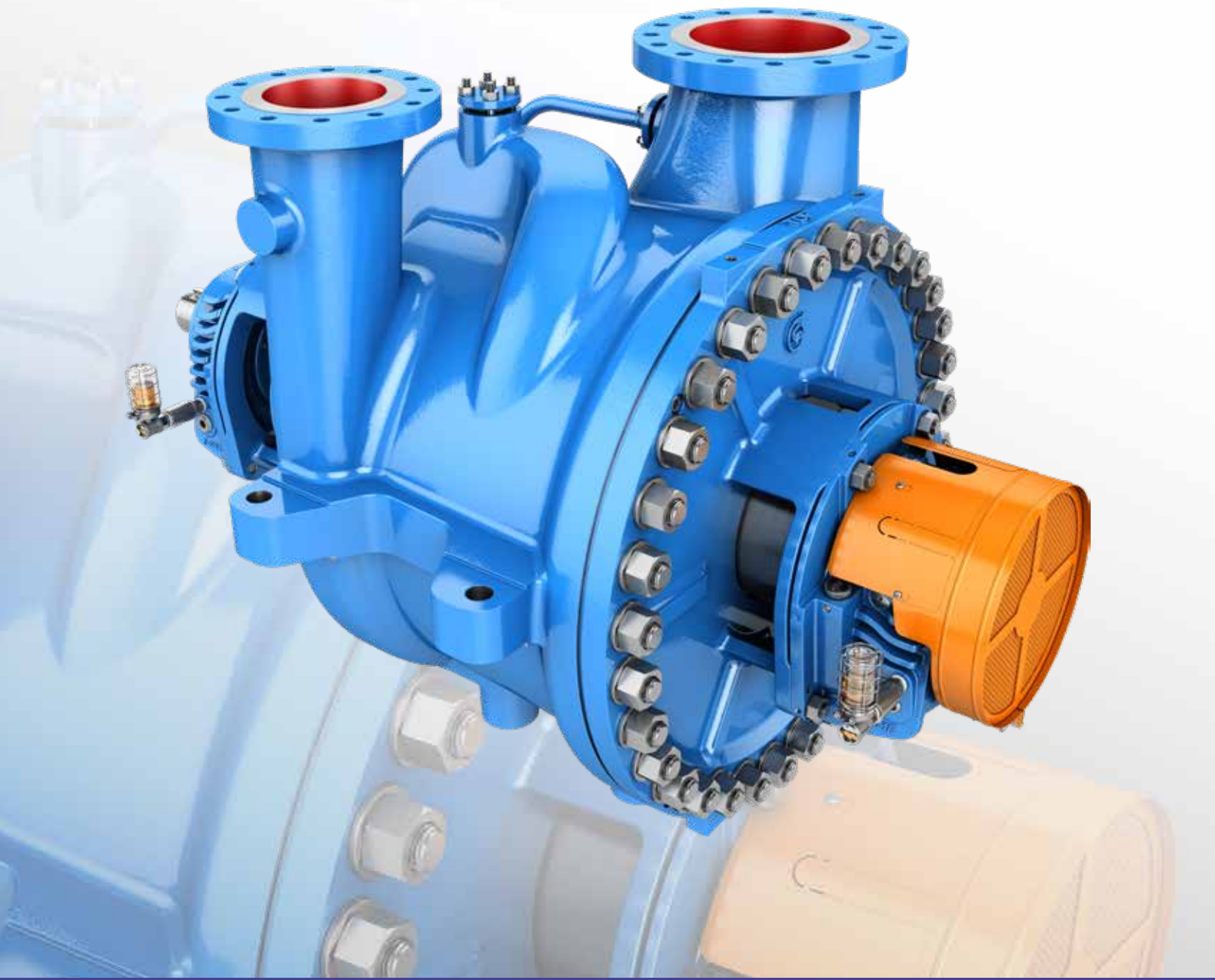
GOULDS PUMPS

An ITT Brand

Goulds 3640 i-FRAME®

API 610 11th Edition / ISO 13709 2nd Edition

API BB2 Two-Stage, Between-Bearing, Radially Split



3640 i-FRAME®

A Leader in API Engineered Pump Package Solutions…

Proven API Leadership

ITT Goulds Pumps is a proven leader in API Pumps

- Over 20,000 units installed
  - Over 17,000 OH2 / OH3s
  - Over 3,000 BB1 / BB2 / BB3 pumps
- 50+ years of API expertise
- Participating member on API 610 and API 682 committees

