9 • Tighten T-bolts evenly, alternating to diametrically opposite position at approximately 20 ft-lbs increments to the recommended torque for your size RFCA.



Recommended Torque:

3" RomaGrip - 45-65 ft-lbs.

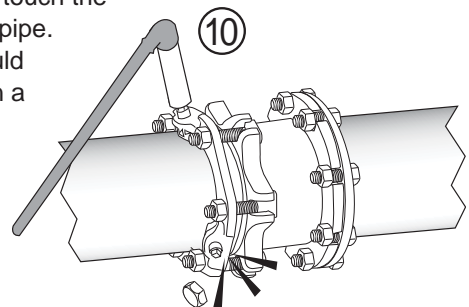
4 - 24" RomaGrip - 75 - 90 ft-lbs.

Note:

90 ft-lbs. torque = 12" wrench w/90 lbs. force

For best results, wait 10 minutes and retighten bolts to proper torque.

Step 10 • Hand tighten the restrainer bolts until the restraining pads touch the surface of the pipe. The bolts should be tightened in a uniform criss-cross pattern, until the heads break off above the notch.



NOTE: Do not turn a bolt more than one turn before alternating to the next bolt.

Step 11 • Pressure test for leaks before backfilling.

RFCA Restrained Flange Coupling Adapter

NOT FOR USE ON PVC PIPE OR PLAIN END MECHANICAL JOINT FITTINGS

PRECAUTIONS

1. Check flange to make sure the bolt holes match the RFCA.
2. Make sure a flange gasket is used between the mating flanges on sizes 14" and larger.
3. Check diameter of pipe to make sure you are using the correct size RFCA; also check gasket to make sure it is the size you think it is.
4. Be sure to clean pipe of as much dirt and corrosion as possible in the area that the gasket will seal.
5. Lubricate both the gasket and the pipe end with soapy water or approved pipe lubricant per ANSI/AWWA C111/A21.11.
6. Make sure no foreign materials lodge between gasket and pipe.
7. Avoid loose fitting wrenches, or wrenches too short to achieve proper torque.
8. Keep threads free of foreign material to allow proper tightening.
9. Take extra care to follow proper bolt tightening procedures and torque recommendations. Bolts are often not tightened enough when a torque wrench is not used.
10. Be sure that the gland is centered around the pipe.
11. Pressure test for leaks before backfilling.
12. Backfill and compact carefully around pipe and fittings.
13. Some initial axial movement may occur in lug style restraints as the lugs seat. Movement is directly related to the size of the piping system and the system pressure. In general terms movement of approximately 0.25" can be expected in restraints under 16". For larger sizes, movement of approximately 0.4" may be seen. If this is critical to your application please contact Romac Engineering for additional information.

COMMON INSTALLATION PROBLEMS

1. Flange gasket not installed on sizes 14" and larger.
2. T-Bolts are not tightened to the proper torque.
3. Rocks or debris between pipe and gasket.
4. Dirt or debris between pipe and restraining pad.
5. Dirt on threads of bolts or nuts.
6. Restraining bolt heads not snapped off.
7. Not enough pipe inserted into bell.
8. Using the RFCA on IPS size steel pipe with wall thickness thinner than schedule 40 steel pipe. (3-12 inch sizes)

IF RFCA MUST BE REMOVED

1. Make sure pipe is not pressurized. Removing the restrainer could cause the pipe joint to separate.
2. To remove the RFCA, use a $\frac{5}{8}$ " hex wrench or socket.
3. To reassemble, follow installation procedures. Tighten the restraining bolts using a $\frac{5}{8}$ " hex wrench to 75-ft-lbs minimum.



Ameron T-Lock[®] PVC Sheet Liner

Protective Lining Products

For Concrete Pipe and Structures

Typical Specifications

1. General

This specification covers the supply and installation of a flexible PVC sheet liner with continuous locking extensions in reinforced concrete pipe and auxiliary structures to effectively protect the exposed concrete surfaces from corrosion. To accomplish this, the liner must be continuous and free of pinholes both across the joints and in the liner itself.

All work for and in connection with the installation of the lining in concrete pipe, and the field sealing and welding of joints, shall be done in strict conformity with all applicable specifications, instructions and recommendations of the lining manufacturer.

The manufacturer of the lining shall furnish an affidavit attesting to the successful use of its material as a lining for sewer pipes for a minimum period of 50 years in sewage conditions recognized as corrosive or otherwise detrimental to concrete.

2. Material

2.1 Liner shall be Ameron T-Lock as manufactured by Ameron Protective Lining Products, Brea, California.

2.2 Composition

The material used in the liner, welding strips and other accessory items, shall be a combination of poly vinyl chloride resin, pigments and plasticizers, specially compounded to remain flexible. Poly vinyl chloride resin shall constitute not less than 99 percent by weight, of the resin used in the formulation. Copolymer resins will not be permitted.

2.3 Physical Properties

2.3.1 All plastic liner plate sheets, welding strips and other accessory items, shall have the following physical properties when tested at 77°F±5° (25°C±3°).

Property	Initial	(Par. 2.4)
Tensile Strength	2200 psi min. (15 MPa min.)	2100 psi min. 14.5 MPa min.)
Elongation at break	200% min.	200% min.
Shore durometer, Type D (with respect to initial test results)	1-sec. 50-60 10-sec. 35-50	±5 ±5
Weight change		±1.5%

2.3.2 Tensile specimens shall be prepared and tested in accordance with ASTM D412 using Die B. Weight change specimens shall be 1-inch (25-mm) by 3-inch (75-mm) samples. Specimens for testing of initial physical properties may be taken from liner sheet and welding strip at any time prior to final acceptance of the work.

2.3.3 Continuous locking extensions embedded in concrete shall withstand a test pull of at least 100 pounds per linear inch (1800 kg/m), applied perpendicularly to the concrete surface for a period of one minute, without rupture of the locking extensions or withdrawal from embedment. This test shall be made at a temperature of 70°- 80°F (21° - 27°C) inclusive.

2.3.4 All plastic liner plate sheets, including locking extensions, all joint, corner and welding strips shall be free of cracks, cleavages or other defects adversely affecting the protective characteristics of the material. The engineer may authorize the repair of such defects by approved methods.

2.3.5 The lining shall have good impact resistance, shall be flexible and shall have an elongation sufficient to bridge up to 1/4-inch (6 mm) settling cracks, which may occur in the pipe or in the joint after installation, without damage to the lining.

2.3.6 The lining shall be repairable at any time during the life of the pipe or the structure.

2.4 Chemical resistance*

After conditioning to constant weight at 110°F (43°C), tensile specimens and weight change specimens shall be exposed to the following solutions for a period of 112 days at 77°F±5° (25°C±3°).

At 28-day intervals, tensile specimens and weight change specimens shall be removed from each of the chemical solutions and tested in accordance with Paragraph 2.3.2. If any specimen fails to meet the 112-day requirement before completion of the 112-day exposure, the material will be subject to rejection.

Chemical Solution	Concentration
Sulfuric acid	20%**
Sodium hydroxide	5%
Ammonium hydroxide	5%**
Nitric acid	1%**
Ferric chloride	1%
Sodium hypochlorite	1%
Soap	0.1%
Detergent (linear alkyl benzyl sulfonate or LAS)	0.1%
Bacteriological	BOD not less than 700 ppm.

* This is to be used as a pre-qualification test and when material formulations are changed.

** Volumetric percentages of concentrated C.P. grade reagents.

2.5 Details and dimensions of basic size sheets (4-foot widths)

2.5.1 Liner sheets shall be a minimum of 0.065 inch (1.65 mm) in thickness. Locking extensions (T-shaped) of the same material as that of the liner shall be integrally extruded with the sheet. Locking extensions shall be approximately 2 1/2 inches (64 mm) apart and shall be at least 0.375-inch (9.5 mm) high.

2.5.2 Sheets shall have a nominal width of 48 inches (1200 mm) and a length of not more than 24 feet (7.3 m), except that longer lengths may be supplied on special order. Lengths specified shall include a tolerance at a ratio of $\pm 1/4$ inch (6 mm) for each 100 inches (2500 mm).

2.5.3 Sheets not used for shop fabrication into larger sheets shall be shop tested for pinholes using an electrical spark tester set between 18,000 and 22,000 volts. Any holes shall be repaired and retested.

2.5.4 Special sized, factory pre-welded sheets are available on special order.

2.6 Pipe-size sheets and accessories

2.6.1 Pipe linings shall be supplied as pipe-size sheets, fabricated by shop-welding the basic-size sheets together. Shop welds shall be made by lapping sheets a minimum of 1/2 inch and applying heat and pressure to the lap to produce a continuous welded joint. Tensile strength measured across shop-welded joints in accordance with ASTM D412 shall be at least 2000 psi (14 MPa).

2.6.2 If required, strap channels shall be 1-inch (25-mm) wide maximum and formed by removing the locking extensions so that a maximum of 3/16 inch (5 mm) remains.

2.6.3 Sheets also can be supplied in prefabricated, pipe-size tubular-shaped sheets, ready to lower onto the inner pipe forms. These normally do not require the use of strap channels.

2.6.4 Transverse flaps may be provided at the ends of sheets for pipe. Locking extensions shall be removed from flaps so that a maximum of 1/32 inch (1mm) of the base of the locking extension is left on the sheet.

2.6.5 Welding strips shall be approximately 1-inch (25 mm) wide with a minimum width of 7/8 inch (22 mm). The edges of weld strips shall be beveled in the manufacturing process. Thickness of weld strip shall be a nominal 1/8 inch (3 mm).

2.6.6 Joint strips for pipe shall be 4-inches (100 mm) wide with a minimum width of 3 3/4 inches (94 mm). Thickness of joint strips shall be a nominal of 3/32 inch (2.3 mm).

2.6.7 Prior to preparing sheets for shipment, they shall be tested for pinholes using an electrical spark tester set between 18,000 and 22,000 volts. Any holes shall be repaired and retested.

3. Installation of Lining

3.1 General

3.1.1 Installation of the lining, including preheating of sheets in cold weather and the welding of all joints, shall be done in accordance with the recommendations of the liner manufacturer.

3.1.2 Coverage of the lining shall not be less than the minimum shown on the plans.

3.1.3 The lining shall be installed with the locking extensions running parallel with the longitudinal axis of the pipe.

3.1.4 The lining shall be held snugly in place against inner forms.

3.1.5 Locking extensions shall terminate not more than 1 1/2 inches (38 mm) from the end of the inside surface of the pipe section. Joint flaps when used shall extend approximately 4 inches (100 mm) beyond the end of the inside surface.

3.1.6 Concrete poured against lining shall be vibrated, spaded or compacted in a careful manner so as to protect the lining and produce a dense, homogenous concrete, securely anchoring the locking extensions into the concrete.

3.1.7 In removing forms, care should be taken to protect the lining from damage. Sharp instruments shall not be used to pry forms from lined surfaces. When forms are removed, any nails that remain in the lining shall be pulled, without tearing the lining, and the resulting holes clearly marked.

3.1.8 All nail and tie holes and all cut, torn and seriously abraded areas in the lining shall be patched. Patches made entirely with welding strip shall be fused to the liner over patch area. Larger patches may consist of smooth liner sheet applied over the damaged area with adhesive. All edges must be covered with welding strip fused to the patch and the sound lining adjoining the damaged area.

3.1.9 Hot joint compounds, such as coal tar, shall not be poured or applied to the lining.

3.1.10 The contractor shall take all necessary measures to prevent damage to installed lining from equipment and materials used in or taken through the work.

3.2 Application to concrete pipe - Special requirements

3.2.1 The lining shall be set flush with the inner edge of the bell or spigot end of a pipe section and shall extend to the opposite end or to approximately 4 inches (100 mm) beyond the opposite end depending upon the type of lining joint to be made with the adjoining concrete pipe.

3.2.2 Wherever concrete pipe or cast-in-place structures protected with lining joint structures not so lined (such as brick structures, concrete pipe or cast-in-place structures with clay lining or clay pipe), the lining shall be extended over and around the end of the pipe and back into the structure for not less than 4 inches (100 mm). This protecting cap may be molded or fabricated from the lining material but need not be locked into the pipe.

3.2.3 Where a pipe lateral (not of plastic lined concrete) is installed through lined concrete pipe, the seal between the lined portion and the lateral shall be made by the method prescribed for cast-in-place structures under Paragraph 3.4.2.

3.2.4 Lined concrete pipe may be cured by standard curing methods.

3.2.5 Care shall be exercised in handling, transporting and placing lined pipe to prevent damage to the lining. No interior hooks or slings shall be used in lifting pipe. All handling operations shall be done with an exterior sling or with a suitable fork lift.

3.2.6 On pipe having a 360° liner coverage, the longitudinal edges of the sheet shall be butt welded. When pipe tubes are furnished, these are shop-welded joints made in accordance with 2.6.1.

3.2.7 No pipe with damaged lining will be accepted until the damage has been repaired to the satisfaction of the engineer.

3.3 Field joints in lining for concrete pipe

3.3.1 The joint between sections of lined pipe shall be prepared in the following manner:

If required, the inside joint shall be filled and carefully pointed with cement mortar in such a manner that the mortar shall not, at any point, extend into the pipe beyond the straight line connecting the surfaces of the adjacent pipe sections. Pipe joints must be dry before lining joints are made.

3.3.2 All mortar and other foreign material shall be removed from lining surfaces adjacent to the pipe joint, leaving them clean and dry.

3.3.3 Field joints in the lining at pipe joints may be either of the following described types:

Type P-1: The joint shall be made with a separate 4-inch (100 mm) joint strip and two welding strips. The 4-inch (100 mm) joint strip shall be centered over the joint, heat sealed to the lining, then welded along each edge to adjacent liner sheets with a 1-inch (25 mm) weld strip. The 4-inch (100 mm) joint strip shall lap over each sheet a minimum of 1/2 inch (13 mm).

Type P-2: The joint shall be made with a joint flap with locking extensions removed per Paragraph 2.6.4 and extending approximately 4 inches (100 mm) beyond the pipe end. The joint flap shall overlap the lining in the adjacent pipe section a minimum of 1/2 inch (13 mm) and be heat-sealed in place prior to welding. The field joint shall be completed by welding the flap to the lining of the adjacent pipe using 1-inch (25 mm) weld strip.

Care shall be taken to protect the flap from damage. Excessive tension and distortion in bending back the flap to expose the pipe joint during laying and joint mortaring shall be avoided. At temperatures below 50°F (10°C), heating of the liner may be required to avoid damage.

3.3.4 The joint flap or strip on beveled pipe shall be trimmed to a width (measured from the end of the spigot) of approximately 4 inches (100 mm) for the entire circumferential length of the lining.

3.3.5 All welding of joints is to be in strict conformance with the specifications and instructions of the lining manufacturer. Welding shall fuse both sheets and weld strip together to provide a continuous joint equal in corrosion resistance and impermeability to the basic liner sheet.

Hot-air welding tools shall provide effluent air to the sheets to be joined at a temperature between 500° and 600°F (260° and 316°C). Welding tools shall be held approximately 1/2 inch (13 mm) from and moved back and forth over the junction of the two materials to be joined. The welding tool shall be moved slowly enough as the weld progresses to cause a small bead of molten material to be visible along both edges and in front of the weld strip.

3.3.6 The following special requirement shall apply when the liner coverage is 360 degrees:

When groundwater is encountered the lining joint shall not be made until pumping of groundwater has been discontinued for at least three days and no visible leakage is evident at the joint.

When welding the downstream side of a joint strip or flap, do not weld 6 to 8 inches (150 to 200 mm) at the pipe invert to provide relief of potential future groundwater buildup.

3.4 Application to cast-in-place concrete structures - Special requirements

3.4.1 Liner sheets shall be closely fitted and properly secured to the inner forms. Sheets shall be cut to fit curved and warped surfaces using a minimum number of separate pieces.

3.4.2 Unless otherwise shown on the plans, the lining shall be returned at least 3 inches (75 mm) at the surfaces of contact between the concrete structure and items not of concrete (including manhole frames, gate guides, clay pipe or brick manholes and clay or cast iron pipes). The same procedure shall be followed at joints where the type of protective lining is changed or the new work is built to join existing unlined concrete. At each return, the returned liner shall be sealed to the item in contact with the plastic-lined concrete using Ameron T-Lock 19Y adhesive system. If the liner cannot be sealed with this adhesive because of the joint at the return being too wide or rough or because of safety regula-

tions, the joint space shall be densely caulked with lead wool or other approved caulking material to a depth of 2 inches (50 mm) and finished with a minimum of 1 inch (25 mm) of an approved corrosion resistant material.

3.5 Joints in lining for cast-in-place concrete structures

3.5.1 Lining at joints shall be free of all mortar and other foreign material and shall be clean and dry before joints are made.

3.5.2 Field joints in the lining shall be of the following described types, used as prescribed:

Type C-1: The joint shall be made with a separate 4-inch (100 mm) joint strip and two welding strips. The 4-inch (100 mm) joint strip shall be centered over the joint, heat-sealed to the liner then welded along each edge to adjacent sheets with a 1-inch (25 mm) wide welding strip. The width of the space between adjacent sheets shall not exceed 2 inches (50 mm). The 4-inch (100 mm) joint strip shall lap over each sheet a minimum of 1/2 inch (13 mm). It may be used at any transverse or longitudinal joint.

Type C-2: The joint shall be made by lapping sheets not less than 1/2 inch (13 mm). One 1-inch (25 mm) welding strip is required. The upstream sheet shall overlap the one downstream. The lap shall be heat-sealed into place prior to welding on the 1-inch (25 mm) welding strip.

Type C-3: The joint shall be made by applying 2-inch (50 mm) wide waterproof tape or 1-inch (25 mm) wide welding strip on the back of the maximum 1/4-inch (6 mm) gap butt joint or by some other method approved by the engineer to prevent wet concrete from getting under the sheet. After the forms have been stripped, a 1-inch (25 mm) welding strip shall be applied over the face of the sheet.

3.5.3 All welding is to be strict conformance with the specifications of the lining manufacturer and Paragraph 3.3.5.

3.6 Testing and repairing damaged surfaces

3.6.1 After the pipe is installed in the trench, all surfaces covered with lining, including welds, shall be tested with an approved electrical holiday detector (Tinker & Rasor Model No. AP-W with power pack) with the instrument set between 18,000 and 22,000 volts.

All welds shall be physically tested by a nondestructive probing method. All patches over holes, or repairs to the liner wherever damage has occurred, shall be accomplished in accordance with Paragraph 3.1.8.

3.6.2 Each transverse welding strip which extends to a lower edge of the liner will be tested by the purchasing agency. The welding strips shall extend 2-inches (50 mm) below the liner to provide a tab. A 10-pound (5 kg) pull will be applied to each tab. The force will be applied normal to the face of the structure by means of a spring balance. Liner adjoining the welding strip will be held against the concrete during application of the force. The 10-pound (5 kg) pull will be maintained if a weld failure develops, until no further separation occurs. Defective welds will be retested after repairs have been made. Tabs shall be trimmed away neatly by the installer of the liner after the welding strip has passed inspection. Inspection shall be made within 2 days after the joint has been completed in order to prevent tearing the protecting weld strip and consequent damage to the liner from equipment and materials used in or taken through the work.

Warranty

Ameron warrants that the product conforms to the specific description in Ameron trade literature as to character and quality of the raw materials, workmanship and adaptability for recommended use. Within one year from date of purchase, Ameron shall supply replacement material for this product or any portion thereof, or at its option equivalent material, F.O.B. Ameron manufacturing facility, if it fails to meet the foregoing warranty, provided that installation and application of the product have been properly accomplished and that Ameron has been promptly notified of the defect.

The preceding constitutes the sole remedy of the Buyer and the sole liability of Ameron for product defect.

No other express or implied warranties, whether of merchantability or of fitness for any particular purpose or use, shall apply. Ameron shall not be responsible for consequential damages.

Ameron's Standard Terms and Conditions of Sale apply to purchase of this product.

The product data sheet and the recommendations for usage it contains were based on test data believed to be reliable, and are intended for use by personnel having skill and know-how, at their own discretion and risk, in accordance with current industry practice and normal operating conditions. Variation in environment, changes in operating procedures or extrapolation of data may cause unsatisfactory results. **Since we have no control over the conditions or service, we expressly disclaim responsibility for the results obtained or for any consequential or incidental effects of any kind. Also refer to Ameron "Safety Precautions," and Ameron International Corporation—Terms and Conditions of Sale.**



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Protective Lining Products

Ameron T-Lock[®]

Installing plain sheet Ameron T-Lock on metal and concrete surfaces

Application Instructions

Shipping and Storage

Care must be taken in transporting, handling and storing Plain Sheet Ameron T-Lock to prevent possible damage. After removing the sheets from their cartons, they should be stored flat and protected from contact with all sharp-edged objects. Care must also be taken in handling the sheets during cold weather since T-Lock becomes brittle as temperatures decrease.

To ensure complete success of an Ameron T-Lock lining installation, it is of prime importance that each step is performed in strict accordance with the following application instructions. This includes proper surface preparation and application of the T-Lock 19Y primer/adhesive system. Close inspection must be maintained throughout application of the sheets and during welding.

Equipment Required

1. Utility knife, or similar sharp knife, suitable for cutting T-Lock sheets
2. Sharp putty knife—2-inch heavy blade
3. High-quality, medium-length bristle brushes
4. Infrared lamp or hot air blower
5. Short-nap paint roller — for spreading the primer.
6. Four-inch hard rubber roller
7. Electric hot air welding tool—Leister Triac with Leister Nozzle Model 30A1

Surface Preparation

Ameron T-Lock— Dry the moisture from all surfaces to be bonded (using air blower). Moisture is detrimental to the bonding properties of the adhesive system.

Wipe the dry surfaces of the T-Lock with a lint-free cloth dampened in Ameron T-Lock 19Y thinner/cleaner. (Allow the surface to dry for 30 seconds prior to applying T-Lock 19Y primer.)

Metal— All metal surface welding must be continuous, no skip-welding. Remove weld splatter and any sharp projections which could puncture the T-Lock, grind sharp corners to a minimum radius of 1/8 inch and grind all welds which will contact the sheet flush with adjacent metal.

Metal surfaces must be sandblasted to a “White Metal Blast Cleaning” in accordance with Steel Structures Painting Council Surface Preparation Specification SSPC-SP5-63. The dry sandblast method using compressed air blast nozzles and dry sand is preferred.

Blasting Procedure

1. Remove any weld splatter and grind all rough welds smooth.
2. Block out work in one-foot squares and blast evenly using an air source with a minimum 200 cfm at 100 psi per blast nozzle with a graded flint or silica sand. 16-30 mesh screen, 100 percent retained on 30 mesh screen. Maximum speed and most effective cleaning are obtained by systematic, even blasting. When blasting is complete, the surface must be an even, gray-white color as defined by the Steel Structures Council in “Surface Preparation Specification No. 5, Blast Cleaning to ‘White’ Metal.” Blotchy surfaces indicate incomplete blasting and are not satisfactory.
3. After blasting, remove sand and dust with brush and/or vacuum and apply one coat of Ameron T-Lock 19Y primer as quickly as possible (within 3 hours). Do not blast clean more surface than can be primed the same day.

Concrete— To obtain a proper adhesive bond, concrete surfaces must be clean, dry and free of previously applied coatings and disintegrated or chalky material. Loose and disintegrated material can be removed by water or sand blasting. Form release agents, concrete curing compounds, or hardeners must not be specified where cement grouting is to be applied. If such materials have already been employed, specific recommendations should be obtained, otherwise, there can be no assurance of a satisfactory job.

Grouting procedure— All concrete imperfections, such as water and air pockets in poured concrete surfaces, must be filled with cement grout as follows:

1. Smooth the concrete surface, breaking down all rough protrusions.
2. Apply cement grout (2 parts fine sand and 1 part cement) by sacking or by working the grout into surface with a wood float.
3. Lightly stone the cement-grouted surface with a carborundum brick to remove any rough areas and to ensure a void-free surface. Rough areas or pinholes in concrete allow penetration of, and corrosion by, chemical reagents.

Etching — All concrete surfaces, original or cement grouted, should be acid-etched to remove glaze and concrete laitance. The final surface is to be slightly granular for the adhesive to obtain a good bond.

1. Etch with a solution of 1 part hydrochloric (muriatic) acid and 2 parts clean water. Apply the acid solution to the concrete by brush or garden spray until the solution runs.
2. Concrete should be wet well with acid. It will bubble for 20-30 seconds and stop, at which point the acid is neutralized.
3. When etching is complete, wash the surface with clean water using a garden hose. Brush during washing with a stiff brush to remove concrete salts.
4. A properly etched surface should be slightly granular and free of glaze.
5. On very dense, machine-troweled surfaces, several applications of acid may be required to obtain proper "tooth," or a slightly granular surface.
6. Dry surface thoroughly for at least 48 hours prior to application of adhesive products. A moist surface will not allow proper adhesion of a primer.
7. After the concrete surface has been properly dried, it should be cleaned by dusting with a brush or clean cloth or by vacuuming.

II. Application of T-Lock 19Y Primer

The temperature of the surface should be in the 60-90°F range. The following procedure should be followed for best results:

1. After the metal or concrete surface has been properly prepared, it should be cleaned by dusting with a brush or clean cloth or by vacuuming.
2. Stir primer thoroughly for two minutes prior to use; then stir throughout application. During mixing, loosen solids which may have settled on the bottom of the container during storage.
3. Brush or roll apply one coat of T-Lock 19Y primer (at approximately 200 square feet/gallon) to both the metal or concrete and the Ameron T-Lock.
4. Allow to dry one hour minimum, seven days maximum (if protected from contamination) before applying the adhesive.

III. Application of T-Lock 19Y Adhesive

1. Brush apply one coat of T-Lock 19Y adhesive to both the primed metal or concrete and the T-Lock sheet.
2. Coverage should be at approximately 150 square feet/gallon. Avoid local heavy spots, sags, runs, or thin spots. One coat is generally sufficient.
3. Allow adhesive to dry for 30 minutes, then apply the Ameron T-Lock to the adhesive-coated surface.
4. Press the adhesive-coated surfaces firmly together. Pressure necessary to obtain complete bonding should be applied using a hard rubber roller or the hand.
5. Mating surfaces should be assembled in not less than 30 minutes and not more than one hour after application of the adhesive. Adhesive-coated T-Lock may be applied to the adhesive-coated surface while the adhesive

is tacky (sticky) to the touch. This time period after application of adhesive is one hour maximum at 70-80°F.

6. Should the prepared bonding surfaces dry to the point where they have insufficient bonding tack, apply a second coat of T-Lock 19Y adhesive to each bonding surface to be joined starting again at Step 1.
7. If tack must be restored after a second coat of adhesive, the bonding surfaces may be reactivated by brushing with T-Lock 19Y thinner/cleaner.

IV. Application of Ameron T-Lock Sheets

Application will be facilitated by heating the sheets to approximately 110-120°F (using an infrared lamp table) immediately before placing them in position. Care should be taken to avoid overexposure of the sheet to this temperature or poor bonding may result.

1. Place one edge of the T-Lock sheet in position along the edge of the metal or concrete surface. Press down firmly, holding the remainder of the sheet up and away from the surface.
2. When the edge has been affixed, roll the remainder of the sheet into position (using a 4-inch hard rubber roller), taking care to avoid inclusion of air pockets.
3. After the sheet has been rolled into position, rub the surface vigorously with a soft cloth to press it firmly in place.

On vertical surfaces — On vertical surfaces, application should be made from bottom to top, proceeding according to the above instructions for horizontal surfaces.

Over sharp angles and bends — Due to T-Lock's "plastic memory" (or tendency to revert to its original state), heat must be used to make the sheet conform to sharp angles or bends, such as lips of tanks or flange returns.

This is accomplished as follows:

1. Apply T-Lock 19Y primer and adhesive to both mating surfaces as for normal application. Allow to dry 30-45 minutes.
2. Then, using a hot-air blower applied to the T-Lock, heat a 2-inch wide area, 1 inch along each side of the bend or angle. (See Figure 1.) Hot-air blower temperature should be approximately 350-400°F, or hot enough to make the heated area take on a high gloss and a soft, "chewing gum" consistency.

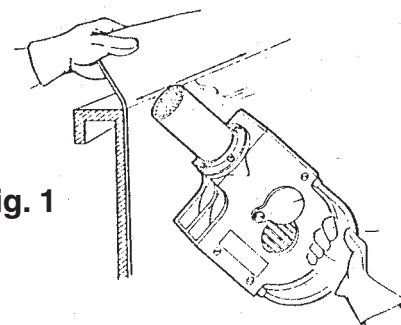


Fig. 1

3. Immediately — while the heated area is still in a soft state — bend the T-Lock sheet firmly around the angled surface, stretching (approximately 1/8 inch per 2 inches) to destroy any "plastic memory." **Do not attempt to reform more than 4-8 inches at a time.**

4. Press the sheet into position by hand with a glove or cloth, taking care to avoid inclusion of air pockets. (See Figure 2.)

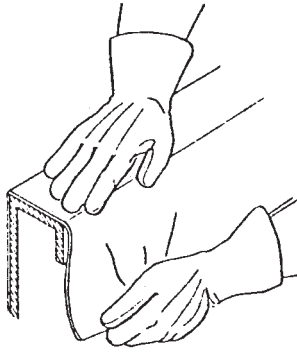


Fig. 2

Hold the sheet taut until cool to the touch. The T-Lock sheet will then be reformed to conform permanently to the surface of the angle being covered.

6. Proceed to the next 4- to 8-inch section.
7. **Mechanical anchors**—After the T-Lock Plain Sheets have adhered to the concrete vertical and overhead surfaces, mechanical anchors shall be placed on 12-inch centers each way. Anchors are to be installed after the T-Lock 19Y Adhesive system has adequately cured (approximately 24 hours).

V. Welding Joints Between T-Lock Sheets

After installation, individual T-Lock sheets are joined by fusing weld strip over the butt joints. Individual T-Lock sheets are welded together at joints using heat and pressure to obtain a continuous plastic liner. On flat surfaces, use T-Lock flat weld strips. For steel tanks where sheets join at corners, use T-Lock corner weld strip. For concrete tanks and structures, consult liner manufacturer for corner weld recommendation. A hand-held, hot-air welding tool is used to fuse a weld strip over the joints of the sheet. The procedure for fusing weld strip is as follows:

1. Clean the areas of the T-Lock sheets and weld strip to be welded prior to welding. Use a non-flammable, water-soluble or dispersible cleaner, such as Oakite Liqui-Det, Formula 409 or equal.
2. Adjust the hot-air welding tool to provide air from approximately 500-600°F so that the effluent air will fuse the sheet and weld strip without charring. (Use a wide slot nozzle, model 30A1.) If a tool with an external air source is used, regulate air pressure to 2-6 psi.
3. Hold the welding tool in one hand so the tip of nozzle is 1/4 to 1/2 inch from the surface to be welded at a 45 degree angle. In the other hand hold the weld strip at approximately 45 degrees to the sheet.
4. Move the welding tool back and forth across the intersection between the weld strip and the sheet, moving slowly enough to cause the sheet to soften and become “tacky” and a small bead of molten material to form in front of the weld strip, and on both sides.
5. As the heat from the welding tool softens the sheet and the bead of molten material forms in front of the weld strip, press the weld strip firmly downward toward the sheet.

