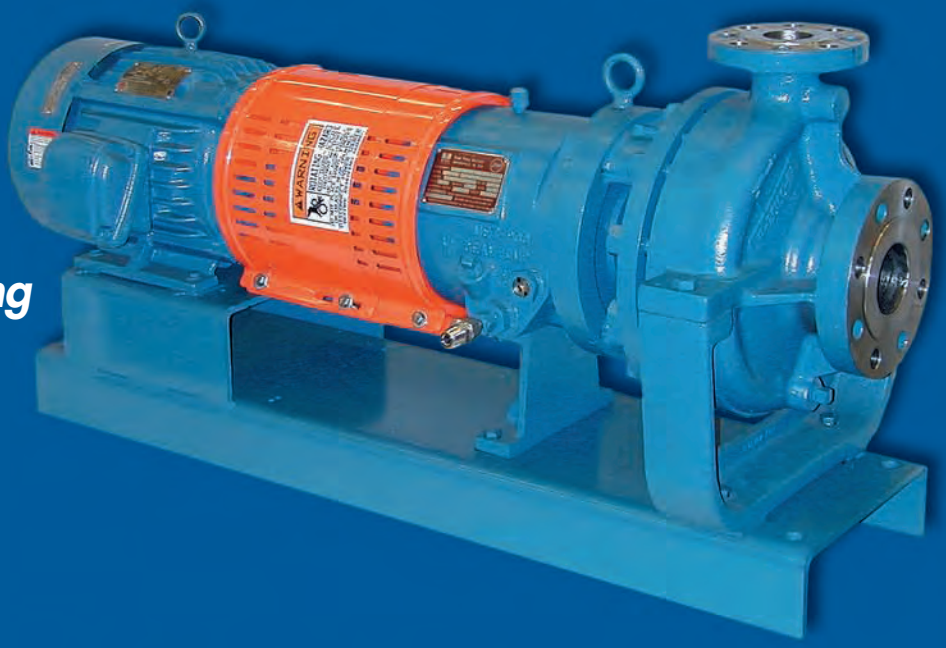
MET-PRO
Global Pump Solutions

A Met-Pro Fluid Handling Technologies Business
Combining the Resources of **Dean Pump, Fybroc & Sethco**

Bulletin C 1.4.43

SERIES R4000

Dean Pump® Heavy Duty, High Temperature Process Pumps



R4140 Telescoping Guard

R4140 C-Face Motor Support

MET PRO CORPORATION

Dean Pump® Series R4000 Centrifugal Process Pumps

- **Capacities to 5000 GPM (1135 m^3/hr)**
- **Heads to 800 feet (245 m)**
- **Pumping temperatures to 850°F (454°C)**
- **Working pressures to 500 PSIG (3445 kPa)**

Experience

Dean Pump is recognized as the industry leader in the design and manufacture of horizontal hot oil/hot water centrifugal process pumps used extensively in the following industries: chemical and petrochemical plants, power plants, plastics, heat transfer OEMs, commercial (hospitals, universities, laboratories), government facilities, pharmaceutical, and food processing.

Dean Series R centrifugal process pumps are designed to insure long, continuous service life at low cost. Each phase in the production of these pumps is meticulously monitored by an independent quality control department.

Pump Sizes

The Dean Series R pump is an end-suction, center line supported, back pull out design regularly available in 27 sizes and divided into four size classifications:

- the R4140 Series in 17 sizes
- the R4170 Series in 3 sizes
- the R4180 Series in 5 sizes
- the R4240 Series in 2 sizes

Materials

Standard materials of construction include carbon steel and 316SS. (Standard Materials of Construction chart is available on Page 3).

Parts Interchangeability

The Series R provides the ultimate in standardization. With wide parts interchangeability among pump sizes, fewer parts are required for inventory. A complete stock of spare parts is readily available from Dean Pump or its network of stocking distributors, thereby reducing shipping time to a minimum.

Shaft Sealing

Dean Pump offers a broad line of mechanical seals and standard packing sets to solve the most difficult sealing problems. Jacketed standard bore (stuffing box), and large taper bore, seal chambers are available for specific applications.

MECHANICAL DESIGN SPECIFICATIONS

Direction of Rotation (Viewed from Coupling End) . . . . . .CCW
Casing Thickness, Minimum . . . . . .5/16"
Corrosion Allowance . . . . . .1/8"
Impeller — Standard . . . . . .Single Plane Balanced
Optional Extra . . . . . Dynamically Balanced
Flanges — ANSI Rating . . . . . .Class 300
Facing . . . . . .Standard Raised Face
Optional Extra . . . . . .Ring Type Joint
Finish . . . . . .125 Ra
Seal Chamber & Bearing Housing Jacket Pressure, Maximum . . . . . .125 psig
Suction Pressure, Maximum . . . .Max. Working Pressure Less Pump Developed Head

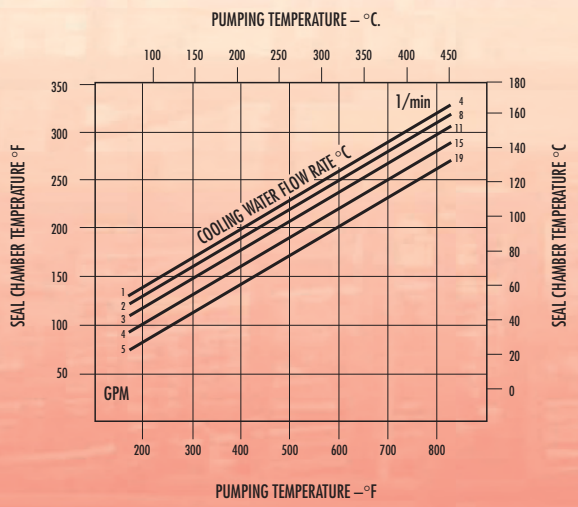
	R4140	R4170	R4180	R4240
Horsepower Rating — Maximum				
@ 3500 rpm	100	200	250	–
@ 1750 rpm	40	100	125	300
@ 1160 rpm	25	–	75	200
Bearings, Type Ball Bearings, Oil Lubricated				
Thrust Bearing (Angular Contact Pair)	7309BG	7311BG	7312BG	7317BG
Radial Bearing	6309	6311	6312	6316
Approximate Oil Capacity of Bearing Housing	41 oz	36 oz	64 oz	120 oz
Seal Chamber Dimensions (Large Taper Bore)				
Length (Depth)	3"	3"	4 1/2"	4 7/8"
Inside Diameter (Bore Diameter)	3 1/2"	3 7/8"	4 1/4"	5"
Shaft Sleeve Diameter	1 3/4"	2 1/8"	2 1/4"	3"
Standard Bore (Stuffing Box) Dimensions				
Length (Depth)	3"	3"	3 7/8"	4 1/8"
Inside Diameter (Bore Diameter)	2 1/2"	2 7/8"	3 1/4"	4"
Shaft Sleeve Diameter	1 3/4"	2 1/8"	2 1/4"	3"
Lantern Gland Width	5/8"	5/8"	3/4"	1"
Lantern Gland to Open End of Stuffing Box	1 1/2"	1 1/2"	1 1/2"	2 3/8"
Packing Size, Square	3/8"	3/8"	1/2"	1/2"
Number of Rings with Lantern Ring	6	6	6	6
Spacing	3G3	3G3	3G3	3G3
Number of Rings Lantern Omitted	7	8	7	8
Pump Shaft Dimensions				
Span Between Bearings ℄ to ℄	6"	5 15/16"	8 1/4"	10 3/16"
Span Between Radial Bearing ℄ and Impeller ℄	8"	8 3/16"	10 3/4"	12 5/16"
Diameter at Coupling	1 1/8"	1 5/8"	1 5/8"	2 3/8"
Diameter Between Bearings	2 1/8"	2 5/8"	2 3/4"	4"
Diameter at Impeller	1 1/8"	1 1/4"	1 1/2"	2 1/4"
L^3/D^4				
Sleeved	101	44	78	36
Solid	55	27	26	23