Family of API Pumps

ITT Goulds Pumps has a family of proven API pumps:

- Overhung pumps
- Single and two-stage between-bearing
- Multistage between-bearing pumps – axially split
- Barrel multistage - radially split
- Vertical, double casing pumps
- Specialty pumps

Global Coverage

ITT Goulds Pumps has the global coverage needed to serve multi-national companies in any region.

Industry Leading Hydraulic Coverage

- We offer extensive coverage to meet your process needs.
- Better hydraulic fits can mean improved efficiency and long-term reliability and parts life.

8000 HP / 6000 kW Testing Capability

- Our expanded test facility can test your pump in the most demanding conditions.
- Testing at rated speeds is critical to assess the impact of dynamic conditions including vibration.

API Engineering Expertise

- We are experts in packaging engineered pumps that meet your demanding applications – with true conformance to the latest API specifications.
- We have extensive experience in nearly every type of driver, bearing, seal, piping configuration, nozzle configuration, flange and baseplate design to meet your application needs.
- ITT is a world leader in technology and engineering including hydraulics, materials science, mechanical design and fluid dynamics.

Broad Applications

- Petroleum refining, production and distribution
- Petrochemical and demanding chemical processing
- High temperature applications including boiler circulation
- General industrial requiring high temperature or high pressures

High Temperature and Pressure Process Pumps that Meet or Exceed API 610 11th Edition / ISO 13709 2nd Edition

Safety, reliability and versatility are the key words for our 2 stage, centerline mounted, between-bearing (BB2) API 610 process pump.

Safety and Reliability

We provide engineered solutions with true conformance to the latest API specifications including the stringent emissions containment per API 682.

The result is a safe and rugged between-bearing API process pump designed for a minimum 20-year life.

Versatility

- Capacity to 7,500 GPM (1700 m^3/h)
- Total Dynamic Head to 2,500 feet (760 m)
- Temperature to 850° F (455° C)
- Pressure to 1,130 psig (75 bar)

Materials: Available in a wide range of materials including all API 610 constructions and custom application needs.

Engineered Hydraulics: Dense hydraulic coverage to better match your process for efficiency and reliability. Custom hydraulics are available.

Engineered Packaging with a wide range of drivers, seals, piping, nozzle configurations, flanges, base plates, and QC testing.

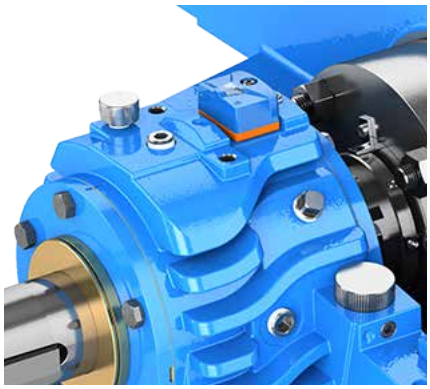
Applications

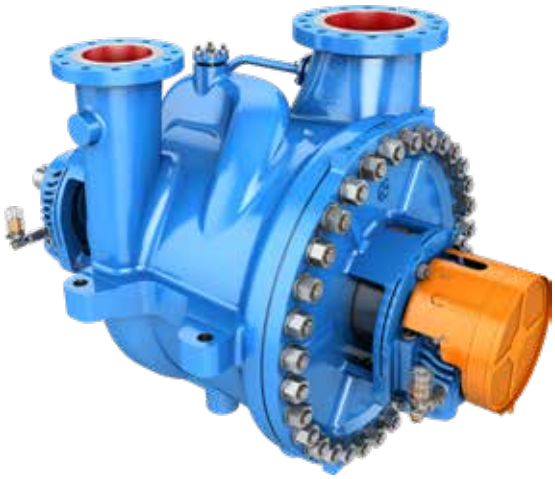
- **Refinery:** Process feed, reflux, splitter bottoms, high-pressure process transfer
- **Boiler Feed Booster**

i-FRAME™ Bearing Housing Features

- This modern i-FRAME™ Ball/Ball design bearing housing comes standard on all Goulds between-bearings pumps. A revolutionary oil capture and delivery system provides consistent lubrication to lower bearing temperatures and optimize bearing life.

