ITT

Goulds Pumps

Goulds LF 3196 *i-FRAME*™

Low Flow ANSI Process Pumps with *i-ALERT*™ Patented Intelligent Monitoring

Engineered for life

***LF 3196** i-FRAME STi*
(1x1 1/2-4, 1x1 1/2-8)

The LF 3196 *i-FRAME* process pump line is specifically designed to provide superior performance for low flow services of the Chemical Process Industries.

***LF 3196** i-FRAME MTi /LTi*
***(1x2-10** MTi/LTi,*
***1 1/2x3-13** LTi)*

Goulds LF 3196 *i-FRAME*™

Low Flow ANSI Process Pumps Designed for Total Range of Industry Services

- Capacities to 220 GPM (50 m3/h)
- Heads to 925 feet (282 m)
- Temperatures to 700° F (371° C)
- Pressures to 450 PSIG (3102 kPa)

Performance Features for Low Flow Services

Extended Pump Life

- Concentric (Circular) casing
- Radial vane impeller
- TaperBore™/Big Bore™ Seal Chambers
- *i-FRAME* Power Ends
- Optional centerline mounted casings

Ease of Maintenance

- Back pull-out design
- Parts interchangeable with Goulds 3196 *i-FRAME*
- External impeller adjustment
- Easy retrofit

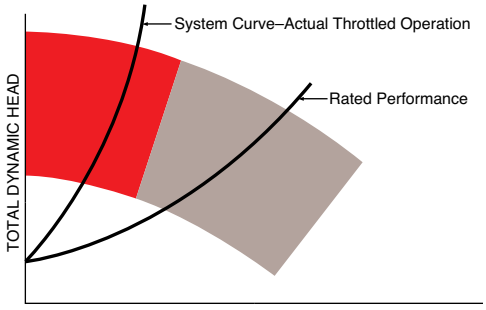
Safety

- ANSI B15.1 coupling guard
- Ductile iron frame adapter
- Raised face flanges
- Optional shaft guard

Services

- Specialty chemicals
- Batch chemical process
- Reactor feed
- Shower service
- Boiler feed
- Condensate
- High pressure process
- Column reflux
- Column bottoms
- Hot oil
- Seal water

Goulds LF 3196 *i-FRAME*™ Designed for Low Flow Services



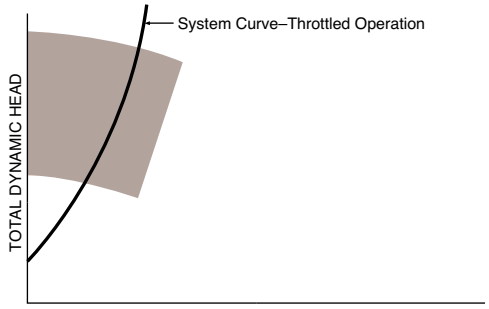
TYPICAL END SUCTION PUMP CURVE

Not All End Suction Pumps are Designed for Low Flows

Many users throttle pumps to attain desired low flow performance. Because these pumps are not designed to operate continuously in this range, the resultant higher radial loads and increased shaft deflection lead to premature bearing and mechanical seal failure. Unscheduled downtime and higher maintenance costs are the consequence.

Off Design Operation Range

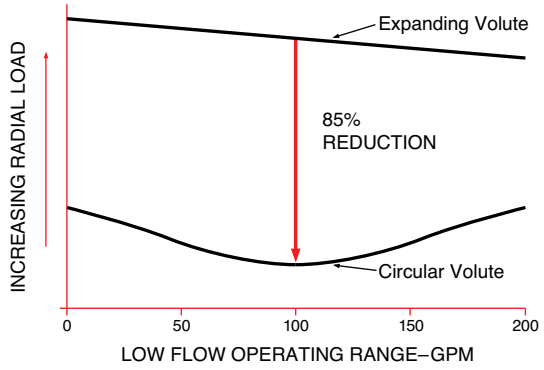
Recommended Operation Range

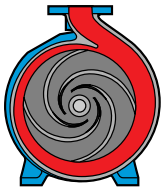


LF 3196 PUMP CURVE

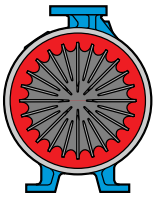
LF 3196 *i-FRAME* Designed Specifically for Trouble-Free Operation At Low Flows

Goulds LF 3196 *i-FRAME* concentric (circular volute) casing and open radial vane impeller are designed to eliminate hydraulic and mechanical problems at throttled low flows.





EXPANDING VOLUTE PUMP



LF 3196 *i-FRAME* CIRCULAR VOLUTE PUMP

Reduced Radial Loads for Optimum Reliability

Radial loads are reduced by as much as 85% compared to end suction expanding volute pumps at low flows. Bearing, mechanical seal and overall pump life are optimized.

Maximum Interchangeability Low Flow Retrofit

Pump Replacement

Since the LF 3196 *i-FRAME* meets ANSI dimensional standards, retrofitting ANSI pumps not designed for operation at low flows is easy. Simply replace the troublesome pump with the equivalent ANSI size LF 3196 *i-FRAME*.