MATERIAL CLASS	MAXIMUM WORKING PRESSURE	PUMPING TEMPERATURE		HYDROSTATIC TEST PRESSURE	
		MINIMUM	MAXIMUM	R4140/R4170	R4180/R4240
40†	500 psig @ 650°F	-20°F	800°F @ 350 psig	850 psig	750 psig
50	500 psig @ 100°F	-20°F	850°F @ 305 psig		

† Carbon Steel with Cast Iron trim. Also available with 316SS trim.

WARNING: Use the "Allowable Working Pressure VS. Pumping Temperature" chart (below, right) to determine the allowable working pressure at any allowable pumpage temperature for the material of construction selected.

Seal Chamber Temperature VS. Pumping Temperature
with respect to the GPM of cooling water flowing through the cooling jacket surrounding the seal chamber.



*GPM Flow Rate of Cooling Water Based on 70°F (21°C) Inlet Temp

Specifications are subject to change without notice

STANDARD MATERIALS OF CONSTRUCTION

Part No.	Part Name	Carbon Steel (Cl. 40)	316SS (Cl. 50)
3	Impeller	C.I. (1)	316 (3)
*4	Impeller Key	Steel (2)	316 (8)
5	Casing	Steel (6)	316 (3)
5A	Casing Drain Plug	Steel (2)	316 (8)
5C	Casing Stud Nut	Steel (5)	
5D	Casing Stud	Steel (4)	
*6	Casing Back Cover Ring	Iron (7)	316 (3)
6A	Casing Ring	Iron (7)	316 (3)
7	Cradle Spacer	D.I. (16)	
7A	Bull's Eye Oil Level Indicator	Steel & Glass	
7G	Spacer to Bearing Housing Capscrew	Steel (2)	
9	Bearing Housing Foot	C.I. (1)	
*10	Shaft Sleeve	316 (8)	
*10K	Shaft Sleeve Key	304 (9)	
*12	Impeller Bolt (Nut on R4170)	Steel (2)	316 (8)
*12A	Impeller Washer	Steel (2)	316 (8)
*12B	Impeller Lock Washer	316 (8)	
*12C	Impeller Washer Pin	304 (9)	316 (8)
13	Seal Chamber Gland	316 (8)	
	Packing Gland	Steel (6)	316 (3)
14	Gland Stud	Steel (4)	304 (9)
15	Gland Nut	Steel (5)	304 (9)
*17	Lantern Ring	C.I. (1)	316 (3)
22	Casing Back Cover	Steel (6)	316 (3)
*22A	Back Cover to Cradle Cap Screw	Steel (2)	
*25	Radial Bearing	—	
*25A	Thrust Bearing	—	
*26	Bearing Housing	C.I. (1)	
*27	Seal Ring	C.I. (1)	
*28	Bearing End Cover	C.I. (1)	
*28A	Bearing End Cover Cap Screw	Steel (2)	
*29	Pump Shaft	Steel (10)	316 (8)
*31	Thrust Bearing Lock Nut	Steel (2)	
*31A	Thrust Bearing Lock Washer	Steel (2)	
*54	Throat Bushing	C.I. (1)	316 (8)
56	Casing Foot	C.I. (1)	
*56B	Casing Foot Dowel	Steel (2)	
*75B	Retaining Ring (All Except R4240)	Steel	
*76	Labyrinth Seal—Front	Bronze & Viton †	
*76A	Labyrinth Seal—Rear	Bronze & Viton †	
77	Casing Gasket	Grafoil (11)	
*77B	End Cover Gasket	Buna (14)	
*80	Bearing Housing Vent	—	
*83	Motor Support (C Face)	C.I. (1)	
*87	Impeller Ring—Back (Optional)	Steel (2)	316 (3)
87A	Impeller Ring—Front (Optional)	Steel (2)	316 (3)
95A	Mechanical Seal Stationary	—	
95B	Mechanical Seal Rotary	—	
*109	Oil Cooler	SS Tubing with Steel Fins	

† Registered Trademark of the E.I. DuPont Co.

* Denotes parts interchangeable in all pump sizes of same type.

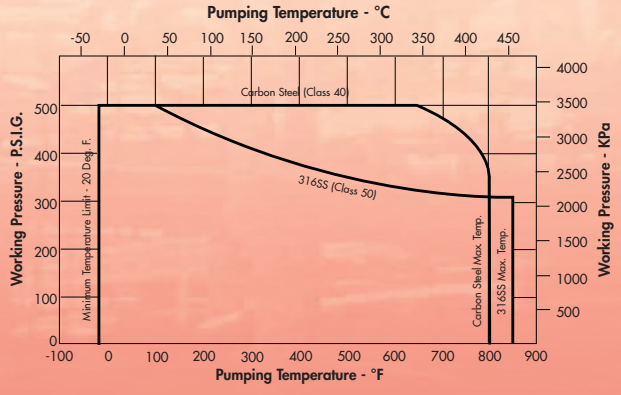
MATERIAL SPECIFICATIONS (REFER TO NUMBERS IN PARENTHESES)

(1) Cast Iron
(2) AISI 1020
(3) 316SS — ASTM #A744 Grade CF8M
(4) AISI 4140, ASTM #A193-B7 Steel
(5) ASTM #A194 Grade 2 Steel
(6) ASTM #A216 Grade WCB Cast Steel (-20 + 800°F)
(7) Hardened Iron
(8) AISI—316SS
(9) AISI—304SS
(10) Alloy Steel —125,000 TS. 100,000 YP
(11) Grafoil — Registered trademark of Union Carbide Corp.
(12) Manila Paper
(13) Fibre Sheet — Non-Asbestos Fibre
(14) Buna N Rubber
(15) Steel Finned, Stainless Steel Tube with Steel End Fittings
(16) Ductile Iron — ASTM-A536 Class 65-45-12

SEAL CHAMBER PRESSURE - R4000 SERIES PUMPS

**With Impeller Balance Holes—Seal Chamber Pressure Equals Pump Suction Pressure Plus .06 x Pump Developed Pressure in PSI
Without Impeller Balance Holes—Seal Chamber Pressure Equals Pump Suction Pressure Plus .75 x Pump Developed Pressure in PSI
Pumps are normally furnished with balance holes

R4000 Series Pumps – Allowable Working Pressure VS Pumping Temperature



1. **CASING COVER**
   Jacketed standard bore or large taper bore. Designed to provide the best environment for the specific application and service conditions.

2. **INTEGRAL ONE-PIECE CASING FLANGES**
   Flanges dimensioned according to ASME/ANSI B16.5 Class 300. Raised face flanges are standard. Ring type joint flanges (Class 300) are available as an option.

3. **SEALING FLEXIBILITY**
   Choice of packed box or mechanical seal. Wide range of sealing arrangements (inside/outside, single/double, balanced/unbalanced, etc.) available to meet specific application and service conditions.

