Goulds VICR
API 610
VS6 Vertical Multi-stage Low Flow, High-Head Pump
Delivering High Head at Low Flows
Nominal Rotating Speeds for Extended Life Cycle
Vertical Multi-stage Low Flow, High-Head Pumps

More efficient & compact design with extended life & easy maintenance

Over 150,000 API Pumps on Installations Worldwide.

ITT Goulds Pumps has been providing safe and reliable pumps to customers in the energy markets for over 150 years.

Since 1971, ITT Goulds Pumps has been an active member of API-610 Task Force, participating as a leader in delivering pumps for Petroleum, Heavy-Duty Chemical, and Gas Industry Services.

Today, the number of installations attest to its remarkable performance including the great choice of a compact, vertically suspended VS6 pump type which is ideal for high head and low flows applications for all energy markets.

ITT is a world leader in technology and engineering including pumping applications, material science, mechanical design, and hydraulic design.
Safety & Reliability from Engineering Expertise

Highly engineered features include:

Design
• Compact product configuration with small installation footprint, ideal for installations with limited space
• Sound mechanical designs with structural and rotor dynamic analyses to ensure low vibration and long equipment life cycle
• Swirl breakers in the suction bell that allow smooth entry of liquid into the first stage impeller eye
• Optional air cooled thrust pot that is API compliant

Efficiency and Reliability
• High suction pressure/Up-thrust: Patent pending dual bearing arrangement that handles rotor up-thrust and to keep the shaft straight under high suction pressure including a thrust balance device with non-galling running clearances
• Reliable vertically-suspended rotor system with multiple radial impellers which maintain running clearances without static deflection capable of producing high-head outputs at nominal motor speeds
• Radially split, double-walled pressure casings with metal-to-metal fits and controlled-compression gaskets, ideal for light hydrocarbon applications
• With low specific speed Ns, the VICR is better suited to increase reliability, decrease investment and maintenance costs while reducing the can length, hence less excavation is required

Technology
• Developed with Pro-E modeling in 3D to achieve effective data mapping and design visualization
• Dynamic flow models that ensure stable performance and consistent high efficiency levels
• i-ALERT Monitoring Solution that provides continuous machine monitoring with comprehensive wireless reporting including diagnostic quality vibration FFTs and operating history to a mobile phone or tablet
VICR

Heavy Duty Multi-stage Pumps Designed for High-Head/Low Flow Services

• Capacities 20 GPM (6.8m³/hr) to 2,800 GPM (636 m³/hr)
• Heads to 4500 feet (1372 meter)*
• Temperature -55°F (-48°C) to 400°F (204°C)
• Maximum allowable working pressure to 2200 PSIG (153 bar)
• Suction Pressures to 1,000 PSIG (69 bar)
• Multiple stages in short-set or deep-set configurations
• API Standard 610 compliant
• ISO 13709 Standard compliant

Benefits
• The VICR has a competitive advantage due to its compact design and reduced number of stages from the radial impeller configuration that can produce more head per stage
• The new bowl assemblies enable the replacement of competitor’s bowl assemblies

Applications
• Typical fluids are Pentane, Propane, LPG and other light hydrocarbons with specific gravities ranging from 0.2 to 1.0
• Hotwater applications such as Boiler feed water

*For higher heads, please consult with your sales representative.
Design / Analysis Capabilities

• Casing pressure capability and structural design developed & refined using advanced finite element analysis

• Rotor designs developed and refined with rotor lateral and rotor torsional dynamic analysis to ensure stable operation and low vibration levels

• Mechanical designs developed with thermal transient analysis to achieve dimensional integrity

• Hydraulic designs developed with computational fluid dynamic analysis to achieve stable performance and consistent high efficiency levels

Versatile and Engineered for Life

• Conformance to ASME B16.5

• Classes 150, 300, 600, and 900 # as standard options

• Raised face as standard and ring joint as standard option

• Suction regions of the pump can be designed for the same MAWP as the discharge section as a standard option

• Discharge flange sizes: 1.5”, 2”, 3”, 4”, 6”, and 8”

• Suction flange sizes: 2”, 3”, 4”, 6”, 8”, 10”, and 12”

• 2-pole speeds as standard. 4-pole and 6-pole speeds as standard options, 50 & 60 Hz

• Suitable for variable frequency drive speeds in the range of 50% to 110% of rated speeds

• Clockwise shaft rotation as viewed from coupling (CW-HI)
Threaded Lineshaft Coupling / Keyed Lineshaft
Threaded lineshaft coupling is commonly used for lower horsepower pumps. It is more economical.

