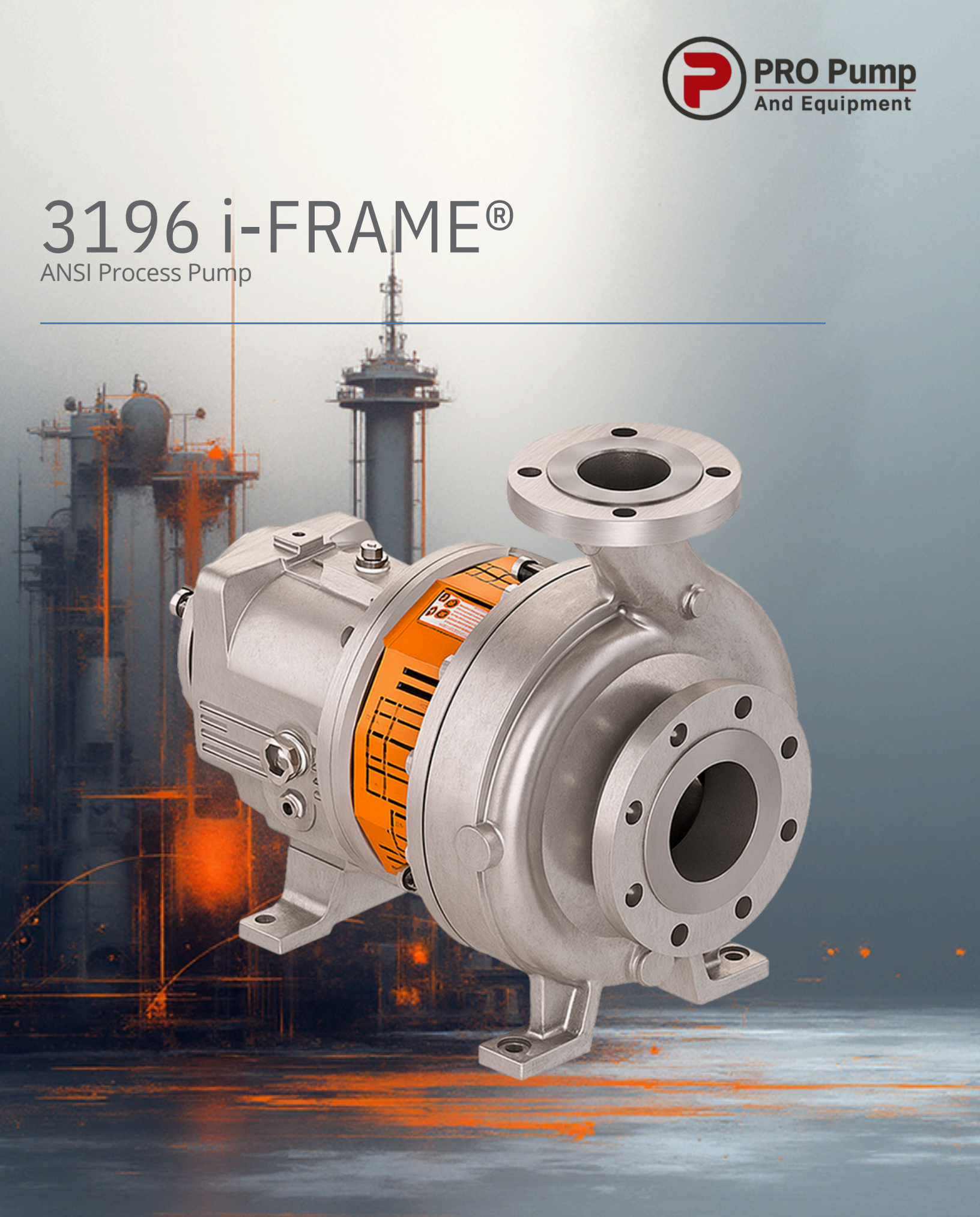
PRO Pump
And Equipment

3196 i-FRAME®

ANSI Process Pump



Proven Performance

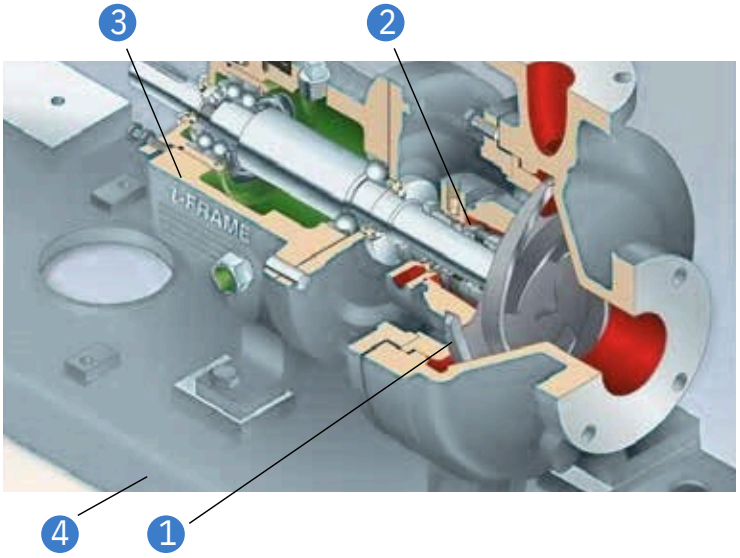
Over One Million Process Pump Installations Worldwide

When the 3196 ANSI Standard Dimension Process Pump , it immediately became the standard for the industry.

Before Selecting A Process Pump

ConsidertheFourDesignFeaturesForExtendedPump Performance

In order to select a chemical process pump wisely, consideration must be given to design features that provide long-term reliable performance. The pump must be designed for optimum shaft seal and bearing life to prevent the failure of these two primary causes of pump downtime.



FULLY OPEN IMPELLER

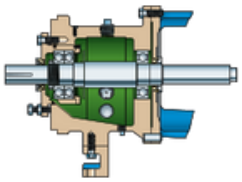
Best design for the Chemical Process Industries services. Ideally suited for corrosives and abrasives, handles solids and stringy fibers with ease. Allows for simple restoration of clearances when wear takes place. Back pump-out vanes reduce pressure on the shaft seal, reduce axial thrust on the bearings.

ENGINEERED SEAL CHAMBERS

BigBore™ and TaperBore™ PLUS seal chambers allow seals to run cooler with better face lubrication. Keep solids, air and vapors away from the seal faces for extended seal life.

i-FRAME® POWER ENDS

Patented design maximizes reliability and Mean Time Between Failure (MTBF). Severe-duty bearings increase bearing life 2-5 times, while onboard condition monitor gives visible indication of general pump health. Backed by a five-year standard warranty.



PUMP MOUNTING SYSTEM

Critical for reliability ... rigid baseplate prevents distortion, maintaining pump/motor alignment, corrosion resistant in severe environments. Designed for low vibration and to withstand pipe loads. Meets total range of plant requirements, easier installation and maintenance.