Pump Retrofit

The LF 3196 *i-FRAME* uses all Goulds Model 3196 parts except casing and impeller. An LF 3196 *i-FRAME* retrofit kit easily converts a 3196 to LF 3196 *i-FRAME*

A CV 3196 *i-FRAME* retrofit kit (casing and impeller) easily converts an existing 3196.

Maximum Sealing Flexibility

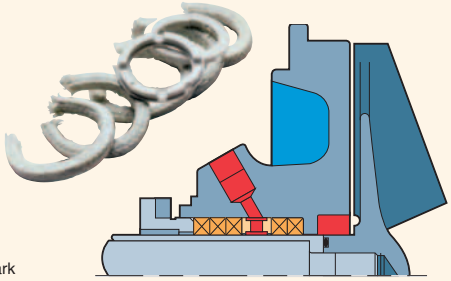
To meet ANSI B73.1M specifications, Goulds provides the best choice of stuffing box or seal chamber and a wide range of sealing arrangements.

Your Goulds representative will gladly recommend the best sealing solution for your service... some of which are illustrated below.

PACKED BOX

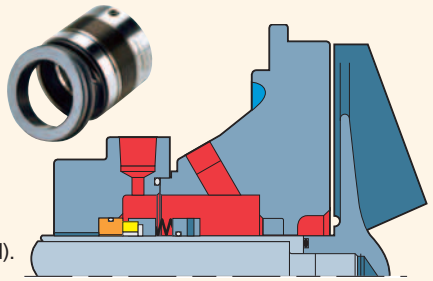
- Teflon*-Impregnated Fiber Packing
- Standard Bore Stuffing Box

*E.I. DuPont reg. trademark



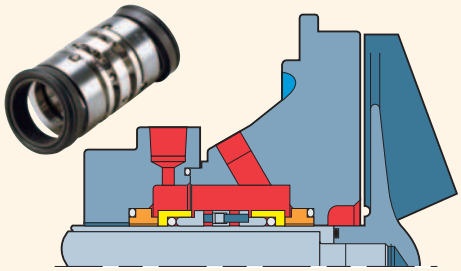
SINGLE INSIDE SEAL

- Flexibly Mounted Seal with Throat Bushing
- BigBore™ Seal Chamber (use TaperBore™ if throat bushing not required).



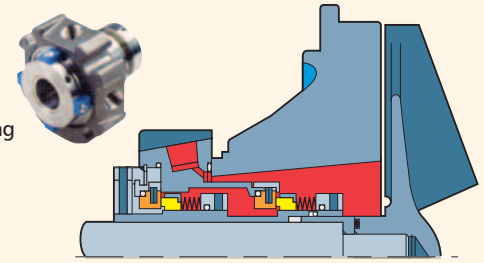
CONVENTIONAL DOUBLE SEAL

- BigBore™ Seal Chamber



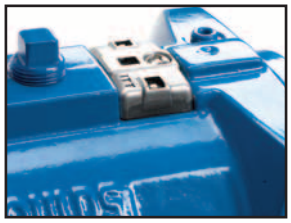
TANDEM SEAL

- TaperBore™ Seal Chamber (use BigBore™ if throat bushing required).



Goulds *i-FRAME*™ Power Ends Designed for Reliability, Extended Pump Life

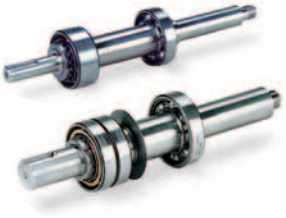
Patented *i-ALERT*™ Condition Monitor



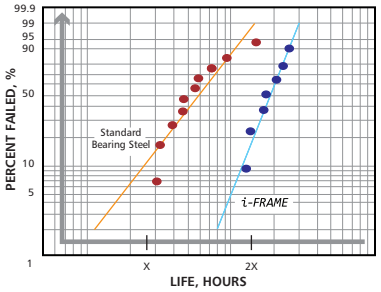
The heart of the *i-FRAME*, the *i-ALERT* condition monitor unit continuously measures vibration and temperature at the thrust bearing and automatically indicates when pre-set levels of vibration and temperature have been exceeded, so that changes to the process or machine can be made before failure occurs.

A visual indication of pump health makes walk-around inspections more efficient and accurate. The result is a more robust process to monitor and maintain all your ANSI pumps so that your plant profitability is maximized.

Shaft and Bearings Engineered for Maximum Reliability

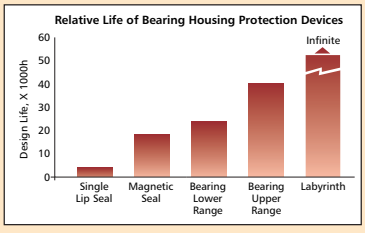


Fatigue life *more than double* that of conventional bearing steels.



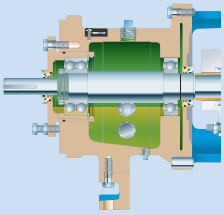
Inpro VBXX-D Hybrid Bearing Isolators

Most bearings fail before reaching their potential life. They fail for a variety of reasons, including contamination of the lubricant. INPRO VBXX-D has long been considered the industry standard in bearing lubricant protection. The *i-FRAME* now improves upon that design by offering stainless steel rotors, for maximum protection against contaminants and the corrosive effects of seal leakage or environmental conditions. These seals are non-contacting and do not wear.



