



## API COMPLIANT INTERNAL GEAR PUMPS

4223AX Series™  
4323AX Series™

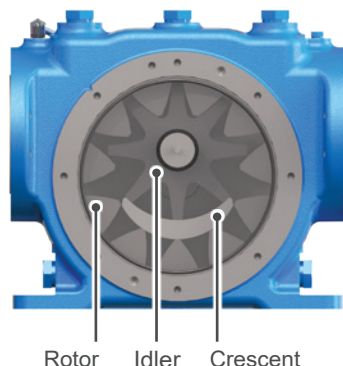
4227AX Series™  
4327AX Series™

4223AA Series™  
4323AA Series™

4227AA Series™  
4327AA Series™

4223C Series™  
4323A Series™

4227C Series™  
4327A Series™



Rotor Idler Crescent

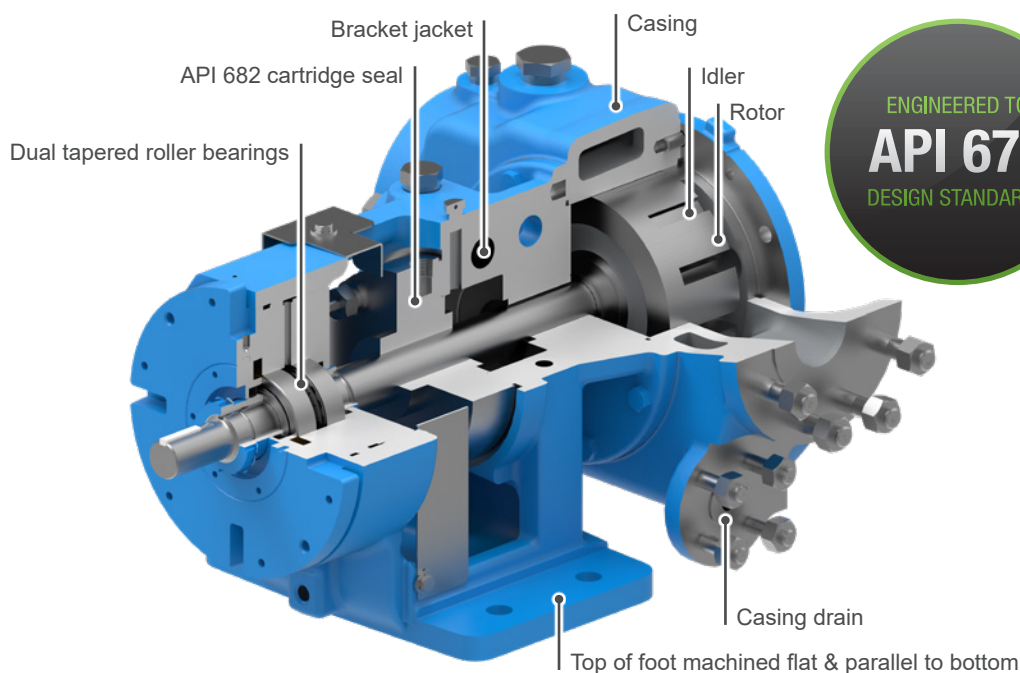
## INTERNAL GEAR TECHNOLOGY

Internal Gear (or gear-within-a-gear) technology was invented in 1902 by the founder of Viking Pump, which is the world-leading provider of internal gear process pumps. Internal gear pumps are rotary positive displacement pumps which move the same amount of fluid with each revolution of the shaft. The flow rate is directly proportional to the speed, which enables easy control over the entire performance range using variable speed drives.

Because system pressure has almost no impact on flow rate, unlike centrifugal pumps, internal gear pumps are excellent for continuous processes where multiple streams are metered together. Handling a broad range of viscosities, they are perfect for cold climate applications where oils and chemicals can become very thick in winter, or for handling polymers whose viscosity increases through the reaction process.

## OTHER VIKING BENEFITS

- High efficiency
- Reversible direction of flow
- Low NPSHr
- Self-priming
- Low pulsation
- Low shear
- Adjustable clearances to compensate for wear
- Rigid shaft support on both sides of the seal



