



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



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ITT

ENGINEERED FOR LIFE

VICR

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 N_s , 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



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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



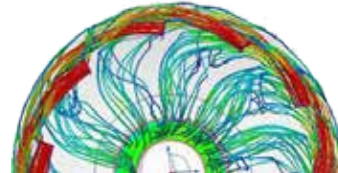
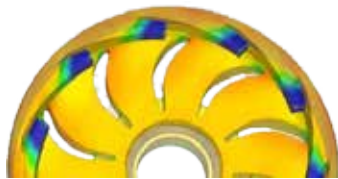
*For higher heads, please consult with your sales representative.

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



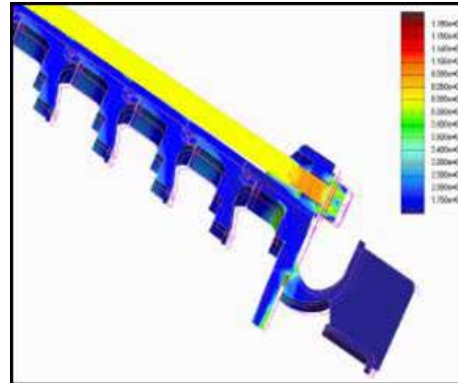
Model meshed with ~ 2 million elements



Flow streamlines with no separation

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)



Finite Element Analysis to Verify Stress and Displacement

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High Suction Pressure/Up-thrust

Patent pending dual bearing arrangement to handle rotor upthrust and to keep the shaft straight under high suction pressure.

Pressure Casings

- Discharge heads and suction cans fabricated with ASME Section IX weld procedures.
- Discharge heads & suction cans with full-penetration welds
- Discharge heads & suction cans designed to ASME Section VIII code
- All discharge head connections with butt-weld and flanged connections only
- Discharge heads with balance line connections as standard option
- All suction cans with full-penetration welds and flanged connections only
- Suction cans with drain connections for all pump sizes as standard and with suction connections for 1.5" and 2"
- Discharge heads with discharge and vent connections for all pump sizes as standard for all pump sizes and with suction connections for 3", 4", 6", and 8" pump sizes only as standard

Deep-set Configuration

Flanged columns to extend pump length with threaded or keyed line shaft coupling to meet customer requirements.

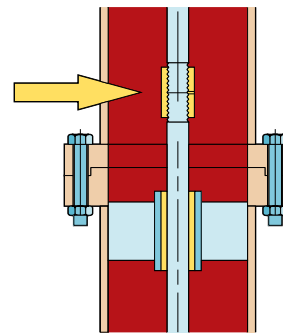
Soleplates

- Single-piece machined with leveling screws as standard
- Single-piece extended for seal flush systems as standard option

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.



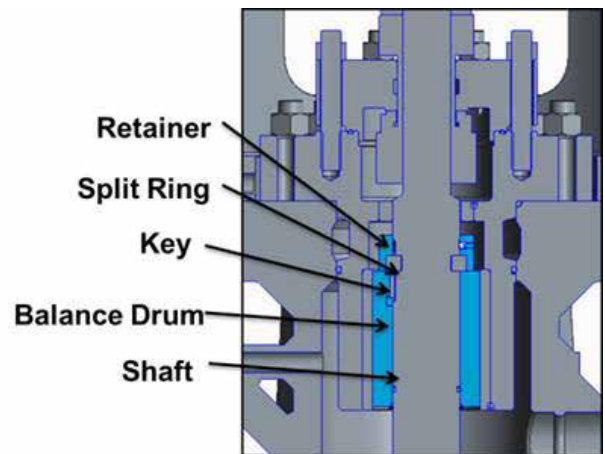
Threaded Lineshaft Coupling



Keyed Lineshaft

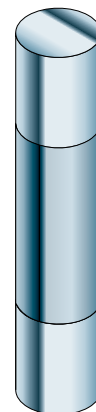
Balance Drum

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

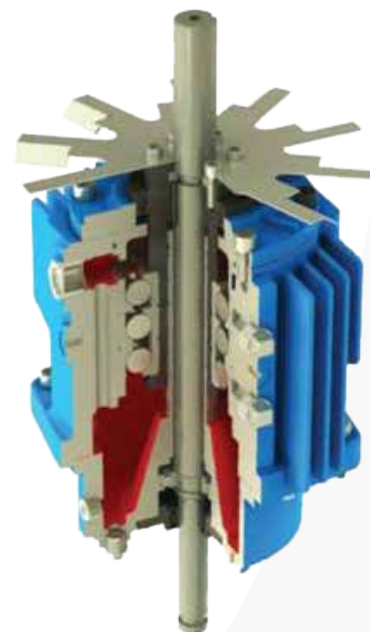
Fan Air Cooled Thrust Pot

- 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 50°F 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