1 Impeller

Must be designed for long-term, maintainable performance and minimum hydraulic loads for maximum reliability.

2 Seal Chamber

Must be designed for favorable seal environment — proper heat dissipation and lubrication of seal faces. The design must also be able to handle tough services: liquids containing solids, air or vapors.

3 Power End

Must be designed for optimum bearing life, effective oil cooling, and minimum shaft deflection. Onboard condition monitoring provides early warning of potential failures, before they occur.

4 Baseplate

Must be rigid, and able to withstand forces and moments of plant piping systems.

Fully Open Impeller

AcknowledgedBestDesignforCPIServices

Theopen impeller is theacknowledged best designfor process services. It is ideally suited for corrosive/erosive liquids containing solids and stringy materials. The most reliable pumps feature open impellers as standard.

See The Difference

shad performance in mind when the Model 3196 standard dimension process pump was developed in 1959. Of timely significance was the decision to feature a fully open impeller rather than an enclosed type. There are three excellent reasons why:

- Greater wear area for longer life
- Renewable performance for reduced repair costs
- Minimum hydraulic loads for maximum mechanical reliability

Open Impeller Enclosed-type Impeller

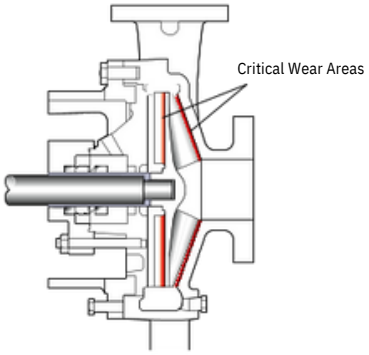
1. Two Times More Wear Area

Longer Life, Reduced Repair Costs

The most criticalwear areasof a pump are the casing and stuffing box/seal chamber clearances. At a given wear rate, the larger wear area means longer life.

Open Impeller

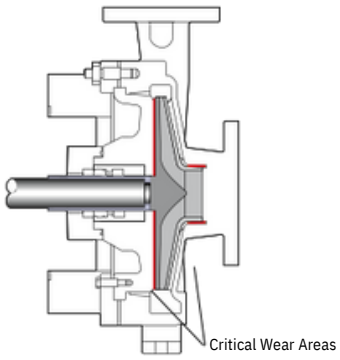
Wear is uniform throughout larger area; no concentrated wear... extended life, reduced repair part cost.



Wear Area Calculation (10 inch dia. impeller)
Area Wear Surface = $\pi r^2 = \pi(5)^2 = 79$ in^2
Total Wear Area (Front & Back) = 2x 79 = 158 in^2

Enclosed Type Impeller

Less wear area with concentrated wear at nose of impeller ... higher repair part cost.

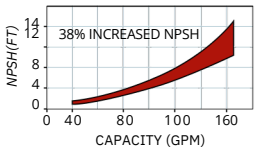


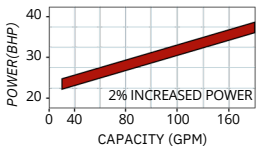
Area Nose Ring = $2\pi rW = 2 \times \pi x(.9)\ (.9) = 5$ in^2
Area Back Cover = $\pi r^2 = \pi(5)^2 = 79$ in^2
Total Wear Area = 5 + 79 = 84 in^2

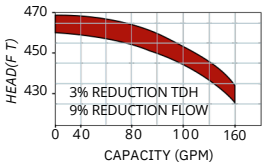
2. Maintained High-Performance

LongPump Life

Itiscommon knowledge that as a pump wears, the performance decreases. Goulds open impeller can be adjusted, simply and quickly, to compensate for wear and renew performance. The enclosed type impeller cannot be adjusted. Performance renewal requires new or repaired casing and impeller.



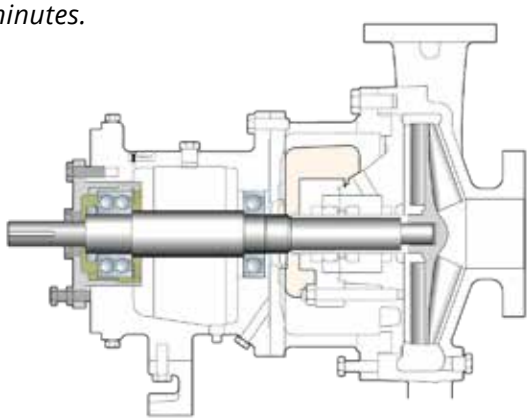




Typical reduction in performance due to wear (.010 inch per year) on any ANSI pump.

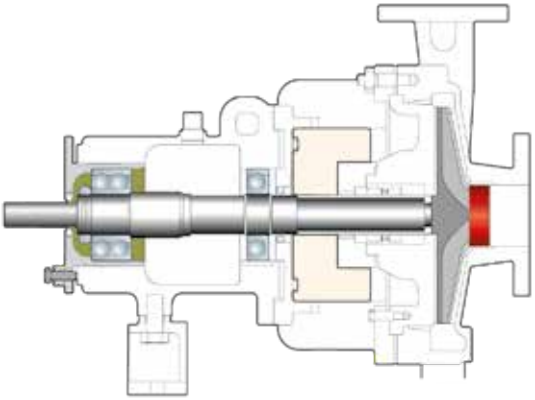
Open Impeller

Original performance can be re-set (at the bench or on-site) with external impeller adjustment using a common open-end wrench and feeler gauge. *It is done in a matter of minutes.*



Enclosed Type Impeller

Front nose ring of impeller cannot be adjusted to provide 'as new' performance. Parts must be replaced or repaired.



3. Minimum Hydraulic Loads

Extended Seal and Bearing Life

Goulds openimpeller isengineered to assureminimum radial and axial thrust loads; controlled clearances between front and back of impeller minimize radial loads; back pump-out vanes control and reduce axial thrust. Bearing life is guaranteed.

Engineered For Long Life

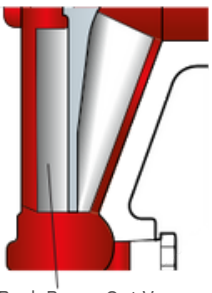
Backvaneheight/angle and shrouddesign are engineered to minimize hydraulic loads throughout the life of the pump. Bearing life is guaranteed.

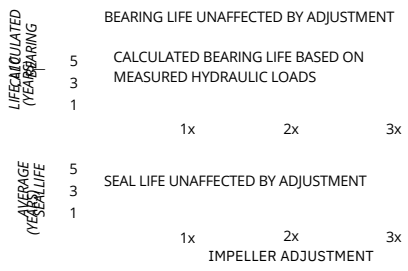
As the open impeller is adjusted and performance renewed, back pump-out vanes control axial thrust.

Bearing and seal life are maintained — unaffected by adjustment.