4. **CLOSED IMPELLER**
   Allows thermal expansion of the pump shaft at high pumping temperatures without interference of the impeller with the casing or the casing cover. Keyed to shaft with positive locking device. Replaceable wear rings optional.

5. **SHAFT SLEEVE**
   Replaceable "hook type" shaft sleeves provided as standard. Allows replacement of the wearing surface without having to replace the pump shaft or the bearings. The design allows the shaft sleeve to expand thermally, independent of the pump shaft. The standard sleeve material is 316SS. Sleeves of alloy construction, hard-facing, hardened chrome 11-13%, or ceramic coatings are available as options. Solid sleeveless shafts are also available.

6. **CENTERLINE CASING SUPPORT**
   The pump is supported at the horizontal centerline of the casing so that the thermal expansion of the casing will not affect the shaft alignment.

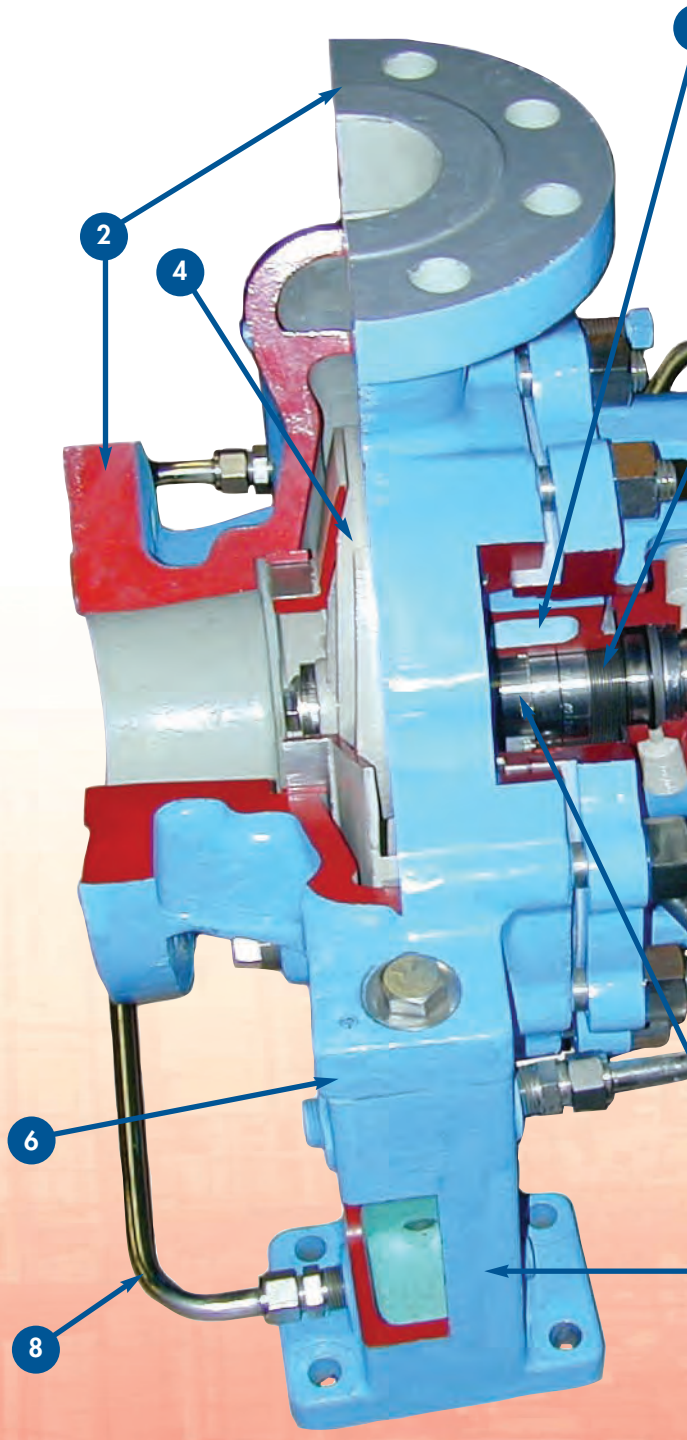
7. **CASING FEET**
   Three different foot designs are available. The standard is a "yoke" design, available on R4140/4170 only, which allows the pump to fit on an ASME/ANSI B73.1 baseplate (as well as Dean's "Economy" baseplates).

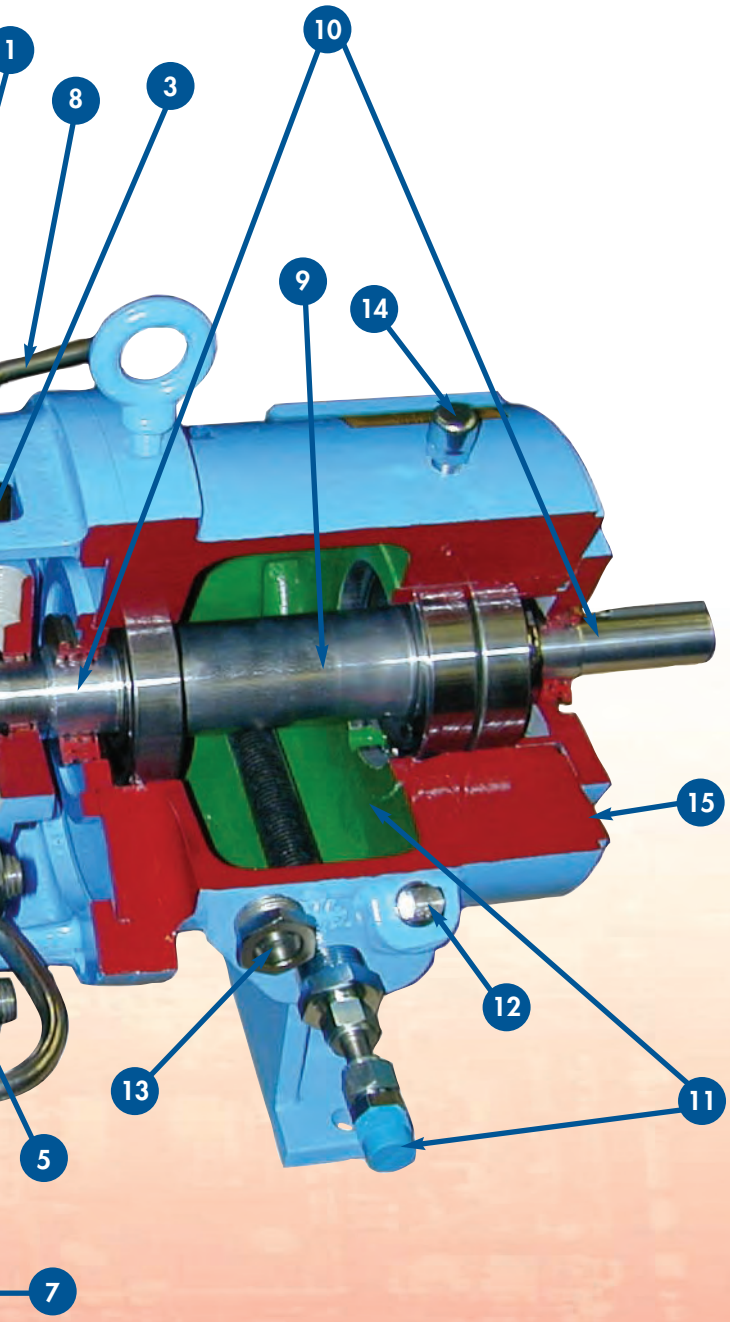
   The second "pedestal" design allows for mounting on API-type baseplates.

