

3996

In-Line Process Pumps



3996

In-Line Process Pumps Designed for Total Range of Industry Services

- Capacities to 1400 GPM (318 m³/h)
- Heads to 700 feet (213 m)
- Temperatures to 500° F (260° C)
- Pressures to 375 PSIG (2586 kPa)

Performance Features for In-Line Services

Extended Pump Life

- Integral pump bearings
- TaperBore™ Plus/BigBore™ seal chambers
- Precision fits for accurate alignment
- Flexibly coupled

Ease of Maintenance

- In-line mounting
- Field alignment not required
- Back pull-out design
- External impeller adjustment

Safety

- ANSI B15.1 coupling guard
- Ductile iron frame and motor support
- Fully serrated flanges

Services

Caustic transfer

Acid unloading

Monomer/Polymer transfer Liquid nitrogen

Liquid ammonia

Reflux and light tower bottoms Waste acid recovery

Pickle liquor circulation Chilled water

Filter feed

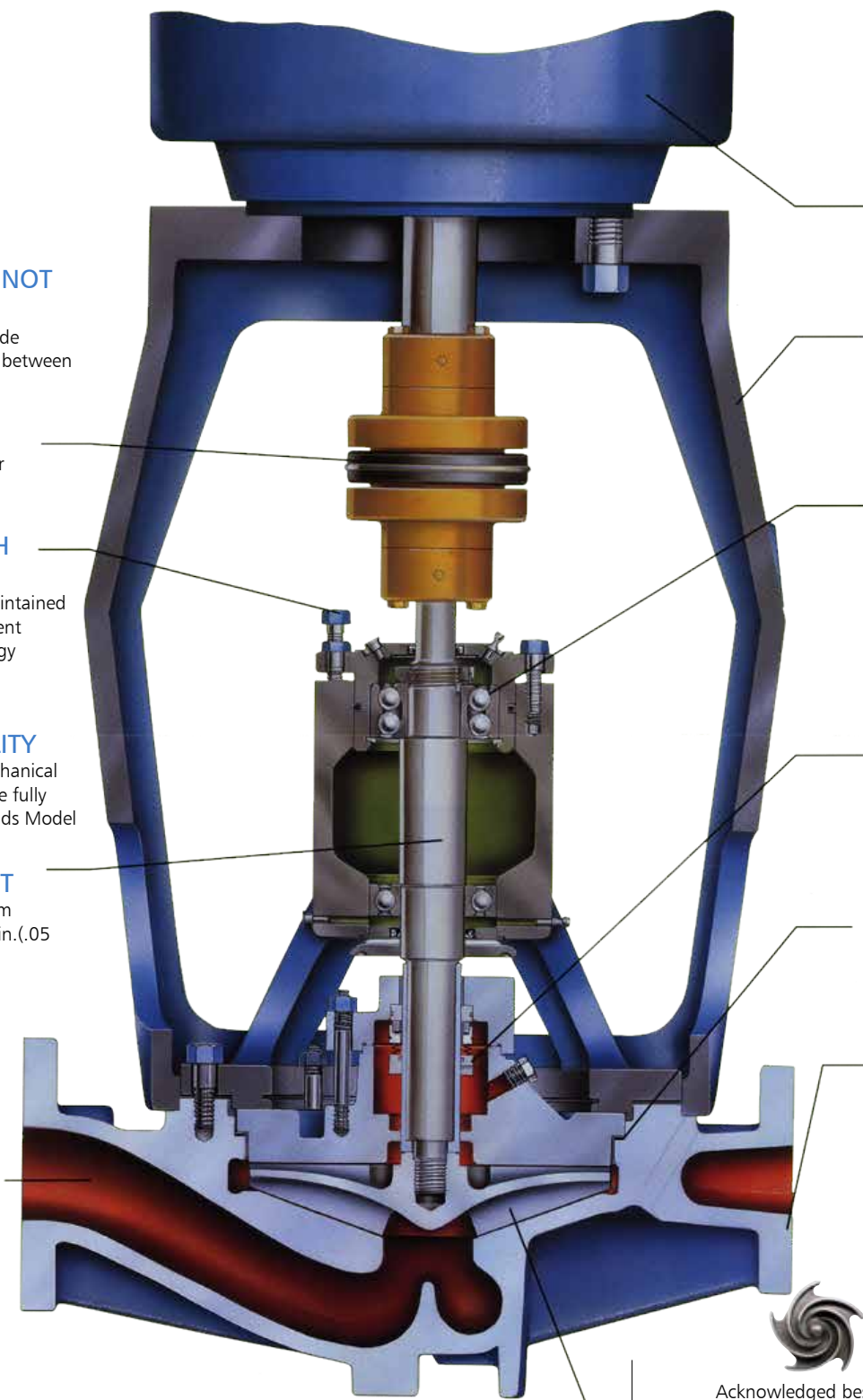
Condensate return



Goulds 3996 process pump line is specifically designed to provide superior performance for in-line services of the Chemical Process Industries.