- See the difference
  - Patent Pending Oil Filter Assembly removes debris and moisture
  - Optimized Housing Design Lowers bearing temperatures up to 6.7+ °C (20+ °F)
  - i-ALERT2 Machine Health Monitor identifies potential problems before they become costly failures
  - Instrumentation provisions as standard





Goulds Model 3640 between-bearings radially split process pumps are designed for smooth, reliable operation, and meet the toughest specification requirements of API 610 / ISO 13709 to assure extended service life.

3640 *i-FRAME®* (API BB2)

API 610 11th Edition / ISO 13709 2nd Edition

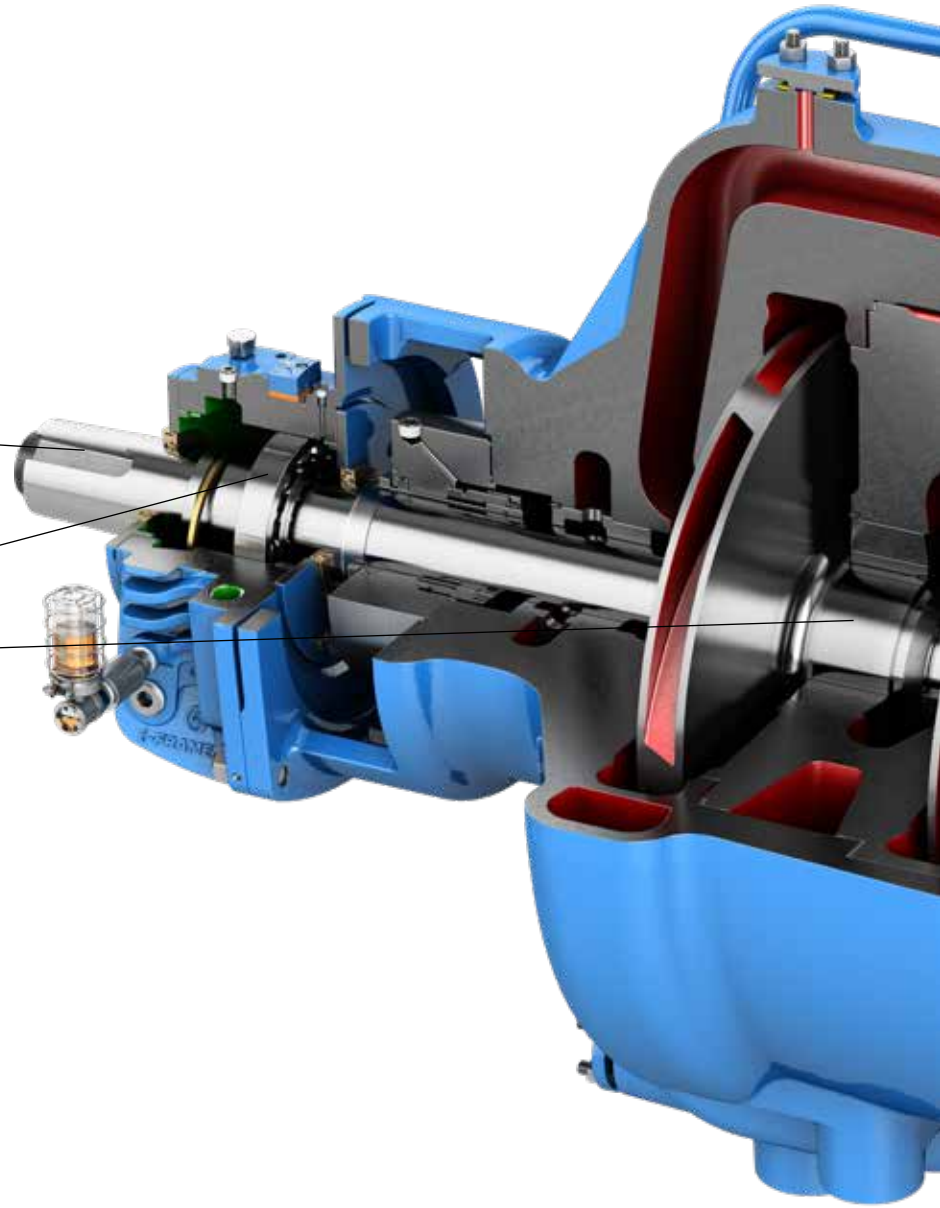
API BB2 Two-Stage, Between-Bearing, Radially Split