   The last design is a "water-cooled" pedestal design (as shown) used specifically for severe service conditions and applications.

8. **COOLING PIPING**
   Optional tubing (as shown) connects the "water-cooled" pedestal design with the casing cover jacket.

   Also available is optional tubing that connects the casing cover jacket with the finned tube oil cooler, and/or tubing that connects the cooled pedestal feet with the casing cover jacket.





9. HEAVY DUTY SHAFT AND BEARINGS
Carbon steel pump shaft (316SS optional) is designed for a maximum deflection of less than 0.002" (0.05mm) at the mechanical seal faces. The duplex mounted angular contact thrust bearings and the single row, deep groove, radial bearing are sized for a 2 year minimum life and a 10 year average life.

10. STANDARD LABYRINTH SEALS
Rugged bronze construction with Viton® O-rings. Magnetic face seals are also an option for all pumps.

11. LUBRICATION OPTIONS
Oil bath lubrication is standard. The extra large oil reservoir is designed for cooler bearing operation. The bearing housing is set up to accommodate oil mist lubrication and grease lubrication as available options. The finned tube oil cooler is provided as standard, to directly cool the oil for lower bearing temperature.

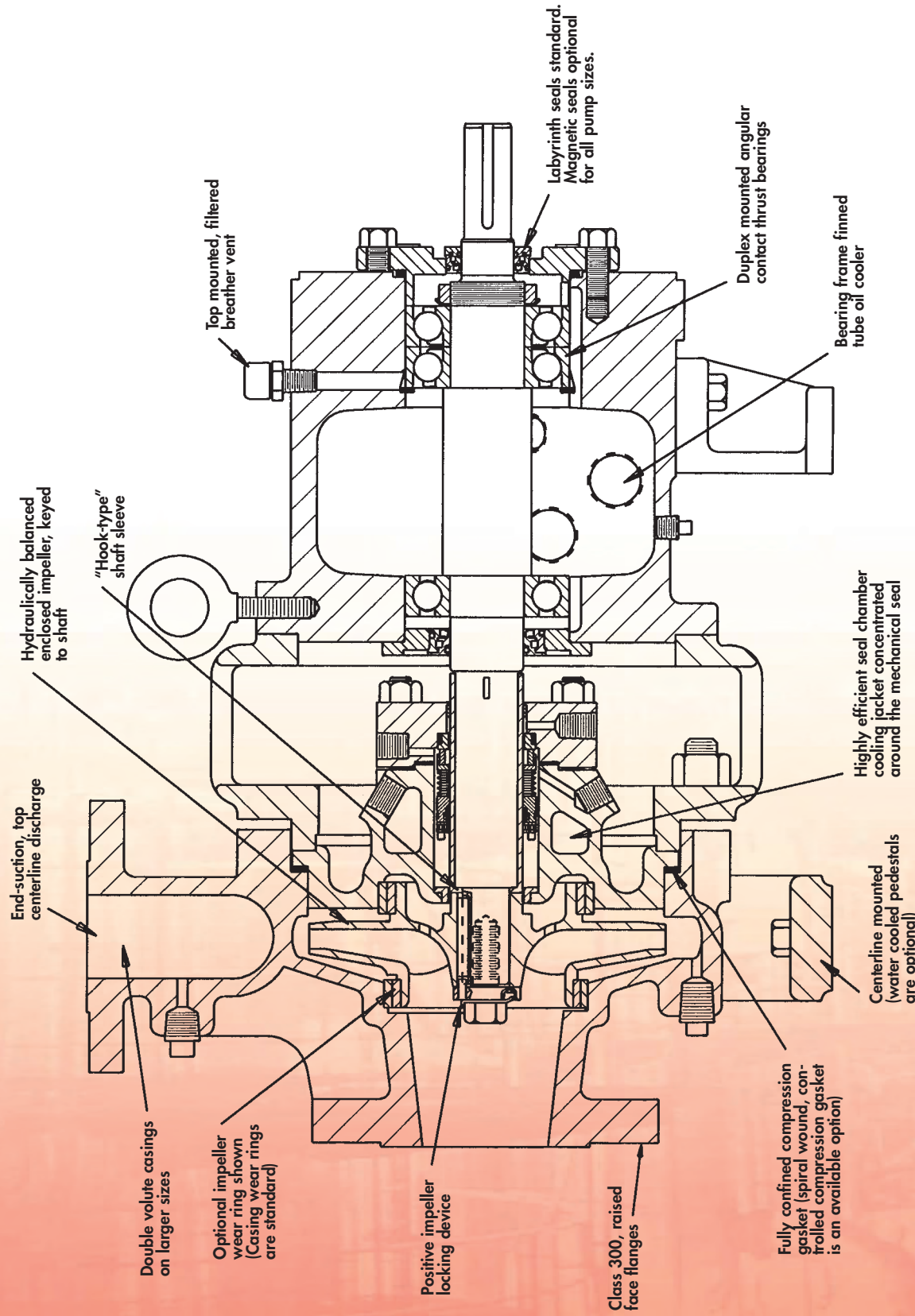
12. FILL PLUG
Easy access to fill plugs supplied on both sides of the bearing housing. Designed to minimize the possibility of overfilling.

13. ONE INCH OIL SIGHT GLASS
Allows for simple and easy monitoring of oil level and condition. The sight glass can be installed on either side of the bearing housing, in the field, for best location and ease of viewing. A combination automatic (bottle) oiler/sight glass is an available option.

14. BREATHER VENT
A filtered bearing housing breather is standard. An optional expansion chamber is available that is used with the optional magnetic oil seals when a sealed bearing housing is desired.