Keyed lineshaft coupling is recommended for motors larger than 700 HP. It provides ease of maintenance.

Balance Drum
Thrust balance device with non-galling running clearances

Hardfacing
Provisions for hard-face coatings at bearing journals as standard option to protect against wear from abrasives in the bearing area.
Options Handling Thrust

Thrust bearing in drivers as standard or in thrust pots as standard option

- Provisions for air-cooled rolling-element type thrust pots as standard option
- Provisions for tilting-pad type thrust pots as engineered option on 4”, 6” and 8” pump sizes

Fan Air Cooled Thrust Pot

- Cast steel body meeting API standard
- 25,000 –hour L-10 bearing life
- Two or three precision bearings configuration
- Up-thrust capability with dual-coupling configuration as standard option
- Vibration and temperature monitoring are standard provisions
- Oil lubrication Thrust bearings & permanently lubricated radial bearings
- Inpro Seals prevent oil contamination
- No external cooling system is required due to its fan configuration
- Enables to remove mechanical seal without removing thrust pot

Exceptional Design

Bearing temperatures are all within limits specified by API-610. Testing has shown exceptional performance with bearings temperatures only 50ºF higher than ambient air temperatures.

Thrust pots are mounted in driver supports, which contains cowlings welded directly to the support inner walls. The cowling forces the air to travel over the fins of the thrust pot housing thereby maximizing the heat transfer between the housing and air.
VICR High Performance Pumps
Suitable for Prime Fluids

Coupling
• Rigid adjustable spacer couplings for seal removal
• Light weight coupling designed with patent pending up-thrust travel limiting feature.

Coupling Guards
• Design per Goulds Pumps std/OHSA as standard
• Design per Goulds Pumps std/ATEX non-sparking as standard option

Mechanical Seal
• In accordance with API Standard 610 and API Standard 682
• Cartridge mechanical seals single and dual configurations
• Seal glands designed for pump Maximum Allowable Working Pressure (MAWP) as standard
• Seal cooling plan 13 with flow restriction to achieve 1 gpm per inch of seal diameter (no balance line as standard)
• Seal flush piping plans with butt-welded piping or tubing construction as standard options

Seal Housing
• Provisions for balance line flow through seal housing as standard option
• Balance line with patent pending two top bearings to manage seal chamber pressures in high-pressure pumps as standard option

Driver Support
• Separate driver support with alignment fixtures

Shipping Covers
• Metal flange protection provided on all flanged connections in accordance with API Standard 610

Suction Bell (689)
• Swirl breakers allows smooth entry of liquid into first stage impeller eye

Suction Bell Bearing
• Provides shaft stability
**Pump Rotor**
- Single-piece pump-head shaft with one diameter for each pump design. Provisions for reduced shaft diameter through seal housing to reduce rotor up-thrust as standard option
- Provisions for shaft sleeves at top bearing or thrust-balance device as standard option
- Couplings with adjustable rotor positioning, spacers for seal removal, and precision fits for runout control
- Rigid couplings with patent pending up-thrust travel limiting feature

**Keyed Impellers (673)**
- Investment cast radial impellers with dimensionally consistent hydraulic passages to maximize efficiency
- For low NPSHA applications, X impeller first stage available to minimize pump length
- Impellers loose fits and individually keyed to shaft and staggered to minimize vibration
- Impellers positioned with individual split rings and reverse-load limitation
- Impellers with integral wear rings as standard and separate wear rings as standard option

**Precision Cast Bowls (670)**
- Investment cast one-piece bowl casings with open diffuser vanes and radial impellers for hydraulic performance optimization.
- Channel-ring assembly compressed with elastic tie rods. Bowl casings with patent-pending intermediate tie-rod construction as standard option
- Casing wear rings and bushing rings as standard
- Registered fits ensure positive alignment with optional wear rings securely installed. All diffusers are interchangeable
VICR