6. As it progresses, center the weld strip over the joint as closely as practical.
7. When properly welded, a small bead of molten material will be visible along each edge of the weld strip.

Note: Ameron T-Lock is permanently thermoplastic and may be rewelded at any time during its service life following the above procedure.

VI. Special Provisions

1. If required for workability, T-Lock 19Y adhesive may be thinned up to 10 percent by volume with T-Lock 19Y thinner/cleaner. (No more than one pint of T-Lock 19Y thinner/cleaner should be added per gallon of adhesive.)
2. Do not apply adhesive or primer to areas of T-Lock which will be joined by heat welding, as these materials will prevent proper fusion during welding. Inspect seam areas prior to welding. In confined areas, remove any adhesive or primer using a Model No. 3040 Red Devil® Scraper (or equal). In well-ventilated areas, T-Lock 19Y thinner/cleaner can be used for removal.
3. T-Lock 19Y adhesive is characterized by a high initial or “green” strength; however, one week is required to develop maximum bond. The required bond can be obtained with one coat of adhesive applied over the primer; however, bond strength can be increased by applying two coats of adhesive over the dry primer. Allow 30 minutes drying time between adhesive coats.
4. Warming adhesive-coated sheets up to 120°F for a short time (not more than 10 minutes) to improve the flexibility prior to placement will not adversely affect the adhesive bond. Warming the sheet normally improves the overall bond by facilitating uniform contact with the underlying surface.

Caution! Use hot-air blower for warming and welding.

Do not use open flames.

Safety precautions required (in tanks or confined areas). Whenever materials containing volatile solvents or toxic substances are used, proper ventilation and protective measures must be provided during application and drying to keep solvent vapor concentrations within safe limits, and to protect personnel against toxic hazards. This is especially true in confined spaces, such as tank interiors, pipelines, and tunnels. Consult Code of Federal Regulations Title 29-Labor and applicable state and local regulations on safe practices in coating operations.

Keep solvent-containing materials away from heat, sparks, and open flame. Avoid inhalation of vapors or spray mist. Avoid contact with eyes or skin. Keep containers tightly closed and upright to prevent leakage when not in use.

Department of Labor Material Safety Data Sheets are available on request.

VII. Testing

When installation and welding is complete, the entire lining and weld areas should be tested with an approved electrical hole detector (Tinker and Rasor Model AP-W or equal) with the instrument set at 20,000 volts. Any imperfections must be repaired before placing the lining in service.

Warning: T-Lock 19Y primer, adhesive and thinner/cleaner are flammable. Keep away from heat and flame. Keep containers closed. Use with adequate ventilation. Avoid prolonged breathing of vapor. Avoid prolonged or repeated contact with skin. If used in confined areas, observe the following precautions to prevent hazards of fire or explosion or damage to the health:

1. Continuously circulate adequate fresh air during application and drying to keep solvent fumes below 20 percent of the explosive limit of 1/4 percent by volume of solvent in the air.
2. Use fresh air masks and explosion-proof equipment.
3. Prohibit all flames, sparks, welding, and smoking. Also refer to "Ameron Safety Precautions."

Safety Precautions

Read material safety data sheet before use. Safety precautions must be strictly followed during storage, handling and use.

CAUTION – Improper use and handling of this product can be hazardous to health.

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas. Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep spray mist concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interior and buildings.

This product is to be used by those knowledgeable about proper application methods. Ameron makes no recommendation about the types of safety measures that may need to be adopted because these depend on application environment and space, of which Ameron is unaware and over which it has no control.

If you do not fully understand these warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

This product is for industrial use only. Not for residential use in California.

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether expressed, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to the use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**

Ameron International Corporation is a multinational manufacturer of highly-engineered products and materials for the industrial, chemical, oil, and construction markets. Traded on the New York Stock Exchange (AMN), Ameron is a leading producer of high-performance coatings, fiberglass composite piping; concrete and steel pipe systems, and specialized construction products. The company operates businesses in North America, South America, Europe, Australasia, and Asia. It also participates in several joint-venture companies in the U.S., Saudi Arabia, and Mexico.



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Phone: (714) 256-7755 • Fax: (714) 256-7750 • E-mail: t-lock@ameron.com • www.amerontlock.com

STRUCTURAL DESIGN AND WET WELL WEIGHTS

All Romtec Utilities concrete wet well pre-cast components conform to ASTM C 478. Wet Well components are pre-cast with 4,000 psi. concrete and 60,000 psi. steel.

RECOMMENDED WET WELL LIFTING METHOD

All wet well concrete components are designed to be lifted and set in the excavated hole by use of the Romtec Utilities supplied anchors and ring clutches. The installation contractor shall excavate the wet well hole, place the base rock as specified by the **SITE ENGINEER (not Romtec Utilities)**, provide a **safe OSHA approved cave-in protection method (shoring) and a crane of adequate size to lift and set the heaviest piece**. The excavation contractor and/or his subcontractor crane company must provide the appropriate lifting cables, straps or chains and connection devices to attach the cables to the crane and the ring clutches. All lifting cables, straps or chains must be long enough that when lifting the concrete components the lifting rigging does not put pressure on the upper concrete joint potentially breaking the concrete. **The use of a spreader bar will greatly reduce the risk of the lifting rigging breaking the concrete upper joint.**

WET WELL CONCRETE COMPONENT WEIGHTS:

ITEM	SIZE	WEIGHT
144" Wet Well Base	14' Outside Diameter	39,500 lbs.
144" Wet Well Riser	14' Outside Diameter	6,700 lbs. Per Foot
144" Wet Well Top Slab	14' Outside Diameter	15,510 lbs.



8.07**WET WELL TESTING FOR WATER INGRESS OR
EGRESS**

Romtec Utilities wet wells are water tight. If testing is required, then the testing is to be performed as follows.

Romtec Utilities recommends performing the testing prior to backfilling. This helps with identifying any leakage and locating the area of leakage.

If the testing is performed after backfilling, Romtec Utilities is not responsible for any excavation than has to be done to fix any leaks.

The recommended test methods are per ASTM C497-05 Section 8. Hydrostatic Test Method or Section 9. Permeability Test Method.

8. Hydrostatic Test Method**8.1 Summary of Test Method**

The section of pipe or manhole is subjected to hydrostatic pressure and observed for leakage at the joint or on the surface of the wall. The joint is defined as a connection between the concrete section of pipe or manhole that provides alignment and the flexible watertight seal using either, rubber gaskets, sealing bands, or preformed flexible joint sealant.

8.2 Significance and Use

The test method is a quality control test performed to establish the fact that the finished, shippable pipe or manhole meets the hydrostatic requirements stated in the specifications for the installed wall or joint, or both.

8.3 Procedure:

8.3.1 The equipment for making the test shall be such that, when the specimen under test is filled with water to the exclusion of air and subject to the required hydrostatic pressure, there shall not be enough leakage of water from the ends of the pipe to interfere with the test. The specimen under test shall be free of all visible moisture prior to the initiation of the test.

8.07**WET WELL TESTING FOR WATER INGRESS OR
EGRESS**

8.3.2 Do not test when the temperature of the specimen, the air around the specimen, or the water within the specimen is below 33°F.

8.3.3 If the joint seal and/or flexible connector are being tested, it shall be the sole element providing joint water tightness. No mortar or concrete coatings, fillings, or packing shall be used prior to the test.

Once the wet well is stacked in the proper sequence, fill the well to the highest operation point in the well or the ground water elevation, whichever is the highest. There shall be no visible leakage. Moisture appearing in the form of patches or beads adhering to the surface shall not be considered leakage. If leakage occurs, the manufacturer is not prohibited from extending the soak time to 24 hour.

9. Permeability Test Method**9.1 Summary of Test Method**

A section of pipe is kept filled with water for specified time and the outer surface is tested for moisture.

9.2 Significance and Use

The test method is a quality control test performed to establish the fact that the finished, shippable pipe meets the leakage limits stated in the specifications.

9.3 Procedure

The pipe specimen under test shall be free of all visible moisture prior to the initiation of the test. Perform tests by placing the specimen to be tested, with the spigot end down on a soft rubber mat or its equivalent, weighted if necessary, and kept filled with water to a level of the base of the socket during the test period. Make the initial inspection approximately 15 min after the test has begun. If the pipe shows moist or damp spots on the outer surface of the pipe at that

8.07**WET WELL TESTING FOR WATER INGRESS OR
EGRESS**

time, continue the tests for period not to exceed 24 h. at the option of the manufacturer. Examine the pipe during the extended period for existence of moist or damp spots.

Prior to either test all inlets and outlets must be plugged.

Repairs

Repair of manhole products shall not be prohibited, if necessary, because of imperfections in manufacture or damage during handling. The repair will be acceptable if, the repaired products conform to the requirements of the ASTM C478-09 specification. Romtec Utilities must be notified if any repairs are necessary.

In other words

If the wet well has any areas of leakage the contractor must report this leakage to Romtec Utilities and then together the contractor and Romtec Utilities will come up with a fix. In the unlikely event of a wet well leaking, this does not warrant a complete replacement. A reasonable effort must be given to fix the leak.



Flygt N-pump series

SELF-CLEANING PUMPS WITH SUSTAINED HIGH EFFICIENCY



Sustained high efficiency is priceless



The N-pump advantage

- Patented technology
- Innovative design
- Sustained high efficiency
- Self cleaning ability
- Modular design
- Reliable
- Fewer unplanned service calls

Flygt N-pumps take on the toughest applications and get the job done. Every component is designed and manufactured to deliver sustained high efficiency. Thanks to patented N-technology with its innovative self-cleaning impeller, Flygt N-pumps deliver the highest total efficiency. It lowers your energy bill and reduces unplanned maintenance costs. That adds up to total peace of mind - and big savings over the long term.

Our vast fluid handling knowledge and dedication to research and development leads to technological advances and continuous improvement.

That's why our Flygt N-pumps are at work in more than a hundred thousand installations worldwide. They have proven, by far, to be the best and most reliable choice for both dry and submersible installations.

Robust and reliable

Every Flygt N-pump is tested in the factory to ensure high performance and premium quality. Flygt products deliver outstanding, cost-effective performance that has been proven in applications such as:

- Wastewater
- Raw water
- Cooling water
- Sludge
- Storm water
- Industrial effluent



Broad range capacity

- Ratings from 1.3 kW to 310 kW
- Flow up to 1,000 l/s
- Heads up to 100 m
- Submersible and dry installations
- Every Flygt pump is performance tested in the factory

Self-cleaning N-pump saves money

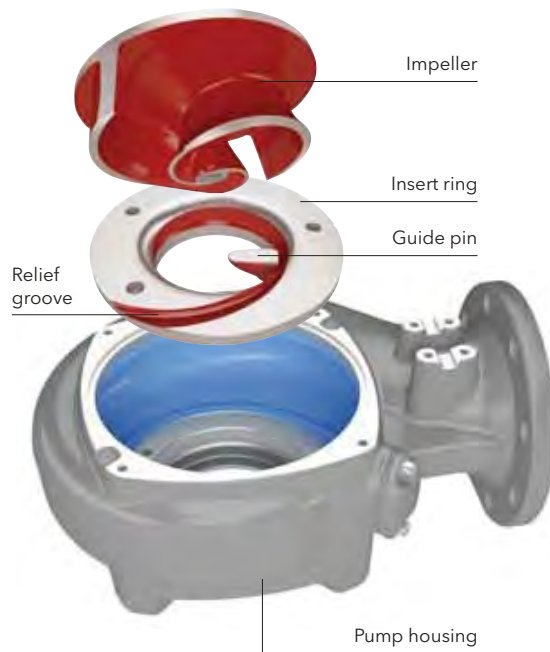
Sustained high efficiency

When solid object such as stringy fibrous material and modern trash, enter the inlet of a conventional pump, they tend to get caught on the leading edges of the impeller vanes. This build-up reduced the impeller's efficiency, resulting in increased power consumption (Fig. A). This increased rate of power consumption generates an increase in energy charges.

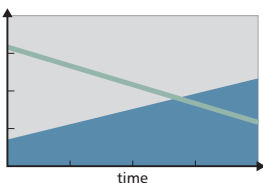
As solids continue to build-up inside the impeller, motor thermal protection can trip causing the pump to stop. This leads to costly unplanned service calls.

If a conventional wastewater pump runs intermittently, the solids build-up will be removed by backflushing when the pump is shut off at the end of the operating cycle. When next cycle begins, efficiency returns to its initial value since the impeller is free from solid objects (Fig B).

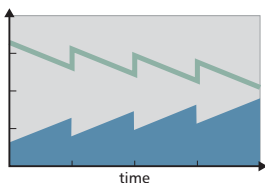
The high efficiency of the Flygt N-pump is sustained over time due to its self-cleaning ability, keeping energy costs to a minimum (Fig. C).



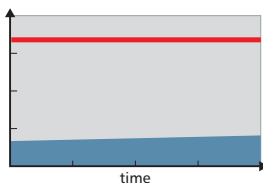
A. Conventional wastewater pump



B. Conventional pump running intermittently



C. Flygt N-pump



— Hydraulic efficiency
 — Sustained high efficiency
 ■ Energy consumption

The self-cleaning concept

All Flygt N-pumps have the same self-cleaning performance regardless of duty point.



Stage 1. Most solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet.



Stage 2. The solid object will slide along the tip of the impeller vane inside the relief groove. The guide pin in the insert ring will push all types of solids away from the center of the impeller, along the leading edge and out through the relief groove.

Designed and engineered for longer life

Xylem specially designs and manufactures Flygt N-pump components, such as the motor, seals and shaft, to optimize operation and prolong pump service life.

Motor

The Class H squirrel-cage induction motor delivers outstanding performance and superior heat transfer in submersible and dry installations. Heat losses are concentrated around the shrink-fitted stator, which is cooled by means of the surrounding water. The motor has a NEMA Class B maximum operating temperature rise of 80°C (176°F) to ensure long service life. Prepared for variable speed operation, all motors are capable of fully utilizing the available power.

Long-life seals

Durable tungsten carbide seals offer exceptional mechanical strength as well as superior sliding properties even when running dry. These low-friction seals withstand thousands of hours of high-pressure operation under extreme conditions without cracking, seizing up or showing signs of unacceptable wear.

Low shaft deflection

To minimize vibration, promote quiet operation and prolong seal and bearing life, all Flygt N-pumps feature a short shaft overhang to reduce shaft deflection.



Spin-out™ seal protection for pumps with cavities in the seal chamber

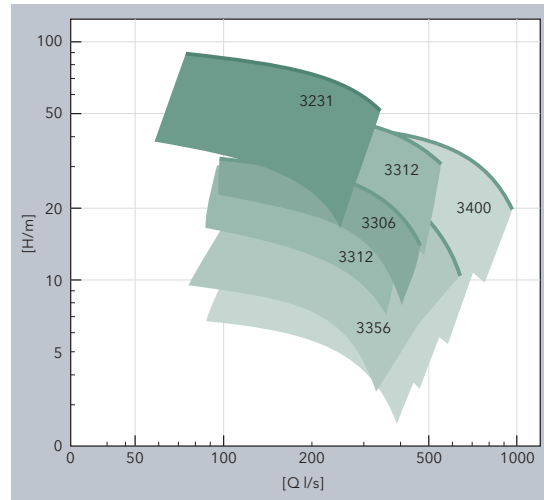
The patented Spin-out™ design expels abrasive particles from the seal chamber, providing protection against wear of the outer seal. As an integral part of the seal chamber, Spin-out™ is as simple as it is effective.

Large capacity pumps

When higher capacity is required, the Flygt N-pump series has five pumps to do the job. These models deliver unprecedented pumping power - reliably and efficiently.



Performance, 50 Hz



Power ratings and sizes

Model	3231	3306	3312	3356	3400
Rating, kW	70-215	58-100	55-250	45-140	40-310
Discharge, mm (in)	200 (8")	300 (12")	300 (12")	350 (14")	400 (16")

Methods of installation

NP



For semi-permanent wet well installations. The pump is installed with twin guide bars on a discharge connection.

NS



A semi-permanent free standing installation. Transportable version with pipe or hose connection.

NT



A vertically-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

NZ



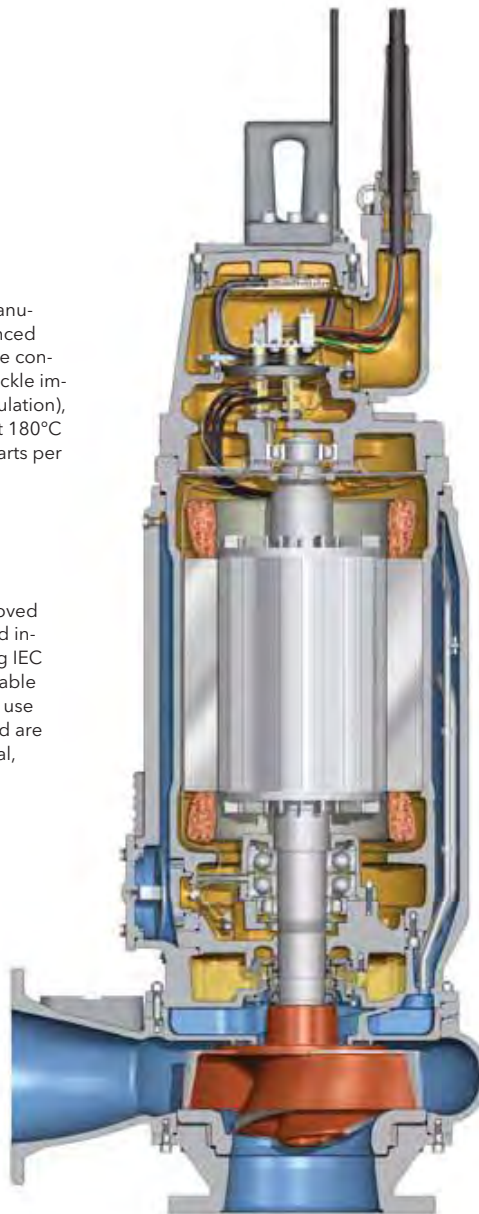
A horizontally-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

BETTER HEAT TRANSFER

Our specially designed and manufactured motor provides enhanced cooling because heat losses are concentrated around the stator. Trickle impregnated in resin (Class H insulation), the stator windings are rated at 180°C (355°F) and enable up to 15 starts per hour.

COMPLIANCE

Each pump is tested and approved in accordance with national and international standards, including IEC 34-1 and CSA. Pumps are available in explosion-proof versions for use in hazardous environments, and are approved by the Factory Mutual, European Standard and IEC.



CABLE ENTRY

Water-resistant cable entry provides both sealing and strain relief functions for a safe installation.

SENSORS

Thermal sensors in the stator windings prevent overheating, and an analogue temperature sensor monitors the lower bearing. The stator housing and the junction box are equipped with leakage sensors. The sensors decrease the risk of bearing and stator failure.

LONG-LIFE BEARINGS

Durable bearings provide a minimum service life of 100,000 hours.

ENDURING SEALS

Two sets of mechanical shaft seals work independently for double security. The Active Seal™ system offers increased sealing reliability and zero leakage into the motor, thereby reducing the risk of bearing and stator failure.

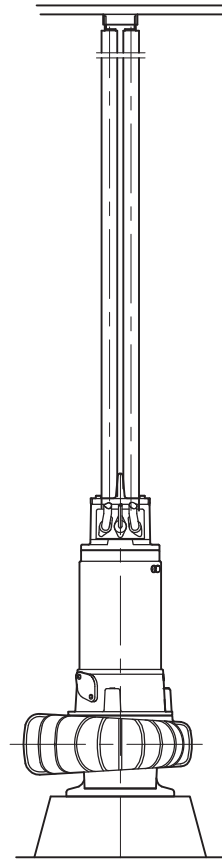
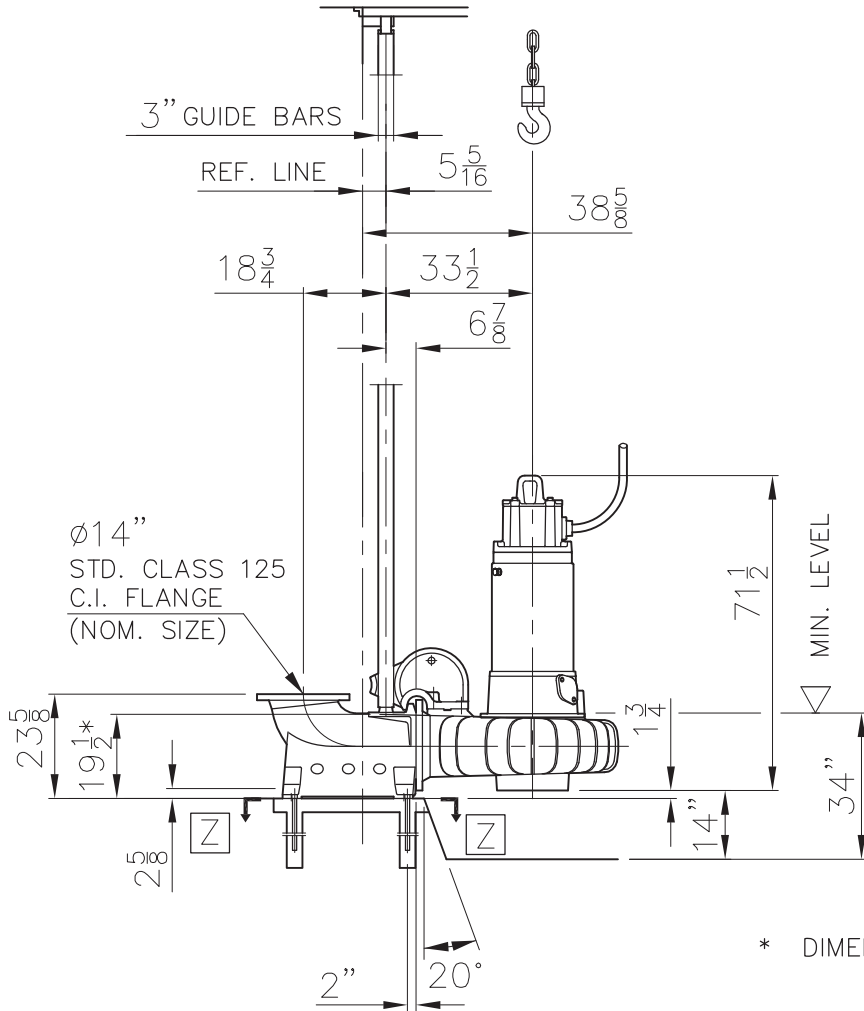
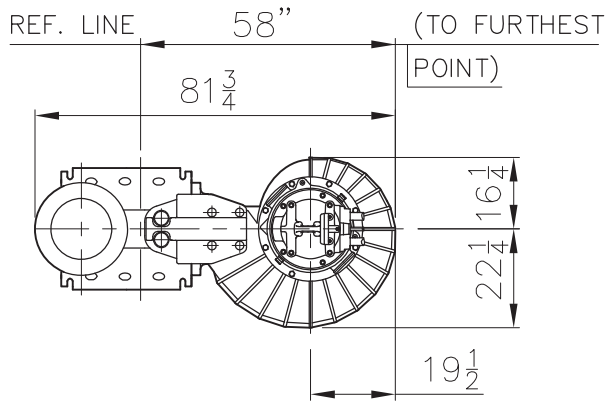
Zero leakage into the motor cavity



The Active Seal™ system is a patented zero-leakage double-seal system that actively prevents liquid from entering the motor cavity, thereby reducing the risk for bearing and stator failure. It comprises a unique inner seal that acts as a micro-pump and an outer seal that prevents leakage of pumped media into the buffer chamber.

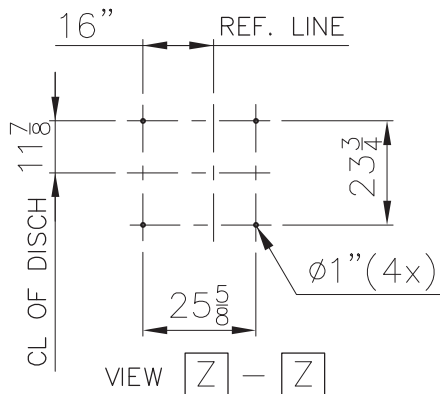
Laser-cut grooves on the inner seal create a hydrodynamic pumping effect that prevents any leakage to enter the motor.

This translates into enhanced sealing reliability, reduced downtime and fewer unscheduled maintenance checks. In addition, regular service inspections can be prolonged in many applications.




Ø14"
STD. CLASS 125
C.I. FLANGE
(NOM. SIZE)

* DIMENSION TO ENDS OF GUIDE BARS



Motor	Weight(lbs)	
	Pump	Disch
35-35-XX	3355	620
35-45-XX	3420	620

 AUTOCAD DRAWING	Denomination Dimensional drwg CP,NP 3356 665/675 Ø14"	Drawn by KA Scale 1: 40	Checked by AEIN Reg no 5399	Date 050629
	6217000		5	



PERFORMANCE CURVE

PRODUCT

NP 3356 /675

TYPE

DATE
2013-08-07

PROJECT

CURVE NO
63-670

ISSUE
2

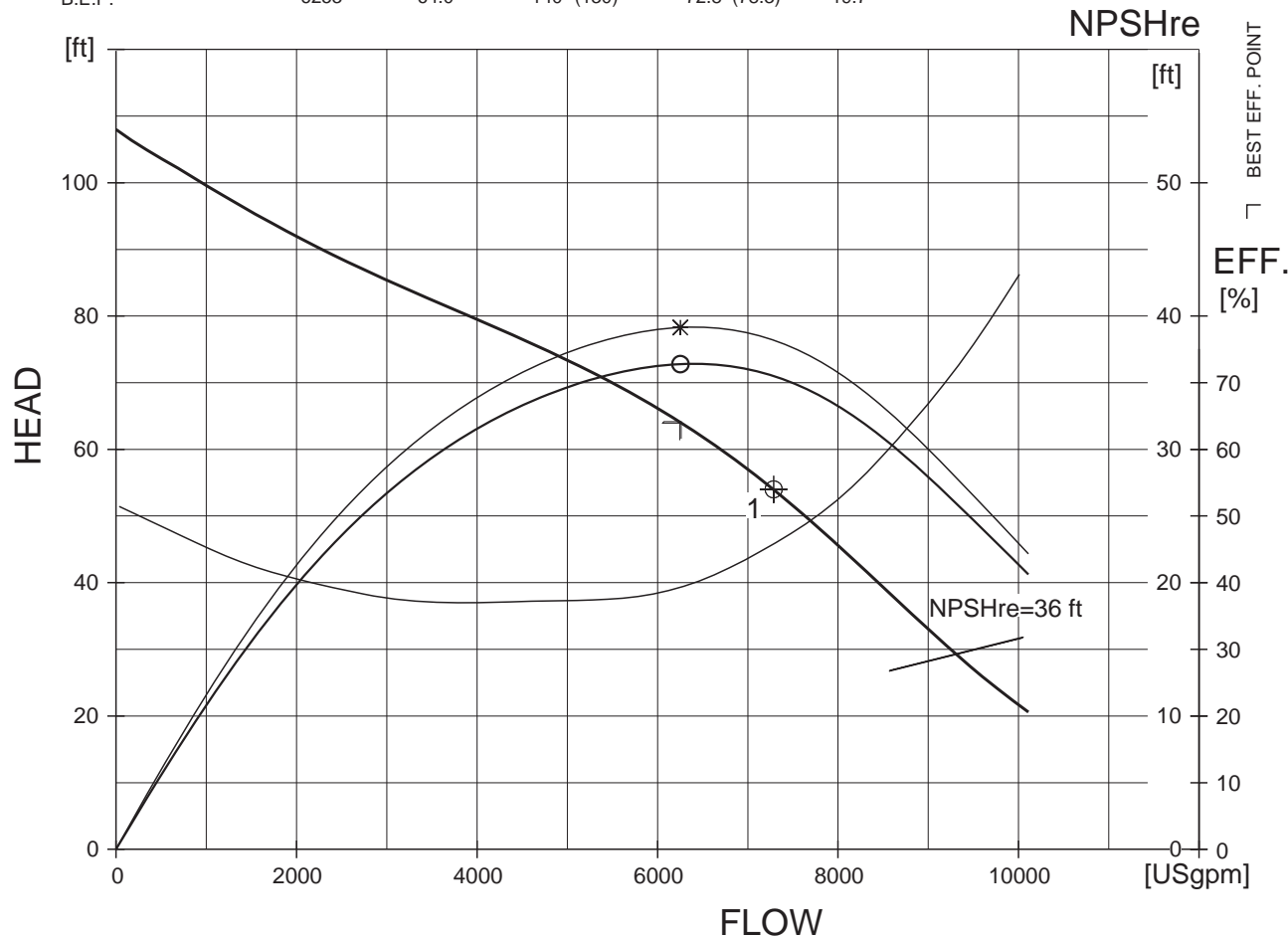
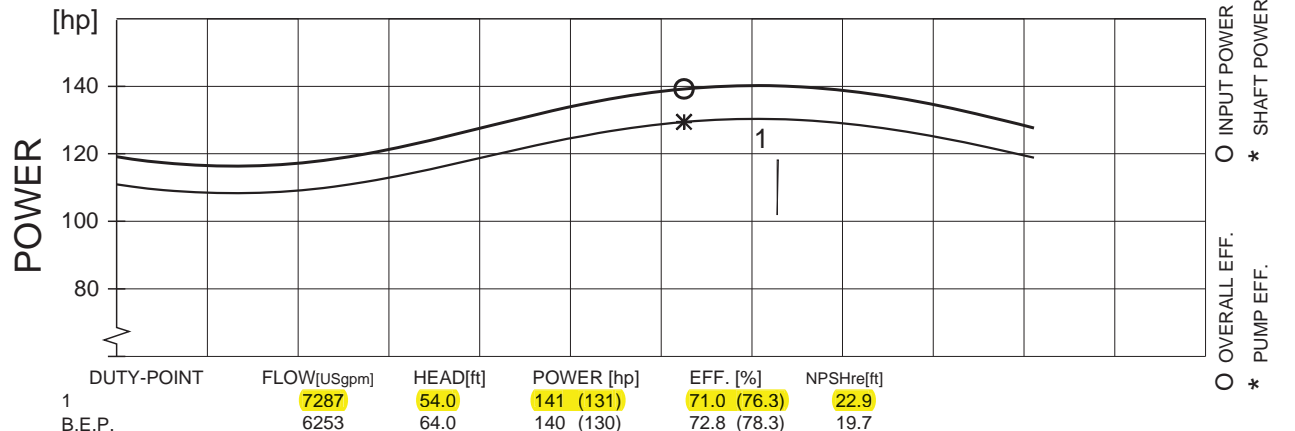
	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.79	0.73	0.62
EFFICIENCY	92.5 %	93.0 %	92.5 %
MOTOR DATA	---	---	---

RATED POWER	140	hp
STARTING CURRENT ...	1195	A
RATED CURRENT ...	179	A
RATED SPEED	1185	rpm
TOT.MOM.OF INERTIA ...	2.0	kgm2
NO. OF BLADES	3	

IMPELLER DIAMETER		
395 mm		
MOTOR #	STATOR	REV
35-45-6AA	01D	11
FREQ.	PHASES	VOLTAGE
60 Hz	3	460 V
GEARTYPE		POLES
---		6
		RATIO

COMMENTS

INLET/OUTLET	-/ 14 inch
IMP. THROUGHLET	---



FLYPS3.1.6.6 (20090313)

NPSHre = NPSH3% + min. operational margin
Performance with clear water and ambient temp 40 °C



HI B Curve

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Support Grips

Standard Duty Support

Single Eye, Single Weave, ~~Tin-Coated Bronze~~



Single Eye, Closed Mesh*

For permanent support when cable end is available to be installed through grip.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Numbers
.50"- .62" (1.27-1.57)	530 (2,357)	7" (17.78)	10" (25.40)	02201013
.63"- .74" (1.60-1.88)	790 (3,514)	8" (20.32)	10" (25.40)	02201014
.75"- .99" (1.90-2.51)	1,020 (4,537)	8" (20.32)	13" (33.02)	02201015
1.00"-1.24" (2.54-3.15)	1,610 (7,161)	9" (22.86)	14" (35.56)	02201017
1.25"-1.49" (3.17-3.78)	1,610 (7,161)	10" (25.40)	15" (38.10)	02201018
1.50"-1.74" (3.81-4.42)	1,610 (7,161)	12" (30.48)	17" (43.18)	02201019
1.75"-1.99" (4.44-5.05)	2,150 (9,563)	14" (35.56)	19" (48.26)	02201020
2.00"-2.49" (5.08-6.32)	3,260 (14,500)	16" (40.64)	21" (53.34)	02201021
2.50"-2.99" (6.35-7.59)	3,260 (14,500)	18" (45.72)	23" (58.42)	02201022
3.00"-3.49" (7.62-8.86)	4,900 (21,795)	21" (53.34)	25" (63.50)	02201023
3.50"-3.99" (8.89-10.13)	4,900 (21,795)	24" (60.96)	27" (68.58)	02201024

IMPORTANT!