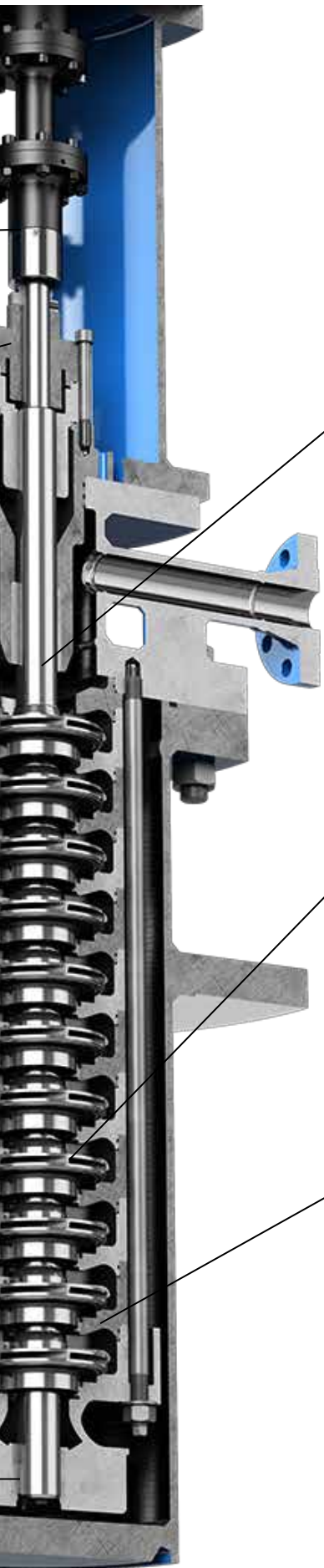
Suction Bell (689)

- 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

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:

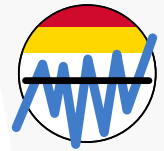
1. ACTIVATE

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.



