Weaver
CONSTRUCTION MANAGEMENT
3679 S Huron Street, Suite 404 Englewood, Colorado 80110
Phone: (303) 789-4111 FAX: (303) 789-4310

SUBMITTAL TRANSMITAL

July 30, 2012

WCM Submittal No: 11373-002

PROJECT: **Harold Thompson Regional WRF**
Birdsall Rd.
Fountain, CO 80817
Job No. 2908

ENGINEER: **GMS, Inc.**
611 No. Weber St., #300
Colorado Springs, CO 80903
719-475-2935 Roger Sams

OWNER: **Lower Fountain Metropolitan Sewage Disposal District**
901 S. Santa Fe Ave.
Fountain, CO 80817
719-382-5303 James Heckman

CONTRACTOR: **HSI, Inc.**
7901 Hansen Rd.
Houston, TX 77061
713-947-1623 Colleen Orth

SUBJECT: Blowers Multistage Blowers ASB-1 through ASB-4

SPEC SECTION: 11373 Blowers

PREVIOUS SUBMISSION DATES: NA

DEVIATIONS FROM SPEC: ___ YES _X_ NO

CONTRACTOR'S STAMP: This submittal has been reviewed by Weaver Construction Management and, unless indicated otherwise, has been found to be in conformance with the intent of the contract documents.

Contractor's Stamp:	Engineer's Stamp:
Date: 7/26/12 Reviewed by: John Jacob () Reviewed Without Comments (X) Reviewed With Comments	

ENGINEER'S COMMENTS:_____
_____

Project: HDTWRF Project

Location: Fountain, CO

Supplier: HSI, Inc.

Date: 7/30/12

Submittal 11373-002 Multistage Blowers ASB-1 through ASB-4

Additional Submittal Review Comments:

1. **HSI has included a warranty statement which is not applicable to this project. The warranty is per the Purchase Agreement between WCM and HSI which references the Contract Documents for warranty terms and conditions.**
2. **Ship to address is 9001Birdsall Road Fountain, CO 80817.**
3. **Bearings are lubricated via oil bath not grease.**
4. **HSI is proposing Bray butterfly valves. GMS to confirm if these are acceptable.**
5. **Controls submittal will follow.**

End or Review.

Thursday, July 26, 2012

John Jacob
Weaver Construction Management Inc.
3679 South Huron Street
Englewood, CO 80110-3496
STE 404

RE: Specifications for Approval for (4) New HSI 08811 Air Multistage Centrifugal Blower Packages - HSI Job WO # 34756, Weaver Construction Management PO # 9103

Dear John,

In reference to your recent purchase order for **(4)** new HSI 08811 Air Multistage Centrifugal Blower Packages, I am enclosing the submittal package for your review.

Please indicate your agreement with the attached specifications by signing below and faxing a copy to me at 713-547-5508.

**** By signing this form, you are approving the release of the order to production per the specifications herein submitted as well as verifying the following shipping address and instructions for physical delivery of the blowers and any accessories. ****

Ship To: Weaver Construction Management, Inc. 3679 South Huron Street STE 404 Englewood, CO 80110-3496
Via: Freight Billed Best-Way

In an effort to effectively and competitively ship your blower HSI arranges many shipments weeks and sometimes months in advance, changes to the shipping address at a later date will cause added delays and expense which will be for the purchasers account. In the event that the address listed above is incorrect, it is requested that you correct this issue and/or add any additional shipping instructions on this sheet before signing and returning. The address stated above will be relied on from here out unless changed in writing with acknowledgement from HSI in writing.

Delivery is tentatively 14 weeks after reception of signed approval.

**The original proposal did not include an external passive harmonic filter and neither does this submittal. However, it has been discussed that the customer might be interested in an external passive harmonic filter. To add an external harmonic filter a signed change order will need to be sent for $11,000 per blower.

Please note that the submittal does not constitute acceptance of any commercial terms and conditions besides what is contained herein. Terms and conditions are agreed to on a signed purchase order only.

Sincerely,

Dakota Turrentine
Project Manage

_____ _____
Signature Date

_____ _____
Print Name Title

7901 Hansen Rd., Houston, TX 77061

MULTISTAGE CENTRIFUGAL BLOWER

Submittal Package

PREPARED FOR:
Weaver Construction Management, Inc.

PO # 9103
HSI JOB # WO34756

July 24, 2012

DET NORSKE VERITAS

MANAGEMENT SYSTEM CERTIFICATE

Certificate No. CERT-10967-2006-AQ-HOU-ANAB, Rev. 2

This is to certify that

Houston Service Industries Inc.

at

7901 Hansen Road, Houston, TX 77061 USA

has been found to conform to the Management System Standard:

ISO 9001:2008

This Certificate is valid for the following product or service ranges:

The Design, Manufacture, Repair And Re-Manufacture Of Multistage Centrifugal Blowers, High Speed Turbo Blowers And Related Accessories For Various Applications

Initial Certification date:
March 09, 2006

This Certificate is valid until:
March 27, 2012

The audit has been performed under the supervision of
Michael Polk
Lead Auditor

Place and date:
Houston, Texas, February 18, 2010

for the Accredited Unit:
DET NORSKE VERITAS
CERTIFICATION INC., HOUSTON TEXAS

Rudy Frueboes
Management Representative

Lack of fulfillment of conditions as set out in the Certification Agreement may render this Certificate invalid.

HEAD OFFICE: Det Norske Veritas Certification, Inc. 1400 Ravello Drive, Katy, Texas 77449. TEL: (281) 396-1000. FAX: (281) 396-1903

HSI
WARRANTY AND LIMITATION OF LIABILITY

The seller hereby warrants the HSI 88 Series Multistage Centrifugal Blower product manufactured by Houston Service Industries, Inc (HSI) to be free from defects in material and/or workmanship under normal use and service. The warranty will be for a period to begin with startup, beginning of beneficial use or achievement of substantial completion, whichever comes first, and will extend for a twenty-four (24) month period. The warranty period will not exceed eighteen (30) months after shipment.

This warranty applies to all standard equipment manufactured by HSI. Standard equipment shall be limited to the product make, model, and design as determined by HSI and shall not cover any customer specified modifications or changes, nor does it cover ancillary components provided with the equipment. Standard wear items used in routine maintenance are not covered the Seller will repair or replace any defective part or parts, FOB HSI Factory, at no charge.

Warranty shall be void if the product is repaired or tampered with in any manner other than by the Seller's authorized service personnel. If inspection does not disclose a defect covered by the warranty, the equipment will be returned to purchaser at its expense or, if purchaser elects, the seller will repair or replace the equipment and charge for such service at the regular rate.

The seller makes no warranties, expressed or implied, as to the merchantability or as to the suitability of the equipment for any particular purpose, and the seller does not warranty the equipment in any manner whatsoever except as expressly stated in this agreement.

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SECTION 1

FACTORY DATA SHEET

SPECIFICATIONS

Houston Service Industries, Inc.

Factory Data Sheet

WO34756

Work Order ID	Part ID	Release	Want Date	Start Date	Finish Date	Qty	Drawing ID/Rev
WO34756/2		6/15/2012	10/8/2012			4.00	

Cust Order#: CO032800 WW200
Date: 6/27/2012
Ship Via:
Cust PO#: PJT NO. 9103
Contact : JOHN JACOB

Customer: WEAVERCON
WEAVER CONSTRUCTION MANAGEM
3679 SOUTH HURON STREET
STE 404
ENGLEWOOD , CO 80110-3498

Ship To:
Same

FACTORY DATA

(4) HSI 08811 MC AIR PACKAGES- NEW
SERIAL NO(1): 0612321-34756
SERIAL NO(2): 0612322-34756
SERIAL NO(3): 0612323-34756
SERIAL NO(4): 0612324-34756

BLOWER SPECIFICATIONS

DRIVE : INLET, DIRECT (OP SPEED 3,550 RPM)
INLET ORIENT: POS#1, VERTICAL
DISCH ORIENT: POS#1, VERTICAL
SHAFT MAT'L : 4140 CARBON STEEL
BRG HSG TYPE: OPEN
BRG SIZE : 312
SEALS : LABYRINTH
LUBE : OIL
BRASS DFLCTR: YES
PAINT COLOR : STANDARD GRAY

IMPELLER INFORMATION

STARTING AT INLET
WHEEL #1 :5011 B.C. CAST
WHEEL #2-8 :5013 B.C CAST
WHEEL #9-11:5014 B.C. CAST

ADDITIONAL COMPONENTS

SKID : (4) 25" X 130", HSI STANDARD
MOTOR BASE : (4) 405TS, CUSTOM
MOTOR : (4) BALDOR 150HP 460/3/60 ODP
3600RPM
COUPLING : (4) OMEGA E30 W/ STANDARD GUARD
CHECK VALVE : (4) TECHNO 8" 5118 (DISCH)
B/FLY VALVE : (4) BRAY 10" S30 (INLET)
(4) BRAY 8" S30 (DISCH)
EXP JNT/TUBE: (4) GENERAL RUBBER 10" (INLET)
(4) GENERAL RUBBER 8" (DISCH)
TEMP SENSOR : (8) CONAX RTD 8030-1
(4) 5" PROBE CONAX RTD (INLET)
(4) 4" PROBE CONAX RTD (DISCH)
VIBR SENSOR : (8) IMI VIBRATION SENSOR: HT640M54
PRES GAUGE : (8) AST PRESSURE TRANSMITTER
FLTR/SILNCER: (4) UNIVERSAL CCS-10" (INLET)
RUBBER BASE : (40) 5/8" X 6" X 6" NEOPRENE PADS
CONTROLS : (4) HSI STANDARD MODEL 3100
IN NEMA 4 CABINET
VFD : (4) VACON 150HP 205A/460V AIR COOLED

SPARE PARTS

LUBRICATION : (4) GALLON OF PETROLEUM HSI PO-100 OIL
BEARINGKIT : (4) 088 OIL REPAIR KITS

AIR FILTER : (4) UNIVERSAL FELT AIR FILTER
SPOOL PIECE : (4) HSI 3100 10" SPACER (INLET)
(4) HSI 3100 8" SPACER (DISCH)

COMMENTS

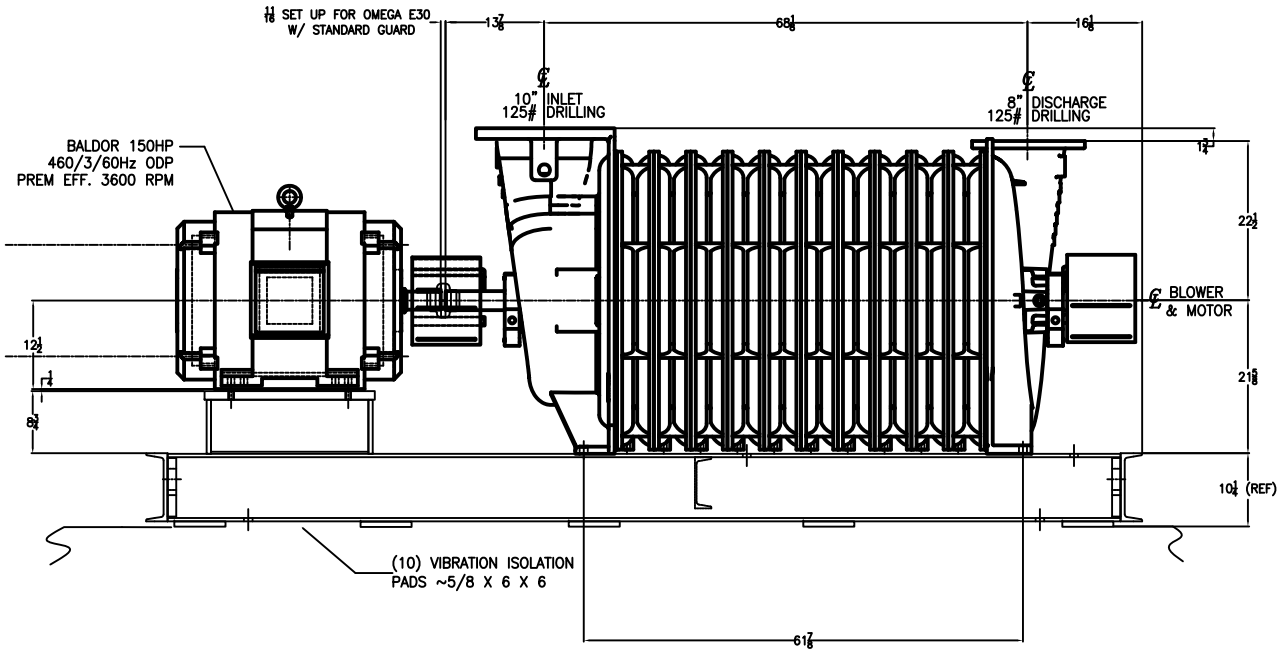
1) DRILL/TAP BEARING HOUSING TO 1/2" NPS
2) PROVIDE LIFTING LUGS
3) BALANCE DRUM W/ RETURN LINE REQUIRED
4) NO EXTERNAL DRAINS REQUIRED
5) UNWITNESSED PTC-10 PERFORMANCE TEST REQUIRED
6) START UP (2) TRIPS (1) DAY EACH
7) FREIGHT TO JOBSITE INCLUDED

SECTION 2

GA DRAWINGS

SPECIFICATIONS

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
0			



NOTES:

1) APPLICATION: AIR
2) LUBE: OIL
3) IMPELLER MIX: (7) 5013, (3) 5014, (1) 5011
4) INTERNAL COATING: NONE
5) EXTERNAL COATING: HSI STANDARD GRAY
6) DRAINS: NONE
7) OPERATING SPEED: 3,550 RPM
8) LIFTING LUGS: YES
9) DRILL & TAP BEARING ½" NPS

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES
TOLERANCES
FINAL OUTSIDE DIM. WHEN MEASURED FROM OPP. OUTSIDE DIM. ±(1/8)
ELEVATIONS IN REF. TO ANY OTHER ELEVATION ±(1/16)
TILTS IN BEAM FLANGE, WEB, OR SURFACE ±(1/2 DEG.) BUT NOT TO EXCEED 1/8in.
BOLT HOLE ORIENTAION ±(1/16)

THIRD ANGLE PROJECTION

MATERIAL:

DRAWN BY	BF	06/27/2012
CHECK'D BY		

HOUSTON SERVICE INDUSTRIES
7901 HANSEN, HOUSTON, TX 77061

TITLE
HSI 088 SERIES (SIDE VIEW)
11 STAGE BLOWER ASSEMBLY

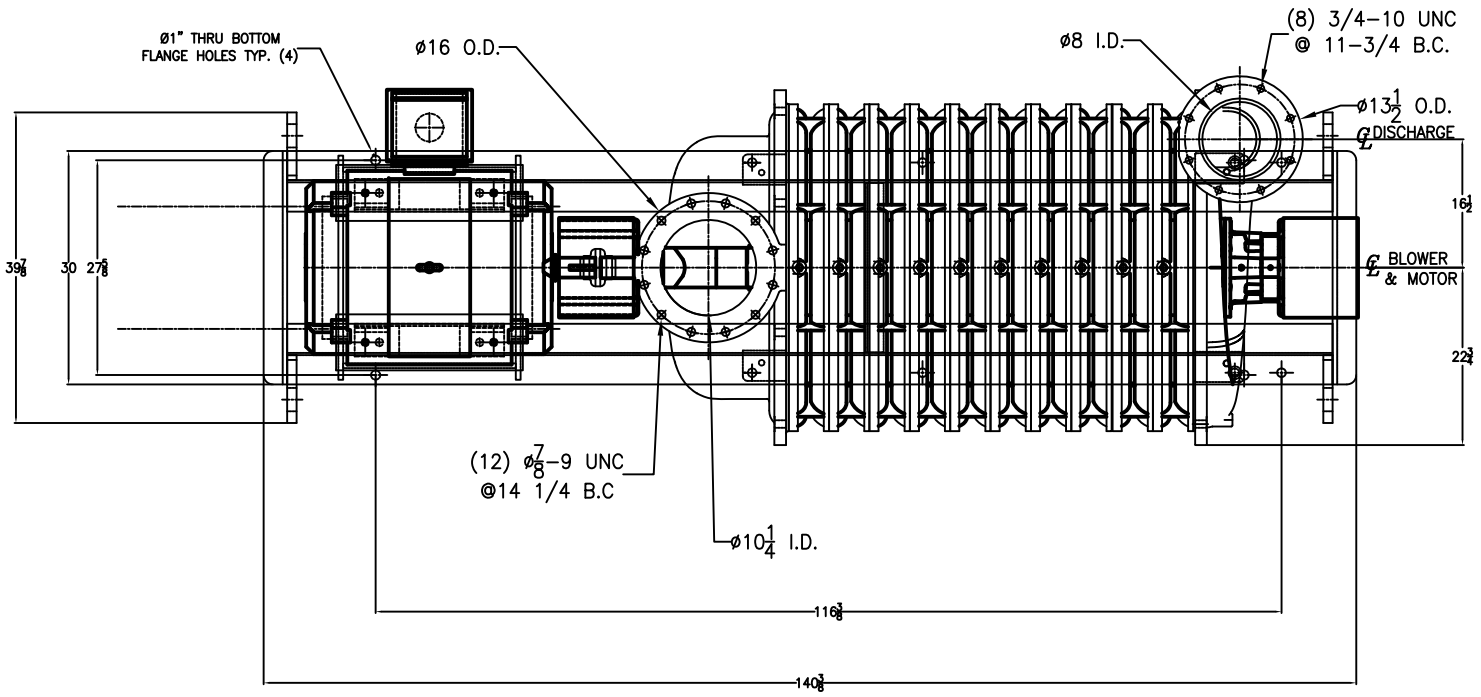
SIZE	REF.	PRT. NO./DWG. NO.	REV
B		W034756-001	0

SCALE: NONE | DO NOT SCALE DRAWING | SHEET: 1 OF 2

AUTOCAD 2000i

WEAVER CONSTRUCTION W034756-001

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED



TOTAL ASSEMBLY WEIGHT	
BLOWER	6060
MOTOR	1060
SKID	539
MOTOR BASE	149
COUPLING	21.2
TOTAL WEIGHT	7829.2

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES
TOLERANCES
FINAL OUTSIDE DIM. WHEN MEASURED FROM OPP. OUTSIDE DIM. ±(1/8)
ELEVATIONS IN REF. TO ANY OTHER ELEVATION ±(1/16)
TILTS IN BEAM FLANGE, WEB, OR SURFACE ±(1/2 DEG.)
BUT NOT TO EXCEED 1/8in.
BOLT HOLE ORIENTAION ±(1/16)
THIRD ANGLE PROJECTION

MATERIAL:

DRAWN BY	BF	06/27/2012
CHECK'D BY		
REVISION BY		

HOUSTON SERVICE INDUSTRIES
7901 HANSEN, HOUSTON, TX 77061

TITLE
HSI 088 SERIES (TOP VIEW)
11 STAGE BLOWER ASSEMBLY

SIZE	REF.	PRT. NO./DWG. NO.	REV
B		W034756-001	0

SCALE: NONE | DO NOT SCALE DRAWING | SHEET: 2 OF 2

WINDOWS XP PRO
AUTOCAD 2008

WEAVER CONSTRUCTION W034756-001

SECTION 3

MULTISTAGE CENTRIFUGAL BLOWERS

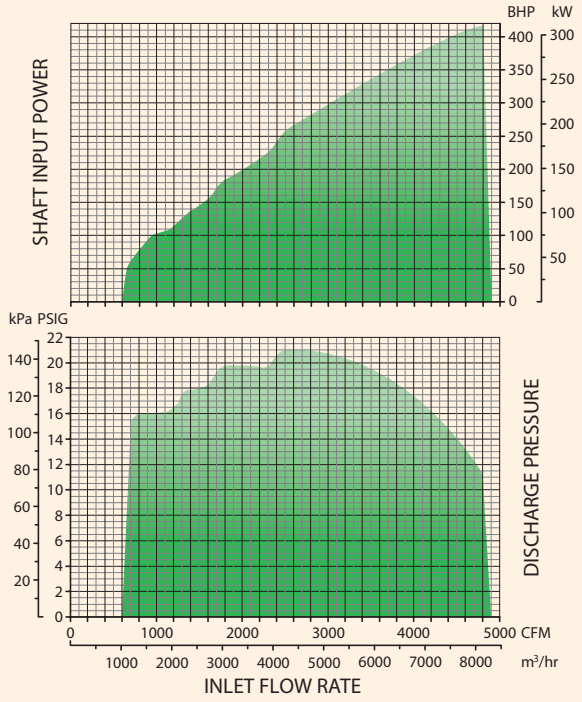
SPECIFICATIONS

Model 88

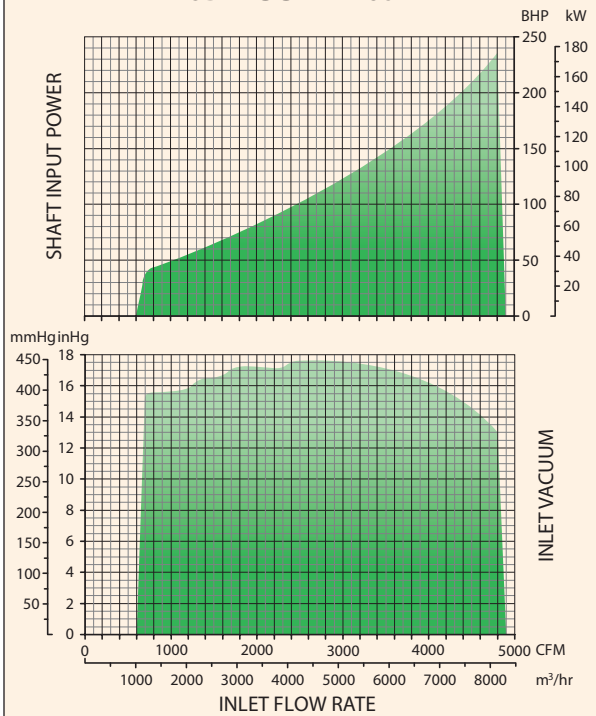
HSI MULTISTAGE CENTRIFUGAL BLOWERS

General Performance

MODEL 88 BLOWER



MODEL 88 EXHAUSTER



Specifications Standard

TECHNICAL DATA

Number of Stages ..... 1 to 11

Inlet Connection ..... 10" (254 mm) flange, ASA 125# / ANSI 150# drilling

Outlet Connection ..... 8" (203.2 mm) flange, ASA 125# / ANSI 150# drilling

Operating Speed ..... Variable or fixed speed
3550 RPM (60 Hz), 2960 RPM (50 Hz)

Casing Pressure (max.) ..... 30 PSIG (1 bar)

Seals (air) ..... Labyrinth type

Seals (gas) ..... OPTi Seal/ Stuffing box type/ Carbon ring type/ Custom available

Bearings ..... Ball, 10-year minimum life per AFBMA L_{10} standard

Lubrication ..... Oil or grease

Impeller Diameter ..... 24.00 in (609.6 mm)

Impeller Tip Speed ..... 372 ft/s (113 m/s) @ 3550 RPM

First Critical Speed ..... 4470 RPM (11-stage)

Drive Type ..... Direct coupled, Belt driven Inlet driven (standard) or Outlet driven, V-Belt or Gear driven

Shaft End ..... 2.25 in (57 mm) diameter at coupling

Vibration Tolerence ..... .25 in/s (6.4 mm/s) ISO overall specification, 1.25 mils (0.03 mm) peak to peak

Rotor Balance ..... Military standard 167-1. Individual impellers and rotating assembly dynamically balanced

MATERIALS OF CONSTRUCTION

Casing ..... Cast iron ASTM A48 grade 30

Bearing Caps & Housings... Cast iron ASTM A48 grade 30

Oil Reservoir ..... Cast iron ASTM A48 grade 30

Shaft ..... Carbon steel AISI 4140 (stainless steel available)

Impellers ..... Cast aluminum ANSI AA319/356 or fabricated aluminum ANSI AA6061 with cast Al AA356 hub stainless steel/custom alloys available

Seals (air) ..... Cast iron ASTM 48 grade 30 with lead babbitt insert Zinc-Alloy, ZA-14

Seals (gas) ..... Consult Factory

Interstage Baffle Rings..... Stainless steel ASTM A240 304

Tie Rods ..... .75 in (19.1 mm) diameter, high strength steel ASTM A193-B7/B7M available

Blower Base ..... Welded structural steel ASTM A36 ASME/AWS D1.1 WPS's available

Motor Pedestal ..... Welded steel plate ASTM A36

Joint Sealing Compound.... RTV silicone

Base Isolation Pads ..... Neoprene rubber

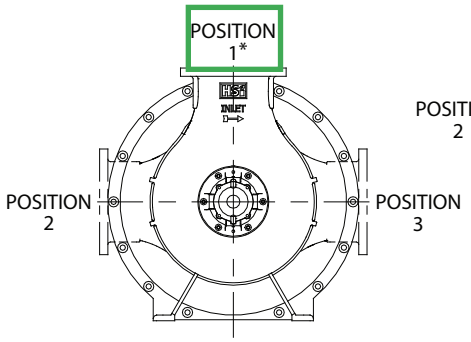
Finish ..... HSI standard

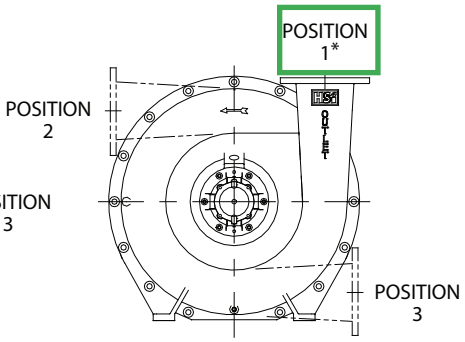
Curves are based on atmospheric conditions of 1 Atm, 68F/20C, 36% RH, and 3550 rpm

MODEL 88 MULTISTAGE CENTRIFUGAL BLOWER

Inlet and Outlet Orientation Options

The orientation of the inlet and outlet is selectable from any of three different positions, as viewed when facing the exterior of the part:





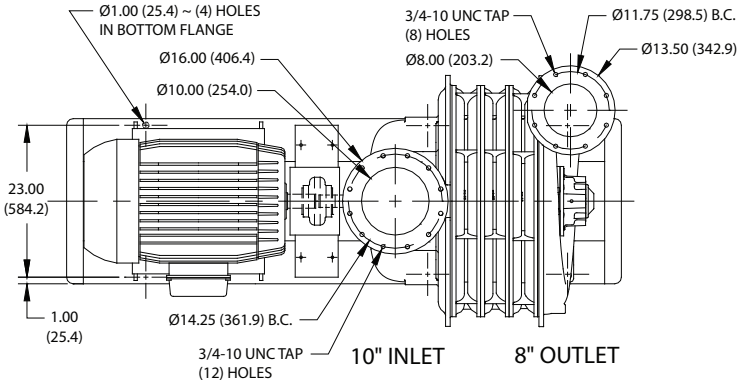
*Standard configuration.

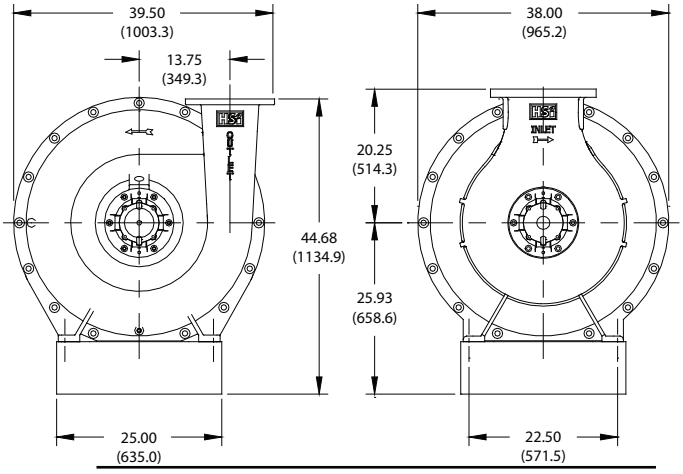
Weight and Inertia

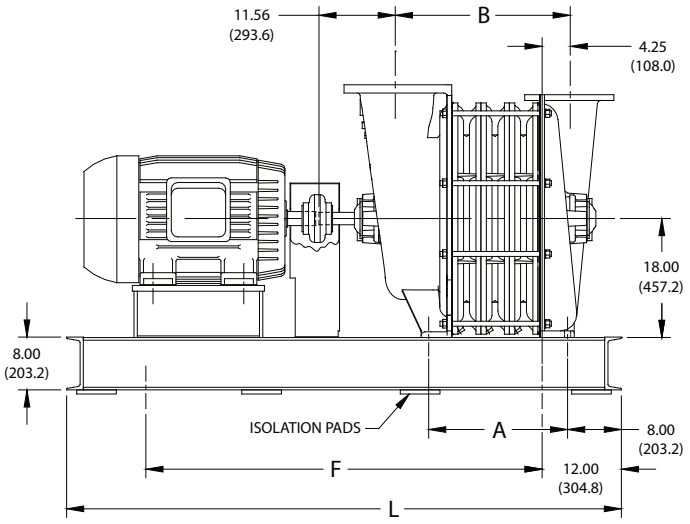
Model	Weight* lb	Weight* kg	Wk^2 lb-ft^2	Wk^2 kg-m^2
8801	1400	635	11	0.48
8802	1800	816	23	0.96
8803	2140	971	34	1.44
8804	2530	1148	45	1.92
8805	2990	1356	57	2.40
8806	3350	1520	68	2.88
8807	3710	1683	79	3.36
8808	4140	1878	91	3.84
8809	4550	2064	102	4.32
8810	5000	2268	113	4.80
8811	6060	2749	125	5.28

*Approximate weight for blower only.

General Arrangement







Dimensions*

Model	A	B
8801	8.25 (210)	13.25 (337)
8802	12.56 (319)	17.56 (446)
8803	16.88 (429)	21.88 (556)
8804	21.19 (538)	26.18 (665)
8805	25.50 (648)	30.50 (775)
8806	29.81 (757)	34.81 (884)
8807	34.12 (867)	39.13 (994)
8808	38.44 (976)	43.44 (1103)
8809	42.75 (1086)	47.75 (1213)
8810	47.06 (1195)	52.06 (1322)
8811	51.38 (1305)	56.38 (1432)

*Dimensions in inches and (millimeters) and are approximate. Do not use for construction purposes.

†Dimension may vary depending on motor frame size.

HSI MULTISTAGE CENTRIFUGAL BLOWERS

Houston Service Industries, Inc.
7901 Hansen Rd., Houston, Texas 77061
713-947-1623
800-725-2291
Fax: 713-947-6409
www.houserv.com
hsi@hsiblowers.com

E-TS-088-001, REV 03-06/12

SECTION 4

BLOWER PREDICTED CURVE

Maximize® Blower/Exhauster Design Datasheet

Datasheet No.: 53964
Design Date : 4/19/2012
Quote/Job No.:
Prepared By : corth

Customer

Fluid Equipment

Project

Fountain, CO- Activated Sludge Winter

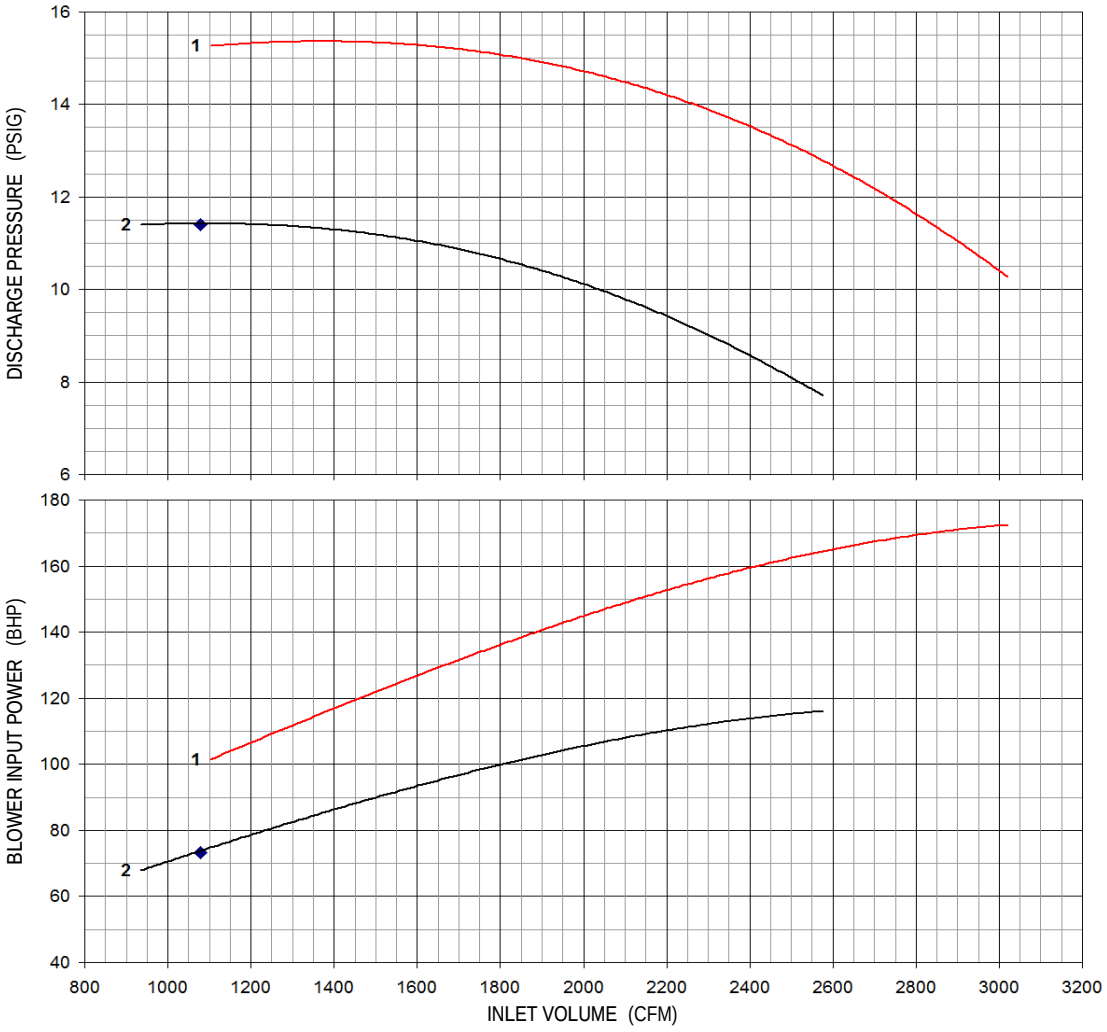
Site Data

Elevation: 5415 ft a.s.l.