3996

Heavy Duty Design Features for a Wide Range of Services.



FIELD ALIGNMENT NOT REQUIRED

Precision rabbet locks provide positive, built-in alignment between pump and motor.

FLEXIBLY COUPLED

Conventional flexible spacer coupling.

CONTINUOUS HIGH PERFORMANCE

Original high efficiency, maintained by simple external adjustment resulting in long-term energy savings.

MAXIMUM INTERCHANGEABILITY

All parts (shaft, sleeve, mechanical seals, etc.) except casing are fully interchangeable with Goulds Model 3196 STX and MTX.

HEAVY DUTY SHAFT

Shaft designed for minimum deflection—less than .002 in. (.05 mm)—at seal faces.

STANDARD NEMA C-FACE NORMAL THRUST MOTOR

HIGH STRENGTH DUCTILE IRON MOTOR SUPPORT

Open on two sides for easy access to back pull-out assembly.

INTEGRAL PUMP BEARINGS

All hydraulic loads carried by pump—not by motor. Bearings sized for 2-year minimum and 10-year average life under tough operating conditions. Regreaseable bearings standard. available with greased-for-life or oil mist lubrication.

ANSI B73.1M SHAFT SEALING

Choice of large or standard bore seal chambers for maximum sealing flexibility to meet service conditions.

POSITIVE SEALING

Fully confined gasket at casing joint protects alignment fit from liquid.

HEAVY WALLED CASING

With ribbed suction and discharge nozzles support pump and driver and resist pipe strain without distortion. ANSI class 150 flanges standard, class 300 flanges optional.

FULLY OPEN IMPELLER

Acknowledged best design for C.P.I. services—solids handling, stringy material, corrosives, abrasives. Back pump-out vanes minimize stuffing box/seal chamber pressure and reduce thrust for longer bearing and seal life.

3996

In-Line Design For Cost Savings

In-line pumps have become increasingly popular with users due to minimal floor space required and reduced installation costs.

Installation is simple since the unit is mounted directly in the line like a valve. Field alignment is not required and the unit is not subject to misalignment due to pipe strain or temperature changes.



Setting The Standards For Reliability

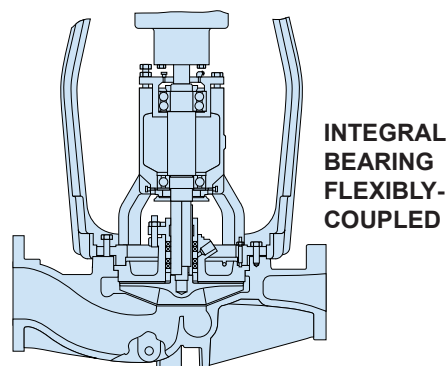
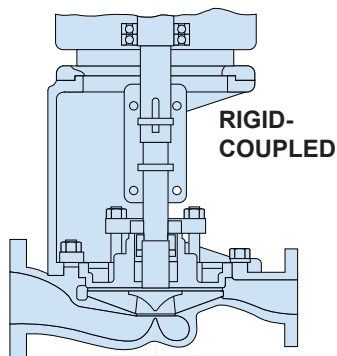
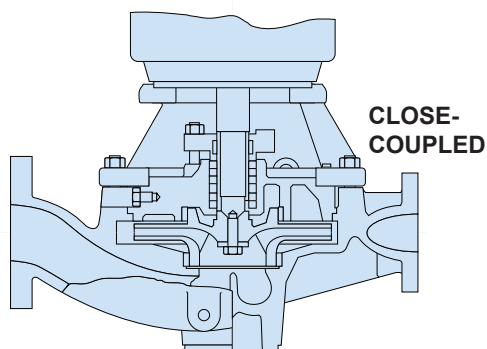
The 3996 is designed for optimum reliable service...shaft size and overhang are optimized to provide maximum seal and bearing life...precision fits provide built-in alignment between pump and motor (field alignment not required). Hydraulic and mechanical loads are carried by the pump, not by special motors (the 3996 uses standard C-face motors).



Goulds 3996...The Preferred In-Line Design

A variety of in-line pumps are available including closecoupled, rigid-coupled, and flexibly-coupled/integral bearing designs. Only the flexibly-coupled design such as the 3996 is built without compromise.

