



## Goulds Model 3996 In-Line Process Pumps



Goulds Pumps



**ITT Industries**  
*Engineered for life*



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

# Goulds Model 3996

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

- Capacities to 1400 GPM (318 m<sup>3</sup>/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



# Model 3996 In-Line Process Pumps

## Heavy Duty Design Features for a Wide Range of Process 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.

### STREAMLINED SUCTION

With contoured suction baffle reduces turbulence assuring low NPSH requirements.

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.

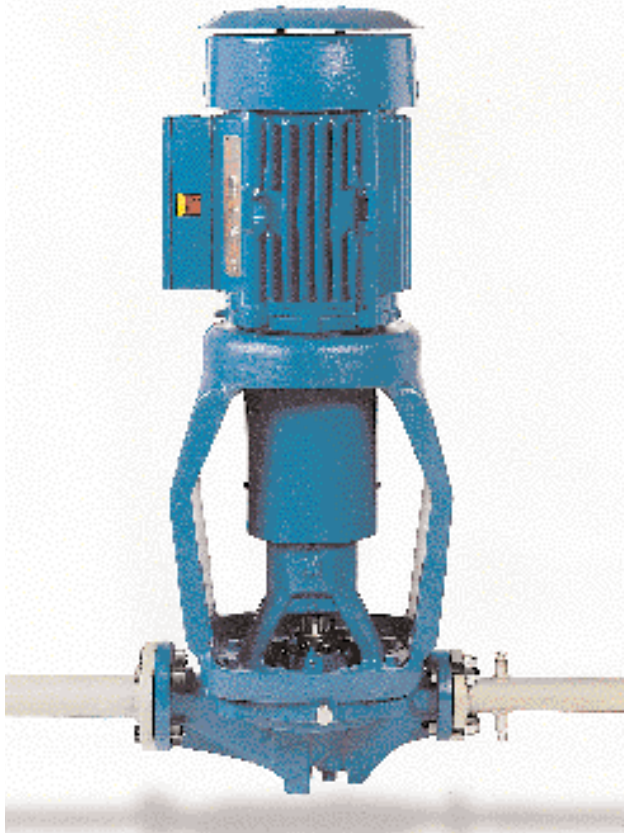
FULLY OPEN IMPELLER

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.



# 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).

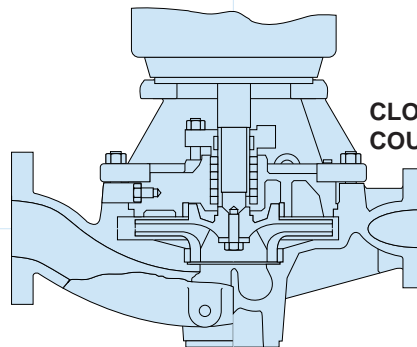
*Goolds Model  
3996—  
Designed for  
Reliable In-line  
Service*



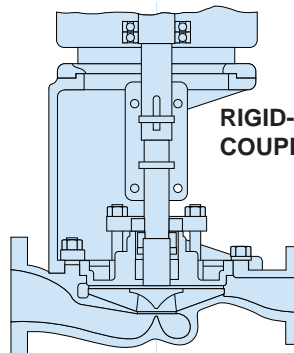
## Goolds 3996...The Preferred In-Line Design

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

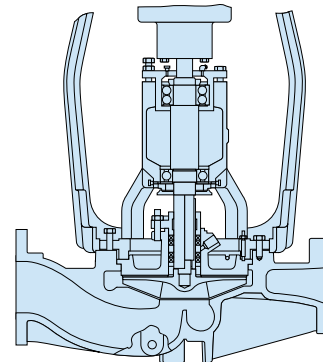
Close-coupled units are difficult to service and rigid-coupled models have long, unsupported shafts which are subject to runout, deflection and imbalance...leading to shortened bearing and seal life.