Optimized Oil Sump Design

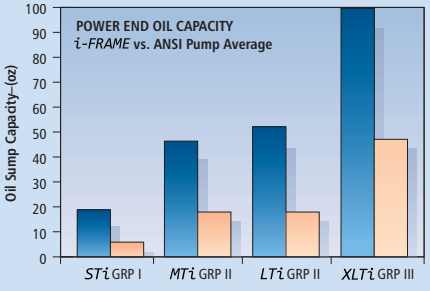
Internal sump geometry is optimized for longer bearing life. Sump size increased by 10%-20% results in better heat transfer and cooler bearings. Contoured design directs contaminants away from bearings, to the magnetic drain plug for safe removal.



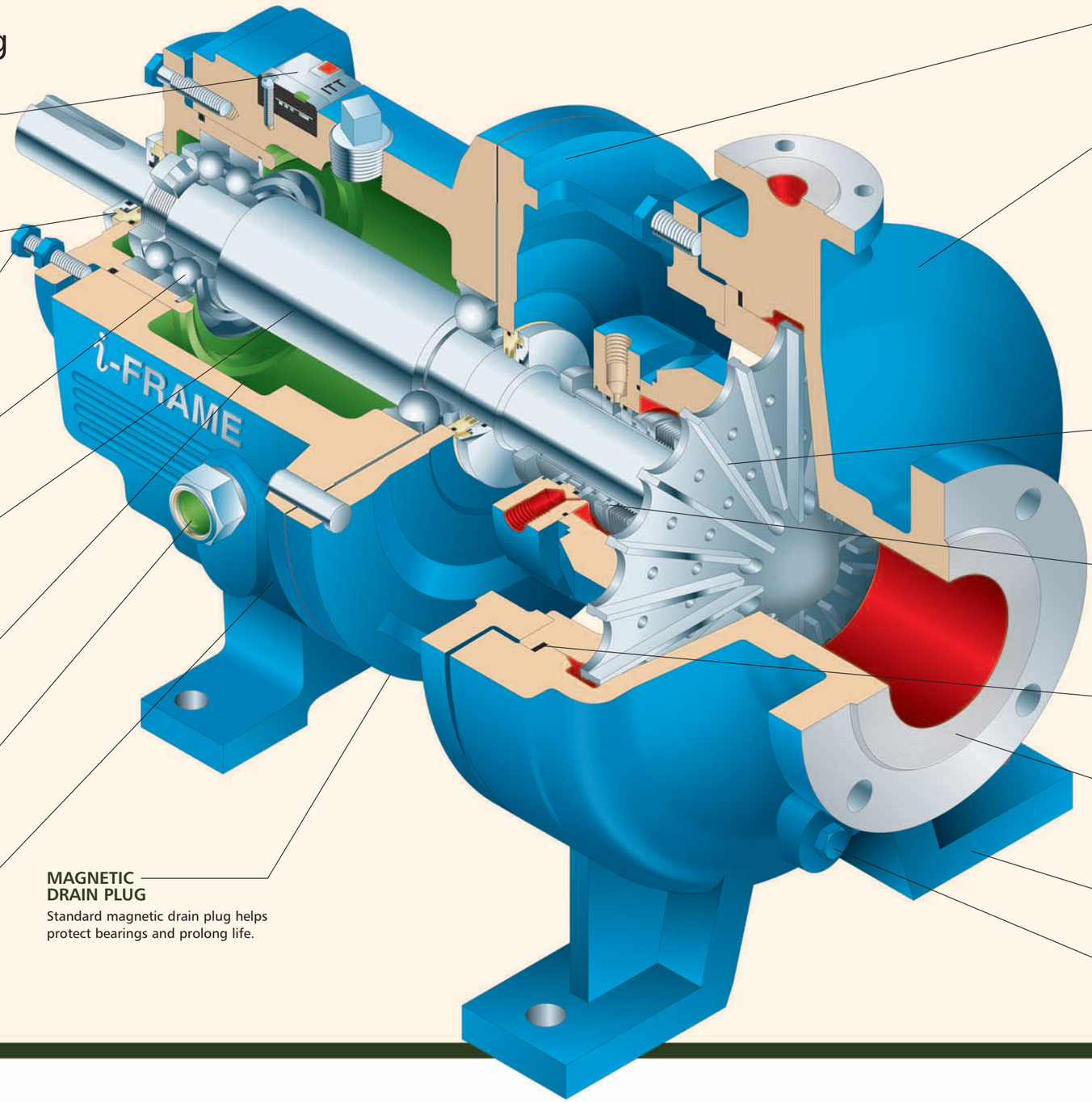
Larger *Means Cooler*

GOULDS

Industry Average



LF 3196 *i-FRAME*™
Low Flow ANSI Process Pumps
Featuring *i-ALERT*™ Patented Monitoring



i-ALERT CONDITION MONITOR
(Patent Pending)

Constantly measures vibration and temperature at the thrust bearing. Colored LED's indicate general pump health. Provides early warning of improper operation before catastrophic failure occurs.

INPRO VBXX-D HYBRID LABYRINTH SEALS

Prevents premature bearing failure caused by lubricant contamination or loss of oil. Stainless steel rotors for optimal performance in corrosive environments.