Close-coupled units are difficult to service and rigid coupled models have long, unsupported shafts which are subject to runout, deflection and imbalance...leading to shortened bearing and seal life.



Parts List and Materials of Construction

		MATERIAL							
Item Number	Part Name	Ductile Iron* 316SS Impeller	316SS	CD4MCuN	Alloy 20	Monel	Nickel	Hastelloy B&C	Titanium
100	Casing	Ductile Iron	316 SS	CD4	Alloy20	Monel	Nickel	Hastelloy	Titanium
101	Impeller	316 SS		CD4	Alloy20	Monel	Nickel	Hastelloy	Titanium
105	Lantern Ring	Glass Filled PTFE							
106	S.B. Packing	PTFE Impregnated Fibers							
112	Thrust Bearing	Double Row Angular Contact							
122	Shaft—Less Sleeve (Optional)	SAE 4140	316SS		Alloy20	Monel	Nickel	Hastelloy	Titanium
122	Shaft—With Sleeve	4140 Steel				316 SS			
126	Shaft Sleeve	316 SS		Alloy 20		Monel	Nickel	Hastelloy	Titanium
136	Bearing Locknut and Lockwasher	Steel							
168	Radial Bearing	Single Row Deep Groove							
184	Seal Chamber/S.B. Cover (Mechanical Seal or Packed Box)	Ductile Iron	316 SS	CD4	Alloy20	Monel	Nickel	Hastelloy	Titanium
228	Bearing Frame	Ductile Iron							
239	Casing Support	ST = Steel / MT = Ductile Iron							
240	Motor Support	Ductile Iron							
250	Gland	316 SS		CD4	Alloy20	Monel	Nickel	Hastelloy	Titanium
262	Repeller/Sleeve (Dynamic Seal Option)	CD4MCuN			Alloy20	Monel	Nickel	Hastelloy	Titanium
264	Gasket, Cover to Backplate	PTFE							
265A	Stud/Nut - Cover to Frame	304SS							
332A	Grease Seal - Outboard	Buna Rubber							
333A	Grease Seal - Inboard	Buna Rubber							
351	Casing Gasket	Aramid Fiber with EPDM Rubber							
358A	Plug—Casing Drain	Carb Steel	316 SS	CD4	Alloy 20	Monel	Nickel	Hastelloy	Titanium
370H	Cap Screw - Frame to Casing	Steel	304 SS						
412	Stud, Cover to Adapter	Glass Filled PTFE							
418	Jacking Bolt	304 SS							
444	Backplate (Dynamic Seal Option)	Ductile Ion	316SS	CD4	Alloy20	Monel	Nickel	Hastelloy	Titanium
469B	Dowel Pin	Steel							
496	O—ring Bearing Housing	Buna N							

*Ductile Iron Casing available with 150# FF or RF only. 300# Flange is Not Available. ® E.I.

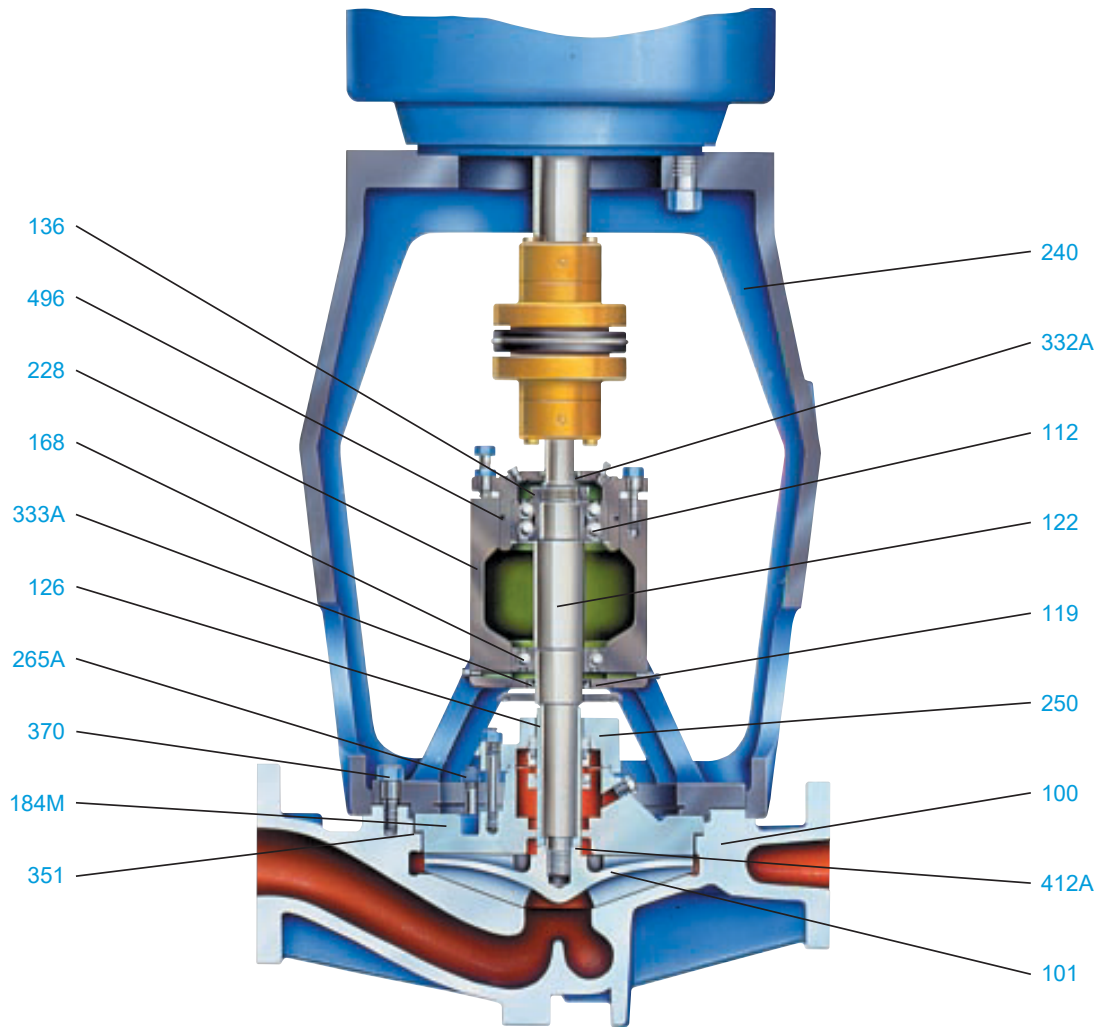
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Construction Details