**CLOSE-  
COUPLED**



**RIGID-  
COUPLED**



**INTEGRAL  
BEARING  
FLEXIBLY-  
COUPLED**

# Parts List and Materials of Construction

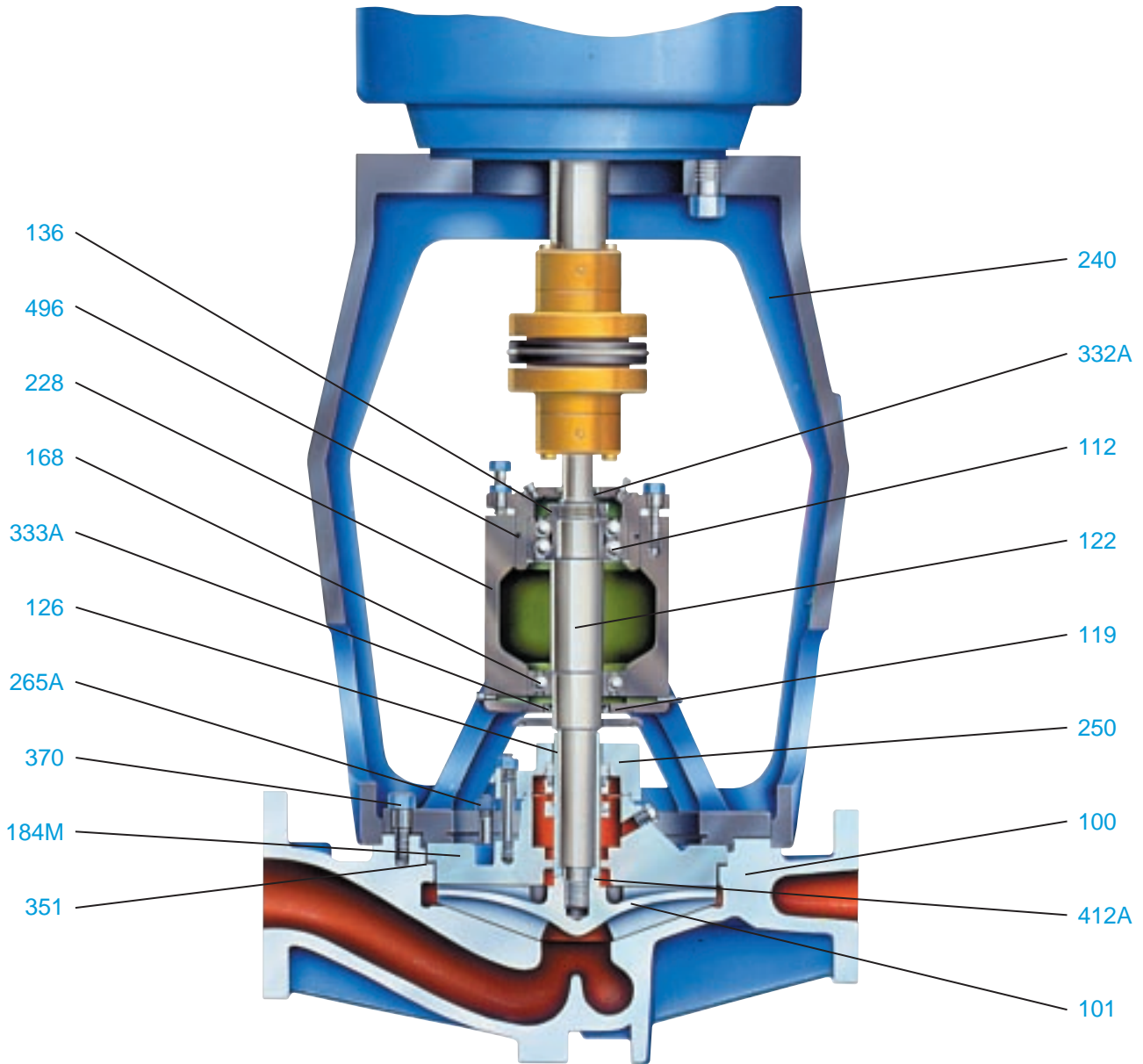
| Item Number | Part Name                                 | Material                      |        |          |          |        |           |                 |          |
|-------------|---|-------------------------------|--------|----------|----------|--------|-----------|-----------------|----------|
|             |   | Ductile Iron                  | 316SS  | CD4MCu   | Alloy 20 | Monel  | Nickel    | Hastelloy B & C | Titanium |
| 100         | Casing                                    | Ductile Iron                  | 316SS  | CD4MCu   | Alloy 20 | Monel  | Nickel    | Hastelloy       | Titanium |
| 101         | Impeller                                  | Ductile Iron                  | 316SS  | CD4MCu   | Alloy 20 | Monel  | Nickel    | Hastelloy       | Titanium |
| 105         | Lantern Ring                              | Glass-Filled Teflon*          |        |          |          |        |           |                 |          |
| 106         | Stuffing Box Packing                      | Teflon* Impregnated Fibers    |        |          |          |        |           |                 |          |
| 112         | Thrust Bearing                            | Double Row Angular Contact    |        |          |          |        |           |                 |          |
| 119         | Bearing End Cover                         | Steel                         |        |          |          |        |           |                 |          |
| 122         | Shaft—Less Sleeve (Optional)              | SAE4140                       | 316SS  |          | Alloy 20 | Monel  | Nickel    | Hastelloy       | Titanium |
| 122         | Shaft—With Sleeve                         | SAE4140                       |        |          | 316SS    |        |           |                 |          |
| 126         | Shaft Sleeve                              | 316SS                         |        | Alloy 20 | Monel    | Nickel | Hastelloy | Titanium        |          |
| 136         | Bearing Locknut and Lockwasher            | Steel                         |        |          |          |        |           |                 |          |
| 168         | Radial Bearing                            | Single Row Deep Groove        |        |          |          |        |           |                 |          |
| 184         | Stuffing Box Cover (Packed Box)           | Ductile Iron                  | 316SS  | CD4MCu   | Alloy 20 | Monel  | Nickel    | Hastelloy       | Titanium |
| 184M        | Seal Chamber (Mechanical Seal)            | Ductile Iron                  | 316SS  | CD4MCu   | Alloy 20 | Monel  | Nickel    | Hastelloy       | Titanium |
| 228         | Bearing Frame                             | Ductile Iron                  |        |          |          |        |           |                 |          |
| 240         | Motor Support                             | Ductile Iron                  |        |          |          |        |           |                 |          |
| 250         | Gland                                     | 316SS                         | CD4MCu | Alloy 20 | Monel    | Nickel | Hastelloy | Titanium        |          |
| 262         | Repeller/Sleeve (Dynamic Seal Option)     | CD4MCu                        |        |          | Alloy 20 | Monel  | Nickel    | Hastelloy       | Titanium |
| 264         | Gasket, Cover to Backplate (Dynamic Seal) | Teflon*                       |        |          |          |        |           |                 |          |
| 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        | Casing Drain Plug (Optional)              | Steel                         | 316SS  | CD4MCu   | Alloy 20 | Monel  | Nickel    | Hastelloy       | Titanium |
| 370         | Cap Screw, Frame-to-Casing                | Steel                         | 304SS  |          |          |        |           |                 |          |
| 412A        | O-ring, Impeller                          | Glass-Filled Teflon*          |        |          |          |        |           |                 |          |
| 418         | Jacking Bolt                              | 304SS                         |        |          |          |        |           |                 |          |
| 444         | Backplate (Dynamic Seal Option)           | Ductile Iron                  | 316SS  | CD4MCu   | Alloy 20 | Monel  | Nickel    | Hastelloy       | Titanium |
| 469B        | Dowel Pin                                 | Steel                         |        |          |          |        |           |                 |          |
| 496         | O-ring, Bearing Housing                   | Buna Rubber                   |        |          |          |        |           |                 |          |