CONTINUOUS PERFORMANCE

Original flow, pressure and efficiency are maintained by simple external adjustment resulting in long-term energy and repair parts savings.

PREMIUM SEVERE-DUTY THRUST BEARINGS

Increase bearing fatigue life by 2-5X that of conventional bearing steels.

HEAVY DUTY SHAFT AND BEARINGS

Rigid shaft designed for 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 provides better heat 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 proper oil level critical to bearing life. Can be mounted on either side of pump for installation flexibility.

i-FRAME POWER END

Designed for reliability and extended pump life, backed with a 5-year warranty.

MAGNETIC DRAIN PLUG

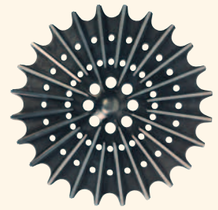
Standard magnetic drain plug helps protect bearings and prolong life.

DUCTILE IRON FRAME ADAPTER

Material strength equal to carbon steel for safety.

CIRCULAR VOLUTE CASING

Reduces radial loads during low flow operation. Mechanical seal and bearings last longer. Fully machined discharge and volute provide maximum efficiency and precise control of hydraulics at low flows.



GOULDS LOW FLOW IMPELLER

Multiple open radial vanes reduce pulsations, vibration and vane stress. Full shroud for superior vane strength when operating at extreme low flows. Balance holes reduce axial thrust, minimize stuffing box/seal chamber pressure for longer bearing and seal life.

SEALING FLEXIBILITY

Wide range of sealing arrangements 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

Fully confined gasket at casing joint protects alignment fit from liquid, makes disassembly easier.

RAISED FACE FLANGES

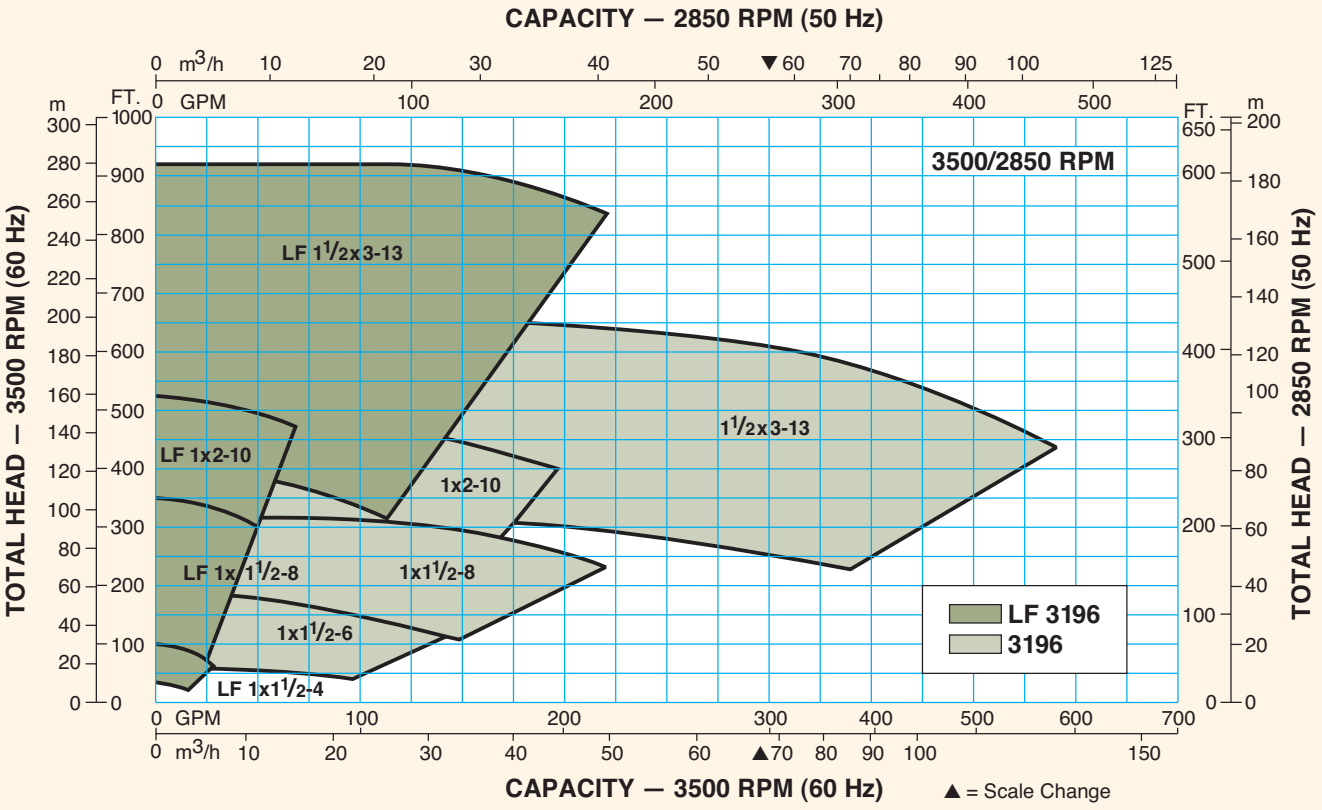
Serrated for positive sealing against leakage. Meets ANSI B16.5 requirements. Class 150 RF standard. Class 300 RF optional. (13 in. casing— 300 RF flanges standard.)