**CAPACITY**  
to 1,600 GPM  
(363 m<sup>3</sup>/h)



**PRESSURE**  
to 200 PSI  
(14 BAR)



**VISCOSITY**  
28 to 2,000,000 SSU  
(0.1 to 440,000 cSt)



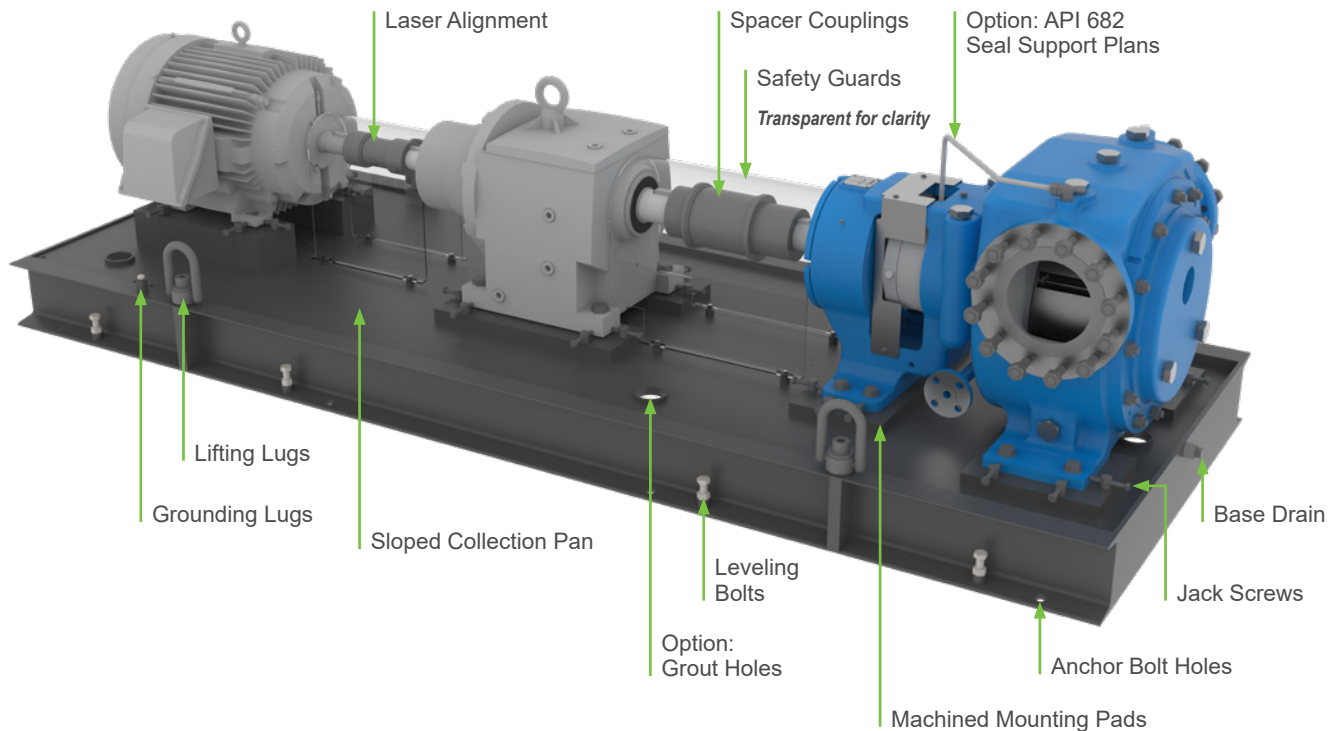
**TEMPERATURE**  
-120°F to +800°F  
(-85°C to +430°C)

## THE API 676 STANDARD: FULL COMPLIANCE OR WITH CLARIFICATIONS

Oil, gas and petrochemical plants worldwide select process equipment that conform to API standards to ensure they use only the ultimate in quality, dependability and safety. The API 676 design standard applies to Rotary Positive Displacement pumps like Viking Internal Gear pumps.

These pump series from Viking Pump were specifically designed to be in conformance with API's 100+ page specification on everything from design of pressure containing parts, bearing life, Non-Destructive Examination, to mounting foot flatness. Ensuring the most robust pump possible. Full compliance reduces risk and simplifies project specs by eliminating sign-offs necessary on non-compliant equipment.

### VIKING PUMP UNIT BUILT TO FULL COMPLIANCE OF API 676 REQUIREMENTS



### VIKING OFFERS THREE OPTIONS FOR API 676 COMPLIANCE



**4223AX Series™ / 4323AX Series™**  
**4227AX Series™ / 4327AX Series™**

Fully Compliant API 676 Pumps with  
4-bolt mount API 682 cartridge seals.  
**NO exceptions.**



**4223AA Series™ / 4323AA Series™**  
**4227AA Series™ / 4327AA Series™**

Pumps with 4-bolt mount API  
682 cartridge seals with **minor**  
**clarifications** to the API 676 standard.



**4223C Series™ / 4323A Series™**  
**4227C Series™ / 4327A Series™**

Pumps with 2-bolt mount cartridge  
seals with **clarifications** to the  
API 676 standard.