Gas Data

MW: 28.966 RH: 0.0%
k : 1.3979 Cp: 0.2410

Gas	Pct
Air (dry)	100.00



Predicted Curve Data

			1. Primary Curve	2. Auto Speed
BLOWER	Model		HSI 8811	HSI 8811
	Configuration			
	Impeller 1		(7) 5013	(7) 5013
	Impeller 2		(3) 5014	(3) 5014
	Impeller 3		(1) 5011	(1) 5011
	Driver			
	Control Method			
CONDITIONS	Op. Speed	[RPM]	3,550	3,154
	Inlet Throttling	[valve/%closed]	none	none
	Bar. Pressure	[PSIA]	12.039	12.039
	Inlet Pressure	[PSIA]	11.839	11.839
	Inlet Temp.	[°F]	25.00	25.00
	Inlet Humidity	[% RH]	50.0	50.0
	MW / k / Cp		28.925/1.398/0.2415	28.925/1.398/0.2415
PERFORMANCE	Volume (Std.)	[SCFM@68F]		950.0
	Volume (Inlet)	[CFM]		1079.2
	Disch. Pressure	[PSIG]		11.40
	Diff. Pressure	[PSI]		11.60
	Power (Shaft)	[BHP]		73.20
	Efficiency	[%]		57.48
	Disch. Temp.	[°F]		206.16
	Pressure Rise	[PSI]		0.00
	Turndown	[%]		13.37
SURGE	Surge Pressure	[PSIG]	15.27	11.40
	Surge Volume	[CFM]	1102.5	934.9

Maximize® Blower/Exhauster Design Datasheet

Datasheet No.: 53963
Design Date : 4/19/2012
Quote/Job No.:
Prepared By : corth

Customer

Fluid Equipment

Project

Fountain, CO- Activated Sludge Spring/Fall Low

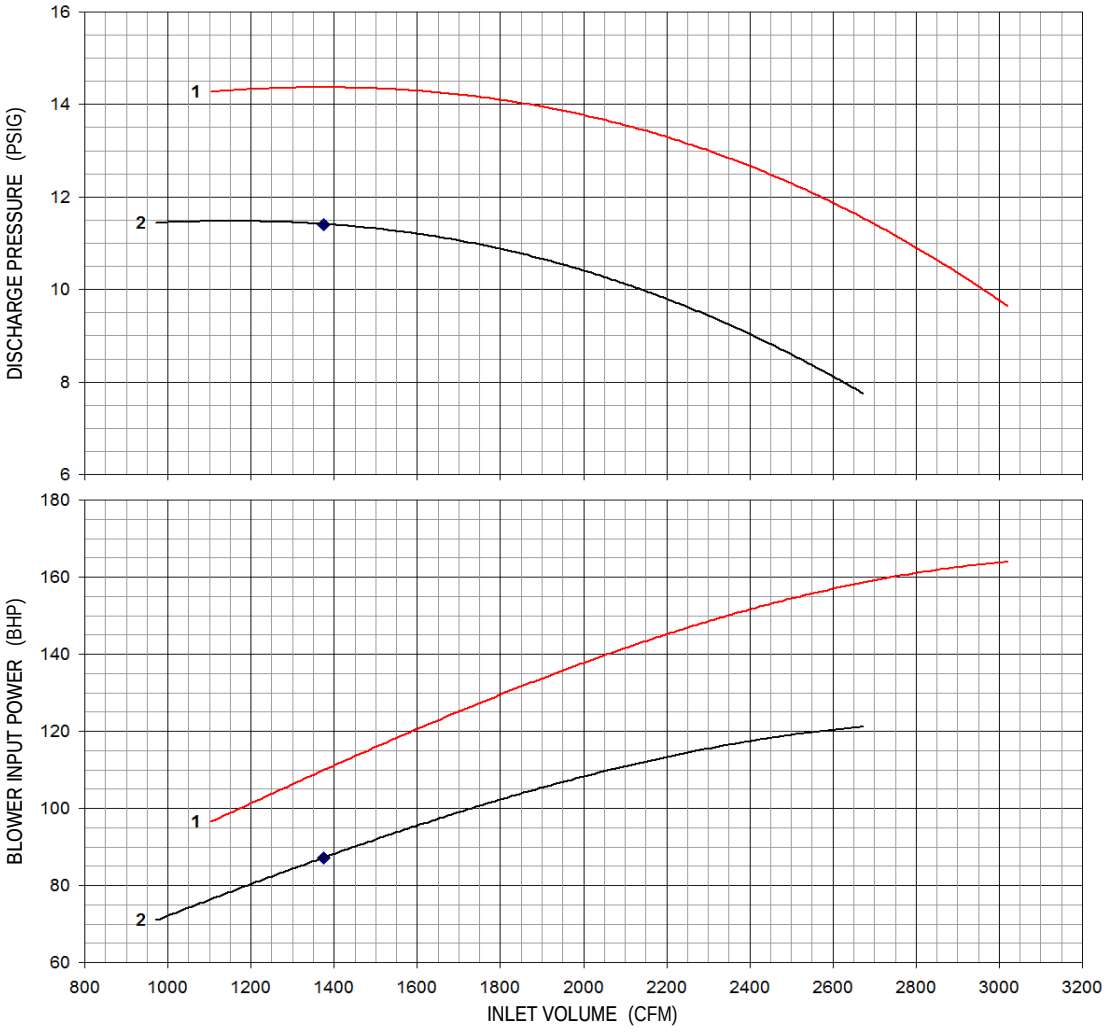
Site Data

Elevation: 5415 ft a.s.l.

Gas Data

MW: 28.966 RH: 0.0%
k : 1.3979 Cp: 0.2410

Gas	Pct
Air (dry)	100.00



Predicted Curve Data

			1. Primary Curve	2. Auto Speed
BLOWER	Model		HSI 8811	HSI 8811
	Configuration			
	Impeller 1		(7) 5013	(7) 5013
	Impeller 2		(3) 5014	(3) 5014
	Impeller 3		(1) 5011	(1) 5011
	Driver			
	Control Method			
CONDITIONS	Op. Speed	[RPM]	3,550	3,244
	Inlet Throttling	[valve/%closed]	none	none
	Bar. Pressure	[PSIA]	12.039	12.039
	Inlet Pressure	[PSIA]	11.839	11.839
	Inlet Temp.	[°F]	50.00	50.00
	Inlet Humidity	[% RH]	30.0	30.0
	MW / k / Cp		28.917/1.398/0.2416	28.917/1.398/0.2416
PERFORMANCE	Volume (Std.)	[SCFM@68F]		1150.0
	Volume (Inlet)	[CFM]		1374.7
	Disch. Pressure	[PSIG]		11.40
	Diff. Pressure	[PSI]		11.60
	Power (Shaft)	[BHP]		87.08
	Efficiency	[%]		61.55
	Disch. Temp.	[°F]		227.89
	Pressure Rise	[PSI]		0.04
	Turndown	[%]		29.33
SURGE	Surge Pressure	[PSIG]	14.28	11.44
	Surge Volume	[CFM]	1102.5	971.5

Maximize® Blower/Exhauster Design Datasheet

Datasheet No.: 53962
Design Date : 4/19/2012
Quote/Job No.:
Prepared By : corth

Customer

Fluid Equipment

Project

Fountain, CO- Activated Sludge Spring/Fall High

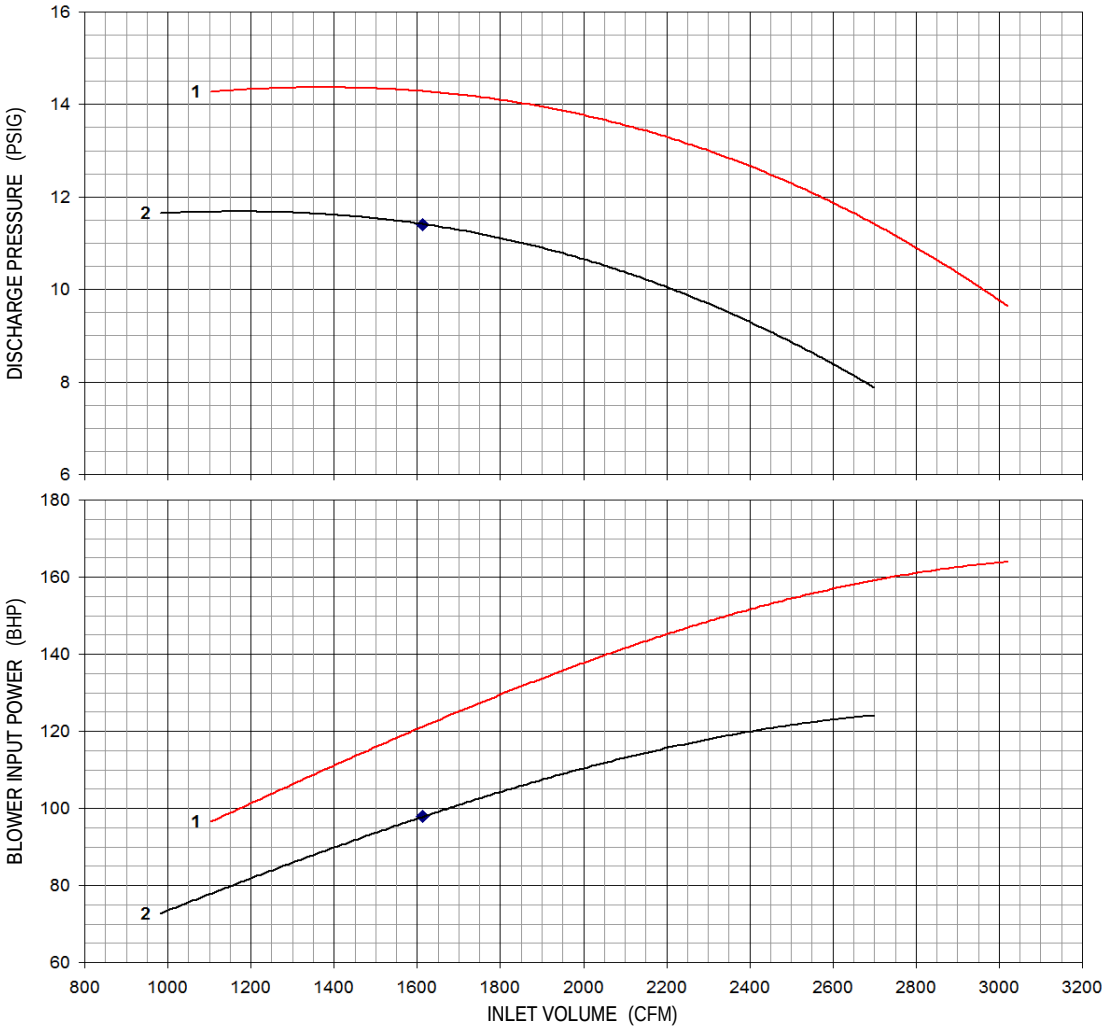
Site Data

Elevation: 5415 ft a.s.l.

Gas Data

MW: 28.966 RH: 0.0%
k : 1.3979 Cp: 0.2410

Gas	Pct
Air (dry)	100.00



Predicted Curve Data

			1. Primary Curve	2. Auto Speed
BLOWER	Model		HSI 8811	HSI 8811
	Configuration			
	Impeller 1		(7) 5013	(7) 5013
	Impeller 2		(3) 5014	(3) 5014
	Impeller 3		(1) 5011	(1) 5011
	Driver			
	Control Method			
CONDITIONS	Op. Speed	[RPM]	3,550	3,267
	Inlet Throttling	[valve/%closed]	none	none
	Bar. Pressure	[PSIA]	12.039	12.039
	Inlet Pressure	[PSIA]	11.839	11.839
	Inlet Temp.	[°F]	50.00	50.00
	Inlet Humidity	[% RH]	30.0	30.0
	MW / k / Cp		28.917/1.398/0.2416	28.917/1.398/0.2416
PERFORMANCE	Volume (Std.)	[SCFM@68F]		1350.0
	Volume (Inlet)	[CFM]		1613.8
	Disch. Pressure	[PSIG]		11.40
	Diff. Pressure	[PSI]		11.60
	Power (Shaft)	[BHP]		97.91
	Efficiency	[%]		64.25
	Disch. Temp.	[°F]		220.39
	Pressure Rise	[PSI]		0.24
	Turndown	[%]		39.20
SURGE	Surge Pressure	[PSIG]	14.28	11.64
	Surge Volume	[CFM]	1102.5	981.2

Maximize® Blower/Exhauster Design Datasheet

Datasheet No.: 53965
Design Date : 4/19/2012
Quote/Job No.:
Prepared By : corth

Customer

Fluid Equipment

Project

Fountain, CO- Activated Sludge Summer

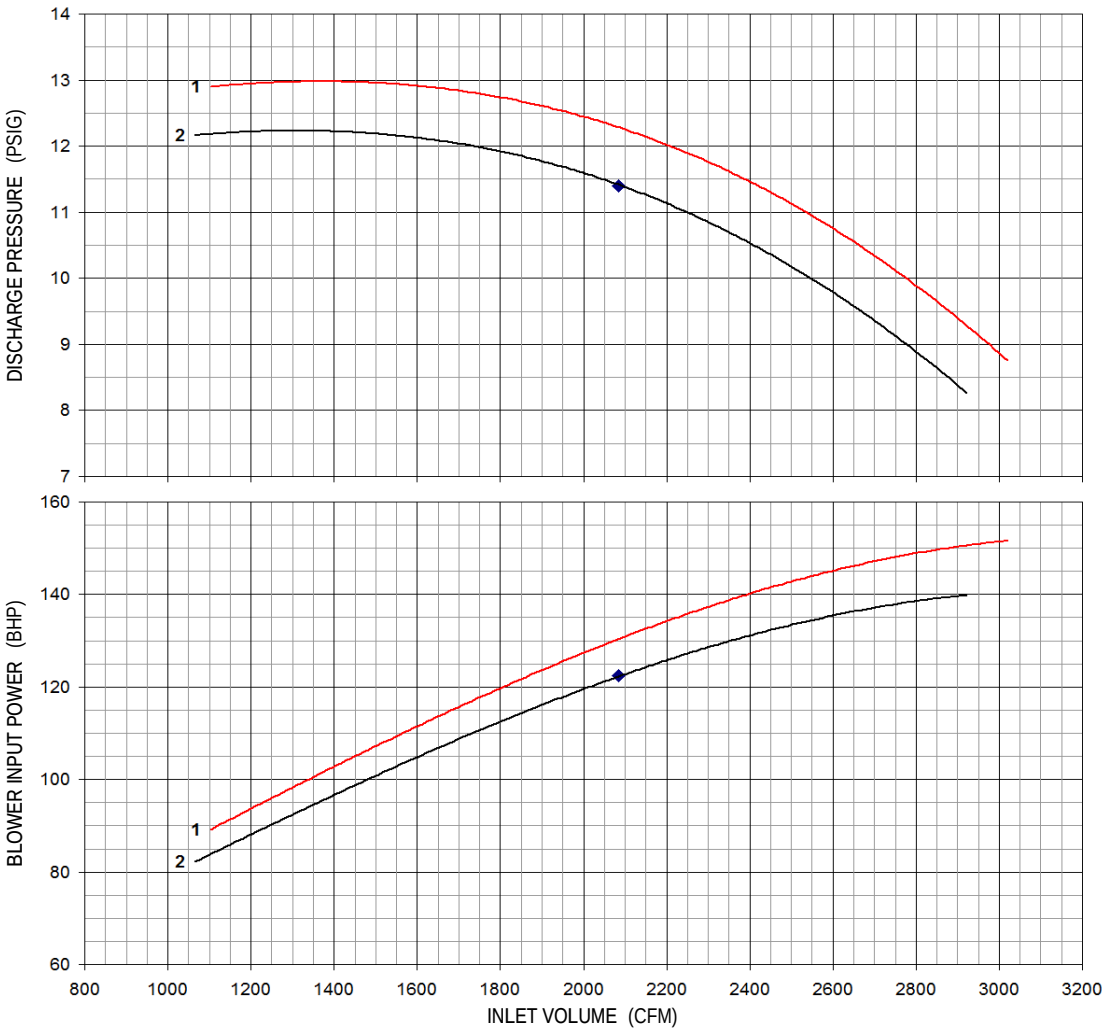
Site Data

Elevation: 5415 ft a.s.l.

Gas Data

MW: 28.966 RH: 0.0%
k : 1.3979 Cp: 0.2410

Gas	Pct
Air (dry)	100.00



Predicted Curve Data

			1. Primary Curve	2. Auto Speed
BLOWER	Model		HSI 8811	HSI 8811
	Configuration			
	Impeller 1		(7) 5013	(7) 5013
	Impeller 2		(3) 5014	(3) 5014
	Impeller 3		(1) 5011	(1) 5011
	Driver			
	Control Method			
CONDITIONS	Op. Speed	[RPM]	3,550	3,466
	Inlet Throttling	[valve/%closed]	none	none
	Bar. Pressure	[PSIA]	12.039	12.039
	Inlet Pressure	[PSIA]	11.839	11.839
	Inlet Temp.	[°F]	85.00	85.00
	Inlet Humidity	[% RH]	70.0	70.0
	MW / k / Cp		28.576/1.395/0.2456	28.576/1.395/0.2456
PERFORMANCE	Volume (Std.)	[SCFM@68F]		1588.0
	Volume (Inlet)	[CFM]		2084.9
	Disch. Pressure	[PSIG]		11.40
	Diff. Pressure	[PSI]		11.60
	Power (Shaft)	[BHP]		122.39
	Efficiency	[%]		66.37
	Disch. Temp.	[°F]		260.37
	Pressure Rise	[PSI]		0.77
	Turndown	[%]		48.89
SURGE	Surge Pressure	[PSIG]	12.90	12.17
	Surge Volume	[CFM]	1102.5	1065.6

Maximize® Blower/Exhauster Design Datasheet

Datasheet No.: 53961
Design Date : 4/19/2012
Quote/Job No.:
Prepared By : corth

Customer

Fluid Equipment

Project

Fountain, CO- Activated Sludge Max Flow, Max Temp

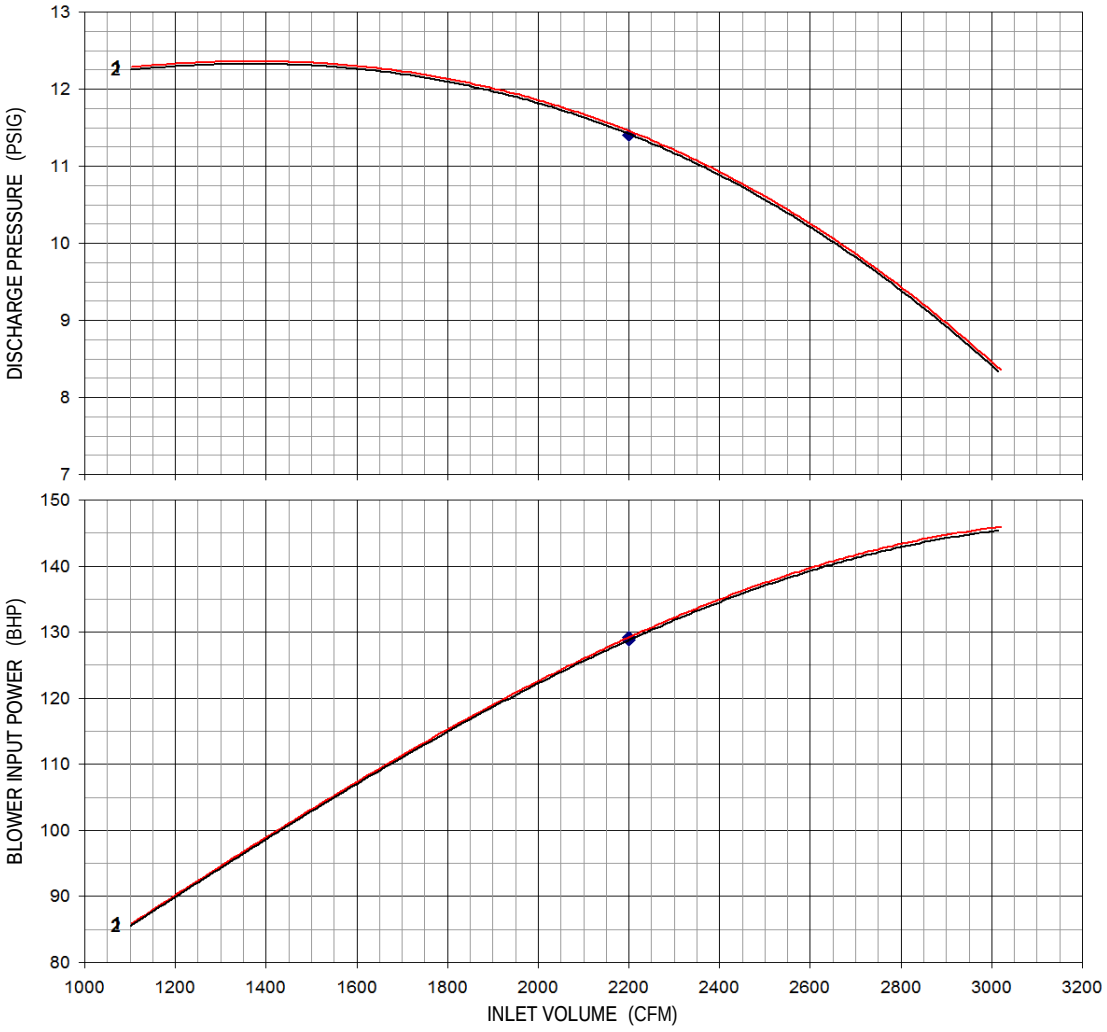
Site Data

Elevation: 5415 ft a.s.l.

Gas Data

MW: 28.966 RH: 0.0%
k : 1.3979 Cp: 0.2410

Gas	Pct
Air (dry)	100.00



Predicted Curve Data

			1. Primary Curve	2. Auto Speed
BLOWER	Model		HSI 8811	HSI 8811
	Configuration			
	Impeller 1		(7) 5013	(7) 5013
	Impeller 2		(3) 5014	(3) 5014
	Impeller 3		(1) 5011	(1) 5011
	Driver			
	Control Method			
CONDITIONS	Op. Speed	[RPM]	3,550	3,546
	Inlet Throttling	[valve/%closed]	none	none
	Bar. Pressure	[PSIA]	12.039	12.039
	Inlet Pressure	[PSIA]	11.839	11.839
	Inlet Temp.	[°F]	100.00	100.00
	Inlet Humidity	[% RH]	80.0	80.0
	MW / k / Cp		28.263/1.393/0.2494	28.263/1.393/0.2494
PERFORMANCE	Volume (Std.)	[SCFM@68F]	1588.0	1588.0
	Volume (Inlet)	[CFM]	2199.0	2199.0
	Disch. Pressure	[PSIG]	11.40	11.40
	Diff. Pressure	[PSI]	11.60	11.60
	Power (Shaft)	[BHP]	129.24	128.85
	Efficiency	[%]	66.47	66.49
	Disch. Temp.	[°F]	279.65	279.11
	Pressure Rise	[PSI]	0.88	0.85
	Turndown	[%]	49.86	49.94
SURGE	Surge Pressure	[PSIG]	12.28	12.25
	Surge Volume	[CFM]	1102.5	1100.7

SECTION 5

MOTOR

SPECIFICATIONS

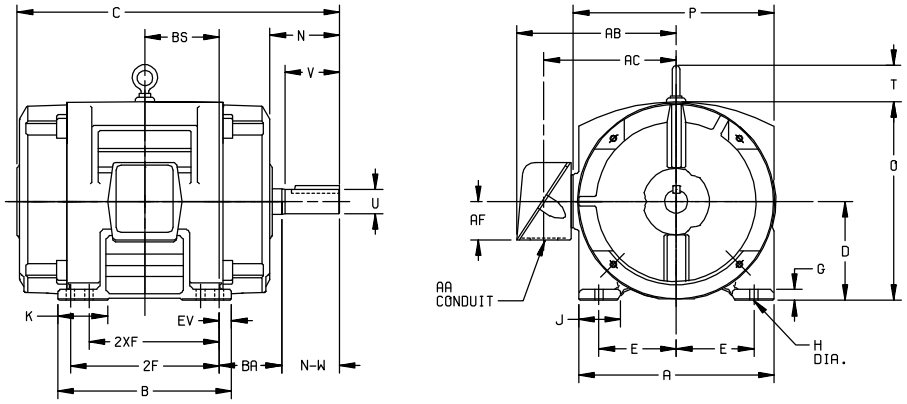
DUTY MASTER ALTERNATING CURRENT MOTORS

SQUIRREL–CAGE INDUCTION

ENCLOSURE: PROTECTED
MOUNTING: FOOT

COOLING: SELF–VENTILATED

FRAMES 250T THRU 440T



DIMENSIONS ARE IN INCHES

FRAME	A	D(2)	E	G	H	J	K	O	P	T	STEEL TERMINAL BOX AA	AB	AC	AF	BA	EV
254T–256T	12.50	6.25	5.00	.69	.56	2.25	3.50	12.61	12.69	2.44	1–1/4	10.19	8.19	2.50	4.25	.62
284T–286TS	14.00	7.00	5.50	.75	.56	2.75	3.75	14.12	14.31	2.44	1–1/2	12.19	9.44	3.19	4.75	1.00
324T–326TS	15.75	8.00	6.25	.88	.69	3.12	4.00	16.10	16.42	2.44	2	14.25	10.75	4.25	5.25	1.00
364T–365TS	17.00	9.00	7.00	.88	.69	3.00	3.62	18.30	19.56	2.94	3	18.06	14.00	5.38	5.88	1.00
404T–405TS	19.00	10.00	8.00	1.12	.81	3.25	4.75	20.56	21.81	2.94	3	19.06	15.00	4.38	6.62	1.12
444T–445TS	21.00	11.00	9.00	1.12	.81	3.25	5.25	22.91	23.62	3.25	3	22.62	17.38	5.50	7.50	1.25
(1)																

FRAME SIZE	C	BS	B	2F	(4) 2XF	N	SHAFT AND KEY N–W(6)	U(3)	V	SQ.	LGTH.	WEIGHT LBS. (5)
254T	22.44	5.00	11.25	---	8.25	4.25	4.00	1.625	3.75	.375	2.75	265
256T	22.44	5.00	11.25	10.00	---	4.25	4.00	1.625	3.75	.375	2.75	275
284T	24.94	5.50	13.00	---	9.50	4.88	4.62	1.875	4.38	.500	3.25	340
284TS	23.56	5.50	13.00	---	9.50	3.50	3.25	1.625	3.00	.375	1.88	340
286T	24.94	5.50	13.00	11.00	---	4.88	4.62	1.875	4.38	.500	3.25	370
286TS	23.56	5.50	13.00	11.00	---	3.50	3.25	1.625	3.00	.375	1.88	370
324T	27.56	6.00	14.00	---	10.50	5.50	5.25	2.125	5.00	.500	3.75	465
324TS	26.06	6.00	14.00	---	10.50	4.00	3.75	1.875	3.50	.500	2.00	465
326T	27.56	6.00	14.00	12.00	---	5.50	5.25	2.125	5.00	.500	3.75	505
326TS	26.06	6.00	14.00	12.00	---	4.00	3.75	1.875	3.50	.500	2.00	505
364T	29.70	6.12	14.25	---	11.25	6.12	5.88	2.375	5.62	.625	4.25	715
364TS	27.58	6.12	14.25	---	11.25	4.00	3.75	1.875	3.50	.500	2.00	710
365T	29.70	6.12	14.25	12.25	---	6.12	5.88	2.375	5.62	.625	4.25	755
365TS	27.58	6.12	14.25	12.25	---	4.00	3.75	1.875	3.50	.500	2.00	750
404T	34.00	6.88	16.00	---	12.25	7.62	7.25	2.875	7.00	.750	5.50	1025
404TS	31.00	6.88	16.00	---	12.25	4.62	4.25	2.125	4.00	.500	2.75	1020
405T	34.00	6.88	16.00	13.75	---	7.62	7.25	2.875	7.00	.750	5.50	1065
405TS	31.00	6.88	16.00	13.75	---	4.62	4.25	2.125	4.00	.500	2.75	1060
444T	39.56	8.25	19.00	---	14.50	8.94	8.50	3.375	8.25	.875	6.88	1715
444TS	35.81	8.25	19.00	---	14.50	5.19	4.75	2.375	4.50	.625	3.00	1710
445T	39.56	8.25	19.00	16.50	---	8.94	8.50	3.375	8.25	.875	6.88	1755
445TS	35.81	8.25	19.00	16.50	---	5.19	4.75	2.375	4.50	.625	3.00	1750
(1)												

(1) SPECIAL DIMENSIONS APPLYING TO THIS ORDER ON THIS LINE.

(2) "D" VARIES — 250T – 320T +.00, –.03.
360T – 440T +.00, –.06.

(3) "U" VARIES +.000, –.001

(4) ALL FRAMES HAVE EIGHT MOUNTING HOLES FOR DUAL MOUNTING.

(5) MOTOR WEIGHTS MAY VARY BY 15% DEPENDING UPON RATING.

(6) "N–W" VARIES +.00, –.25.

CONDUIT BOX LOCATED ON OPPOSITE SIDE WHEN F–2,W–1, W–4,W–5,W–7, OR C–1 MOUNTING IS SPECIFIED.

IF MOUNTING CLEARANCE DETAILS ARE REQUIRED, CONSULT FACTORY.

MAXIMUM PERMISSIBLE SHAFT RUNOUT WHEN MEASURED AT END OF STD. SHAFT EXTENSION IS .002 T.I.R. UP TO AND INCLUDING 1.625 DIA. AND .003 T.I.R. ABOVE 1.625 TO 5 INCH DIA.

FRAME–_____ TYPE–_____ CERTIFIED FOR– _____

ORDER–_____ ITEM–_____ HP–_____ RPM–_____ PH– _____ HZ _____ VOLTS _____

SALES ORDER– _____ APPROVED BY–_____ DATE _____

CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

REV. DESC: ASSIGNED TO BUSLOAD
REV. LTR: A
FILE: \RAG\00008\297
MTL: –

VERSION: 01
REVISED: 15:03:33 02/02/2009

TDR: 000000489455
BY: RAGZJR

Baldor • Dodge • Reliance

DIM SHT PROT SV FT 250–440T
SH 1 of 1

REL. S.O.	FRAME	HP	TYPE	PHASE/ HERTZ	RPM	VOLTS
	405TS	150	P	3/60	3560	460

AMPS	DUTY	AMB °C/ INSUL.	S.F.	NEMA DESIGN	CODE LETTER	ENCL.
167	CONT	40/B	1.15	B	G	PRXE

E/S	ROTOR	TEST S.O.	TEST DATE	STATOR RES.@25 °C OHMS (BETWEEN LINES)
596937	418142005SE	---	---	.0360

PERFORMANCE

LOAD	HP	AMPERES	RPM	% POWER FACTOR	% EFFICIENCY
NO LOAD	0	44.7	3600	5.22	0
1/4	37.5	60.1	3591	62.8	93.1
2/4	75.0	89.9	3581	81.9	95.4
3/4	112	127	3572	86.8	95.6
4/4	150	167	3561	88.1	95.4
5/4	188	208	3550	88.8	94.9

SPEED TORQUE

	RPM	TORQUE % FULL LOAD	TORQUE LB.-FT.	AMPERES
LOCKED ROTOR	0	215	476	1057
PULL UP	1545	193	428	962
BREAKDOWN	3406	238	527	544
FULL LOAD	3561	100	221	167

AMPERES SHOWN FOR 460. VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE

REMARKS: CALCULATED DATA
XE MOTOR-NEMA NOM. EFF. 95.4%
GUARANTEED MIN. EFF. 95.0%

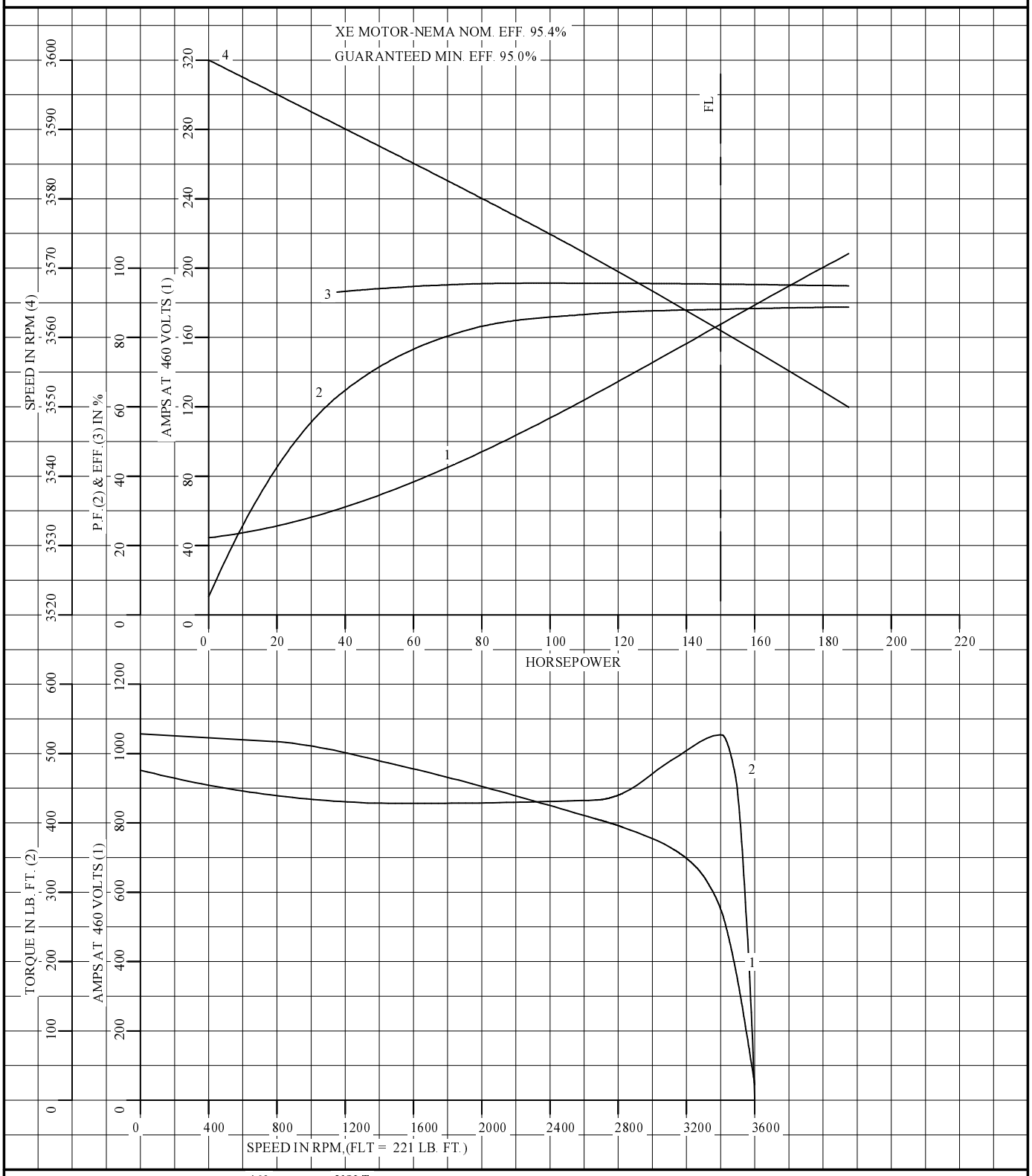
BALDOR · DODGE · RELIANCE

DR. BY W. L. SMITH
CK. BY G. R. WEBB
APP. BY D. M. BYRD
DATE 03/05/02

A-C MOTOR PERFORMANCE DATA

W06399-A-A001
ISSUE DATE 03/05/02

REL S.O.	RPM 3560	S.F. 1.15	ROTOR 418142005SE
FRAME 405TS	VOLTS 460	NEMA DESIGN B	TEST S.O. CALCULATED DATA
HP 150	AMPS 167	CODE LETTER G	TEST DATE ---
TYPE P	DUTY CONT	ENCLOSURE PRXE	STATOR RES.@ 25℃ .0360
PHASE/HERTZ 3/60	AMB℃/INSUL 40/B	E/S 596937	OHMS (BETWEEN LINES)



AMPERES SHOWN FOR 460 VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

BALDOR · DODGE · RELIANCE

DR. BY W. L. SMITH
CK. BY G. R. WEBB
APP. BY D. M. BYRD
DATE 03/05/02

A-C MOTOR PERFORMANCE CURVES

W06399-A-A001

ISSUE DATE 03/05/02

Printed on 11/26/07 12:50 @ usmghengdev1

SECTION 6

ACCESSORIES

SPECIFICATIONS

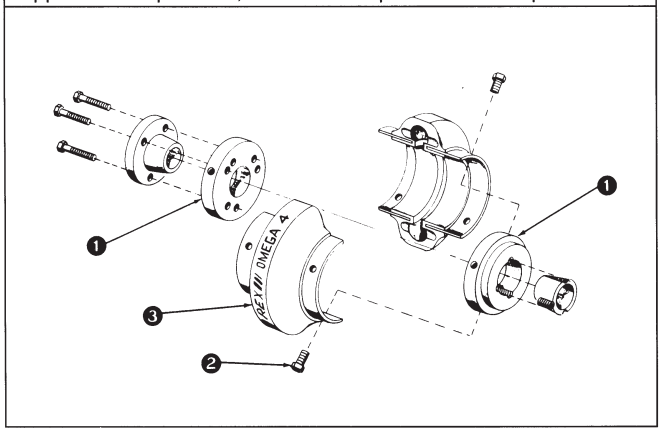
Coupling

REX OMEGA® COUPLINGS
NO OTHER COUPLING CAN OFFER ALL THESE FEATURES & BENEFITS

Features	Benefits
Split-In-Half Flex Element Design	Easy replacement without moving the hubs or connected equipment
Polyurethane Flex Element	No lubrication required, excellent chemical resistance
Torsionally Soft	Protects equipment by cushioning shock loads and torsional vibration
High Misalignment Capacity	Accommodates unavoidable misalignment with low reactionary forces
Visual Inspection	No need for coupling disassembly to inspect
Interchangeable Hubs	Standard and spacer coupling hubs are identical
Adjustable Spacer	One spacer coupling size can accommodate different shaft separations

Rex Omega Standard Coupling

Standard "close coupled" design available in 15 sizes covering applications up to 425,250 in-lbs torque and bores up to 9.00".