- Control Axial Thrust
- Low Radial Loads
- Control Seal Chamber Pressure

- Guaranteed Bearing Life
- Extended Seal Life


Back Pump-Out Vanes



Goulds Engineered Seal Chambers

Extend Seal Life And Lower Maintenance Costs

Seal Environment is Critical for Extended Seal Life

The number one cause of pumpdowntimeisfailure of the shaft seal. These failures arenormally the result of an unfavorable seal environmentsuch as improper heat dissipation (cooling), poor lubrication of the seal faces, or seals operating in liquids containing solids, air or vapors.

Goulds engineered seal chambers are designed to provide the best seal environment for any sealing arrangement.

Enlargedbore sealchambers (BigBore™ and TaperBore® PLUS) with increased radial clearance between the mechanical seal and seal chamber provide better circulation of liquid to and from seal faces. Improved lubrication and heat removal extend seal life and pump uptime. The bottom line is lower maintenance costs.

Engineered Seal Chamber Selection Guide

A Ideally suited
B Acceptable
C Not Recommended

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

Goulds 3196 i-FRAME®

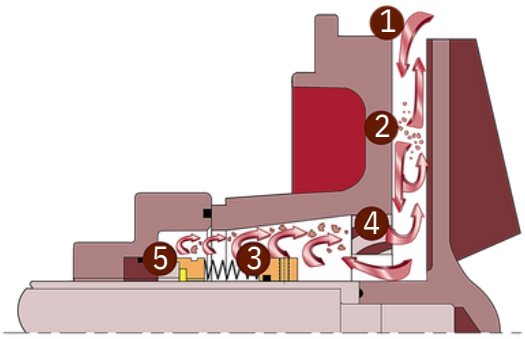
Goulds Dynamic Seal

Goulds TaperBore® PLUS

How it Works

The unique flow path created by the 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 Pumps 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. Enhanced streamline 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.

Benefits of Dynamic Seal:

- Eliminate use of seal water
- Eliminate pumpage contamination and product dilution
- Reduce utility cost
- Eliminate problems associated with piping from a remote source
- Eliminate need to treat seal water
- Considerably less expensive than a slurry mechanical seal

Stuffing Box Cover

Repeller

Repeller Plate

Besides being available as a complete unit, any Goulds 3196 can be easily field-converted to Dynamic Seal. Retrofit kits are available.

Eliminate Sealing Problems, Reduce Maintenance Costs

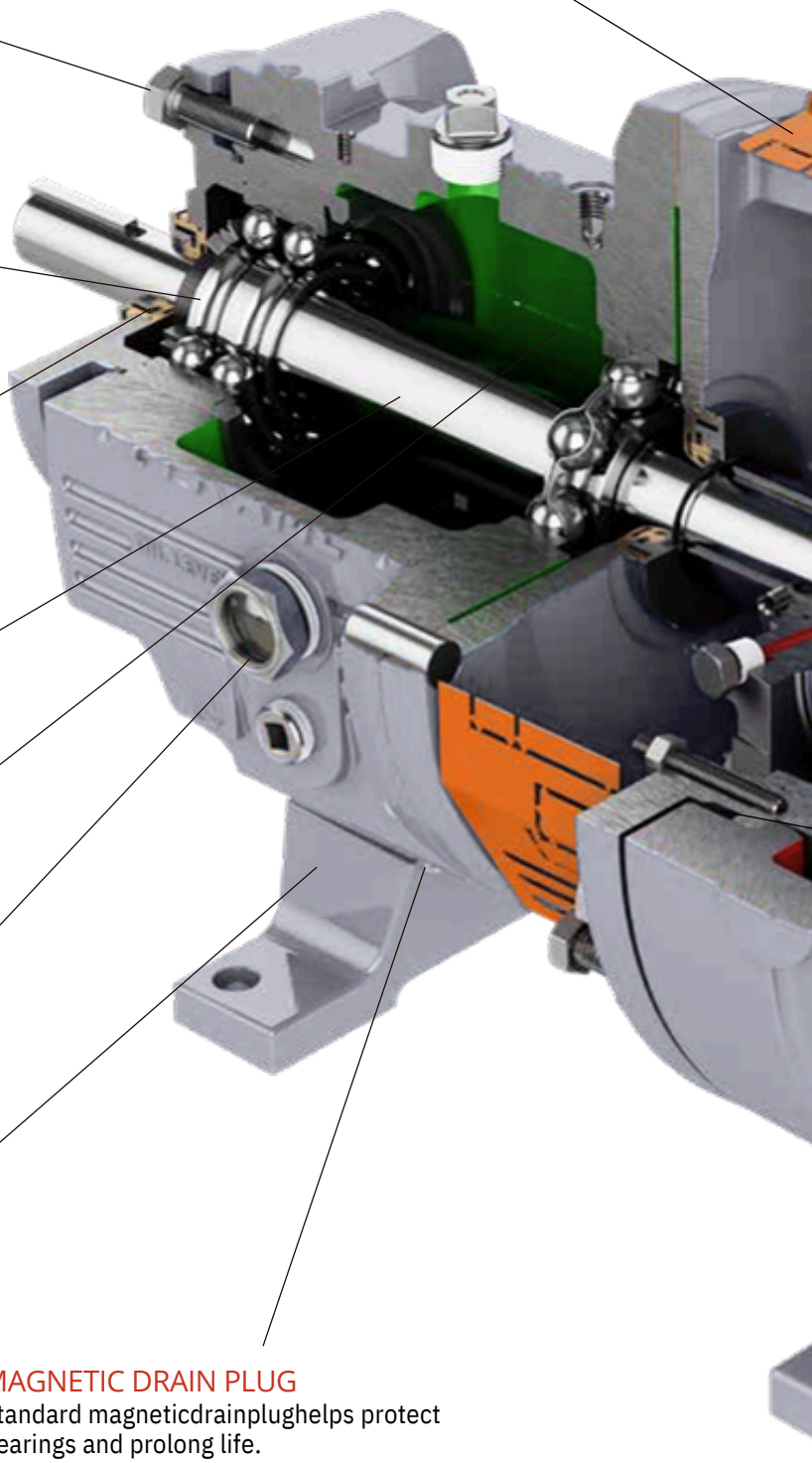
Ontough pumping services, especially corrosives and slurries, mechanical seals require outside flush and constant, costly attention. Even then, seal failures are common, resulting in downtime.

Goulds Pumps offers a solution: The Dynamic Seal which, simply by fitting a repeller between the stuffing box cover andimpeller, eliminates the need for a mechanical seal.

3196 i-FRAME® Process Pumps

DUCTILE IRON FRAME ADAPTER
Material strengthequaltocarbonsteel for safety and reliability.

CONTINUOUS PERFORMANCE
Originalflow, pressure andefficiencyare maintained by simple external adjustment resulting in long-term energy and repair partssavings.



PREMIUM SEVERE-DUTY THRUST BEARINGS
Premium bearings using improved tolerances and cleaner steel provide reduced assembled runout and longer bearing life.

INPRO VBXX-D HYBRID LABYRINTH SEALS
Prevents prematurebearing failure causedby lubricant contamination or loss of oil. Stainless steel rotors for optimal performance in corrosive environments.