## SPECIFICATIONS

| STEEL MODELS |            |            | SPECIFICATIONS |                                   |      |               |                               |     |
|--------------|------------|------------|----------------|-----------------------------------|------|---------------|-------------------------------|-----|
| ②④<br>AX     | ②④<br>AA   | ③<br>C / A | Standard Port  | Nominal Capacity at Maximum Speed |      | Maximum Speed | Maximum Pressure Differential |     |
|              |            |            | Inches         | GPM                               | m³/h | RPM           | PSI                           | BAR |
| —            | H4223AA ①  | H4223C ①   | 1.5            | 15                                | 3    | 1750          | 200                           | 14  |
| HL4223AX     | HL4223AA ① | HL4223C ①  | 1.5            | 30                                | 7    | 1750          | 200                           | 14  |
| —            | K4223AA ①  | K4223C ①   | 2              | 75                                | 17   | 780           | 200                           | 14  |
| KK4223AX     | KK4223AA ① | KK4223C ①  | 2              | 100                               | 23   | 780           | 200                           | 14  |
| —            | L4223AA ①  | L4223C ①   | 2.5            | 135                               | 31   | 640           | 200                           | 14  |
| —            | LL4223AA ① | LL4223C ①  | 3              | 140                               | 32   | 520           | 200                           | 14  |
| LS4223AX     | LS4223AA ① | LS4223C ①  | 3              | 200                               | 45   | 640           | 200                           | 14  |
| Q4223AX      | Q4223AA ①  | Q4223C ①   | 4              | 300                               | 68   | 520           | 200                           | 14  |
| QS4223AX     | QS4223AA ② | QS4223C ②  | 6              | 500                               | 114  | 520           | 200                           | 14  |
| N4323AX      | N4323AA ②  | N4323A ②   | 6              | 600                               | 136  | 350           | 200                           | 14  |
| R4323AX      | R4323AA ②  | R4323A ②   | 8              | 1100                              | 250  | 280           | 200                           | 14  |
| —            | RS4323AA ② | RS4323A ②  | 10             | 1600                              | 365  | 280           | 125                           | 8.5 |

① 90° ports are standard, opposite ports optional.

② Opposite ports.

③ Cartridge seal.

④ API 682 compliant cartridge seal (Category 1, 2 or 3).

| STAINLESS STEEL MODELS |            |            | SPECIFICATIONS |                                   |      |               |                               |     |
|------------------------|------------|------------|----------------|-----------------------------------|------|---------------|-------------------------------|-----|
| ②④<br>AX               | ②④<br>AA   | ③<br>C / A | Standard Port  | Nominal Capacity at Maximum Speed |      | Maximum Speed | Maximum Pressure Differential |     |
|                        |            |            | Inches         | GPM                               | m³/h | RPM           | PSI                           | BAR |
| —                      | H4227AA ①  | H4227C ①   | 1.5            | 10                                | 1.9  | 1150          | 150                           | 10  |
| HL4227AX               | HL4227AA ① | HL4227C ①  | 1.5            | 20                                | 3.7  | 1150          | 150                           | 10  |
| —                      | K4227AA ①  | K4227C ①   | 2              | 50                                | 11   | 520           | 150                           | 10  |
| KK4227AX               | KK4227AA ① | KK4227C ①  | 2              | 65                                | 15   | 520           | 150                           | 10  |
| —                      | L4227AA ①  | L4227C ①   | 2.5            | 100                               | 23   | 520           | 150                           | 10  |
| —                      | LL4227AA ① | LL4227C ①  | 3              | 135                               | 31   | 520           | 150                           | 10  |
| LS4227AX               | LS4227AA ① | LS4227C ①  | 3              | 160                               | 36   | 520           | 150                           | 10  |
| Q4227AX                | Q4227AA ①  | Q4227C ①   | 4              | 200                               | 45   | 350           | 150                           | 10  |
| QS4227AX               | QS4227AA ② | QS4227C ②  | 6              | 320                               | 73   | 350           | 150                           | 10  |
| N4327AX                | N4327AA ②  | N4327A ②   | 6              | 600                               | 136  | 350           | 200                           | 14  |
| R4327AX                | R4327AA ②  | R4327A ②   | 8              | 1100                              | 250  | 280           | 175                           | 12  |
| —                      | RS4327AA ② | RS4327A ②  | 10             | 1600                              | 365  | 280           | 125                           | 8.5 |

① 90° ports are standard, opposite ports optional.

② Opposite ports.

③ Cartridge seal.

④ API 682 compliant cartridge seal (Category 1, 2 or 3).