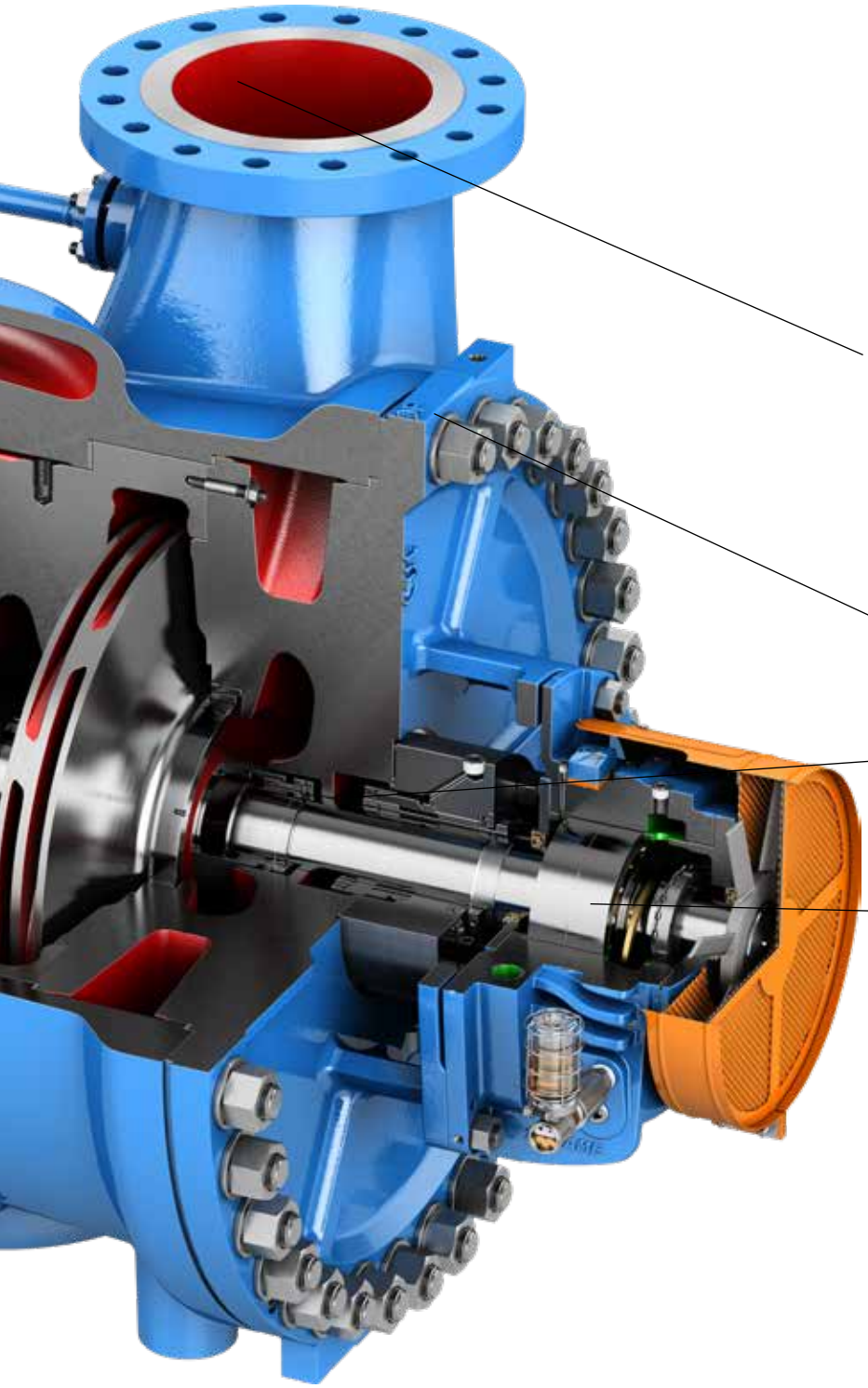
HEAVY DUTY SHAFT
Minimum shaft deflection for extended seal bearing life. Sized to meet deflection and rotor dynamics requirements of API 610 / ISO 13709.