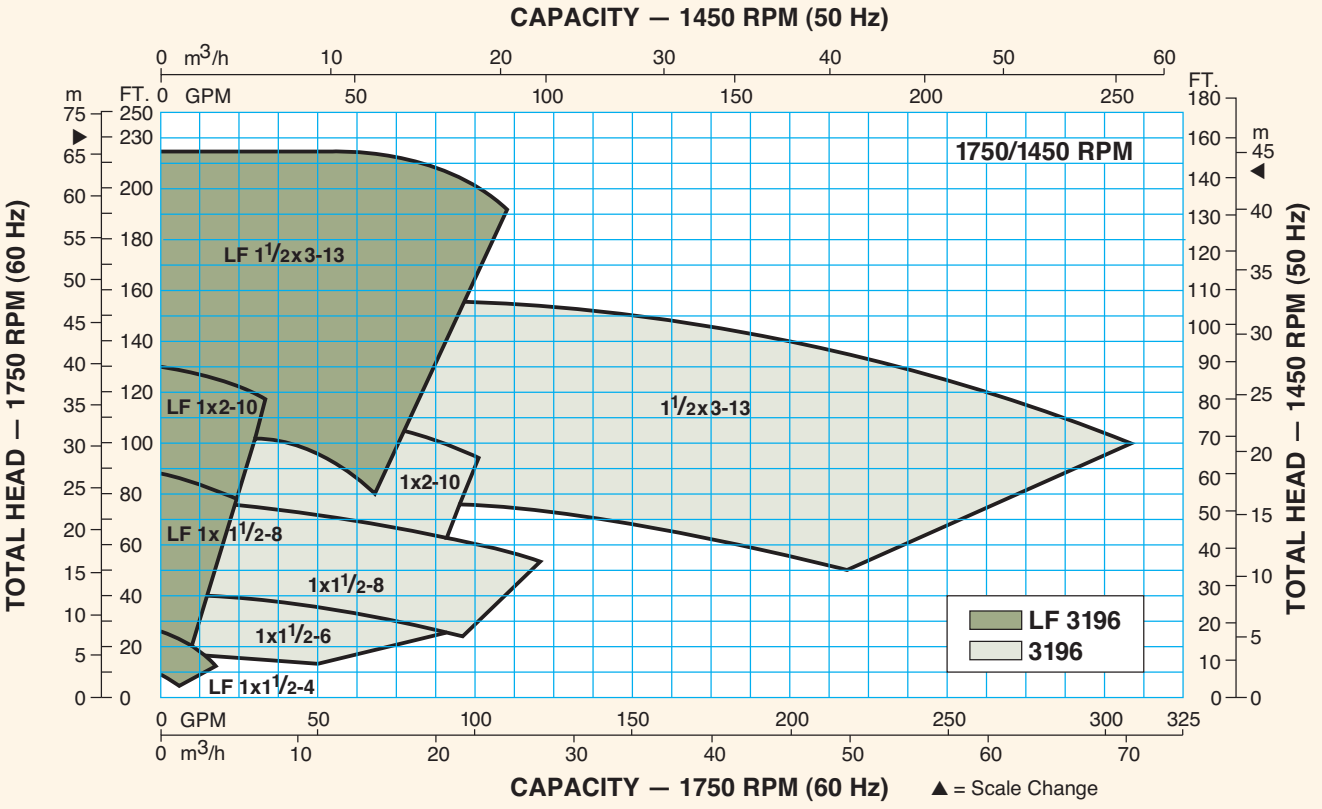
RIGID FRAME (AND CASING) FEET

Reduce effects of pipe loads on shaft alignment; pump vibration reduced.