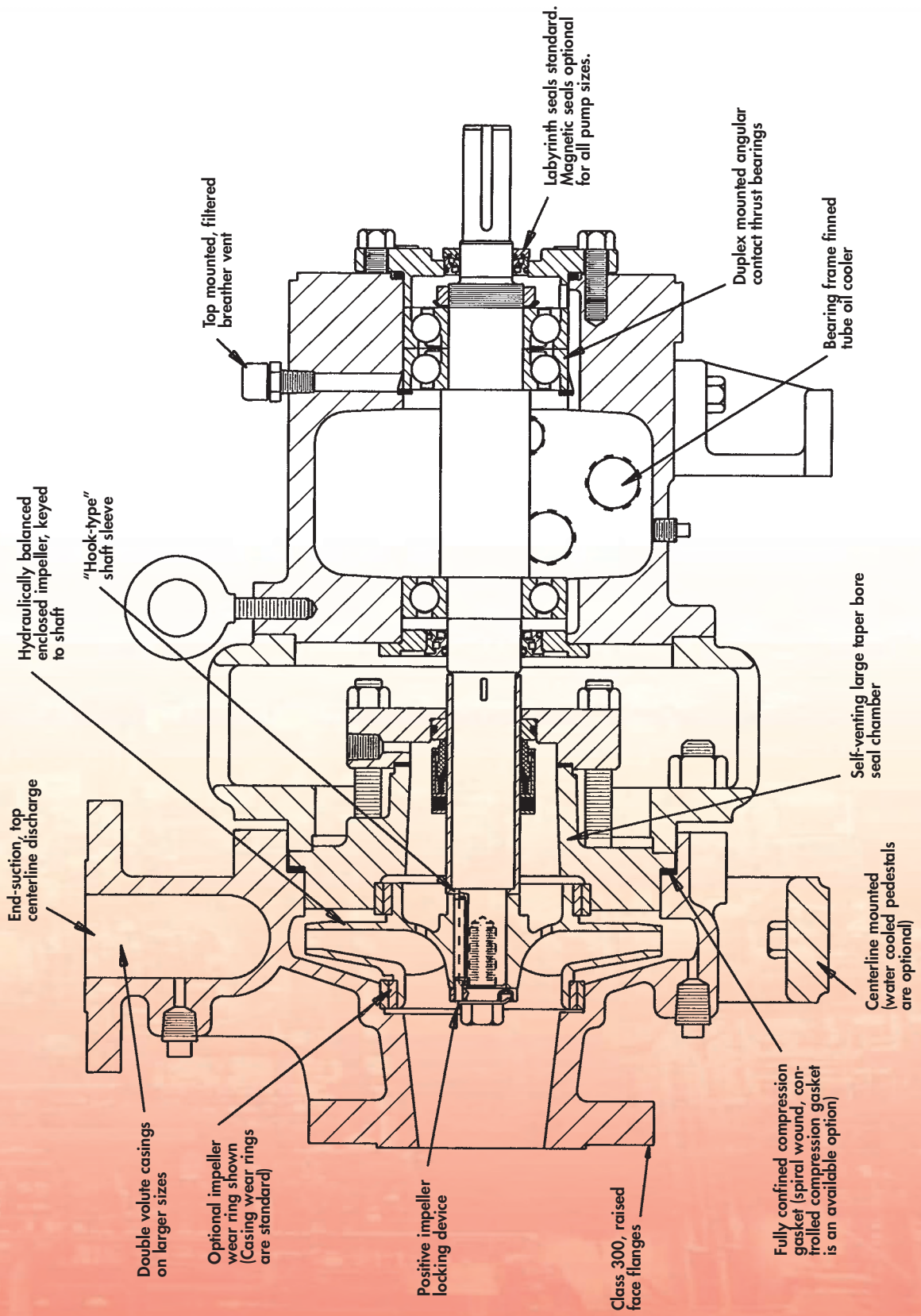
15. PILOT AND BOLT HOLES
The bearing housing of the R4140 is supplied with a pilot fit and four bolt holes at the motor end. The holes allow for mounting of the telescoping coupling guard. The pilot fit also allows for use of an optional "C-Face" motor support. The support permits self-aligning of the motor shaft to the pump shaft.