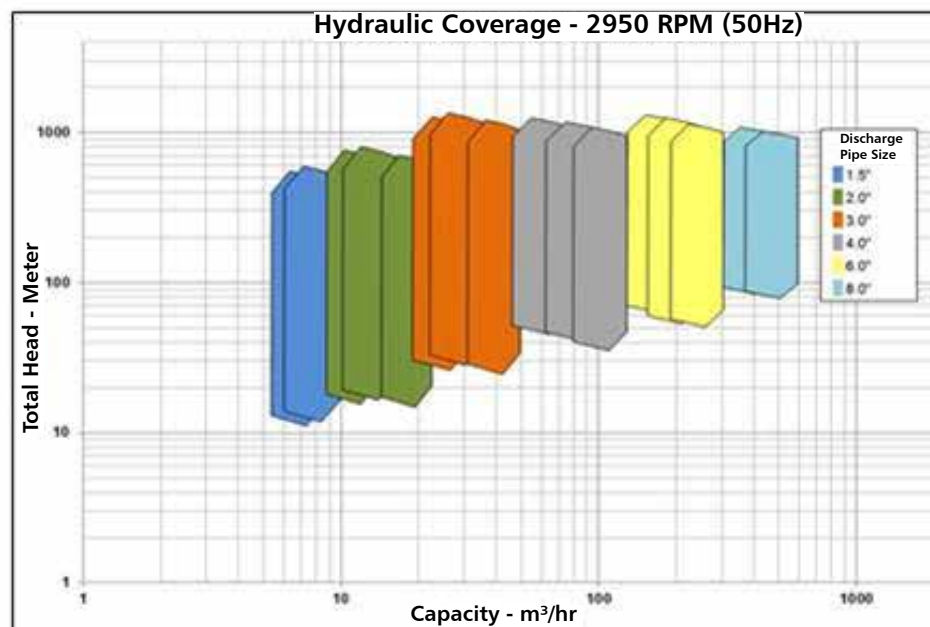
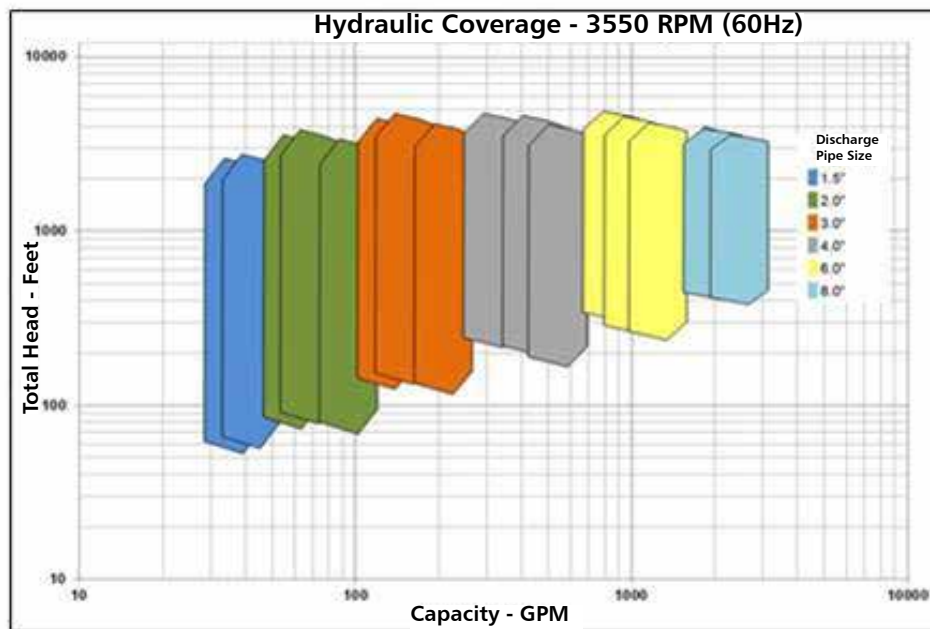
BOM

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

VICR

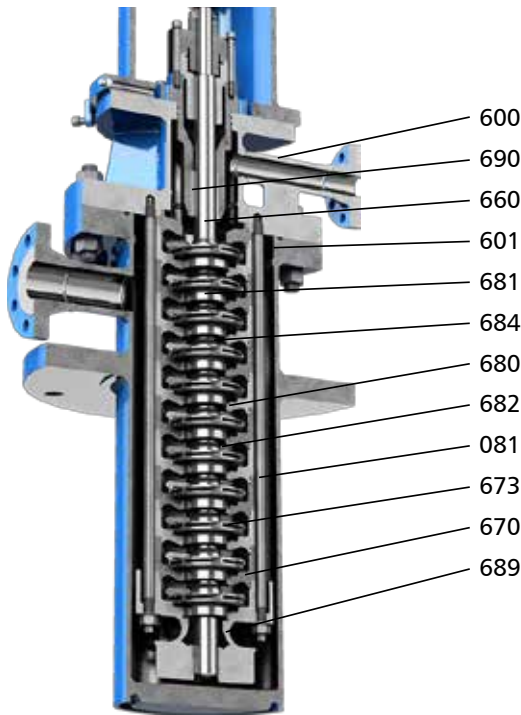
Hydraulic Coverage to Give You the Right Fit