It is important that you read all breaking strength, safety and technical data relating to this product on pages T-43 through T-48.

02401015 Stainless Steel

02401017 Stainless Steel

02401020 Stainless Steel



Single Eye, Closed Mesh

Single Eye, Split Mesh, Lace Closing*

For permanent support when cable end is not available.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Numbers
.50"- .62" (1.27-1.57)	530 (2,357)	7" (17.78)	10" (25.40)	02202013
.63"- .74" (1.60-1.88)	790 (3,514)	8" (20.32)	10" (25.40)	02202014
.75"- .99" (1.90-2.51)	1,020 (4,537)	8" (20.32)	13" (33.02)	02202015
1.00"-1.24" (2.54-3.15)	1,610 (7,161)	9" (22.86)	14" (35.56)	02202017
1.25"-1.49" (3.17-3.78)	1,610 (7,161)	10" (25.40)	15" (38.10)	02202018
1.50"-1.74" (3.81-4.42)	1,610 (7,161)	12" (30.48)	17" (43.18)	02202019
1.75"-1.99" (4.44-5.05)	2,150 (9,563)	14" (35.56)	19" (48.26)	02202020
2.00"-2.49" (5.08-6.32)	3,260 (14,500)	16" (40.64)	21" (53.34)	02202021
2.50"-2.99" (6.35-7.59)	3,260 (14,500)	18" (45.72)	23" (58.42)	02202022
3.00"-3.49" (7.62-8.86)	4,900 (21,795)	21" (53.34)	25" (63.50)	02202023
3.50"-3.99" (8.89-10.13)	4,900 (21,795)	24" (60.96)	27" (68.58)	02202024



Single Eye, Split Mesh, Lace Closing

Single Eye, Split Mesh, Rod Closing*

For support when cable end is not available.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Numbers
.50"- .62" (1.27-1.57)	790 (3,514)	7" (17.78)	8 1/2" (21.59)	02203013
.63"- .74" (1.60-1.88)	790 (3,514)	8" (20.32)	8 1/2" (21.59)	02203014
.75"- .99" (1.90-2.51)	1,020 (4,537)	8" (20.32)	10 1/2" (26.67)	02203015
1.00"-1.24" (2.54-3.15)	1,610 (7,161)	9" (22.86)	12 1/2" (31.75)	02203017
1.25"-1.49" (3.17-3.78)	1,610 (7,161)	10" (25.40)	14 1/2" (36.83)	02203018
1.50"-1.74" (3.81-4.42)	1,610 (7,161)	12" (30.48)	15 1/2" (39.37)	02203019
1.75"-1.99" (4.44-5.05)	2,150 (9,563)	14" (35.56)	16 1/2" (41.91)	02203020
2.00"-2.49" (5.08-6.32)	3,260 (14,500)	16" (40.64)	19 1/2" (49.53)	02203021
2.50"-2.99" (6.35-7.59)	3,260 (14,500)	18" (45.72)	21 1/2" (54.61)	02203022
3.00"-3.49" (7.62-8.86)	5,750 (25,576)	21" (53.34)	23 1/2" (59.69)	02203023
3.50"-3.99" (8.89-10.13)	5,750 (25,576)	24" (60.96)	25 1/2" (64.77)	02203024

F-Eye length M-Mesh length at nominal diameter

* Change catalog number from 022 to 024 for stainless steel. Consult factory for availability.



Single Eye, Split Mesh, Rod Closing

Flygt Grip-Eye System



The normal method of lowering and raising a CP pump in and out of a lift station is by use of a chain or cable attached to the pump. The length of the chain or cable is dependent on the depth of the station. The average length would probably be between 18 to 20 ft. and in certain cases may be much longer. In many cases, depending on the lifting device (usually a hoist), the operator may have to take a second or third bite on the pump chain in order to lift the pump clear of the station.

An added accessory to the Flygt line is the patented Flygt Grip-Eye System which consists of 33 ft. of nylon line, a short length of high tensile strength stainless steel chain and a forged "Grip-Eye" of wrought alloy steel.

The operation of this positive recovery system is as follows:

1. Connect the small eye of the grip-eye to the end of the hoist cable.
2. Slip the end of the nylon line through the large eye of the grip-eye. The nylon line simply acts as a guide for the grip-eye on its way down to the short length of the pump lifting chain.
3. While keeping the nylon line (guide line) taut, proceed to lower the grip-eye until it is well positioned over the pump lifting chain.
4. Release the tension on the nylon guide line. The lifting chain will now take a position to become engaged in the grip-eye.
5. Gradually take up tension on the hoist cable and the grip-eye will make a positive grip on the pump lifting chain. Continue hoisting until the pump is clear of the station.

Caution: The Grip-Eyes may only be used with the corresponding special Flygt Chain Sling Units.

Grip-Eyes are not warranted if other chains are used.

Refer to the following pages for pump models and correct assembly.

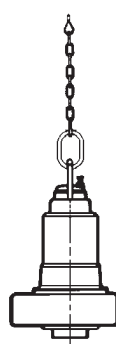
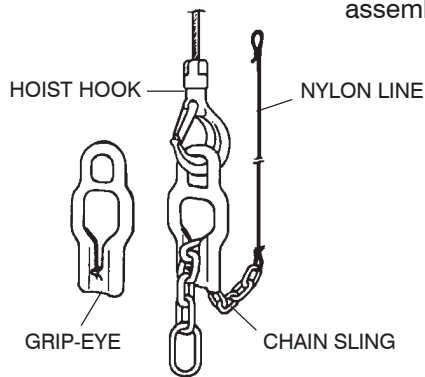


FIG. 1

(Standard) The end ring of the Chain Sling is slipped over the pump lifting handle.

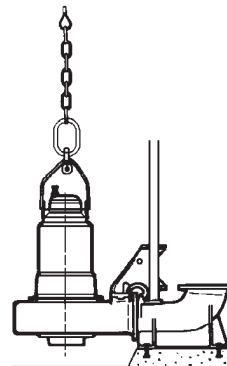


FIG. 2

(Customer to supply extra shackle) A shackle can be used in conjunction with the standard ring should customer choose not to remove and replace pump handle.

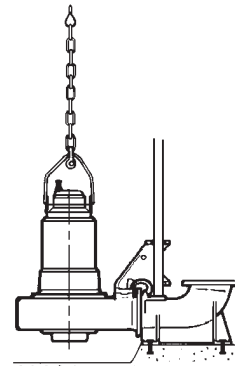


FIG. 3

(Standard) This type comes with a shackle as part of the Chain Sling for connecting to pump lifting handle.

Upper Guide Bar Brackets

Section 10



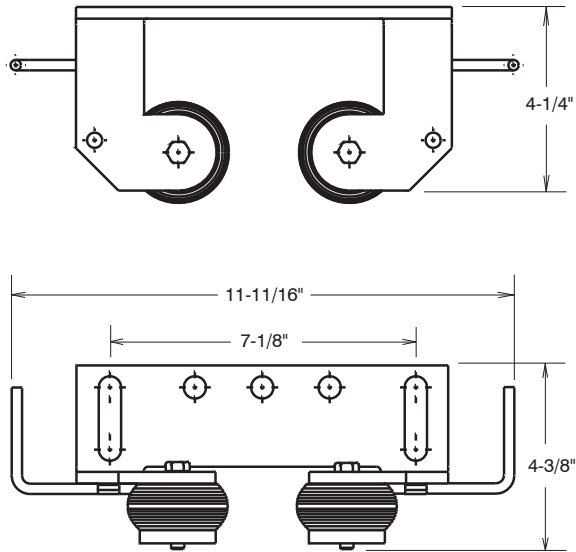
Accessories

Issued: 5/02

Supersedes: 11/00

UPPER GUIDE BAR BRACKET

613 68 00 - Galvanized Steel
613 68 04 - 316 Stainless Steel



Note: use with 2" nominal guide bars

MOUNTING HARDWARE

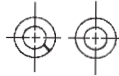
(stainless steel)



3/8"-16 LATERAL NUT
14-46 37 05



HEX. HEAD BOLT (2),
3/8"-16 x 7/8"
14-46 20 25

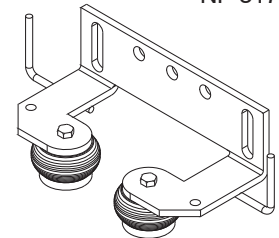


3/8" PLAIN WASHER
(2)
14-46 50 07

3/8" LOCK
WASHER (2)
14-46 50 67

Standard for the following pumps:

DP-3067
DP-3068
CP-3075
DP-3080
BP/CP/DP/FP/NP-3085
CP/FP/NP-3102
CP-3126
CP/FP/NP-3127
CP/NP-3140
CP/FP/NP-3152
NP-3153
NP-3171



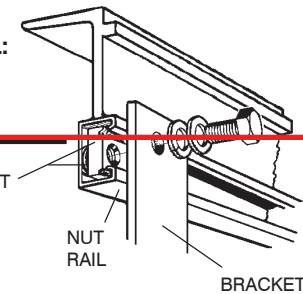
OPTIONAL:

NUT RAIL
FEATURE

LATERAL NUT

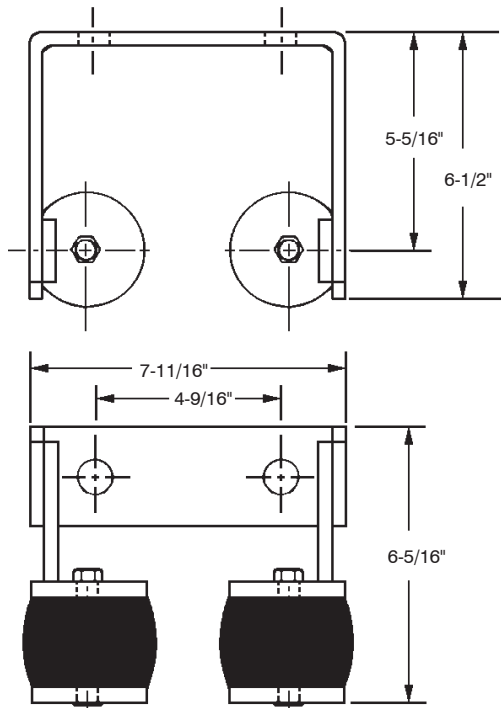
NUT
RAIL

BRACKET



UPPER GUIDE BAR BRACKET

14-58 93 17 - Galvanized Steel
14-58 93 18 - 316 Stainless Steel



Note: use with 3" nominal guide bars

MOUNTING HARDWARE

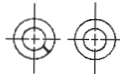
(stainless steel)



5/8"-11 LATERAL NUT
14-46 37 06



HEX. HEAD
BOLT (2),
5/8"-11 x 1-1/4"
14-46 20 13

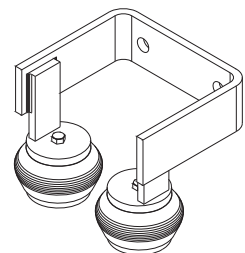


5/8" LOCK
WASHER (2)
14-46 50 70

5/8" PLAIN
WASHER (2)
14-46 50 30

Standard for the following pumps:

CP/NP-3170 CP-3351
NP-3171 CP-3356
CP/HP/NP-3201 CP-3400
CP/RP-3231 CP-3501
CP/NP/RP-3300 CP-3531
CP-3306 CP-3602
CP-3312 CP-3800



9.03 TRIPLEX SYSTEM

TRIPLEX SYSTEM PUMP INFORMATION FOLLOWS THIS PAGE



Flygt N-pump series

SELF-CLEANING PUMPS WITH SUSTAINED HIGH EFFICIENCY



Sustained high efficiency is priceless



The N-pump advantage

- Patented technology
- Innovative design
- Sustained high efficiency
- Self cleaning ability
- Modular design
- Reliable
- Fewer unplanned service calls

Flygt N-pumps take on the toughest applications and get the job done. Every component is designed and manufactured to deliver sustained high efficiency. Thanks to patented N-technology with its innovative self-cleaning impeller, Flygt N-pumps deliver the highest total efficiency. It lowers your energy bill and reduces unplanned maintenance costs. That adds up to total peace of mind - and big savings over the long term.

Our vast fluid handling knowledge and dedication to research and development leads to technological advances and continuous improvement.

That's why our Flygt N-pumps are at work in more than a hundred thousand installations worldwide. They have proven, by far, to be the best and most reliable choice for both dry and submersible installations.

Robust and reliable

Every Flygt N-pump is tested in the factory to ensure high performance and premium quality. Flygt products deliver outstanding, cost-effective performance that has been proven in applications such as:

- Wastewater
- Raw water
- Cooling water
- Sludge
- Storm water
- Industrial effluent



Broad range capacity

- Ratings from 1.3 kW to 310 kW
- Flow up to 1,000 l/s
- Heads up to 100 m
- Submersible and dry installations
- Every Flygt pump is performance tested in the factory

Self-cleaning N-pump saves money

Sustained high efficiency

When solid object such as stringy fibrous material and modern trash, enter the inlet of a conventional pump, they tend to get caught on the leading edges of the impeller vanes. This build-up reduced the impeller's efficiency, resulting in increased power consumption (Fig. A). This increased rate of power consumption generates an increase in energy charges.

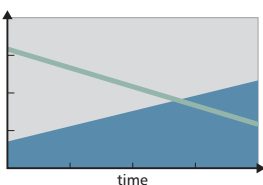
As solids continue to build-up inside the impeller, motor thermal protection can trip causing the pump to stop. This leads to costly unplanned service calls.

If a conventional wastewater pump runs intermittently, the solids build-up will be removed by backflushing when the pump is shut off at the end of the operating cycle. When next cycle begins, efficiency returns to its initial value since the impeller is free from solid objects (Fig B).

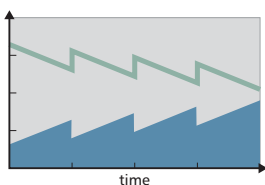
The high efficiency of the Flygt N-pump is sustained over time due to its self-cleaning ability, keeping energy costs to a minimum (Fig. C).



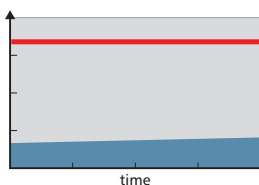
A. Conventional wastewater pump



B. Conventional pump running intermittently



C. Flygt N-pump



— Hydraulic efficiency
 — Sustained high efficiency
 ■ Energy consumption

The self-cleaning concept

All Flygt N-pumps have the same self-cleaning performance regardless of duty point.



Stage 1. Most solid objects entering the pump will pass through the impeller between the impeller vanes. If an object gets caught on the leading edge of one of the vanes, it will slide along the backswept shape towards the perimeter of the inlet.



Stage 2. The solid object will slide along the tip of the impeller vane inside the relief groove. The guide pin in the insert ring will push all types of solids away from the center of the impeller, along the leading edge and out through the relief groove.

Designed and engineered for longer life

Xylem specially designs and manufactures Flygt N-pump components, such as the motor, seals and shaft, to optimize operation and prolong pump service life.

Motor

The Class H squirrel-cage induction motor delivers outstanding performance and superior heat transfer in submersible and dry installations. Heat losses are concentrated around the shrink-fitted stator, which is cooled by means of the surrounding water. The motor has a NEMA Class B maximum operating temperature rise of 80°C (176°F) to ensure long service life. Prepared for variable speed operation, all motors are capable of fully utilizing the available power.

Long-life seals

Durable tungsten carbide seals offer exceptional mechanical strength as well as superior sliding properties even when running dry. These low-friction seals withstand thousands of hours of high-pressure operation under extreme conditions without cracking, seizing up or showing signs of unacceptable wear.

Low shaft deflection

To minimize vibration, promote quiet operation and prolong seal and bearing life, all Flygt N-pumps feature a short shaft overhang to reduce shaft deflection.



Spin-out™ seal protection for pumps with cavities in the seal chamber

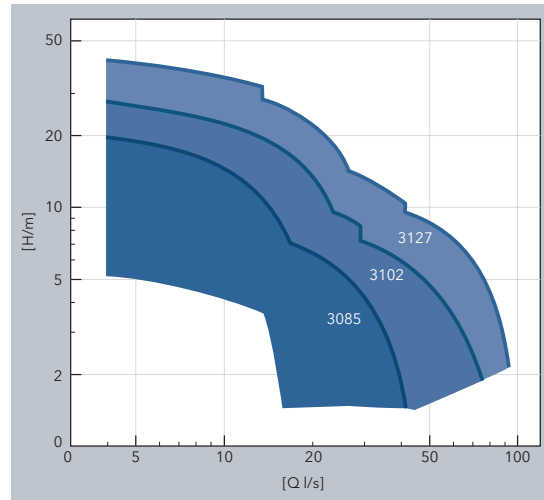
The patented Spin-out™ design expels abrasive particles from the seal chamber, providing protection against wear of the outer seal. As an integral part of the seal chamber, Spin-out™ is as simple as it is effective.

Low capacity pumps

This series of Flygt N-pumps includes three models that handle capacities up to 100 l/s. Like all Flygt N-pumps, these contribute to reducing the total life cycle costs of your installation.



Performance, 50 Hz



Power ratings and sizes

Model	3085	3102	3127
Rating, kW	1.3-2.4	3.1-4.2	4.7-7.4
Discharge, mm (in)	80 (3")	80 (3") 100 (4") 150 (6")	80 (3") 100 (4") 150 (6")

Methods of installation

NP



For semi-permanent wet well installations. The pump is installed with twin guide bars on a discharge connection.

NS



A semi-permanent free standing installation. Transportable version with pipe or hose connection.

NT



A vertically-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

NZ



A horizontally-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

NL



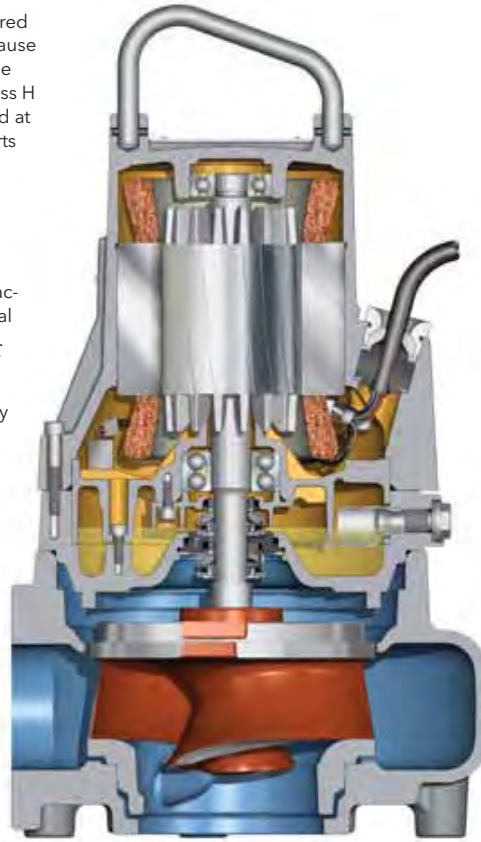
A semi-permanent installation of a pump within a vertical steel or concrete column.

BETTER HEAT TRANSFER

Our specially designed and manufactured motor provides enhanced cooling because heat losses are concentrated around the stator. Trickle impregnated in resin (Class H insulation), the stator windings are rated at 180°C (355°F) and enable up to 30 starts per hour.

COMPLIANCE

Each pump is tested and approved in accordance with national and international standards, including IEC 34-1 and CSA. Pumps are available in explosion-proof versions for use in hazardous environments, and are approved by the Factory Mutual, European Standard and IEC.



CABLE ENTRY

Water-resistant cable entry provides both sealing and strain relief functions to ensure a safe installation.

SENSORS

Thermal sensors embedded in the stator windings prevent overheating. Optional leakage sensors in the stator and oil housings are also available.

LONG-LIFE BEARINGS

Durable bearings provide a minimum service life of 50,000 hours.

ENDURING SEALS

The Griploc™ system consists of two sets of mechanical shaft seals that operate independently to provide double security against leakage.

Griploc™ seal

With a robust design, Griploc™ seals offer consistent performance and trouble-free operation in challenging environments. Solid seal rings minimize leakage and the patented griplock spring, which is tightened around the shaft, provides axial fixation and torque transmission. In addition, the Griploc™ design facilitates quick and correct assembly and disassembly.



Adaptive N-impeller

The Flygt N3085 features an adaptive self-cleaning N-impeller that can move axially to enable easy passage of large solids through the pump.

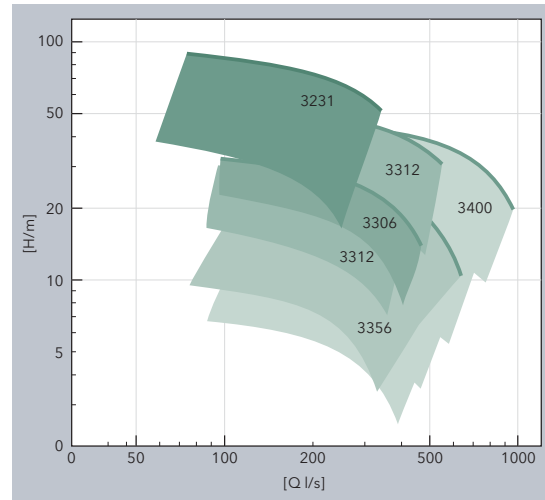


Large capacity pumps

When higher capacity is required, the Flygt N-pump series has five pumps to do the job. These models deliver unprecedented pumping power - reliably and efficiently.



Performance, 50 Hz



Power ratings and sizes

Model	3231	3306	3312	3356	3400
Rating, kW	70-215	58-100	55-250	45-140	40-310
Discharge, mm (in)	200 (8")	300 (12")	300 (12")	350 (14")	400 (16")

Methods of installation

NP

For semi-permanent wet well installations. The pump is installed with twin guide bars on a discharge connection.

NS

A semi-permanent free standing installation. Transportable version with pipe or hose connection.

NT

A vertically-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

NZ

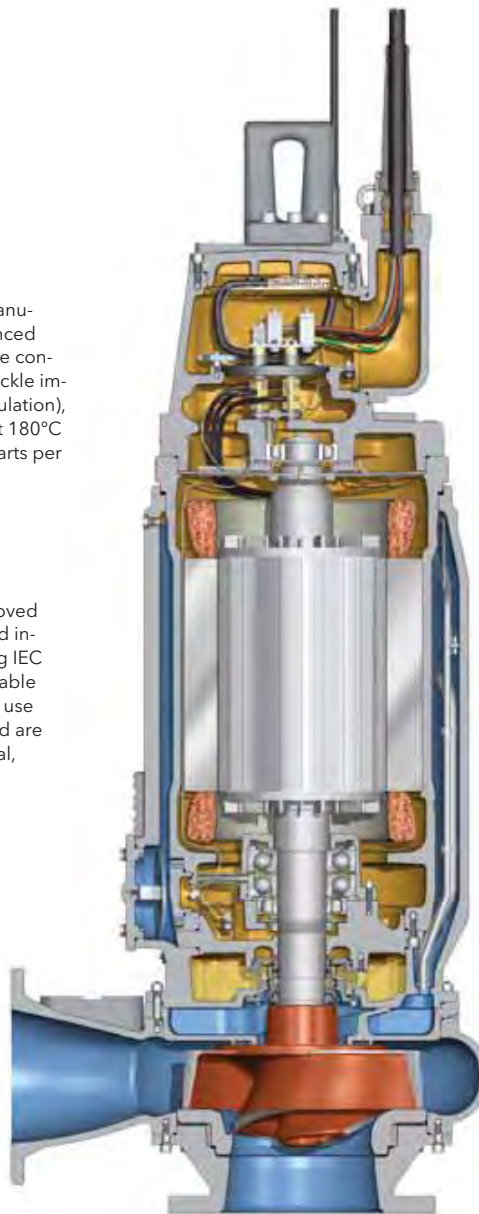
A horizontally-mounted, permanent dry well or in-line installation with flange connections for suction and discharge pipework.

BETTER HEAT TRANSFER

Our specially designed and manufactured motor provides enhanced cooling because heat losses are concentrated around the stator. Trickle impregnated in resin (Class H insulation), the stator windings are rated at 180°C (355°F) and enable up to 15 starts per hour.

COMPLIANCE

Each pump is tested and approved in accordance with national and international standards, including IEC 34-1 and CSA. Pumps are available in explosion-proof versions for use in hazardous environments, and are approved by the Factory Mutual, European Standard and IEC.



CABLE ENTRY

Water-resistant cable entry provides both sealing and strain relief functions for a safe installation.

SENSORS

Thermal sensors in the stator windings prevent overheating, and an analogue temperature sensor monitors the lower bearing. The stator housing and the junction box are equipped with leakage sensors. The sensors decrease the risk of bearing and stator failure.

LONG-LIFE BEARINGS

Durable bearings provide a minimum service life of 100,000 hours.

ENDURING SEALS

Two sets of mechanical shaft seals work independently for double security. The Active Seal™ system offers increased sealing reliability and zero leakage into the motor, thereby reducing the risk of bearing and stator failure.

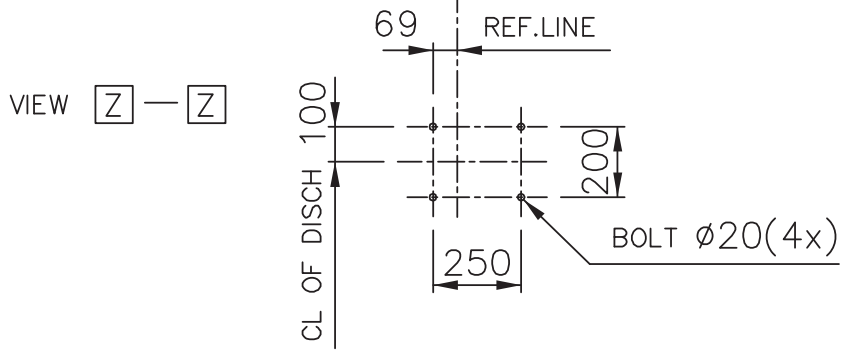
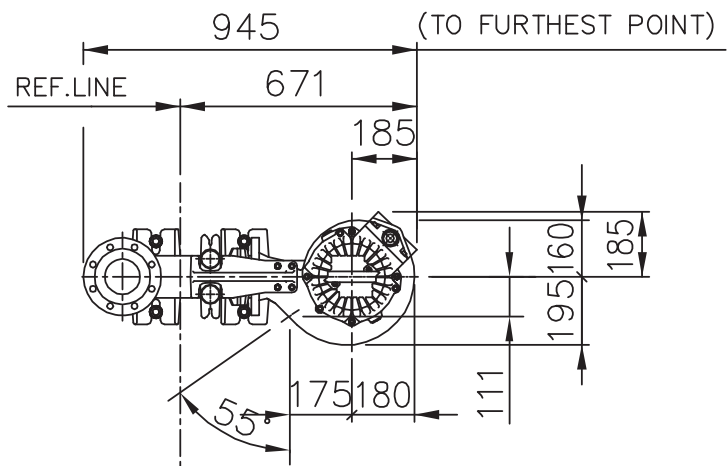
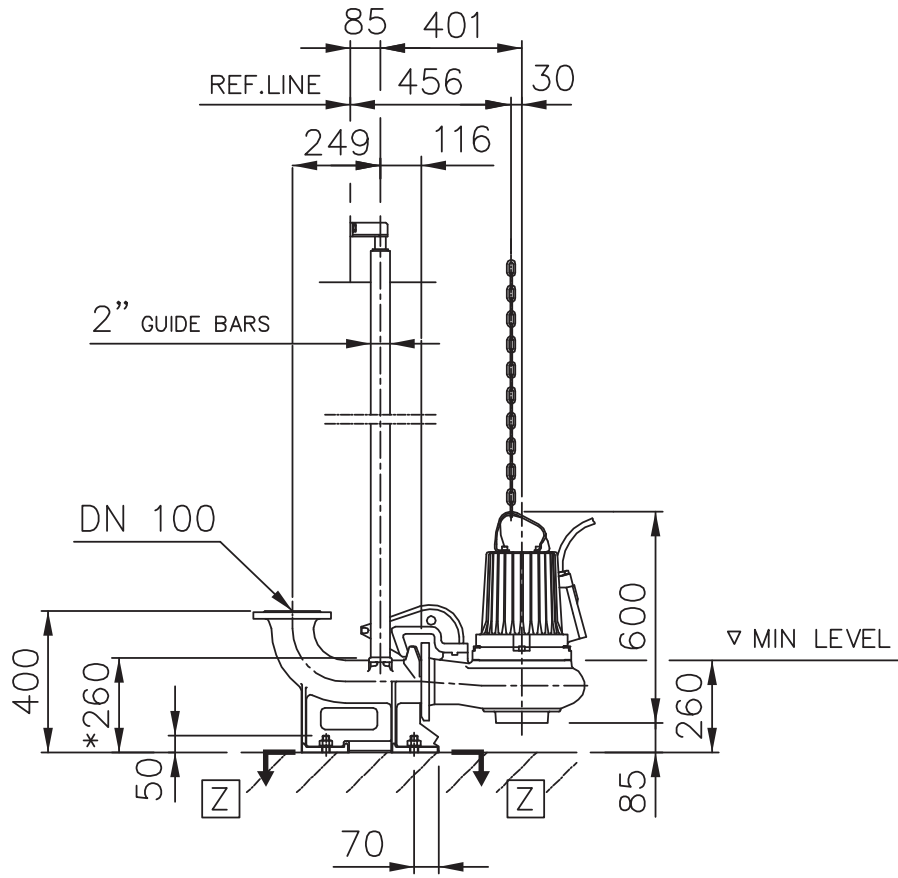
Zero leakage into the motor cavity



The Active Seal™ system is a patented zero-leakage double-seal system that actively prevents liquid from entering the motor cavity, thereby reducing the risk for bearing and stator failure. It comprises a unique inner seal that acts as a micro-pump and an outer seal that prevents leakage of pumped media into the buffer chamber.