DEAN PUMP® R4000 WITH SEAL CHAMBER COOLING AND BEARING FRAME COOLING

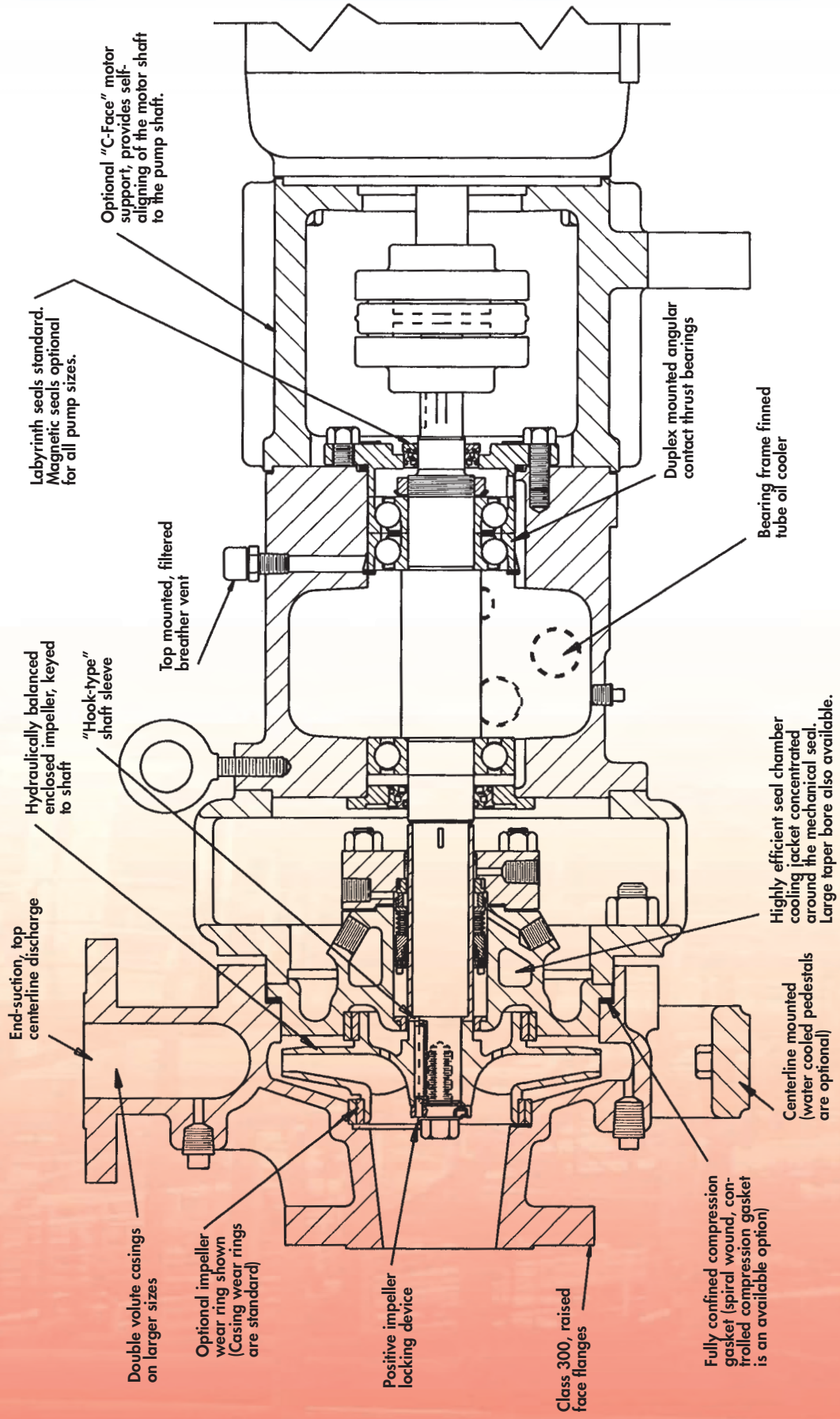


JACKETED STANDARD BORE (STUFFING BOX) SEAL CHAMBER

DEAN PUMP® R4000 WITH LARGE TAPER BORE SEAL CHAMBER



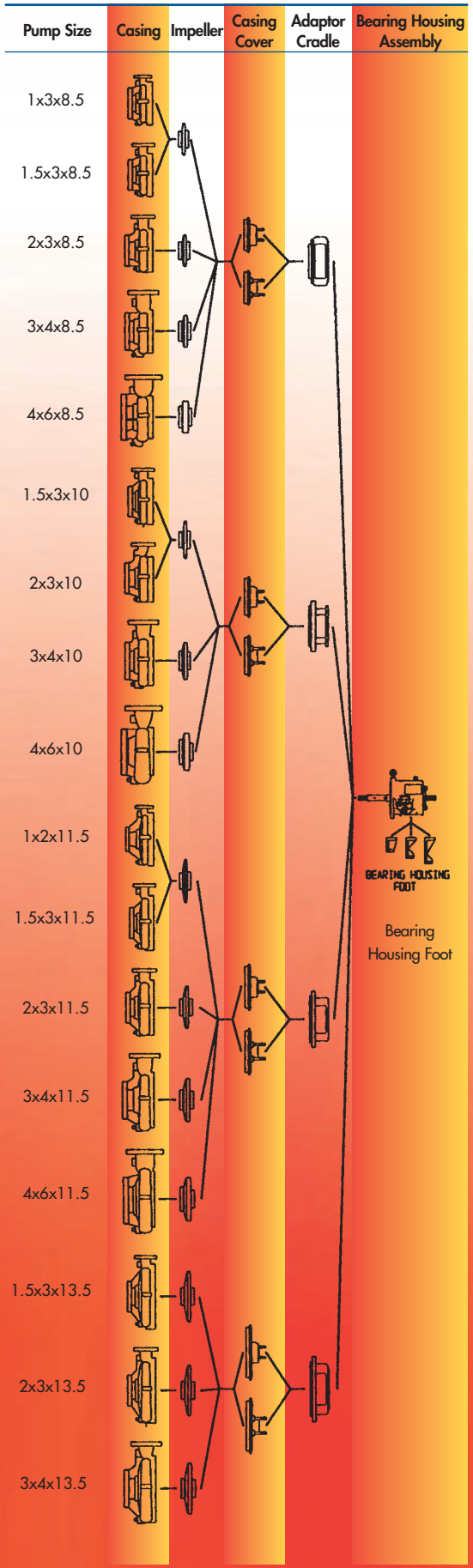
LARGE TAPER BORE SEAL CHAMBER



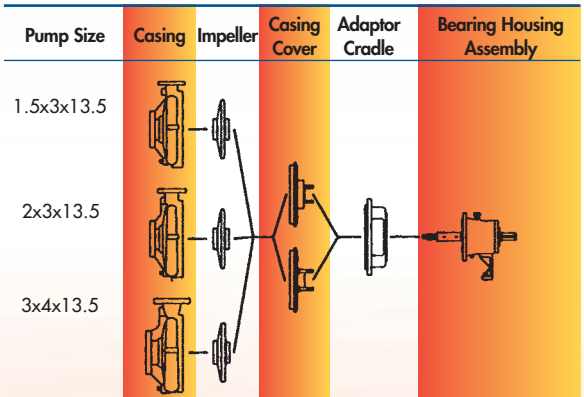
"C-FACE" MOTOR SUPPORT

DEAN PUMP® PARTS INTERCHANGEABILITY OF 27 PUMP SIZES

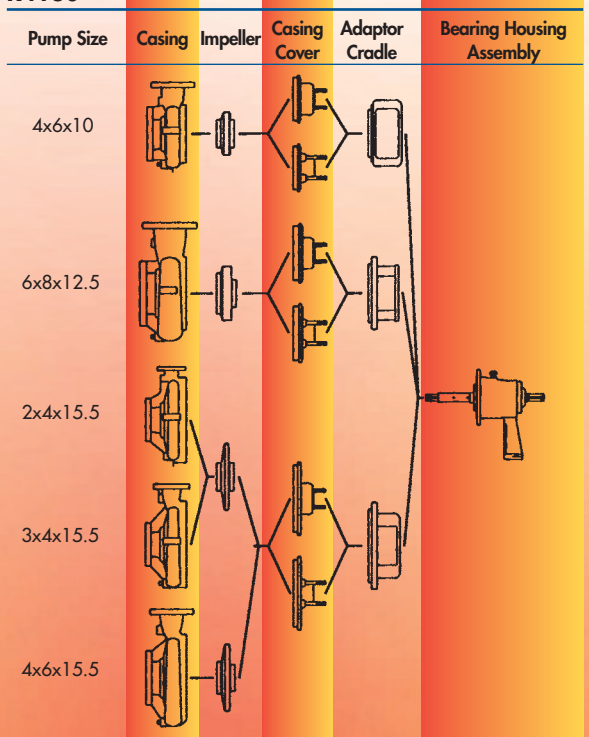
R4140



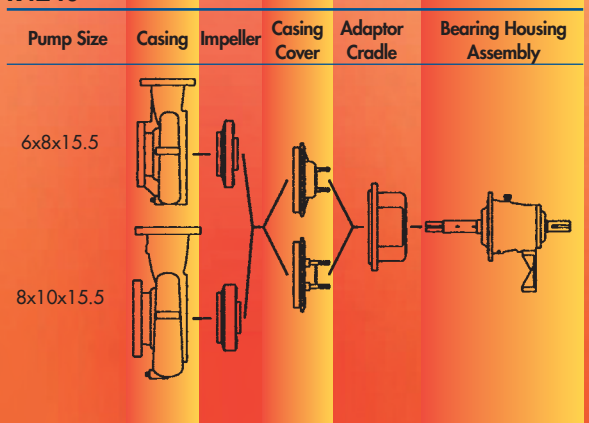
R4170



R4180



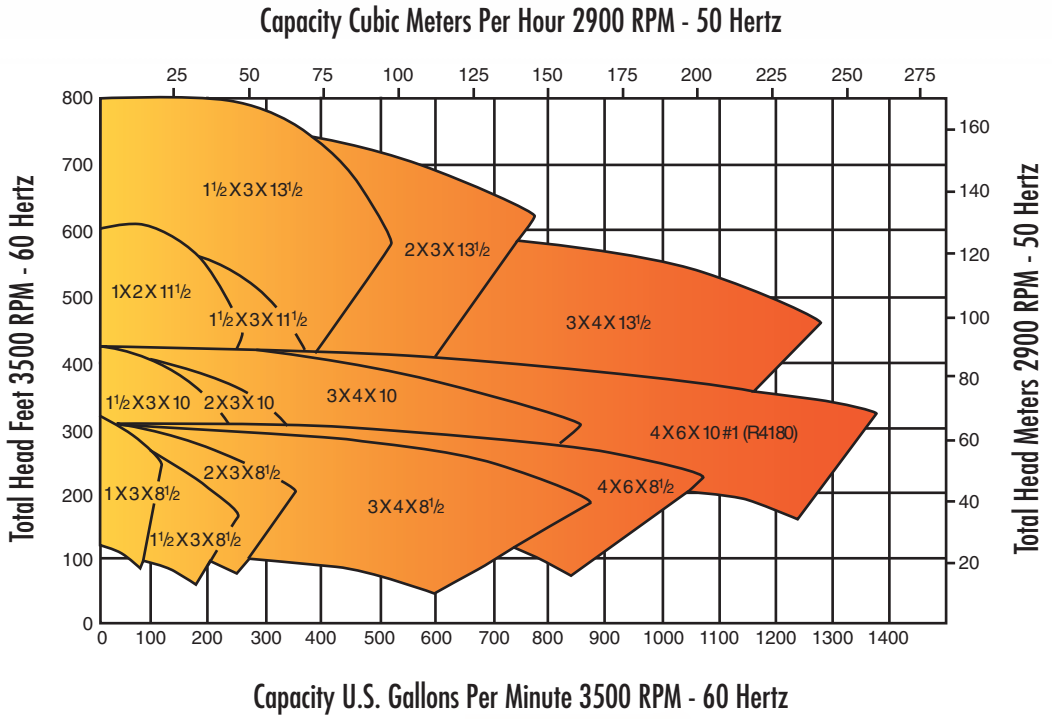