HEAVY DUTY RADIAL BEARING STANDARD

RENEWABLE WEAR RINGS
API 610 / ISO 13709 running clearances. Positively locked.

CENTERLINE MOUNTED CASING
Heavy duty mounting extensions accept API 610 / ISO 13709 nozzle loads and maintain pump alignment under extreme service conditions.





CLASS 300 RF FLANGES STANDARD
Other classes and facings optional.

RADIALLY SPLIT CASING
Designed specifically for high pressure / high temperature services. Fully confined controlled compression gaskets assure leak-proof sealing.

CASING HEAD ON OUTBOARD END
Allows removal of rotor without disturbing suction and discharge piping.

ENLARGED SEAL CHAMBERS
Conform to API 610 / ISO 13709 dimensional requirements. Allows use of wide range of API 682 / ISO 21049 cartridge mechanical seals to meet specific service conditions.

HEAVY DUTY THRUST BEARING
Duplex 40° angular contact standard. Ring oil lubricated. Other bearing configurations available to meet specific service requirements.

OPPOSED IMPELLERS ARRANGEMENT
Reduced axial forces for maximum bearing life. Impellers are driven by individual keys and positioned on shaft by dual locknuts. Staggered impeller vane tips for reduced pressure pulsations at vane passing frequency. Double suction first stage impeller available as an option. Single suction impeller is standard.

3640 i-FRAME®

Design Features for Optimum Reliability

Low Vibration / Smooth Performance

- Individual impellers and complete rotor assembly dynamically balanced.
- Precision cast impellers have equal volumes between vanes for reduced pressure pulsations.

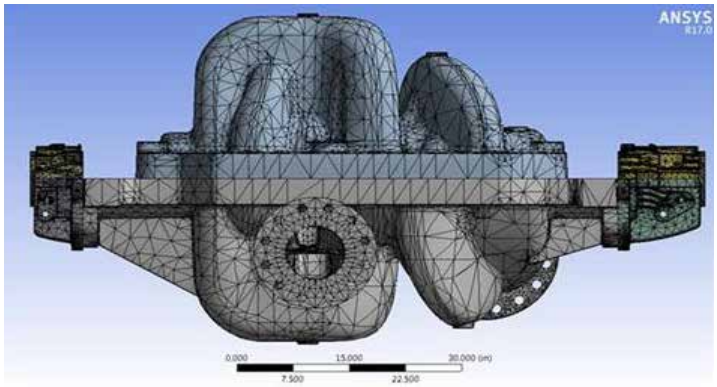
Serviceability

- Cartridge type mechanical seals for ease of assembly, proper installation.

Entire rotating assembly can be removed for maintenance without disturbing suction/discharge piping.

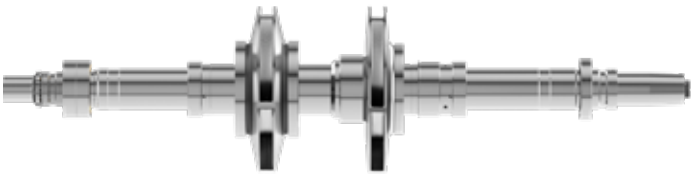
Design / Analysis Capabilities

Goulds utilizes FEA and CFD analysis to check the pressure capability, structure integrity of the casings and flow pattern in the pump. Goulds Engineering staff is fully equipped to perform the Rotor Lateral response analysis, Torsional analysis and Rotor residual unbalance checks to ensure stable operation, low vibration level and trouble free operation of the pumps.