❶ **Reversible hubs are available from "stock" with rough bore, finished straight bore, or bored to accept compression bushings. Consult factory for tapered bores, splines and other special bore requirements.**

❷ **Premium grade capscrews with self-locking patches. Also available in stainless steel.**

❸ **Tough, two-piece urethane flex element transmits torque, accepts misalignment, reduces vibration and noise and is not seriously affected by petroleum products or most chemicals.**

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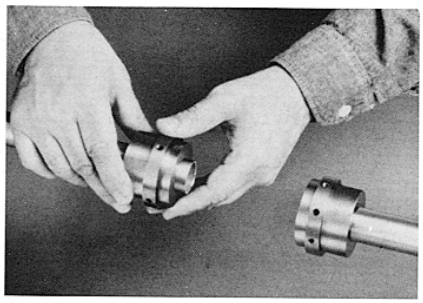
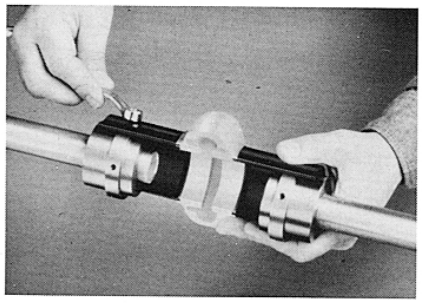
REX OMEGA® COUPLINGS

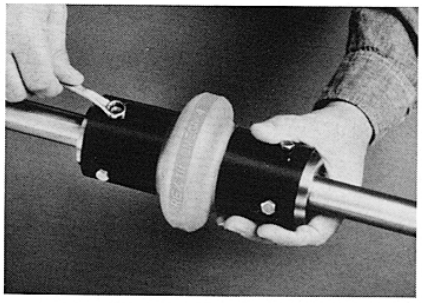
INSTALLATION...AS SIMPLE AS PEELING AN ORANGE



Mount one hub to shaft, leave other hub loose for adjustment of spacing.



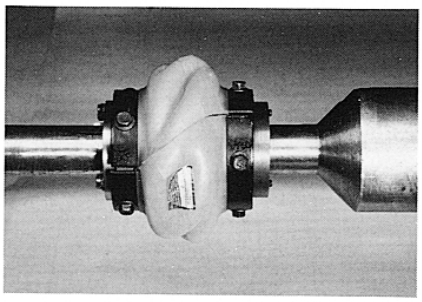
Place half of the Omega element around hubs and secure with self-locking capscrews. Omega element will space the other hub. Now secure the other hub.



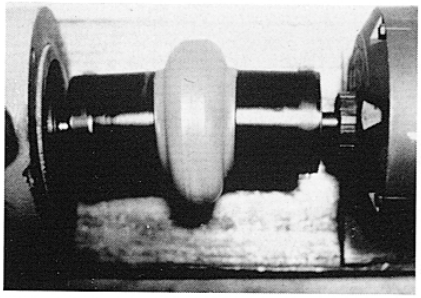
Mount other half of the Omega element. Tighten all capscrews to recommended torques below and you're done! Refer to the installation instructions for further details.

Tested Tough

Rigorous testing demonstrates that the Rex Omega coupling protects connected equipment from the damaging effects of misalignment, vibration, and gross overload. Where other coupling designs might allow equipment damage, the super flexible element of Rex Omega couplings minimizes the reactionary forces on equipment bearings under severe misalignment conditions and reduces the effects of excessive shock overloads.



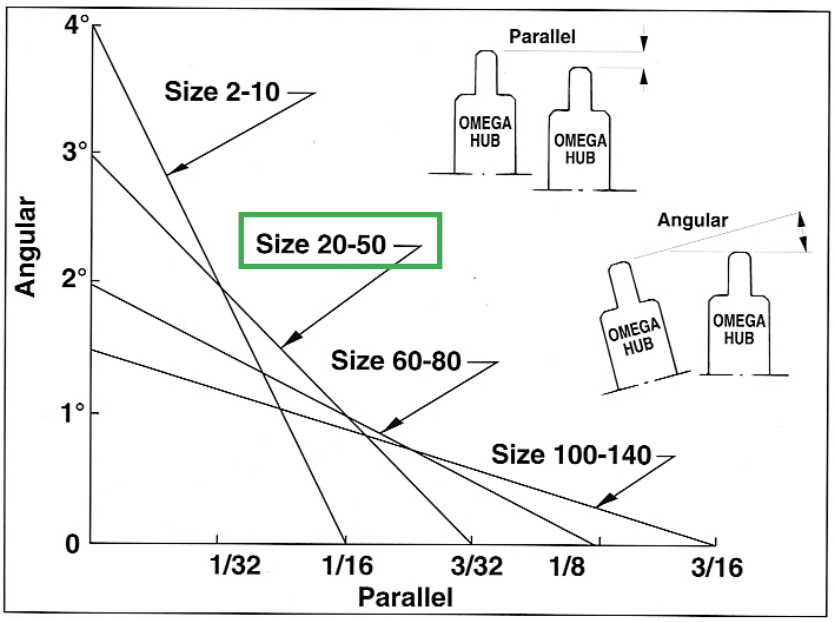
Severe static testing (5 x rating) shows element flexibility, rugged design, and positive adhesive bond to the metal shoes.



Demonstrates coupling's ability to accept severe misalignment.

Omega Coupling

Allowable Misalignment



—IMPORTANT—
RECOMMENDED CAPSCREW TORQUE
FOR PROPER INSTALLATION

Cplg. Size	Torque — Dry	
	In. Lbs.	Ft. Lbs.
2 3 4 5 10	204	17
20 30 40 50	360	30
60 70 80	900	75
100 120	3240	270
140	7080	590

NOTE: Capscrews have self-locking patches which should not be reused more than twice. Capscrews can be further used if a thread locking adhesive is applied.

Do NOT Lubricate Capscrew Threads

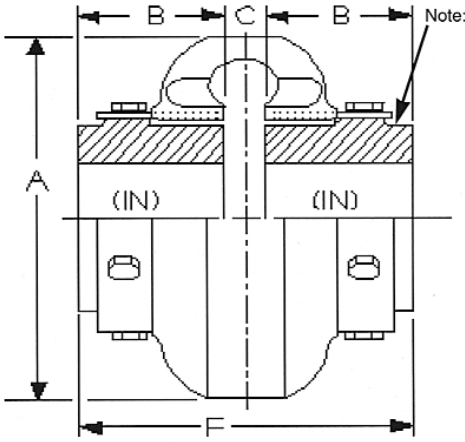
Note:

Any combination of parallel and angular misalignment which falls under the triangle will not cause a premature fatigue failure of the flexible element in normal use.

Important Note:

Coupling alignment is directly related to smooth, efficient equipment operation. Care should be taken for best possible alignment.

OMEGA® STANDARD COUPLING
WITH STRAIGHT BORE HUBS



Note: Hub/shoulder design varies per coupling size. Consult Rexnord for specific size assembly drawings.

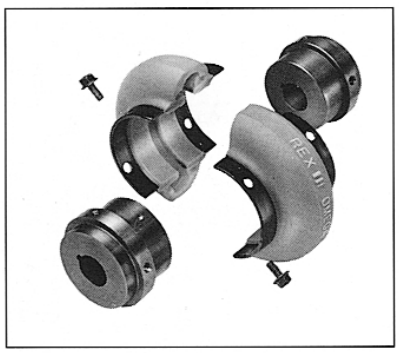
(Hubs Inboard)

Specification Data With Straight Bore Hubs

Standard Omega No.	Recom. Max. Bore (In.) ❶	HP/100 RPM ❷	Continuous Torque (In. Lbs.) ❷	Max. RPM	Dimensions In Inches							Weight (Lb.) ❸
					A	B	C		D	F		
							(In.)	(Out)		(In.)	(Out)	
E2	1.13	.30	190	7500	3.50	.94	1.34	1.90	1.85	3.22	3.78	1.2
E3	1.38	.58	365	7500	4.00	1.50	.81	1.31	2.32	3.81	4.31	2.4
E4	1.63	.88	550	7500	4.56	1.69	.44	1.31	2.60	3.81	4.69	3.0
E5	1.88	1.48	925	7500	5.38	1.75	.81	1.81	3.13	4.31	5.31	5.4
E10	2.13	2.30	1450	7500	6.38	1.88	.56	1.81	3.65	4.31	5.56	8.2
E20	2.38	3.65	2300	6600	7.25	2.06	.50	2.38	4.48	4.62	6.50	13.0
E30	2.88	5.79	3650	5800	8.25	2.31	.56	2.44	5.42	5.19	7.06	21.2
E40	3.38	8.85	5500	5000	9.50	2.50	.56	2.68	6.63	5.56	7.68	35
E50	3.63	12.14	7650	4200	11.00	2.75	.63	3.38	8.13	6.13	8.88	54
E60	4.00	19.84	12,500	3800	12.50	3.25	.69	3.44	8.75	7.19	9.94	72
E70	4.50	35.12	22,125	3600	14.00	3.62	.75	3.75	9.25	8.00	11.00	86
E80	6.00	62.70	39,500	2000	16.00	4.87	.75	5.00	11.25	10.50	14.75	170
E100	6.75	135	85,050	1900	21.00	5.50	1.75	3.75	14.13	12.75	14.75	244
E120	7.50	270	170,100	1800	25.00	6.00	2.25	4.88	17.63	14.24	16.88	425
E140	9.00	540	340,200	1500	30.00	7.00	3.00	5.00	20.88	17.00	19.00	746

❶ Standard hubs. See page E-16 for steel hub maximum bores.
❷ Service factor = 1.0
❸ With maximum bore standard hubs.

- **Split-In-Half Flex Element**
  Allows disassembly and replacement without disturbing hubs or connected equipment.



Straight Bore Hubs

Note: Dimensions subject to change. Certified drawings of ordered material furnished on request.

Filter-Silencer

CARTRIDGE FILTERS AND FILTER-SILENCERS

FOR BLOWERS, COMPRESSORS, AND ENGINES

Outstanding Features

- **Weatherhoods for CCF and CCS sizes 2½ in. through 5 in. are rugged blue ABS composite material that may be painted. All other components are carbon steel construction with a high-quality semi-gloss enamel finish.**
- **Unique design options, combined with the latest manufacturing techniques, ensure optimum performance and long life even under demanding conditions.**
- **Choice of filter only or filter-silencer.**
- **Female pipe thread connections are standard for pipe sizes ½ in. through 3½ in. and optional for pipe sizes 4 in. and 5 in.**
- **Removable lightweight weatherhood (CCS and CCF) or removable top plate (CS and CF) for easy access to the filter element.**
- **Interchangeable element options for desired filtration characteristics in the same housing.**
- **Filter restriction gauges are optional for all units.**

Advanced Design and Testing

- **Our extensive in-house engineering, manufacturing, and testing facilities ensure optimized process, mechanical, and acoustic performance for your application.**

Universal Silencer's cartridge filters and filter-silencers offer high-performance filtration and silencing in a convenient, economical cartridge configuration. Choose from four standard models for pipe sizes ranging from ½ in. to 16 in. and for flow capacities ranging from 15 to 7700 CFM. Three types of filter element media — pleated paper, pleated felt, or wire mesh — are available to suit your application.

The CCF and CF series filters are high-quality air filters without a silencing section. The CCF has a removable weatherhood, and the CF has a removable top plate. Our CCS and CS intake filter-silencers have a built-in silencing section. The CCS features a removable weatherhood, and the CS has a removable top plate for easy access to the filter element.

UNIVERSAL™

UNIVERSAL SILENCER

A FLEETGUARD/NELSON COMPANY

Noise Control and Air Filtration

UNIVERSAL SILENCER

CARTRIDGE AIR FILTERS AND FILTER-SILENCERS

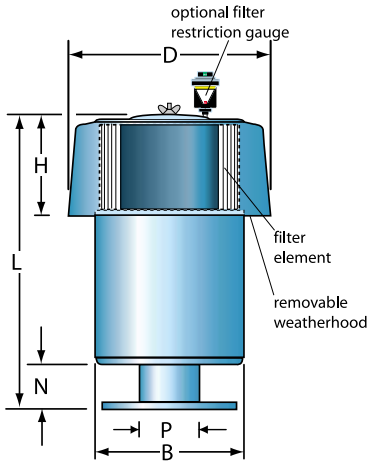
Product Catalog 242-C

SPECIFICATIONS

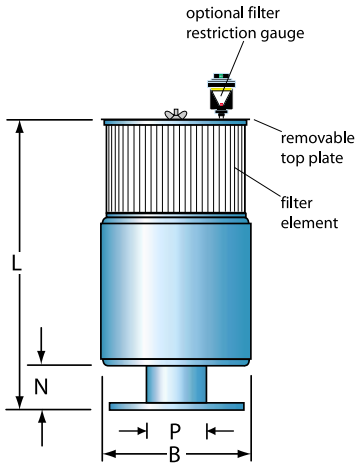
CCS and CS Filter-Silencers

Noise Attenuation, CCS and CS Filter-Silencers

Octave Band Center Frequency, Hz	63	125	250	500	1 k	2 k	4 k	8 k
Attenuation, dB	5	8	10	12	14	14	14	14

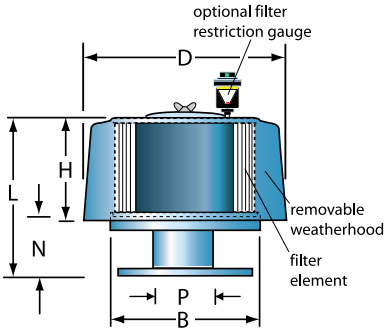


CCS Series (with weatherhood)

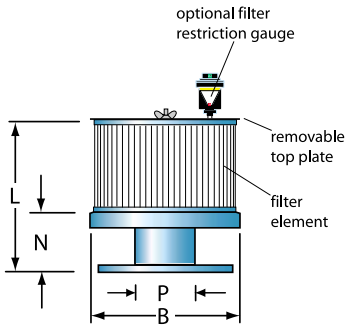


CS Series (with top plate)

CCF and CF Filters



CCF Series (with weatherhood)



CF Series (with top plate)

DIMENSIONS AND WEIGHTS

P (size)	Rated Flow Capacity (CFM)	D	H	B	N				L				Approximate Weight with Paper Elements			
					CCF	CCS	CF	CS	CCF	CCS	CF	CS	CCF	CCS	CF	CS
½	15	8.00	3.13	6.00	Use	—	Use	—	Use	6.50	Use	6.50	Use	7	Use	7
¾	22	8.00	3.13	6.00	CCS	—	CS	—	CCS	6.50	CS	6.50	CCS	7	CS	7
1	35	8.00	3.13	6.00	Series.	—	Series.	—	Series.	6.50	Series.	6.50	Series.	7	Series.	7
1¼	60	9.00	3.50	6.50	—	—	—	—	3.50	7.88	3.50	7.88	9	10	5	9
1½	75	9.00	3.50	6.50	—	—	—	—	3.50	7.88	3.50	7.88	9	10	5	9
2	120	9.00	3.50	6.50	—	—	—	—	3.50	7.88	3.50	7.88	8	10	5	8
2½	190	13.44	6.75	10.00	1.00	1.00	1.00	1.00	7.50	17.69	7.13	17.31	11	19	10	18
3	275	13.44	6.75	10.00	1.00	1.00	1.00	1.00	7.50	17.69	7.13	17.31	10	18	9	17
3½	375	13.44	6.75	10.00	1.13	1.13	1.13	1.13	7.63	17.69	7.25	17.31	13	2012	19	
4 (NPT)	500	13.44	6.75	10.00	1.13	1.13	1.13	1.13	7.63	17.69	7.25	17.31	12	19	11	18
4 (flanged)	500	13.44	6.75	10.00	4.00	3.00	4.00	3.00	10.50	19.63	10.13	19.25	14	21	13	20
5 (NPT)	750	13.44	6.75	10.00	1.81	1.81	1.81	1.81	8.38	18.25	8.00	17.88	12	19	11	18
5 (flanged)	750	13.44	6.75	10.00	4.00	3.00	4.00	3.00	10.50	19.56	10.13	19.13	16	23	15	22
6	1100	18.00	9.50	14.00	4.00	3.00	4.00	3.00	13.31	25.25	12.75	24.75	31	43	23	35
8	2200	18.00	18.00	14.00	4.00	3.00	4.00	3.00	21.88	33.88	21.38	33.38	43	56	30	43
10	3000	24.00	11.50	18.00	4.00	3.00	4.00	3.00	15.38	29.25	14.19	28.13	52	83	41	67
12	4300	24.00	11.50	18.00	4.00	3.00	4.00	3.00	15.38	29.25	14.19	28.13	64	91	48	75
14	5900	30.00	15.44	24.00	4.00	3.00	4.00	3.00	19.38	36.25	18.25	35.06	97	143	75	121
16	7700	30.00	15.44	24.00	4.00	3.00	4.00	3.00	19.38	36.25	18.25	35.06	101	145	79	123

- All models have a 1/8-in. FNPT tap for installation of a gauge or manometer to monitor pressure drop.
- Sizes ½ in. through 3½ in. are standard with female pipe thread connection (FNPT).
- Sizes 4 in. and 5 in. are available with female threads or flanges. Please specify "threaded" or "flanged" when you order 4 in. and 5 in. sizes.
- Sizes 6 in. through 16 in. are standard with 150# ANSI drilled plate flanges.
- Rated capacity is based upon exit velocity of approximately 5500 ft/min. If pressure drop allowance permits, capacity may be increased by as much as 50%.

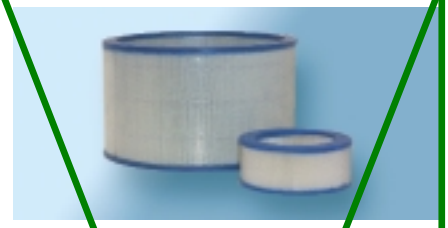
PRESSURE DROP, CLEAN, ALL MODELS

Percentage of Rated Flow	50	75	100	125	150
Pressure Drop, Inches H_2O	0.7	1.6	2.8	4.4	6.3

FILTER ELEMENTS

Three types of filter elements are available for Universal's cartridge filters and filter-silencers. The pleated paper elements provide the highest efficiency and are considered standard. Pleated felt and wire mesh elements are available for less demanding service, with respect to efficiency. The three types of elements are completely interchangeable and will fit the CCS, CS, CF, or CCF filter housings.

SERVICE INTERVALS: Paper and felt elements are typically cleaned or replaced when the air flow resistance has increased by 4 inches of water over the initial clean resistance. The maximum restriction recommended across the filter elements is 20 inches of water, but this value may be greater than the equipment can tolerate for best efficiency. The wire mesh elements should be cleaned when they are visibly dirty and re-treated with Universal Oil-Free Adhesive or motor oil. Resistance is typically not a good indicator for cleaning wire mesh elements; a periodic cleaning schedule is recommended.



Pleated Paper Element

SPECIFICATIONS:

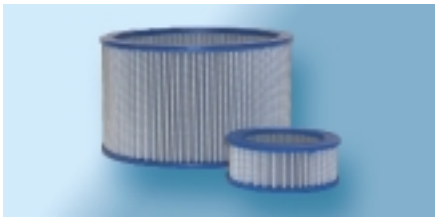
- **High-quality industrial grade filter paper—pleated and oven-cured during production.**
- **Oven-cured plastisol end caps with molded sealing beads (larger elements for pipe sizes (P) 10 in., 12 in., 14 in., and 16 in. have metal end caps and closed-cell rubber gaskets).**
- **Media efficiency: 99.5% on 2 microns; 97% on 1 micron.**
- **Maximum operating temperature: 200° F for units with ½ in. through 16 in. pipe sizes.**

SERVICE INSTRUCTIONS:

Because of the low cost of the paper element, it is generally treated as a consumable and replaced when dirty. However, depending upon customer preference, the paper element may be cleaned with compressed air and reused.

Compressed Air Cleaning:

Carefully direct compressed air (100 PSI maximum) through the dry element, opposite the normal direction of flow. After cleaning, inspect carefully for holes or cracks. If damaged, replace element.



Pleated Felt Element

SPECIFICATIONS:

- **Durable polyester felt media — pleated.**
- **Oven-cured plastisol end caps with molded sealing beads (larger elements for pipe sizes (P) 10 in., 12 in., 14 in., and 16 in. have metal end caps with closed cell rubber gaskets).**
- **Media efficiency: 99% on 10 microns.**
- **Maximum operating temperature: 200° F for units with ½ in. through 8 in. pipe sizes.**

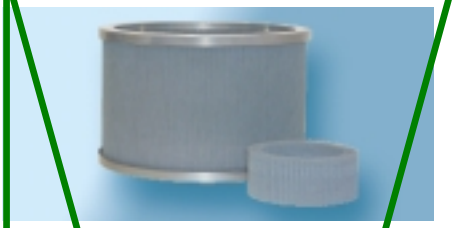
  250° F for units with 10 in. through 16 in. pipe sizes using elements with metal end caps.

SERVICE INSTRUCTIONS:

Pleated felt elements may be cleaned with compressed air (as described for paper elements) or water and reused.

Water Cleaning:

Rap gently to dislodge accumulated dirt, soak thoroughly approximately 15 minutes in warm water and mild detergent. Rinse thoroughly under low-pressure water. Air dry—do not dry with compressed air. After cleaning, inspect carefully for holes or cracks. If damaged, replace element.



Wire Mesh Element

SPECIFICATIONS:

- **Galvanized wire-mesh media—corrugated construction.**
- **Larger elements for pipe sizes (P) 6 in., 8 in., 10 in., 12 in., 14 in., and 16 in. have metal end caps.**
- **For best efficiency, wire mesh elements must be treated with oil or oil-free adhesive.**
- **May be cleaned and reused indefinitely.**
- **Wire mesh elements are considered "roughing" filters and are not recommended for applications that require efficient filtration of fine particles.**
- **Approximate efficiency: 93% on 10 microns. Efficiency will vary with element oil or adhesive coverage.**
- **Maximum operating temperature: 200° F for ½ in. through 16 in. with oil-free adhesive (the flash point for oil-free adhesive is 235° F).**

  300° F for ½ in. through 16 in. without oil-free adhesive. Filter efficiency is much lower without oil-free adhesive on the filter. Higher temperatures can be used with uncoated ½ in. through 5 in. filter elements without end caps.

SERVICE INSTRUCTIONS:

New elements are delivered pre-treated with Universal Silencer's oil-free adhesive. See the back page for details. For best efficiency, wire mesh elements must be re-treated after each cleaning. Spray the element on both sides with Universal Oil-Free Adhesive, P/N 81-0323, following the directions on the container. For oil treatment, dip the element in SAE 30-50 motor oil and drain thoroughly before using.

To clean wire mesh elements, wash in solvent or warm water and detergent in a container large enough for complete immersion of element. Rinse completely, drain, and either air dry or use compressed air. After cleaning and drying, re-treat the element with oil-free adhesive or oil as described.

	Replacement Element Part No.		
P (nom.)	Paper	Felt	Wire
1/2	81-0470	81-1202	81-1035
3/4	81-0470	81-1202	81-1035
1	81-0470	81-1202	81-1035
1 1/4	81-0471	81-1203	81-1036
1 1/2	81-0471	81-1203	81-1036
2	81-0471	81-1203	81-1036
2 1/2	81-1063, 81-0472 (old)	81-1205, 81-1204 (old)	81-1038, 81-1037 (old)
3	81-1063, 81-0472 (old)	81-1205, 81-1204 (old)	81-1038, 81-1037 (old)
3 1/2	81-1063	81-1205	81-1038
4	81-1063	81-1205	81-1038
5	81-1063, 81-0474 (old)	81-1205, 81-1206 (old)	81-1038, 81-1039 (old)
6	81-0475	81-1207	81-1040
8	(2) 81-0475	(2) 81-1207	(2) 81-1040, (1) 81-1199 (old)
10	81-1163	81-1209	81-1200
12	81-1163	81-1209	81-1200
14	81-1164	81-1210	81-1201
16	81-1164	81-1210	81-1201

Expansion Joint

INLET 10"
DISCHARGE 8"

Maxi-Joint®

Wide Arch Expansion Joints

Style 1015

Features:

- Wide Flowing Arch Design
- Exceptional All Directional Movement Capability
- Virtually Eliminates Sediment Buildup
- Higher Pressure Rating than Conventional Expansion Joints
- Excellent Chemical and Abrasion Resistance
- Full Vacuum Rating (30" Hg) in All Sizes
- 250ºF Continuous Service Standard, 400ºF Available
- Filled Arch Design Available
- Economical Fully Molded Construction
- Standard Face to Face Dimensions with ANSI 125/150 lb. Drilling
- Hot Dipped Galvanized Retaining Rings Standard
- Wide Variety of Tube and Cover Elastomers Available, Including Pure Gum Rubber, EPDM, Neoprene, Butyl, Nitrile, Hypalon®, Viton®, Food Grade, and More
- Absorbs Noise, Vibration and Shock
- Compensates for Minor Misalignment and Offset
- Low Stiffness and Deflection Forces
- Integrally Flanged Design, No Gaskets Required
- Large Inventory Means Quick Shipments
- Simple to Install, Lightweight and High Strength
- Provides Easy Access to Piping and Equipment

Notes:

1.) All parts listed are designed for 30" Hg (full vacuum) and have a maximum test at 26" Hg due to facility altitude and equipment limitations.

2.) Maximum operating temperature of 250ºF for EPDM, Butyl, Hypalon®, and Viton®; 225ºF for Neoprene; 210ºF for Nitrile; 180ºF for Pure Gum Rubber; 300ºF for EPDM and Butyl in air service at 25 PSI maximum; higher pressure and temperature ratings available.

3.) All sizes can be supplied with a filled arch reducing their movements by 50% and increasing the spring rates fourfold.

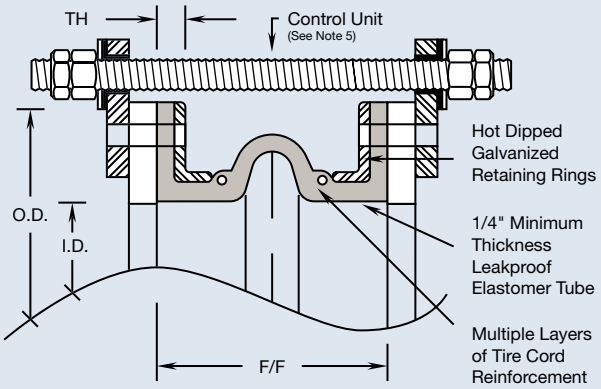
4.) For full product specifications and installation instructions, see SPEC 1015-1 and ININ 1015-1. Gross weights include retaining rings.

5.) **WARNING**: Control units (sold separately) must be used when piping is not properly anchored. Number of rods are dependent upon maximum field test pressures. Expansion joints may operate in pipelines carrying fluids at elevated temperatures and pressures, so precaution should be taken to ensure proper installation and regular inspection. Care is required to protect personnel in the event of leakage or splash. Adequate floor drains are always recommended.

6.) Movements are non-concurrent. Contact General Rubber for concurrent movements, and for sizes not shown up to 144" I.D.

7.) Retaining rings are typically "L" shaped and can be flat depending on internal reinforcements.

8.) Standard 125/150 lb. drilling includes, 1"-24" with ANSI B16.1 Class 125 lb./B16.5 Class 150 lb., 30"-60" with ANSI B16.1 Class 125 lb./ B16.47 series A, Class 150 lb., 72"-108" with ANSI B16.1 Class 125 lb./ AWWA C207 Class B.



Toll Free: 800-233-6294
Web: www.general-rubber.com

general rubber corporation

Fax: 201-641-4710
sales@general-rubber.com

STYLE 1015 EPDM

BLOWER SERVICE

XJ-105

General Rubber Corporation
11-A Empire Boulevard
S. Hackensack, NJ 07606
Requested by: _____

Tel: (201)641-4700
Fax:(201)641-4710

SUBMITTAL DATA

Job: _____
Purchase order: _____
Date: _____

MAXI-JOINT STYLE 1015E FOR BLOWER APPLICATIONS

☐ With Control Units
☐ Less Control Units

Standard dimensions for flanged spool type Expansion Joints

TABLE I — DIMENSIONAL DATA (ALL DIMENSIONS EXPRESSED IN INCHES)

SIZE I.D.	Flange O.D.	BOLT CIRCLE	BOLT HOLES		DIMENSIONS										STD. F/F
			No.	Diam.	A	B	C	D	E	G	H	J *	K	L	
1	4-1/4	3-1/8	4	5/8	1/2	1/2	1-1/2	3/4	1/2	3/8	5/8	10-1/2	7-1/2	1-1/4	6
1-1/2	5	3-7/8	4	5/8	7/16	7/16	1-1/2	3/4	7/16	3/8	5/8	10-1/2	8-1/2	1-3/8	6
2	6	4-3/4	4	3/4	7/16	7/16	2	1	7/16	3/8	5/8	10-1/2	9-1/4	1-1/8	6
2-1/2	7	5-1/2	4	3/4	7/16	1/2	2	1	1/2	3/8	5/8	10-1/2	10-1/4	1-1/16	6
3	7-1/2	6	4	3/4	7/16	1/2	2	1	1/2	3/8	5/8	10-1/2	10-3/4	1-1/16	6
4	9	7-1/2	8	3/4	7/16	1/2	2	1	1/2	3/8	5/8	11	12-1/4	1-1/16	6
5	10	8-1/2	8	7/8	7/16	1/2	2	1	1/2	1/2	5/8	11	14-1/4	1-1/16	6
6	11	9-1/2	8	7/8	7/16	1/2	2	1	1/2	1/2	5/8	11	15-1/4	1-1/16	6
8	13-1/2	11-3/4	8	7/8	1/2	9/16	2	1	9/16	9/16	3/4	12 & 14	19-1/4	1-1/16	6 & 8
10	16	14-1/4	12	1	1/2	9/16	2	1	9/16	3/4	1	15	22-3/4	1-15/16	8
12	19	17	12	1	1/2	5/8	2	1	5/8	3/4	1	15	24-3/4	1-7/8	8
14	21	18-3/4	12	1-1/8	9/16	11/16	2-1/2	1-1/4	11/16	3/4	1	15	25-1/4	1-1/2	8
16	23-1/2	21-1/4	16	1-1/8	9/16	11/16	2-1/2	1-1/4	11/16	3/4	1-1/8	15	28-1/4	1-1/2	8
18	25	22-3/4	16	1-1/4	5/8	3/4	2-1/2	1-1/4	3/4	3/4	1-1/8	15	29-7/8	3/4	8
20	27-1/2	25	20	1-1/4	5/8	3/4	2-1/2	1-1/4	3/4	3/4	1-1/8	15	32-1/8	3/4	8
24	32	29-1/2	20	1-3/8	3/4	7/8	3	1-1/2	7/8	1	1-1/4	20	37-5/16	1-3/8	10
30	38-3/4	36	28	1-3/8	3/4	3/4	3	1-1/2	3/4	1-1/4	1-1/2	20	44	1-3/8	10
36	46	42-3/4	32	1-5/8	3/4	3/4	3	1-1/2	3/4	1-1/2	1-1/2	22	52-1/2	1-3/8	10
42	53	49-1/2	36	1-5/8	3/4	3/4	3	2	3/4	1-1/2	1-1/2	24	59-1/4	1-7/8	12
48	59-1/2	56	44	1-5/8	3/4	3/4	3	2	3/4	1-1/2	1-3/4	24	65-3/4	1-7/8	12

RETAINING RINGS	
SIZE	# Segments
1-14	2
16-24	4
30	7
36	8
42	9
48	11

All retaining rings are segmented

CONTROL UNITS	
SIZE	# Rods (**Max WP**)
2-24	2
30-36	2
42-48	2

RATED	
** TEMPERATURE	300 Deg. F
PRESSURE	25 PSIG
VACUUM	26 In. Hg.