R4240



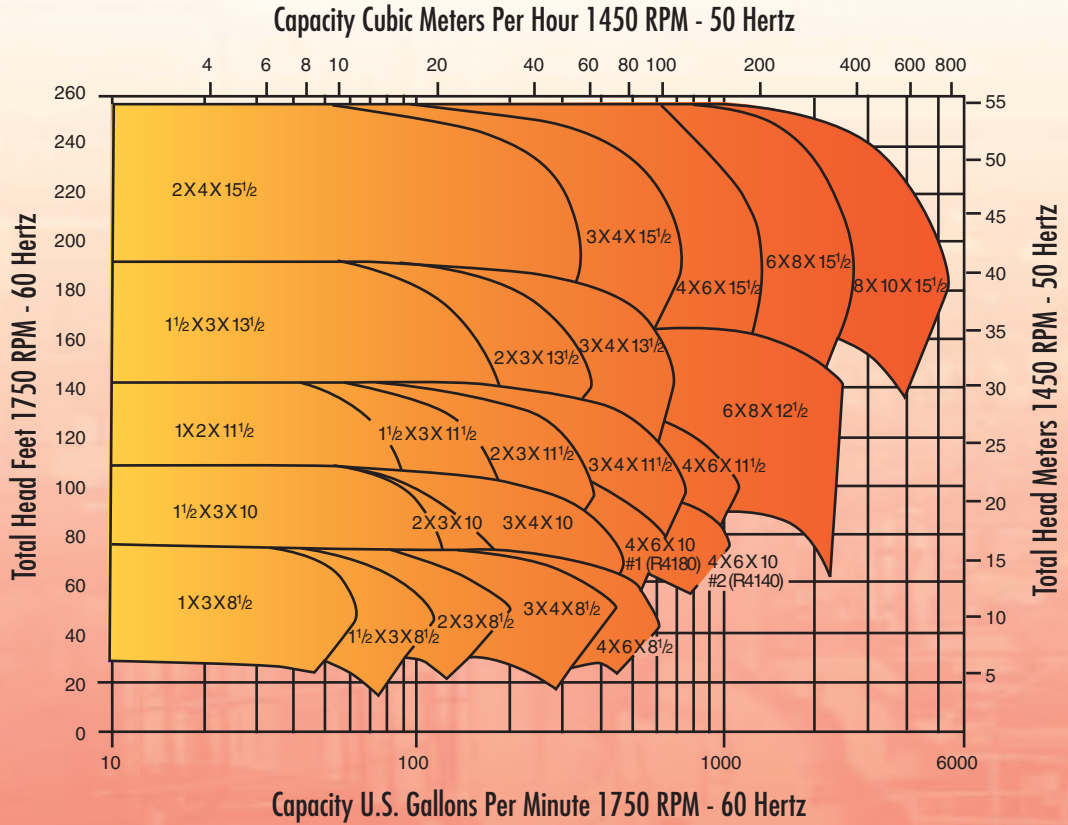
Casing covers with jackets and large taper bore seal cavities are available on all pumps. Bearing housings with finned tube oil coolers are standard on all pumps.

PERFORMANCE R4000 SERIES PUMP

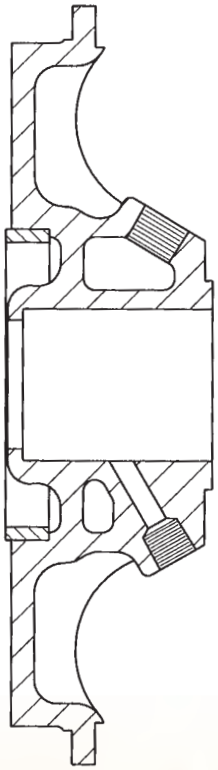
Two Pole Motor



Four Pole Motor



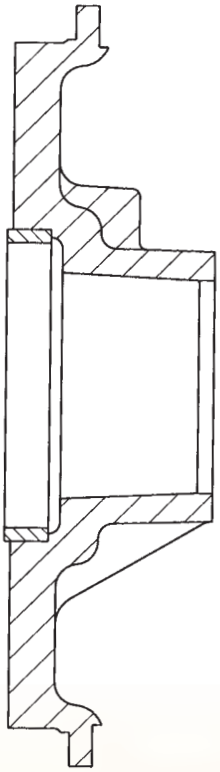
JACKETED STANDARD BORE (STUFFING BOX) SEAL CHAMBER



R4144
R4148
R4174
R4178
R4184
R4188
R4244
R4248

- Designed to remove heat from the sealing device only.