Designed for API 610 11th Edition / ISO 13709 Services

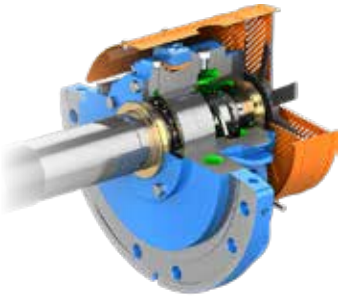
- Casing, nozzles and baseplate meet API 610 / ISO 13709 nozzle load requirements.
- Impellers are secured against axial movement by impeller locknuts.
- Seal chambers meet dimensional requirements of API 610 / ISO 13709 and can be fitted with single, double or tandem cartridge mechanical seals.
- Non metallic rings available for applications with low specific gravity, or for increased efficiency or ability to withstand short periods of dry running
- Impellers and rotating equipment element dynamically balanced to API 610 / ISO 13709 requirements.



Optional Features for Application Flexibility

Bearing Arrangements

Oil lubricated Ball/Ball bearings are standard on the Model 3640. Ring oil lubricated Sleeve/Ball or pressure lubricated Sleeve/Tilt bearings can be furnished to meet customer or operating requirements.
Hydrodynamic bearings are offered with pressurized oil lube system.



Ball / Ball

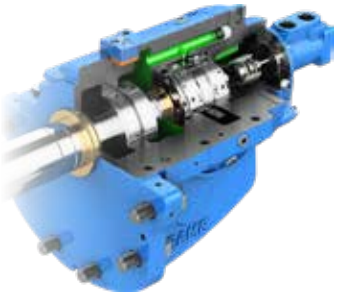
Double Suction First Stage Impeller

Available on 4-inch and larger discharge size pumps for services where $NPSH_A$ is limited.

Instrumentation

The 3600 can be furnished with instrumentation options to measure vibration and temperature. RTDs can be furnished to measure bearing temperatures and to monitor temperature rise in the casing. Bearing housing vibration can be monitored on pumps. Pumps supplied with Hydrodynamic bearings can be furnished with non contacting vibration probes to measure rotor vibration.

Sleeve / Ball



Sleeve / Tilt

Bearings & Bearing Housings

To get superior MTBF you need two things: Optimum pump hydraulics and a robust pump structure. The new i-FRAME housings delivers on the second point by providing a premium robust housing with unique new and improved features that raises the bar on what you can expect from your pump's long term performance. These i-FRAME bearing housings include the new patented one piece design bearing housing for the ball/ball bearing arrangement, as well as the patent pending split bearing housing for the sleeve/ball and sleeve/tilt pad bearing arrangement.

Bearing housings constructed in ASTM A216 Grade WCB carbon steel. Three bearing arrangements available:

- Ball/Ball bearings
  - Duplex 40° Angular Contact Bearing Set on the Non-Drive End (NDE) to handle radial and axial loads. Bearing set is supplied with a light clearance
  - Deep Groove Ball Bearing on the Drive End (DE) to handle radial loads

- Sleeve/Ball bearings
  - Duplex 40° Angular contact Bearing Set on the Non-Drive End (NDE) handle axial loads. Bearing set is supplied with a light clearance.
  - Babbitt lined Sleeve Bearings handle radial loads on NDE and DE (Non Drive End and Drive End)

- Sleeve/Tilt pad bearings
  - Babbitt lined Sleeve Bearings handle radial loads and are installed on NDE and DE (Non Drive End and Drive End).
  - Tilting pad Bearings are installed on NDE to handle axial load.
  - This bearing configuration utilizes an external pressurized LOS to lubricate and cool the bearings. Both API, standard and custom designed systems can be offered.

All bearing housings feature a 180° bearing saddle bolted to the casing positioned with precision dowels for accurate, repeatable alignment. The 180° bearing saddle is optimized for stiffness and rigidity of connection between the pump casing and housing along with increased bolt diameters. This provides significantly increased stiffness compared to the previous design housings, resulting in reduced vibration.

The bearing housing exterior includes distinctive cooling fins optimized by CFD/FEA analysis to aid in heat dissipation.

The Ball/Ball and Sleeve/Ball i-FRAME bearing housings have enhanced air cooling with axial fans and achieves metal and oil temperature reductions of up to 30° F from previous design without the need for cooling water. The NDE side comes standard with a guarded extension to accept a fan for ease of field retrofit, so if your process needs change the fan can be fitted without the need for expensive pump disassembly and installation.

Bearing housing put through rigorous testing.