\*E.I. DuPont reg. trademark

## Construction Details All dimensions in inches and (mm).

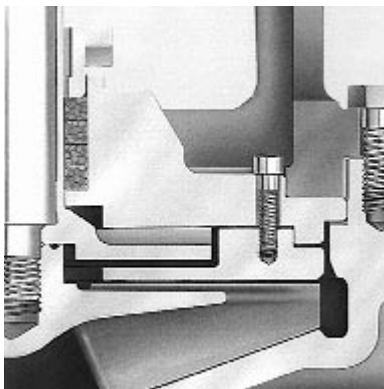
|                            |   | ST              | MT          |
|----------------------------|---|-----------------|-------------|
| Shaft                      | Diameter at Impeller                                | .75 (19)        | 1 (25)      |
|                            | Diameter in Stuffing Box/Seal Chamber (Less Sleeve) | 1.375 (35)      | 1.75 (45)   |
|                            |   | (With Sleeve)   | 1.125 (29)  |
|                            | 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        |             |
|                            | Thrust  | SKF 5306 A/C3   |             |
|                            | Bearing Span  | 4.125 (105)     | 6.75 (171)  |
|                            | Average L <sub>10</sub> 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)        |             |

# Sectional View Model 3996



## 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 PLUS™ 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:

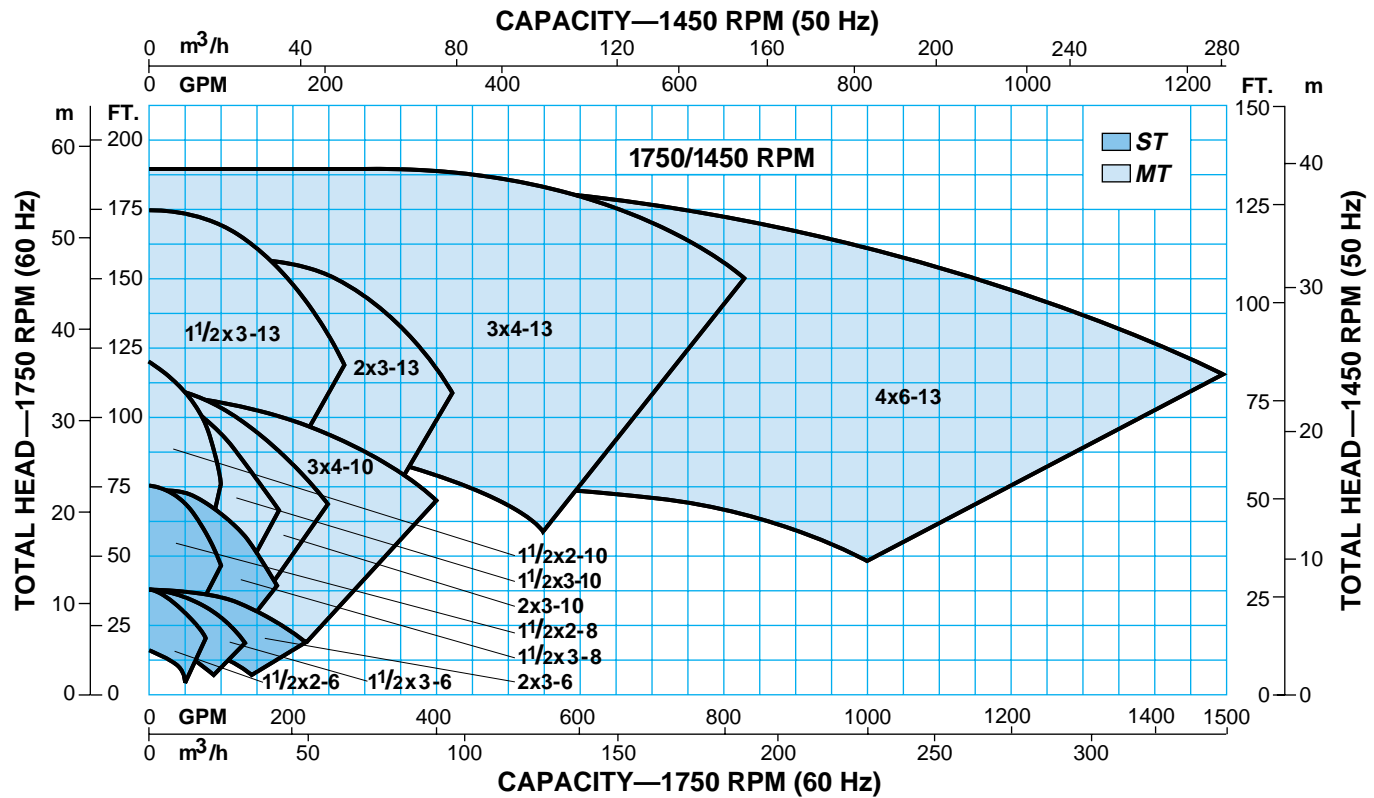
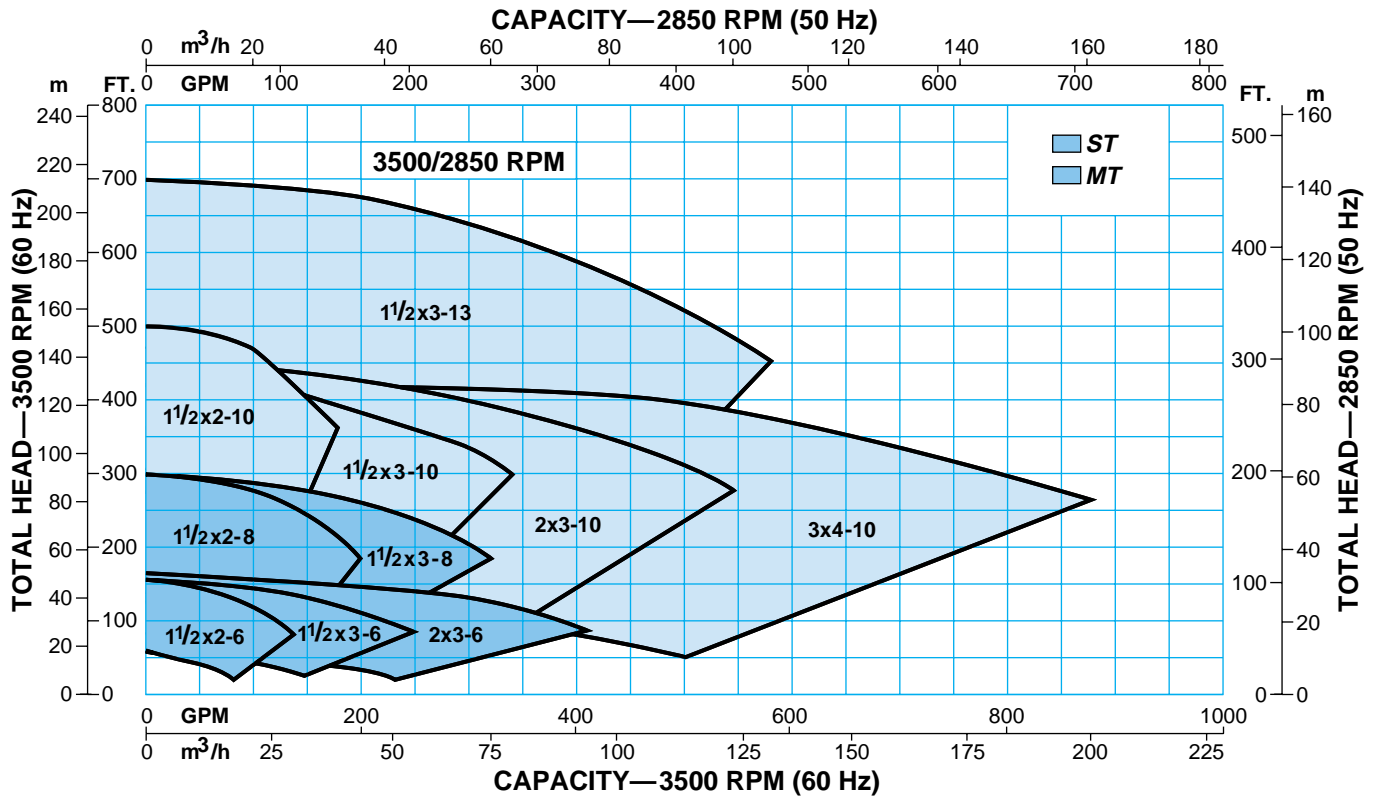
- External seal water not required
- Elimination of pumpage contamination and product dilution
- Reduces utility cost
- No need to treat seal water
- Eliminates problems associated with piping from a remote source