- 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



Item	Part Name	S-5	S-8	A-8	D-1	D-2
689	Suction Bell	Grade WCB Carbon Steel	Grade CF3M Austenitic S.S.		Grade 4A Duplex S.S.	Grade 5A Super Duplex S.S.
670	Bowl	Grade WCB Carbon Steel	Grade CF3M Austenitic S.S.		Grade 4A Duplex S.S.	Grade 5A Super Duplex S.S.
673	Impeller	Grade WCB Carbon Steel	Grade CF3M Austenitic S.S.		Grade 4A Duplex S.S.	Grade 5A Super Duplex S.S.
660	Shaft	Type 630 H1150D 17-4 PH S.S.	Alloy XM-19 Nitronic 50 S.S.		Alloy 2205 Duplex S.S.	Alloy 2507 Super Duplex S.S.
681/682	Wear Ring - Impeller	Grade CG-6MMN Nitronic 50 S.S.			Grade 4A Duplex S.S.	Grade 5A Super Duplex S.S.
680/684	Wear Ring - Bowl	Grade CF10SMnN Nitronic 60 S.S. (1)(2)		Grade CY5SnBiM Waukesha 88 S.S. (1)(2)	Nickel Impregnated Carbon (2)	
690	Bearing	Nickel Impregnated Carbon (2)				
081	Tie-Rod	Alloy 2205 Duplex S.S.				Alloy 2507 Super Duplex S.S.
600	Discharge Head	Carbon Steel		Type 316L Stainless Steel	Alloy 2205 Duplex S.S.	Alloy 2507 Super Duplex S.S.
601	Suction Can	Carbon Steel		Type 316L Stainless Steel	Alloy 2205 Duplex S.S.	Alloy 2507 Super Duplex S.S.

(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

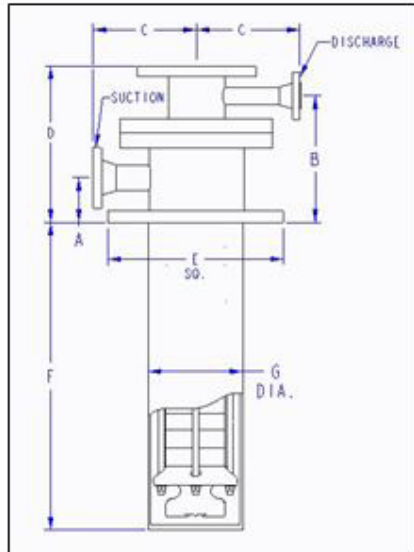


Fig. 1
Model 10RHC/RM C, 12RH C/RM C/RLC

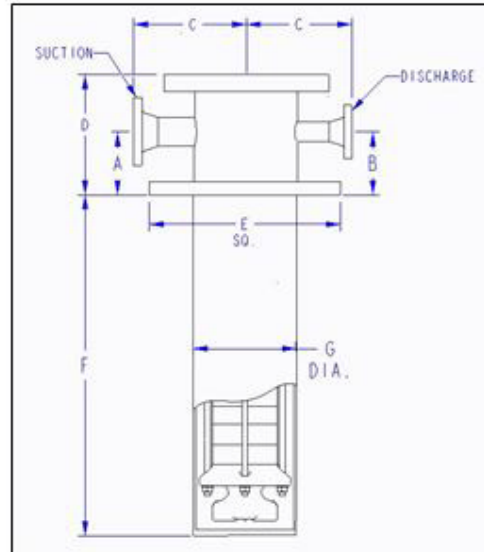


Fig. 2
Model 15RHC/RM C/RLC, 19RHC/RM C/RLC
23RHC/RM C/RLC, 28RHC/RM C

DIMENSIONS									
Pump Model	Discharge Size	Suction Size	"A"	"B"	"C"	"D"	"E"	"F"	"G"
10RMC	1.5	2	6 (152)	20 (508)	14 (356)	26 (660)	24 (610)	39 (991) (20 stages)	12.75 (324)
10RHC									
12RLC	2	3	6.5 (165)	23 (584)	15 (381)	29 (737)	26 (660)	43 (1092) (20 stages)	14 (355)
12RMC									
12RHC									
15RLC	3	4	12 (305)	12 (305)	17 (432)	24 (610)	32 (813)	36 (915) (10 stages)	16 (406)
15RMC									
15RHC									
19RLC	4	6	14 (355)	14 (355)	20 (508)	25 (635)	38 (965)	48 (1219) (10 stages)	20 (508)
19RMC									
19RHC									
23RLC	6	8	15 (381)	15 (381)	22 (559)	27 (686)	42 (1067)	36 (915) (5 stages)	24 (610)
23RMC									
23RHC									
28RMC	8	10/12	16 (406)	16 (406)	26 (660)	28 (711)	48 (1219)	42 (1067) (5 stages)	32 (813)
28RHC									

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.