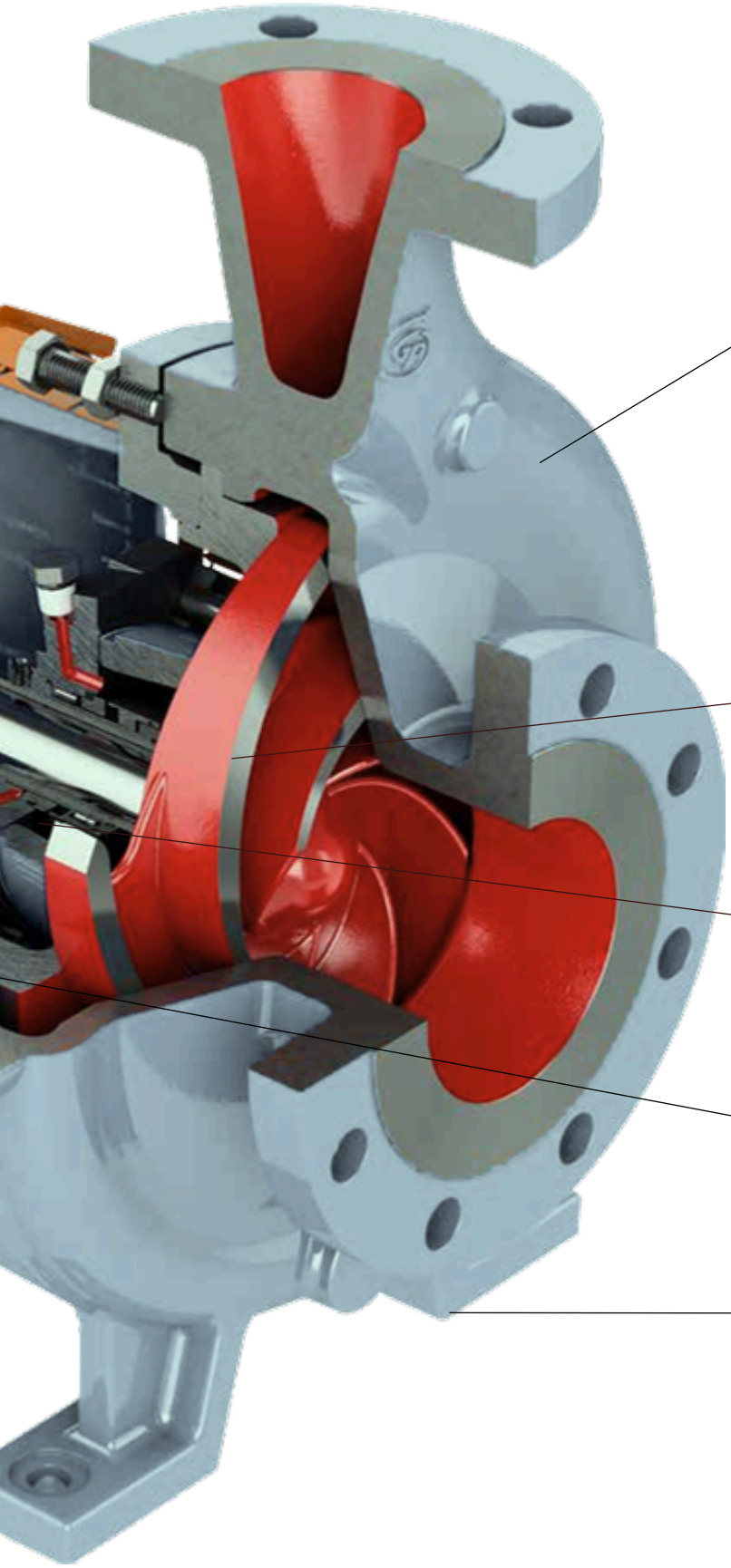
HEAVY DUTY SHAFT AND BEARINGS
Rigid shaftdesignedfor minimum deflection at seal faces–less than 0.002 in. (.05 mm). Bearings sized for 10-year average life under tough operating conditions. Available with or without shaft sleeve.

OPTIMIZED OIL SUMP DESIGN
Increased oil capacity providesbetterheat transfer for reduced oil temperature.Bearings run cooler and last longer. Contaminants directed away from bearings to magnetic drain plug.

ONE - INCH BULL'S EYE SIGHT GLASS
Assures properoil levelcritical to bearing life. Can be mounted on either side of pump for installation flexibility.

i-FRAME® POWER END
Designedfor reliability andextended pump life, backed with a 5-year warranty.

MAGNETIC DRAIN PLUG
Standard magneticdrainplughelps protect bearings and prolong life.



CASING

- Bonus casingthickness:Class150 pumps featureClass300wall thickness asstandard;increased reliability andmaximizedcasinglife.
- Top centerlinedischargeforair handling, selfventing.
- Back pull-outdesignforeaseof maintenance.
- Integral casingfeetpreventpipe load misalignment–maximized seal and bearinglife.
- Serrated flangesstandardforpositive sealing againstleakage.MeetsANSI B16.5 requirements.Class150FF flanges standard,optionalClass150 RF, 300 FF/RF.

FULLY OPEN IMPELLER

Acknowledgedbest design for CPI services – solids handling, stringy material, corrosives, abrasives. Two times the wear area of closed-type impellers for longer life. Back pump-out vanes reduce radial thrust loads and seal chamber pressure.

SEALING FLEXIBILITY

Widerange of sealingarrangements available to meet service conditions. Engineered seal chambers improve lubrication and heat removal (cooling) of seal faces for extended seal life and pump uptime.

POSITIVE SEALING

Fullyconfinedgasket at casing joint protects alignment fit from liquid, makes disassembly easier.

RIGID FRAME (AND CASING) FEET

Reduceeffectsof pipeloads onshaft alignment; pump vibration reduced.

Baseplate Mounting Systems

Pumps offers a completerangeof pump mounting systems to meet plant requirements; make installation and maintenance easier.






Baseplate Selection Guide	**CAMBER TOP CAST IRON** Preferred standard of process industries. Rigid and corrosion resistant, it is the best value in the industry today.	**CHEMBASE PLUS™** Polymer concrete construction provides exceptional rigidity & corrosion resistance. ANSI 1991 dimensional.	**FABRICATED STEEL** An economical choice that meets ANSI/ASME B73.1 dimensional requirements.	**ENHANCED FEATURE FABRICATED STEEL** Upgraded ANSI baseplate designed to maximize pump operation life and ease installation. Meets API-minded chemical pump users' toughest requirements.	**ADVANTAGE** Heavy duty PIP compliant fabricated steel baseplate.	**POLYSHIELD ANSI COMBO** Heavy duty polymer concrete combination baseplate and foundation.
PLANT REQUIREMENTS						
Corrosion Resistance (mild/moderate)	■	■	■	■	■	■
Corrosion Resistance (severe)		■			□	■
Machined Pump & Motor Parts	■		■	■	■	□
Circular Grout Holes (4 in. min.)	■	■	■	■	■	■
Vent Holes (1 in. min.)	■					■
Vent Holes (1/2 in. min.)		■		■	■	
Non-Overhang				■	■	
Full Drain Rim				■	■	
Built-in Drain Pan (under pump)		■				■
Drain Pan Under Pump	□		□		■	■
Baseplate Leveling Screws		□		□	□	
Motor Alignment Adjusters	□	□	□	□	□	□
Lifting Feature				■	■	
Continuous Welding Used				■	■	
Flexibly Mounted	□	□	□			
Spring Loaded*			□			
Available in 304 and 316 SS			□	□	□	
ANSI B73.1-1991 Conformance			■	■		
API-610 Conformance					□	
PIP RESP 002 Conformance					■	

■ STANDARD □ OPTIONAL *Engineered option—requires special baseplate

Bonus Interchangeability

i-FRAMEPowerEndsFit7Different Process Pumps

Minimize inventory, reduce downtime.