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.

# Hydraulic Coverage Model 3996

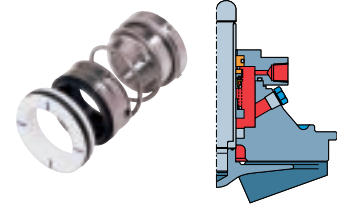


# Sealing Solutions

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.

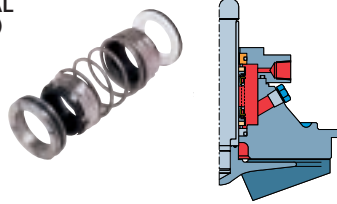
## SINGLE INSIDE SEAL (with BigBore™ Seal Chamber)

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



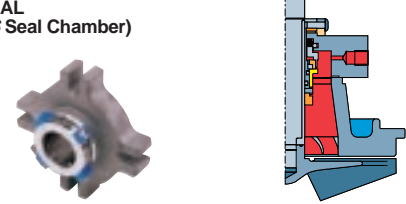
## CONVENTIONAL DOUBLE SEAL (with BigBore™ Seal Chamber)

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



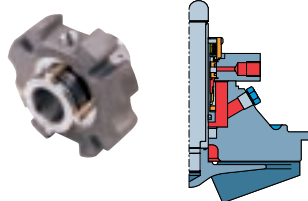
## SINGLE CARTRIDGE SEAL (with TaperBore™ PLUS Seal Chamber)