OPTIONAL CASING DRAIN

Hydraulic Coverage LF 3196 *i-FRAME*™





Parts List and Materials of Construction

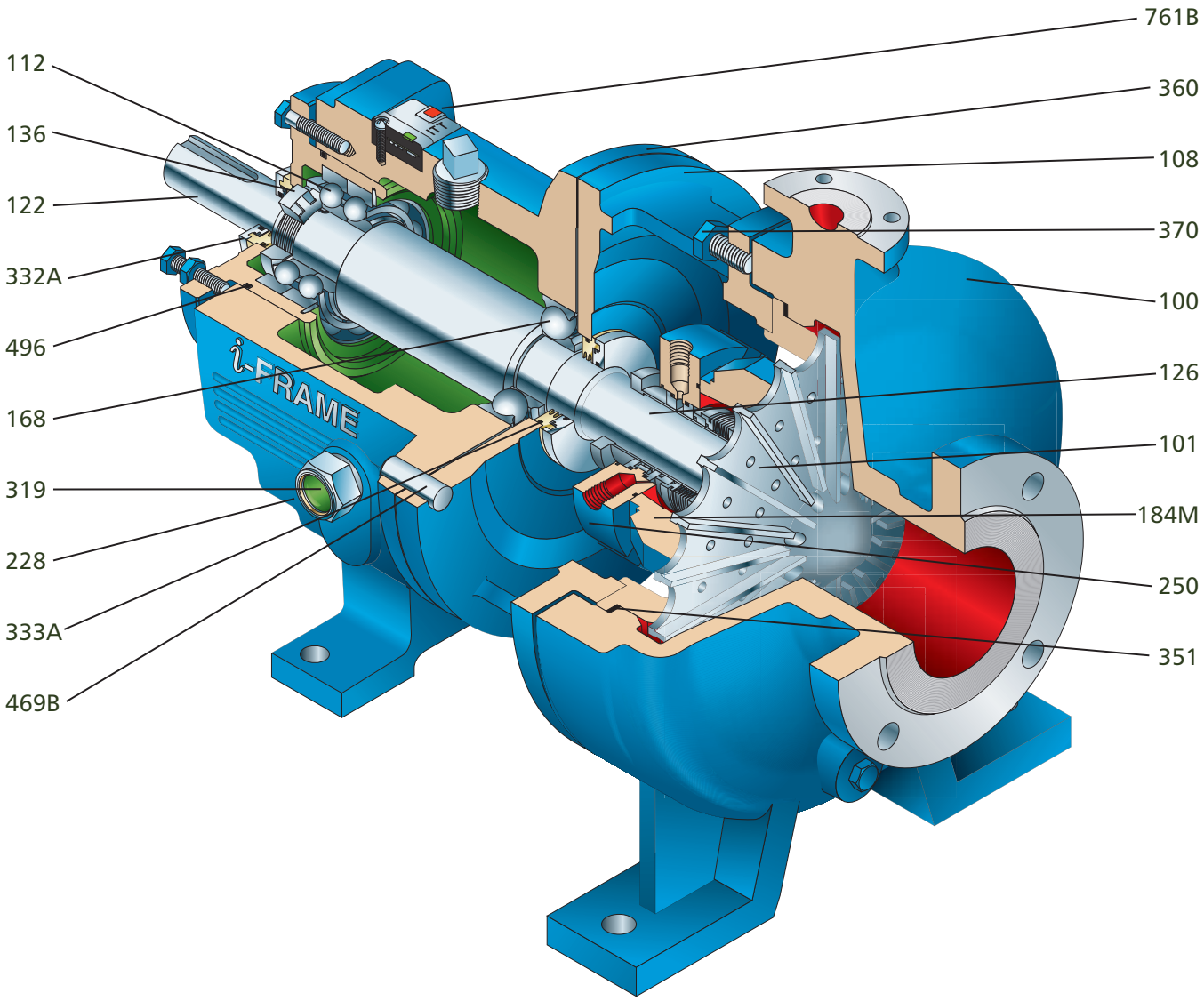
Item Number	Part Name	Material				
		Ductile Iron/ 316SS Trim	316SS	CD4MCu	Alloy 20	Hastelloy B & C
100	Casing	Ductile Iron	316SS	CD4MCu	Alloy 20	Hastelloy
101	Impeller	316SS	316SS	CD4MCu	Alloy 20	Hastelloy
105	Lantern Ring (Not Illustrated)	Glass-Filled Teflon*				
106	Stuffing Box Packing (Not Illustrated)	Teflon* Impregnated Fibers				
108	Frame Adapter	Ductile Iron				
112	Thrust Bearing	Double Row Angular Contact Conrad**				
122	Shaft—Less Sleeve (Optional)	SAE4140	316SS		Alloy 20	Hastelloy
122	Shaft—With Sleeve	SAE4140				316SS
126	Shaft Sleeve	316SS		Alloy 20		Hastelloy
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	Hastelloy
184M	Seal Chamber (Mechanical Seal)	Ductile Iron	316SS	CD4MCu	Alloy 20	Hastelloy
228	Bearing Frame	Cast Iron (Ductile Iron for STX Group)				
250	Gland	316SS		CD4MCu	Alloy 20	Hastelloy
262	Repeller/Sleeve (Dynamic Seal Option)	CD4MCu			Alloy 20	Hastelloy
264	Gasket, Cover-to-Backplate (Dynamic Seal)	Teflon*				
265A	Stud/Nut, Cover-to-Adapter	304SS				
319	Oil Sight Glass	Glass/Steel				
332A	Inpro® vbxx-d Labyrinth Oil Seal (Outboard)	Stainless Steel/Bronze				
333A	Inpro® vbxx-d Labyrinth Oil Seal (Inboard)	Stainless Steel/Bronze				
351	Casing Gasket	Aramid Fiber with EPDM Rubber				
358A	Casing Drain Plug (Optional)	Steel	316SS	CD4MCu	Alloy 20	Hastelloy
360	Gasket, Frame-to-Adapter	Buna				
370	Cap Screw, Adapter-to-Casing	Steel	304SS			
418	Jacking Bolt	304SS				
444	Backplate (Dynamic Seal Option)	Ductile Iron	316SS	CD4MCu	Alloy 20	Hastelloy
469B	Dowel Pin	Steel				
496	O-ring, Bearing Housing	Buna Rubber				
496A	O-ring, Impeller	Glass-Filled Teflon*				
761B	*i-ALERT*™ Condition Monitor	Stainless Steel/Epoxy				