3196 i-*FRAME*
Process Pumps

CV 3196 i-*FRAME*
Non-Clog
Process Pumps

HT 3196 i-*FRAME*
High Temperature
Process Pumps

LF 3196 i-*FRAME*
Low Flow ANSI
Process Pumps

NM 3196 i- *FRAME*
Non-Metallic
Process Pumps

Options

Goulds Pumps offers a complete range of pump mounting systems to meet plant requirements; make installation and maintenance easier.

Seal Flush Plans

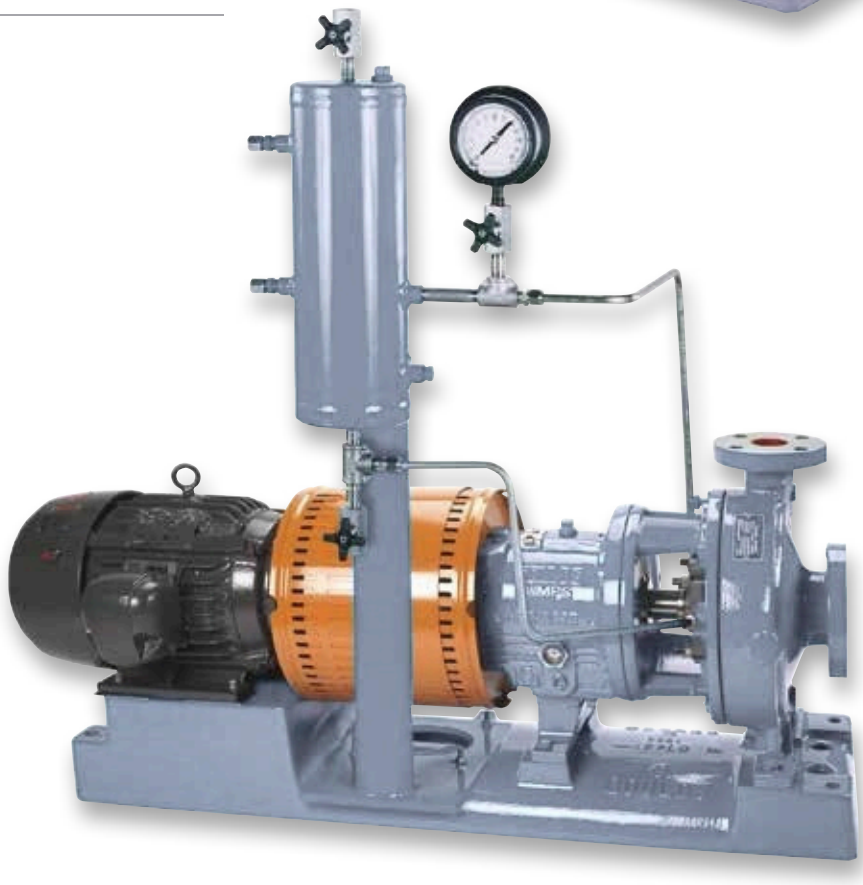
All ANSI B73.1 seal flush and cooling plans are available to control emission levels and meet seal installation requirements of user preference.

CPI PLAN 7311

By-pass flush lubricates single seal faces.

CPI PLAN 7353

Pressurized circulation lubricates double seal faces.



High and Low Temperature Capability

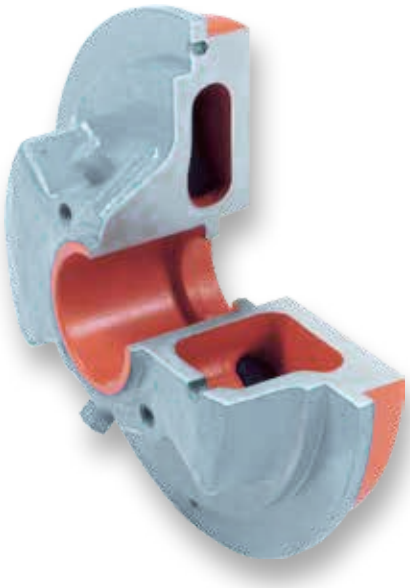
Options are readily available for high and low temperature applications or where pump age temperature must be controlled.

HEAT JACKET

Economical clamp-onjacket provides practical method of heating or cooling thecasing. Excellent heat transfer characteristics. Easy to install or remove for pump servicing.

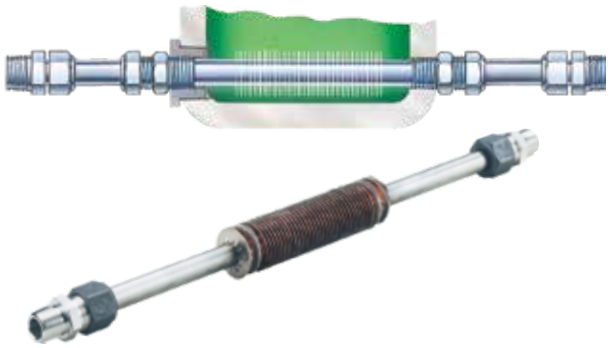
JACKETED SEAL CHAMBER

Maintains propertemperature control of sealingenvironment. Ideal for maintainingtemperature for services such as molten sulphur and polymerizing liquids. Available in BigBore and TaperBore® designs.

