

# Goulds API 3620 i-FRAME<sup>®</sup>

API 610 11<sup>th</sup> Edition / ISO 13709 2<sup>nd</sup> Edition

API BB2 Axially-Split, Between-Bearing, Radially Split



# 3620 *i-FRAME*<sup>®</sup>

## 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
- 40+ 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



# 3620 i-FRAME<sup>®</sup>

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

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

### 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 API process pump designed for a 20-year life.

### Versatility

- Capacity to 20,000 GPM (4,540 m<sup>3</sup>/h)
- Total Dynamic Head to 1,500 feet (455 m)
- Temperature to 850° F (455° C)
- Pressure to 1,000 psig (70 bar)



Goulds Model 3620 between-bearings radially split process pumps are designed for smooth, reliable operation and fully meet the specification requirements of ISO 13709 / API-610 to assure extended service life.



**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.

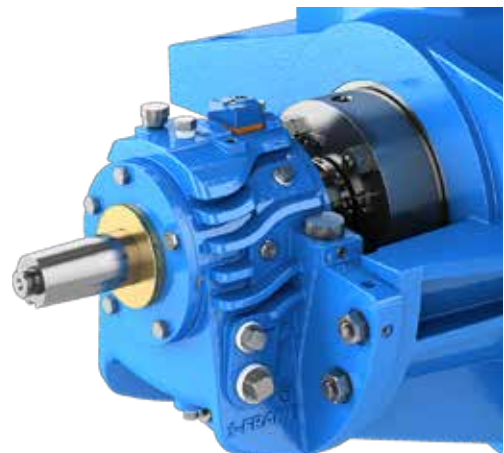
**Engineered Packaging** with a wide range of drivers, seals, piping, nozzle configurations, flanges, baseplates, and QC testing.

### Applications

- **Refinery:** Tower bottoms, process feed, column reflux, circulation and pump around, process booster
- **Power Plant:** Boiler feed booster, boiler circulation, ash sluice

### i-FRAME™ Bearing Housing Features

- This sleeve ball's modern i-FRAME™ design 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



# 3620 *i-FRAME*<sup>®</sup>

## 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.

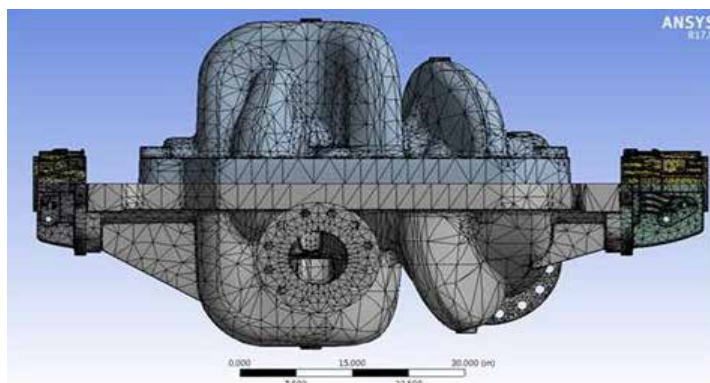
Entire rotating assembly can be removed for maintenance without disturbing suction/discharge piping.



Split stage pieces and center case bushing can be removed for inspection of wear surfaces without disassembling rotor assembly.

### 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 11<sup>th</sup> 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

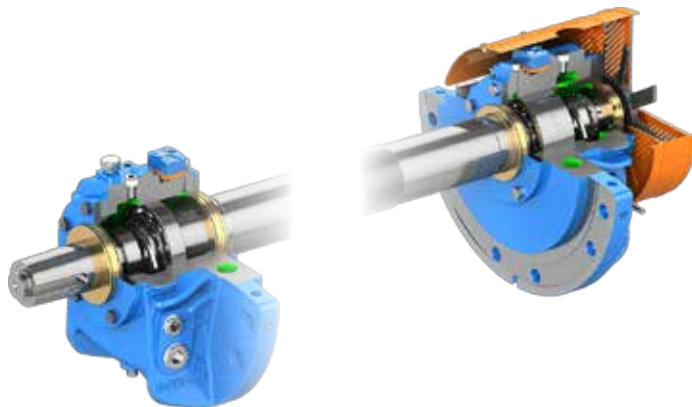
### Bearing Arrangements

Oil lubricated ball radial and duplex thrust bearings are standard on the Model 3620. Ring oil lubricated sleeve radial and ball thrust or pressure lubricated sleeve radial and tilting pad thrust bearings can be furnished to meet customer or operating requirements.