Laser-cut grooves on the inner seal create a hydrodynamic pumping effect that prevents any leakage to enter the motor.

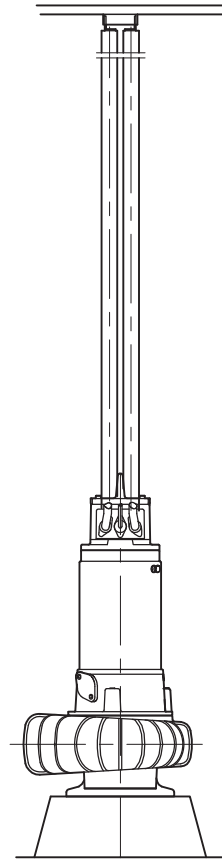
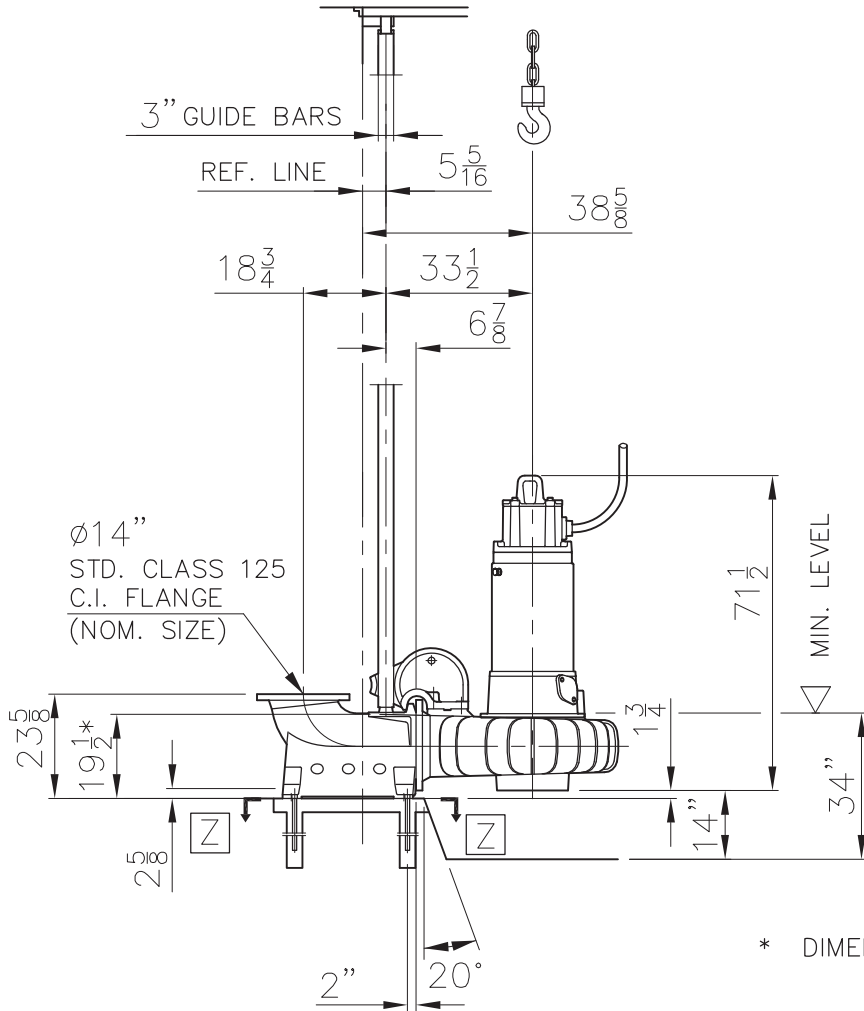
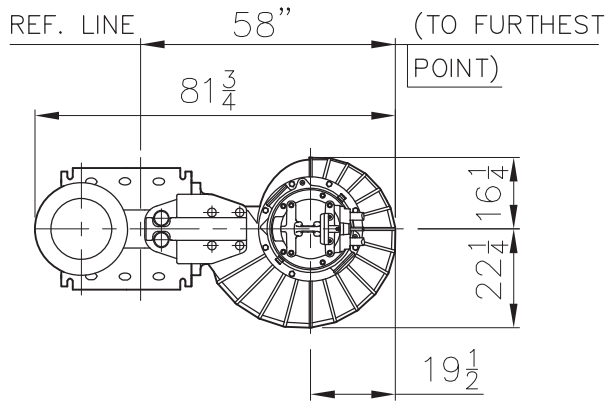
This translates into enhanced sealing reliability, reduced downtime and fewer unscheduled maintenance checks. In addition, regular service inspections can be prolonged in many applications.



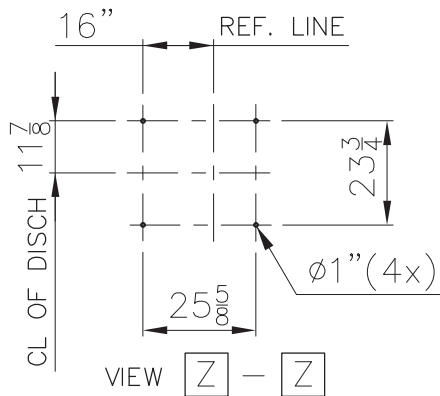
* DIMENSION TO ENDS OF GUIDE BARS

Weight (kg)	
Pump	Disch
107	35


 AUTOCAD DRAWING	Denomination Dimensional drwg NP 3102 MT DN 100	Drawn by NK Checked by Scale 1:20	Date 080813 Reg no 5399
	6602300		1



* DIMENSION TO ENDS OF GUIDE BARS



Motor	Weight(lbs)	
	Pump	Disch
35-35-XX	3355	620
35-45-XX	3420	620

 AUTOCAD DRAWING	Denomination Dimensional drwg CP,NP 3356 665/675 Ø14"	Drawn by KA Scale 1: 40	Checked by AEIN 6217000	Date 050629 Reg no 5399	5
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PERFORMANCE CURVE

PRODUCT
NP3102.090

TYPE
MT

DATE
2013-08-16

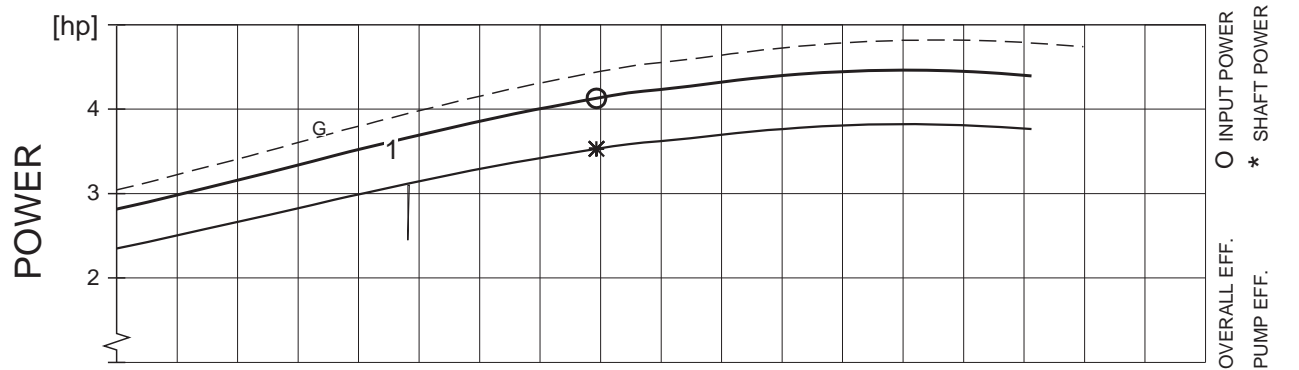
PROJECT
STATE COLLEGE - ANAHIEM

CURVE NO
63-464-00-3703

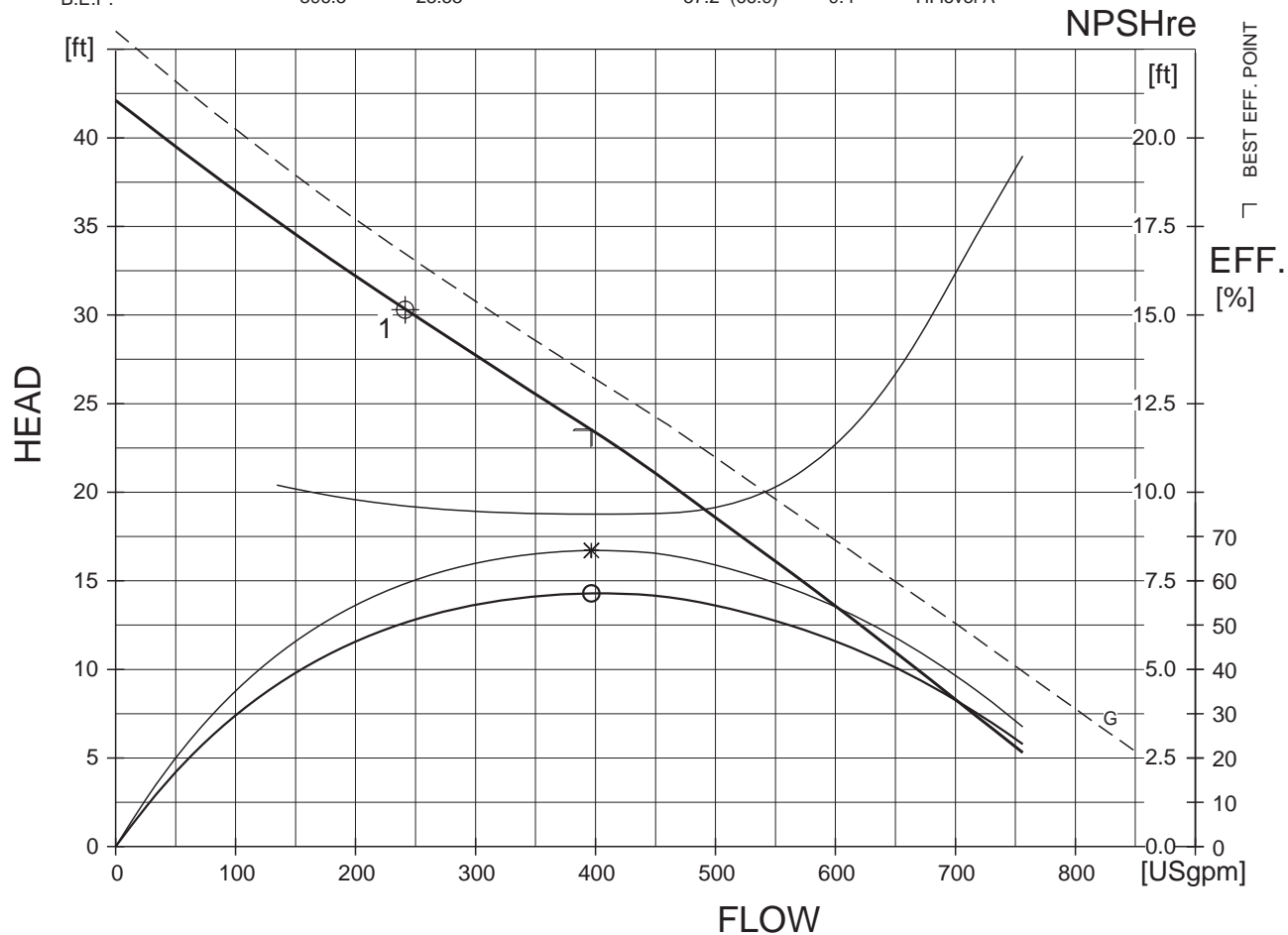
ISSUE
11

	1/1-LOAD	3/4-LOAD	1/2-LOAD	RATED POWER	5	hp
POWER FACTOR	0.81	0.75	0.64	STARTING CURRENT ...	41	A
EFFICIENCY	85.0 %	85.5 %	84.0 %	RATED CURRENT ...	6.7	A
MOTOR DATA	---	---	---	RATED SPEED	1745	rpm
COMMENTS	INLET/OUTLET			TOT.MOM.OF	0.027	kgm2
	-/ 4 inch			INERTIA ...		
	IMP. THROUGHLET			NO. OF		
				BLADES	2	

IMPELLER DIAMETER 162 mm		
MOTOR #	STATOR	REV
18-11-4AL	61D	10
FREQ.	PHASES	VOLTAGE
60 Hz	3	460 V
GEARTYPE		RATIO
---		---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]	GUARANTEE
1 B.E.P.	241.3 396.5	30.30 23.53	3.70 (3.11)	50.5 (59.4) 57.2 (66.9)	9.6 9.4	HI level A



FLYPS3.1.6.6 (20090313)

NPSHre = NPSH3% + min. operational margin
Performance with clear water and ambient temp 40 °C

GUARANTEE BETWEEN LIMITS (G) ACC. TO
HI level A



PERFORMANCE CURVE

PRODUCT

NP 3356 /675

TYPE

DATE
2013-08-07

PROJECT

CURVE NO
63-670

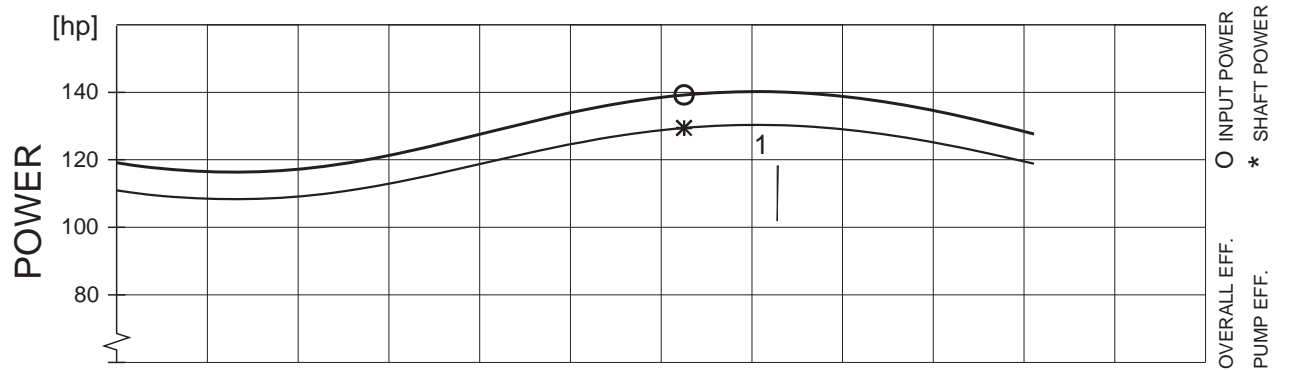
ISSUE
2

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.79	0.73	0.62
EFFICIENCY	92.5 %	93.0 %	92.5 %
MOTOR DATA	---	---	---

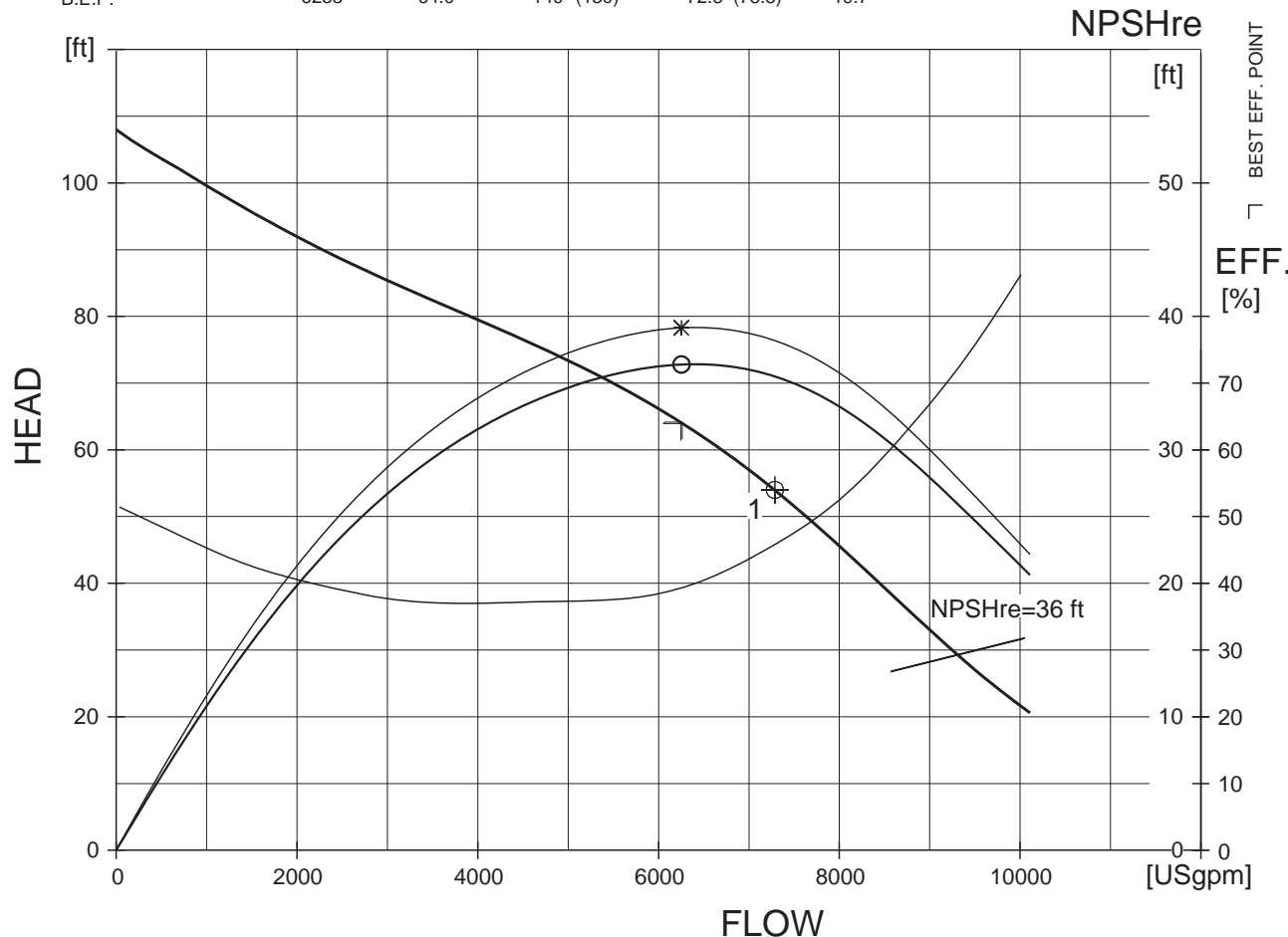
RATED POWER	140	hp
STARTING CURRENT ...	1195	A
RATED CURRENT ...	179	A
RATED SPEED	1185	rpm
TOT.MOM.OF INERTIA ...	2.0	kgm2
NO. OF BLADES	3	

IMPELLER DIAMETER 395 mm		
MOTOR #	STATOR	REV
35-45-6AA	01D	11
FREQ.	PHASES	VOLTAGE
60 Hz	3	460 V
GEARTYPE		RATIO
---		---

COMMENTS	INLET/OUTLET
	-/ 14 inch
	IMP. THROUGHLET



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
1 B.E.P.	7287	54.0	141 (131)	71.0 (76.3)	22.9
	6253	64.0	140 (130)	72.8 (78.3)	19.7



FLYPS3.1.6.6 (20090313)

NPSHre = NPSH3% + min. operational margin
Performance with clear water and ambient temp 40 °C



HI B Curve

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Support Grips

Standard Duty Support

Single Eye, Single Weave, ~~Tin-Coated Bronze~~



Single Eye, Closed Mesh*

For permanent support when cable end is available to be installed through grip.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Numbers
.50"- .62" (1.27-1.57)	530 (2,357)	7" (17.78)	10" (25.40)	02201013
.63"- .74" (1.60-1.88)	790 (3,514)	8" (20.32)	10" (25.40)	02201014
.75"- .99" (1.90-2.51)	1,020 (4,537)	8" (20.32)	13" (33.02)	02201015
1.00"-1.24" (2.54-3.15)	1,610 (7,161)	9" (22.86)	14" (35.56)	02201017
1.25"-1.49" (3.17-3.78)	1,610 (7,161)	10" (25.40)	15" (38.10)	02201018
1.50"-1.74" (3.81-4.42)	1,610 (7,161)	12" (30.48)	17" (43.18)	02201019
1.75"-1.99" (4.44-5.05)	2,150 (9,563)	14" (35.56)	19" (48.26)	02201020
2.00"-2.49" (5.08-6.32)	3,260 (14,500)	16" (40.64)	21" (53.34)	02201021
2.50"-2.99" (6.35-7.59)	3,260 (14,500)	18" (45.72)	23" (58.42)	02201022
3.00"-3.49" (7.62-8.86)	4,900 (21,795)	21" (53.34)	25" (63.50)	02201023
3.50"-3.99" (8.89-10.13)	4,900 (21,795)	24" (60.96)	27" (68.58)	02201024

IMPORTANT!

It is important that you read all breaking strength, safety and technical data relating to this product on pages T-43 through T-48.

02401015 - Stainless Steel

02401017 - Stainless Steel

02401020 - Stainless Steel



Single Eye, Closed Mesh

Single Eye, Split Mesh, Lace Closing*

For permanent support when cable end is not available.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Numbers
.50"- .62" (1.27-1.57)	530 (2,357)	7" (17.78)	10" (25.40)	02202013
.63"- .74" (1.60-1.88)	790 (3,514)	8" (20.32)	10" (25.40)	02202014
.75"- .99" (1.90-2.51)	1,020 (4,537)	8" (20.32)	13" (33.02)	02202015
1.00"-1.24" (2.54-3.15)	1,610 (7,161)	9" (22.86)	14" (35.56)	02202017
1.25"-1.49" (3.17-3.78)	1,610 (7,161)	10" (25.40)	15" (38.10)	02202018
1.50"-1.74" (3.81-4.42)	1,610 (7,161)	12" (30.48)	17" (43.18)	02202019
1.75"-1.99" (4.44-5.05)	2,150 (9,563)	14" (35.56)	19" (48.26)	02202020
2.00"-2.49" (5.08-6.32)	3,260 (14,500)	16" (40.64)	21" (53.34)	02202021
2.50"-2.99" (6.35-7.59)	3,260 (14,500)	18" (45.72)	23" (58.42)	02202022
3.00"-3.49" (7.62-8.86)	4,900 (21,795)	21" (53.34)	25" (63.50)	02202023
3.50"-3.99" (8.89-10.13)	4,900 (21,795)	24" (60.96)	27" (68.58)	02202024



Single Eye, Split Mesh, Lace Closing

Single Eye, Split Mesh, Rod Closing*

For support when cable end is not available.

Cable Diameter Range Inches (cm)	Approx. Breaking Strength Lbs. (N)	E Inches (cm)	M Inches (cm)	Catalog Numbers
.50"- .62" (1.27-1.57)	790 (3,514)	7" (17.78)	8 1/2" (21.59)	02203013
.63"- .74" (1.60-1.88)	790 (3,514)	8" (20.32)	8 1/2" (21.59)	02203014
.75"- .99" (1.90-2.51)	1,020 (4,537)	8" (20.32)	10 1/2" (26.67)	02203015
1.00"-1.24" (2.54-3.15)	1,610 (7,161)	9" (22.86)	12 1/2" (31.75)	02203017
1.25"-1.49" (3.17-3.78)	1,610 (7,161)	10" (25.40)	14 1/2" (36.83)	02203018
1.50"-1.74" (3.81-4.42)	1,610 (7,161)	12" (30.48)	15 1/2" (39.37)	02203019
1.75"-1.99" (4.44-5.05)	2,150 (9,563)	14" (35.56)	16 1/2" (41.91)	02203020
2.00"-2.49" (5.08-6.32)	3,260 (14,500)	16" (40.64)	19 1/2" (49.53)	02203021
2.50"-2.99" (6.35-7.59)	3,260 (14,500)	18" (45.72)	21 1/2" (54.61)	02203022
3.00"-3.49" (7.62-8.86)	5,750 (25,576)	21" (53.34)	23 1/2" (59.69)	02203023
3.50"-3.99" (8.89-10.13)	5,750 (25,576)	24" (60.96)	25 1/2" (64.77)	02203024

E-Eye length M-Mesh length at nominal diameter

* Change catalog number from 022 to 024 for stainless steel. Consult factory for availability.



Single Eye, Split Mesh, Rod Closing

Flygt Grip-Eye System

The normal method of lowering and raising a CP pump in and out of a lift station is by use of a chain or cable attached to the pump. The length of the chain or cable is dependent on the depth of the station. The average length would probably be between 18 to 20 ft. and in certain cases may be much longer. In many cases, depending on the lifting device (usually a hoist), the operator may have to take a second or third bite on the pump chain in order to lift the pump clear of the station.

An added accessory to the Flygt line is the patented Flygt Grip-Eye System which consists of 33 ft. of nylon line, a short length of high tensile strength stainless steel chain and a forged "Grip-Eye" of wrought alloy steel.

The operation of this positive recovery system is as follows:

1. Connect the small eye of the grip-eye to the end of the hoist cable.
2. Slip the end of the nylon line through the large eye of the grip-eye. The nylon line simply acts as a guide for the grip-eye on its way down to the short length of the pump lifting chain.
3. While keeping the nylon line (guide line) taut, proceed to lower the grip-eye until it is well positioned over the pump lifting chain.
4. Release the tension on the nylon guide line. The lifting chain will now take a position to become engaged in the grip-eye.
5. Gradually take up tension on the hoist cable and the grip-eye will make a positive grip on the pump lifting chain. Continue hoisting until the pump is clear of the station.

Caution: The Grip-Eyes may only be used with the corresponding special Flygt Chain Sling Units.

Grip-Eyes are not warranted if other chains are used.

Refer to the following pages for pump models and correct assembly.

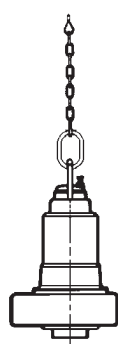
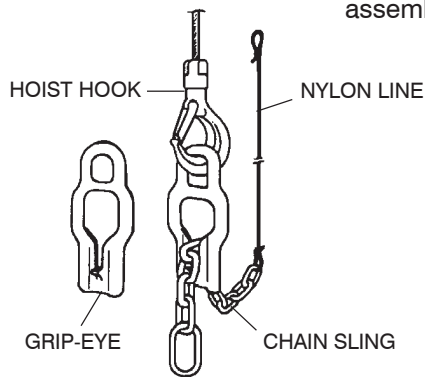


FIG. 1
(Standard) The end ring of the Chain Sling is slipped over the pump lifting handle.

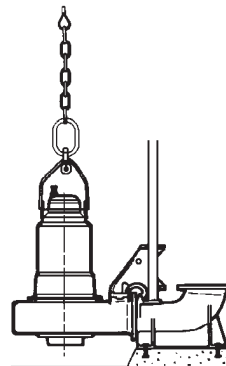


FIG. 2
(Customer to supply extra shackle) A shackle can be used in conjunction with the standard ring should customer choose not to remove and replace pump handle.

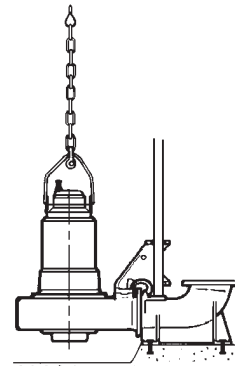


FIG. 3
(Standard) This type comes with a shackle as part of the Chain Sling for connecting to pump lifting handle.