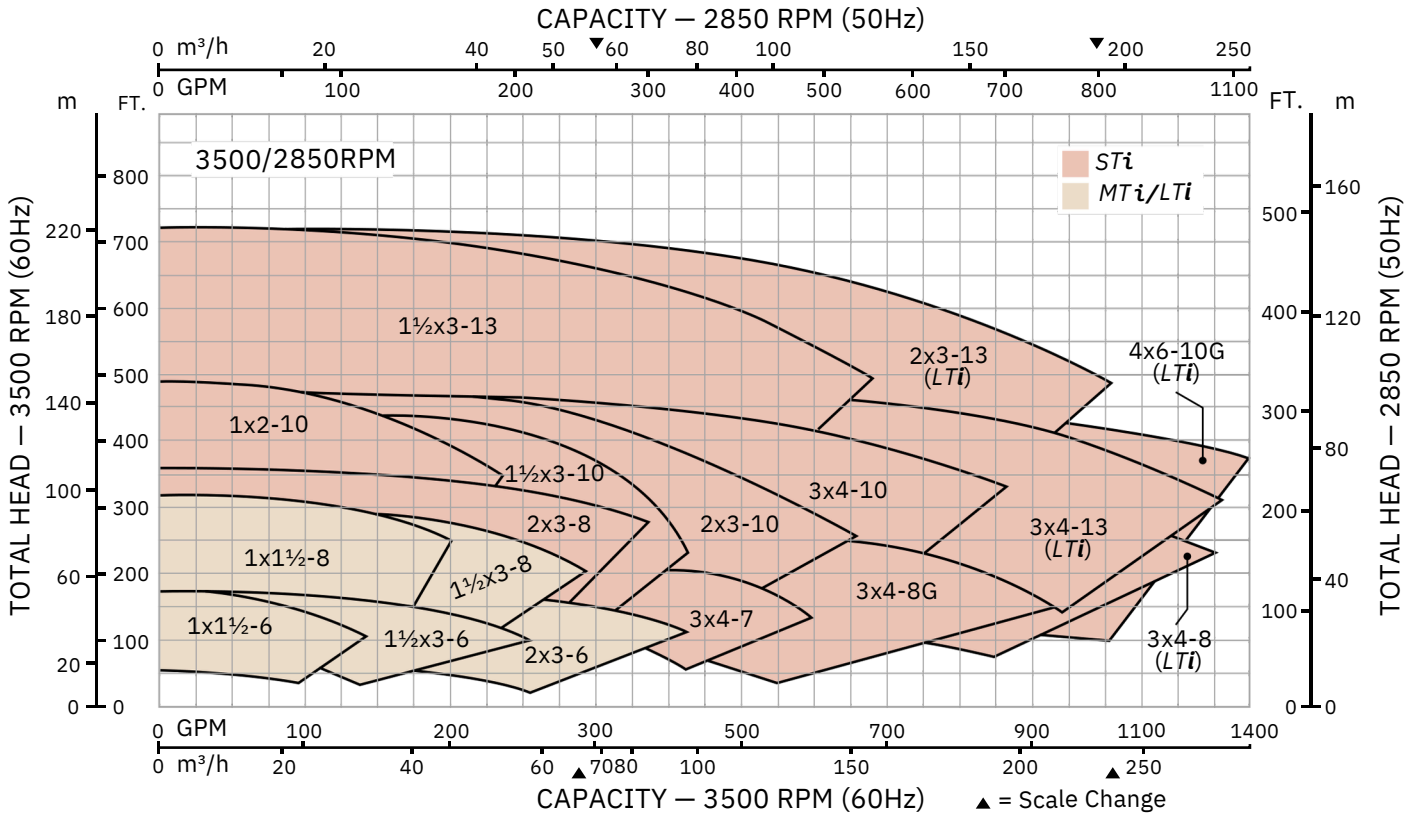


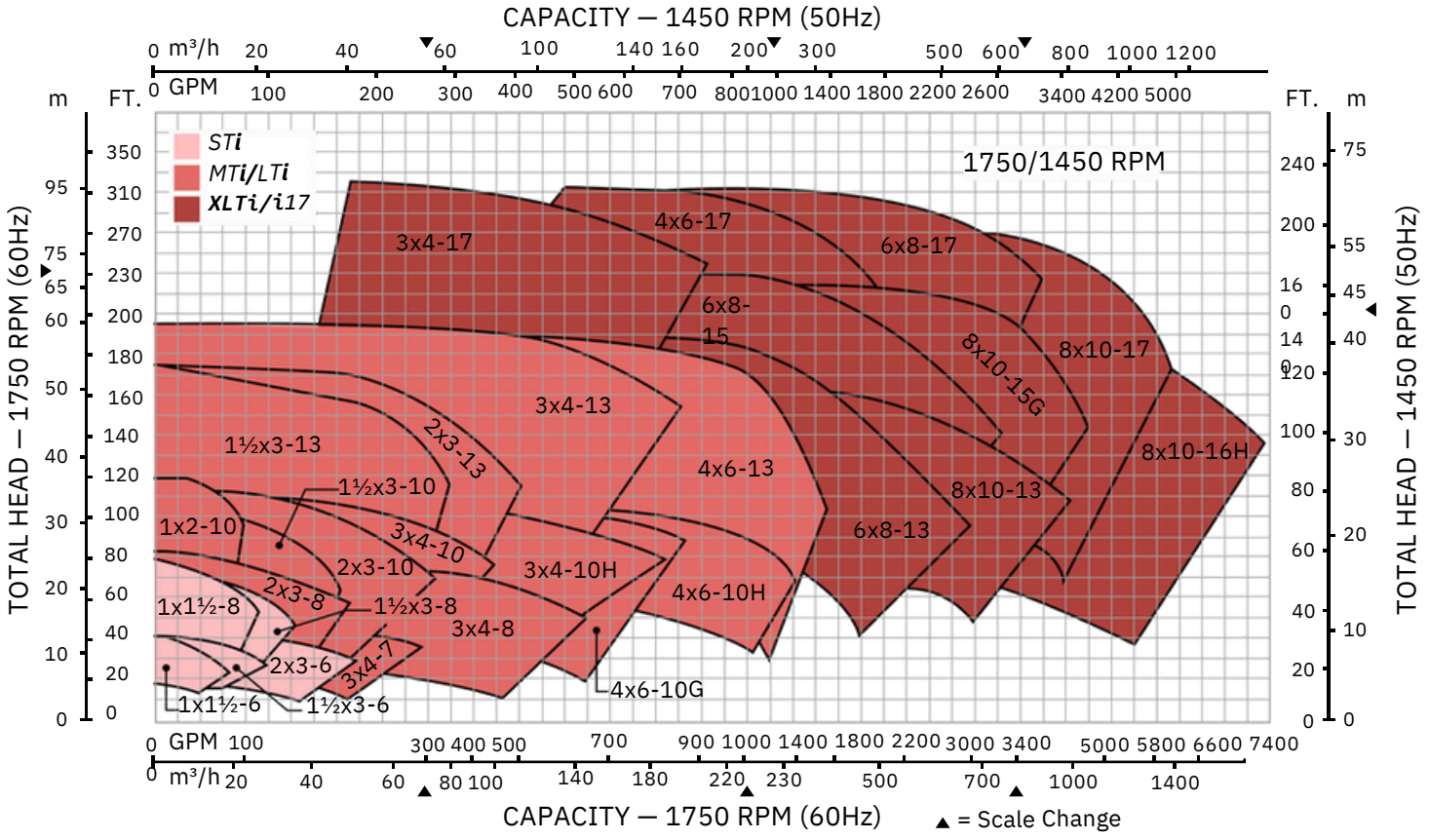
BEARING FRAME FINNED COOLER

Directly coolsoil for lower bearing operating temperature.Requires minimum cooling water. Corrosion resistant construction. Recommended for temperatures over 350°F (177°C) when using conventional oil. When synthetic oil is used, pump can run up to 450°F without cooling. Above 450° add for high temperature option.