All dimensions in inches and (mm)

		ST	MT
Shaft	Diameter at Impeller	.75 (19)	1 (25)
	Diameter in Stuffing Box/Seal Chamber (Less Sleeve) (With Sleeve)	1.375 (35) 1.125 (29)	1.75 (45) 1.5 (38)
	Diameter Between Bearings	1.5 (38)	2.125 (54)
	Diameter at Coupling	.875 (22)	1.125 (29)
	Overhang	6.125 (156)	8.375 (213)
	Maximum Shaft Deflection	0.002 (0.05)	
Sleeve	O.D. thru Stuffing Box/Seal Chamber	1.375 (35)	1.75 (45)
Bearings	Radial	SKF 6207	SKF 6309
	Thrust	SKF 5306 A/C3	SKF 5309 A/C3
	Bearing Span	4.125 (105)	6.75 (171)
	Average L'10 Bearing Life	87,600 hours	
BigBore Seal Chamber	Bore	2.875 (73)	3.5 (89)
Stuffing Box	Bore	2 (51)	2.5 (64)
Power Limits	HP (kW) per 100 RPM	1.1 (.82)	3.4 (2.6)
Maximum Liquid Temperature	Grease Lubrication without Cooling	250° F (121° C)	
	Grease Lubrication with Heat Flinger	450° F (232° C)	
	Oil Mist Lubrication with Heat Flinger and Cooling	500° F (260° C)	
Casing	Corrosion Allowance	.125 (3)	

3996 Sectional View



Dynamic Seal

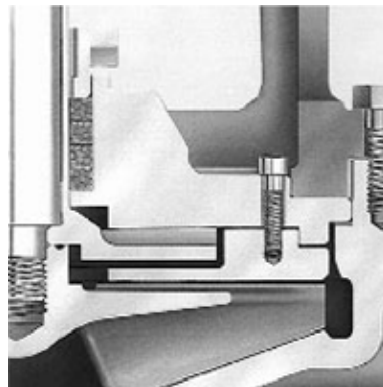
For Elimination of Sealing Problems—Reduced Maintenance Costs

On tough pumping services, especially corrosives and slurries, mechanical seals require outside flush and constant, costly attention. Even then, seal failures are common, resulting in downtime. Goulds offers the ANSI PLUSTM Dynamic Seal which, simply by fitting a repeller between the stuffing box and impeller, eliminates the need for a mechanical seal. Benefits of Goulds Dynamic Seal:

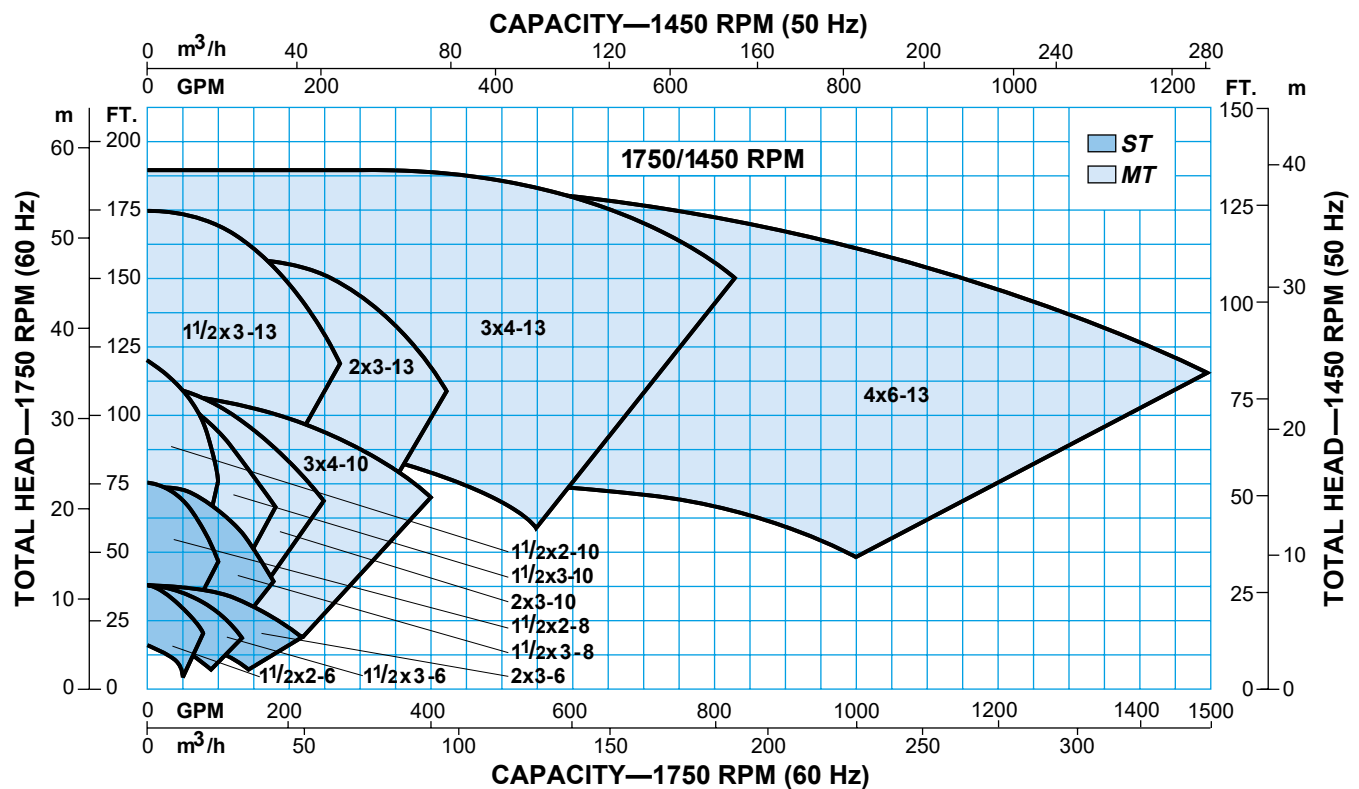
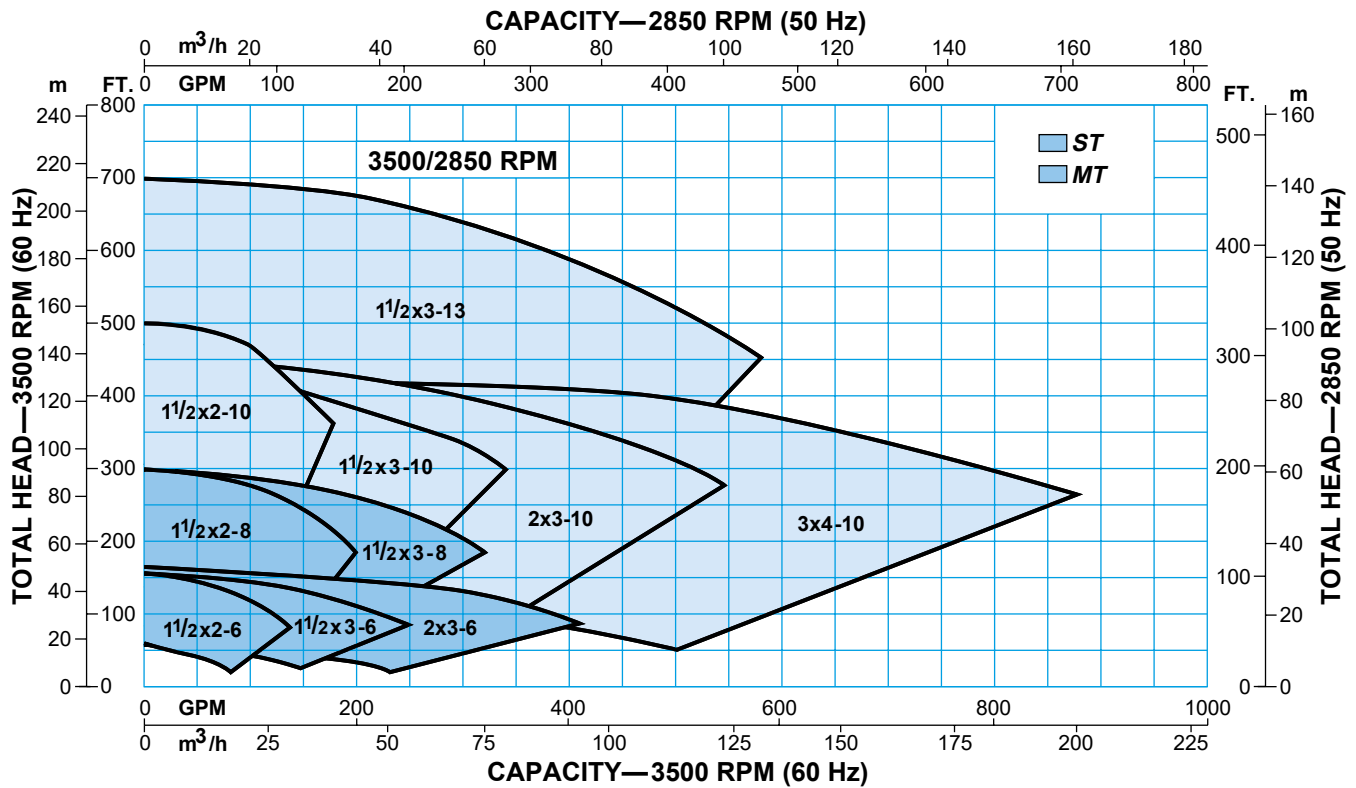
- External seal water not required
- Elimination of pumpage contamination and product dilution
- Reduces utility cost
- No need to treat seal water
- Eliminates problems associated with piping
- from a remote source