Upper Guide Bar Brackets

Section 10



Accessories

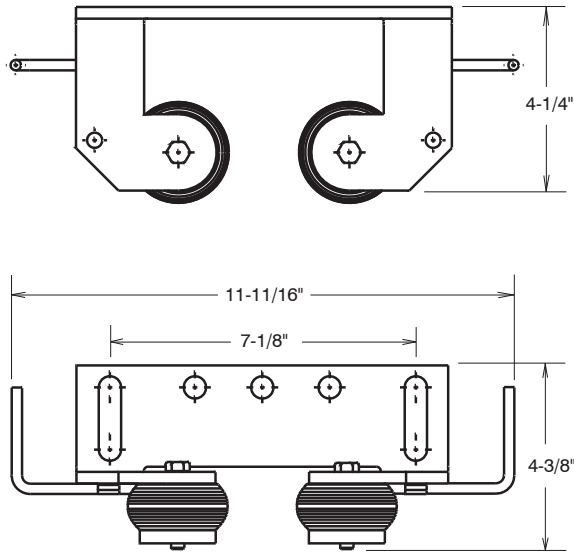
Issued: 5/02

Supersedes: 11/00

UPPER GUIDE BAR BRACKET

613 68 00 - Galvanized Steel

613 68 04 - 316 Stainless Steel



Note: use with 2" nominal guide bars

USED WITH THE NP3102MT

MOUNTING HARDWARE

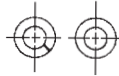
(stainless steel)



3/8"-16 LATERAL NUT
14-46 37 05



HEX. HEAD BOLT (2),
3/8"-16 x 7/8"
14-46 20 25

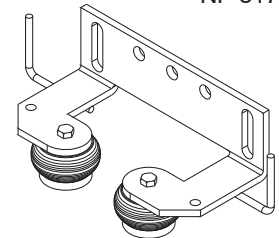


3/8" PLAIN WASHER
(2)
14-46 50 07

3/8" LOCK
WASHER (2)
14-46 50 67

Standard for the following pumps:

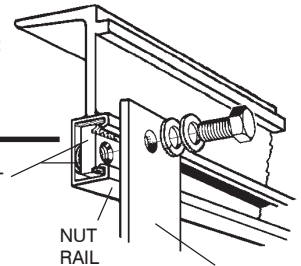
- DP-3067
- DP-3068
- CP-3075
- DP-3080
- BP/CP/DP/FP/NP-3085
- CP/FP/NP-3102
- CP-3126
- CP/FP/NP-3127
- CP/NP-3140
- CP/FP/NP-3152
- NP-3153
- NP-3171



OPTIONAL:

NUT RAIL
FEATURE

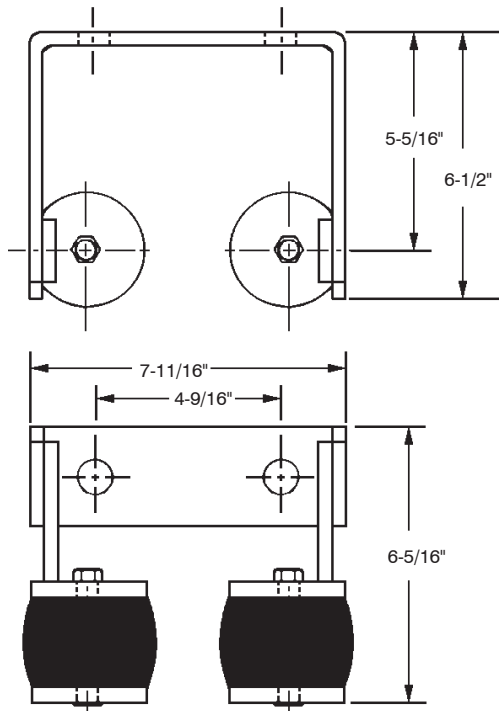
LATERAL NUT



UPPER GUIDE BAR BRACKET

14-58 93 17 - Galvanized Steel

14-58 93 18 - 316 Stainless Steel



Note: use with 3" nominal guide bars

USED WITH THE NP3356

MOUNTING HARDWARE

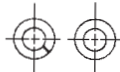
(stainless steel)



5/8"-11 LATERAL NUT
14-46 37 06



HEX. HEAD
BOLT (2),
5/8"-11 x 1-1/4"
14-46 20 13

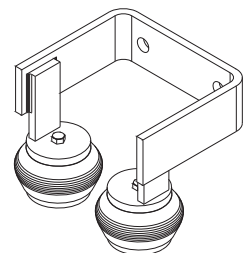


5/8" LOCK
WASHER (2)
14-46 50 70

5/8" PLAIN
WASHER (2)
14-46 50 30

Standard for the following pumps:

- CP/NP-3170
- NP-3171
- CP/HP/NP-3201
- CP/RP-3231
- CP/NP/RP-3300
- CP-3306
- CP-3312
- CP-3351
- CP-3356
- CP-3400
- CP-3501
- CP-3531
- CP-3602
- CP-3800



9.05 PUMP EXTENDED STORAGE

Recommendations:

1. Store pumps upright in a dry location free of extreme temperatures and direct sunlight.
2. To insure that all rotating parts (seals, bearings, and impellers) are free for final installation and start-up the pump impeller should be rotated by hand every month.
3. Use silicone spray or rust inhibiting oil and spray into the lower casing completely coating the impeller and inner lower case. In addition, fully coat the discharge flange face.
4. Protect pump cables from damage and moisture. Cables should be placed so that there is no tension on the cable entry point into the pump. The free end of the cable should be protected from moisture at all times during storage and handling.
5. Never store pumps in the wet well.
6. Never lift the pump by the power cable.
7. Consult pump manufacture for further recommendations for pumps stored longer than one year.

PERIODS OF EXTENDED STORAGE FOR FLYGT PUMPS

For long periods of storage, the pump must be protected against moisture and heat. The impeller should be rotated by hand (for example every month) to prevent the Seal Rings from sticking together.

Storing for 6 Months:

In general, rotating machinery left idle for extended periods of time tend to establish a "set" position due to inaction of the moving parts. Some of these areas may be damaged (especially seals) from the sudden fast breakaway of start-up after a prolonged idle time.

To insure that all rotating parts are free for final installation and start-up, it is good practice to **rotate the Impeller/Propeller by hand once a month**. If the pump is stored for more than a six (6) month period, this rotation is mandatory.

For very long periods of storage it is good practice to relieve the tension on the Cable Entry sealing Grommet by backing off the Cable Entry compression screws slightly. If this is done, it is most important that a clear note be attached as a reminder to:

"Re-Tighten Cable Entry Compression Screws Before Installation"

Note: The backing off of the Cable Entry screws should only be done if the pump is stored in a dry protected area.

Up to 12 months:

In addition to the above it is recommended the use of a silicon spray or rust inhibiting oil be sprayed through the pump outlet and up through the pump inlet so as to coat the Impeller/Propeller and the inside of the Discharge with a protective coating.

Any pump that is stored in a place where the ambient temperature may drop below freezing must be emptied of any water what so ever. It is particular important that the Seal Oil Chamber only contain clean oil (no free water or oil-water emulsion would be allowed).

After a long periods of storage the pump should be fully inspected before it is put into operation. Pay special attention to the Shaft Seal and the Cable Entry making sure the compression screws are tight.

Pumps stored in their original shipping cartons/crates must be periodically removed in order to meet the storage mandate.

A log showing dates in which the proper maintenance was performed is essential and will be required for review in the event a failure occurs after start-up following a prolonged period of storage.

Further considerations that should appear in "the log" when storing product for prolonged periods greater that twelve (12) months:

- 1) Drives should be stored without coolant
- 2) The pump Drives should be stored in the horizontal position
- 3) Impellers should be removed from the Shaft along with the Volute. Shaft should be rotated monthly to protect Seals.
- 4) The Power Cables should be set off of the pump and positioned in such a way that all strain removed from the cables

PERIODS OF EXTENDED STORAGE FOR FLYGT PUMPS

Before installation the operator:

- 1) Inspect the unit for corrosion around the pump and under the Junction Chamber Cap for indications of condensation.
- 2) Reinstall the Impeller in accordance with Flygt procedures
- 3) Fill with new coolant with a mix of 30% mono-propylene glycol and 70% water
- 4) Manually rotate the Impeller after introducing new coolant
- 5) Perform all static electrical checks of the Drive and Motor
- 6) Ensure that all bolts and fasteners on the pump are tight and secure
- 7) Install pump, run for fifteen (15) minutes.
- 8) Remove pump and check oil in Oil Housing. If discolored or contains water, change Shaft Seals as described in Flygt service manual.
- 9) Inspect Stator for moisture as indicated in manual.
- 10) Before returning the pump for operation, check that the direction of rotation is correct.

The ability to keep Flygt product clean, out of the elements and free of rust and/or corrosion should maintain the integrity of the Flygt pump components for extended periods of time and reduce the deterioration probability to a point where it would no longer be a consideration.

In conjunction with the steps outlined above there are three O-Rings that should be replaced (if equipped on the unit) after prolonged periods of storage:

- The two (2) inspection O-Rings and the O-Rings located in the Junction Cover.

By introducing proper maintenance, cleanliness and some common sense in the "equation"... the integrity of a Flygt pump will be long lasting.

Regarding warranty... the standard is... Start-up must occur within one (1) year from ship date unless previous arrangements and costs have been negotiated with the Flygt Quality/Warranty Department.

Quality/Warranty
prodqual@itt.com

Flush Diaphragm Submersible Liquid Level Sensor



AST4520

ISO9001:2008



The AST4520 Flush Submersible Series is the cost effective solution for level monitoring of turbulent tanks with viscous media. Approved to **UL/cUL913 Class 1 Division 1 IS, Groups C and D with an approved barrier**, the product ensures a safe, reliable source for level measurement.

The AST4520 is offered with pressure ranges from 0-2.5 to 0-15 PSIG. The AST4520 steel cage front end design allows for proper flow of media while keeping the sensor at the bottom of the tank or well. With an engraved stainless steel housing and Kynar PVDF cable, this sensor is built to handle the toughest environments.

Benefits

- Engraved 316L Housing
- Protective Steel Cage Assembly
- Kynar PVDF Cable
- Compatible with a Wide Range of Chemicals
- Ruggedly Designed for Harsh Waste Water Environments
- Suitable for Waste, Salt, Brackish, or Fresh Water Systems
- EMI/RFI and Reverse Polarity Protection
- Lightening and Surge Protection
- Competitively Priced for OEM Applications
- ABS (American Bureau of Shipping)

Approved

Applications

- Lift Stations - Wastewater, Storm Water, Industrial Applications
- Food Tanks
- Viscous Media Tanks
- Heavy Oil

Environmental Data

<i>Temperature</i>	
Operating	-40 to 85°C (-40 to 185°F)
Storage	-40 to 100°C (-40 to 212°F)
<i>Thermal Limits</i>	
Compensated Range	0 to 55°C (30 to 130°F)
TC Zero	<±1.5% of FS
TC Span	<±1.5% of FS
<i>Other</i>	
Shock	100G, 11 msec, 1/2 sine
Vibration	10G peak, 20 to 2000 Hz.
EMI/RFI Protection:	Yes
Rating:	IP-68

Performance @ 25°C (77°F)

Accuracy*	< ±0.25% BFSL
Stability (1 year)	±0.25% FS, typical
Over Range Protection	2X Rated Pressure
Burst Pressure	5X or 1,250 PSI (whichever is less)
Pressure Cycles	> 50 Million

*Accuracy includes non-linearity, hysteresis & non-repeatability

Electrical Data

Output	4-20mA
Excitation	10-28VDC
Output Impedance	>10k Ohms
Current Consumption:	20mA, typical
Bandwidth	(-3dB): DC to 250 Hz
Output Noise:	-
Zero Offset:	<±1% of FS (<±4% 1PSI)
Span Tolerance:	<±2% of FS (<±4% 1PSI)
Output Load:	0-800 Ohms@10-28VDC
Reverse Polarity Protection	Yes

Ordering Information

AST4520 Y 00020 P 4 X 1

Series Type

Process Connection

Y= G1/2 with steel cage

Pressure Range

Insert 5-digit pressure range code

Pressure Unit

H= Inches H2O P= PSI

Outputs

4= 4-20mA (2 wire loop powered)

Electrical

(for wiring information visit: <http://www.astensors.com/mediacenter.php>)

X= Optional Length (see options)

Wetted Material

1 = 316L / 304 SS / Kynar

Options Cable Lengths:

353 = 25 ft. (7.62 m)

354 = 50 ft. (15.24 m)

355 = 75 ft. (22.86 m)

Custom Length: 100 ft.

	Gage PSIG	Pressure Range Code	Feet of Water Column @ 4°C (approx.)
AST4520	0-15	00015	34.60
	0-10	00010	23.07
	0-7.5*	00208*	17.30
	0-5	00005	11.53
	0-2.5*	00069*	5.77

*2.5 and 7.5 PSI Sensor must be ordered in inches of H₂O.

Barrier Installation

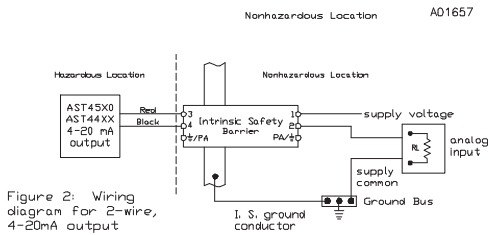


Figure 2: Wiring diagram for 2-wire, 4-20mA output

The transducers listed below are designed for installation in a Class I, Division 1, Groups C and D, Division 1 hazardous location when connected to Associated Apparatus as described in note 1.

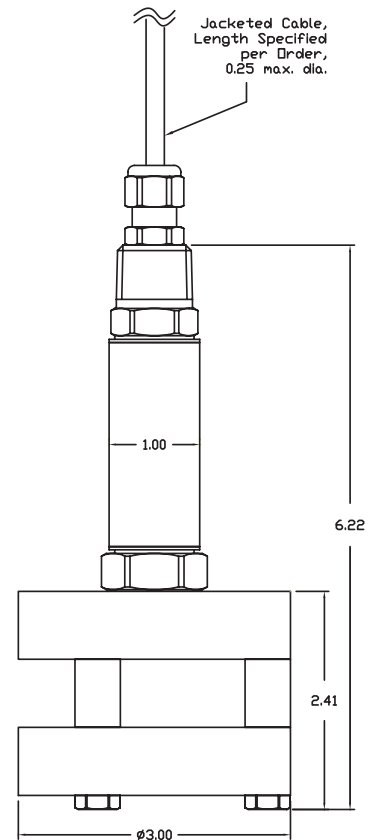
Entity Parameters

V_{max} = 28Vdc
 I_{max} = 175mA I_{max} is the total current available from the Associated Apparatus under any condition.
 C_i = 0.44uf
 L_i = 0

Notes:

- Associated Apparatus shall provide intrinsically safe connections which meet the following parameters:
 $V_{oc} \text{ or } V_t \leq V_{max}$ $C_a \geq C_i + C_{leads}$
 $I_{sc} \text{ or } I_t \leq I_{max}$ $L_a \geq L_i + L_{leads}$
- Control Room apparatus shall not generate in excess of 250V (Unax).
- Installation should be in accordance with Article 504 in the National Electrical Code, ANSI/NFPA 70.

Dimensional Data





The NIVA level controller MS 1 is the ideal solution to control liquid levels with limited switching space, e. g. in:

- Pump stations
- Wells
- Pump chambers



The NIVA level controller MS 1 is engineered especially for use in sewage works and pumping stations in liquids heavily charged with solid matter such as raw sewage etc. Thanks to the good chemical and thermal properties our level controllers are resistant to lees, uric acid, fecal sewage water, oils, petrol, diesel oil, emulsions, alcohol, fruit acids, and even many chemicals. For use at temperatures up to 80 °C (176 °F). The MS 1 has been submitted for UL certification. Optionally the level controller MS 1 is available with EX-certificate in accordance with EC directive 94/9 (ATEX 95) – see next pages.

Available versions:

Type	Cable	Length (m)	Order-no.
W	TPR/PVC 3 x 0.75	5	40 000105
W	TPR/PVC 3 x 0.75	10	40 000110
W	TPR/PVC 3 x 0.75	20	40 000120
W	TPR/PVC 3 x 0.75	30	40 000130

W = Changeover (SPDT)

Other cable types and lengths are available upon request

Application:

For use in municipal, industrial, commercial and domestic applications.

Electronic connection

Connection of level controllers	Wire		
	grey	black	brown
For emptying a tank	insulate	X	X
For filling a tank	X	insulate	X
Alarm high level	insulate	X	X
Alarm low level	X	insulate	X

Technical data subject to change

Technical data:

Specific weight: 0.95–1.05 or according to specification
 Max. temperature: 80 °C (176 °F)
 Breaking capacity: 1 mA / 4 V - 5 A / 250 V *
 Switch point: 10°
 Protective system: IP 68 / 2 bar
 Equipment group: II
 Cable cross section: 3 x 0.75 mm²
 Height / diameter: 180 / 100 mm (7 in / 3.9 in)
 Housing quality: Polypropylene (PP)
 Housing Colour: Orange
 Cable quality: TPR/PVC
 Cable colour: Orange

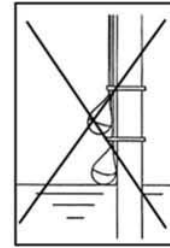
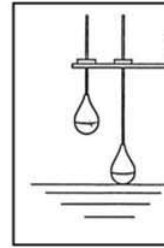
* Micro-switch with gold-plated contacts especially for low currents in electronic circuits

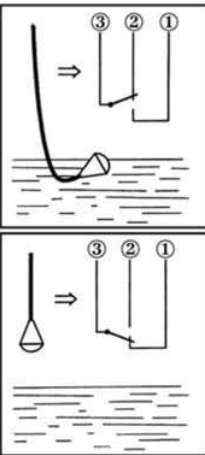
MS 1

CE
73/23/EEC



1mA/4V-5A/250V
□ ⚡ +++ μ T80
γ 0,95 - 1,05



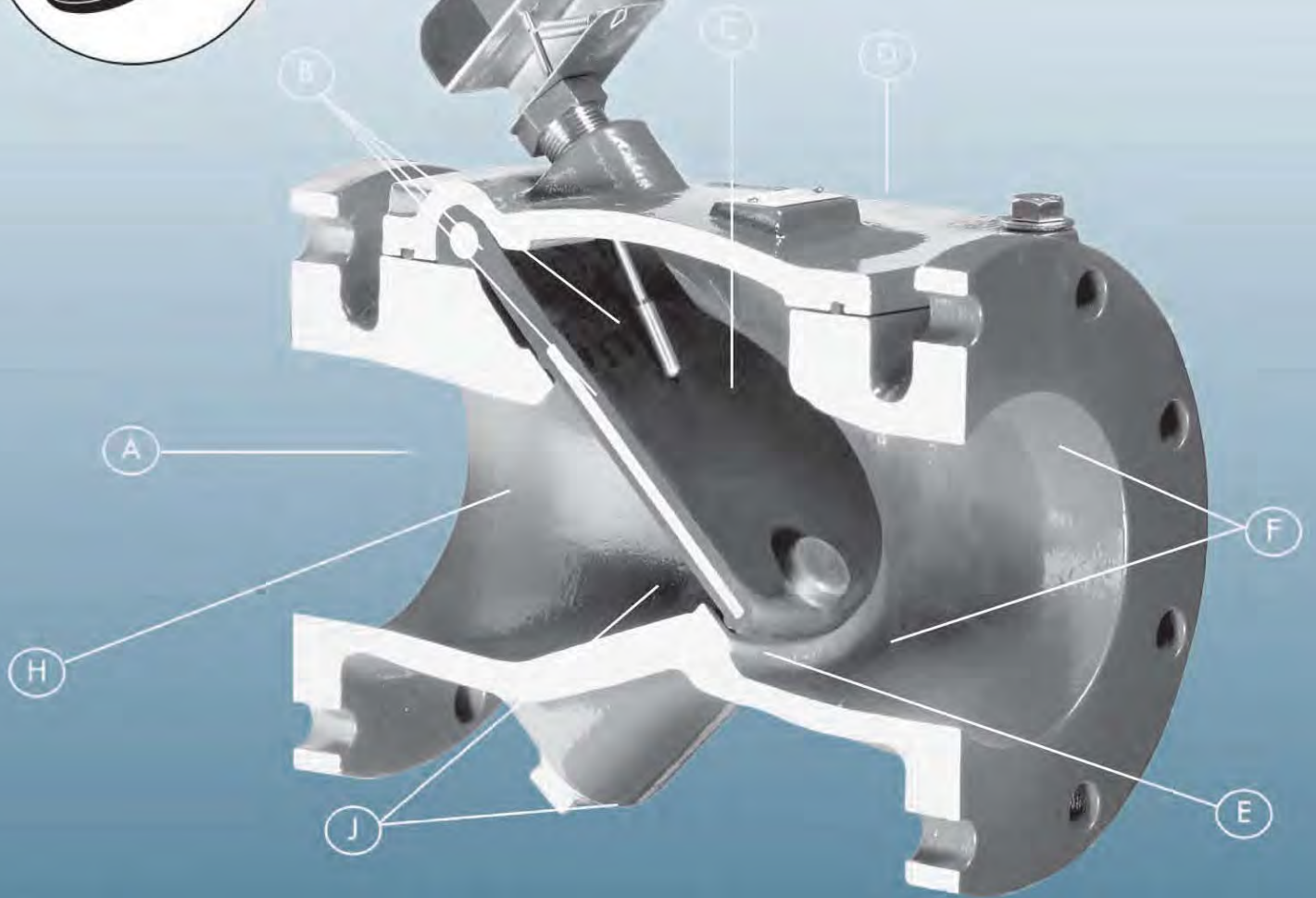
<p>(GB) Connection of Level Regulators (D) Anschluss der Niveauregler (F) Branchement des régulateurs de niveau (I) Collegamento regolatori di livello (E) Conexión de los reguladores de nivel (P) Conexão dos reguladores de nível (NL) Aansluiting van de niveauregelaar (DK) Tilslutning af niveauregulator (S) Anslutning av nivåregulatorn (N) Forbindelse til nivåregulatoren (FIN) Pinnansäätimen liittäminen (RU) подсоединение регулятора уровня (PL) Przyłącze regulatorów poziomu (H) A szintszabályozók csatlakoztatása (CZ) Připoj regulátorů hladiny (SK) Pripoj regulátorov hladiny (SL) Priključitev regulatorjev nivoja (HR) Cijev za regulator razine (SC) Cev za spravu za regulisanje nivoa (GR) Σύνδεση ρυθμιότη οτάθμησ (TR) Seviye regülatörlerinin bağlantısı</p>		<p>① grey grau gris grigio gris cinzento grijs grá grá grá grá harmaa серый kolor szary szürke šedý sivý siv sivo sivo γκριζο gri</p>	<p>② black schwarz noir nero negro preto zwart svart svart musta чёрный kolor czarny fekete černý čierný črno crni crni μαύρο siyah</p>	<p>③ brown braun brun marrone marrón castanho bruin brun brun brun ruskea коричневый kolor brązowy barna hnědý hnedý rjavo smeđi smeđi καφέ kahverengi</p>
<p>(GB) For emptying a tank (D) Zum Entleeren eines Behälters (F) Pour vider un réservoir (I) Per lo svuotamento (E) Para vaciar un recipiente (P) Para esvaziar um reservatório (NL) Om een reservoir te legen (DK) Til tømning af en beholder (S) För tömning av en behållare (N) For å tomme en beholder (FIN) Säiliön tyhjennykseen (RU) для опорожнения резервуара (PL) Opróżnienie pojemnika (H) Egy tartály ürítéséhez (CZ) K vyprázdnění nádrže (SK) K vyprázdneniu nádrže (SL) Za praznjenje posode (HR) Za praznjenje nekog spremnika (SC) Za praznjenje nekog rezervoara (GR) Για την εκκένωση των περιέκτη (TR) Bir hazneyi/kabi boşaltmak için</p>	<p>Alarm high level Alarm bei hohem Flüssigkeitsstand Alarme au niveau supérieur Allarme di massimo livello Alarma con alto nivel de líquido Alarme de nível máximo Alarm bij een hoog vloeistofpeil Alarm ved høj væskeniveau Larm vid hög vätskenivå Alarm ved høyt væskenivå Ylärajahälytys сигнал тревоги при высоком уровне жидкости Alarm w przypadku wysokiego poziomu cieczy Riasztás túl magas töltésszint esetén Poplach při vysokém stavu kapaliny Poplach pri vysokom stave kvapaliny Alarm pri visokem nivoju tekočine Alarm kod visokog stanja tekućine Alarm kod visokog stanja tečnosti Αλάρμ σε πολύ υψηλή οτάθμη υγρού Yüksek sıvı seviyesinde alarm</p>	<p>insulate isolieren isoler isolare aislar isolat isoleren isolere isoler isolera isolere eristä изолировать zaizolować szigeteljük izolovat izolovat' izolirati izolirati izolovati μόνωση izole etmek</p>	<p>X</p>	<p>X</p>
<p>(GB) For filling a tank (D) Zum Füllen eines Behälters (F) Pour remplir un réservoir (I) Per il riempimento (E) Para llenar un recipiente (P) Para encher um reservatório (NL) Om een reservoir te vullen (DK) Til fyldning af en beholder (S) För fyllning av en behållare (N) For å fylle en beholder (FIN) Säiliön täyttämiseen (RU) для наполнения резервуара (PL) Napełnienie pojemnika (H) Egy tartály töltéséhez (CZ) K naplnění nádrže (SK) K naplneniu nádrže (SL) Za polnjenje posode (HR) Za punjenje nekog spremnika (SC) Za punjenje nekog rezervoara (GR) Για την πλήρωση των περιέκτη (TR) Bir hayneyi/kabi doldurmak için</p>	<p>Alarm low level Alarm bei niedrigem Flüssigkeitsstand Alarme au niveau inférieur Allarme di minimo livello Alarma con bajo nivel de líquido Alarme de nível mínimo Alarm bij een laag vloeistofpeil Alarm ved lav væskeniveau Larm vid låg vätskenivå Alarm ved lavt væskenivå Alarajahälytys сигнал тревоги при низком уровне жидкости Alarm w przypadku niskiego poziomu cieczy Riasztás túl alacsony töltésszint esetén Poplach při nízkém stavu kapaliny Poplach pri nízkom stave kvapaliny Alarm pri nizkem nivoju tekočine Alarm kod niskog stanja tekućine Alarm kod niskog stanja tečnosti Αλάρμ σε πολύ χαμηλή οτάθμη υγρού Düşük sıvı seviyesinde alarm</p>	<p>X</p>	<p>insulate isolieren isoler isolare aislar isolat isoleren isolere isoler isolera isolere eristä изолировать zaizolować szigeteljük izolovat izolovat' izolirati izolirati izolovati μόνωση izole etmek</p>	<p>X</p>

VAL-MATIC®



**EFFICIENCY &
RELIABILITY
THROUGH
SIMPLICITY
OF DESIGN**

Swing-Flex® Check Valve



A. 100% FLOW AREA

For improved flow characteristics and lower head loss, the Val-Matic Swing-Flex® Check Valve provides 100% unrestricted flow area.

B. REINFORCED DISC

The one piece precision molded disc is steel and nylon reinforced to provide years of trouble free performance. It is backed by a 25 year warranty for the flex portion of the disc. (Tested for proof of design - see page 5.)

C. ONE MOVING PART

The Memory-Flex™ disc, the only moving part, assures long life with minimal maintenance. No packing or O-rings, mechanical hinges, pivot pins or bearings to wear out.

D. DOMED ACCESS PORT

Full size top access port allows removal of disc without removing valve from line. Access cover includes a drilled and tapped port for installation of optional Disc Position Indicator.

E. DROP TIGHT SEATING

The synthetic reinforced disc, with its integral O-ring type seal design assures positive seating at high and low pressures.

F. NON-SLAM CLOSURE

"Short Disc Stroke" combined with Memory-Flex™ Disc Action reduces potentially destructive water hammer.

G. BACKFLOW ACTUATOR (Not Shown)

Body is drilled and tapped for installation of optional backflow actuator (see options).

H. NON-CLOG DESIGN

The unrestricted full flow area combined with smooth streamlined contouring allows passage of large solids minimizing the potential for clogging.

I. MECHANICAL DISC POSITION INDICATOR* (Optional)

Provides clear indication of the valve's disc position. Can also be provided with a SCADA compatible limit switch for off site monitoring (see options).

J. FUSION BONDED EPOXY

Fusion Bonded Epoxy (FBE) is provided standard on the interior and exterior of the valve. The FBE is ANSI/NSF 61 certified. Other coatings are available on request.

EFFICIENCY..... RELIABILITYBY DESIGN!

Efficiency and reliability through simplicity of design is the key to the superior performance and long life of the Val-Matic **Swing-Flex**® Check Valve.

ENERGY EFFICIENT BY DESIGN

The streamlined contour of the **Swing-Flex**® body provides 100% flow area with no restrictions at any point through the valve (Figure 1.) Flow tests performed by an independent laboratory have shown that this unique body design produces minimal head loss through the valve. Flow and head loss charts, developed from the test data, are shown on Page 4.

DISC STABILIZATION BY DESIGN

In the full open position, the disc is stabilized by using body contouring to ease the direction of flow towards the disc assuring long disc life (Figure 1).

NON-CLOGGING BY DESIGN

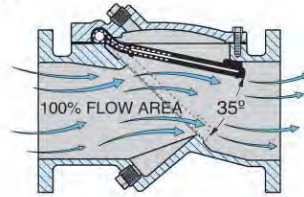
Clog resistant performance is achieved by maintaining an unobstructed 100% flow area, smooth streamlined body contouring and the simplicity of one moving part. The entrapment or hang-up of solids and stringy materials is minimized by the elimination of mechanical devices in the valve design. The standard 4" **Swing-Flex**® is designed to pass a 3" solid.

NON-SLAM CLOSING BY DESIGN

The non-slam closing characteristic of the **Swing-Flex**® Check Valve is achieved by utilizing a "Short Disc Stroke" in conjunction with the unique "**Memory-Flex**"™ action" of the valve's disc. The 35° stroke, a result of the angled seat, is less than half the typical 80° to 90° stroke of a conventional swing check valve. (Figures 1 & 2) The feature is similar to that found in high performance tilted disc check valves.

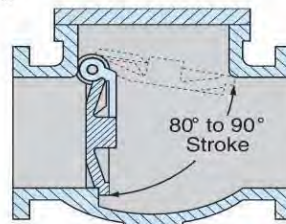
VAL-MATIC SWING-FLEX® VALVE

Figure 1



CONVENTIONAL SWING CHECK VALVE

Figure 2



The short disc stroke and "**Memory-Flex**"™ action" (Figure 1) serve to reduce the closing time of the valve. This reduced closing time minimizes flow reversal and the resultant water hammer normally associated with the sudden stoppage of reverse flow.

RELIABILITY BY DESIGN

Operational reliability is achieved by utilizing just one moving part, the **Memory-Flex**™ disc. Extended life is --

designed into the disc by the inclusion of steel and nylon reinforcements. The steel and nylon are precision molded into the disc, providing a tough, durable disc with a 25-year warranty*. (Figure 3)

Unlike a conventional horizontal swing check valve, the **Swing-Flex**® has no packing or O-rings, mechanical hinges, shafts, pivot pins, or bearings to wear out (Figure 3.) Upon conclusion of a 1,000,000 (one million) cycle test, an independent testing laboratory reported that the valve had no visible signs of wear and remained drop tight. (See Page 5.)