Hydraulic Coverage





Construction Details

		STi	MTi	LTi	XLTi / i-17
Shaft	Diameter at Impeller	.75 (19)	1 (25)	1.25 (32)	1.5 (38)
	Diameter in Stuffing Box/Seal Chamber (Less Sleeve) (With Sleeve)	 1.375 (35) 1.125 (29)	 1.75 (45) 1.5 (38)	 2.125 (54) 1.875 (48)	 2.5 (64) 2 (51)*
	Diameter Between Bearings	1.5 (38)	2.125 (54)	2.5 (64)	3.125 (79)
	Diameter at Coupling	.875 (22)	1.125 (29)	1.875 (48)	2.375 (60)
	Overhang	6.125 (156)	8.375 (213)	8.375 (213)	9.969 (253)
	Maximum Shaft Deflection	0.002 (0.05)			
	Shaft Deflection Index ($L^3/D4$) (With Sleeve) (Less Sleeve)	 143 64	 116 63	 48 29	 62 25
Sleeve	O.D. thru Stuffing Box/Seal Chamber	1.375 (35)	1.75 (45)	2.125 (54)	2.5 (64)*
Bearings	Radial	6207	6309	6311	6313
	Thrust	3306	3309	7310	3313
	Bearing Span	4.125 (105)	6.75 (171)	6.875 (164)	9.25 (235)
BigBore™ Seal Chamber	Bore	2.875 (73)	3.5 (89)	3.875 (98)	4.75 (120)*
Stuffing Box	Bore	2 (51)	2.5 (64)	2.875 (73)	3.375 (86)*
Power Limits	HP (kW) per 100 RPM	1.1 (.82)	3.4 (2.6)	5.6 (4.2)	14 (10.5)**
Temperature	Maximum Liquid Temperature – Oil/Grease Lubrication without Cooling	350°F (177°C)			
	Maximum Liquid Temperature – Oil Lubrication with High Temp. Option	700°F (370°C)			
	Corrosion Allowance	.125 (3)			
Casing					

* 17 inch sizes have 2¼ inch (57) shaft diameters in stuffing box/seal chamber with sleeve. Shaft sleeve O.D. is 2¾ inches (70) for packing and 2½ inches (64) for mechanical seals. Seal chamber bore is 4¾ inches (121). Stuffing box bore is 35/8 inches (92).

** 17 inch sizes power limit per 100 RPM is 20 HP (15kW).

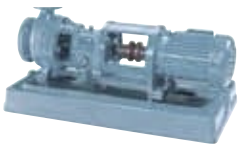
Process Industry Practices (PIP) Compliance

Thestandard designfeatures of Goulds 3196 (ANSI B73.1M)and 3996 (ANSI B73.2M) pumps meet ASME/ANSI standards. In addition, both models can be manufactured to comply with PIP Specifications for application of horizontal and vertical in-line ANSI process pumps.

Model 3196 meets B73.1M and RESP73H

Model 3996 meets B73.2M and RESP73V

Other Features For Safety & Reliability



C-FACE ADAPTER

i-FRAME power ends accommodate optional C-face motor adapter – simplifies pump/motor alignment.

CENTERLINES-MOUNTED CASING

For high temperature services (500˚ to 700˚ F/260˚ to 370˚C).

ANSICOUPLINGGUARD

Meets all requirements of ANSI B15.1 specifications.

SHAFTGUARD

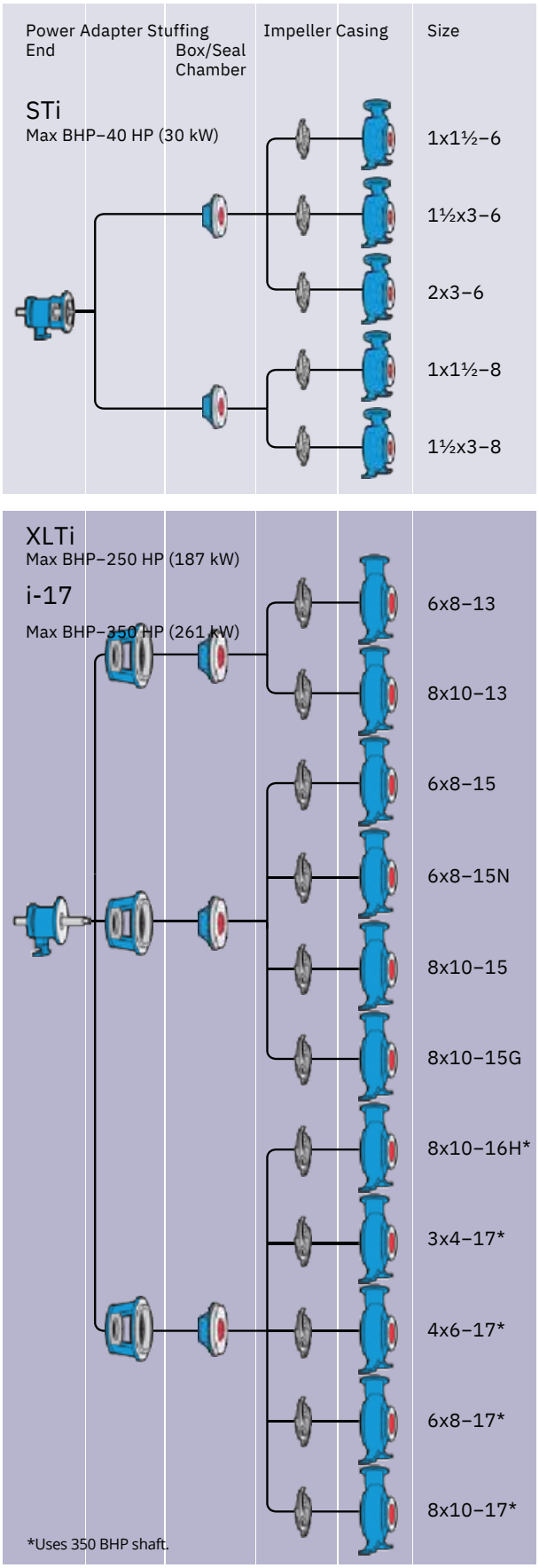
When a guard around all rotating shaft parts is required.