* The length of the control rod (J) is governed by the mating flange thickness meeting ANSI B16.5; Class 150 or AWWA C207, Table 3, Class E. If the mating flange thickness is different, advise factory so the rod length can be changed to accommodate the installation.

**Based on air as the transport media through Expansion Joint. Parts listed have a design rating of 30 In. Hg. (Full Vacuum)

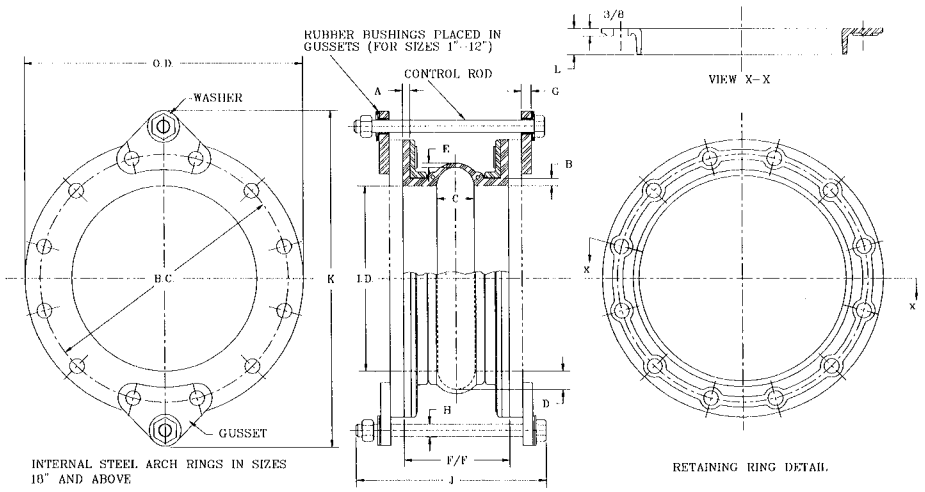


TABLE II

		MOVEMENT CAPABILITY & FORCES							
		AXIAL				DEFLECTION			
Size I.D. (Inch)	F/F (Inch)	Compr. (Inch)	Force (Lbs.)	Elong. (Inch)	Force (Lbs.)	Lateral (Inch)	Force (Lbs.)	Angular (Deg.)	WEIGHT ea.(Lbs.)
1*	6	5/8	374	1/4	204	1/4	272	15	4
1-1/2*	6	5/8	391	1/4	221	1/4	289	15	5
2	6	1-3/4	374	3/4	204	3/4	272	30	6
2-1/2	6	1-3/4	476	3/4	255	3/4	289	30	8
3	6	1-3/4	561	3/4	306	3/4	323	30	9
4	6	1-3/4	765	3/4	425	3/4	357	25	10
5	6	1-3/4	935	3/4	527	3/4	425	25	13
6	6	1-3/4	1139	3/4	629	1	629	20	17
8	6	1-3/4	1258	3/4	697	1	765	20	22
10	8	1-3/4	1581	3/4	884	1	816	15	34
12	8	1-3/4	1649	3/4	935	1	969	15	45
14	8	2	2023	7/8	1139	1-1/8	1275	12	55
16	8	2	2159	7/8	1224	1-1/8	1479	12	64
18	8	2	2431	7/8	1377	1-1/8	1632	9	71
20	8	2	2703	7/8	1530	1-1/8	1819	9	82
24	10	2-1/4	3638	1	2108	1-1/8	1955	9	102
30	10	2-1/4	4590	1	2660	1-1/8	2466	6	140
36	10	2-1/4	5610	1	3250	1-1/8	3013	5	190
42	12	2-1/4	6375	1	3655	1-1/8	3391	4	235
48	12	2-1/4	7140	1	4153	1-1/8	3837	3	290

* 1 & 1-1/2" available with filled arches only.

STYLE 1015E CONSTRUCTION DETAILS

HIGH STRENGTH polyester reinforcement provides higher rated working pressure in all sizes.
STANDARD ELASTOMER MATERIALS ARE: EPDM. Other materials are available upon request Contact the factory for their physical properties as required.
FLANGES are full faced and flat 125/150 Lbs. ANSI B16.1 and ANSI B16.5 standard drilling, mating to all types of full faced metal and fragile plastic pipe, eliminating problems of fracturing mating flanges, as can happen with raised face flanges. Retaining rings are cast ductile iron, ASTM A-536-67. Do not interface with wafer type flanges on valves or fittings.

EXPANSION JOINT INSTALLATION INSTRUCTIONS

To satisfactorily function as flexible member between rigid metal piping, a number of engineering and installation precautions should be taken:

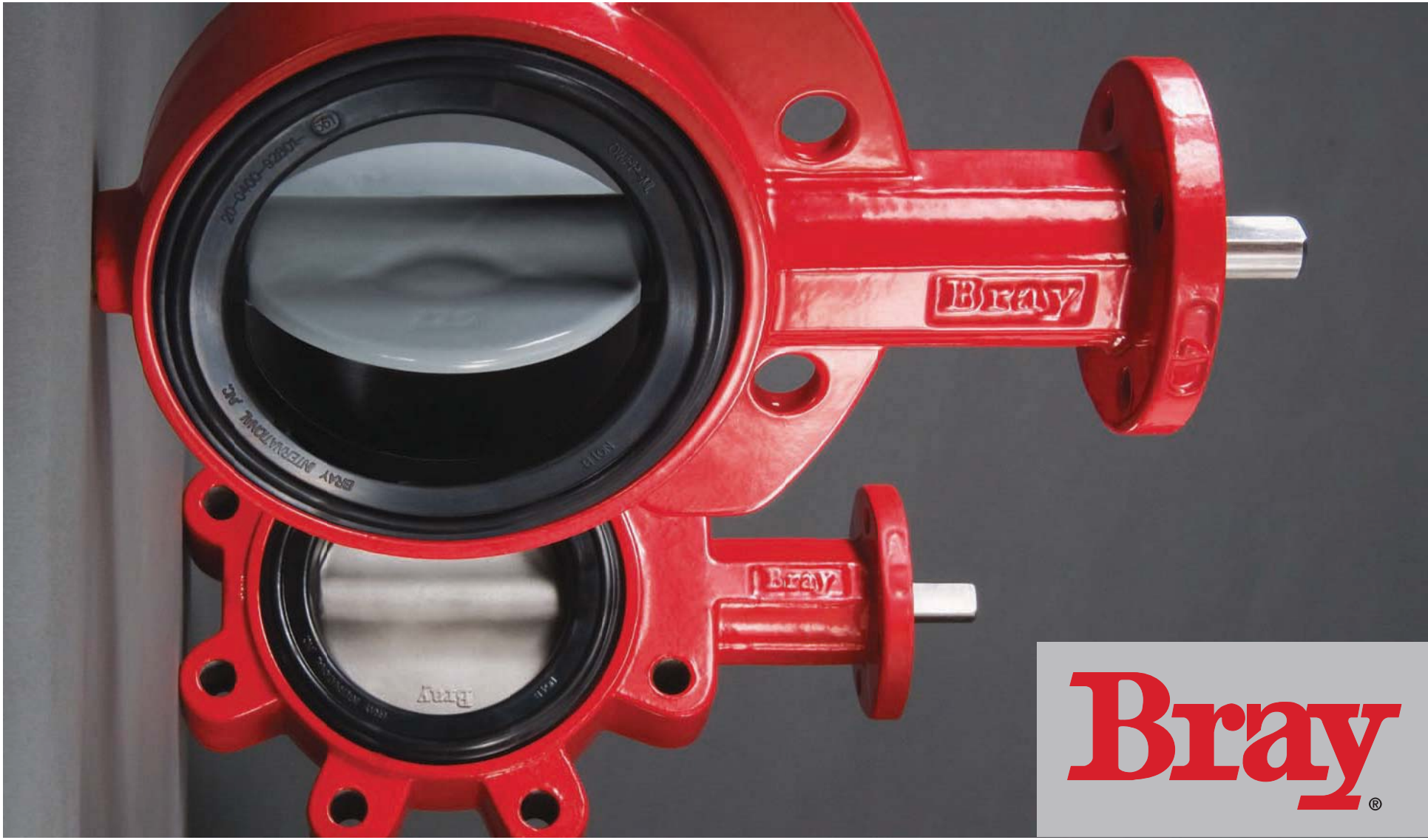
1. Proper anchoring of the rigid metal piping at both ends of the Expansion Joint unit is ESSENTIAL to eliminate the danger of over elongation. In the event anchoring is not possible, control units must be used as approved by General Rubber Corporation.
2. The span between the rigid piping should have the same overall length as the Expansion Joint.
3. The Expansion Joint must be installed in a relatively straight line to eliminate twisting the unit.
4. Tighten flange bolts until the rubber flange bulges slightly. CAUTION - Tighten bolts in equal steps to maintain uniform tension and alignment.
5. Check bolt tightness periodically. As any rubber-like material takes a set after a period of compression, the bolts may loosen and result in a break in the seal. It is particularly important to check bolts in a hot and cold water system before changing over from one medium to another.

CONTROL UNIT INSTALLATION

1. Control units MUST be used when the piping is not anchored on both sides of the Expansion Joints.
2. The function of the control unit is to allow the Expansion Joint to move axially and laterally within its capabilities, but to eliminate the danger of excessive elongation axially.
3. Installation of the control unit is done after the Expansion Joint is in place. The component parts of the control unit are packaged separately from the Expansion Joint because they are fitted to the backside of the companion flange - interfacing with the Expansion Joint (See line drawing).
4. The control unit should be installed to allow the Expansion Joint to extend to the maximum axial capability. The nut should then be "set" in a permanent position. Remember, the axial elongation of the Expansion Joint varies depending on size (See table II). DO NOT exceed the published figures at the time of installation.
5. To prevent over-compression of the Expansion Joint, compression sleeves can be furnished as an accessory, if requested. Generally, over-compression is not as serious a problem as excessive elongation. Compression sleeves are fitted over each of the rods with sufficient clearance to provide axial compression within the movement capability of the Expansion Joint.
6. Materials of Construction 1 set consists of the following:

2 Steel Rods	ASTM-A-307
4 Ductile gusset plates	ASTM-A-536
4 Neoprene Bushings	ASTM-D-735-SC-725-BF (1-12" ONLY)
4 Steel Washers	ASTM-A-307
2 Steel Nuts	ASTM-A-307

Butterfly Valve



The High Performance Company

Bray®

BUTTERFLY VALVES

RESILIENT SEATED

SERIES 30/31 Wafer/Lug

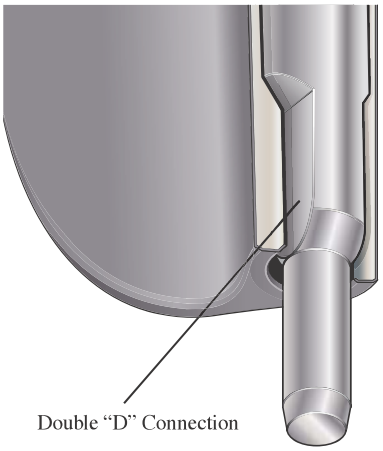
2" - 20" (50mm-500mm)

SERIES 30

2"–20" (50mm–500mm)
Bray® Controls is proud to offer a high quality line of butterfly valves to meet the requirements of today's market. Combining years of field application experience, research and development, Bray has designed many unique features in the Series 30/31 not previously available. The results are longer service life, greater reliability, ease of parts replacement and interchangeability of components.

DISC AND STEM CONNECTION

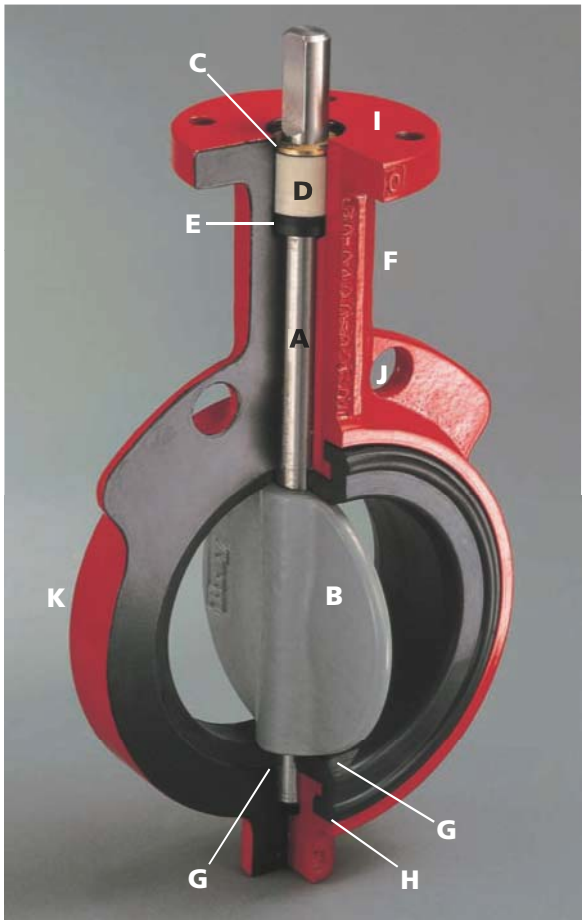
(**A**) Features a high-strength through stem design. The close tolerance, double "D" connection that drives the valve disc is an exclusive feature of the Bray valve. It eliminates stem retention components being exposed to the line media, such as disc screws and taper pins, which commonly result in leak paths, corrosion, and vibration failures. Disc screws or taper pins, due to wear and corrosion,



Double "D" Connection

often require difficult machining for disassembly. Disassembly of the Bray stem is just a matter of pulling the stem out of the disc. Without fasteners obstructing the line flow, the Series 30/31 Cv values are higher than many other valves, turbulence is reduced, and pressure recovery is increased. The stem ends and top mounting flange are standardized for interchangeability with Bray actuators.

DISC (**B**) Casting is spherically machined and hand polished to provide a bubble-tight shut off, minimum torque, and longer seat life. The disc O.D. clearance is designed to work with all standard piping.



STEM BUSHING (D)

Non-corrosive, heavy duty acetal bushing absorbs actuator side thrusts.

STEM SEAL (E)

Double "U" cup seal design is self-adjusting and gives positive sealing in both directions. Prevents external substances from entering the stem bore.

NECK (F)

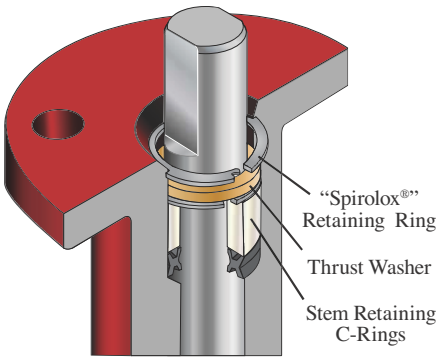
Extended neck length allows for 2" of piping insulation and is easily accessible for mounting actuators.

PRIMARY AND SECONDARY SEALS (G)

The Primary Seal is achieved by an interference fit of the molded seat flat with the disc hub. The Secondary Seal is created because the stem diameter is greater than the diameter of the seat stem hole. These seals prevent line media from coming in contact with the stem or body.

STEM RETAINING ASSEMBLY (C)

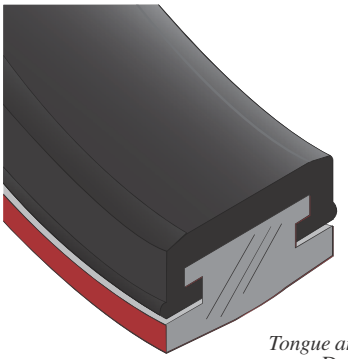
The stem is retained in the body by means of a unique Stainless Steel "Spirolox®" retaining ring, a thrust washer and two C-rings, manufactured from brass as standard, stainless steel upon request. The retaining ring may be easily removed with a standard hand tool. The stem retaining assembly prevents unintentional removal of the stem during field service.



*"Spirolox®" designation is a registered trademark of Kaydon Ring and Seal, Inc.

BRAY UNIQUE SEAT DESIGN (H)

One of the valve's key elements is Bray's unique *tongue and groove* seat design. This resilient seat features lower torque than many valves on the market today and provides complete isolation of flowing media from the body. The tongue-and-groove seat to body retention method is superior to traditional designs, making field replacement simple and fast. The seat is specifically designed to seal with slip-on or weld-neck flanges. The seat features a molded O-ring which eliminates the use of flange gaskets. An important maintenance feature is



Tongue and Groove Design

that all resilient seats for Bray butterfly valves Series 20, 21, 30 and 31 are completely interchangeable.

ACTUATOR MOUNTING FLANGE AND STEM CONNECTION (I)
Universally designed to ISO 5211 for direct mounting of Bray® power actuators and manual operators.

FLANGE LOCATING HOLES (J)
Provide quick and proper alignment during installation.

BODY (K) One-piece wafer or lug style. Polyester coating for excellent corrosion resistance. Bray valve bodies meet ANSI 150 pressure ratings for hydrostatic shell test requirements.

DESIGN FEATURES

Bray's Series 30 valve is a wafer version with flange locating holes, and the Series 31 is the companion lug version for dead-end service and other flange requirements. All Bray valves are tested to 110% of full pressure rating before shipment.

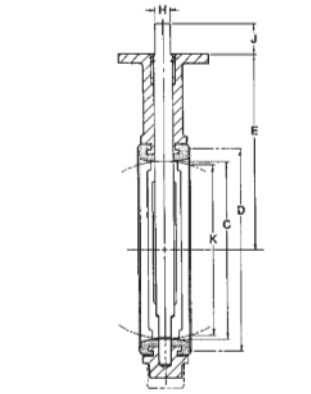
A major design advantage of Bray valve product lines is international compatibility. The same valve is compatible with most world flange standards – ANSI Class 125/150, BS 10 Tables D and E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS10. In addition the valves are designed to comply with ISO 5752 face-to-face and ISO 5211 actuator mounting flanges. Therefore, one valve design can be used in many different world markets.

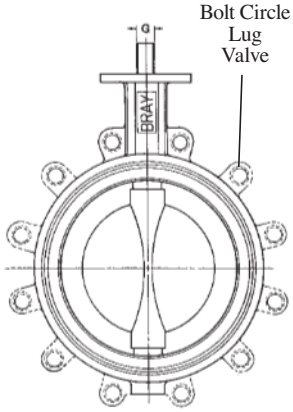
Due to a modular concept of design, all Bray® handles, manual gear operators and pneumatic and electric actuators mount directly to Bray valves. No brackets or adapters are required.

Bray interchangeability and compatibility offers you the best in uniformity of product line and low-cost performance in the industry today.

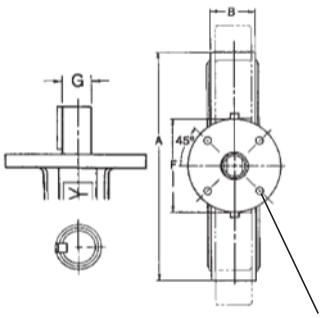
POLYESTER COATING CORROSION PROTECTION Bray's standard product offers valve bodies with a polyester coating, providing excellent corrosion and wear resistance to the valve's surface. The Bray polyester coating is a hard, gloss red finish.
Chemical Resistance –resists a broad range of chemicals including: dilute aqueous acids and alkalies, petroleum solvents, alcohols, greases and oils. Offers outstanding resistance to humidity and water.
Weatherability–outdoor tested resistant to ultra-violet radiation.
Abrasion Resistance – excellent resistance to abrasion.
Impact Resistance–withstands impact without chipping or cracking.

NYLON 11 COATING
Optionally available for valve bodies where outstanding protection and performance is needed. A thermoplastic produced from a vegetable base, this coating is inert to fungus growth and molds. Nylon 11 is *USDA Approved*, as well as certified to ANSI/NSF 61 for water service.
Corrosion Resistance – superior resistance to a broad range of chemical environments. Salt spray tested in excess of 2,000 hours and seawater immersion tested for over 10 years without corrosion to metal substrates.
Nylon 11 features a very low coefficient of friction and excellent resistance to impact and ultra-violet radiation.





Bolt Circle
Lug
Valve



See chart for Actuator Mounting Flange Drilling.

DIMENSIONS SERIES 30 Wafer

Valve Size								Mounting Flange Drig.						
Ins	mm	A	B	C	D	E	F	Bolt Circle	No. Holes	Hole Dia.	G	H	J	K
2	50	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32
21/2	65	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91
3	80	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55
4	100	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57
5	125	7.06	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63
6	150	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45
8	200	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45
10	250	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53
12	300	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47
14	350	17.05	3.00	13.25	15.28	13.62	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04
16	400	19.21	4.00	15.25	17.41	14.75	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04
18	450	21.12	4.25	17.25	19.47	16.00	8.27	6.50	4	.81	1.97	2.50	.39x.47	16.85
20	500	23.25	5.00	19.25	21.29	17.25	8.27	6.50	4	.81	1.97	2.50	.39x.47	18.73

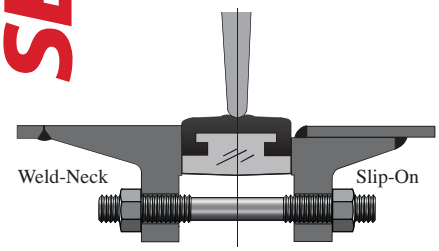
SERIES 31 Lug

Lug Bolting Data		
Bolt Circle	No. Holes	Threads UNC-2B
4.75	4	5/8-11
5.50	4	5/8-11
6.00	4	5/8-11
7.50	8	5/8-11
8.50	8	3/4-10
9.50	8	3/4-10
11.75	8	3/4-10
14.25	12	7/8-9
17.00	12	7/8-9
18.75	12	1-8
21.25	16	1-8
22.75	16	11/8-7
25.00	20	11/8-7

SELECTION DATA

FLANGE REQUIREMENTS

Bray valves are designed for installation between ANSI Class 125/150 lb. weld-neck or slip-on flanges, BS 10 Tables D & E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS 10, either flat faced or raised faced. While weld-neck flanges are recommended, Bray has specifically designed its valve seat to work with slip-on flanges, thus eliminating common failures of other butterfly valve designs. When using raised face flanges be sure to properly align valve and flange. Type C stub-end flanges are not recommended.



PRESSURE RATINGS*

For bi-directional bubble-tight shut off, disc in closed position:

Inches	mm	psig	bar
2-12	50-300	175	12
14-20	350-500	150	10

For Dead-end Service Applications: With *downstream flanges installed* or with *aerospace bonded seats,* the dead-end pressure ratings are equal to valve bi-directional ratings as stated above. With no downstream flanges or with seats that are not aerospace bonded, the dead-end pressure rating for 2"-12" valves is 75 psi (5 bar) for 14"-20" valves, 50 psi (3.5 bar).

*Pressure Ratings are based on standard disc diameters. For low pressure application, Bray offers a standard reduced disc diameter to decrease seating torques and to extend seat life, thus increasing the valve's performance and reducing actuator costs for the customer.

VELOCITY LIMITS

For On/Off Services:
Fluids – 30 ft/sec (9m/s)
Gases – 175 ft/sec (54m/s)

Cv VALUES–VALVE SIZING COEFFICIENT

Valve Size		Disc Position(degrees)								
ins	mm	90°	80°	70°	60°	50°	40°	30°	20°	10°
2	50	144	114	84	61	43	27	16	7	1
21/2	65	282	223	163	107	67	43	24	11	1.5
3	80	461	364	267	154	96	61	35	15	2
4	100	841	701	496	274	171	109	62	27	3
5	125	1376	1146	775	428	268	170	98	43	5
6	150	1850	1542	1025	567	354	225	129	56	6
8	200	3316	2842	1862	1081	680	421	241	102	12
10	250	5430	4525	2948	1710	1076	667	382	162	19
12	300	8077	6731	4393	2563	1594	1005	555	235	27
14	350	10538	8874	5939	3384	2149	1320	756	299	34
16	400	13966	11761	7867	4483	2847	1749	1001	397	45
18	450	17214	14496	10065	5736	3643	2237	1281	507	58
20	500	22339	18812	12535	7144	4536	2786	1595	632	72

C_V is defined as the volume of water in U.S.G.P.M. that will flow through a given restriction or valve opening with a pressure drop of one (1) p.s.i. at room temperature. Recommended control angles are between 25°–70° open. Preferred angle for control valve sizing is 60°–65° open.

EXPECTED SEATING/UNSEATING TORQUES (Lb.-Ins.)

Valve Size		Full-Rated Pressure Valves				Reduced Disc Diameter
		ΔP (PSI)				ΔP (PSI)
ins	mm	50	100	150	175	50
2	50	125	130	135	140	125
21/2	65	195	205	215	220	195
3	80	260	275	290	297	260
4	100	400	425	450	462	267
5	125	615	670	725	755	410
6	150	783	871	953	1003	537
8	200	1475	1650	1825	1915	983
10	250	2240	2520	2800	2940	1493
12	300	3420	3870	4320	4545	2280
14	350	4950	5700	6450	—	3300
16	400	6400	7700	9000	—	4267
18	450	7850	9850	11850	—	5267
20	500	10300	12900	15500	—	6867

Valve Torque Rating – Bray has classified valve torque ratings according to 3 types: non-corrosive lubricating service, general service, and severe service. Torques listed above are for general services. Consult Bray for torque information corresponding to specific applications.

TO USE TORQUE CHART, NOTE THE FOLLOWING:
1) For Bray valves, Series 20, 21, 30, 31 and 34.
2) Review Technical Bulletin No. 1001, Expected Seating/Unseating Torques, for explanation of the 3 service classes and their related seating/unseating torque values for given pressure differentials of Full-Rated and Reduced Disc Diameter valves.
3) Dynamic Torque values are not considered. See Technical Bulletin No. 1002 for evaluation of Dynamic Torque values vs. Seating/Unseating Torque values.
4) Do not apply a safety factor to above torque values when determining actuator output torque requirement.
5) For 3 way assemblies where one valve is opening and other is closing, multiply torque by 1.5 factor.

SPECIFICATIONS

RECOMMENDED SPECIFICATIONS FOR BRAY SERIES 30/31 SHALL BE:

- Polyester coated, cast iron, wafer or lug bodies.
- With flange locating holes that meet ANSI Class 125/150 (or BS 10 Tables D & E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS 10) drillings.
- Through-stem direct drive double "D" design requiring no disc screws or pins to connect stem to disc with no possible leak paths in disc/stem connection.
- Stem mechanically retained in body neck and no part of stem or body exposed to line media.
- Tongue-and-groove seat design with primary hub seal and a molded O-ring suitable for weld-neck and slip-on flanges. Seat totally encapsulates the body with no flange gaskets required.
- Spherically machined, hand polished disc edge and hub for minimum torque and maximum sealing capability.
- Equipped with non-corrosive bushing and self-adjusting stem seal.
- Bi-directional and tested to 110% of full rating.
- Bi-directional pressure ratings: 2"-12" valves: 175 psi, 14"-20" valves: 150 psi
  Lug bodies for dead end service
  With downstream flanges or aerospace bonded seats, pressure ratings are equal to bi-directional ratings as stated above.
  With no downstream flanges or non-bonded seats: 2"-12" valves: 75 psi, 14"-20" valves: 50 psi
- No field adjustment necessary to maintain optimum field performance.
- The valve shall be Bray Series 30 wafer / 31 lug or equal.

WEIGHTS (lbs.)

Valve Size ins	Valve Size mm	Series 30	Series 31
2	50	5.5	7.0
2½	65	7.0	8.0
3	80	7.5	9.0
4	100	11.5	15.0
5	125	14.0	20.0
6	150	17.0	23.0
8	200	34.0	42.0
10	250	49.0	66.0
12	300	67.0	88.0
14	350	95.0	114.0
16	400	135.0	166.0
18	450	200.0	226.0
20	500	260.0	305.0

MATERIALS SELECTION

2"–20" (50mm-500mm)

BODY:
- Cast Iron ASTM A126 Class B
- Ductile Iron ASTM A536
- Cast Steel ASTM A216 WCB
- Aluminum ASTM B26

SEAT:
- Buna-N – Food Grade
- EPDM – Food Grade
- FKM*
- White Buna-N – Food Grade

STEM:
- 416 Stainless Steel ASTM A582 Type 416
- 304 Stainless Steel ASTM A276 Type 304
- 316 Stainless Steel ASTM A276 Type 316
- Monel

DISC:
- Aluminum Bronze ASTM B148-954
- Coated Ductile Iron ASTM A536 Gr. 65-45-12
- Ductile Iron, Nylon 11 Coated, ASTM A536 Gr. 65-45-12
- Ductile Iron, Halar® Coated, ASTM A536 Gr. 65-45-12
- 316 Stainless Steel ASTM A351 CF8M
- Hastelloy® C-276 ASTM B575 Alloy N10276
- 304 Stainless Steel ASTM A351 CF8M

TEMPERATURE RANGE OF SEATS

Type	Maximum	Minimum
EPDM	+250°F(121°C)	-40°F(-40°C)
Buna-N	+212°F(100°C)	0°F(-18°C)
FKM*	+400°F(204°C)	0°F(-18°C)

COMPONENTS

No.	Qty.	Description
1	1	Body
2	1	Seat
3	1	Disc
4	1	Stem
5	1	Stem Seal
6	1	Stem Bushing
7	2	Stem Retainer
8	1	Thrust Washer
9	1	Retaining Ring

*FKM is the ASTM D1418 designation for Fluorinated Hydrocarbon Elastomers (also called Fluoroelastomers).

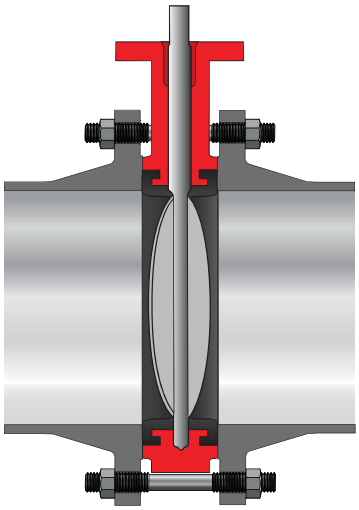
Hastelloy® is a registered trademark of Haynes International, Inc.

Halar® is a registered trademark of Ausimont U.S.A., Inc.

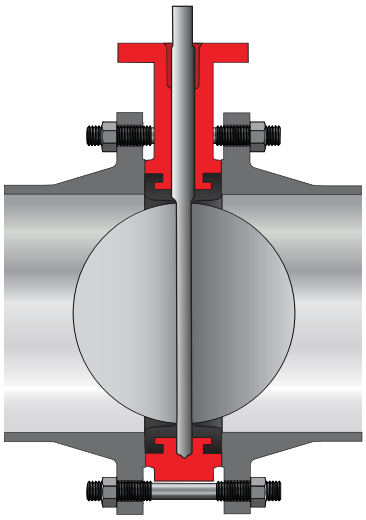
ASSEMBLY

INSTALLATION

Position the disc in the partially open position, maintaining the disc within the body face-to-face. Place the body between the flanges and install flange bolts. *Do not use flange gaskets*. Before tightening flange bolts, carefully open the disc to the full open position to ensure proper alignment and clearance of the disc O.D. with the adjacent pipe I.D. Leave disc in the full open position and tighten flange bolts per required specification. Once bolts are tightened, carefully rotate disc to closed position to ensure disc O.D. clearance.



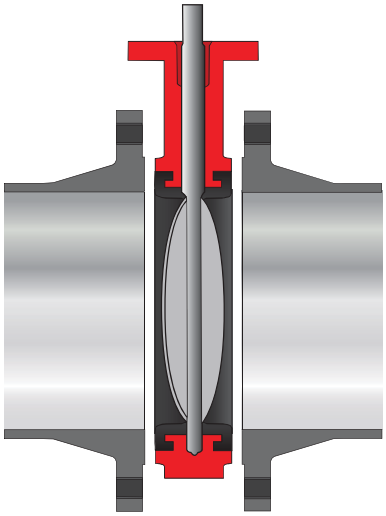
Disc in the Partially Open Position



Disc in the Full Open Position

MAINTENANCE AND REPAIR

The many Bray features minimize wear and maintenance requirements. No routine lubrication is required. All components – stem, disc, seat, bushing, stem seal, etc., are field replaceable, no adjustment is needed. If components require replacement, remove the valve from the line by placing the disc near the closed position, spread the flanges, support the valve, then remove the flange bolts. No valve maintenance, including removal of manual or power actuators, should be performed until the piping system is completely depressurized.



Disc in the Near Closed Position

DISASSEMBLY

Remove the handle, gear operator, or actuator from actuator mounting flange. Remove "Spirolox®" retaining ring. Remove stem with its thrust washer and two C-ring stem retainers. Remove bushing and seal. Remove the disc from the seat, protecting disc edge at all times. Push the seat into an oval shape, then remove the seat from the body.