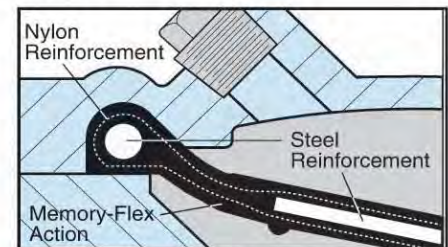


Figure 3

POSITIVE SHUT OFF BY DESIGN

The **Memory-Flex**™ disc with its integral O-ring type seal design assures drop tight seating at both high and low working pressures. Each and every valve is tested to this standard. A certified report is available upon request.

OPTIONAL ACCESSORIES

RUBBER LINING -- Unlike conventional swing check valves, the **Swing-Flex**® Check Valve is designed to accept synthetic or natural rubber lining. Body lining coupled with synthetic **Memory-Flex**™ discs makes the **Swing-Flex**® ideally suited for systems containing abrasive or corrosive fluids.



DISC POSITION INDICATOR -- The cover mounted disc position indicator provides clear indication of the valve's disc position. A SCADA compatible limit switch can also be provided. Both can be provided at the time of valve purchase or for field installation at a later date.



BACKFLOW ACTUATOR -- Available for use when manual backflow operation is required. Most commonly used for priming pumps, back flushing, draining lines, and system testing. The Val-Matic Backflow Actuator can be provided at the time of valve purchase or for field installation at a later date.

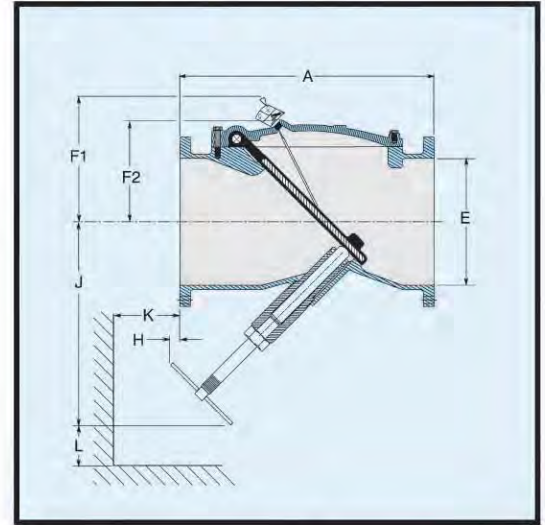


* The Val-Matic warranty and its remedies are available for 25 years covering the flex portion of the disc.

INSTALLATION DIMENSIONS AND CONSTRUCTION

VALVE SIZE	MODEL #	A	E	F1	F2	H	J	K	L
2	502A	8.00	2.00	N/A	3.38	-0.50	6.75	1.50	1.50
2 1/2	525A	8.50	2.50	N/A	3.38	-0.50	7.00	1.50	1.50
3	503A	9.50	3.00	8.69	5.12	-0.38	7.50	1.50	1.50
4	504A	11.50	4.00	10.63	5.75	3.38	10.75	2.50	2.50
6	506A	15.00	6.00	11.69	6.88	1.38	11.38	3.00	3.00
8	508A	19.50	8.00	13.25	8.38	2.00	15.75	5.75	5.75
10	510A	24.50	10.00	15.63	10.75	0.50	17.00	5.75	5.75
12	512A	27.50	12.00	17.19	12.50	3.50	22.50	6.50	6.50
14	514A	31.00	14.00	17.81	13.00	4.00	26.25	6.50	6.50
16	516A	32.00	16.00	19.06	14.25	4.63	30.00	6.50	6.50
18	518A	36.00	18.00	20.25	15.25	5.25	33.75	6.50	6.50
20	520A	40.00	20.00	21.69	16.88	5.88	37.50	8.00	8.00
24	524A	48.00	24.00	24.50	19.25	1.81	45.00	8.00	8.00
30	530A	56.00	30.00	27.81	23.00	-0.63	41.25	8.00	8.00
36	536A	63.00	36.00	32.63	27.38	-0.38	49.00	9.75	9.75
42	542A	70.00	42.00	39.63	36.88	-5.50	53.50	9.75	9.75
48	548A	76.00	48.00	43.41	40.66	-2.90	41.98	10.00	10.00

Dimensions "L" and "K" represent the clearance required to remove backflow actuator.



*Dimension "E" represents nominal valve size.
Note: Flanged ends conform to ANSI B16.1 Class 125.

MATERIALS OF CONSTRUCTION

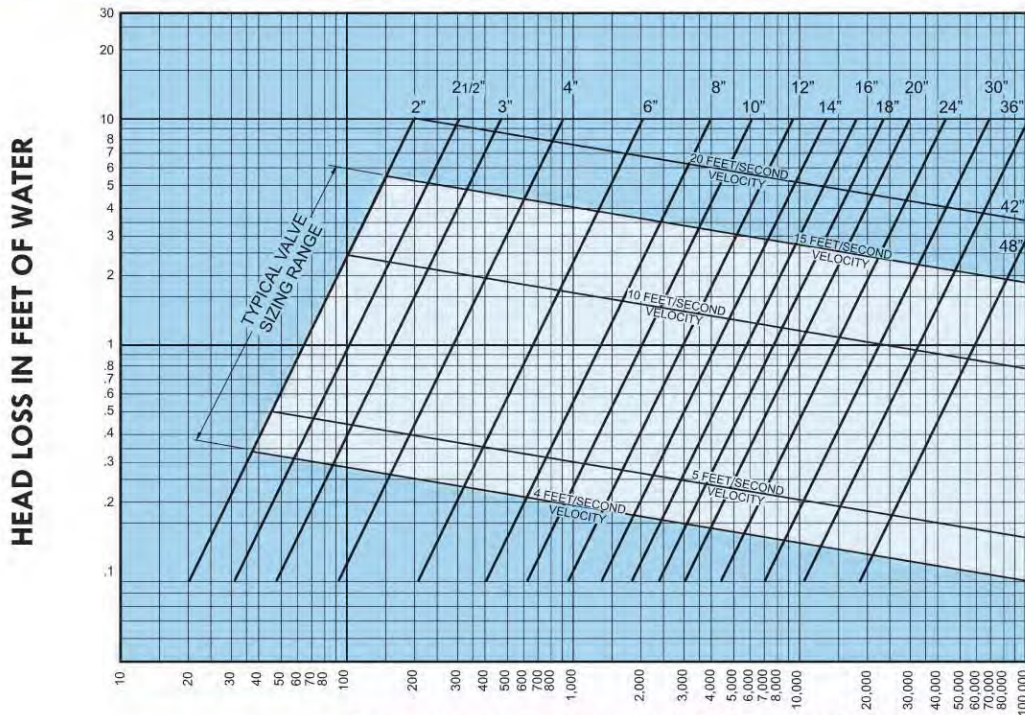
Component	Standard	Optional
Body and Cover	Ductile Iron	Stainless Steel, Bronze
	ASTM A536 Grade 65-45-12	
Disc	Buna-N (NBR), ASTM D2000-BG	Viton (FKM), ASTM D2000-HK
Coatings	Interior	Rubber Lining
	Exterior	Fusion Bonded Epoxy*

Consult factory for additional material and coating options.
*ANSI/NSF 61 Certifications

ANSI MAXIMUM PRESSURE-TEMPERATURE RATING

Maximum Non-Shock Working Pressure (P.S.I.) ANSI Class 125		
Temperature °F	2" - 48"	30" - 48"
100°	250	150
150°		
200°	235	135
Hydrostatic Test Pressures	500	300

HEAD LOSS CHART



FLOW OF WATER IN GALLONS PER MINUTE

Consult factory for Digester Gas Service

Flow Tests performed by the Utah Water Research Laboratory of Utah State University.

SAMPLE SPECIFICATIONS

The check valve shall be of the **Swing-Flex**[®] full body flanged type, with a domed access cover and only one moving part - the valve disc.

The valve body shall have full flow equal to nominal pipe diameter at any point through the valve. The seating surface shall be on a 45° angle to minimize disc travel. The top access port shall be full size, allowing removal of the disc without removal of the valve from the pipeline and shall include a port for installation of an optional mechanical position indicator.

The disc shall be of one piece construction, precision molded with an integral O-ring type sealing surface and contain steel and nylon reinforcements in both the **Memory Flex**[™] and central disc areas. The flex portion of the disc shall be warranted for 25 years. Non-slam closing characteristic shall be provided through a short 35° disc stroke and a

Memory-Flex[™] disc return action.

A mechanical indicator shall be provided when specified to provide disc position indication on valves 3" and larger. The indicator shall have continuous contact with the disc under all operating conditions to assure accurate disc position indication.

A limit switch will be provided when specified to indicate open/closed position to a remote location. The mechanical type limit switch shall be activated by the external position indicator. The switch shall be rated for NEMA 4, 6, or 6P and shall have U.L. rated 5 amp, 125, or 250 VAC contacts.

Backflow capabilities shall be available by means of an optional screw type backflow actuator. Both the disc position indicator and backflow actuator shall be capable of installation without special tools.

The valve body and cover shall be ASTM A536 Grade 65-45-12, Class B Ductile Iron. The disc shall be Buna-N (NBR), ASTM D2000-BG.

The interior and exterior of the valve shall be coated with an ANSI/NSF 61 approved Fusion Bonded Epoxy.

The valve shall be proof of design cycle tested 1,000,000 times with no signs of wear or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures. The test results shall be independently certified.

The manufacturer shall have a minimum of five years experience in the manufacture of flexible disc type check valves.

The valve shall be Val-Matic **Swing-Flex**[®] series 500 and shall be designed, manufactured and tested in accordance with ANSI/AWWA Standard C508.

INDEPENDENT PROOF OF DESIGN TEST

In the case of the Val-Matic **Swing-Flex**[®] Check Valve, we have taken quality assurance one step further by having the valve cycle tested. Utilizing an eight-inch **Swing-Flex**[®] with optional signal switch, the valve was cycled over 1,000,000 (one million) times.

To place one million cycles in perspective, it would take an average of 100 cycles per day for more than 27 years

to equal the 1,000,000 cycles. Upon conclusion, PSI/Pittsburgh Testing Laboratory Division reported the following results:

1. After 1,000,000 cycles the valve's disc showed no signs of fatigue or stress cracks.
2. After 1,000,000 cycles the valve seating areas showed no signs of wear

or distortion. The valve seating remained drop tight during the low and high pressure hydrostatic tests.

3. After 1,000,000 cycles the signal switch continued to function as designed.

Copies of the PSI/Pittsburgh Testing Laboratory Division report are available upon request.

QUALITY ASSURANCE

Val-Matic's Quality Assurance is the sum of imaginative design, solid engineering, careful manufacturing and dedicated people.

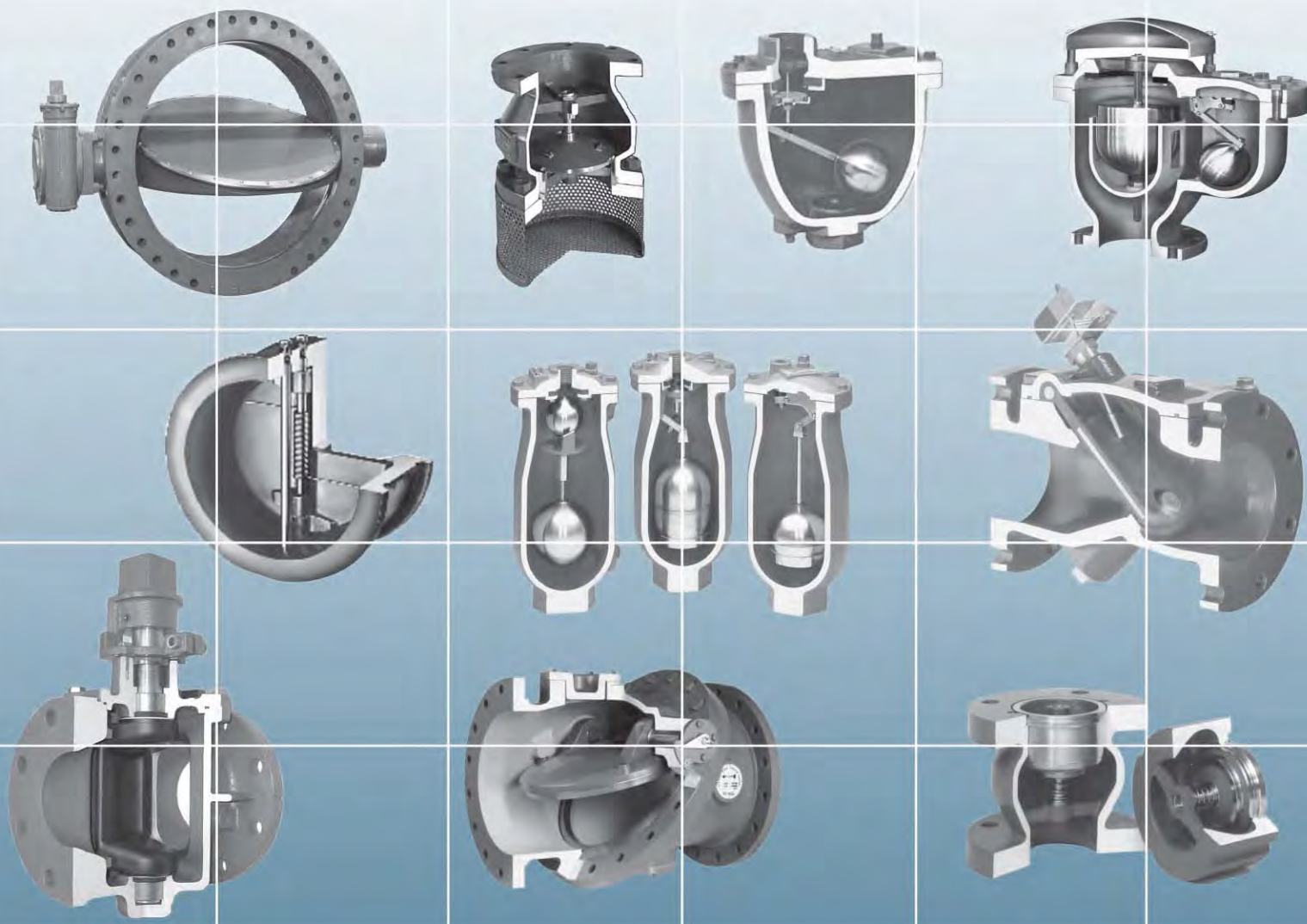
These all combine to ensure total customer satisfaction. We recognize the need for, and encourage, individual pride and the self-satisfaction, which is gained in producing reliable and quality valves.

This quality attitude permeates through the corporation from the president to our newest employee.

Testing (right) is the backbone of our quality assurance. Every **Swing-Flex**[®] Check Valve is 100% tested including a seat test to assure drop tight sealing and hydrostatic testing to assure the integrity of the casting.



Swing-Flex[®] Valve at test.



Make the change to **QUALITY!** Specify **VAL-MATIC®**

Val-Matic's quality of design and meticulous workmanship has set the standards by which all others are measured. Quality design features such as Type 316 stainless steel trim as standard on Air Release, Air/Vacuum and Combination Air Valves...combined resilient/metal to metal seating for Silent Check® Valves...stabilized components that provide extended life of the Dual Disc® Check Valves...high strength and wear resistant aluminum bronze trim as standard for Tilted Disc® Check valves...unrestricted full flow area through Swing-Flex® Check Valves...heavy duty stainless steel screened inlet on Sure Seal® Foot Valves...a Cam-Centric®

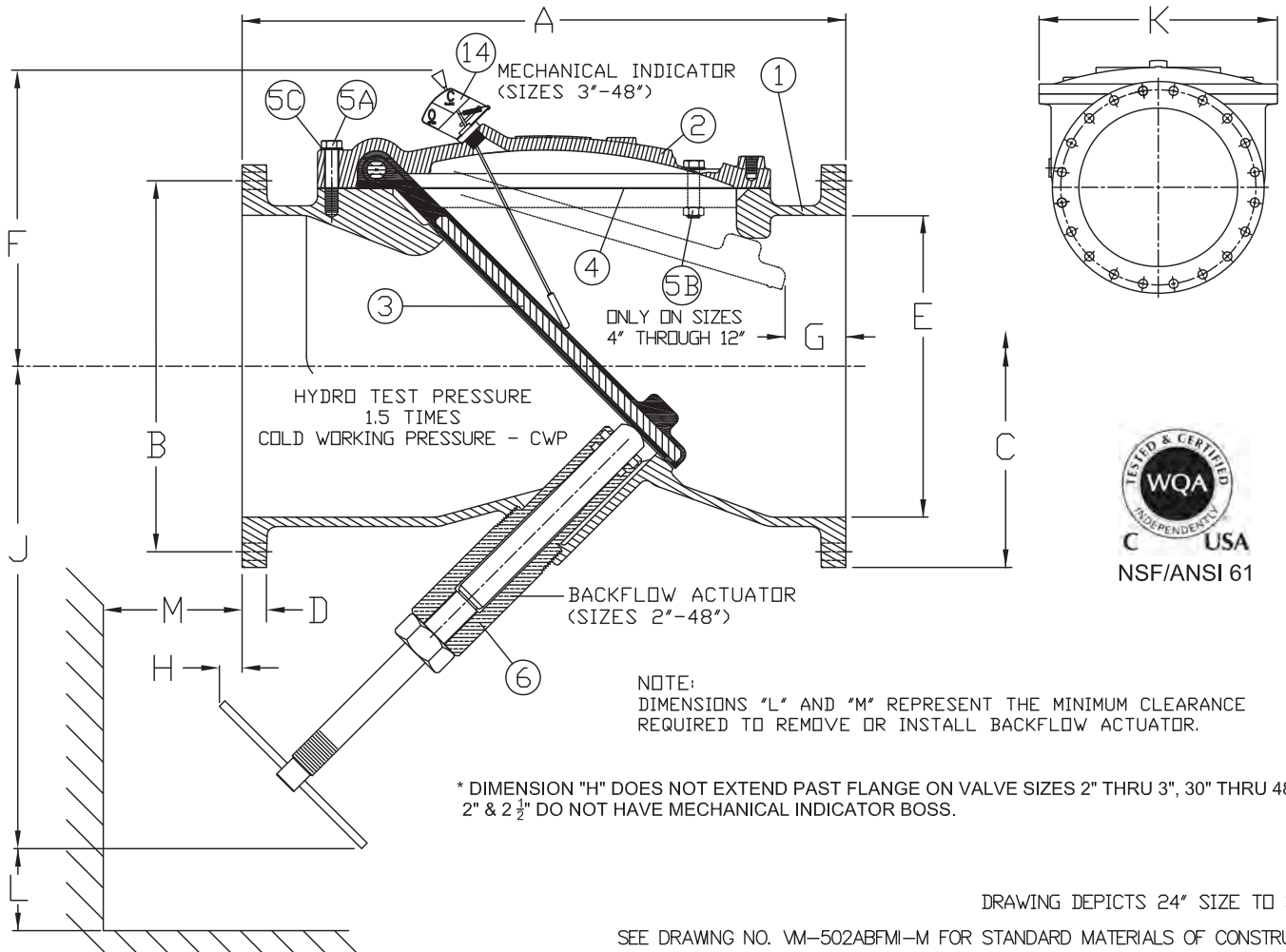
Plug Valve with more requested features than any other eccentric plug valve, and the American-BFV® Butterfly Valve that provides a field replaceable seat without the need for special tools. These features coupled with our attention to detail put Val-Matic valves in a class by themselves.

Val-Matic is totally committed to providing the highest quality valves and outstanding service to our customers. Complete customer satisfaction is our goal.

VAL-MATIC®

VAL-MATIC VALVE AND MANUFACTURING CORP.

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630/941-7600 * FAX: 630/941-8042
www.valmatic.com valves@valmatic.com



DRAWING DEPICTS 24" SIZE TO SCALE

SEE DRAWING NO. VM-502ABFMI-M FOR STANDARD MATERIALS OF CONSTRUCTION

ANSI CLASS 125

VALVE SIZE	MODEL NO.	CWP (PSI)	A	B	C	D	E	F	G	*H	J	K	L	M	BOLT SIZE	NO. OF BOLTS	SHPG. WT.
2	502ABF	250	8.00	4.75	6.00	0.63	2.00	N/A	1.63	-0.50	6.75	5.18	1.50	1.50	5/8	4	27
2 1/2	525ABF	250	8.50	5.50	7.00	0.68	2.50	N/A	1.63	-0.50	7.00	5.18	1.50	1.50	5/8	4	32
3	503ABFMI	250	9.50	6.00	7.50	0.75	3.00	8.69	1.63	-0.38	7.50	7.50	1.50	1.50	5/8	4	45
4	504ABFMI	250	11.50	7.50	9.00	0.75	4.00	10.63	2.12	3.38	10.75	8.25	2.50	2.50	5/8	8	70
6	506ABFMI	250	15.00	9.50	11.00	0.75	6.00	11.69	2.12	1.38	11.38	11.12	3.00	3.00	3/4	8	130
8	508ABFMI	250	19.50	11.75	13.50	0.88	8.00	13.25	2.88	2.00	15.75	16.00	5.75	5.75	3/4	8	250
10	510ABFMI	250	24.50	14.25	16.00	1.18	10.00	15.63	3.12	0.50	17.00	21.00	5.75	5.75	7/8	12	430
12	512ABFMI	250	27.50	17.00	19.00	1.25	12.00	17.19	3.43	3.50	22.50	24.00	6.50	6.50	7/8	12	660
14	514ABFMI	250	31.00	18.75	21.00	1.38	14.00	17.81	3.63	4.00	26.25	23.25	6.50	6.50	1	12	750
16	516ABFMI	250	32.00	21.25	23.50	1.43	16.00	19.06	3.25	4.63	30.00	25.25	6.50	6.50	1	16	900
18	518ABFMI	250	36.00	22.75	25.00	1.56	18.00	20.25	3.12	5.25	33.75	28.25	6.50	6.50	1 1/8	16	1230
20	520ABFMI	250	40.00	25.00	27.50	1.68	20.00	21.69	3.50	5.88	37.50	30.63	8.00	8.00	1 1/8	20	1750
24	52A4BFMI	250	48.00	29.50	32.00	1.88	24.00	24.50	5.00	1.81	45.00	36.00	8.00	8.00	1 1/4	20	2400
30	530BFMI	150	56.00	36.00	38.75	2.12	30.00	27.81	5.75	-0.63	41.25	45.88	8.00	8.00	1 1/4	28	4350
30	530ABFMI	250	56.00	36.00	38.75	2.12	30.00	27.81	5.75	-0.63	41.25	45.88	8.00	8.00	1 1/4	28	4350
36	536BFMI	150	63.00	42.75	46.00	2.38	36.00	32.63	3.88	-.38	49.00	55.00	9.75	9.75	1 1/2	32	7000
36	536ABFMI	250	63.00	42.75	46.00	2.38	36.00	32.63	3.88	-.38	49.00	55.00	9.75	9.75	1 1/2	32	7000
42	542BFMI	150	70.00	49.50	53.00	2.63	42.00	39.63	0.12	-5.50	53.50	60.18	9.75	9.75	1 1/2	36	9410
42	542ABFMI	250	70.00	49.50	53.00	2.63	42.00	39.63	0.12	-5.50	53.50	60.18	9.75	9.75	1 1/2	36	9410
48	548BFMI	150	76.00	56.00	59.50	2.75	48.00	43.41	0.12	-2.90	41.98	68.00	10.00	10.00	1 1/2	44	12700
48	548ABFMI	250	76.00	56.00	59.50	2.75	48.00	43.41	0.12	-2.90	41.98	68.00	10.00	10.00	1 1/2	44	12700

Revised 3-31-11

SWING-FLEX CHECK VALVE W/ BACKFLOW ACTUATOR AND MECHANICAL INDICATOR

DATE 6-9-09



VALVE AND MANUFACTURING CORP.

DRWG. NO.

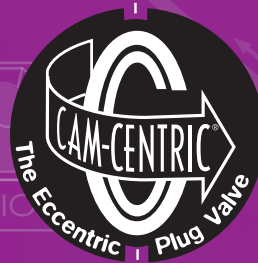
VMC-502ABFMI

VALMATIC®

Proven Design

Preferred Features

Advanced Technology



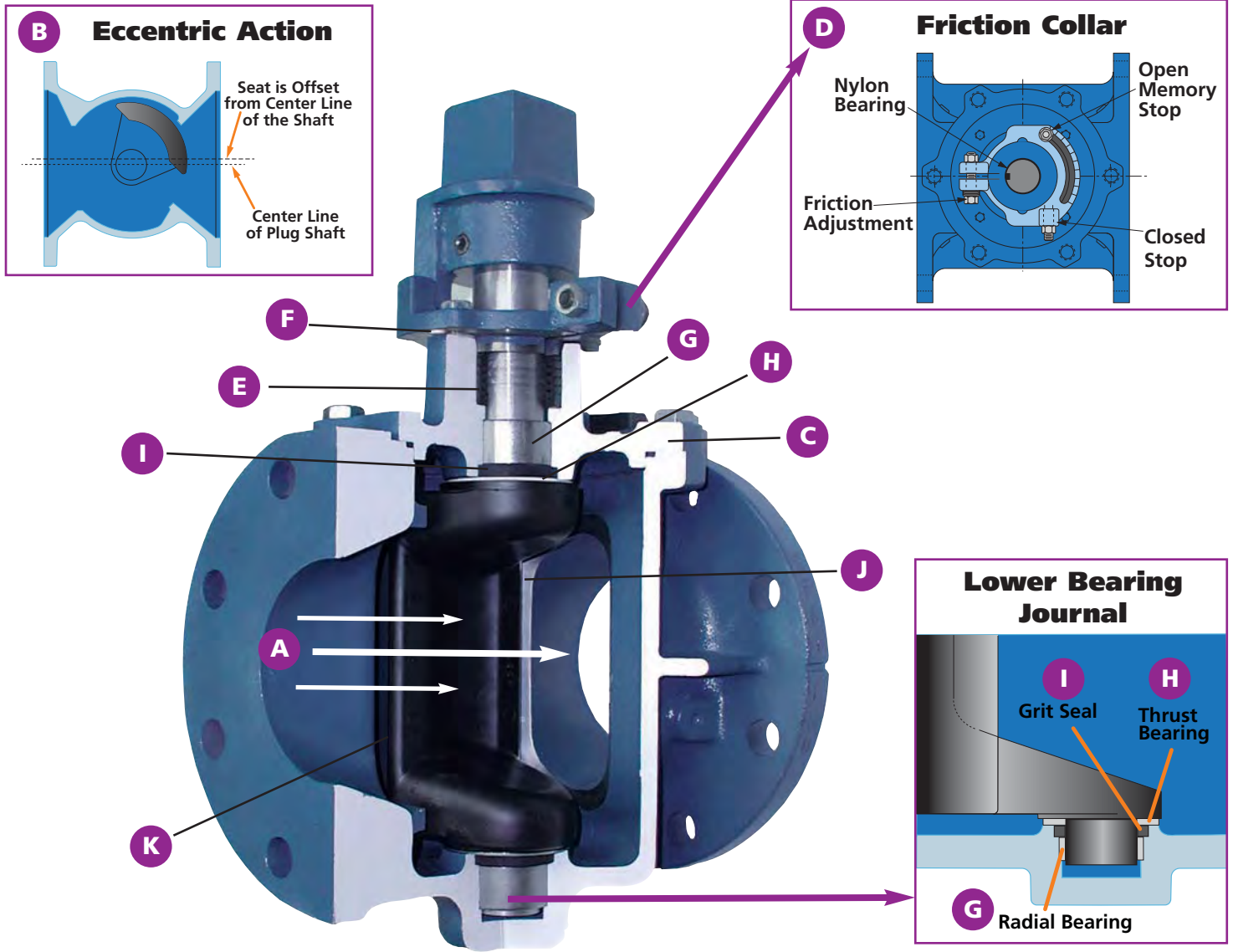
Cam-Centric®
Plug Valves



www.valmatic.com

Meets AWWA C517
NSF/ANSI 372 Certified

Feature Highlights



A. Non-Clog Design

The unrestricted flow area combined with smooth streamline contouring allows passage of large solids to prevent potential clogging and provide low headloss.

B. Eccentric Action

Provides positive shut off with wear resistant action and low torque.

C. Full Top Access Cover

Provides accessibility for inspection without removal of the valve from the line.

D. Friction Collar with Memory Stop

Secures valve plug in any position and includes a nylon bearing for ease of operation.

E. V-Type Packing

Field adjustable and replaceable without removal of worm gear or motor actuators.

F. Removable POP™ Shims

Packing Overload Protection Shims protect packing by preventing overload during field adjustment.

G. Radial Bearings

Heavy Duty, T316 Stainless Steel, Permanently Lubricated.

H. Thrust Bearing

Upper: PTFE - Provides ease of actuation during operating conditions.
Lower: Stainless Steel - Prevents wear to plug and Grit-Guard.

I. Grit-Guard™ Shaft Seal

The *Val-Matic Exclusive* Grit-Guard™ shaft seal extends packing and bearing life by minimizing contact with abrasive line media.

J. Seat

Welded overlay of 95% pure nickel applied directly to the body using a state-of-the-art robotic welding system for a consistent, high quality weld. Machined and ground to a smooth finish.

K. Plug

Fully rubber encapsulated molded plug eliminates exposed surfaces preventing corrosion and delamination.

Proven Design

With installations worldwide, the Val-Matic Cam-Centric® Plug Valve has proven itself as the preferred valve for wastewater, industrial waste and process applications. The Cam-Centric® Plug Valve is a ¼ turn eccentric plug valve allowing cost effective, low torque actuation for pump control, shut-off and throttling service. The valve's eccentric action rotates the plug in and out of the seated position with minimal contact, thereby preventing high torque and wear to the valve seat and plug. The combination of the eccentric action, stainless steel bearings, Grit-Guard™ seals and heavy duty nickel seat assures long life with minimal maintenance.