At start-up, the repeller functions like an impeller, and pumps liquid and solids from the stuffing box. When pump is shut down, packing (illustrated) or other type of secondary seal prevents pumpage from leaking.

Besides being available as a complete unit, any Goulds 3996 can be easily field-converted to Dynamic Seal. Retrofit kits are readily available.



3996 Hydraulic Coverage

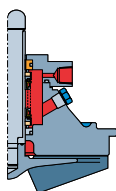


Sealing Solutions

Goulds engineered seal chambers are designed to accept a wide range of sealing arrangements to meet specific user requirements. Your Goulds representative will gladly recommend the best sealing solution for your service...some of which are illustrated here.

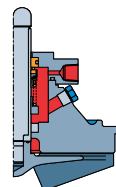
CONVENTIONAL DOUBLE SEAL (with BigBore™ Seal Chamber)

- Liquids not compatible with single seal
- Toxic, hazardous, abrasive, corrosive
- When pump is operating under cavitation or low flows
- Meet environmental regulations



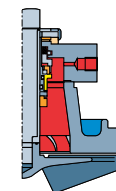
SINGLE INSIDE SEAL (with BigBore™ Seal Chamber)

- Non-corrosive to moderate corrosive liquids
- Moderate abrasives
- Liquids that have good lubrication qualities



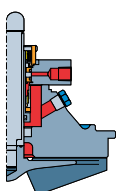
SINGLE CARTRIDGE SEAL (with TaperBore™ PLUS Seal Chamber)

- Same application as conventional single seal
- Ease of maintenance
- No seal setting problems



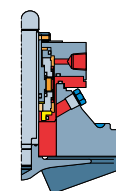
DOUBLE CARTRIDGE SEAL (with BigBore™ Seal Chamber)

- Same applications as conventional double seal
- Reduced maintenance costs
- No seal setting errors



DOUBLE GAS BARRIER SEAL (with BigBore™ Seal Chamber for Gas Seals)

- Toxic or hazardous liquids
- Meet environmental regulations
- When use of seal pot or external flush is not desirable
- When compatible seal flush liquid not available



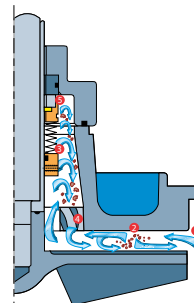
Goulds Patented TaperBore™ PLUS

How It Works

The unique flow path created by the patented Vane Particle Ejector directs solids away from the mechanical seal, not *towards* the seal as with other tapered bore designs. And, the amount of solids entering the bore is minimized. Air and vapors are also efficiently removed.