**Quality Standards**
- CE Marking as standard option
- ATEX Certification as standard option
- Performance & NPSH testing per API Standard 610
- Complete-unit testing as standard option
- Impellers balanced to API Standard 610
- Inspection of mechanical seals and bearings after test optional
- Sound level testing optional
- Auxiliary equipment testing optional
- Resonance testing optional
- CMTR for casing, impeller, shaft
- UT of shaft as standard option
- Hydrostatic testing of pressure casing per API Standard 610

**Most Advanced Design**
- Complete Finite Element Analysis static and dynamic as standard option for the most reliable pump-driver operation
- Efficiencies for the VICR are higher than comparable lower specific speed pumps and as a result of less number of stages to meet conditions

**Standard Feature in all VICR Pumps**
i-ALERT sensor monitors tri-axial vibration, temperature and run-time hours on rotating equipment for preventative maintenance. With a mobile APP, users can monitor right from their phones.
i-ALERT® Monitoring Solution

Sensor | App | Ai Platform

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)

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.

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.

www.i-alert.com
Hydraulic Coverage to Give You the Right Fit

- Total of 6 pump sizes and 16 hydraulics with options from 2 to 30 or more stages with hybrid selection
- Hydraulic range shown presents 80% to 110% of Best Efficiency Point (BEP) for 3550 & 2950 RPM
- Overall pump performances accounting for volumetric losses and mechanical losses
## Materials of Construction

Material classes S5, S8, A8, D1 and D2 per API Standard 610

<table>
<thead>
<tr>
<th>Item</th>
<th>Part Name</th>
<th>S-5</th>
<th>S-8</th>
<th>A-8</th>
<th>D-1</th>
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</table>

(1) Nickel Impregnated Carbon available as option.
(2) Polyether ether ketone (PEEK) available as option.
NACE compliance materials are available as an option for each component in all categories.
### Dimensions

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<tr>
<th>Pump Model</th>
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<th>Suction Size</th>
<th>&quot;A&quot;</th>
<th>&quot;B&quot;</th>
<th>&quot;C&quot;</th>
<th>&quot;D&quot;</th>
<th>&quot;E&quot;</th>
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<td>6 (152)</td>
<td>20 (508)</td>
<td>14 (356)</td>
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All dimensions in inches and (mm). Not to be used for construction. Estimated based on Discharge Flange Class 900 and Suction Flange Class 300 design with standard features.
The Right Equipment for the Right Markets

- Best pumping suitable for Ethylene, Propylene, Pentane, Propane, Methane, Butane, LPG and other light hydrocarbons at gas separation plants, petrochemicals or produced during the refining of crude oil.

- With the large increase in wet gas production from shale in the USA and global markets, these applications are becoming more common and the VICR pump is the perfect fit for high head at low flows in petroleum, production, storage and distribution.

- Other markets in the Industry are Chemical, Desalination, LNG, Petrochemical and Industrial requiring low and high temperature or high pressures.

- In Power, these type of pumps can be used for boiler feed and condensate applications.

- The VICR has a competitive advantage due to its compact design and reduced number of stages from the radial impeller configuration that can produce more head per stage.

Many of these high head applications involve pumping low specific gravity hydrocarbons in a VS6 suction can arrangement.
Wherever you are, we’re there too.

Reliability has no quitting time.
Buildling on over 160 years of Goulds Pumps experience, PRO Services provides an array of services focused on reducing equipment total cost of ownership (TCO) and increasing plant output, including predictive monitoring, maintenance contracts, field service, engineered upgrades, inventory management, and overhauls for pumps and other rotating equipment.

Your Total Solution For Equipment Life Cycle Optimization

Control Solutions (PumpSmart)
Power Ends
Monitoring Solutions (ProSmart)
On-board Continuous Monitoring (i-Alert)
Reliability Engineering
Energy Performance Services
Pump Root Cause Analysis
Rotating Equipment Repairs

Design & Sourcing
Goulds Pumps/ Bornemann
Pump Parts
Inventory Management
Engineered Parts (ProCast)

Pump Replacements
Field Services
Pump Upgrades

Manufacturing/Assembly/Packaging
Direct Sales Offices
Service Centers (ITT)
Distribution Center