Preferred Features

The Cam-Centric® Plug Valve features a shaft sealing system that utilizes V-Type packing, a packing follower and a Grit-Guard™ seal for ease of maintenance and to reduce wear. The Grit-Guard™ seals reduce wear by preventing grit and media from reaching the bearings and packing to prevent plug lock up. The seals are standard in both the upper and lower journals (Figures 1 & 2). To prevent the packing from being over tightened, the shaft seal incorporates POP™ (Packing Overload Protection) Shims. The packing is easily adjusted by removing the POP™ shims as necessary utilizing the pull tab feature (Figure 1). Adjustment or

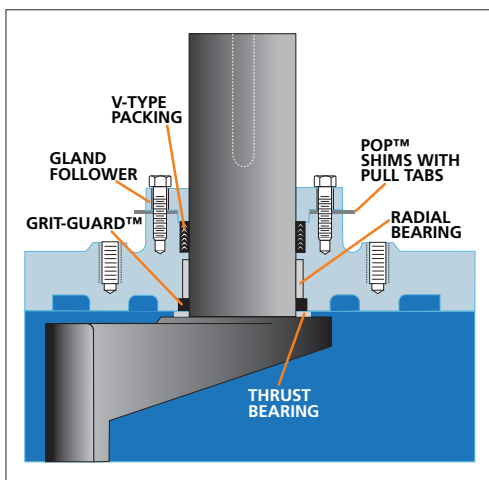


Figure 1. Upper Bearing Journal

replacement of the V-Type packing can be done without removal of the gear, motor or cylinder actuator.

The Cam-Centric® bearing package consists of permanently lubricated, T316 stainless steel radial bearings in both the upper and lower journals. The upper thrust bearing is made of Teflon and the lower thrust bearing is T316 stainless steel. The bearings

are protected from grit related wear by the Grit-Guard™ seals (Figures 1 & 2).

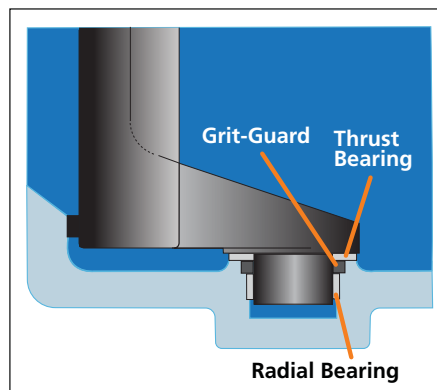


Figure 2. Lower Bearing Journal

The Cam-Centric® Plug Valve utilizes a totally encapsulated molded plug to protect exposure to corrosion and delamination in severe abrasive applications.



Figure 3. Robotic welding of nickel seat

The valve seat is a welded overlay of 95% pure nickel applied directly to the body on a machined surface using a state-of-the-art robotic welding system for a consistent, high quality weld (Figure 3).

Advanced Technology

Incorporating the latest in valve technology assures a high-quality valve that will provide long service. The design process utilized solid Modeling and Finite Element Analysis (FEA) of the key structural components. Flow and torque data was derived from flow tests, mathematical models and Computational Fluid Dynamics (CFD). Manufacturing technology uses automated process control in the foundry and ISO 9001 controlled manufacturing processes. Every valve is tested in accordance with AWWA C517 and MSS SP-108 on automated hydraulic test rigs with gauges calibrated per ISO standards.

Actuation

The Cam-Centric® Plug Valve is available with a wide range of actuation options, from simple lever operation to advanced pump control systems. Options include 2" operator nuts, worm gears, chainwheels, electric motor and cylinder actuation. A wide variety of accessories such as floor stands and extended bon-

nets are also available (see accessories on page 7). Val-Matic Engineering personnel work closely with cylinder and electric actuation manufacturers to assure actuator/valve compatibility. This assures the actuator you specify will deliver the performance you expect when utilized with a Cam-Centric® Plug Valve.



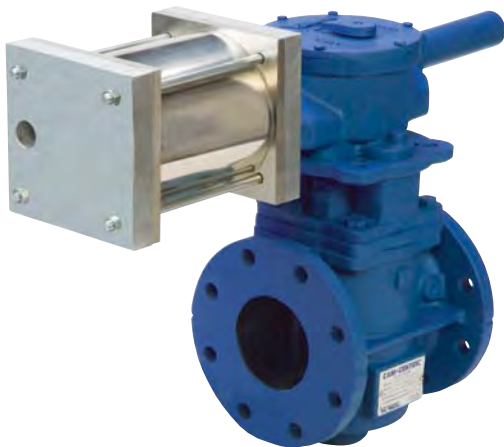
Direct Nut operated valve with memory stop:

- Adjustable open memory stop for system balancing
- Adjustable close stop
- Adjustable friction collar
- For use with lever accessories



Val-Matic Worm Gears:

- Heavy Duty, totally enclosed and sealed
- For above ground and buried service applications
- Bronze radial bearings and roller thrust bearings provide smooth operations and extended life



Val-Matic Cylinder Actuation:

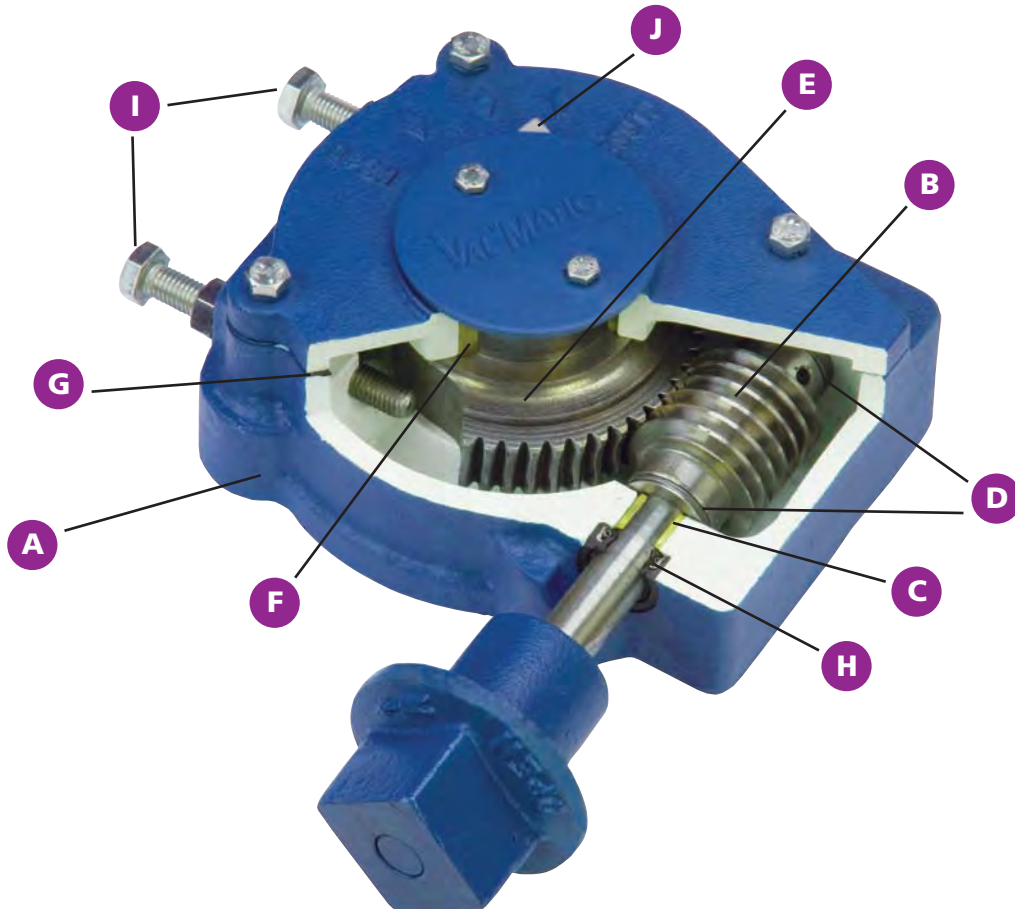
- Compliance with AWWA C541 for Power Actuation
- Pneumatic/Hydraulic
- Single Acting or Double Acting
- Fail Open/Closed for power failure
- Modulating Service
- Throttling Service
- Limit Switches, Solenoid Valves, Positioners
- Manual Overrides
- Pump Control



Electric Actuation:

- 110 Single Phase, 230/460 Three Phase
- Compliance with AWWA C542 for Power Actuation
- Modulating Service
- Throttling Service
- Remote push button control and indication
- Torque Switches, Limit Switches
- De-clutchable handwheels
- Available from a wide variety of manufacturers

Worm Gear Features



Val-Matic Worm Gear

A valve actuator must perform to the same level as the valve. The Val-Matic worm gear is designed and built to provide the same long term service as our Cam-Centric® Plug Valve. The exclusive bearing package in the worm gear includes four bronze sleeve bearings and two roller thrust bearings. This exclusive package assures smooth operation and long life regardless of the valve's orientation or application. The ductile iron segment gear coupled with the upper and lower bronze radial bearings exceed the requirements of AWWA C517 for strength and durability. All worm gears are designed to exceed, a rim pull of 200 pounds on handwheels and input torques of 300 foot pounds for operator nuts without damage. Buried service worm gears are grease packed, sealed and include stainless steel shafts. Worm gears can be provided with handwheels, chainwheels or 2" operator nuts.

A. Housing

Heavy duty, totally enclosed and sealed.

B. Worm

Hardened steel for durability and long life.

C. Radial Shaft Bearings

Bronze shaft bearings extend life and provide ease of operation (rear shaft bearing not visible).

D. Roller Thrust Bearings

Provides smooth operation and extends life.

E. Segment Gear

Heavy duty ductile iron for high strength. Provided with precision bore and keyway for connection to the valve shaft in multiple positions.

F. Segment Gear Radial Bearings

Upper and lower bronze bearings provide ease of operation and extend life (lower bearing not visible).

G. Cover Gasket

Seals housing and prevents foreign material from entering actuator and prevents loss of grease.

H. Shaft Seal

Prevents foreign material from entering the actuator.

I. External Stops

Both open and closed stops are external and easily adjustable.

J. Position Indicator

Displays precise plug position on above ground service.

PRESSURE RATINGS

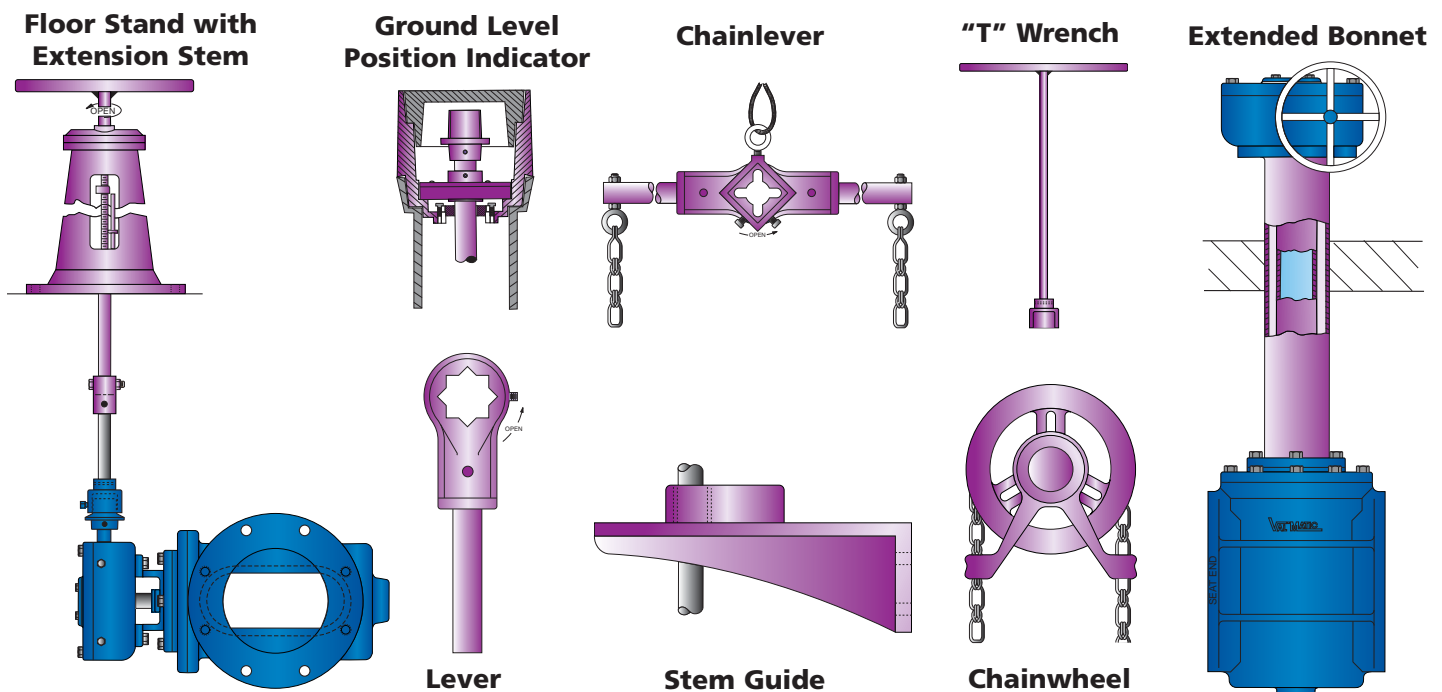
MAXIMUM PRESSURE RATINGS			
SERIES	CONNECTION	SIZE RANGE	CWP (psig)
5400	ANSI Class 125 Flanged 4-Way	4" - 12"	175
5500	ANSI Class 125 Flanged 3-Way	4" - 12"	175
5600R	ANSI Class 125 Flanged 100% Port	4" - 10"	175
		12" - 48"	150
5700R	AWWA C111 Mechanical Joint 100% Port	4" - 10"	175
		12" - 48"	150
5800RTL	ASME NPT Threaded	1/2" - 2"	175
5800R	ANSI Class 125 Flanged	2" - 12"	175
		14" - 54"	150
5800HP	ANSI Class 125 Flanged High Pressure	3" - 24"	250
5900R	AWWA C111 Mechanical Joint	3" - 12"	175
		14" - 54"	150
5900HP	AWWA C111 Mechanical Joint High Pressure	3" - 48"	250

MATERIALS OF CONSTRUCTION

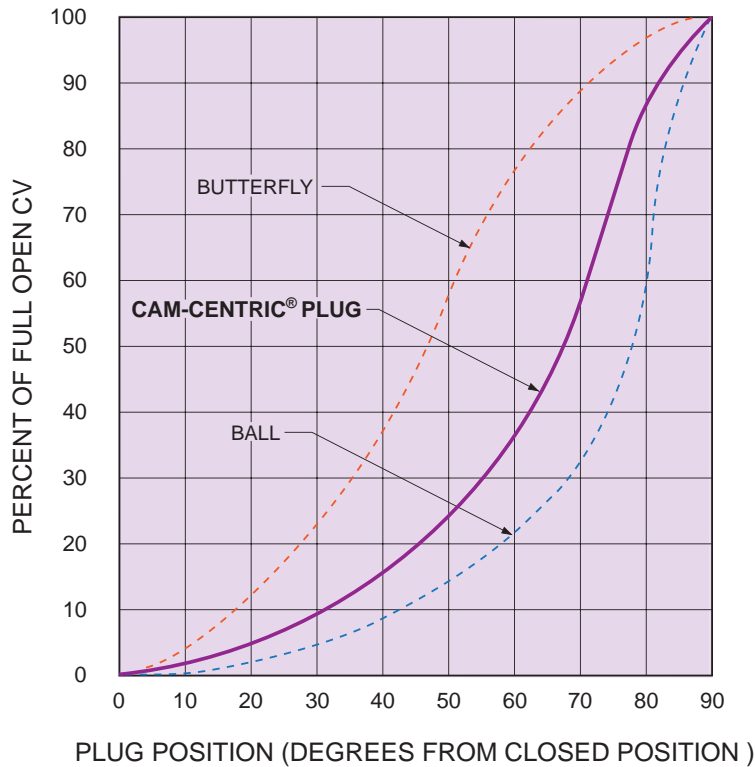
COMPONENT	STANDARD
Body (5600R, 5700R, 5800R, 5900R)	Cast Iron ASTM A126, Class B
Body (5400, 5500, 5800HP, 5900HP)	Ductile Iron ASTM A536, Grade 65-45-12
Plug (5600R, 5700R, 5800R, 5900R)	Cast Iron ASTM A126, Class B, Buna-N Encapsulated, ASTM D2000
Plug (5400, 5500, 5800HP, 5900HP)	Ductile Iron ASTM A536, Grade 65-45-12, Buna-N Encapsulated, ASTM D2000
Radial Shaft Bearings	T316 Stainless Steel
Top Thrust Bearing	Teflon
Bottom Thrust Bearing	T316 Stainless Steel
Available Coatings	Two-Part Epoxy, Fusion Bonded Epoxy, Glass Lining, Rubber Lining

Accessories

Space limitations and application specifics often require special accessories. In addition to those shown below, Val-Matic offers a wide range of accessories to meet your application requirements.



Flow Characteristics



INHERENT PUMP CONTROL FLOW CHARACTERISTICS

To control pressure surges and provide good-controllability, the flow characteristics of valves should be considered.

The graph at left shows the inherent flow characteristics at a constant ΔP for various valves.

The Plug Valve has an inherent flow characteristic similar to a ball valve. When installed in a pipeline, the plug valve will approximate a linear flow characteristic because the piping system pressure losses will shift the flow curve to the left. A linear installed flow characteristic will help control surges and provide a wide range of controllability.

Installations



Cam-Centric® Plug Valve with worm gear actuator and chainwheel



Cam-Centric® Plug Valve with Val-Matic Swing-Flex®



3-Way Cam-Centric® Plug Valves with worm gear actuators



Cam-Centric® Plug Valve with motor actuator



Cam-Centric® Plug Valve with worm gear actuator



Cam-Centric® Plug Valve with worm gear actuator and extension stem

2-Way Specification

SCOPE

- 1.1 This specification covers the design, manufacture, and testing of 1/2 in. (15 mm) through 3 in. (80 mm) Threaded Eccentric Plug Valve, 2 1/2 in. (60 mm) through 60 in. (1500 mm) Eccentric Plug Valve, and 4 in. (100 mm) through 60 in. (1500 mm) 100% Port Eccentric Plug Valve suitable for water or wastewater service with pressures up to 250 psig (1725 kPa).
- 1.2 Plug Valves shall be quarter-turn, non-lubricated with resilient encapsulated plug.

STANDARDS AND APPROVALS

- 2.1 2 1/2 in. (60 mm) through 60 in. (1500 mm) plug valves shall be designed, manufactured and tested in accordance with American Water Works Association Standard ANSI/AWWA C517.
- 2.2 All Plug Valves shall be certified Lead-Free in accordance with NSF/ANSI 372.
- 2.3 Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

CONNECTIONS

- 3.1 Threaded valves shall have threaded NPT full size inlets. The connection shall be hexagonal for a wrench connection.
- 3.2 Flanged valves shall have flanges with drilling to ANSIB16.1, Class 125.
- 3.3 Mechanical Joint valves shall fully comply with ANSI/AWWA C111/A21.11.

DESIGN

- 4.1 Threaded and all other valves under 4" (100mm) shall have port areas of not less than 100% of pipe area. Port areas on other sizes are 85% on 16" (400 mm) and smaller, 80% on 18"-24" (150 mm- 600 mm), and 75% on 30" (800 mm) and larger.
- 4.2 Threaded valve seat shall be a machined seating surface.
- 4.3 2 1/2 in. (60 mm) through 60 in. (1500 mm) plug valves shall have a valve seat that is a welded overlay of 95% pure nickel applied directly to the body on a pre-machined, cast seating surface and machined to a smooth finish.
- 4.4 Threaded valves shall have shaft seals which consist of V-type lip seal in a fixed gland with a resilient O-ring spring.
- 4.5 2 1/2 in. (60 mm) through 60 in. (1500 mm) plug valves shall have shaft seals which consist of V-type packing in a fixed gland with an adjustable follower designed to prevent over compression of the packing and to meet design parameter of the packing manufacturer. Removable POP™ shims shall be provided under the follower flanges to provide for adjustment and prevent over tightening.
- 4.6 Permanently lubricated, radial shaft bearings shall be supplied in the upper and lower bearing journals. Thrust bearings shall be provided in the upper and lower journal areas, except for threaded type which only have upper thrust bearings.
- 4.7 Both the packing and bearings in the upper and lower journals shall be protected by a Grit-Guard™ "drip tight" Buna-N shaft seal located on the valve shaft to minimize the entrance of grit into the bearing journal and shaft seal areas.
- 4.8 The threaded valve body shall have 1/8" NPT upstream and downstream pressure ports.

MATERIALS

- 5.1 Valve bodies and covers shall be constructed of ASTM A126 Class B cast iron for working pressures up to 175 psig (1200 kPa) and ASTM A536 Grade 65-45-12 for working pressures up to 250 psig (1725 kPa). The words "SEAT END" shall be cast on the exterior of the body seat end.
- 5.2 Threaded valve plugs in sizes 1/2 in. (15 mm) through 3 in. (80 mm) shall be of one-piece construction and made of ASTM A126 Class B cast iron fully

- encapsulated with a resilient facing per ASTM D2000-BG and ANSI/AWWA C517 requirements.
- 5.3 2 1/2 in. (60 mm) through 60 in. (1500 mm) plugs shall be of one-piece construction and made of ASTM A126 Class B cast iron or ASTM A536 Grade 65-45-12 ductile iron and fully encapsulated with resilient facing per ASTM D2000-BG and ANSI/AWWA C517 requirements.
- 5.4 Threaded valves shall have radial shaft bearings constructed of self-lubricating Type 316 stainless steel. The top thrust bearing shall be Teflon.
- 5.5 2 1/2 in. (60 mm) through 60 in. (1500 mm) plug valves shall have radial shaft bearings constructed of self-lubricating Type 316 stainless steel. The top thrust bearing shall be Teflon. The bottom thrust bearing shall be self-lubricating Type 316 stainless steel. Cover bolts shall be corrosion resistant with zinc plating.

ACTUATION

- 6.1 Threaded valves shall be equipped with a hand lever with a dial indicator and open memory stop.
- 6.2 Valves 2 1/2 in. (60 mm) to 8 in. (200 mm) and 4 in. (100mm) to 6 in. (150 mm) 100% ported shall be equipped with a 2 inch square nut for direct quarter turn operation. The packing gland shall include a friction collar and an open position memory stop. The friction collar shall include a nylon sleeve to provide friction without exerting pressure on the valve packing.
- 6.3 When specified valves 4 in. (100 mm) and larger shall include a totally enclosed and sealed worm gear actuator with position indicator (above ground service only) and externally adjustable open and closed stops. The worm segment gear shall be ASTM A536 Grade 65-45-12 ductile iron with a precision bore and keyway for connection to the valve shaft. Bronze radial bearings shall be provided for the segment gear and worm shaft. Alloy steel roller thrust bearings shall be provided for the hardened worm.
- 6.4 All gear actuators shall be designed to withstand, without damage, a rim pull of 200 lb. on the hand wheel and an input torque or 300 ft-lbs. for nuts.
- 6.5 Buried service actuators shall be packed with grease and sealed for temporary submergence to 20 feet of water. Exposed worm shafts shall be stainless steel.

OPTIONS

- 7.1 When specified, the valve port area shall have not less than 100% of pipe area.
- 7.2 The interior and exterior of the valve shall be coated with an NSF/ANSI 61 approved fusion bonded epoxy.
- 7.3 The interior of the valve shall be coated with 8 mils SG-14 glass lining or 1/8" soft rubber lining.

MANUFACTURE

- 8.1 Manufacturer shall demonstrate a minimum of ten (10) years' experience in the manufacture of plug valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings and operation and maintenance manuals.
- 8.2 The exterior of the valve for above ground service shall be coated with a universal alkyd primer. Valve exterior for buried service shall be coated with an epoxy coating.
- 8.3 Valve shall be marked with the Serial Number, Manufacturer, Size, Cold Working Pressure (CWP) and the Direct and Reverse Actuator Pressure Ratings on a corrosion resistant nameplate.
- 8.4 Plug Valves shall be Series # 5600R (100% Port Flanged), 5700R (100% Port Mechanical Joint), 5800RTL (Threaded), 5800R (Flanged), 5800HP (Flanged), 5900R (Mechanical Joint) or 5900HP (Mechanical Joint) as manufactured by Val-Matic Valve and Mfg. Corporation, Elmhurst, IL. USA or approved equal.

VAL-MATIC®

Val-Matic's quality of design and meticulous workmanship has set the standards by which all others are measured. Quality design features such as the AWWA **Ener-G® Ball Valve** with its energy efficient design, fusion bonded epoxy and adjustable resilient seating....**Cam-Centric® Plug Valves** have more requested features than any other eccentric plug valve....**American-BFV® Butterfly Valves** include a field replaceable seat without the need for special tools....**Tilted Disc® Check Valves** with high strength and wear resistant aluminum bronze trim as standard....**Silent Check Valves** featuring combined resilient/metal-to-metal seating and are **NSF/ANSI 61 & 372 Certified**....**Sure Seal Foot Valves** provided with a heavy duty stainless steel screened inlet....**Swing-Flex® and Surgebuster® Check Valves** designed with an unrestricted full flow area....**Swing Check Valves** with field adjustable closure versatility....**Dual Disc® Check Valves** utilizing stabilized components to provide extended life....**Air Release, Air/Vacuum and Combination Air Valves** provided standard with Type 316 stainless steel trim....**VaultSafe®** family of products includes the **FloodSafe® Inflow Preventer, FrostSafe®** two-way damper and the **VentSafe®** vent pipe security cage. These features coupled with our attention to detail put Val-Matic Valves in a class by themselves. All products are WQA certified Lead-Free in accordance with NSF/ANSI 372.

Val-Matic is totally committed to providing the highest quality valves and outstanding service to our customers. Complete customer satisfaction is our goal.

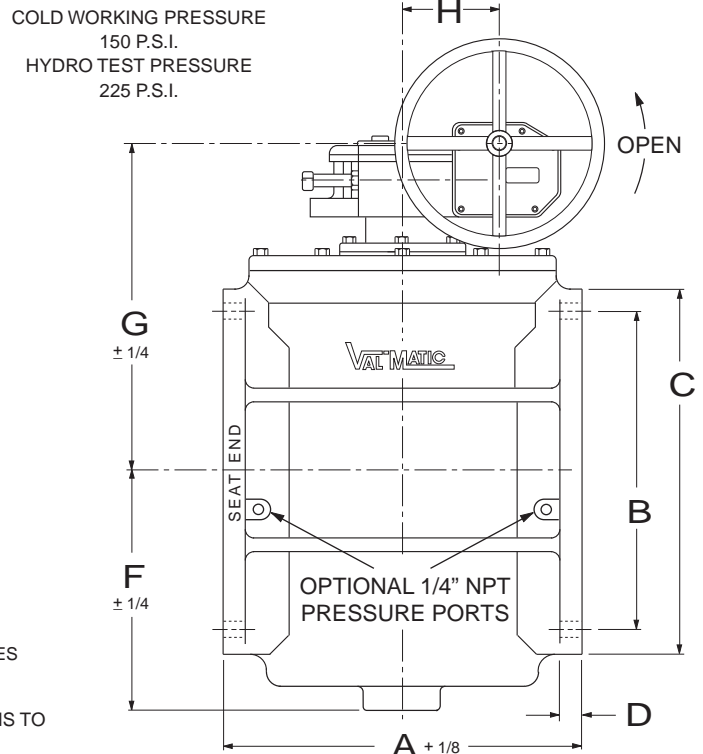
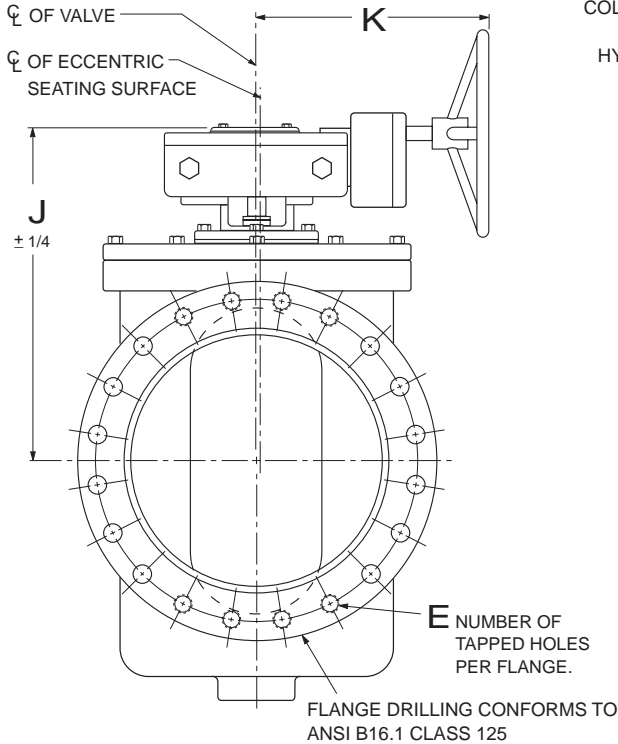
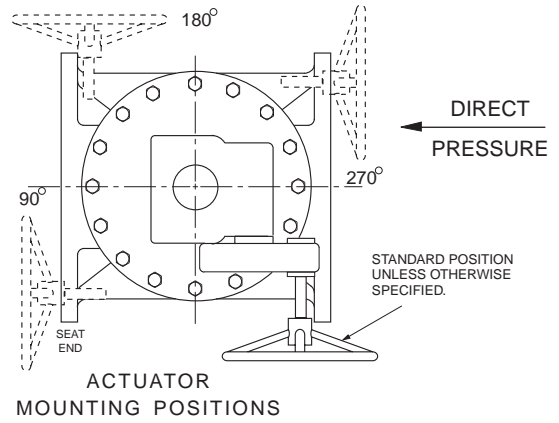
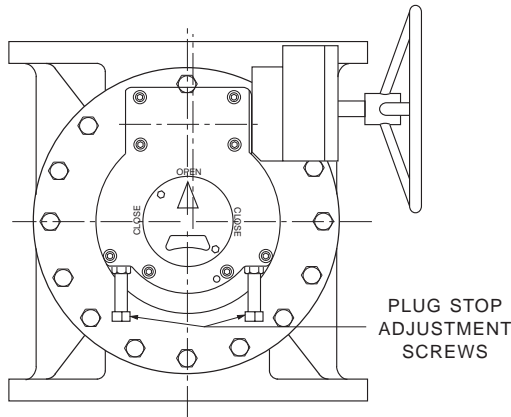
Make the Change
to Quality!

Specify

VAL-MATIC®

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www.valmatic.com
valves@valmatic.com

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ISO 9001:2008 certified company



SEE DRAWING NO. VM-5804RN-M FOR STANDARD MATERIALS OF CONSTRUCTION.

* ASTERISK INDICATES VALVE MODEL NUMBERS W/O SPUR GEAR.