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



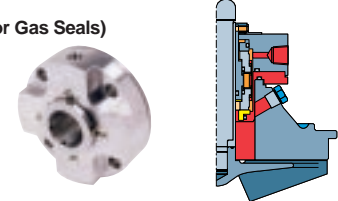
## DOUBLE CARTRIDGE SEAL (with BigBore™ Seal Chamber)

- 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



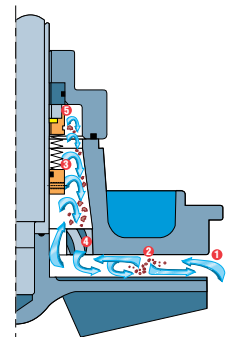
# Goulds Patented TaperBore™ PLUS

## 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.

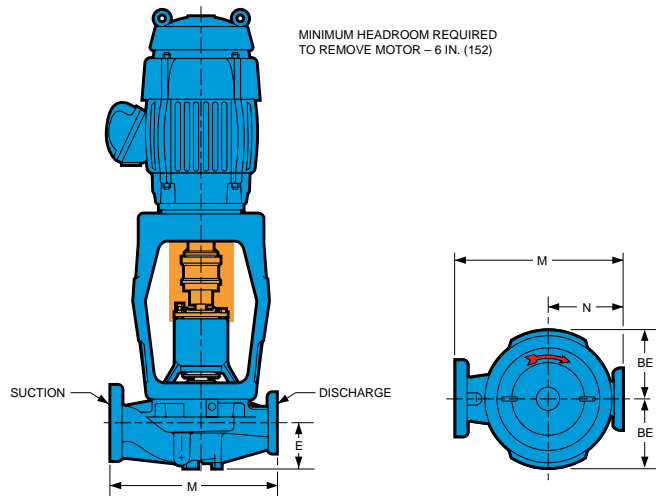


# Engineered Seal Chamber Selection Guide

|   | A  | B  | C   |
|---|--|--|---|
|   | Ideally Suited   | Acceptable   | Not Recommended   |
|   | <b>TYPE 1</b><br>Standard Bore   | <b>TYPE 2</b><br>BigBore™  | <b>TYPE 3</b><br>TaperBore™ PLUS  |
|   | 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. |
|   | <b>TYPE 4</b><br>Jacketed TaperBore™ PLUS                                      | <b>TYPE 5</b><br>Jacketed BigBore™   |   |
|   | Maintains proper temperature control (heating or cooling) of seal environment. | Maintains proper temperature control (heating or cooling) of seal environment.     |   |
| <b>Service</b>                          |  |  |   |
| Water-Based Liquids with Flush          | A  | A  | A   |
| Entrained Air or Vapor                  | C  | B  | A   |
| Solids 0-10%, no Flush                  | C  | C  | A   |
| Solids Greater than 10% with Flush      | B  | A  | C   |
| 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   |
| High Boiling Point Liquids, no Flush    | C  | C  | A   |
| Temperature Control                     | C  | C  | A   |
| Self-Venting and Draining               | C  | B  | A   |
| Seal Face Heat Removal                  | C  | A  | A   |
| Molten or Polymerized Liquid, no Flush  | C  | C  | A   |
| Molten or Polymerized Liquid with Flush | C  | C  | A   |

# Dimensions Model 3996

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       | 47/8 (124)   | 15 (381) | 6¾ (171)   |          | 200 (91)                           |
|       | 2x3-6     | 3020/17          | 2         | 3       | 45/8 (1118)  | 17 (432) | 7½ (191)   |          | 205 (93)                           |
|       | 1½x2-8    | 2015/17          | 1½        | 2       | 413/16 (122) | 17 (432) | 8 (203)    |          | 200 (91)                           |
|       | 1½x3-8    | 3015/19          | 1½        | 3       | 5¼ (133)     | 19 (483) | 83/8 (213) |          | 210 (95)                           |
| MT    | 1½x2-10   | 2015/19          | 1½        | 2       | 51/8 (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       | 55/8 (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       | 67/8 (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.



**Model 3196**  
X-Series Chemical Process Pumps

**Model CV 3196**  
Non-Clog Process Pumps

**Model HT 3196**  
High Temperature Chemical Process Pumps

**Model LF 3196**  
Low Flow ANSI Process Pumps

**Model NM 3196**  
FRP Process Pumps

**Model 3198**  
PFA TEFLON®-Lined Process Pumps

**Model 3796**  
Self-Priming Process Pumps

**Model 3996**  
In-Line Process Pumps

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