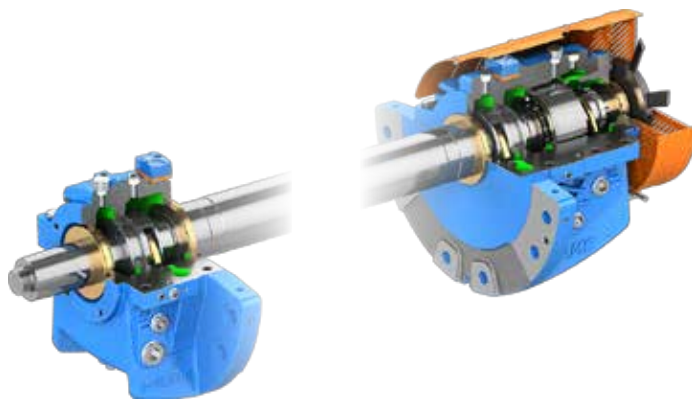
Hydrodynamic bearings offered with pressurized oil lube systems.

### Instrumentation

The 3620 can be furnished with instrumentation options to measure vibration and temperature. RTDs or thermocouples can be furnished to measure bearing temperatures and to monitor temperature rise in the casing. Bearing housing vibration can be monitored on pumps furnished with ball bearings. Pumps supplied with sleeve bearings can be furnished with non-contacting vibration probes to measure actual rotor vibration.



Duplex Ball Thrust / Ball Radial Bearings



Duplex Ball Thrust / Sleeve Radial Bearings

# 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 raise 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.

The housings are cast and machined out of ASTM A216 Grade WCB carbon steel.

- Ball/Ball bearings (New Orders Only)
  - Deep Groove Ball Bearing on the Drive End (DE) to handle radial loads
  - 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
- Sleeve / Ball bearings (New Orders Only)
  - The housings are cast and machined out of ASTM A216 Grade WCB carbon steel.
  - 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)
  - The bearing housings feature a full 180° bearing saddle

All bearing housings feature a full 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 generation, resulting in reduced vibration.

The bearing housing exterior includes distinctive cooling fins placed in a CFD/FEA optimized pattern to aid in heat dissipation.

The 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. All shaft ends on the NDE side come 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.



Bearing housing put through rigorous testing.

# Patented Filters and Monitoring

Bearing oil contamination 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.

Another smart feature included as standard is the award winning, i-ALERT. This provides continuous machine monitoring with comprehensive wireless reporting including diagnostic quality vibration FFTs and operating history to the mobile phone or tablet of your choice. The bearing housings come equipped *as standard* with constant level oilers\*, sight window\* and provisions for instrumentation including: RTD's, proximity probes\*, and accelerometers. If your monitoring needs change in the future, this comprehensive approach allows field retrofitting of almost any monitoring scheme without replacing your bearing housings or relying on ad-hoc instrument mounting.

It is important to note these new i-FRAME bearing housings are not interchangeable with the previous design. For other features, see the Standard Product Configuration under the Application and Selection Guide section.



# i-ALERT<sup>®</sup> Monitoring Solution

## Sensor | App | Ai Platform

www.i-alert.com



### 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 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.

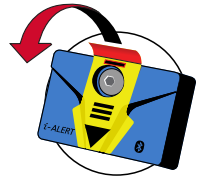


Spend less time collecting data and more time fixing problems. The i-ALERT mobile app has the ability to scan multiple i-ALERT2 sensors within range to quickly and safely inspect multiple machines.

### How it Works:

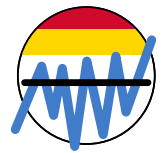
#### 1. ACTIVATE

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.