VALVE SIZE	MODEL NO.	PRESS. RATING P.S.I.		HD. WHEEL DIA.	A	B	C	D	E	E	E	F	G	H	J	K	BOLT SIZE	NO. OF BOLTS	NO. OF TURNS			
		REVERSE	DIRECT																			
14	5814R/7E18*	50	100	18	17.00	18.75	21.00	1.38	4	1-8	1.56	13.00	19.31	5.62	22.00	15.25	1	12	20			
	5814R/7F24*	100	150	24									19.31	5.62	22.00	17.12						
	5814R/7G12	150	150	12									21.25	9.60	23.24	14.00						
16	5816R/7E24*	50	100	24	17.75	21.25	23.50	1.44	8	1-8	1.44	14.50	20.62	5.62	23.31	17.12	1	16	20			
	5816R/7F30*	100	150	30									20.62	5.62	23.31	18.62						
	5816R/7G14	150	150	14									22.56	9.69	24.62	14.62						
18	5818R/7J30*	50	100	30	21.50	22.75	25.00	1.56	8	1 1/8-7	1.87	16.25	22.25	5.62	24.94	18.62	1 1/8	16	60			
	5818R/7K18	100	150	18									25.12	7.38	25.25	19.25						
	5818R/7L24	150	150	24									7.38	25.25	19.25	60						
20	5820R/7M18	50	100	18	23.50	25.00	27.50	1.69	8	1 1/8-7	1.87	17.50	26.25	7.38	26.25	19.00	1 1/8	20	60			
	5820R/7N24	100	150	24												19.25				19.25	21.88	
	5820R/7P30	150	150	30												21.88				23.25	23.25	
24	5824R/7M24	50	100	24	30.00	29.50	32.00	1.88	8	1 1/4-7	1.87	20.25	29.00	7.38	29.00	19.25	1 1/4	20	60			
	5824R/7N30	100	150	30										7.38		21.88				21.88		
	5824R/7Q36	150	150	36										6.00		23.25				23.25		
30	5830R/7R24	50	100	24	37.50	36.00	38.75	2.12	8	1 1/4-7	2.12	24.00	31.00	4.06	35.12	16.12	1 1/4	28	85			
	5830R/7S30	100	150	30												16.12				16.12	16.12	
	5830R/7T30	150	150	36												16.12				16.12	16.12	
36	5836R/7S30	50	100	30	52.00	42.75	46.00	2.38	16	1 1/2-6	2.38	29.00	31.00	31.00	4.06	35.12	1 1/2	32	85			
	5836R/7V24	100	150	24									32.25							10.50	37.25	23.50
	5836R/7W36	150	150	36									32.25							10.50	37.25	23.50

ANSI CLASS 125 CAM-CENTRIC® FLANGED PLUG VALVE WITH WORM GEAR ACTUATOR

DATE Revised 10-17-12
10-19-95



VALVE AND MANUFACTURING CORP.

DRWG. NO.

VM-5814R/WGA



RFCA (Restrained Flanged Coupling Adapter)

Material Specifications

Flange Body: Ductile (nodular) iron, meeting or exceeding ASTM A 536, Grade 65-45-12. Flange meets the dimensional requirements of ANSI Class 125 and 150 bolt circles.

Gaskets: Compounded for water and sewer service in accordance with ASTM D 2000 (Sizes 3 - 12" have flange O-Ring gasket). Other compounds available for petroleum, chemical, or high temperature service.

Gland: Romac RomaGrip™. See page 7-6.

Restraining Bolts: 7/8 -9 roll thread, Ductile (nodular) iron, meeting or exceeding ASTM A 536.

Restraining Lugs: Ductile (nodular) iron, meeting or exceeding ASTM A 536. Heat treated using a proprietary process.

Lug Locators: Polyurethane, a thermal plastic.

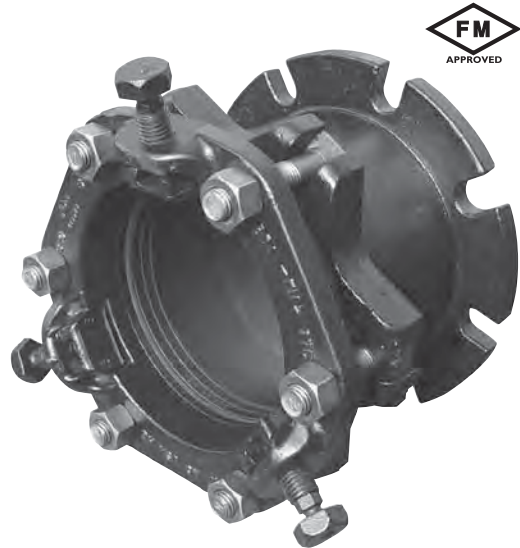
T-bolts and Nuts: High strength low alloy steel T-head bolt. National coarse rolled thread and heavy hex nut. Steel meets AWWA C111 composition specifications. **Stainless steel bolts and nuts** available on request.

Coatings: Shop coat applied to cast parts for corrosion protection in transit. **Fusion bonded epoxy** available on request.

Use: Ductile Iron Pipe 3 - 24", cast iron pipe 3" - 24" (same OD's as ductile iron) and IPS size STD steel pipe 3 - 12".

To Order: Specify catalog number. **Example:** For a 12" RFCA Order: **RFCA - 13.20**

NOTE: 3" - 12" special Romac gasket works on both steel and D.I. ODs.



Not for use on PVC, HDPE pipe or plain-end mechanical joint fittings. For applications on PVC, please contact your Romac representative.

NOM. PIPE SIZE	GASKET RANGE	LENGTH	GLAND BOLTS QTY: SIZE	CATALOG NUMBER	LIST PRICE				WEIGHT (lbs.)
					Shopcoat w/Std. B&N	Shopcoat w/304 SS B&N	Fusion Epoxy w/Std. B&N	Fusion Epoxy w/304SS B&N	
3"	3.50-3.96	8.00"	4: 5/8" x 3"	RFCA - 3.96	\$145.45	\$157.56	\$165.10	\$177.20	21
4"	4.50-4.80	9.00"	4: 3/4" x 3 1/2"	RFCA - 4.80	183.32	209.43	207.88	233.99	29
6"	6.63-6.90	9.25"	6: 3/4" x 4"	RFCA - 6.90	233.85	273.01	267.10	306.26	40
8"	8.63-9.05	9.25"	6: 3/4" x 4"	RFCA - 9.05	315.59	354.75	355.82	394.98	53
10"	10.75-11.10	10.25"	8: 3/4" x 4"	RFCA - 11.10	581.96	634.17	669.69	721.91	83
12"	12.75-13.20	10.25"	8: 3/4" x 4"	RFCA - 13.20	632.13	684.34	739.86	792.07	110
14"	15.30	11.70"	10: 3/4" x 4 1/2"	RFCA - 15.30	882.79	947.37	1,020.54	1,085.12	170
16"	17.40	11.70"	12: 3/4" x 4 1/2"	RFCA - 17.40	1,225.93	1,302.91	1,410.23	1,487.21	200
18"	19.50	11.80"	12: 3/4" x 4 1/2"	RFCA - 19.50	1,346.63	1,423.60	1,546.13	1,623.10	217
20"	21.60	11.80"	14: 3/4" x 4 1/2"	RFCA - 21.60	1,521.19	1,611.94	1,772.94	1,863.69	256
24"	25.80	12.00"	16: 3/4" x 5"	RFCA - 25.80	1,845.38	1,959.61	2,130.38	2,244.61	305



Some initial axial movement may occur in lug style restraints as the lugs seat. Movement is directly related to the size of the piping system and the system pressure. In general terms movement of approximately 0.25" can be expected in restraints under 16". For larger sizes, movement of approximately 0.4" may be seen. If this is critical to your application please contact Romac Engineering for additional information.

INSTALLATION INSTRUCTIONS

Read installation instructions first before installing. Check parts to ensure that no damage has occurred during transit and that no parts are missing. Also check the diameter of the pipe and the size marked on the coupling to ensure you have the proper size.



RFCA Restrained Flange Coupling Adapter

NOT FOR USE ON PVC PIPE OR PLAIN END MECHANICAL JOINT FITTINGS

NOTE: Not for use on polyethylene pipe, plain end mechanical joint fittings or PVC pipe.

The "Stab-Fit" installation technique may also be employed on 3"-10" sizes.

Step 1 • Check the RFCA parts to insure that no damage has occurred during transit and that no parts are missing.

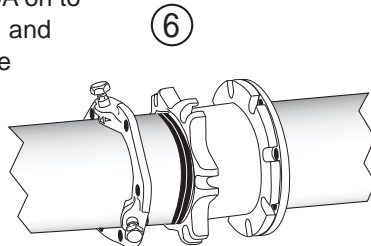
Step 2 • Clean pipe end for a distance of 2" greater than length of the RFCA.

Step 3 • Place RomaGrip gland on pipe end.

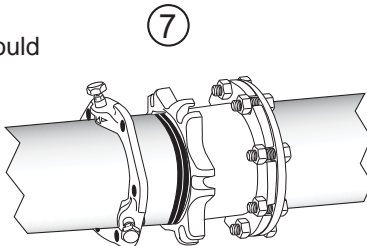
Step 4 • Lubricate the gasket and pipe surface with soapy water or other suitable gasket lubricant.

Step 5 • Place gasket over pipe with beveled edge toward the flange adapter.

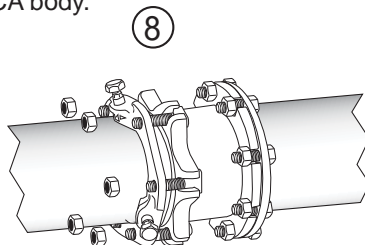
Step 6 • Slide the RFCA on to the pipe. Position the pipe and flanged coupling against the mating flange, inserting flange gasket (14" and larger) between the flange faces. Assemble the flange joint using flange bolts.



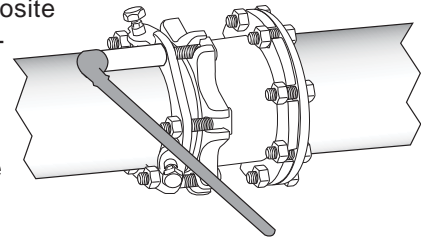
Step 7 • The pipe should be centered such that the space between the OD of the pipe and the ID of the RFCA is even all around the pipe. Slide the RFCA gasket into position with the beveled edge engaging the beveled end of the RFCA body.



Step 8 • Slide the RomaGrip into position against the gasket, and insert T-bolts.



Step 9 • Tighten T-bolts evenly, alternating to diametrically opposite position at approximately 20 ft-lbs increments to the recommended torque for your size RFCA.



Recommended Torque:

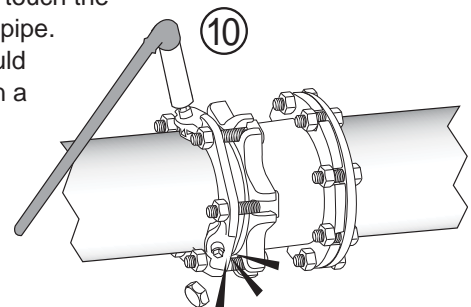
- 3" RomaGrip - 45-65 ft-lbs.
- 4 - 24" RomaGrip - 75 - 90 ft-lbs.

Note:

90 ft-lbs. torque = 12" wrench w/90 lbs. force

For best results, wait 10 minutes and retighten bolts to proper torque.

Step 10 • Hand tighten the restrainer bolts until the restraining pads touch the surface of the pipe. The bolts should be tightened in a uniform criss-cross pattern, until the heads break off above the notch.



NOTE: Do not turn a bolt more than one turn before alternating to the next bolt.

Step 11 • Pressure test for leaks before backfilling.

RFCA Restrained Flange Coupling Adapter

NOT FOR USE ON PVC PIPE OR PLAIN END MECHANICAL JOINT FITTINGS

PRECAUTIONS

1. Check flange to make sure the bolt holes match the RFCA.
2. Make sure a flange gasket is used between the mating flanges on sizes 14" and larger.
3. Check diameter of pipe to make sure you are using the correct size RFCA; also check gasket to make sure it is the size you think it is.
4. Be sure to clean pipe of as much dirt and corrosion as possible in the area that the gasket will seal.
5. Lubricate both the gasket and the pipe end with soapy water or approved pipe lubricant per ANSI/AWWA C111/A21.11.
6. Make sure no foreign materials lodge between gasket and pipe.
7. Avoid loose fitting wrenches, or wrenches too short to achieve proper torque.
8. Keep threads free of foreign material to allow proper tightening.
9. Take extra care to follow proper bolt tightening procedures and torque recommendations. Bolts are often not tightened enough when a torque wrench is not used.
10. Be sure that the gland is centered around the pipe.
11. Pressure test for leaks before backfilling.
12. Backfill and compact carefully around pipe and fittings.
13. Some initial axial movement may occur in lug style restraints as the lugs seat. Movement is directly related to the size of the piping system and the system pressure. In general terms movement of approximately 0.25" can be expected in restraints under 16". For larger sizes, movement of approximately 0.4" may be seen. If this is critical to your application please contact Romac Engineering for additional information.

COMMON INSTALLATION PROBLEMS

1. Flange gasket not installed on sizes 14" and larger.
2. T-Bolts are not tightened to the proper torque.
3. Rocks or debris between pipe and gasket.
4. Dirt or debris between pipe and restraining pad.
5. Dirt on threads of bolts or nuts.
6. Restraining bolt heads not snapped off.
7. Not enough pipe inserted into bell.
8. Using the RFCA on IPS size steel pipe with wall thickness thinner than schedule 40 steel pipe. (3-12 inch sizes)

IF RFCA MUST BE REMOVED

1. Make sure pipe is not pressurized. Removing the restrainer could cause the pipe joint to separate.
2. To remove the RFCA, use a $\frac{5}{8}$ " hex wrench or socket.
3. To reassemble, follow installation procedures. Tighten the restraining bolts using a $\frac{5}{8}$ " hex wrench to 75-ft-lbs minimum.



KOR-N-SEAL® I & II FLEXIBLE PIPE-TO-MANHOLE CONNECTORS

SPECIFICATION SHEET



KOR-N-SEAL I - WEDGE KORBAND CONNECTOR ASSEMBLY



Install Kor-N-Seal I - Wedge Korbond with Socket Wrench & Torque Limiter



Install Kor-N-Seal II - Wedge Korbond with Standard Torque Wrench



Install Pipe Clamp(s) with T-Handle Torque Wrench





KOR-N-SEAL® I & II

Flexible Pipe-to-Manhole Connectors

SPECIFICATION SHEET

PERFORMANCE

Test	ASTM Method	Test Requirements	Kor-N-Seal® I & II
Head Pressure	C923 - 7.1	0° - 13 psi (30 ft) for 10 min. 7° - 10 psi (23 ft) for 10 min.	+13 psi for 10 min. +10 psi for 10 min.
Deflection Test	C923 - 7.2.2	7° in any direction	Over 7° in any direction
Load Test	C923 - 7.2.3	150 lbs/in. pipe dia.	Over 150 lbs/in. pipe dia.

Performed on all standard sizes of Kor-N-Seal Connectors.

RESILIENT EPDM OR POLYISOPRENE RUBBER

Conforms to ASTM C923

Test	ASTM Method	Test Requirements	TEST RESULTS Kor-N-Seal® I & II
Chemical Resistance	D543, at 22°C for 48 h		
1 N Sulfuric Acid		No weight loss	No weight loss
1 N Hydrochloric Acid		No weight loss	No weight loss
Tensile Strength	D412	1200 psi	1580 psi
Elongation at Break		350% min.	500%
Hardness	D2240 (shore A durometer)	± 5 from the manufacturer's specified hardness	48 ± 5
Accelerated Oven-Aging	D573 70 ± 1°C for 7 days	Decrease of 15%, max. of original tensile strength, decrease of 20% max. of elongation	10.1% tensile decrease 14.0% elongation decrease
Compression Set	D395, method B, at 70°C for 22 h	Decrease of 25%, max. of original deflection	13% decrease
Water Absorption	D471, immerse 0.75 by 2-in. specimen in distilled water at 70°C for 48 h	Increase of 10%, max. of original by weight	.8% increase
Ozone Resistance	D1171	Rating 0	Rating 0
Low-temperature Brittle Point	D746	No fracture at -40°C	No fracture at -40°C
Tear Resistance	D624, method B	200 lbf/in.	No tear at 210 lbf/in.

INTERNAL KORBAND

Conforms to ASTM C923, ASTM A666, and A240

- Korband Assembly is manufactured of 300 series stainless steel.
- Toggle Expander is made of 300 series stainless steel.
- The 106/406 series Wedge Expander is made from reinforced nylon or 300 series stainless steel.
- The 206/306 series Wedge Expander is made from 300 series stainless steel.

EXTERNAL PIPE CLAMP

Conforms to ASTM C923, ASTM A666, and A240

External take-up clamps are manufactured of 300 series stainless steel.

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250 Elm Street • P.O. Box 301
Milford, NH 03055, U.S.A.

Tel: 603-673-8680 • 800-626-2180 • Fax: 603-673-7271

NPC Kor-N-Seal Pipe-to-Manhole Connector

Technical Specification

Scope:

This specification describes the function of the NPC Kor-N-Seal pipe-to-manhole connector, its principle of operation, and the component materials that constitute the Kor-N-Seal connector, and their physical properties.

Product Application:

NPC Kor-N-Seal connectors are designed and manufactured to meet or exceed the requirements of ASTM C-923 "Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals". This specification requires the connector to provide a watertight seal under the following conditions:

- 10 PSI (23 feet head) of groundwater pressure
- Minimum 7 Degrees of pipe articulation in any direction
- Radial loading test of 150 pounds per inch diameter of pipe

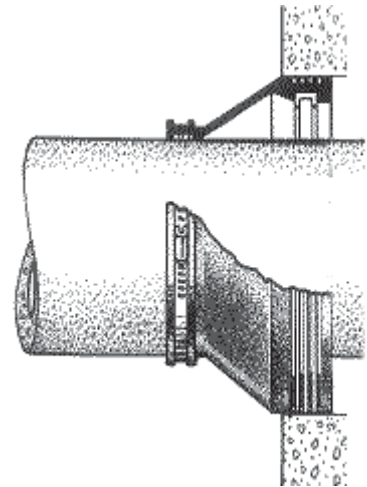
Principle of Operation:

The Kor-N-Seal connector creates a watertight seal between the pipe and manhole by first sealing to the inside of the cored or formed hole in the manhole and then sealing to the outside of the pipe. See illustration at right.

The seal at the inside of the manhole is created by the stainless steel Korband. The Korband is located inside of the end of the Kor-N-Seal connector that fits into the manhole. Once the Kor-N-Seal connector is located in the manhole, the diameter of the Korband is increased. This compresses the Kor-N-Seal connector against the inside wall of the hole in the manhole creating a watertight seal at the manhole.

The seal at the outside of the pipe is created by the stainless steel pipe clamp(s). The pipe clamp is located on the outside of the Kor-N-Seal connector. Once the pipe has been positioned in the connector the diameter of the pipe clamp is decreased. This compresses the Kor-N-Seal connector against the outside wall of the pipe creating a watertight seal at the pipe.

Reference the [Kor-N-Seal Recommended Installation Instructions](#) for a detailed explanation of the preparation and installation of the Kor-N-Seal connector.





KOR-N-SEAL – STAINLESS STEEL WEDGE

Recommended Installation Procedure

Refer to reverse side *Kor-N-Seal I - Wedge Korband Installation Chart* for Hole Size Range, Connector Dimensions, and Suggested Pipe O.D. Range.

CONNECTOR INSTALLATION:

1. Check to be sure Korband is properly located in Connector groove. (Fig. 1)
2. Insert Connector Assembly into hole with Wedge Expander at top of hole. (Fig. 2)
3. Position Connector so it is square to manhole both vertically and horizontally. (Fig. 3)
4. Tighten Wedge Expander using 1/2" [13 mm] socket with a preset torque limiter for each. For each size connector use torque limiter preset to proper torque. (Fig. 4) Retorquing is not required prior to shipment.

CAUTION: DO NOT USE IMPACT WRENCH.

IMPORTANT

RECOMMENDED TORQUE		TORQUE LIMITER
Connector Inches [mm]	Foot Pounds [Newton Meters]	P/N
10 – 24 [254 – 610]	12 [16]	91440-12

Fig. 4

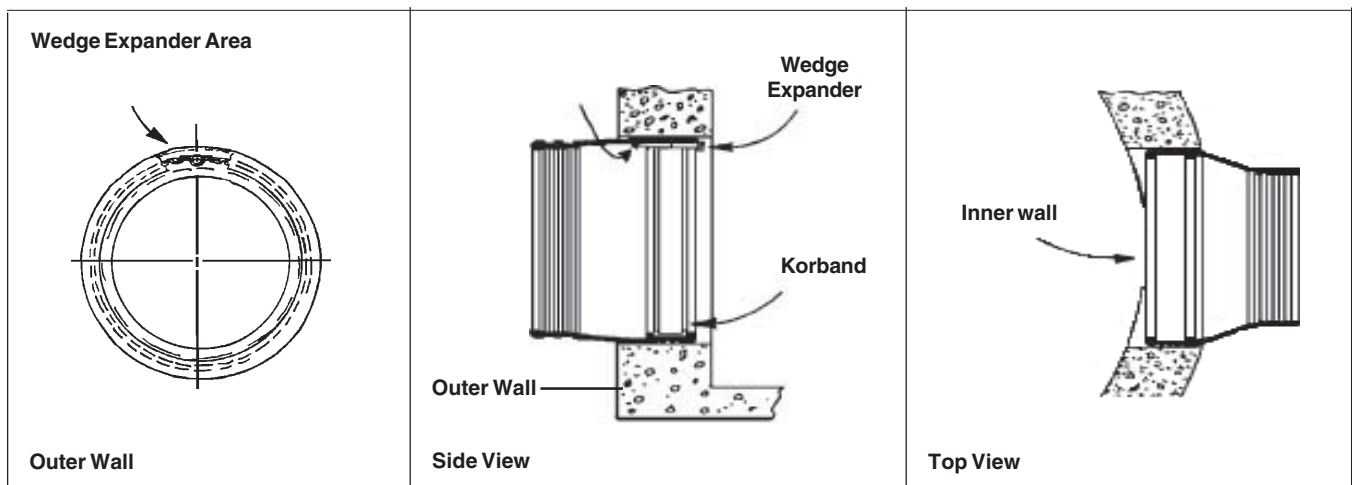


Fig. 1

Fig. 2

Fig. 3

PIPE INSTALLATION:

1. Center pipe in Connector opening.
2. On maximum pipe O.D. installations, use a pipe lubricant on the outside barrel of the pipe and/or the inside ridges of the Connector (under the Pipe Clamp area) to allow the pipe to slide into place more easily.
3. Position the Pipe Clamp in the Connector's Pipe Clamp groove with the screw at the top.
4. Tighten the Pipe Clamp screw to 60 inch pounds [7 Newton Meters] with a T-handle Torque Wrench, P/N 80090.
5. On minimum pipe O.D. installations, lift the rubber up underneath the Pipe Clamp screw so that the Connector contacts the bottom surface of the pipe while the Pipe Clamp screw is being tightened. Application of pipe lubrication on the underside of the clamp will also help assure that an even contraction of rubber is maintained throughout the clamping area.
6. After the Pipe Clamp has been tightened down firmly, move the pipe horizontally and/or vertically to bring it to grade.

CAUTION: Pipe must **NOT** rest on Connector Korband.

CAUTION:

All capped stubs awaiting pipe installation at a later date must be restrained. Assure that a proper backfill material is used in adverse conditions. Prior to any critical usage, contact NPC Customer service at 1-800-626-2180.



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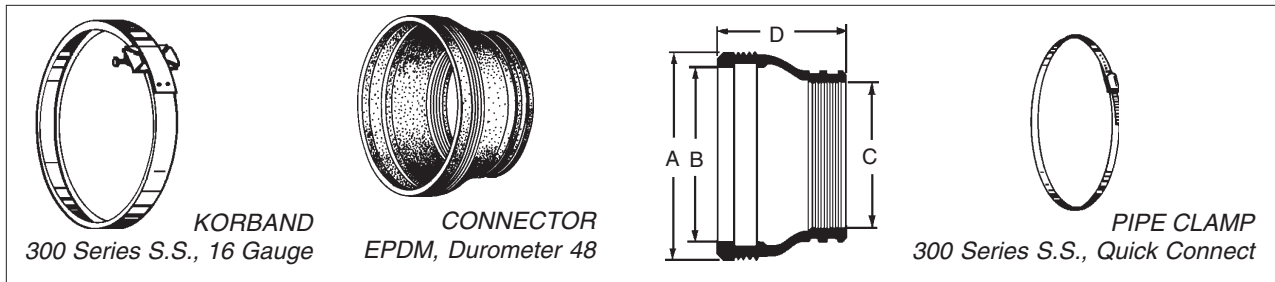
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KOR-N-SEAL – STAINLESS STEEL WEDGE

Recommended Installation Procedure



Kor-N-Seal S106 Series

Connector P/N	Suggested Pipe O.D. Range Inches	Hole Size Range Inches	Connector Dimensions Inches			Pipe Clamp P/N
		A	B	C	D	
S106-12BWS	5.75 — 7.00	12.00 — 12.20	10.30	6.50	8	I-128
S106-12AWS	7.00 — 8.50	12.00 — 12.20	10.30	8.00	8	I-180
S106-12WS	8.25 — 9.75	12.00 — 12.20	10.30	9.25	8	I-180
S106-14AWS	9.50 — 11.25	14.00 — 14.20	12.25	10.50	8	I-190
S106-16BWS	9.50 — 11.25	15.95 — 16.15	14.30	10.50	8	I-190
S106-16AWS	11.25 — 13.00	15.95 — 16.15	14.30	12.25	8	I-218
S106-16WS	13.00 — 14.20	15.95 — 16.15	14.30	14.00	8	I-242
S106-20BWS	14.00 — 15.50	19.95 — 20.10	18.25	15.00	8	I-306
S106-20AWS	15.50 — 17.00	19.95 — 20.10	18.25	16.50	8	I-306
S106-20WS	17.00 — 18.15	19.95 — 20.10	18.25	18.00	8	I-306
S106-22WS	17.75 — 19.25	21.95 — 22.10	20.25	18.75	8	I-318
S106-24WS	19.60 — 21.10	23.95 — 24.10	22.25	20.60	8	I-348

Kor-N-Seal S406 Series

S406-10AWS	6.00 — 6.75	10.00 — 10.20	8.30	6.50	6	I-128
S406-10WS	7.50 — 8.20	10.00 — 10.20	8.30	8.50	6	I-180
S406-10.5AWS	6.00 — 6.75	10.50 — 10.70	8.80	6.50	6	I-128
S406-10.5WS	7.50 — 8.70	10.50 — 10.70	8.80	8.50	6	I-180
S406-11BWS	6.00 — 7.00	11.00 — 11.20	9.30	6.00	6	I-128
S406-11AWS	7.50 — 9.00	11.00 — 11.20	9.30	8.00	6	I-180
S406-12CWS	6.00 — 7.00	12.00 — 12.20	10.30	6.50	6	I-128
S406-12BWS	6.25 — 7.50	12.00 — 12.20	10.30	7.00	6	I-128
S406-12AWS	7.50 — 9.00	12.00 — 12.20	10.30	8.50	6	I-180
S406-12WS	9.00 — 10.20	12.00 — 12.20	10.30	10.00	6	I-180

Suggested pipe O.D. range comes from field experience. Refer to *Recommended Pipe Installation Procedure*.



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08/06

**CONSEAL™**
Concrete Sealants INC.**CS-202**

Butyl Rubber Sealant

APPLICATIONS

For self-sealing joints in: Manholes, Concrete Vaults, Septic Tanks, Concrete Pipe, Box Culverts, Utility Vaults, Burial Vaults, and Vertical Panel Structures.

SEALING PROPERTIES

- Provides permanently flexible watertight joints.
- Low to high temperature workability: 0°F to 120°F (-12°C to 48°C)
- Rugged service temperature: -30°F to +200°F (-34°C to +93°C)
- Excellent chemical and mechanical adhesion to clean, dry surfaces.
- Sealed Joints will not shrink, harden or oxide upon aging.
- No priming normally necessary. When confronted with difficult installation conditions, such as wet concrete or temperatures below 40°F (4°C), priming the concrete will improve the bonding action. Consult Concrete Sealants for the proper primer to meet your application.

HYDROSTATIC STRENGTH

ConSeal CS-202 meets the hydrostatic performance requirement as set forth in ASTM C-990 section 10.1 (Performance requirement: 10psi for 10 minutes in straight alignment – in plant, quality control test for joint materials.)

SPECIFICATIONS

ConSeal CS-202 meets or exceeds the requirements of Federal Specification SS-S-210 (210-A), AASHTO M-198B, and ASTM C-990-91.



CONSEAL™
Concrete Sealants INC.

CS-202

Butyl Rubber Sealant

PHYSICAL PROPERTIES

	Spec	Required*	CS-202
Hydrocarbon blend content % by weight	ASTM D4 (mod.)	50% min.	52%
Inert mineral filler % by weight	AASHTO T111	30% min.	35%
Volatile Matter % by weight	ASTM D6	2% max.	1.2
Specific Gravity, 77°F	ASTM D71	1.15-1.50	1.20
Ductility, 77°F	ASTM D113	5.0 min.	12
Penetration, cone 77°F, 150 gm. 5 sec.	ASTM D217	50-100	60-65
Penetration, cone 32°F, 150 gm. 5 sec.	ASTM D217	40 mm	50-55
Flash Point, C.O.C., °F	ASTM D92	350°F min.	425°F
Fire point, C.O.C., °F	ASTM D92	375°F min.	450°F

IMMERSION TESTING

- 30-Day Immersion Testing: No visible deterioration when tested in 5% Caustic Potash, 5% Hydrochloric Acid, 5% Sulfuric Acid, and 5% saturated Hydrogen Sulfide. *
- One Year Immersion Testing: No visible deterioration when tested in 5% Formaldehyde, 5% Formic Acid, 5% Sulfuric Acid, 5% Hydrochloric Acid, 5% Sodium Hydroxide, 5% Hydrogen Sulfide and 5% Potassium Hydroxide.

* Requirements of ASTM C-990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

LIMITED WARRANTY

This information is presented in good faith, but we cannot anticipate all conditions under which this information and our products, or the products of other manufacturers in combination with our products, may be used. We accept no responsibility for results obtained by the application of this information or the safety and suitability of our products, either alone or in combination with other products. Users are advised to make their own tests to determine the safety and suitability of each such product or product combinations for their own purposes. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for this own particular use. We sell this product without warranty, and buyers and users assume all responsibility and liability for loss or damage arising from the handling and use of this product, whether used alone or in combination with other products.