ASSEMBLY

Push the valve seat into an oval and push it into the body with seat stem holes aligned to body stem holes. Push stem into the stem hole of body. For aid in inserting disc, slightly protrude stem beyond the I.D. of the top of the seat. Install a light coating of foodgrade silicone oil (for silicone free applications use soap and water) on the I.D. of seat. Insert the disc into the seat by lining up the disc hole with the stem hole of the seat. Note: the broached double "D" flats in the disc must be toward the bottom of valve body. (Take special care when lining disc up with stem.) With a downward pressure and rotating the stem back and forth, push the stem until the stem touches the bottom of the body stem hole. Make certain that when pushing the stem through disc bottom, the broached flats of stem and disc are aligned. After the stem has engaged the disc, but before the stem is firmly seated in the body, replace the stem seal and bushing. Install the two C-ring stem retainers in the groove in the stem and thrust washer on top of the C-rings. Seat the stem firmly in the body and install the "Spirolox®" retaining ring back into position.

LLOYD'S REGISTER QUALITY ASSURANCE R ISO9001

DISTRIBUTOR

Bray® CONTROLS

A Division of BRAY INTERNATIONAL, Inc.
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B-1002_EN_S30-31_2009-03

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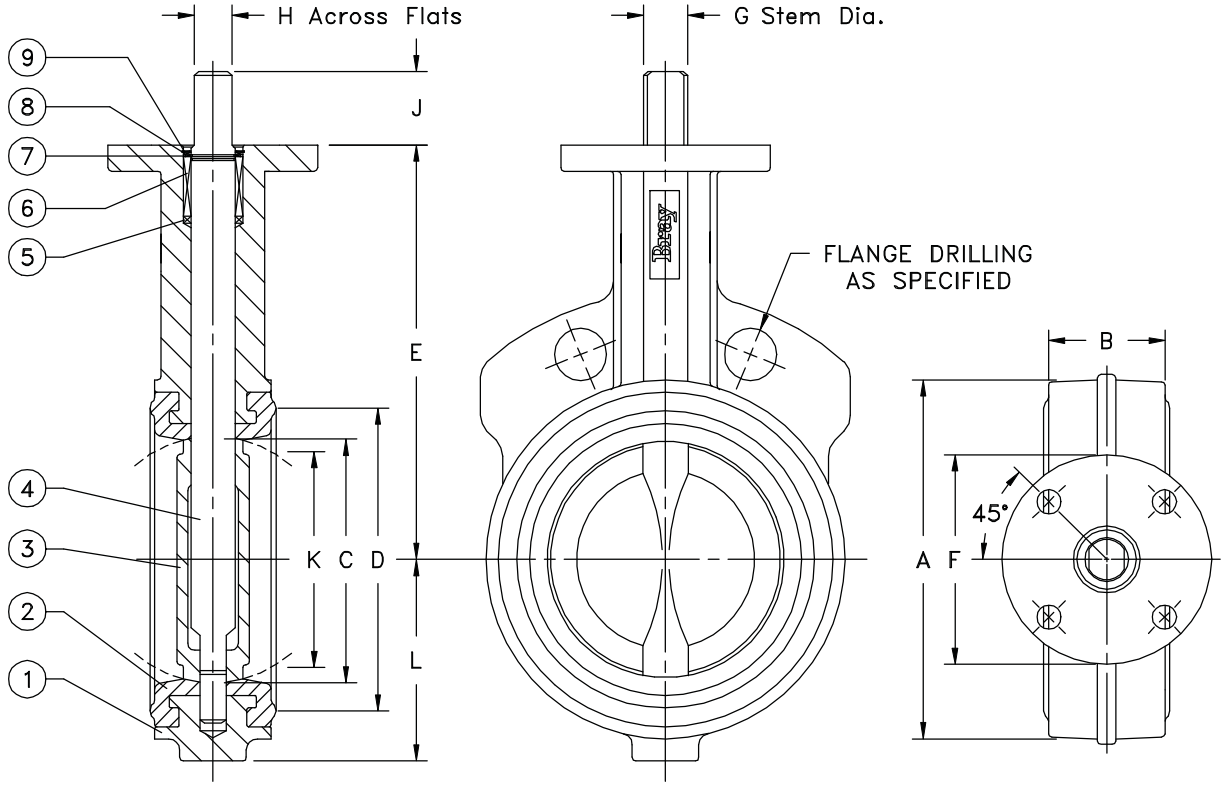
SERIES 30
ES11A-0010
Date: June 1993

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	No. of Holes	Hole Diameter	G	H	J	K	L	Adapter Code	Weight
2	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32	2.22	A	5.5
2½	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91	2.47	A	7.0
3	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55	2.81	A	7.5
4	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57	3.41	B	11.5
5	7.06	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63	4.03	C	14.0
6	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45	4.53	C	17.0
8	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45	5.75	D	34.0
10	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53	7.12	E	49.0
12	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47	8.12	E	67.0

Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
9	RETAINING RING	1			
8	THRUST WASHER	1			
7	STEM RETAINER	2			
6	BUSHING	1			
5	PACKING	1			
4	STEM	1			
3	DISC	1			
2	SEAT	1			
1	BODY	1			

Valve Size _____ Flg. Drilling _____
Pressure Rating _____
Customer/Project _____
Inq./P.O. No. _____
Bray Order No. _____
Certified Correct By _____ Date _____

The High Performance Company

BRAY VALVE & CONTROLS
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS (Inches)
BUTTERFLY VALVE, SERIES 30 SIZES 2"-12"

Series	Size	Part No.	Material Trim Code	Drawing No.
				ES11A-0010

Bray

REV. 1 / ERN-1238

DISK NO. 300

Bray®

MANUAL OPERATORS

HANDLE / GEAR OPERATOR / DECLUTCHABLE GEAR OPERATOR

SERIES 1 1"-12" (25mm-300mm)
SERIES 4 2"-48" (50mm-1200mm)
SERIES 5 2"-36" (50mm-900mm)

Bray Controls proudly offers three operators for manual control of valve position. All manual operators mount directly to Bray valves, and all are epoxy coated for excellent corrosion, abrasion and impact resistance.

SERIES 1 HANDLE & NOTCH PLATE

Bray offers two handles for on-off and throttling service – one for resilient seated valves from 1"-12" (25mm-300mm), and a high torque handle for high pressure valves from 2 $^{1}/_{2}$"- 8" (65mm-200mm). These quarter turn handles have a locking spring and a directional pointer for valve disc position indication. Bolted notch plates are offered. For resilient seated valves a 10 position plate is standard. For high pressure valves an 8 position plate is standard. Both contain on-off stops to prevent over rotation of the valve. Optionally available are an infinite position plate, a 180° notch plate, a memory stop, a padlock kit, and a 2" square nut version.

SERIES 4 GEAR OPERATOR

For heavy duty on-off and throttling service of 2"-48" (50mm-1200mm) valves, the Series 4 is self lubricated for smooth, trouble-free operation. The rugged, cast iron body with O-ring body seals is weatherproof to IP65. A self-locking worm and worm gear drive holds the valve in the desired position. Features include a readily accessible handwheel, a valve position indicator and mechanical travel stops which permit field adjustment of valve movement to specific degrees of rotation. Optionally available are chainwheel accessories, padlock kits and 2" square nut versions. A Gear Operator with a Stainless Steel housing is also available for valve sizes 1"-16".

SERIES 5 DECLUTCHABLE GEAR OPERATOR

Available for 2"-36" (50mm-900mm) valves, the Series 5 offers the same superior features as the Series 4 gear operator with the added ability to manually override pneumatic actuators or rotate the valve when air pressure is not available. This operator is excellent for the safe handling of spring return actuators. During pneumatic operation, the worm of the gear unit is disengaged. Should the valve require opening or closing in the event of power loss, manual rotation of the declutch lever will provide a camming action and engage the worm to the segmented worm gear, allowing rotation of the valve using the handwheel. The Series 5 can be installed in the field with existing Bray pneumatic actuators.

The High Performance Company

SERIES 1

Standard 10 Position Notch Plate has been designed to lock the handle securely in place, preventing position change of disc due to line pressure, vibration or shock. *Standard 8 Position Plate for high pressure valves is not shown.*

Infinite Position Notch Plate, for throttling applications, allows for very precise adjustments of valve disc positioning anywhere from 0° to 90°. Positioning is simply a matter of loosening the set knob, moving the handle, then retightening the knob. *For resilient seated valves only.*

Handle and 180° Notch Plate allows the operator to switch the handle to either side without removing the notch plate from the valve.

Memory Stop allows the operator to set the maximum amount the valve can open. When set, this limit will remain fixed until the stop is reset.

Padlock Kit allows the customer to lock the valve in the full open or closed position, tamper proofing the valve. By drilling a new hole in the top plate, the handle can be locked in mid travel.

2" Square Nut is used where the valve is buried under the surface. To rotate valve disc position, the nut is reached with a T handle wrench.

SERIES 4

Chainwheel for remote access to valve positioning when the handwheel is not accessible, such as valves positioned high out of reach.
A **Padlock Kit** and a **2" Square Nut** version for buried service are also available with the Series 4 *(not shown)*.

SERIES 5

Operation Any residual air pressure in the pneumatic actuator must be vented before operation of the Declutchable Gear Operator. Bray recommends the use of a vent valve to block the incoming air supply and vent residual air. Then engage the declutching lever and rotate the valve using the handwheel. When returning to automatic operation, disengage the manual override by rotating the declutching lever, turning the vent valve to off, then restoring air pressure to the actuator.

DISTRIBUTOR

Bray CONTROLS
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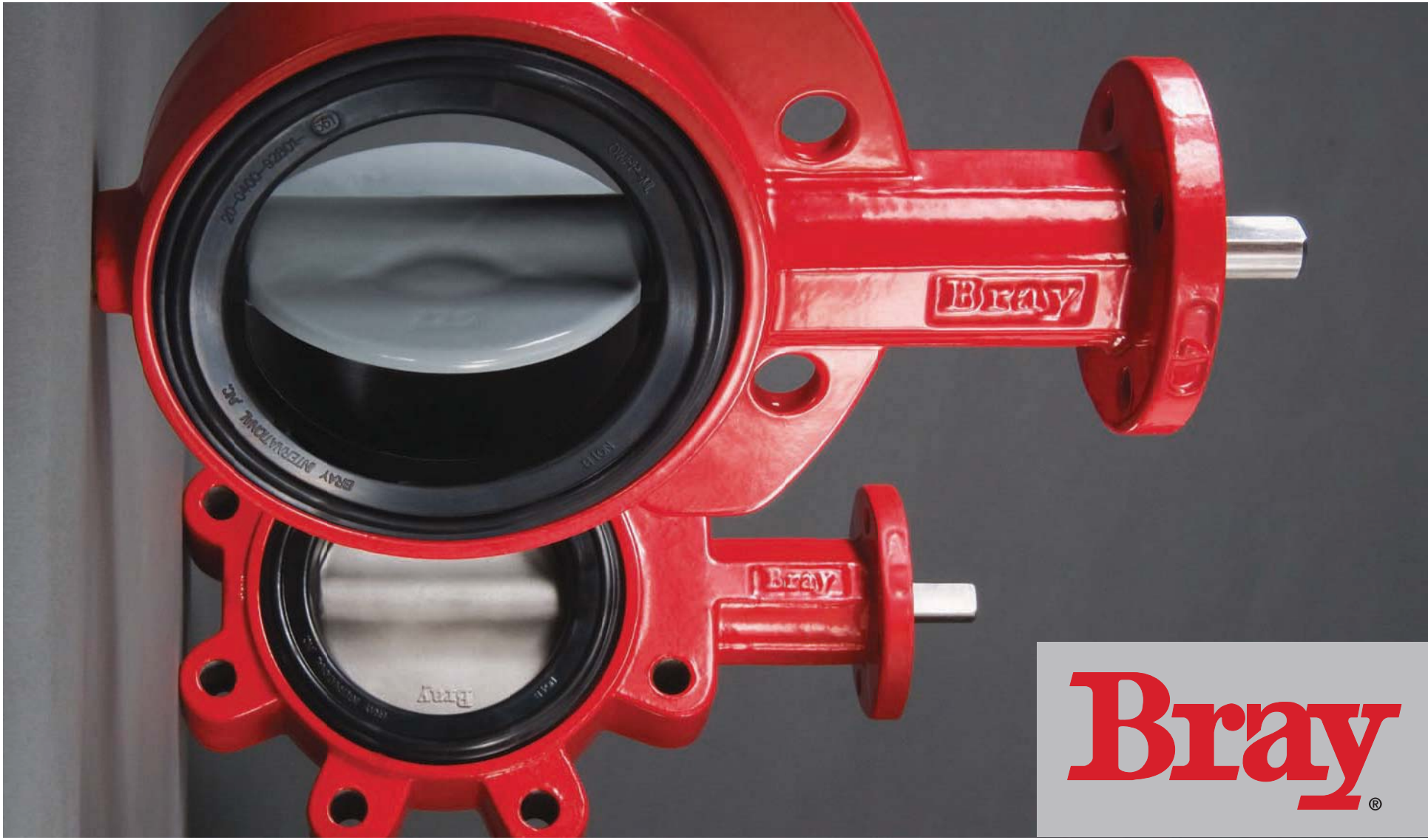
B-1025_S1-4-5 _EN_2008-08

Butterfly Valve



The High Performance Company

BUTTERFLY VALVES

RESILIENT SEATED

SERIES 30/31 Wafer/Lug

2" - 20" (50mm-500mm)

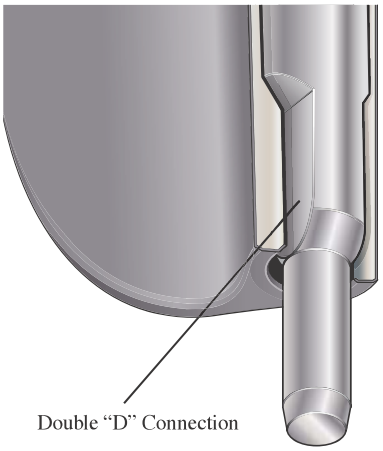
Bray®

SERIES 30

2"–20" (50mm–500mm)
Bray® Controls is proud to offer a high quality line of butterfly valves to meet the requirements of today's market. Combining years of field application experience, research and development, Bray has designed many unique features in the Series 30/31 not previously available. The results are longer service life, greater reliability, ease of parts replacement and interchangeability of components.

DISC AND STEM CONNECTION

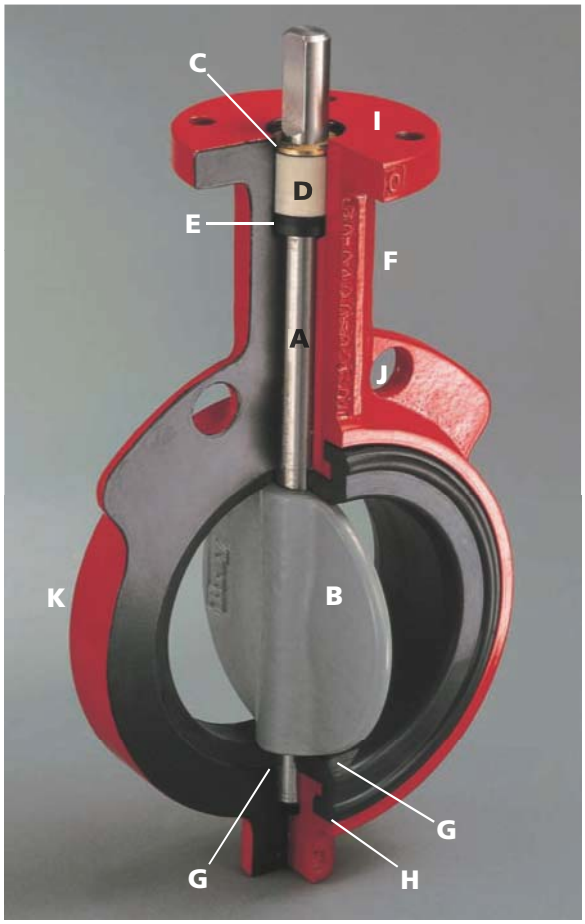
(**A**) Features a high-strength through stem design. The close tolerance, double "D" connection that drives the valve disc is an exclusive feature of the Bray valve. It eliminates stem retention components being exposed to the line media, such as disc screws and taper pins, which commonly result in leak paths, corrosion, and vibration failures. Disc screws or taper pins, due to wear and corrosion,



Double "D" Connection

often require difficult machining for disassembly. Disassembly of the Bray stem is just a matter of pulling the stem out of the disc. Without fasteners obstructing the line flow, the Series 30/31 Cv values are higher than many other valves, turbulence is reduced, and pressure recovery is increased. The stem ends and top mounting flange are standardized for interchangeability with Bray actuators.

DISC (**B**) Casting is spherically machined and hand polished to provide a bubble-tight shut off, minimum torque, and longer seat life. The disc O.D. clearance is designed to work with all standard piping.



STEM BUSHING (D)

Non-corrosive, heavy duty acetal bushing absorbs actuator side thrusts.

STEM SEAL (E)

Double "U" cup seal design is self-adjusting and gives positive sealing in both directions. Prevents external substances from entering the stem bore.

NECK (F)

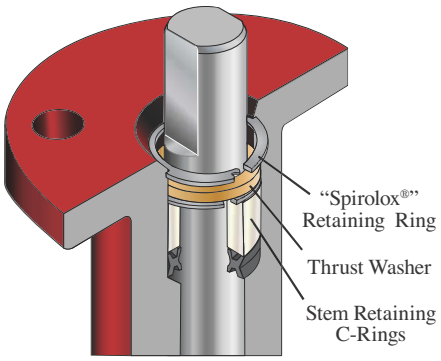
Extended neck length allows for 2" of piping insulation and is easily accessible for mounting actuators.

PRIMARY AND SECONDARY SEALS (G)

The Primary Seal is achieved by an interference fit of the molded seat flat with the disc hub. The Secondary Seal is created because the stem diameter is greater than the diameter of the seat stem hole. These seals prevent line media from coming in contact with the stem or body.

STEM RETAINING ASSEMBLY (C)

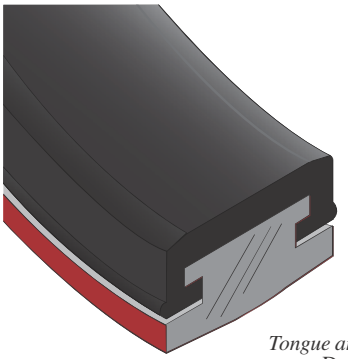
The stem is retained in the body by means of a unique Stainless Steel "Spirolox®" retaining ring, a thrust washer and two C-rings, manufactured from brass as standard, stainless steel upon request. The retaining ring may be easily removed with a standard hand tool. The stem retaining assembly prevents unintentional removal of the stem during field service.



*"Spirolox®" designation is a registered trademark of Kaydon Ring and Seal, Inc.

BRAY UNIQUE SEAT DESIGN (H)

One of the valve's key elements is Bray's unique *tongue and groove* seat design. This resilient seat features lower torque than many valves on the market today and provides complete isolation of flowing media from the body. The tongue-and-groove seat to body retention method is superior to traditional designs, making field replacement simple and fast. The seat is specifically designed to seal with slip-on or weld-neck flanges. The seat features a molded O-ring which eliminates the use of flange gaskets. An important maintenance feature is



Tongue and Groove Design

that all resilient seats for Bray butterfly valves Series 20, 21, 30 and 31 are completely interchangeable.

ACTUATOR MOUNTING FLANGE AND STEM CONNECTION (I)
Universally designed to ISO 5211 for direct mounting of Bray® power actuators and manual operators.

FLANGE LOCATING HOLES (J)
Provide quick and proper alignment during installation.

BODY (K) One-piece wafer or lug style. Polyester coating for excellent corrosion resistance. Bray valve bodies meet ANSI 150 pressure ratings for hydrostatic shell test requirements.

DESIGN FEATURES

Bray's Series 30 valve is a wafer version with flange locating holes, and the Series 31 is the companion lug version for dead-end service and other flange requirements. All Bray valves are tested to 110% of full pressure rating before shipment.

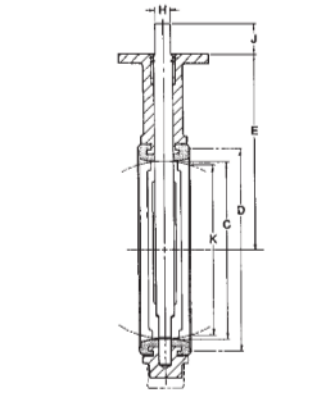
A major design advantage of Bray valve product lines is international compatibility. The same valve is compatible with most world flange standards – ANSI Class 125/150, BS 10 Tables D and E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS10. In addition the valves are designed to comply with ISO 5752 face-to-face and ISO 5211 actuator mounting flanges. Therefore, one valve design can be used in many different world markets.

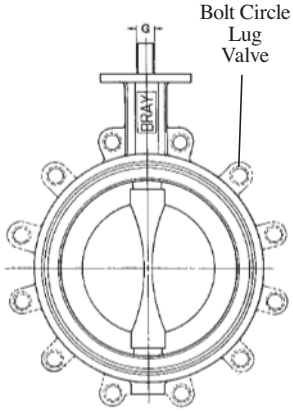
Due to a modular concept of design, all Bray® handles, manual gear operators and pneumatic and electric actuators mount directly to Bray valves. No brackets or adapters are required.

Bray interchangeability and compatibility offers you the best in uniformity of product line and low-cost performance in the industry today.

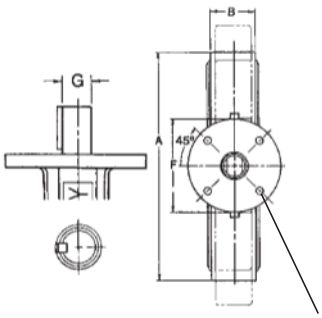
POLYESTER COATING CORROSION PROTECTION Bray's standard product offers valve bodies with a polyester coating, providing excellent corrosion and wear resistance to the valve's surface. The Bray polyester coating is a hard, gloss red finish.
Chemical Resistance –resists a broad range of chemicals including: dilute aqueous acids and alkalies, petroleum solvents, alcohols, greases and oils. Offers outstanding resistance to humidity and water.
Weatherability–outdoor tested resistant to ultra-violet radiation.
Abrasion Resistance – excellent resistance to abrasion.
Impact Resistance–withstands impact without chipping or cracking.

NYLON 11 COATING
Optionally available for valve bodies where outstanding protection and performance is needed. A thermoplastic produced from a vegetable base, this coating is inert to fungus growth and molds. Nylon 11 is *USDA Approved*, as well as certified to ANSI/NSF 61 for water service.
Corrosion Resistance – superior resistance to a broad range of chemical environments. Salt spray tested in excess of 2,000 hours and seawater immersion tested for over 10 years without corrosion to metal substrates.
Nylon 11 features a very low coefficient of friction and excellent resistance to impact and ultra-violet radiation.





Bolt Circle
Lug
Valve



See chart for Actuator Mounting Flange Drilling.

DIMENSIONS SERIES 30 Wafer

Valve Size		A	B	C	D	E	F	Mounting Flange Drig.			G	H	J	K
Ins	mm							Bolt Circle	No. Holes	Hole Dia.				
2	50	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32
21/2	65	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91
3	80	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55
4	100	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57
5	125	7.06	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63
6	150	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45
8	200	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45
10	250	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53
12	300	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47

SERIES 31 Lug

Lug Bolting Data		
Bolt Circle	No. Holes	Threads UNC-2B
4.75	4	5/8-11
5.50	4	5/8-11
6.00	4	5/8-11
7.50	8	5/8-11
8.50	8	3/4-10
9.50	8	3/4-10
11.75	8	3/4-10
14.25	12	7/8-9
17.00	12	7/8-9

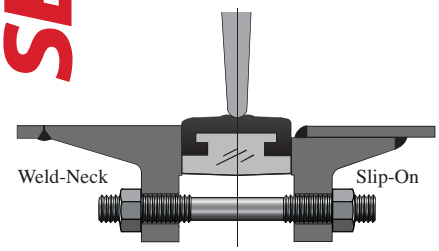
Valve Size		A	B	C	D	E	F	Mounting Flange Drig.			G	H	J	K
Ins	mm							Bolt Circle	No. Holes	Hole Dia.				
14	350	17.05	3.00	13.25	15.28	13.62	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04
16	400	19.21	4.00	15.25	17.41	14.75	5.91	4.92	4	.57	1.38	2.00	.39x.39	13.04
18	450	21.12	4.25	17.25	19.47	16.00	8.27	6.50	4	.81	1.97	2.50	.39x.47	16.85
20	500	23.25	5.00	19.25	21.29	17.25	8.27	6.50	4	.81	1.97	2.50	.39x.47	18.73

Lug Bolting Data		
Bolt Circle	No. Holes	Threads UNC-2B
18.75	12	1-8
21.25	16	1-8
22.75	16	11/8-7
25.00	20	11/8-7

SELECTION DATA

FLANGE REQUIREMENTS

Bray valves are designed for installation between ANSI Class 125/150 lb. weld-neck or slip-on flanges, BS 10 Tables D & E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS 10, either flat faced or raised faced. While weld-neck flanges are recommended, Bray has specifically designed its valve seat to work with slip-on flanges, thus eliminating common failures of other butterfly valve designs. When using raised face flanges be sure to properly align valve and flange. Type C stub-end flanges are not recommended.



PRESSURE RATINGS*

For bi-directional bubble-tight shut off, disc in closed position:

Inches	mm	psig	bar
2-12	50-300	175	12
14-20	350-500	150	10

For Dead-end Service Applications: With *downstream flanges installed* or with *aerospace bonded seats,* the dead-end pressure ratings are equal to valve bi-directional ratings as stated above. With no downstream flanges or with seats that are not aerospace bonded, the dead-end pressure rating for 2"-12" valves is 75 psi (5 bar) for 14"-20" valves, 50 psi (3.5 bar).

*Pressure Ratings are based on standard disc diameters. For low pressure application, Bray offers a standard reduced disc diameter to decrease seating torques and to extend seat life, thus increasing the valve's performance and reducing actuator costs for the customer.

VELOCITY LIMITS

For On/Off Services:
Fluids – 30 ft/sec (9m/s)
Gases – 175 ft/sec (54m/s)

Cv VALUES–VALVE SIZING COEFFICIENT

Valve Size		Disc Position(degrees)								
ins	mm	90°	80°	70°	60°	50°	40°	30°	20°	10°
2	50	144	114	84	61	43	27	16	7	1
21/2	65	282	223	163	107	67	43	24	11	1.5
3	80	461	364	267	154	96	61	35	15	2
4	100	841	701	496	274	171	109	62	27	3
5	125	1376	1146	775	428	268	170	98	43	5
6	150	1850	1542	1025	567	354	225	129	56	6
8	200	3316	2842	1862	1081	680	421	241	102	12
10	250	5430	4525	2948	1710	1076	667	382	162	19
12	300	8077	6731	4393	2563	1594	1005	555	235	27
14	350	10538	8874	5939	3384	2149	1320	756	299	34
16	400	13966	11761	7867	4483	2847	1749	1001	397	45
18	450	17214	14496	10065	5736	3643	2237	1281	507	58
20	500	22339	18812	12535	7144	4536	2786	1595	632	72

C_V is defined as the volume of water in U.S.G.P.M. that will flow through a given restriction or valve opening with a pressure drop of one (1) p.s.i. at room temperature. Recommended control angles are between 25°–70° open. Preferred angle for control valve sizing is 60°–65° open.

EXPECTED SEATING/UNSEATING TORQUES (Lb.-Ins.)

Valve Size		Full-Rated Pressure Valves ΔP (PSI)				Reduced Disc Diameter ΔP (PSI)
ins	mm	50	100	150	175	50
2	50	125	130	135	140	125
21/2	65	195	205	215	220	195
3	80	260	275	290	297	260
4	100	400	425	450	462	267
5	125	615	670	725	755	410
6	150	783	871	953	1003	537
8	200	1475	1650	1825	1915	983
10	250	2240	2520	2800	2940	1493
12	300	3420	3870	4320	4545	2280
14	350	4950	5700	6450	—	3300
16	400	6400	7700	9000	—	4267
18	450	7850	9850	11850	—	5267
20	500	10300	12900	15500	—	6867

Valve Torque Rating – Bray has classified valve torque ratings according to 3 types: non-corrosive lubricating service, general service, and severe service. Torques listed above are for general services. Consult Bray for torque information corresponding to specific applications.

TO USE TORQUE CHART, NOTE THE FOLLOWING:
1) For Bray valves, Series 20, 21, 30, 31 and 34.
2) Review Technical Bulletin No. 1001, Expected Seating/Unseating Torques, for explanation of the 3 service classes and their related seating/unseating torque values for given pressure differentials of Full-Rated and Reduced Disc Diameter valves.
3) Dynamic Torque values are not considered. See Technical Bulletin No. 1002 for evaluation of Dynamic Torque values vs. Seating/Unseating Torque values.
4) Do not apply a safety factor to above torque values when determining actuator output torque requirement.
5) For 3 way assemblies where one valve is opening and other is closing, multiply torque by 1.5 factor.

SPECIFICATIONS

RECOMMENDED SPECIFICATIONS FOR BRAY SERIES 30/31 SHALL BE:

- Polyester coated, cast iron, wafer or lug bodies.
- With flange locating holes that meet ANSI Class 125/150 (or BS 10 Tables D & E, BS 4504 NP 10/16, DIN ND 10/16, AS 2129 and JIS 10) drillings.
- Through-stem direct drive double "D" design requiring no disc screws or pins to connect stem to disc with no possible leak paths in disc/stem connection.
- Stem mechanically retained in body neck and no part of stem or body exposed to line media.
- Tongue-and-groove seat design with primary hub seal and a molded O-ring suitable for weld-neck and slip-on flanges. Seat totally encapsulates the body with no flange gaskets required.
- Spherically machined, hand polished disc edge and hub for minimum torque and maximum sealing capability.
- Equipped with non-corrosive bushing and self-adjusting stem seal.
- Bi-directional and tested to 110% of full rating.
- Bi-directional pressure ratings: 2"-12" valves: 175 psi, 14"-20" valves: 150 psi
  Lug bodies for dead end service
  With downstream flanges or aerospace bonded seats, pressure ratings are equal to bi-directional ratings as stated above.
  With no downstream flanges or non-bonded seats: 2"-12" valves: 75 psi, 14"-20" valves: 50 psi
- No field adjustment necessary to maintain optimum field performance.
- The valve shall be Bray Series 30 wafer / 31 lug or equal.

WEIGHTS (lbs.)

Valve Size ins	Valve Size mm	Series 30	Series 31
2	50	5.5	7.0
2½	65	7.0	8.0
3	80	7.5	9.0
4	100	11.5	15.0
5	125	14.0	20.0
6	150	17.0	23.0
8	200	34.0	42.0
10	250	49.0	66.0
12	300	67.0	88.0
14	350	95.0	114.0
16	400	135.0	166.0
18	450	200.0	226.0
20	500	260.0	305.0

MATERIALS SELECTION

2"–20" (50mm-500mm)

BODY:
- Cast Iron ASTM A126 Class B
- Ductile Iron ASTM A536
- Cast Steel ASTM A216 WCB
- Aluminum ASTM B26

SEAT:
- Buna-N – Food Grade
- EPDM – Food Grade
- FKM*
- White Buna-N – Food Grade

STEM:
- 416 Stainless Steel ASTM A582 Type 416
- 304 Stainless Steel ASTM A276 Type 304
- 316 Stainless Steel ASTM A276 Type 316
- Monel

DISC:
- Aluminum Bronze ASTM B148-954
- Coated Ductile Iron ASTM A536 Gr. 65-45-12
- Ductile Iron, Nylon 11 Coated, ASTM A536 Gr. 65-45-12
- Ductile Iron, Halar® Coated, ASTM A536 Gr. 65-45-12
- 316 Stainless Steel ASTM A351 CF8M
- Hastelloy® C-276 ASTM B575 Alloy N10276
- 304 Stainless Steel ASTM A351 CF8M

TEMPERATURE RANGE OF SEATS

Type	Maximum	Minimum
EPDM	+250°F(121°C)	-40°F(-40°C)
Buna-N	+212°F(100°C)	0°F(-18°C)
FKM*	+400°F(204°C)	0°F(-18°C)

COMPONENTS

No.	Qty.	Description
1	1	Body
2	1	Seat
3	1	Disc
4	1	Stem
5	1	Stem Seal
6	1	Stem Bushing
7	2	Stem Retainer
8	1	Thrust Washer
9	1	Retaining Ring

*FKM is the ASTM D1418 designation for Fluorinated Hydrocarbon Elastomers (also called Fluoroelastomers).

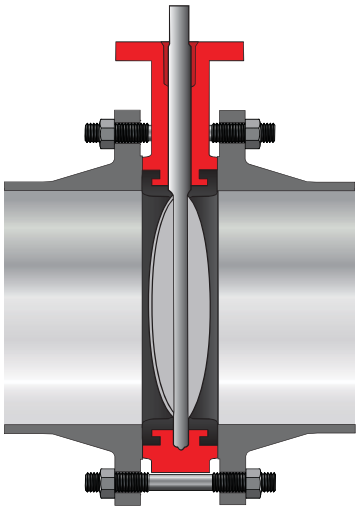
Hastelloy® is a registered trademark of Haynes International, Inc.

Halar® is a registered trademark of Ausimont U.S.A., Inc.

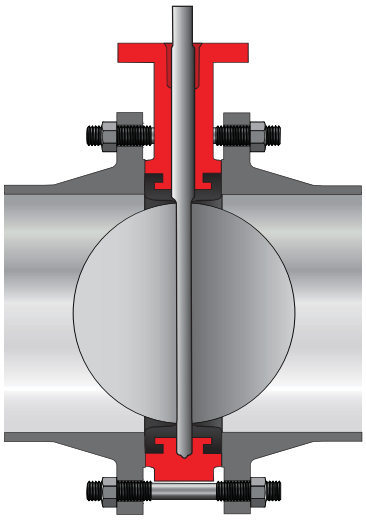
ASSEMBLY

INSTALLATION

Position the disc in the partially open position, maintaining the disc within the body face-to-face. Place the body between the flanges and install flange bolts. *Do not use flange gaskets*. Before tightening flange bolts, carefully open the disc to the full open position to ensure proper alignment and clearance of the disc O.D. with the adjacent pipe I.D. Leave disc in the full open position and tighten flange bolts per required specification. Once bolts are tightened, carefully rotate disc to closed position to ensure disc O.D. clearance.