LARGE TAPER BORE SEAL CHAMBER

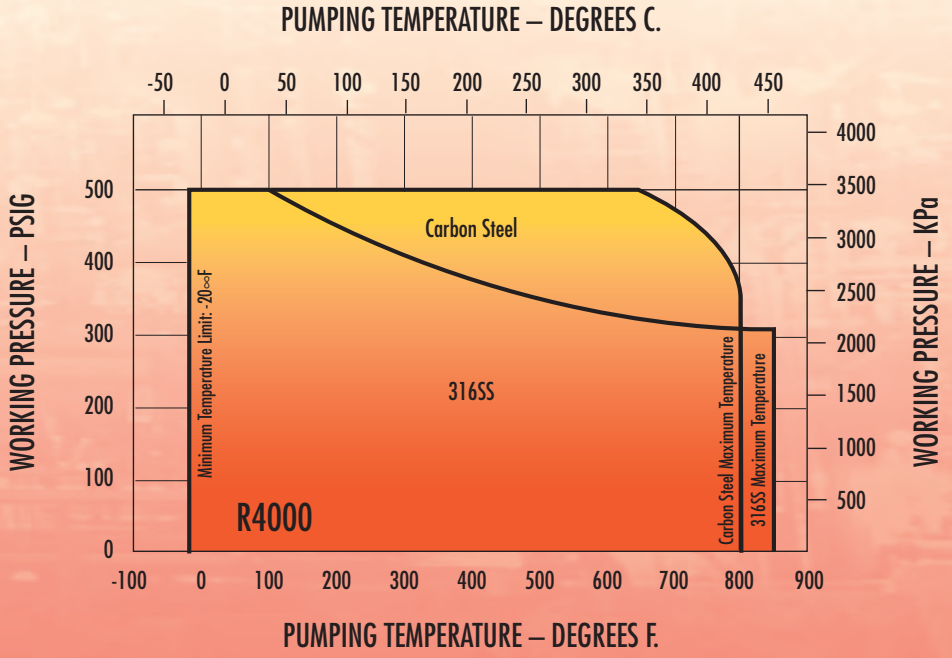


R4146
R4176
R4186
R4246

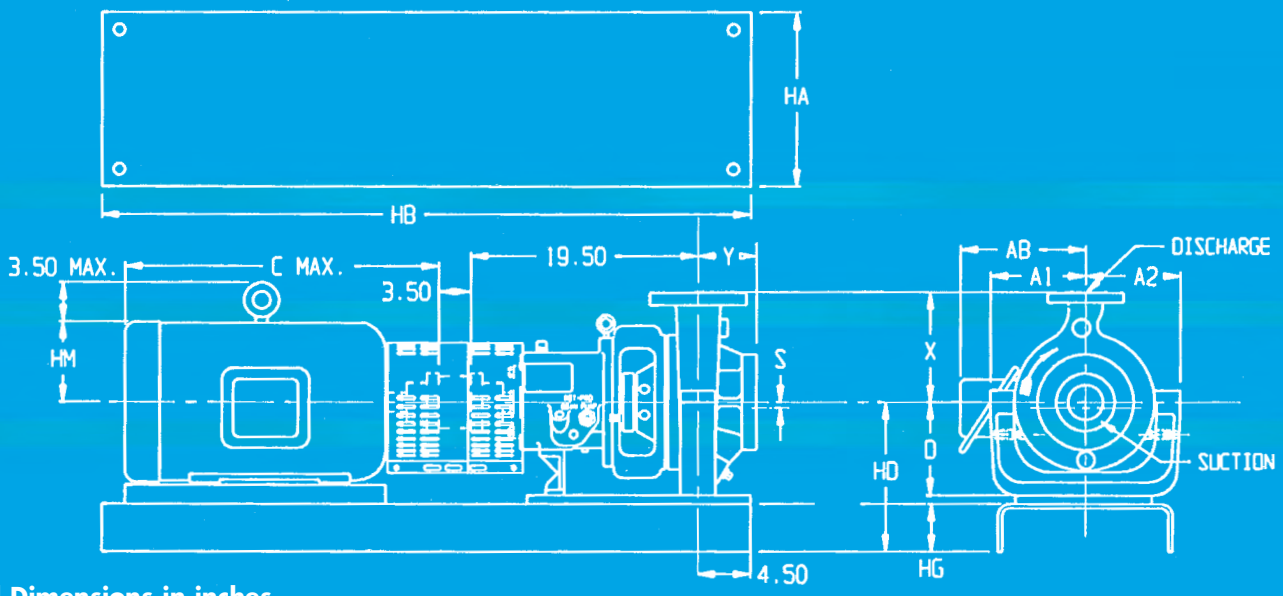
- Designed to remove heat and vapor out of the seal chamber and away from the seal faces.

WORKING PRESSURE VS TEMPERATURE

used to determine the allowable working pressure at any allowable process fluid temperature for the material of construction selected



Dimensions of R4140 with "Economy" Baseplate



All Dimensions in inches.

Pump Size	Discharge					Suction					A1	A2	D	S	X	Y
	Size	O.D.	Thick.	B.C.	Bolts	Size	O.D.	Thick.	B.C.	Bolts						
1x3x8.5	1	4.875	.688	3.50	4-5/8	3	8.25	1.13	6.63	8-3/4	8.13	8.13	8.25	0	7.50	4
1.5x3x8.5	1.5	6.125	.813	4.50	4-3/4	3	8.25	1.13	6.63	8-3/4	8.13	8.13	8.25	0	8.50	4
2x3x8.5	2	6.50	.875	5	8-5/8	3	8.25	1.13	6.63	8-3/4	8.13	8.13	8.25	0	9.50	5
3x4x8.5	3	8.25	1.13	6.63	8-3/4	4	10	1.25	7.88	8-3/4	9	8.13	10	0	11	5
4x6x8.5	4	10	1.25	7.88	8-3/4	6	12.50	1.44	10.63	12-3/4	10.25	8.13	10	.63	11.50	6
1.5x3x10	1.5	6.125	.813	4.50	4-3/4	3	8.25	1.13	6.63	8-3/4	9	8.75	10	0	9	4
2x3x10	2	6.50	.875	5	8-5/8	3	8.25	1.13	6.63	8-3/4	9	8.75	10	0	9.50	5
3x4x10	3	8.25	1.13	6.63	8-3/4	4	10	1.25	7.88	8-3/4	10.38	8.75	10	0	11	5
4x6x10#2	4	10	1.25	7.88	8-3/4	6	12.5	1.44	10.63	12-3/4	11.75	10	11.50	.13	12.50	6
1x2x11.5	1	4.875	.688	3.50	4-5/8	2	6.5	.875	5	8-5/8	9.75	9.75	10	0	9	5
1.5x3x11.5	1.5	6.125	.813	4.50	4-3/4	3	8.25	1.13	6.63	8-3/4	9.75	9.75	10	0	10.50	4
2x3x11.5	2	6.50	.875	5	8-5/8	3	8.25	1.13	6.63	8-3/4	10.25	9.75	10	0	10.50	5
3x4x11.5	3	8.25	1.13	6.63	8-3/4	4	10	1.25	7.88	8-3/4	11.25	10	11.50	0	12.50	6
4x6x11.5	4	10	1.25	7.88	8-3/4	6	12.50	1.44	10.63	12-3/4	11.75	10.50	11.50	.38	13.50	6
1.5x3x13.5	1.5	6.125	.813	4.50	4-3/4	3	8.25	1.13	6.63	8-3/4	11.50	11.50	11.50	0	11	5
2x3x13.5	2	6.50	.875	5	8-5/8	3	8.25	1.13	6.63	8-3/4	11.50	11.50	11.50	0	11.50	5
3x4x13.5	3	8.25	1.13	6.63	8-3/4	4	10	1.25	7.88	8-3/4	12	11.50	11.50	0	12.50	6

Frame	C	AB	HA	HB	HD			HG	HM
					D=8.25	D=10	D=11.5		
143T	13.25	6.50	12	45	12.00	13.75	15.25	3.75	3.88
145T	13.75	6.50	12	45	12.00	13.75	15.25	3.75	3.88
182T	14.63	7.50	12	45	12.00	13.75	15.25	3.75	5.25
184T	15.63	7.50	12	45	12.00	13.75	15.25	3.75	5.25
213T	18.13	9.50	12	45	12.00	13.75	15.25	3.75	6.0
215T	19.63	9.50	12	45	12.00	13.75	15.25	3.75	6.0
254T	23.13	10.75	15	52	12.38	14.13	15.63	4.13	7.0
256T	24.88	10.75	15	52	12.38	14.13	15.63	4.13	7.0
284T	26.88	12.63	15	52	12.38	14.13	15.63	4.13	7.75
284TS	25.50	12.63	15	52	12.38	14.13	15.63	4.13	7.75
286T	28.38	12.63	15	52	12.38	14.13	15.63	4.13	7.75

Frame	C	AB	HA	HB	HD			HG	HM
					D=8.25	D=10	D=11.5		
286TS	27.00	12.63	15	52	12.38	14.13	15.63	4.13	7.75
324T	29.88	14.75	18	58	13.00	14.75	16.25	4.75	8.75
324TS	28.37	14.75	18	58	13.00	14.75	16.25	4.75	8.75
326T	31.38	14.75	18	58	13.00	14.75	16.25	4.75	8.75
326TS	29.88	14.75	18	58	13.00	14.75	16.25	4.75	8.75
364T	33.13	15.63	18	58	13.75	14.75	16.25	4.75	9.88
364TS	31.50	15.63	18	58	13.75	14.75	16.25	4.75	9.88
365T	34.13	15.63	18	58	13.75	14.75	16.25	4.75	9.88
365TS	32.50	15.63	18	58	13.75	14.75	16.25	4.75	9.88
404TS	33.50	17.50	18	60	—	14.63	16.13	4.63	11.0
405TS	35.00	17.50	18	60	—	14.63	16.13	4.63	11.0

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