On services with or without solids, air or vapors, Goulds TaperBore™ PLUS is the effective solution for extended seal and pump life and lower maintenance costs.

- 1 Solids/liquid mixture flows toward mechanical seal/seal chamber.
- 2 Turbulent zone. Some solids continue to flow toward shaft. Other solids are forced back out by centrifugal force (generated by back pump-out vanes).
- 3 Clear liquid continues to move toward mechanical seal faces. Solids, air, vapors flow away from seal.
- 4 Low pressure zone created by Vane Particle Ejector. Solids, air, vapor liquid mixture exit seal chamber bore.
- 5 Flow in TaperBore™ PLUS seal chamber assures efficient heat removal (cooling) and lubrication. Seal face heat is dissipated. Seal faces are continuously flushed with clean liquid.



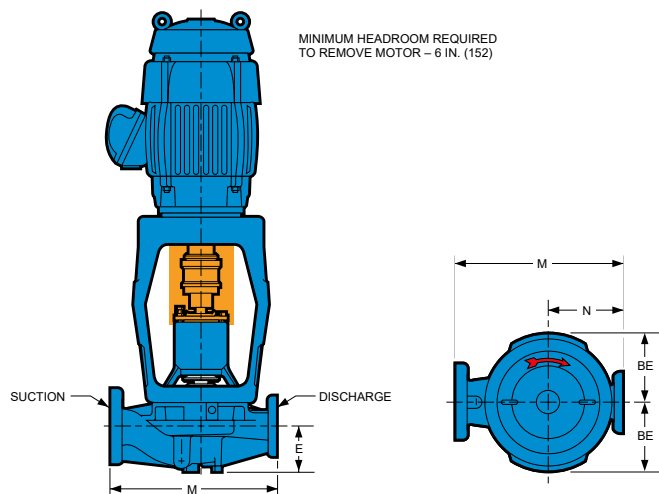
Engineered Seal Chamber Selection Guide

	A	B	C
Ideally Suited			
Acceptable			
Not Recommended			

	TYPE 1 Standard Bore	TYPE 2 BigBore™	TYPE 3 TaperBore™ PLUS	TYPE 4 Jacketed TaperBore™ PLUS	TYPE 5 Jacketed BigBore™
	Designed for packing. Also accommodates mechanical seals.	Enlarged chamber for increased seal life through improved lubrication and cooling.	Lower seal face temperatures, self-venting and draining. Solids and vapors circulated away from seal faces.	Maintains proper temperature control (heating or cooling) of seal environment.	Maintains proper temperature control (heating or cooling) of seal environment.
Service					
Water-Based Liquids with Flush	A	A	A	A	A
Entrained Air or Vapor	C	B	A	A	B
Solids 0-10%, no Flush	C	C	A	A	C
Solids Greater than 10% with Flush	B	A	C	C	A
Paper Stock 0-5%, no Flush	C	C	A	-	-
Paper Stock 0-5%, with Flush	B	A	-	-	-
Slurries 0-5%, no Flush	C	C	A	A	C
High Boiling Point Liquids, no Flush	C	C	A	A	C
Temperature Control	C	C	A	A	A
Self-Venting and Draining	C	B	A	A	C
Seal Face Heat Removal	C	A	A	A	A
Molten or Polymerized Liquid, no Flush	C	C	C	A	C
Molten or Polymerized Liquid with Flush	C	C	C	A	A

3996 Dimensions

All dimensions in inches and (mm). Not to be used for construction.



DIMENSIONS									
Group	Pump Size	ANSI Designation	Discharge	Suction	E	M	N	BE	Pump Weight (Less Motor) Lbs. (kg)
ST	1½x2-6	2015/15	1½	2	4¼ (108)	15 (381)	6¾ (171)	6¾ (162)	190 (86)
	1½x3-6	3015/15	1½	3	4⅞ (124)	15 (381)	6¾ (171)		200 (91)
	2x3-6	3020/17	2	3	4⅝ (1118)	17 (432)	7½ (191)		205 (93)
	1½x2-8	2015/17	1½	2	4⅓/16 (122)	17 (432)	8 (203)		200 (91)
	1½x3-8	3015/19	1½	3	5¼ (133)	19 (483)	8⅜ (213)		210 (95)
MT	1½x2-10	2015/19	1½	2	5⅛ (130)	19 (483)	9¼ (235)	10 (254)	370 (168)
	1½x3-10	3015/19	1½	3	5 (127)	19 (483)	9¼ (235)		380 (173)
	2x3-10	3020/20	2	3	5¼ (133)	20 (508)	9½ (241)		390 (177)
	3x4-10	4030/25	3	4	6 (152)	25 (635)	11½ (292)		430 (195)
	1½x3-13	3015/24	1½	3	5⅝ (143)	24 (610)	11½ (292)		460 (209)
	2x3-13	3020/24	2	3	5¾ (146)	24 (610)	11½ (292)		490 (223)
	3x4-13	4030/28	3	4	6⅞ (175)	28 (711)	13 (330)		520 (236)
	4x6-13	6040/30	4	6	8½ (216)	30 (762)	14 (356)		610 (277)