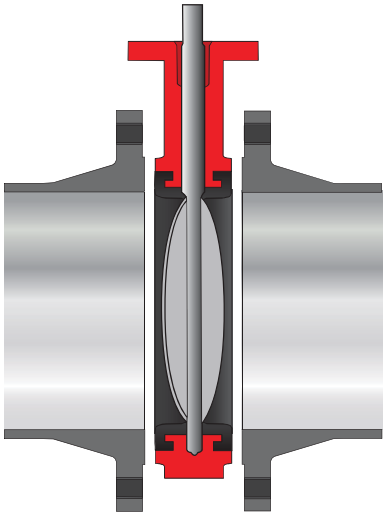
Disc in the Partially Open Position



Disc in the Full Open Position

MAINTENANCE AND REPAIR

The many Bray features minimize wear and maintenance requirements. No routine lubrication is required. All components – stem, disc, seat, bushing, stem seal, etc., are field replaceable, no adjustment is needed. If components require replacement, remove the valve from the line by placing the disc near the closed position, spread the flanges, support the valve, then remove the flange bolts. No valve maintenance, including removal of manual or power actuators, should be performed until the piping system is completely depressurized.



Disc in the Near Closed Position

DISASSEMBLY

Remove the handle, gear operator, or actuator from actuator mounting flange. Remove "Spirolox®" retaining ring. Remove stem with its thrust washer and two C-ring stem retainers. Remove bushing and seal. Remove the disc from the seat, protecting disc edge at all times. Push the seat into an oval shape, then remove the seat from the body.

ASSEMBLY

Push the valve seat into an oval and push it into the body with seat stem holes aligned to body stem holes. Push stem into the stem hole of body. For aid in inserting disc, slightly protrude stem beyond the I.D. of the top of the seat. Install a light coating of foodgrade silicone oil (for silicone free applications use soap and water) on the I.D. of seat. Insert the disc into the seat by lining up the disc hole with the stem hole of the seat. Note: the broached double "D" flats in the disc must be toward the bottom of valve body. (Take special care when lining disc up with stem.) With a downward pressure and rotating the stem back and forth, push the stem until the stem touches the bottom of the body stem hole. Make certain that when pushing the stem through disc bottom, the broached flats of stem and disc are aligned. After the stem has engaged the disc, but before the stem is firmly seated in the body, replace the stem seal and bushing. Install the two C-ring stem retainers in the groove in the stem and thrust washer on top of the C-rings. Seat the stem firmly in the body and install the "Spirolox®" retaining ring back into position.

LLOYD'S REGISTER QUALITY ASSURANCE R ISO9001

DISTRIBUTOR

Bray® CONTROLS

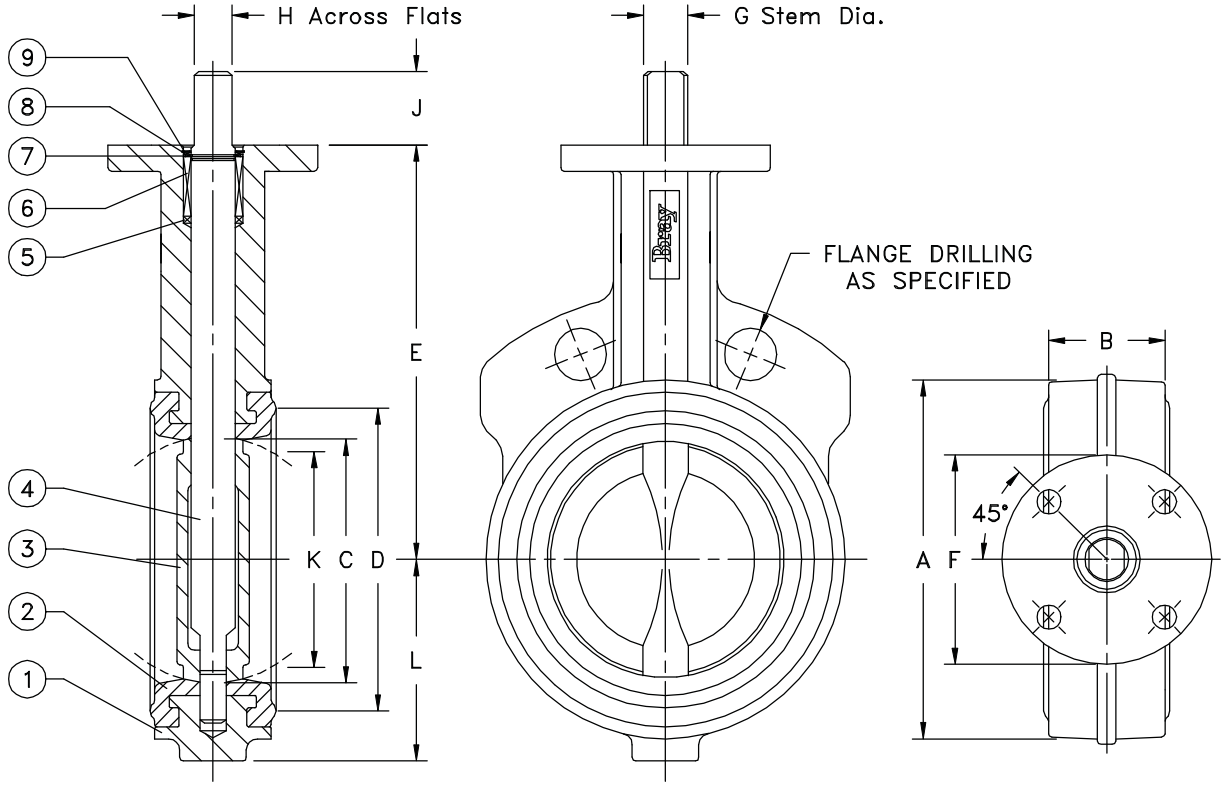
A Division of BRAY INTERNATIONAL, Inc.
13333 Westland East Blvd. Houston, Texas 77041
281.894.5454 FAX 281.894.9499 www.bray.com

B-1002_EN_S30-31_2009-03

SERIES 30
ES11A-0010
Date: June 1993

Valve Size	A	B	C	D	E	F	Top Plate Drilling BC	No. of Holes	Hole Diameter	G	H	J	K	L	Adapter Code	Weight
2	3.69	1.62	2.00	2.84	5.50	3.54	2.76	4	.39	.55	.39	1.25	1.32	2.22	A	5.5
2½	4.19	1.75	2.50	3.34	6.00	3.54	2.76	4	.39	.55	.39	1.25	1.91	2.47	A	7.0
3	4.88	1.75	3.00	4.03	6.25	3.54	2.76	4	.39	.55	.39	1.25	2.55	2.81	A	7.5
4	6.06	2.00	4.00	5.16	7.00	3.54	2.76	4	.39	.63	.43	1.25	3.57	3.41	B	11.5
5	7.06	2.12	5.00	6.16	7.50	3.54	2.76	4	.39	.75	.51	1.25	4.63	4.03	C	14.0
6	8.12	2.12	5.75	7.02	8.00	3.54	2.76	4	.39	.75	.51	1.25	5.45	4.53	C	17.0
8	10.50	2.50	7.75	9.47	9.50	5.91	4.92	4	.57	.87	.63	1.25	7.45	5.75	D	34.0
10	12.75	2.50	9.75	11.47	10.75	5.91	4.92	4	.57	1.18	.87	2.00	9.53	7.12	E	49.0
12	14.88	3.00	11.75	13.47	12.25	5.91	4.92	4	.57	1.18	.87	2.00	11.47	8.12	E	67.0

Note: K dim is disc chordal dimension at valve face.



ITEM No.	NAME	No. REQUIRED	SERIES/PART No.	MATERIAL	SPECIFICATION/REMARKS
9	RETAINING RING	1			
8	THRUST WASHER	1			
7	STEM RETAINER	2			
6	BUSHING	1			
5	PACKING	1			
4	STEM	1			
3	DISC	1			
2	SEAT	1			
1	BODY	1			

Valve Size _____ Flg. Drilling _____
Pressure Rating _____
Customer/Project _____
Inq./P.O. No. _____
Bray Order No. _____
Certified Correct By _____ Date _____

The High Performance Company

BRAY VALVE & CONTROLS
A Subsidiary of BRAY INTERNATIONAL, Inc.

PARTS LIST AND DIMENSIONS (Inches)
BUTTERFLY VALVE, SERIES 30 SIZES 2"-12"

Series	Size	Part No.	Material Trim Code	Drawing No.
				ES11A-0010

Bray

Bray®

MANUAL OPERATORS

HANDLE / GEAR OPERATOR / DECLUTCHABLE GEAR OPERATOR

SERIES 1 1"-12" (25mm-300mm)
SERIES 4 2"-48" (50mm-1200mm)
SERIES 5 2"-36" (50mm-900mm)

Bray Controls proudly offers three operators for manual control of valve position. All manual operators mount directly to Bray valves, and all are epoxy coated for excellent corrosion, abrasion and impact resistance.

SERIES 1 HANDLE & NOTCH PLATE

Bray offers two handles for on-off and throttling service – one for resilient seated valves from 1"-12" (25mm-300mm), and a high torque handle for high pressure valves from 2 $^{1}/_{2}$"- 8" (65mm-200mm). These quarter turn handles have a locking spring and a directional pointer for valve disc position indication. Bolted notch plates are offered. For resilient seated valves a 10 position plate is standard. For high pressure valves an 8 position plate is standard. Both contain on-off stops to prevent over rotation of the valve. Optionally available are an infinite position plate, a 180° notch plate, a memory stop, a padlock kit, and a 2" square nut version.

SERIES 4 GEAR OPERATOR

For heavy duty on-off and throttling service of 2"-48" (50mm-1200mm) valves, the Series 4 is self lubricated for smooth, trouble-free operation. The rugged, cast iron body with O-ring body seals is weatherproof to IP65. A self-locking worm and worm gear drive holds the valve in the desired position. Features include a readily accessible handwheel, a valve position indicator and mechanical travel stops which permit field adjustment of valve movement to specific degrees of rotation. Optionally available are chainwheel accessories, padlock kits and 2" square nut versions. A Gear Operator with a Stainless Steel housing is also available for valve sizes 1"-16".

SERIES 5 DECLUTCHABLE GEAR OPERATOR

Available for 2"-36" (50mm-900mm) valves, the Series 5 offers the same superior features as the Series 4 gear operator with the added ability to manually override pneumatic actuators or rotate the valve when air pressure is not available. This operator is excellent for the safe handling of spring return actuators. During pneumatic operation, the worm of the gear unit is disengaged. Should the valve require opening or closing in the event of power loss, manual rotation of the declutch lever will provide a camming action and engage the worm to the segmented worm gear, allowing rotation of the valve using the handwheel. The Series 5 can be installed in the field with existing Bray pneumatic actuators.

The High Performance Company

SERIES 1

Standard 10 Position Notch Plate has been designed to lock the handle securely in place, preventing position change of disc due to line pressure, vibration or shock. *Standard 8 Position Plate for high pressure valves is not shown.*

Infinite Position Notch Plate, for throttling applications, allows for very precise adjustments of valve disc positioning anywhere from 0° to 90°. Positioning is simply a matter of loosening the set knob, moving the handle, then retightening the knob. *For resilient seated valves only.*

Handle and 180° Notch Plate allows the operator to switch the handle to either side without removing the notch plate from the valve.

Memory Stop allows the operator to set the maximum amount the valve can open. When set, this limit will remain fixed until the stop is reset.

Padlock Kit allows the customer to lock the valve in the full open or closed position, tamper proofing the valve. By drilling a new hole in the top plate, the handle can be locked in mid travel.

2" Square Nut is used where the valve is buried under the surface. To rotate valve disc position, the nut is reached with a T handle wrench.

SERIES 4

Chainwheel for remote access to valve positioning when the handwheel is not accessible, such as valves positioned high out of reach.
A **Padlock Kit** and a **2" Square Nut** version for buried service are also available with the Series 4 *(not shown)*.

SERIES 5

Operation Any residual air pressure in the pneumatic actuator must be vented before operation of the Declutchable Gear Operator. Bray recommends the use of a vent valve to block the incoming air supply and vent residual air. Then engage the declutching lever and rotate the valve using the handwheel. When returning to automatic operation, disengage the manual override by rotating the declutching lever, turning the vent valve to off, then restoring air pressure to the actuator.

DISTRIBUTOR

Bray CONTROLS
A Division of BRAY INTERNATIONAL, Inc.
13333 Westland East Blvd. Houston, Texas 77041
281.894.5454 FAX 281.894.9499 www.bray.com

B-1025_S1-4-5 _EN_2008-08

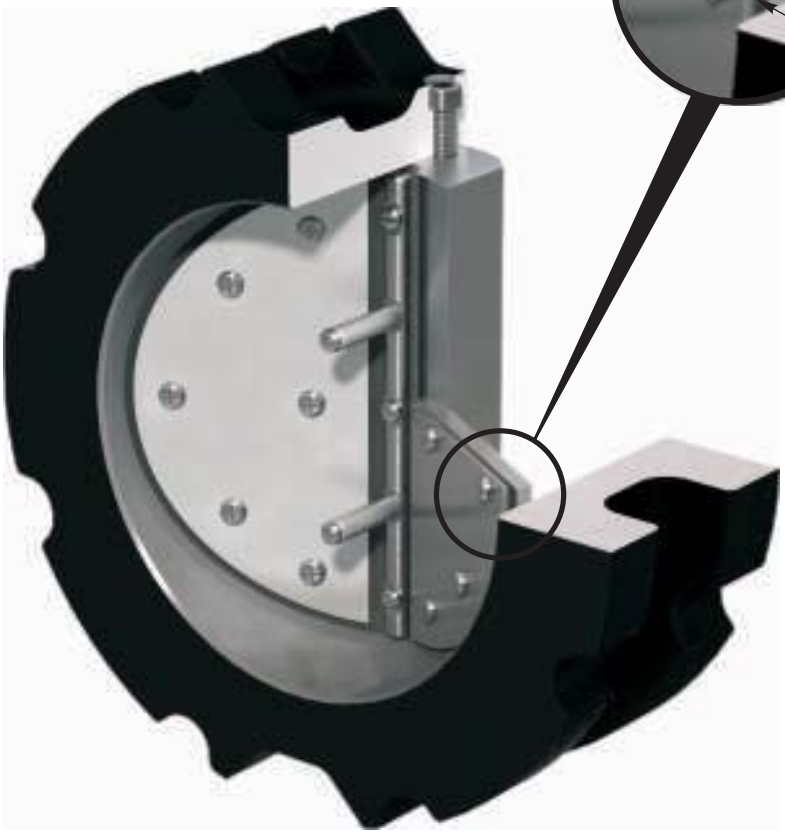
Check Valve

TECHNO™ Short Form Wafer Style Check Valves

TECHNO™

SHORT FORM WAFER STYLE CHECK VALVES

Technocheck Short Form (SF), Cost Efficient, Reliable, "Wafer Style" Check Valve



Non-Slam Quick Closure Feature
The Valve Plate Design offers Minimum Travel from Full Open to Full Closed Position and complete Metal-to-Metal Valve Plate Structural Support.

Unique Flexible Elastomer Seal
Continuous Elastomer Seal provides Final Closure around complete valve bore with the strength and durability to ensure prolonged cycle life.

Can Be Mounted In Any Position for the most efficient piping layout.

Unrestricted Full Port Seatless Design provides Free-Flow through Design with virtually no pressure loss.

Elimination of Metal-to-Metal Rotating Parts. The stationary Hinge Post and Hinge Clamp Design eliminates wear of Hinges, Pins, Valve Seats, Springs and the need for routine maintenance.

TECHNO has been a leading supplier of high quality check valves to all phases of industry for many years. Thousands of TECHNO products are presently in service demonstrating an outstanding performance record.

Exclusive Technocheck design combined with an extensive selection of materials result in exceptionally high performance and reliability for most liquid and gaseous applications.

The Short Form (SF) Technocheck split disc wafer style check valve offers compact design along with heavy duty construction.

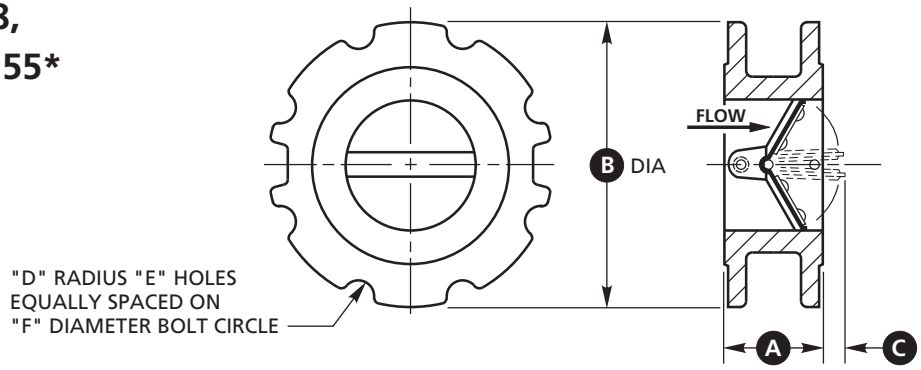
TECHNO's scalloped body design assures proper and easy alignment between mating gaskets and line flanges. It offers strength and eliminates the need for expensive supports, expansion joints and foundations that may be necessary with a conventional check valve.

Our unique design combined with many years of experience allows us to satisfy the most difficult applications.

Specials available upon request.

CERTIFICATIONS		

TECHNO SHORT FORM WAFER STYLE CHECK VALVES
STYLES 5412, 5118, 5831-F, 5831-R, 5355* AND 5355-316



GENERAL DIMENSIONS FOR STYLES 5412, 5118, 5831-F, 5831-R, 5355* AND 5355-316

VALVE SIZE in.	A	B	C	D	E	F
2	1 3/8	4 3/4	1/2	3/8	4	4 3/4
2 1/2	1 5/8	5 1/2	9/16	3/8	4	5 1/2
3	1 7/8	6	11/16	3/8	4	6
4	2 3/8	7 1/2	7/8	3/8	8	7 1/2
5	2 7/8	8 1/2	1 1/8	7/16	8	8 1/2
6	3 3/8	9 1/2	1 1/2	7/16	8	9 1/2
8	4 3/8	11 3/4	2 1/4	7/16	8	11 3/4
10	5 3/8	14 1/4	2 1/2	1/2	12	14 1/4
12	6 3/8	17	3	1/2	12	17
14	7 3/8	18 3/4	3 1/4	9/16	12	18 3/4
16	8 3/8	21 1/4	3 3/4	9/16	16	21 1/4
18	9 3/8	22 3/4	4 1/4	5/8	16	22 3/4
20	10 3/8	25	4 3/4	5/8	20	25
24	12 3/8	29 1/2	5 3/4	11/16	20	29 1/2
30	15 3/8	36	7 3/4	11/16	28	36
36	18 3/8	42 3/4	8 1/2	13/16	32	42 3/4
42	21 3/8	49 1/2	9 1/2	13/16	36	49 1/2
48	24 3/8	56	11 1/2	13/16	44	56
54	27 3/8	62 3/4	13	15/16	44	62 3/4
60	30 3/8	69 1/4	14	15/16	52	69 1/4
66	33 3/8	76	15	15/16	52	76
72	36 3/8	82 1/2	16 1/2	15/16	60	82 1/2

*For sizes 2 inch - 8 inch see style 5296 on page 4.

STANDARD MODELS AND MATERIALS

STYLE	BODY	INTERNALS	FLANGE CLASS	CWP psi
5412	Aluminum	Aluminum	125 (FF)	125
5118	Cast Iron	Aluminum	125 (FF)	125
5831-F	Bronze	Brass	125 (FF)	150
5831-R	Bronze	Brass	150 (RF)	150
5355*	Steel	Plated Steel	150 (RF)	150
5355-316	316 Stainless Steel	316 Stainless Steel	150 (RF)	150

Standard Elastomer: Buna-N (FF) = Flat Face, (RF) = Raised Face

OPTIONAL MATERIAL SELECTION

Internal Materials

- Aluminum
- Brass
- 316 Stainless Steel
- Plated Steel

SEALING MEMBER MATERIALS

Material	Temperature Range*
• Buna-N	-60°F to 225°F
• Neoprene	-40°F to 225°F
• EPDM	-40°F to 300°F
• Viton	-20°F to 400°F
• Silicone	-100°F to 500°F

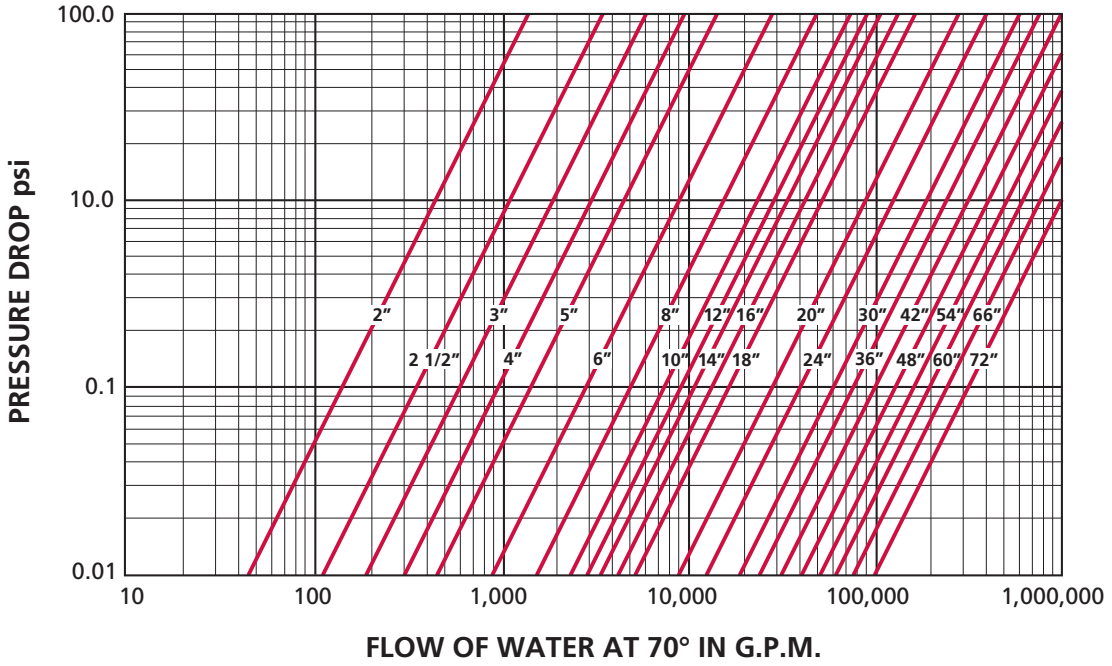
* This temperature range is for general guidance. The figures may vary with application.

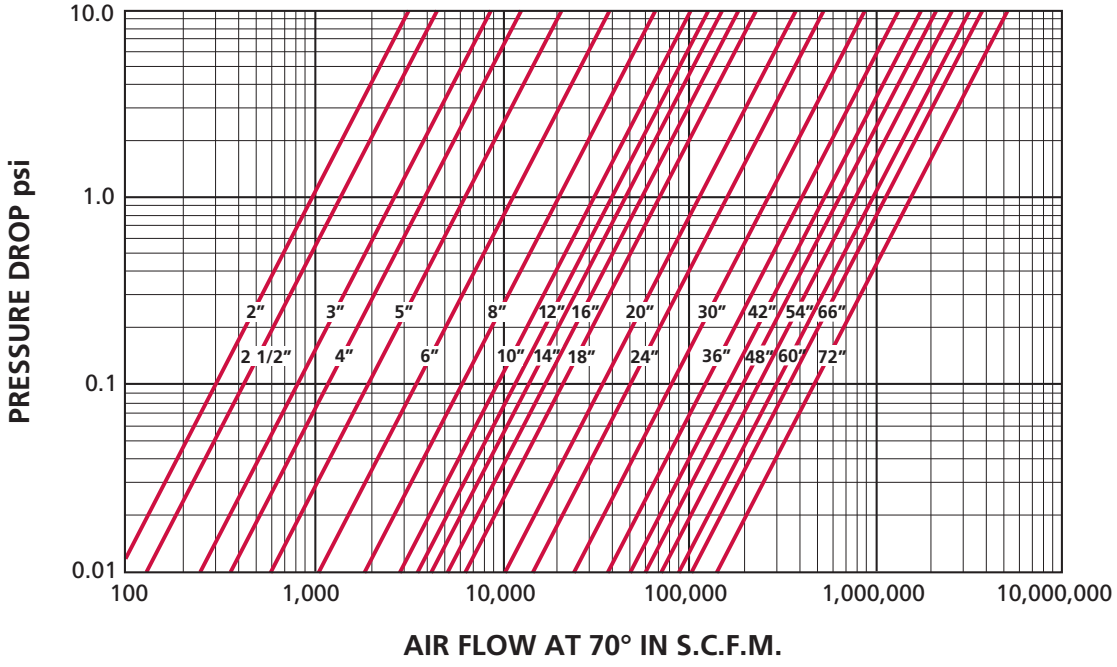
SPRING MATERIAL

- 302 Stainless Steel

TECHNO FULL FLANGED CHECK VALVES

PRESSURE DROP CHARTS FOR WATER AND AIR SERVICE

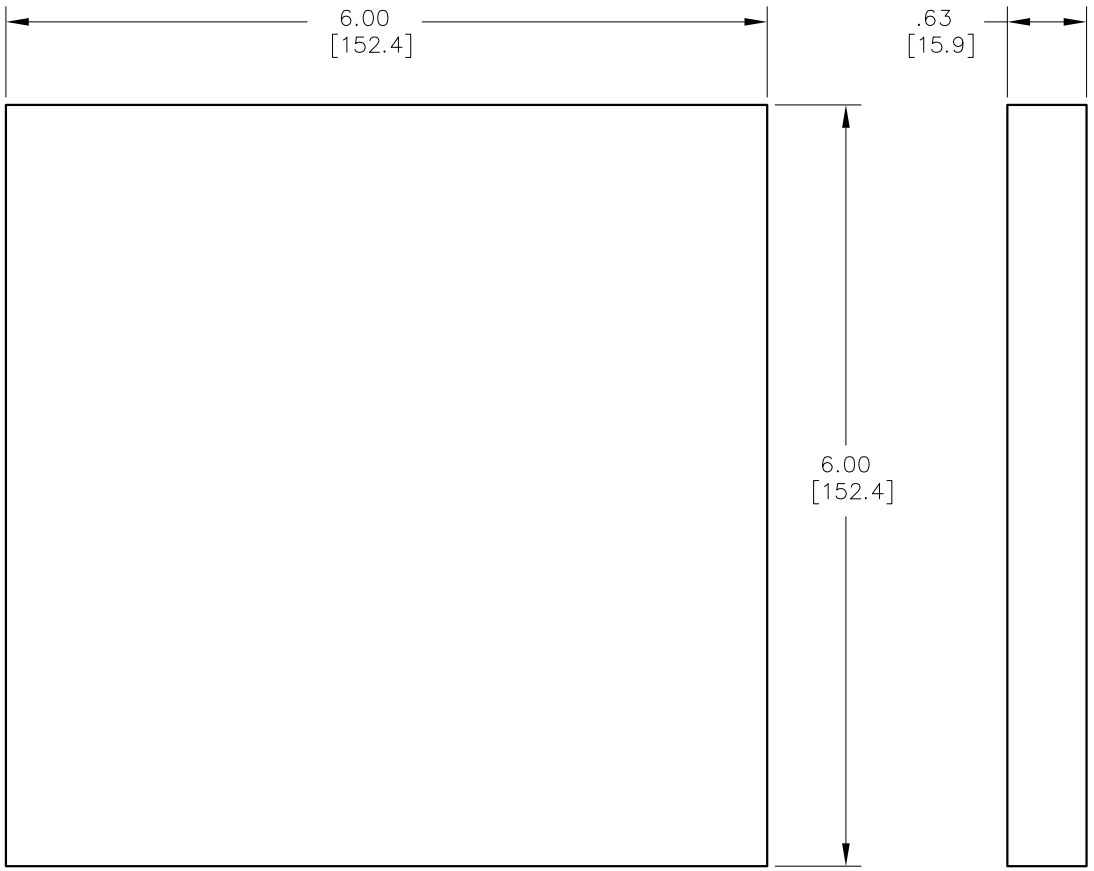


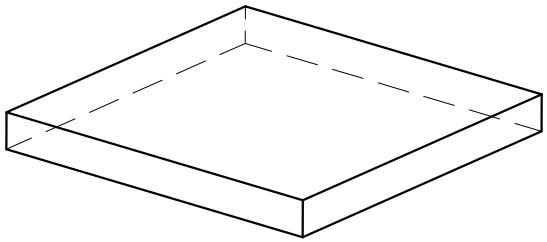


TRADEMARK INFORMATION

Vibration Pads

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED





NOTE: DIMENSIONS IN INCHES AND [MILLIMETERS].

UNLESS OTHERWISE SPECIFIED:
3 PLACE DECIMALS ±.005
2 PLACE DECIMALS ±.010
1 PLACE DECIMAL ±.063
ANGLES ±1°
MACHINED SURFACE FINISH 125
DIMENSIONING AND TOLERANCES PER ANSI Y14.5M–1994
ALL DIMENSIONS IN INCHES
REMOVE ALL BURRS AND SHARP EDGES

THIRD ANGLE PROJECTION

MATERIAL:
NEOPRENE
DUROMETER 60±5
BLACK

DRAWN BY	DMC	9/25/01

HOUSTON SERVICE INDUSTRIES
7901 HANSEN, HOUSTON, TX 77061

TITLE: BASE PAD

SIZE	REF.	PRT. NO./DWG. NO.	REV
B		19018	1

SCALE: NONE | DO NOT SCALE DRAWING | SHEET: 1 OF 1

SECTION 7

INSTRUMENTATION

SPECIFICATIONS

Vibration Sensor

Model Number
HT640M54

LOOP POWERED CURRENT OUTPUT SENSOR

Revision:
ECN #:

PERFORMANCE	ENGLISH	SI	
Measurement Range	0.0 – 1.0 in/s pk	0.0 – 25.4 mm/s pk	[1]
Output	4 - 20 mA	4 - 20 mA	
Frequency Response (±10%)	180 - 90,000 cpm	3 Hz - 1.5 kHz	[2] [3]
Broadband Resolution	0.005 in/s pk	0.13 mm/s pk	[4]
Non-Linearity	±1%	±1%	
ENVIRONMENTAL			
Temperature Range	-40 to +257 °F	-40 to +125 °C	
ELECTRICAL			
Excitation Voltage	12 to 30 VDC	12 to 30 VDC	
Load Resistance	50 (Vs-12) ohms	50 (Vs-12) ohms	
Settling Time (within 2% of value)	<15 sec	<15 sec	
Electrical Isolation (Case)	$>10^8$ ohms	$>10^8$ ohms	
MECHANICAL			
Size (Diameter x Height)	1.50 x 3.93 in	38.1 x 99.8 mm	
Weight	1.2 lbs	544 gm	
Mounting Thread	½-14 NPT	Not Applicable	
Sensing Element	Ceramic	Ceramic	
Sensing Geometry	Shear	Shear	
Housing Material	Stainless Steel	Stainless Steel	
Electrical Connector	Terminal Block	Terminal Block	
Electrical Connector Position	Top	Top	
Electrical Connections (Tab 1)	4-20mA Pos	4-20mA Pos	
Electrical Connections (Tab 2)	4-20mA Neg	4-20mA Neg	
Screw Terminal Wire Size	12-24 AWG	3.0 - .2mm²	
Conduit Housing Thread	1" NPT	Not Applicable	

CE [5]

OPTIONAL VERSIONS

Optional versions have identical specifications and accessories as listed for the standard model except where noted below. More than one option may be used.

-None-

NOTES:

[1] Conversion Factor 1 in/sec = 0,0254 m/sec.
[2] 1 Hz = 60 cpm (cycles per minute).
[3] Current will fluctuate at frequencies below 5 Hz.
[4] Typical value.
[5] See PCB Declaration of Conformance PS039 for details.

Hazardous Area Certification

-None-

SUPPLIED ACCESSORIES:

Model ICS-4 NIST-traceabe single-axis amplitude response calibration from 0cpm (0Hz) to upper 10% frequency for 4-20mA output vibration sensor

All specifications are at room temperature unless otherwise specified.