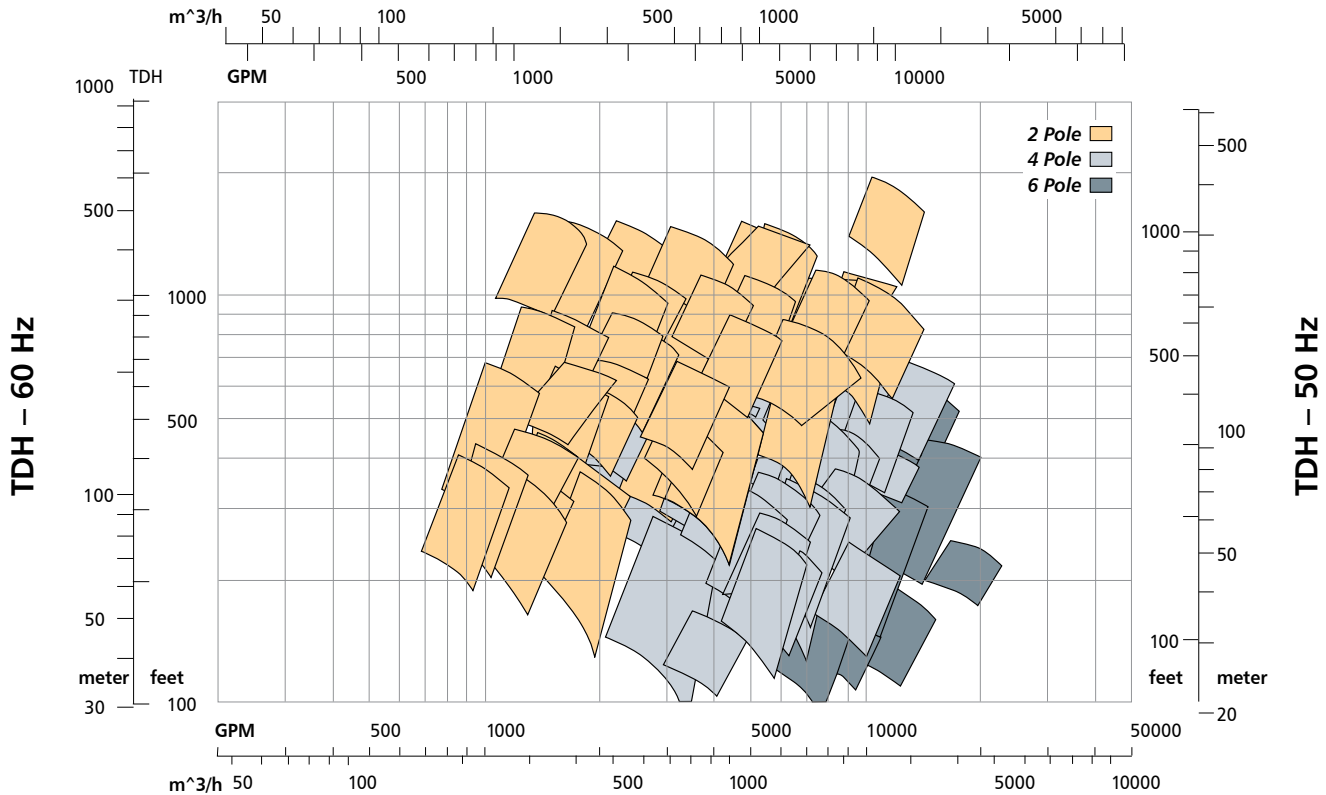
#### BOM

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).



### Custom Solutions

Model 3620 6 × 10-13 custom designed with side-top nozzles for fuel oil service in Saudi Arabia.

# 3620 *i-FRAME*<sup>®</sup> (API BB2)

API 610 11th Edition / ISO 13709 2nd Edition

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

## CLASS 300 RF FLANGES STANDARD

Other classes and facings optional.

## HEAVY DUTY RADIAL BEARINGS STANDARD

## HEAVY DUTY SHAFT

Minimum shaft deflection for extended seal and bearing life. Sized to meet deflection and rotordynamics requirements of API 610 / ISO 13709.

## RENEWABLE WEAR RINGS

API 610 / ISO 13709 clearances. Positively locked. Standard feature.