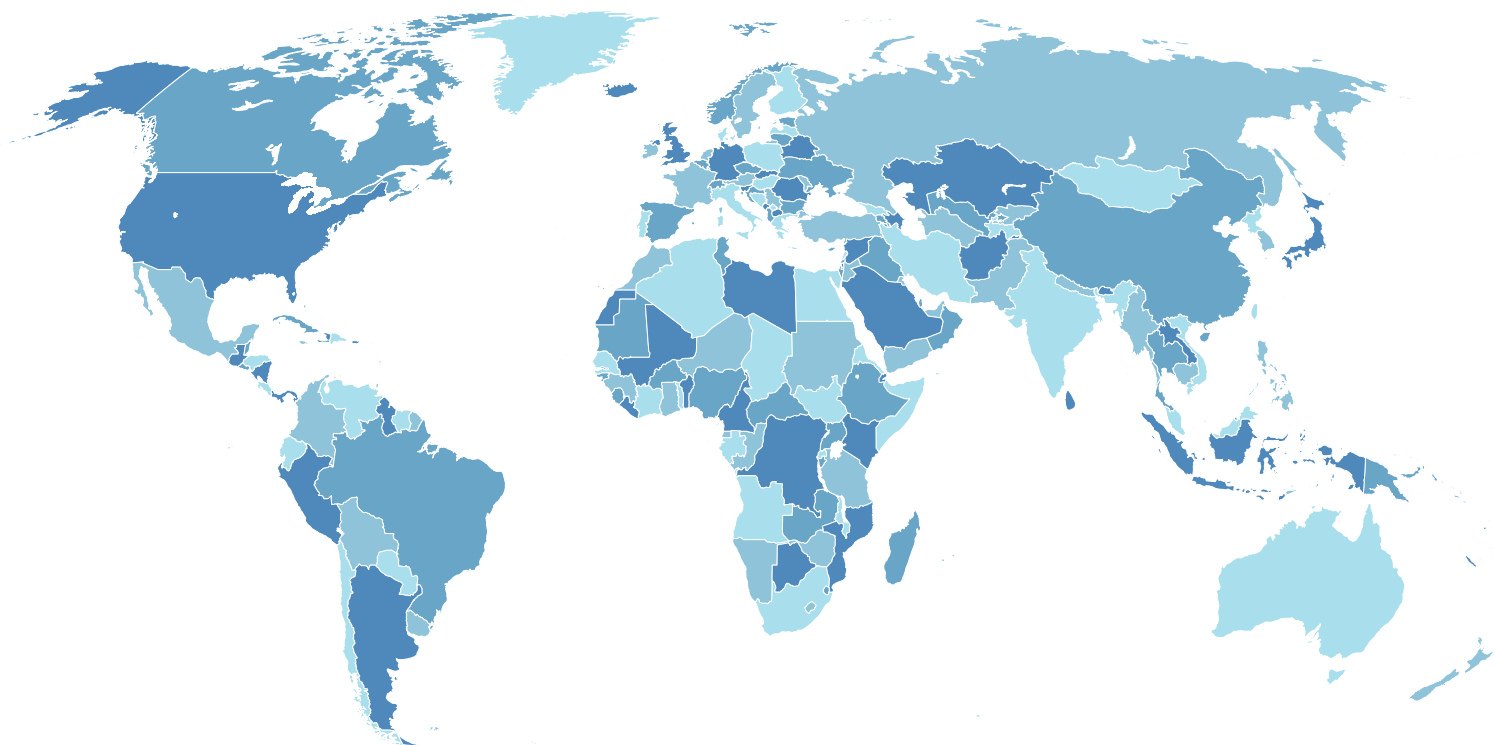
X-Series Power Ends Fit 8 Different Process Pumps

Minimize inventory, reduce downtime.



Notes

Notes



Visit www.ittproservices.com & www.gouldspumps.com to
find nearest service, sales, and manufacturing locations



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