Part List and Materials of Construction

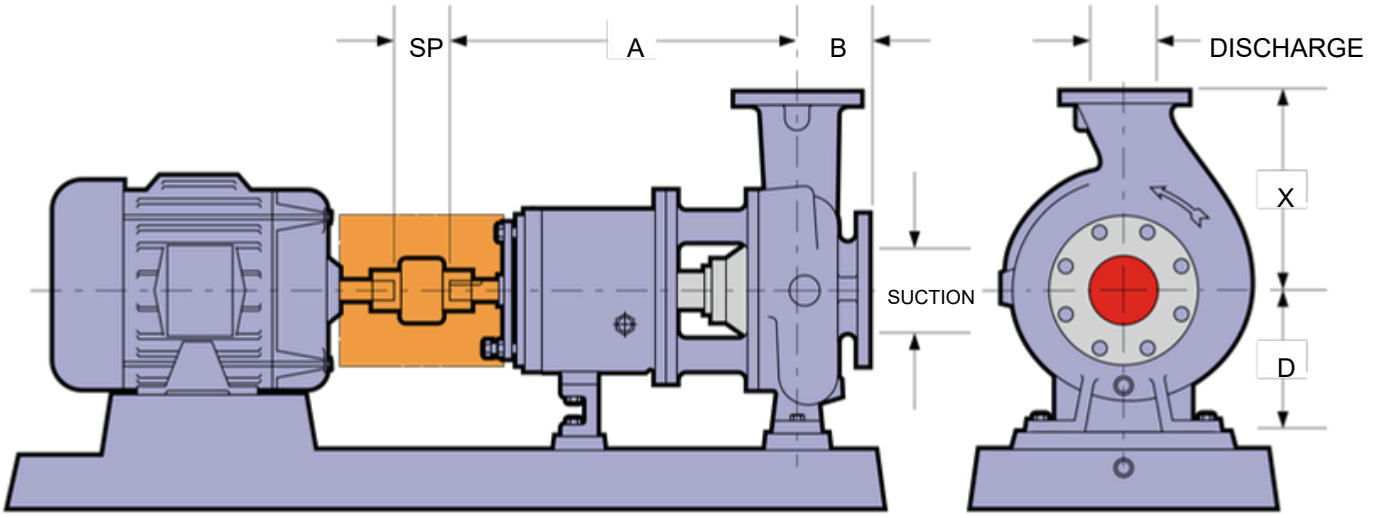
Item Number	Part Name	Material							
		Ductile Iron	316SS	CD4MCu	Alloy 20	Monel	Nickel	Hastelloy B&C	Titanium
100	Casing	Ductile Iron	316SS	CD4MCu	Alloy 20	Monel	Nickel	Hastelloy	Titanium
101	Impeller	Ductile Iron	316SS	CD4MCu	Alloy 20	Monel	Nickel	Hastelloy	Titanium
105	Lantern Ring	Glass-Filled PTFE							
106	Stuffing Box Packing	PTFE Impregnated Fibers							
108	Frame Adapter	Ductile Iron							
112A	Thrust Bearing	Double Row Angular Contact**							
122	Shaft – Less Sleeve (Optional)	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							
168A	Radial Bearing	Single row Deep Groove							
184	Stuffing Box Cover (Packed Box)	Ductile Iron	316SS	CD4MCu	Alloy 20	Monel	Nickel	Hastelloy	Titanium
184	Seal Chamber (Mechanical Seal)	Ductile Iron	316SS	CD4MCu	Alloy 20	Monel	Nickel	Hastelloy	Titanium
228	Bearing Frame	Cast Iron (Ductile Iron for STi Group)							
250	Gland	316SS		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)	PTFE							
370H	Stud/Nut, Cover-to-Adapter	304SS							
319	Oil Sight Glass	Glass/Steel							
332A	INPRO® VB-XX-D Labyrinth Oil Seal (Outboard)	Stainless Steel/Bronze							
333A	INPRO® VB-XX-D Labyrinth Oil Seal (inboard)	Stainless Steel/Bronze							
351	Casing Gasket	Aramid Fiber with EPDM Rubber							
358	Casing Drain Plug (Optional)	Steel	316SS		Alloy 20	Monel	Nickel	Hastelloy	Titanium
360F	Gasket, Frame-to-Adapter	Buna							
360C	Gasket, Bearing End Cover	Cellulose Fiber with Binder							
370	Cap Screw, Adapter-to-Casing	Steel							
412A	O-ring, Impeller	Glass-Filled PTFE							
418	Jacking Bolt		304SS						
444	Backplate (Dynamic Seal Option)	Ductile Iron	316SS	CD4MCu	Alloy 20	Monel	Nickel	Hastelloy	Titanium
469B	Dowel Pin, Frame-to-Adapter	Steel							
496	O-ring, Bearing Housing	Buna Rubber							

**LTi Power End features standard Duplex Angular Contact: Optional STi, MTi, XLT-i
Other Alloys Available: 316L, 317, 317L, 254SMO, Zirconium, etc.

Modular Interchangeability



Dimensions



DIMENSIONS										
Group	Pump Size	ANSI Designation	Discharge Size	Suction Size	X	A	B	D	SP	Bare Pump Weight Lbs. (kg)
STi	1x1½-6	AA	1	1½	6.5 (165)	13.5 (343)	4 (102)	5.25 (133)	3.75 (95)	84 (38)
	1½x3-6	AB	1½	3						92 (42)
	2x3-6	AC	2	3						95 (43)
	1x1½-8	AA	1	1½						100 (45)
	1½x3-8	AB	1½	3						108 (49)
	3X4-7	A70	3	4						220 (100)
MTi/LTi	2X3-8	A60	2	3	11 (280)	19.5 (495)	4 (102)	8.25 (210)	3.75 (95)	220 (91)
	3X4-8	A70	3	4	9.5 (242)					
	3X4-8G	A70	3	4	11 (280)					220 (100)
	1X2-10	A05	1	2						
	1½X3-10	A50	1½	3	8.5 (216)					200 (91)
	2X3-10	A60	2	3						220 (100)
	3X4-10	A70	3	4	9.5 (242)					230 (104)
	3X4-10H	A40	3	4	11 (280)					265 (120)
	4X6-10G	A80	4	6	12.5 (318)	19.5 (495)	4 (102)	10 (254)		275 (125)
	4X6-10H	A80	4	6	13.5 (343)					305 (138)
	1½X3-13	A20	1½	3						
	2X3-13	A30	2	3	10.5 (267)					245 (111)
	3X4-13	A40	3	4	11.5 (292)					275 (125)
	4X6-13	A80	4	6	12.5 (318)					330 (150)
	6X8-13	A90	6	8	13.5 (343)					405 (184)
XLTi/i-17	8X10-13	A100	8	10	16 (406)	27.875 (708)	6 (152)	14.5 (368)	5.25 (133)	560 (254)
	6X8-15	A110	6	8	18 (457)					670 (304)
	6X8-15N	A110	6	8						610 (277)
	8X10-15	A120	8	10						610 (277)
	8X10-15G	A120	8	10						740 (336)
	8X10-16H	A120	8	10	19 (483)					710 (322)
	4X6-17	A105	4	6						850 (385)
	3x4-17	—	3	4						650 (295)
	6X8-17	A110	6	8	16 (406)					457 (207)
	8X10-17	A120	8	10	16 (406)					730 (331)
					18 (457)					830 (376)
					19 (483)					

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