Patented Filters

Bearing oil contamination often discussed as black oil, caused by wind-blown sand and dust together with atmospheric moisture are major contributors to bearings failing well before their design life. In an industry first, all self-contained bearing housings include a cartridge filter assembly that will help safeguard the bearing oil from debris contamination.

The patent pending filter cartridge will also continuously work to scrub water from the bearing oil utilizing specifically engineered moisture absorbing materials built into the filter.

Oil with Particulate**

Run time = 72 hrs*	Run time = 314 hrs*
Black Oil	Result: Clean Oil

Oil with Water

Run time = 0 hrs*	Run time = 72 hrs*
Cloudy Oil	Result: Clean Oil

*Continuous operation at 3100RPM
**Test dust used is ISO 12103-1, A3 Medium test dust

The design allows for easy changeover of filter cartridges even while the pump is operating – no need to stop your process. All this additional reliability is achieved ***without*** the need for additional oil pumps or piping – no additional system complexity, monitoring or control overhead.

You change the oil and filter in your car, and it doesn't have a sight glass

- Black oil caused by debris and moisture contaminating the oil.
- Multi-functional filter assembly captures oil and circulates down through filter and liquid absorbing beads.
- Filter captures debris and beads absorb any water that may be present.
- Moisture absorbing beads are non-toxic and biodegradable.
- New bearing housings designed so oil is thrown by oil ring to trough that leads to the oil filter assembly.

Typical oil change interval was every 3 months. That is extended to every 6 months with the filter. Pump doesn't need to be stopped in order to change the filter.

i-ALERT® Monitoring Solution

Sensor | App | Ai Platform

www.i-alert.com

Bluetooth®

What it Does:

Monitor
Tracks vibration, temperature & run-time hours 24/7/365.

Alarm
Takes high resolution data when an alarm condition occurs and stores it for later analysis.

Trend
Captures data every 1-60 minutes and has up to 170 days of hourly on-board storage.

Analyze
Diagnose machine faults with vibration tools
Fast Fourier Transform (FFT) & Time Wave Form Analysis.

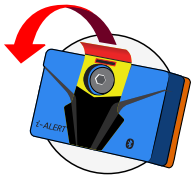
Environment
Rated for any industrial environment. water & dust resistant. Intrinsically Safe with a 3-year battery life (use dependent).
- ATEX Zone 0 AEx ia IIB Ga (Groups C & D)

Wireless
Sync data via Bluetooth Smart enabled smartphones and tablets.

Online Monitoring
Monitor and manage all of your i-ALERT enabled machines in one place - i-ALERT Ai Online Platform. This subscription service requires no software to download or dedicated hardware to run.

Spend less time collecting data and more time fixing problems. The i-ALERT mobile app has the ability to scan multiple i-ALERT2 sensors within range to quickly and safely inspect multiple machines.

How it Works:



1. ACTIVATE
The i-ALERT2 devices are light activated by removing the sticker. The sensor begins wirelessly broadcasting once activated.

2. AUTO CONFIGURATION
The i-ALERT device averages the vibration over 25 hours of run-time and sets the alarm levels to 2 x average (0.1-1.5ips minimum). Temperature alarm default to 80°C (176°F)

OR

2. MANUAL CONFIGURATION
User manually sets the alarm thresholds via the i-ALERT mobile application.

3. Monitor
The i-ALERT2 sensor is configurable to check every 1-5 minutes. If two consecutive readings are above alarm threshold the i-ALERT device will go into alarm.