## CENTERLINE MOUNTED CASING

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

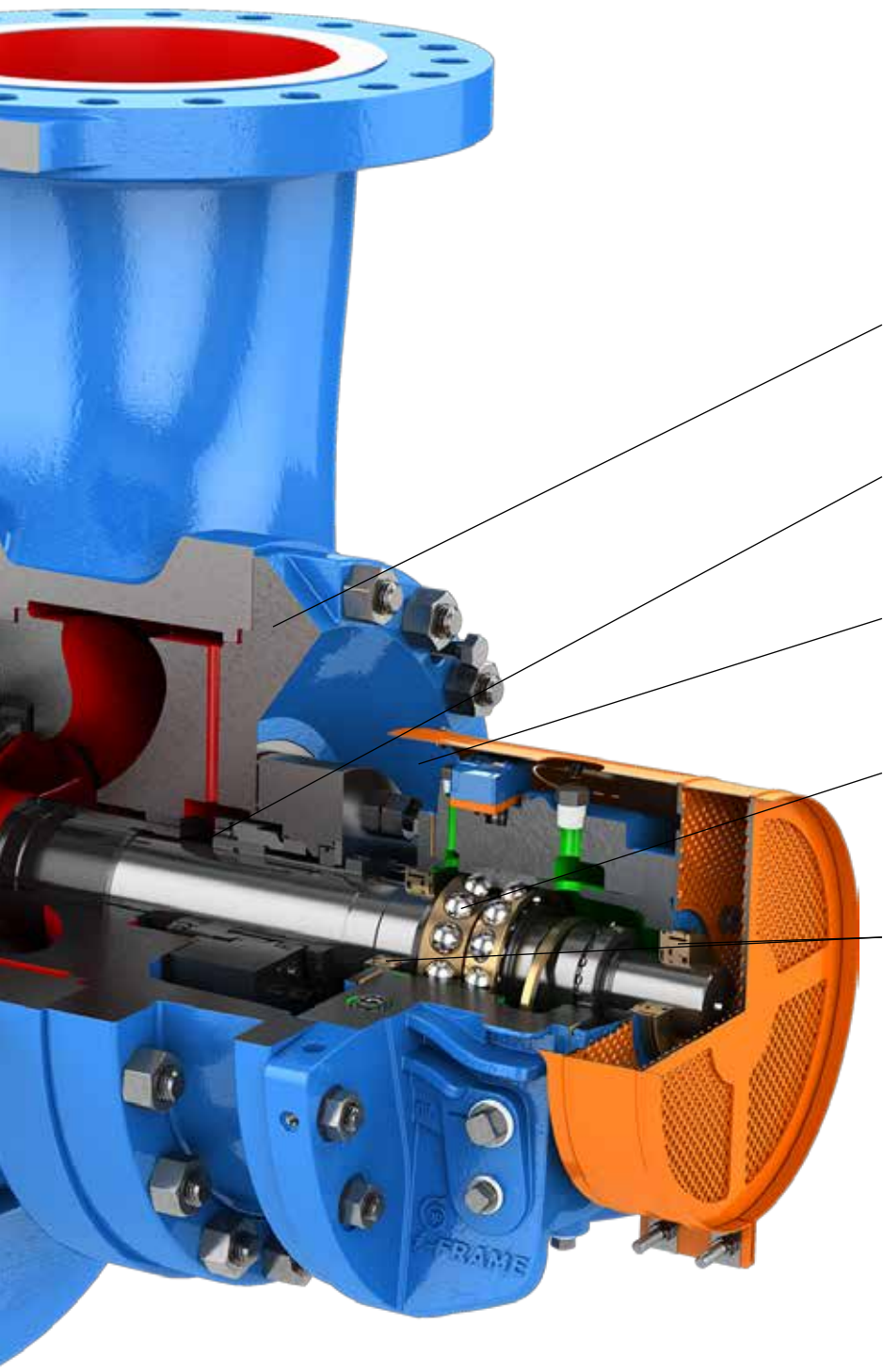
## DOUBLE SUCTION IMPELLER

Designed for low NPSH services. Hydraulically designed to balance axial loads for increased bearing life. Rotor and impeller balanced to stringent ISO 1940 Grade 1.0 (exceeds API minimum).

## DUAL VOLUTE CASING

Evenly balances radial forces for minimum shaft deflection, increased bearing and seal life.





#### **RADIALLY SPLIT CASING**

Designed specifically for high pressure / high temperature services. Fully confined controlled compression gasket assures leak-proof sealing.

#### **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.

#### **CASING HEAD ON OUTBOARD END**

Allows removal of rotor without disturbing driver or suction and discharge piping. Single head standard. Double head design optional.

#### **HEAVY DUTY THRUST BEARING**

Duplex 40° angular contact thrust bearings and deep-groove (Conrad) radial bearings sized for minimum three (3) year bearing life under most severe operating conditions. Exceeds API 610 / ISO 13709 requirements.

#### **LABYRINTH OIL SEALS**

Labyrinth seal design prevents oil from leaking out and contaminants from intruding. Made from non-sparking metal.

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



Model 3600  
BB-3



Model 7200CB  
BB-5



# Notes





An ITT Brand

240 Fall Street

Seneca Falls, NY 13148

Phone: 315.568.2811

Fax: 315.568.2418

[www.gouldspumps.com](http://www.gouldspumps.com)

© 2018 ITT Goulds Pumps Inc.

B.3620.en-US.2018-05