*E.I. DuPont reg. trademark **_LTX_ Power End features Duplex Angular Contact

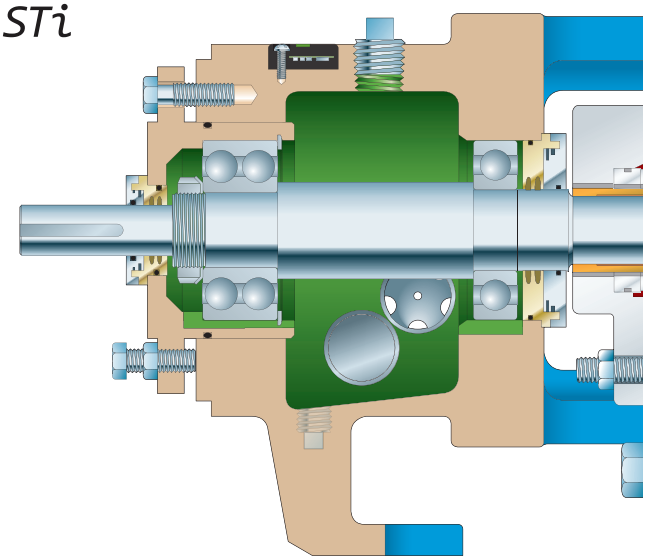
Construction Details All dimensions in inches and (mm).

		STi	*MTi*	*LTi*
Shaft	Diameter at Impeller	.75 (19)	1 (25)	1.25 (32)
	Diameter in Stuffing Box/Seal Chamber (Less Sleeve)	1.375 (35)	1.75 (45)	2.125 (54)
	(With Sleeve)	1.125 (29)	1.5 (38)	1.875 (48)
	Diameter Between Bearings	1.5 (38)	2.125 (54)	2.5 (64)
	Diameter at Coupling	.875 (22)	1.125 (29)	1.875 (48)
	Overhang	6.125 (156)	8.375 (213)	8.375 (213)
	Maximum Shaft Deflection	0.002 (0.05)		
Sleeve	O.D. thru Stuffing Box/Seal Chamber	1.375 (35)	1.75 (45)	2.125 (54)
Bearings	Radial	SKF 6207	SKF 6309	SKF 6311
	Thrust	3306	3309	7310
	Bearing Span	4.125 (105)	6.75 (171)	6.875 (164)
BigBore™ Seal Chamber	Bore	2.875 (73)	3.5 (89)	3.875 (98)
Stuffing Box	Bore	2 (51)	2.5 (64)	2.875 (73)
Power Limits	HP (kW) per 100 RPM	1.1 (.82)	3.4 (2.6)	5.6 (4.2)
Maximum Liquid Temperature	Oil/Grease Lubrication without Cooling	350° F (177° C)		
	Oil Lubrication with Finned Cooler	500° F (260° C)		
	Oil Lubrication with High Temperature Option	700° F (371° C)		
Casing	Corrosion Allowance	.125 (3)		