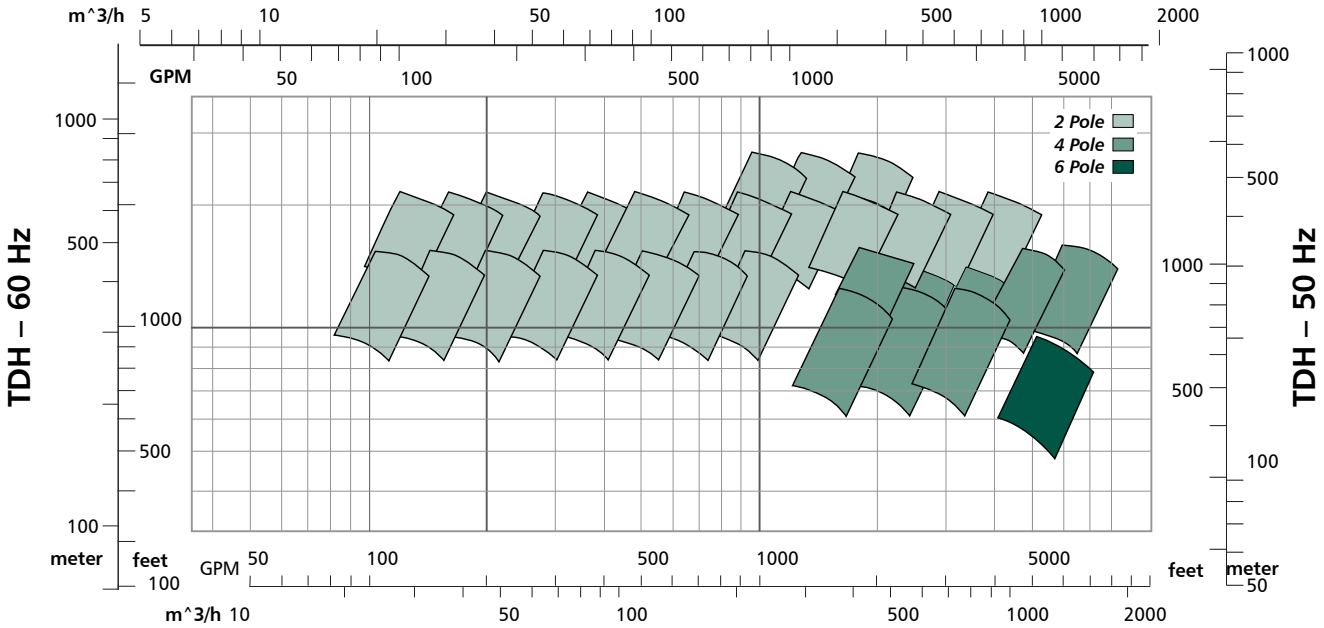
Dashboard
Simple, intuitive dashboard to track vibration, temperature, run-time & battery life.

Trending
Trend vibration, temperature, & kurtosis to monitor any changes in the equipment operation.

BOM
Load the as built of materials based on the pump serial number.

Hydraulic Coverage

Flow Capacity – 50 Hz



Flow Capacity – 60 Hz

Note: Hydraulics above represent 80% to 110% of best efficiency point (BEP).

PRO Services® Engineered Upgrade

Example of our PRO Services® Engineered upgrade capability. The following two-stage API BB2 Model 3640 was upgraded from an old edition of API 610 to the lastest (11th) edition of API.

Original Pump

10th Edition Upgrade

A Leader in API Engineered Pump Package Solutions

API Family of Pumps

Model 3700
OH-2

Model 3910
OH-3

Model 3620
3640
BB-2

Model 3610
BB-1

API Type	Goulds Model	Capacity GPM (M³/Hour)	TDH Feet (Meters)	Temperature °F (°C)	Pressure PSIG (kg/cm2)
OH-2	3700	8500 (1930)	1200 (360)	800 (425)	870 (60)
OH-3	3910	6000 (1360)	750 (230)	650 (340)	600 (42)
BB-1	3610	50000 (11355)	700 (215)	300 (150)	300 (21)
BB-2	3640	7500 (1700)	2500 (760)	850 (455)	1130 (75)
BB-2	3620	20000 (4540)	1500 (455)	850 (455)	1000 (70)
BB-3	3600	8500 (1930)	9000 (2740)	400 (205)	4000 (275)
BB-5	7200CB	4000 (910)	9000 (2740)	800 (425)	4000 (275)
VS4	API 3171	3180 (720)	525 (160)	450 (232)	750 (50)
VS1	VIT	70000 (14760)	3500 (1060)	500 (260)	2500 (175)
VS6	VIC	70000 (14760)	3500 (1060)	500 (260)	2500 (175)

Model 3600
BB-3

Model 7200CB
BB-5

GOULDS PUMPS

An ITT Brand

240 Fall Street
Seneca Falls, NY 13148
Phone: 315.568.2811
Fax: 315.568.2418
www.gouldspumps.com

B.3640.en-US.2021-04