Form DD030 Rev.F 2/23/99

Drawn:	Engineer:	Sales:	Approved:	Spec Number:
Date:	Date:	Date:	Date:	**35476**

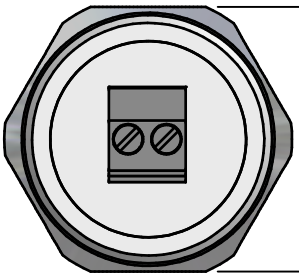
PCB PIEZOTRONICS INC. IMI DIVISION

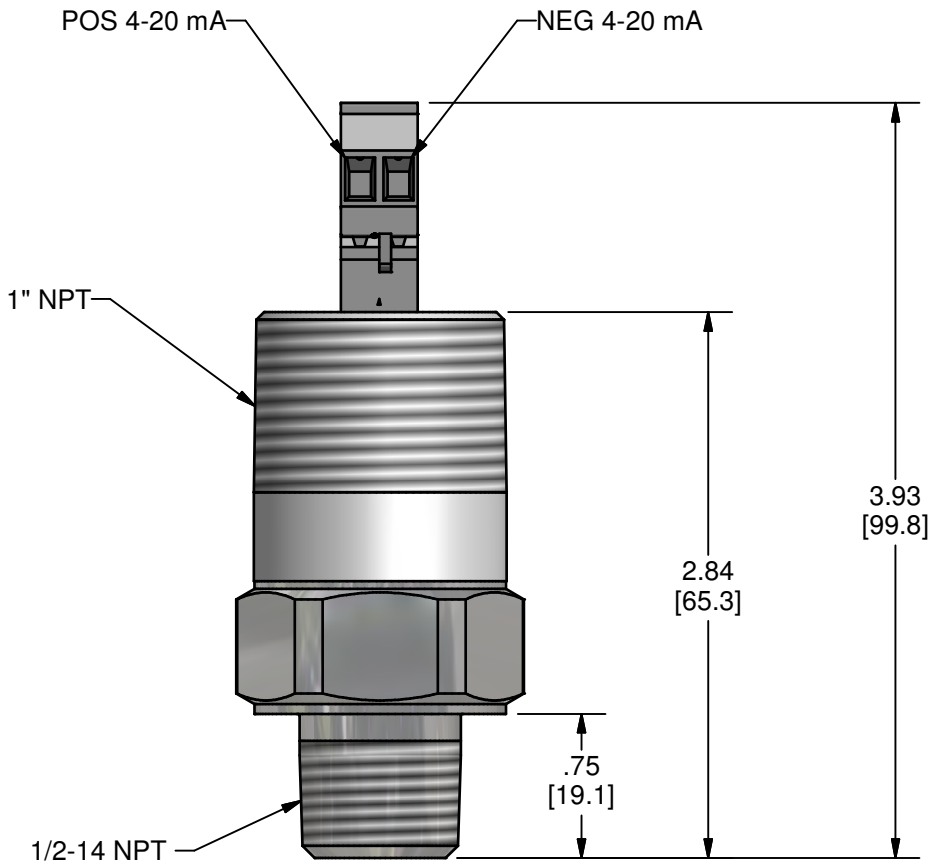
3425 Walden Avenue, Depew, NY 14043 800-959-4464 Fax (716) 684-3823 E-Mail: imisales@pcb.com

35477

APPLICATION		
NEXT ASS'Y	USED ON	VAR

REVISIONS			
REV	DESCRIPTION	ECN	APP'D
LAB2	AS PER CUSTOMER NPT TO NPSM		
LAB3	AS PER CUSTOMER NPSM TO NPT		





CUSTOMER APPROVAL

CUSTOMER SIGNATURE

PRINT YOUR NAME HERE

TITLE DATE

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

DIMENSIONS IN INCHES	DIMENSIONS IN MILLIMETERS [IN BRACKETS]
DECIMALS XX ± .03	DECIMALS X ± 0.8
XXX ± .010	XX ± 0.25
ANGLES ± 2 DEGREES	ANGLES ± 2 DEGREES
FILLETS AND RADII .003 - .005	FILLETS AND RADII [0.07 - 0.13]

DRAWN			MFG			
CHK'D			ENGR			
APP'D			SALES			

TITLE PRELIMINARY DRAWING

MODEL HT640M54
4-20 mA VELOCITY SENSOR

PCB PIEZOTRONICS INC.
3425 WALDEN AVE. DEPEW, NY 14043
(716) 684-0001 E-MAIL: sales@pcb.com

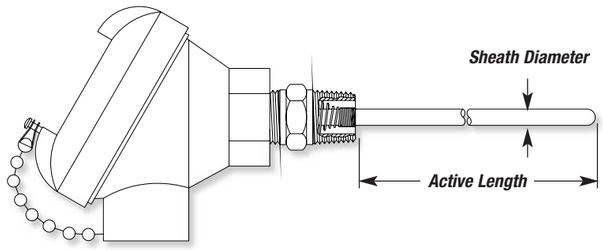
CODE IDENT. NO.	DWG. NO.
52681	35477
SCALE: FULL	SHEET 1 OF 1

Temperature Sensor

RTD Assemblies with Terminal He ads and Spring-Loaded Mounting

RTD Assemblies

Spring-loaded assemblies are used to maintain positive contact between the sensor tip and the surface to be monitored, typically used with thermowell assemblies. Conax Buffalo supplies a number of styles of spring-loaded assemblies to meet application needs. Spring-loaded assemblies can be provided with all terminal heads. In addition, the T11SL model provides a spring-loaded assembly built into the T11 aluminum terminal head. This allows complete disassembly and removal of the sensor probe without dismantling the terminal head from the conduit or the vessel. For detailed information on these mounting styles, see pages 44-45.



Progressive Description Example: **RTD43W3-316SS25-T5AL(CSLW)-12.00"**

Sensor Element | 'W' Sensor Tolerance | '3' Sensor Lead Configuration | 0.250" 316 Stainless Steel Sheath | T5 Aluminum Termination | Mounting Style | Length

Specify Sensor Element

RTD43 Platinum
- 100Ω @ 0˚ C
- α = 0.00385 Ω/Ω/˚C
- -250˚ C to +600˚ C
- -418˚ F to +1112˚ F

MRTDF43 Platinum
- 100Ω @ 0˚ C
- α = 0.00385 Ω/Ω/˚C
- -50˚ C to +550˚ C
- -58˚ F to +1022˚ F

RTD44 Platinum
- 100Ω @ 0˚ C
- α = 0.00385 Ω/Ω/˚C
- -250˚ C to +800˚ C
- -418˚ F to +1472˚ F
- Inconel 600 sheath standard

RTD45 Platinum
- 100Ω @ 0˚ C
- α = 0.003916 Ω/Ω/˚C
- -250˚ C to +600˚ C
- -418˚ F to +1112˚ F

RTD86 Platinum
- 200Ω @ 0˚ C
- α = 0.00385 Ω/Ω/˚C
- -250˚ C to +600˚ C
- -418˚ F to +1112˚ F

MRTDF430 Platinum
- 1000Ω @ 0˚ C
- α = 0.00385 Ω/Ω/˚C
- -50˚ C to +550˚ C
- -58˚ F to +1022˚ F
- Available with 0.250" sheath diameter or larger

Note: For ASTM E1137 assemblies, use ordering prefix ARTD44W4-SS25 or ARTD44W4-INC25.

Specify Sensor Tolerance

W (Class B)
- Available for RTD43, 44 and 45, single and dual; and RTD86, MRTDF43 and MRTDF430, single only
- Tolerance at 0˚ C is ±0.3˚ C

V (1/3 Class B)
- Available for RTD43, 44 and 45 single only
- Tolerance at 0˚ C is ±0.1˚ C

S (Class A)
- Available for RTD43, 44 and 45 single only
- Tolerance at 0˚ C is ±0.15˚ C

X
- Available for ERTD41, single only; tolerance at 0˚ C is ±0.4˚ C
- Available for ERTD42, single; tolerance at 0˚ C is ±0.8˚ C
- Available for ERTD42, dual; tolerance at 0˚ C is ±1.4˚ C

ERTD41 Copper
- 10Ω (9.05Ω actual) @ 0˚ C
- α = 0.00426 Ω/Ω/˚C
- -70˚ C to +150˚ C
- -94˚ F to +300˚ F
- Available with 0.250" sheath diameter or larger

ERTD42 Nickel
- 120Ω @ 0˚ C
- α = 0.00672 Ω/Ω/˚C
- -40˚ C to +180˚ C
- -40˚ F to +350˚ F
- Available with 0.250" sheath diameter or larger

Specify Sensor Lead Configuration

2 — RED, WHITE — 2-WIRE SINGLE

3 — RED, RED, WHITE — 3-WIRE SINGLE

4 — RED, RED, WHITE, WHITE — 4-WIRE SINGLE

6 — RED, RED, WHITE, WHITE — 2-WIRE DUAL

7 — RED, RED, RED, WHITE, WHITE — 3-WIRE DUAL

8 — RED, RED, RED, RED, WHITE, WHITE, WHITE, WHITE — 4-WIRE DUAL

Note: 0.125" and 0.187" diameter sheaths can contain up to 4 wires; 0.250" diameter sheaths can contain up to 8 wires.

Specify Sheath Material & Size

304 Stainless Steel

SS12
- 0.125" diameter

SS18
- 0.187" diameter

SS25
- 0.250" diameter

316 Stainless Steel

316SS12
- 0.125" diameter

316SS18
- 0.187" diameter

316SS25
- 0.250" diameter

Inconel 600

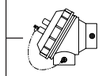
INC12
- 0.125" diameter
- Standard sheath material for RTD44

INC18
- 0.187" diameter
- Standard sheath material for RTD44

INC25
- 0.250" diameter
- Standard sheath material for RTD44

Note: For additional diameters and other sheath materials, see pages 23-24.

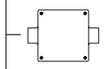
Specify Termination Style



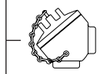
T11SL
- Weather proof
- Aluminum construction
- Built-in spring loaded assembly
- Conduit port 1/2 NPT

T5AL - Aluminum
T5CI - Cast Iron
- NEMA 4 rated
- Conduit port 3/4 NPT

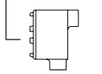
T5SS
- NEMA 4X rated
- 316 stainless steel construction
- Conduit port 3/4 NPT



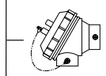
T7
- Weather proof
- Aluminum conduit box accommodates up to 8 terminals
- Conduit port 3/4 NPT



T8
- Weather proof
- Cast iron construction
- Black epoxy coated (E-coat)
- Conduit port 3/4 NPT

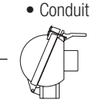


T8E
- Explosion proof rating Class I, Group B, C & D Class II, Group E, F & G Class III
- Gray iron body with aluminum screw cover
- NEMA 4 rated
- Conduit port 1/2 NPT

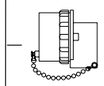


T11
- Weather proof
- Aluminum construction
- Conduit port 1/2 NPT

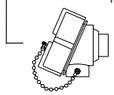
T11PL
- Weather proof
- Plastic construction
- Conduit port 1/2 NPSM



T12
- Weather proof
- Aluminum construction
- Flip-top head
- Conduit port 1/2 NPT



T13T
- FDA compliant, NEMA 4X rated
- White, unpigmented polypropylene construction
- 4 terminal posts
- Conduit port 3/4 NPT

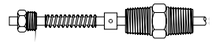


T15EAL - Aluminum
T15ESS - Stainless Steel
- Explosion Proof rating Class 1, Division 1, Groups B, C and D and Dust Proof/Ignition Proof rating for Class II, Division 1, Group E, F & G
- Ratings: T15EAL – NEMA 4, T15ESS – NEMA 4X
- Conduit port 3/4 NPT

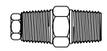
Note: For additional terminal head types and detailed descriptions, see page 46-51.

Specify Mounting Style

CSLW
- For 0.125", 0.187" and 0.250" diameter sheaths
- Stainless steel construction
- Mounting thread 1/2 NPT



SLAN
- For 0.125", 0.187" and 0.250" diameter sheaths
- Stainless steel construction
- Mounting thread 1/2 NPT
- Probe position can be adjusted in the field



SLANS
- For 0.250" diameter sheath
- Includes Viton O-ring
- Stainless steel construction
- Mounting thread 1/2 NPT
- Probe position can be adjusted in the field

Specify Length in Inches (required)

.00"

SLN
- For 0.125", 0.187" and 0.250" diameter sheath
- Mounting thread 1/2 NPT
- Most durable

SL
- Spring-loaded packing gland
- Spring travel: 1/4" to 3/8"
- 2-8 pounds spring pressure
- Stainless steel construction, Teflon sealant
- Available with B cap for direct mount
- *Additional dimensional data required, see page 44.*

SL12
- For 0.125" diameter sheath
- Mounting thread 1/8 NPT

SL18
- For 0.187" diameter sheath
- Mounting thread 1/4 NPT

SL25
- For 0.250" diameter sheath
- Mounting thread 1/2 NPT
- Optional 1/4 NPT mounting thread is available. Consult factory.

For additional information on spring-loaded mounting styles, see pages 44-45.

PRODUCT NUMBER: C8030-1
DESCRIPTION: ERTD43W3-SS25-T5ALHPT(HRB-SLANS)-.82"(0-350F)

For more information call: **1-800-223-2389** • e-mail: **conaxbuf@conaxbuffalo.com** • visit our website: **www.conaxbuffalo.com**

Temperature Transmitter

Model HPT

The Conax Model HPT is a low cost, 2-wire, non-isolated temperature transmitter for RTD sensors, and is designed to fit in our popular T11 model terminal head.

The HPT housing has a removable base allowing access to the electronics for the purpose of temperature range changes, which are easily accomplished with plug-in resistors.

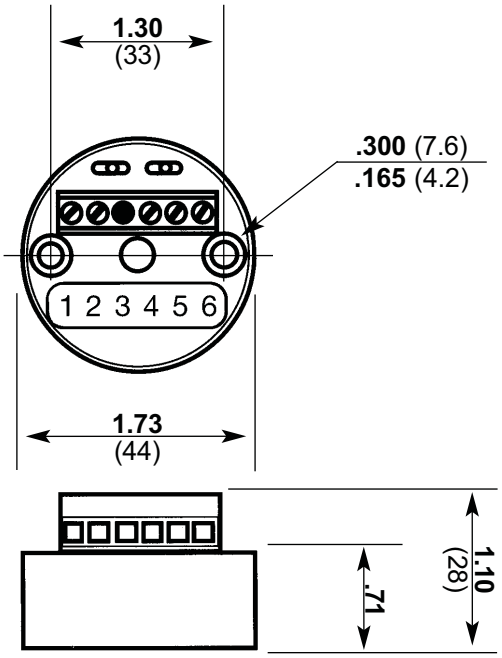
Specifications

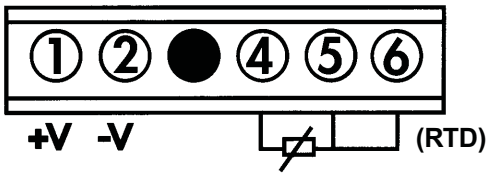
Output SPAN	4-20mA, limiting @ <28mA
Input	RTD - 100Ω, 2 or 3 wire connection
Input Span	RTD: 20°C min., 500°C max.
Burnout Detection	Upscale, Standard
Supply Voltage	8-38 VDC polarity protected
Maximum Load	Rmax = (V supply - 8V)÷ 20 mA
Ambient Temp.	-20°C to +70°C
Humidity	0-95% RH, non-condensing
Linearity	RTD: Better than ±.05% of SPAN referred to sensor temperature
Stability (for both ZERO and SPAN)	RTD (100°C SPAN): .03% of SPAN/°C

All specifications are subject to change without notice.

Dimensions & Electrical Connections

Dimensions are in inches (mm)





For more information call Conax Buffalo Technologies at: 1-800-223-2389

Represented By:

2300 Walden Avenue
Buffalo, New York 14225
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Toll free in the USA at 1-800-223-2389
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PO Box 91
BOGNOR REGIS PO22 7JB, England
FAX: +44 (0) 1243 587799 • Phone: +44 (0) 1243 587878
e-mail: cbteurope@compuserve.com

Pressure Transmitter

American Sensor Technologies
Your sensor business partner...

Krystal Bond™ Technology by AST

AST4310 *Class 1 Div 2 Groups A, B, C, D Non-Incendive*

Media Isolated, Field Adjustable Pressure Sensor

RoHS COMPLIANT LEAD FREE

OVERVIEW

The AST4310 is a media isolated, field adjustable pressure transmitter suitable for use in hazardous areas. Protected by a Viton O-ring, this transmitter's two potentiometers have the ability to adjust the zero and span output signals up to ± 5% [of the full scale pressure]. Additionally, the AST4310 offers access points through the housing of the transmitter in order to simplify adjustments after installation. Complete with a wide range of threads, pressure ranges and output signals, the AST4310 is the solution for pressure measurement when adjust ability is necessary.

BENEFITS

- **UL/cUL 1604 (CSA 213)** Class 1 Div 2 Groups A, B, C, D
- High Strength Stainless Steel Construction
- No Oil, Welds or Internal O-rings
- Wide Operating Temperature Range
- Ranges from Vacuum to 10,000 PSI
- Low Static and Thermal Errors
- Unparalleled Price and Performance
- Compatible with Wide Range of Liquids and Gases
- EMI/RFI Protection

APPLICATIONS

- Refrigeration
- Industrial OEM Equipment
- Pressure Instrumentation
- Gas Compression & Storage
- Oxygen Delivery Systems
- Water Management
- Oil & Gas Platforms
- Process Control
- Test Stands
- Hydrogen Fuel (316L)

Performance @25°C (77°F)

Accuracy*	< ±0.25% BFSL
Stability (1 year)	±0.25%FS, typ
Over range Protection	2X Rated Pressure
Burst Pressure	5X or 20,000 psi (whichever is less)
Pressure Cycles	> 100 Million

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

Electrical Data

Output	**4-20mA**	**1-5VDC, 1-6VDC**
Excitation	10-28VDC	10-28VDC
Output Impedance	>10k Ohms	<100 Ohms, Nominal
Current Consumption:	20mA, typ.	<10mA
Bandwidth	(-3dB): DC to 250 Hz	(-3dB): DC to 1kHz
Output Noise:	-	<2mV RMS
Zero Offset:	<±1% of FS	<±1% of FS
Span Tolerance:	<±2% of FS	<±1.5% of FS
Output Load:	0-800 Ohms@10-28VDC	10k Ohms, Min.
Reverse Polarity Protection	Yes	Yes

Environmental Data

Temperature	
Operating	-40 to 85°C (-40 to 185°F)
Storage	-40 to 100°C (-40 to 212°F)
Thermal Limits	
Compensated Range	0 to 55°C (30 to 130°F)
TC Zero	<±1.5% of FS
TC Span	<±1.5% of FS
Other	
Shock	100G, 11 msec, 1/2 sine
Vibration	10G peak, 20 to 2000 Hz.
EMI/RFI Protection:	Yes
Rating:	IP-66

American Sensor Technologies
450 Clark Drive, Mount Olive, NJ 07828 USA
Tel 973.448.1901 Fx 973.448.1905 *Email: info@astsensors.com*
www.astsensors.com

Ordering Information

AST4310 A 00500 P 3 L 0 000

Series Type

Process Connection
A=1/4" NPT Male
B=1/8" NPT Male
C=1/4" BSPP Male
I= 1/4" NPT Female
P=1/2" NPT Male

Pressure Range
Insert pressure range code from chart

Pressure Unit
B= Bar
K= kg/cm2
P= PSI

Outputs
3= 1-5V
4= 4-20mA (2 wire loop powered)

Electrical (Standard Conduit is 1/2-14 Male NPT)
I= DIN 43650A
L= Conduit fitting, Cable 2ft (0.6m)
M= Conduit fitting, Cable 4ft (1.2m)
N= Conduit fitting, Cable 6ft (1.8m)
P= Conduit fitting, Cable 10ft (3.0m)

Wetted Material
0=17-4PH
1=316 L

Options
000= No special options

Pressure Ranges*

PSIG Measurement Range	Pressure Range Code
-14.7 to 30**	V0030**
0-25	00025
0-50	00050
0-100	00100
0-200	00200
0-250	00250
0-300	00300
0-500	00500
0-1,000	01000
0-1,500	01500
0-2,500	02500
0-3000	03000
0-5,000	05000
0-7,500	07500
0-10,000	10000

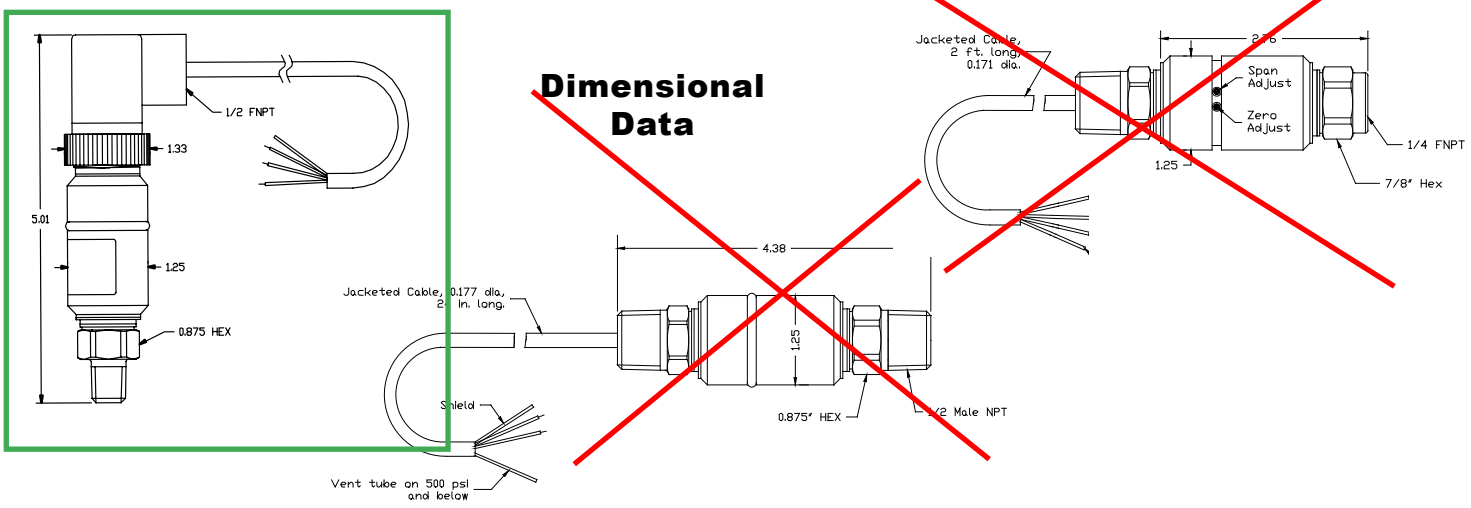
BARG Measurement Range	Pressure Range Code
-1 to 2**	V0002**
0-2	00002
0-5	00005
0-10	00010
0-20	00020
0-50	00050
0-100	00100
0-250	00250
0-350	00350
0-500	00500
0-700	00700

*Typical ranges. All ranges between 0-25 psi and 0-10,000 psi available. **Compound ranges up to -14.7 to 2500 psi available. Please consult factory.

INLET
DISCHARGE

INLET - AST4310-P-V0030-P-4-I-1-000
DISCHARGE - AST4310-P-00025-P-4-I-1-000

Dimensional Data



Warranty

Workmanship - AST, Inc. pressure transmitters have a limited one-year warranty to the original purchaser. AST, Inc. will replace or repair, free of charge, any defective transmitter. This warranty does not apply to any units that have been modified; misused, neglected or installed where the application exceeds published ratings. AST's sensors are **made with pride in New Jersey, USA**. If in the area please feel free to stop by for a visit!

Installation/Applications - The purchaser is responsible for media compatibility, functional adequacy, and correct installation of the transmitter.

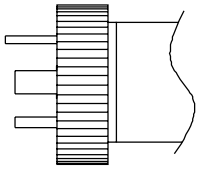
www.astsensors.com

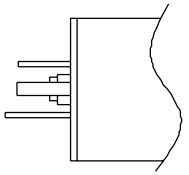
American Sensor Technologies
Standard Electrical Connections For AST Pressure Products

DIN

	mV	Voltage			4-20mA
		0.5-4.5V ratiometric	1-5V, 1-6V, 0-5V	0-10V, 1-10V	
Supply Voltage	5VDC typ., 10VDC max.	5VDC ± 0.01V	10-28VDC	15-28VDC	10-28VDC
Output Load	>1 MΩ	>10 KΩ	>10 KΩ	>10 KΩ	0-800Ω
Operating Temperature	-40 to 105ºC	-40 to 85ºC	-40 to 85ºC	-40 to 85ºC	-40 to 85ºC

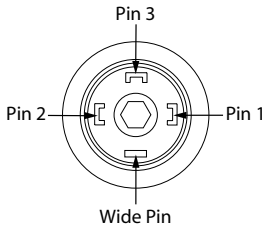
Hirschmann	DIN 43650A 18.0mm	Mini-DIN 43650C 8.0mm
AST Electrical Connection option	"I"	"E"
Mates with	Hirschmann 931 970-100 [conduit] or equivalent	Hischmann 933 023-100
AST Mating Connector Part Number	A04598 [for Class 1 Div 2 applications]	A01980
Available on AST Models:	AST4300/4310/43LP/4400/4410/44LP/ 4700/4710/47LP/47HP/1000	AST4000/4200/4400/4410/44LP/4700/ 4710/47LP/47HP/4900/1000/5000/5100/ AG200

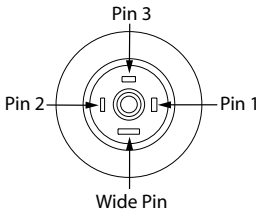




Hirschmann	DIN43650A 18.0mm				Mini-DIN 43650C 8.0mm			
Output Type	**Pin 1**	**Pin2**	**Pin 3**	**Wide Pin**	**Pin 1**	**Pin 2**	**Pin 3**	**Wide Pin**
mV & 4-Wire Voltage	+S	GND	+V	-S	-S	GND	+V	+S
3 Wire Voltage	+V	GND	S	N/C	S	GND	+V	N/C
4-20mA (2 wire loop powered)	+V	GND	N/C	N/C	N/C	GND	+V	N/C
4-20mA (3 wire, available on the AST5400 only)	+V	GND	S	N/C	S	GND	+V	N/C

S= Output Signal
V= Voltage Supply
N/C= Not Connected





SECTION 8

VFD

SPECIFICATIONS

VACON NXS
ROBUST DRIVE FOR HEAVY USE

VACON
DRIVEN BY DRIVES

THE RELIABLE CHOICE

The Vacon NXS is a compact AC drive in the power range of 0.37—560 kW and supply voltages of 208—690 V for heavy use in machines, buildings and all branches of industry.

The robust design incorporates effective protection against supply network disturbances. Trip-free operation is also guaranteed due to sophisticated motor control principles and motor/drive protection features, component selection and effective cooling.

Enclosure classes of IP21 and IP54 and integrated high-level EMC filters make the Vacon NXS suitable for all environments.

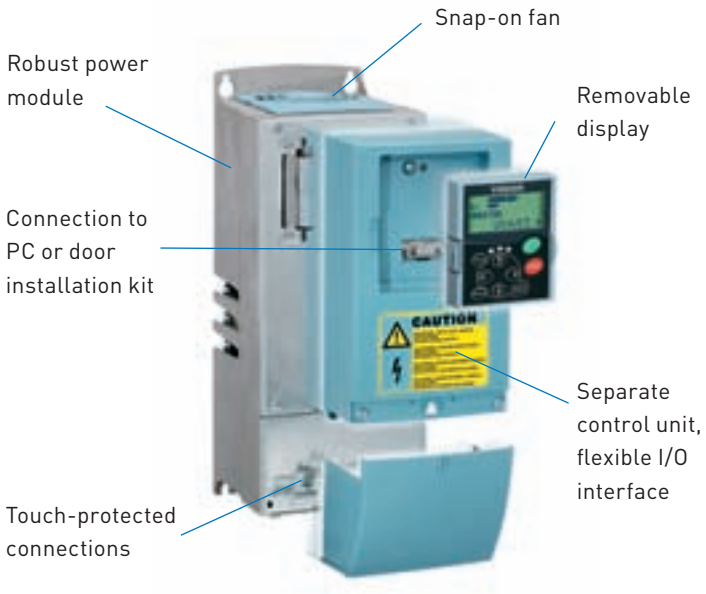
The Start-Up Wizard and the standard All-In-One Application Package make parameter setting extremely easy in all cases, from simple to complex.

The wide and flexible standard I/O and option for five I/O boards provide versatile controllability. The most common fieldbus options are also available.

The modular design of the Vacon NXS brings several advantages: the control terminals are safely separated from power terminals, upgrading the control inputs and outputs is easy and convenient, replacing the cooling fan (the only regularly replaceable component) is fast, the display panel can be utilized for parameter copying, etc.

Features

- Easy to use display panel
- Interactive programming with Start-Up Wizard
- Versatile All-in-One Package
- PID controller and PFC for 1-5 pumps
- Special applications available (water application package, high speed, etc.)
- Five slots for control boards (2 basic boards and 3 option boards)
- High switching frequency, low noise
- Steady state speed error < 1%
- Low torque ripple
- Starting torque > 200%, depending on AC drive sizing
- Suitable for multi-motor applications



VACON NXS IP21

FR4 FR5 FR6 FR7 FR8 FR9

The mechanical design is extremely compact. The IP54 units in particular are the smallest AC drives on the market. All units are suitable for both wall and enclosure mounting with all necessary components: integrated EMC filters, AC chokes, cable protection, dust and water protection. The effective super-cooling principle allows high ambient temperatures and high switching frequencies without derating.

Mains voltage 380—500 V, 50/60 Hz, 3~, Wall-mounted units

AC drive type	Loadability					Motor shaft power		Frame size	Dimensions W*H*D (mm)
	Low (+40°C)		High (+50°C)		Maximum current I_S	400 V supply			
	Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overl. P (kW)	50% overl. P (kW)		
NXS 0003 5 A 2 H 1 SSS	3.3	3.6	2.2	3.3	4.4	1.1	0.75	FR4	128*292*190
NXS 0004 5 A 2 H 1 SSS	4.3	4.7	3.3	5.0	6.2	1.5	1.1	FR4	128*292*190
NXS 0005 5 A 2 H 1 SSS	5.6	6.2	4.3	6.5	8.6	2.2	1.5	FR4	128*292*190
NXS 0007 5 A 2 H 1 SSS	7.6	8.4	5.6	8.4	10.8	3	2.2	FR4	128*292*190
NXS 0009 5 A 2 H 1 SSS	9	9.9	7.6	11.4	14	4	3	FR4	128*292*190
NXS 0012 5 A 2 H 1 SSS	12	13.2	9	13.5	18	5.5	4	FR4	128*292*190
NXS 0016 5 A 2 H 1 SSS	16	17.6	12	18.0	24	7.5	5.5	FR5	144*391*214
NXS 0022 5 A 2 H 1 SSS	23	25.3	16	24.0	32	11	7.5	FR5	144*391*214
NXS 0031 5 A 2 H 1 SSS	31	34	23	35	46	15	11	FR5	144*391*214
NXS 0038 5 A 2 H 1 SSS	38	42	31	47	62	18.5	15	FR6	195*519*237
NXS 0045 5 A 2 H 1 SSS	46	51	38	57	76	22	18.5	FR6	195*519*237
NXS 0061 5 A 2 H 1 SSS	61	67	46	69	92	30	22	FR6	195*519*237
NXS 0072 5 A 2 H 0 SSS	72	79	61	92	122	37	30	FR7	237*591*257
NXS 0087 5 A 2 H 0 SSS	87	96	72	108	144	45	37	FR7	237*591*257
NXS 0105 5 A 2 H 0 SSS	105	116	87	131	174	55	45	FR7	237*591*257
NXS 0140 5 A 2 H 0 SSS	140	154	105	158	210	75	55	FR8	291*758*344
NXS 0168 5 A 2 H 0 SSS	170	187	140	210	280	90	75	FR8	291*758*344
NXS 0205 5 A 2 H 0 SSS	205	226	170	255	336	110	90	FR8	291*758*344
NXS 0261 5 A 2 H 0 SSF	261	287	205	308	349	132	110	FR9	480*1150*362
NXS 0300 5 A 2 H 0 SSF	300	330	245	368	444	160	132	FR9	480*1150*362

Mains voltage 380—500 V, 50/60 Hz, 3~, Standalone units

AC drive type	Loadability					Motor shaft power		Frame size	Dimensions W*H*D (mm)
	Low (+40°C)		High (+40°C)		Maximum current I_S	400 V supply			
	Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overload P (kW)	50% overload P (kW)		
NXS 0385 5 A 2 L 0 SSA	385	424	300	450	540	200	160	FR10	595*2020*602
NXS 0460 5 A 2 L 0 SSA	460	506	385	578	693	250	200	FR10	595*2020*602
NXS 0520 5 A 2 L 0 SSA	520	572	460	690	828	250	250	FR10	595*2020*602
NXS 0590 5 A 2 L 0 SSA	590	649	520	780	936	315	250	FR11	794*2020*602
NXS 0650 5 A 2 L 0 SSA	650	715	590	885	1062	355	315	FR11	794*2020*602
NXS 0730 5 A 2 L 0 SSA	730	803	650	975	1170	400	355	FR11	794*2020*602

VACON NXS IP54

FR4 FR5 FR6 FR7 FR8 FR9

PRODUCT RANGE

Mains voltage 525—690 V, 50/60 Hz, 3~, Wall-mounted units

AC drive type	Loadability					Motor shaft power		Frame size	Dimensions W*H*D (mm)
	Low (+40°C)		High (+50°C)		Maximum current I_S	690 V supply			
	Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overl. P (kW)	50% overl. P (kW)		
NXS 0004 6 A 2 L 0 SSS	4.5	5.0	3.2	4.8	6.4	3	2.2	FR6	195*519*237
NXS 0005 6 A 2 L 0SSS	5.5	6.1	4.5	6.8	9.0	4	3	FR6	195*519*237
NXS 0007 6 A 2 L 0 SSS	7.5	8.3	5.5	8.3	11.0	5.5	4	FR6	195*519*237
NXS 0010 6 A 2 L 0 SSS	10	11.0	7.5	11.3	15.0	7.5	5.5	FR6	195*519*237
NXS 0013 6 A 2 L 0 SSS	13.5	14.9	10	15.0	20.0	11	7.5	FR6	195*519*237
NXS 0018 6 A 2 L 0 SSS	18	19.8	13.5	20.3	27	15	11	FR6	195*519*237
NXS 0022 6 A 2 L 0 SSS	22	24.2	18	27.0	36	18.5	15	FR6	195*519*237
NXS 0027 6 A 2 L 0 SSS	27	29.7	22	33.0	44	22	18.5	FR6	195*519*237
NXS 0034 6 A 2 L 0 SSS	34	37	27	41	54	30	22	FR6	195*519*237
NXS 0041 6 A 2 L 0 SSS	41	45	34	51	68	37.5	30	FR7	237*591*257
NXS 0052 6 A 2 L 0 SSS	52	57	41	62	82	45	37.5	FR7	237*591*257
NXS 0062 6 A 2 L 0 SSS	62	68	52	78	104	55	45	FR8	291*758*344
NXS 0080 6 A 2 L 0 SSS	80	88	62	93	124	75	55	FR8	291*758*344
NXS 0100 6 A 2 L 0 SSS	100	110	80	120	160	90	75	FR8	291*758*344
NXS 0125 6 A 2 L 0 SSF	125	138	100	150	200	110	90	FR9	480*1150*362
NXS 0144 6 A 2 L 0 SSF	144	158	125	188	213	132	110	FR9	480*1150*362
NXS 0170 6 A 2 L 0 SSF	170	187	144	216	245	160	132	FR9	480*1150*362
NXS 0208 6 A 2 L 0 SSF	208	229	170	255	289	200	160	FR9	480*1150*362

For all Vacon NXS drives, overloadability is defined as follows:
High: 1.5 x I_H (1 min/10 min) @ 50°C; Low: 1.1 x I_L (1 min/10 min) @ 40°C; I_S for 2 sec every 20 sec.