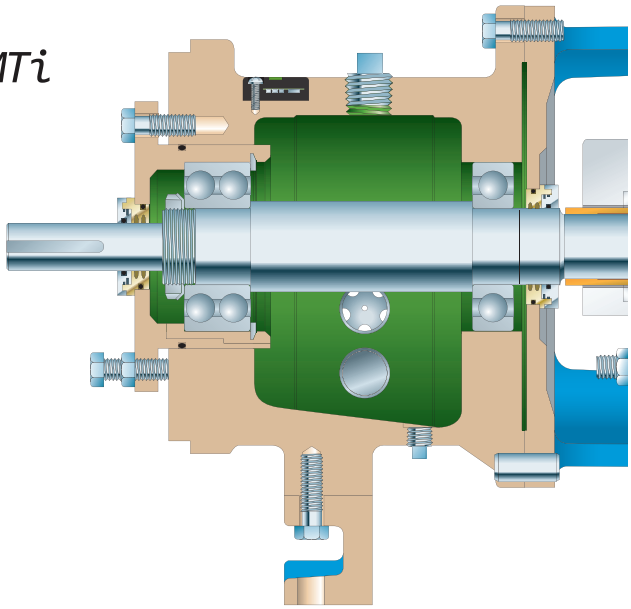
Sectional View LF 3196 *i-FRAME*™



STi

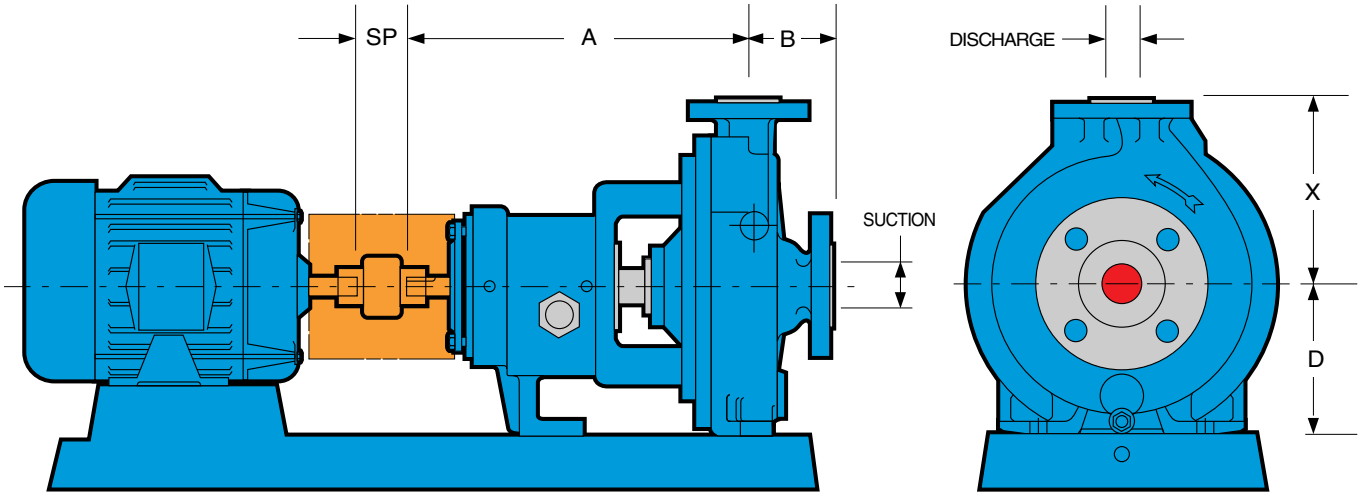


MTi



Dimensions LF 3196 *i-FRAME*™

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



DIMENSIONS										
Group	Pump Size	ANSI Designation	Discharge Size	Suction Size	X	A	B	D	SP	Bare Pump Weight Lbs. (kg)
STi	1x1½-4	AA	1	1½	6.5 (165)	13.5 (343)	4.0 (102)	5.25 (133)	3.75 (95)	84 (38)
	1x1½-8	AA	1	1½	6.5 (165)	13.5 (343)	4.0 (102)	5.25 (133)	3.75 (95)	100 (45)
MTi	1x2-10	A05	1	2	8.5 (216)	19.5 (495)	4.0 (102)	8.25 (210)	3.75 (95)	200 (91)-MTX 245 (111)-LTX
LTi	1½x3-13	A20	1½	3	10.5 (267)	19.5 (495)	4.0 (102)	10.0 (254)	3.75 (95)	285 (129)

High Temperature LF 3196 *i-FRAME*™

For high temperature services (500˚-700˚F/ 260˚-370˚C), the LF 3196 *i-FRAME* is furnished with the following standard features:

- Centerline-mounted casing
- Graphite casing gasket
- Graphite impeller O-ring
- Jacketed stuffing box
- High temperature bolting
- Stainless steel shaft
- Finned oil cooler

PRO Services® Extending Equipment Life...

Product Repair (all types and brands of rotating equipment)

- Service Center Repair
- Field Service
- Parts Supply

Reliability Improvement

- Inventory Management
- Replacement/Exchange
- Turnkey Repair/Installation
- Training

Optimization of Assets

- Predictive Analysis/Condition Monitoring
- Root Cause Failure Analysis
- Pump & System Assessments
- Upgrades – Mechanical & Hydraulic
- Maintenance Management/Contract Maintenance

- Technical Expertise
- Factory Trained Service Personnel
- Quality
- Fast Turnaround
- Emergency Service – 24 hours/day, 7 days/week
- ISO and Safety Certified

PROSMART

ProSmart® provides continuous machinery monitoring to identify little problems before they become big problems…like downtime. Using wireless technology, advanced signal processing capabilities, and easy-to-deploy sensors, ProSmart offers an affordable means to monitor all of your rotating equipment anywhere in the world. By identifying and alerting you to changes in operating conditions, ProSmart increases your time to respond to either correcting the upset condition, or properly plan its repair.

Key Features include:

- Continuous data acquisition and analysis – ProSmart collects vibration, temperature, and available process conditions every five seconds; saving you time from routine data collection.
- Automatic Notification and Accessibility – By alerting when a machine goes into distress, you are able to focus your resources on recovery activities. The ProNet web-hosted solution allows access to information anywhere in the world through a standard Internet browser connection.
- Advanced diagnostic tools – More than simple overall data, ProSmart provides advanced analysis capabilities such as time-waveform, spectral, and spectral windowing.
- Easy to deploy – Using plug and play sensors, wireless connectivity, and an industrially hardened enclosure, ProSmart can be easily deployed throughout your plant, including hazardous areas.

PUMPSMART

PumpSmart® is the latest advancement in pump control and protection to reduce energy consumption, increase uptime and decrease maintenance cost. It allows the pump to be right-sized to the application by dialing in the speed and torque which increases flow economy, reduces heat and vibration, and improves overall system reliability.

- **Simplified Pump Control** — PumpSmart was designed specifically to optimize pumping applications and can be used to control a single pump or coordinate between multiple pumps without the need for an external controller.
- **Pump Protection** — PumpSmart guarantees to protect the pump from upset conditions with patented sensorless pump protection algorithms.
- **Smart Flow** — PumpSmart features a sensorless flow function for centrifugal pumps that can calculate the flow of the pump within ± 5% of the pump rated flow.
- **Drive for the DCS** — While most VFDs can only provide basic information, PumpSmart offers unparalleled insight to the pump operation which allows for smoother process control and efficiency.
- **Pump Experts** — PumpSmart is a variable speed drive with pump-specific algorithms imbedded into the drive. With over 150 years of pump knowledge, let the pump experts take responsibility of your pump system.

Visit our Web site at www.gouldspumps.com

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Form BLF3196i-FRAME 10/08