Mains voltage 525—690 V, 50/60 Hz, 3~, Standalone units

AC drive type	Loadability					Motor shaft power		Frame size	Dimensions W*H*D (mm)
	Low (+40°C)		High (+40°C)		Maximum current I_S	690 V supply			
	Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)		10% overload P (kW)	50% overload P (kW)		
NXS 0261 6 A 2 L 0 SSA	261	287	208	312	375	250	200	FR10	595*2020*602
NXS 0325 6 A 2 L 0 SSA	325	358	261	392	470	315	250	FR10	595*2020*602
NXS 0385 6 A 2 L 0 SSA	385	424	325	488	585	355	315	FR10	595*2020*602
NXS 0416 6 A 2 L 0 SSA*	416	458	325	488	585	400	315	FR10	595*2020*602
NXS 0460 6 A 2 L 0 SSA	460	506	385	578	693	450	355	FR11	794*2020*602
NXS 0502 6 A 2 L 0 SSA	502	552	460	690	828	500	450	FR11	794*2020*602
NXS 0590 6 A 2 L 0 SSA*	590	649	502	753	904	560	500	FR11	794*2020*602

* max. ambient temperature of +35°C

Hardware configurations, Standalone units

FUNCTION	AVAILABILITY
IP21	Standard
IP54 (FR10 only)	Optional (H: +20mm)
Integrated fuses	Standard
Integrated load switch	Optional
EMC filtering L	Standard
EMC filtering T	Optional
Integrated brake chopper (cabling top entry)	Optional (H: +122 mm)

FR10

FR11

Mains voltage 208—240 V, 50/60 Hz, 3~, Wall-mounted units

AC drive type	Loadability					Motor shaft power		Frame size	Dimensions W*H*D (mm)
	Low (+40°C)		High (+50°C)			230 V supply			
	Rated continuous current I_L (A)	10% overload current (A)	Rated continuous current I_H (A)	50% overload current (A)	Maximum current I_S	10% overl. P (kW)	50% overl. P (kW)		
NXS 0004 2 A 2 H 1 SSS	4.8	5.3	3.7	5.6	7.4	0.75	0.55	FR4	128*292*190
NXS 0007 2 A 2 H 1 SSS	6.6	7.3	4.8	7.2	9.6	1.1	0.75	FR4	128*292*190
NXS 0008 2 A 2 H 1 SSS	7.8	8.6	6.6	9.9	13.2	1.5	1.1	FR4	128*292*190
NXS 0011 2 A 2 H 1 SSS	11	12.1	7.8	11.7	15.6	2.2	1.5	FR4	128*292*190
NXS 0012 2 A 2 H 1 SSS	12.5	13.8	11	16.5	22	3	2.2	FR4	128*292*190
NXS 0017 2 A 2 H 1 SSS	17.5	19.3	12.5	18.8	25	4	3	FR5	144*391*214
NXS 0025 2 A 2 H 1 SSS	25	27.5	17.5	26.3	35	5.5	4	FR5	144*391*214
NXS 0031 2 A 2 H 1 SSS	31	34.1	25	37.5	50	7.5	5.5	FR5	144*391*214
NXS 0048 2 A 2 H 1 SSS	48	52.8	31	46.5	62	11	7.5	FR6	195*519*237
NXS 0061 2 A 2 H 1 SSS	61	67.1	48	72.0	96	15	11	FR6	195*519*237
NXS 0075 2 A 2 H 0 SSS	75	83	61	92	122	18.5	15	FR7	237*591*257
NXS 0088 2 A 2 H 0 SSS	88	97	75	113	150	22	18.5	FR7	237*591*257
NXS 0114 2 A 2 H 0 SSS	114	125	88	132	176	30	22	FR7	237*591*257
NXS 0140 2 A 2 H 0 SSS	140	154	105	158	210	37	30	FR8	291*758*344
NXS 0170 2 A 2 H 0 SSS	170	187	140	210	280	45	37	FR8	291*758*344
NXS 0205 2 A 2 H 0 SSS	205	226	170	255	336	55	45	FR8	291*758*344
NXS 0261 2 A 2 H 0 SSF	261	287	205	308	349	75	55	FR9	480*1150*362
NXS 0300 2 A 2 H 0 SSF	300	330	245	368	444	90	75	FR9	480*1150*362

VACON NXS TYPE DESIGNATION CODE

NXS 0007 5 A 2 H 1 SSS A1A20000C3

- Factory installed I/O boards and expanders (slots A, B, C, D and E)
  - C3 = Profibus board OPT-C3 (slot E)
  - 00 = no board (slot D)
  - 00 = no board (slot C)
  - A1 = basic I/O boards OPT-A1 (slot A)
  - A2 = basic output relay board OPT-A2 (slot B)
  - A3 = basic output relay board OPT-A3 (slot B) including thermistor input
- Hardware modifications (power unit, special modifications, board varnishing)
- Brake chopper option:
  - 0 = no brake chopper
  - 1 = internal brake chopper
  - 2 = internal brake chopper and resistor
- Emission level:
  - H = fulfils the standard EN 61800-3 (2004), category C2
  - T = fulfils the standard EN 61800-3 (2004), category C4. Low earth current solution for IT networks
  - L = fulfils the standard EN 61800-3 (2004), category C3
  - C = fulfils the standard EN 61800-3 (2004), category C1
- Enclosure classification:
  - 2 = IP21
  - 5 = IP54
- Control keypad:
  - A = standard alpha-numeric keypad
  - B = no keypad
  - G = graphic keypad (Chinese and Russian letters)
- Nominal mains voltage:
  - 2 = 208...240 V AC (3-phase)
  - 5 = 380...500 V AC (3-phase)
  - 6 = 525...690 V AC (3-phase)
- Nominal current
  - Maximum continuous current of the unit @ 40°C
  - e.g. 0007 = 7 Amps
- Product range:
  - NXS

VACON NXS CONTROL UNIT

There are no fixed inputs or outputs in the Vacon NXS. There are five slots (A, B, C, D and E) for I/O boards, and a suitable board can be selected for each slot (see the table below).

The NXS units are delivered with OPT-A1 and OPT-A2 boards if the I/O is not specified. In many countries, boards OPT-A1 and OPT-A3 are used as standard I/O as the galvanically isolated thermistor input is often required.

Removable terminals, snap-in card installation, automatic card identification and instructions on the drive help making quick connections. If necessary, the inputs, outputs and fieldbus boards can be added in the field. The Vacon NXS is simply the most flexible frequency converter series on the market.

An external +24 V supply option enables communication with the control unit even if the mains supply is switched off (e.g. fieldbus communication and parameter settings).

VACON OPTION BOARDS

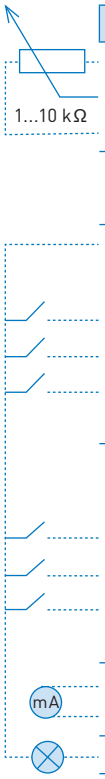
Card typecode	Card slot					I / O signal													
	A	B	C	D	E	DI	DO	DI DO	AI mA ±V	AI mA isol.	AO mA V	AO mA isol.	RO NO NC	RO NO	+10V ref	Therm	+24 EXT +24V	Pt100	42-240 VAC input	NOTE
Basic I/O cards (OPT-A)																				
OPT-A1						6	1		2		1				1		2			
OPT-A2													2							
OPT-A3													1	1		1				
OPT-A8						6	1		2		1				1		2			1)
OPT-A9						6	1		2		1				1		2			2,5 mm² terminals
I/O expander cards (OPT-B)																				
OPT-B1								6									1			Selectable DI/DO
OPT-B2													1	1		1				
OPT-B4										1		2					1			2)
OPT-B5														3						
OPT-B8																	1	3		
OPT-B9														1					5	
Fieldbus cards (OPT-C)																				
OPT-C2						RS-485 (Multiprotocol)														Modbus, N2
OPT-C3						Profibus DP														
OPT-C4						LonWorks														
OPT-C5						Profibus DP (D9 type connector)														
OPT-C6						CANopen (slave)														
OPT-C7						DeviceNet														
OPT-C8						RS-485 (Multiprotocol, D9 type connector)														Modbus, N2
OPT-CI						Modbus/TCP														
OPT-CJ						BACNet														

NOTES: Allowed slots for the board are marked in blue.

1) analogue signals galvanically isolated as a group, 2) analogue signals galvanically isolated separately.

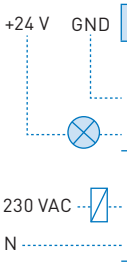
VACON NXS STANDARD I/O

OPT-A1



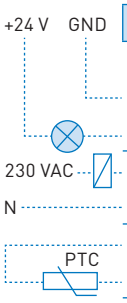
Terminal		Defaults settings	Programmable
1	+10V	Reference voltage	
2	AI1+	Frequency reference 0–10 V	-10–+10 V, 0/4–20 mA
3	AI1-	AI common (GND)	Differential
4	AI2+	Frequency reference 4–20 mA	0–20mA, 0/-10 V–10 V
5	AI2-	AI common (differential)	GND
6	+24V	Control supply (bidirectional)	
7	GND	I/O Ground	
8	DIN1	Start forward	Many possibilities
9	DIN2	Start reverse	Many possibilities
10	DIN3	External fault input	Many possibilities
11	CMA	Common for DIN1 - DIN3 (GND)	Floating
12	+24V	Control supply (bidirectional)	
13	GND	I/O Ground	
14	DIN4	Multi-step speed select 1	Many possibilities
15	DIN5	Multi-step speed select 2	Many possibilities
16	DIN6	Fault reset	Many possibilities
17	CMB	Common for DIN4 - DIN6 (GND)	Floating
18	AO1+	Output frequency (0–20 mA)	Many possibilities
19	AO1-	AO common (GND)	4–20 mA, 0–10 V
20	DO1	READY, I ≤ 50 mA, U ≤ 48 VDC	Many possibilities

OPT-A2



Terminal		Defaults settings	Programmable
21	R01	RUN	Many possibilities
22	R01		
23	R01		
24	R02	FAULT	Many possibilities
25	R02		
26	R02		

OPT-A3 (alternative)



Terminal		Defaults settings	Programmable
21	R01	RUN	Many possibilities
22	R01		
23	R01		
25	R02	FAULT	Many possibilities
26	R02		
28	TI1+	Thermistor input fault	Warning, fault, no response
29	TI1-		

Default settings of OPT-A1, OPT-A2 and OPT-A3 for the Basic and Standard Applications.

OTHER TYPICAL OPTIONS

OPTION	ORDER TYPECODE	AVAILABILITY	NOTE
IP54 enclosure	Factory option	All	Replace '2' by '5' in the type code, e.g. NXS02605A**5**H0 (SSS...)
	IP5-FR_	FR4, FR5, FR6	IP54 kit, e.g. IP5-FR4
Through-hole mounting	Factory option	FR4-FR9	E.g. NXS02605A**T**H0S**T**S..., IP54 back, IP21 front, kits available
Integrated brake choppers	Standard	FR4-6/230, 500 V	E.g. NXS00455A2H**1** (SSS...)
	Factory option	FR7-, FR6-/690 V	E.g. NXS02605A2H**1** (SSS...)
External brake resistors (380 - 500 V range)	BRR-0022-LD-5	00035-00225	LD = Light duty: 5 sec nominal torque braking from nominal speed decreasing linearily to zero, once per 120 sec. HD = Heavy duty: 3 sec nominal torque braking at nominal speed + 7 sec nominal torque braking from nominal speed decreasing linearily to zero, once per 120 sec. Replace LD by HD in the type code, e.g. BRR-0105-**HD**-5 Brake resistors are also available for 208-240 V and 525-690 V NXS drives The brake resistor manual is available for more precise selection
	BRR-0031-LD-5	00315	
	BRR-0045-LD-5	00385-00455	
	BRR-0061-LD-5	00615	
	BRR-0105-LD-5	00725-01055	
	BRR-0300-LD-5	01405-03005	
Integrated brake resistors	Factory option	FR4-6/500 V	Replace '1' by '2' in the typecode, e.g. NXS00455A2H**2** (SSS...) Light duty: 2 sec nominal torque braking from nominal speed decreasing linearily to zero, once per 60 sec.
Graphical display panel	Factory option	All	Replace 'A' by 'G', e.g. NXS00455**G**2H1 (SSS..), supports Chinese & Russian
	PAN-G	All	Order typecode when ordered separately
Panel door installation sets	DRA-02B (-04B, -15B)	All	Length of RS232C cable is specified in the typecode, e.g. DRA-02B includes 2-meter RS232C cable
Varnished circuit boards	Factory option	All	Frame sizes FR4-FR8: replace the 'S' by 'V', e.g. NXS00455A2H1SS**V**..., frame size FR9-FR11: replace 'S' by 'G'
C-level RFI filters	Factory option	FR4-6/500 V	Replace 'H' by 'C' in the typecode, e.g. NXS00455A5**C**1 (SSS..)
Du/dt & sinus filters			Available for all drives, contact local Vacon supplier

FIRST-CLASS USABILITY

The uncluttered text display panel with a well-defined menu structure and functions such as automatic parameter copy and start-up wizard makes commissioning and fine-tuning as easy as possible.

A maximum of three values can be monitored simultaneously (the multi-monitoring feature).

The Vacon PC tools are available for downloading from the Vacon website at http://www.vacon.com. These include:

- Vacon NCDrive for parameter setting, copying, storing, printing, monitoring and controlling
- Vacon NCLoad for software updating and uploading special software to the drive
- Vacon NC61131-3 Engineering is available for making tailor-made software. A license key and training required.

The Vacon PC tools require only an RS232C cable for communication with the drive (no adapters etc. required).

Basic

I/O	Defaults	
AI1	f_{ref}	P
AI2	f_{ref}	P
DI1	Start forward	
DI2	Start reverse	
DI3	External fault	P
DI4	Speed select 1	
DI5	Speed select 2	
DI6	Fault reset	
AO1	f_{out}	P
DO1	Ready	
RO1	Run	
RO2	Fault	

Suitable for most purposes

Standard

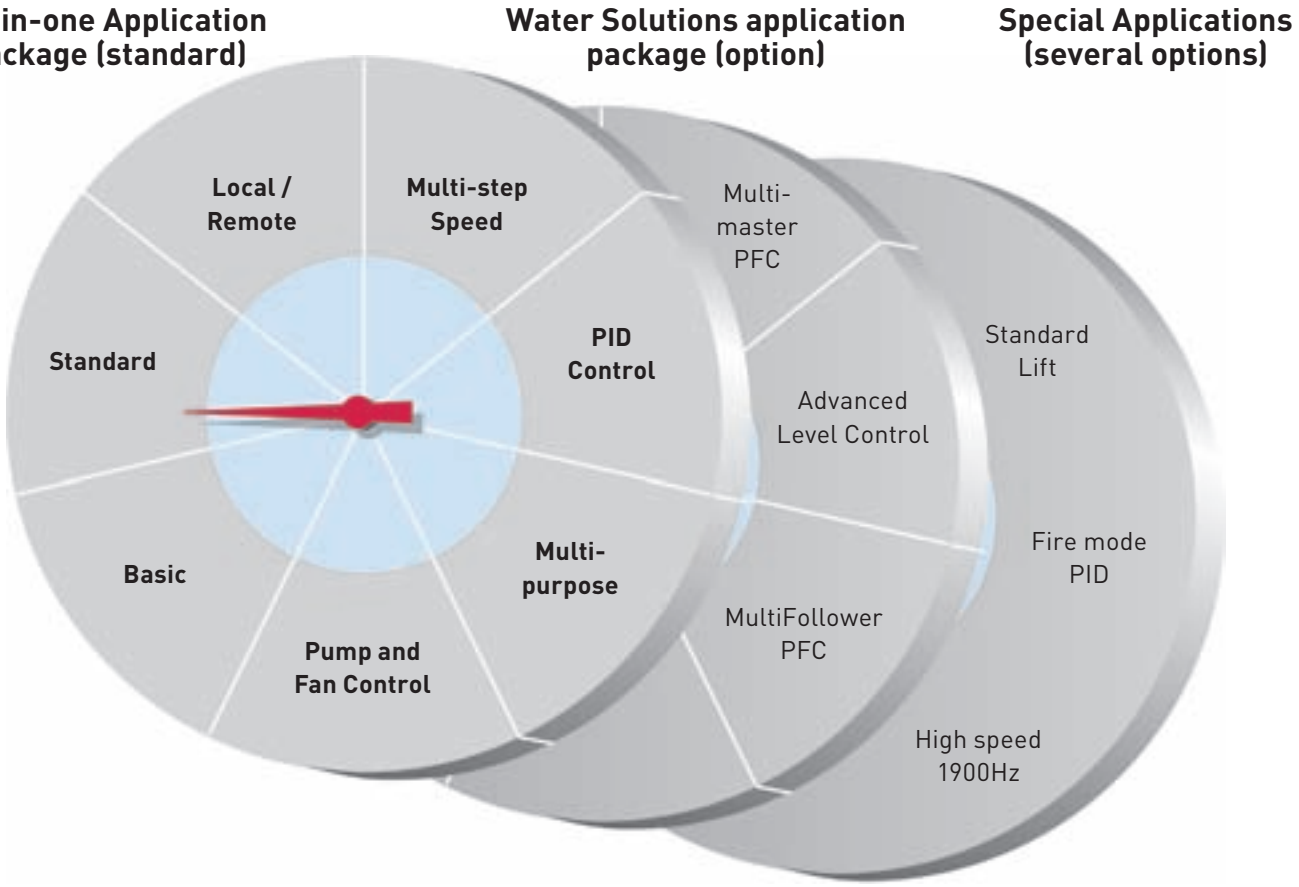
I/O	Defaults	
AI1	f_{ref}	P
AI2	f_{ref}	P
DI1	Start forward	P
DI2	Start reverse	P
DI3	External fault	P
DI4	Speed select 1	
DI5	Speed select 2	
DI6	Fault reset	
AO1	f_{out}	P
DO1	Ready	P
RO1	Run	P
RO2	Fault	P

Basic, with more programming possibilities

Local/Remote

I/O	Defaults	
AI1	B f_{ref}	P
AI2	A f_{ref}	P
DI1	A Start forward	P
DI2	A Start reverse	P
DI3	External fault	P
DI4	B Start forward	P
DI5	B Start reverse	P
DI6	A/B selection	
AO1	f_{out}	P
DO1	Ready	P
RO1	Run	P
RO2	Fault	P

Two external control places



The All-in-One application package has seven applications (=default settings and functionality of control inputs and outputs, see tables below) which can be selected with one parameter. The application will also be requested by the Start-up Wizard at the first power-up. With this single setting, the controls can be programmed e.g. for two external control places or a pressure control with the integrated PID controller. In most cases, the default basic application is suitable and only the min/max frequencies as well as motor nominal values must be set.

Thanks to the modular software applications made by the Vacon NC61131-3 Engineering tool, the All-in-One application package can be replaced by the Water application package that contains several applications optimized for water handling. There are also several other general-purpose software applications available.

P = Programmable

Multi-step Speed Control

I/O	Defaults	
AI1	f_{ref}	P
AI2	f_{ref}	P
DI1	Start forward	P
DI2	Start reverse	P
DI3	External fault	P
DI4	Speed select 1	
DI5	Speed select 2	
DI6	Speed select 3	
AO1	f_{out}	P
DO1	Ready	P
RO1	Run	P
RO2	Fault	P

16 fixed speeds

PID Control

I/O	Defaults	
AI1	PID reference	P
AI2	PID actual value	P
DI1	PID start/stop	
DI2	External fault	P
DI3	Fault reset	P
DI4	f ctrl start/stop	
DI5	Jog speed select	P
DI6	PID/f ctrl select	
AO1	f_{out}	P
DO1	Ready	P
RO1	Run	P
RO2	Fault	P

When PID is required

Multi-purpose Control

I/O	Defaults	
AI1	f_{ref}	P
AI2	f_{ref}	P
DI1	Start forward	P
DI2	Start reverse	P
DI3	Fault reset	P
DI4	Jog speed sel	P
DI5	External fault	P
DI6	Acc/dec time sel	P
AO1	f_{out}	P
DO1	Ready	P
RO1	Run	P
RO2	Fault	P

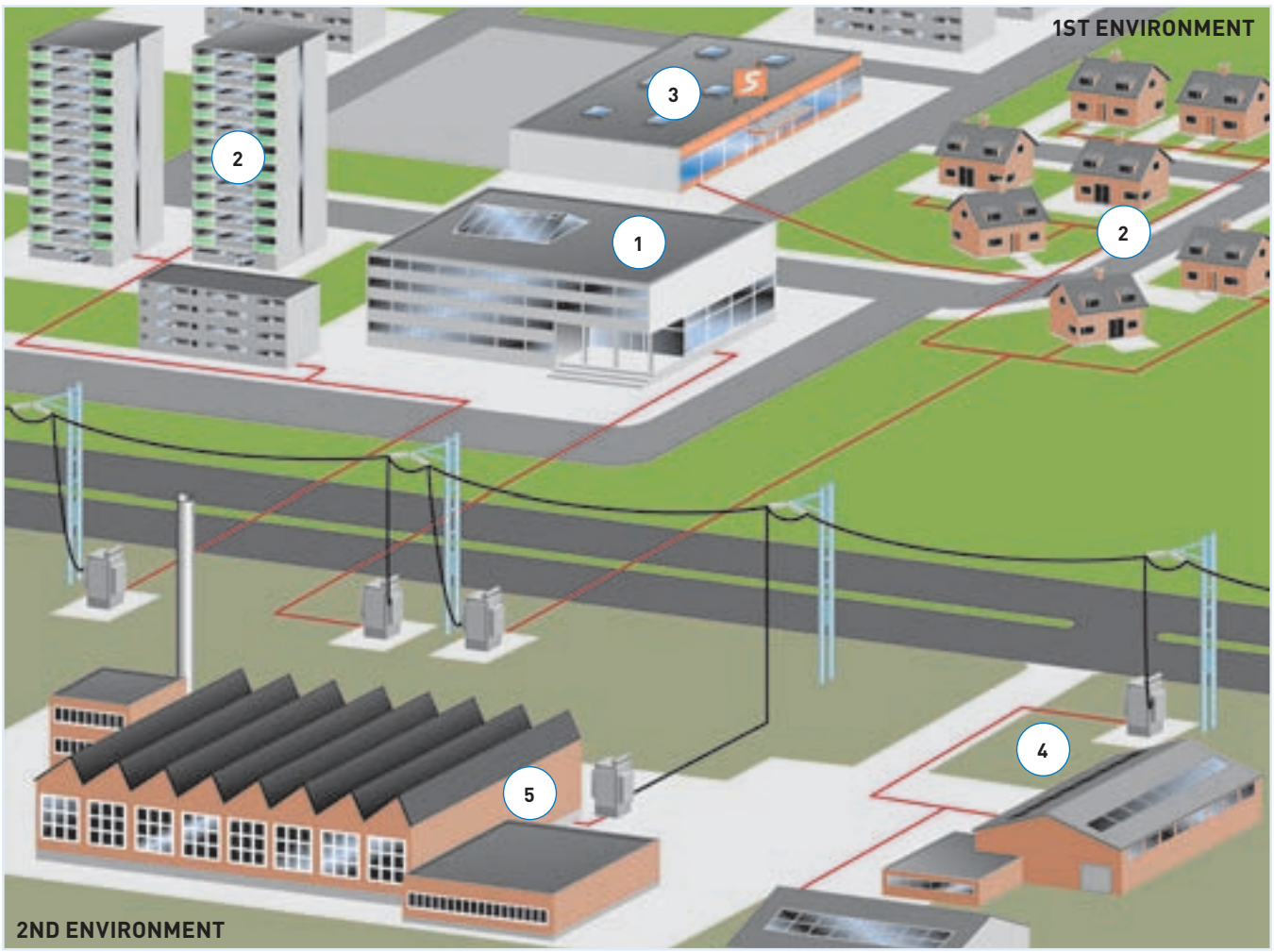
Most flexible of all

Pump and Fan Control

I/O	Defaults	
AI1	PID reference	P
AI2	PID actual value	P
DI1	PID start/stop	P
DI2	Interlock 1	P
DI3	Interlock 2	P
DI4	f ctrl start/stop	P
DI5	Jog speed select	P
DI6	PID/f ctrl select	P
AO1	f_{out}	P
DO1	Fault	P
RO1	Autochange 1	P
RO2	Autochange 2	P

Control of up to five pumps with auto-change

EMC AND INSTALLATION ENVIRONMENT



The product family standard EN61800-3 sets limits for both emissions and immunity of radio frequency disturbances. The environment has been divided into the 1st and 2nd environments, i.e. in practice, the public and industrial networks, respectively.

Radio Frequency Interference (RFI) filters are typically required to meet the EN61800-3 standard. These filters are integrated in the Vacon NXS as standard.

The 208–240 V and 380–500 V ranges of the Vacon NXS (FR4-FR9) fulfills the requirements of the 1st and 2nd environments (H level: EN61800-3(2004), category C2). No additional RFI filters or cabinets are required. The FR10-FR11 and the 525-690 V range of the Vacon NXS fulfills the requirements of the 2nd environment (L-level: EN61800-3(2004), category C3).

The units in the frame sizes of FR4, FR5 and FR6 (the voltage range from 380 to 500 V) are also available with extremely low-emission integrated EMC filters (C level: EN61800-3 (2004), category C1). This is sometimes required in very sensitive locations such as hospitals.

EMC Selection Table, restricted distribution

	1	2	3	4	5	
Vacon NXS EMC	**Hospital**	**Residential Area**	**Commercial**	**Light Industry Area**	**Heavy Industry**	**Marine**
C	O					
H	R	R	R	O	O	
L				R	R	
T					R (IT Network)	R (IT Network)

R = Required ; O = Optional

Mains connection	Input voltage U_{in}	208...240 V; 380...500 V; 525...690 V; (–15%...+10%)
	Input frequency	50...60 Hz (± 10%)
	Connection to mains	Once per minute or less (normal case)
Motor connection	Output voltage	0—U_{in}
	Continuous output current	High overloadability: I_H Low overloadability: I_L
	Overloadability	High: 1.5 x I_H (1 min/10 min), Low: 1.1 x I_L (1 min/10 min)
	Max. starting current	I_s for 2 s every 20 s
	Output frequency	0...320 Hz; up to 7200 Hz with special software
	Frequency resolution	0.01 Hz
Control characteristics	Control method	Frequency control U/f; Open Loop Vector Control (speed, torque)
	Switching frequency	208..240V/380..500V: FR4-6: 1...16 kHz; Factory default: 10 kHz FR7-9: 1...10 kHz; Factory default: 3.6 kHz FR10-11: 1...6 kHz; Factory default: 3.6 kHz 525..690V: FR4-11: 1...6 kHz, Factory default: 1.5 kHz
	Field weakening point	8...320 Hz
	Acceleration time	0...3000 sec
	Deceleration time	0...3000 sec
	Braking	DC brake: 30% * T_N (without brake resistor), flux braking
Ambient conditions	Ambient operating temperature	–10°C (no frost)...+50°C: I_H (FR10-FR11: max +40°C) –10°C (no frost)...+40°C: I_L (NXS 0416 6 and NXS 0590 6: max +35°C)
	Storage temperature	–40°C...+70°C
	Relative humidity	0 to 95% RH, non-condensing, non-corrosive, no dripping water
	Air quality: - chemical vapours - mechanical particles	 IEC 60721-3-3, unit in operation, class 3C2 IEC 60721-3-3, unit in operation, class 3S2
	Altitude	100% load capacity (no derating) up to 1000 m 1-% derating for each 100 m above 1000 m; max. 3000 m
	Vibration EN50178/EN60068-2-6	5...150 Hz: Displacement amplitude 1 mm (peak) at 5...15.8 Hz (FR10-FR11: 0,25 mm (peak) at 5...31 Hz) Max acceleration amplitude 1 G at 15.8...150 Hz (FR10 and up: 1 G at 31...150 Hz)
	Shock EN50178, EN60068-2-27	UPS Drop Test (for applicable UPS weights) Storage and shipping: max 15 G, 11 ms (in package)
	Enclosure class	IP21 and IP54
EMC	Immunity	Fulfil all EMC immunity requirements
	Emissions	**EMC level C**: EN61800-3 (2004), category C1 **EMC level H**: EN61800-3 (2004), category C2 **EMC level L**: EN61800-3 (2004), category C3 **EMC level T**: Low earth-current solution suitable for IT networks, EN61800-3 (2004), category C4
Safety		EN 50178 (1997), EN 60204-1 (2006), IEC 61800-5, CE, UL, CUL; (see unit nameplate for more detailed approvals)
Control connections (OPT-A1, -A2 or OPT-A1, -A3)	Analogue input voltage	0...+10 V (–10 V...+10 V joystick control), R_i = 200 kΩ, resolution 0.1%, accuracy ±1%
	Analogue input current	0(4)...20 mA, R_i = 250 Ω differential, resolution 0.1%, accuracy ±1%
	Digital inputs	6, positive or negative logic; 18...30 VDC
	Auxiliary voltage	+24 V, ±15%, max. 250 mA
	Output reference voltage	+10 V, +3%, max. load 10 mA
	Analogue output	0(4)...20 mA; R_L max. 500 Ω, resolution 10 bit, accuracy ±2%
	Digital output	Open collector output, 50 mA/48 V
	Relay outputs	2 programmable change-over (NO/NC) relay outputs (OPT-A3: NO/NC+NO) Switching capacity: 24 VDC/8 A, 250 VAC/8 A, 125 VDC/0.4 A. Min. switching load: 5 V/10 mA
	Thermistor input (OPT-A3)	Galvanically isolated, R_{trip} = 4.7 kΩ
Protections		Overvoltage, undervoltage, earth fault, mains supervision, motor phase supervision, overcurrent, unit overtemperature, motor overload, motor stall, motor underload, short-circuit of +24 V and +10 V reference voltages

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BC00146E

SECTION 9

CONTROL PANEL

SPECIFICATIONS

Houston Service Industries, Inc.
7901 Hansen Rd., Houston, TX 77061
Phone: 713-947-1623, 800-725-2291 Fax: 713-947-6409
www.houserv.com, hsi@houserv.com

Series 3100 Blower Local Control Panel

The HSI 3100 is a PLC based control panel that is operated by a 6" Color Touch Screen Display. The 3100 calculates flow very precisely to allow a wide turndown and can allow operation of the blower very close to surge with excellent control and protection. It is used with Blowers that have VFD control. The 3100 is capable of alarming and shutting down due to:

- Blower Surge
- Blower Overload
- Blower Bearing Vibration
- Blower Bearing Temperature
- Motor Bearing Vibration
- Motor Bearing Temperature
- Motor Winding Temperature

Additional Capabilities include:

- Surge / Overload Prevention & Control
- Variable Frequency Drive Control
- Blow-Off Valve Control
- Remote Alarm & Status
- Alarm Log

Control Functions can be driven by:

- Amps
- Dissolved Oxygen Sensors
- Flow Meters
- Pressure Sensors

Technical Data

Enclosure	Carbon Steel (NEMA 4) or Stainless Steel (NEMA 4X), Indoor Only
Panel Display	6" Color Touch screen Interface, graphic display
Power	120VAC, <1.0 Amps
Controller	Allen-Bradley MicroLogix
Memory	Non-volatile memory, 100% data retention
Inputs	Requires Normally Closed Motor Auxilliary Contact, as well as 4-20mA Analog Inputs (with 275 ohm max impedance) for monitoring Current, Vibration, Temperature, and PID Loop process variable input, etc.
PID Loop Output	4-20mA output for control signal (250 ohm Max loop impedance)
Alarm Outputs	Relay Contacts rated 120VAC @ 1.5 amps
Surge Suppressor	45KA surge capacity, High Frequency Noise Filtering, LED power indication, UL1283
Communications	Modbus Master/Slave, DH485, Others upon request
Weight	Approx. 75 LBS. (34 KG)
Temperature Ratings	32 to 104 deg F (0 to 40 deg C) Indoor Only - optional outdoor installation kit is available upon request, including a panel heater and window kit
Approvals	UL 508A, CUL 508A

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Ordering Information

Model	Description
3100	MicroLogix 1200 PLC Based Control System with Touchscreen *I/O included with base unit: KW input from VFD, Speed reference from VFD, Input for Inlet Temperature, Input for Outlet Temperature, Input for Inlet Pressure, Input for Outlet Pressure, Monitoring of one Analog Process Variable,and VFD Speed control output*

Model	Enclosure Selection
0	NEMA 4 – Painted Carbon Steel
1	NEMA 4X SS – Stainless Steel
2	Lockable Quarter-Turn Latch
3	Special – Consult Factory

Model	Optional Functionality Selection
0	No additional functionality
A	Blower Bearing Temperature Monitoring
B	Blower Bearing Vibration Monitoring
C	Motor Bearing Vibration Monitoring
D	Motor Bearing Temperature Monitoring
E	Motor Winding Temperature Monitoring
F	Special Functionality – Consult Factory

Model	Communication Options
0	None
1	DH485 Adapter
2	Ethernet Adapter
3	Phone Modem
4	Special – Consult Factory

Model	Additional Accessories
0	None
A	Clear Hinged Cover for Touchscreen
B	Anti-Condensation Heater
C	Special – Consult Factory

Model	Design/Programming Options
0	None
1	Submittals
2	Programming for Special System Configuration such as Master-Local setups
3	Special – Consult Factory

HSI3100	-	0	-	AC	-	0	-	0	-	0

Sample Model Number

HSI3100	-		-		-		-		-	

Your Model Number

Note: More than one option may be selected where applicable in each field.

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Additional Accessories

Model	Description
CT100-A	Current Transducer, 4-20mA output, selectable ranges of 0-50, 0-100, 0-200 Amps
CT100-B	Current Transducer, 4-20mA output, 0-300 Amps
CT100-C	Current Transducer, 4-20mA output, 0-800 Amps
CT100-D	Current Transducer, 4-20mA output, 0-2400 Amps
CT200-A	Current Transducer, True RMS, 4-20mA output, selectable ranges of 0-10, 0-20, 0-50 Amps
CT200-B	Current Transducer, True RMS, 4-20mA output, selectable ranges of 0-100, 0-150, 0-200 Amps
CT200-C	Current Transducer, True RMS, 4-20mA output, selectable ranges of 0-375, 0-500, 0-750 Amps