## PUMP FEATURE COMPARISON

|                     |                                                                         | AX | AA | C / A |
|---------------------|-------------------------------------------------------------------------|----|----|-------|
| QUALITY TESTING     | Material Traceability                                                   | ●  | ●  | ●     |
|                     | Weld Maps                                                               | ●  | ●  | ●     |
|                     | Serialized Castings                                                     | ●  | ●  | ●     |
|                     | Welder Certification                                                    | ●  | ●  | ●     |
|                     | Welding Procedure Qualification                                         | ●  | ●  | ●     |
|                     | Post-Weld Heat Treatment                                                | ●  | ●  | ●     |
|                     | Visual Test (VT)                                                        | ●  | ●  | ●     |
|                     | Mag Particle Test (MT)                                                  | ●  | ●  | ●     |
|                     | Dye Penetrant Test (PT)                                                 | ●  | ●  | ●     |
|                     | Hydrostatic Test                                                        | ●  | ●  | ●     |
|                     | Pneumatic Test                                                          | ●  | ●  | ●     |
|                     | PMI                                                                     | ●  | ●  | ●     |
|                     | Ultrasonic Shaft Inspection (UT) Test                                   | ●  | ●  | ●     |
|                     | Certified Performance Test                                              | ●  | ●  | ●     |
| PERFORMANCE TESTING | NPSHr Test                                                              | ●  | ●  | ●     |
|                     | Mechanical Run Test                                                     | ●  | ●  | ●     |
|                     | Sound Pressure Test                                                     | ●  | ●  | ●     |
|                     | Vibration Test                                                          | ●  | ●  | ●     |
|                     | Bearing Temperature Test                                                | ●  | ●  | ●     |
|                     | Pump Unit Test                                                          | ●  | ●  | ●     |
|                     | Visual Inspection, Internals                                            | ●  | ●  | ●     |
|                     | Witnessed Tests                                                         | ●  | ●  | ●     |
|                     | Fully Compliant API-682 Seal                                            | ●  | ●  | ●     |
| DESIGN FEATURES     | Oversized bearings to meet API-676                                      | ●  | ●  | ●     |
|                     | Application specific nameplate                                          | ●  | ●  | ●     |
|                     | O-Ring joint seals                                                      | ●  | ●  | ●     |
|                     | 3mm Corrosion Resistance Thickness                                      | ●  | ●  | ●     |
|                     | Upgraded Fasteners                                                      | ●  | ●  | ●     |
|                     | Foot flatness for improved alignment                                    | ●  | ●  | ●     |
|                     | Class 300 Raised Face Flanges                                           | ●  | ●  | ●     |
|                     | Cast-in Class 300 RF Flanged Drain Connection as standard               | ●  | ●  | ●     |
|                     | Hydrostatic testing to 1.5 x MACP                                       | ●  | ●  | ●     |
|                     | Documentation Package                                                   | ●  | ●  | ●     |
|                     | Designed for 20+ Years service life and 3 Years uninterrupted operation | ●  | ●  | ●     |

● = Standard    ● = Available Option    ● = Not Available

## DOES YOUR API 676 PUMP COMPLY WITH ALL OF THESE?



**IF NOT, IT DOESN'T COMPLY WITH API 676 STANDARDS. ✓**  
**VIKING API 676 PUMPS DO:**

Viking  
Pump Others

- | Viking Pump                         | Others                              |                                                                                                                                                                                                           |
|-------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Materials of Construction – pressure-containing components carbon steel (ASTM A216, Grade WCC) or stainless steel (ASTM A743, Grade CF8M)                                                                 |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Bearing Life – minimum 25,000 hour L-10 life at maximum speed and pressure conditions.                                                                                                                    |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Seal Gland – 4 bolt mount fully compliant API 682 cartridge seals to enable compliance with required seal standards.                                                                                      |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Casing Drain and Seal Chamber Venting Port – enable complete draining of casing before opening pump for maintenance.                                                                                      |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Fasteners have the material grade and manufacturer's identification symbols applied.                                                                                                                      |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | In pressure containing areas, metal at least half the nominal bolt diameter left around drilled and threaded holes. Depth of threaded holes at least 1.5 times stud diameter.                             |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | All threaded openings plugged with long-shank or hex-head, taper-threaded plugs per ASME B16.11.                                                                                                          |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Flanges conform to ASME B16.5 Class 300.                                                                                                                                                                  |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Mounting surfaces (feet) machined to 25 µm (0.001 in.) flatness, with a minimum finish of 6.3 µm (250 µin.) Ra.                                                                                           |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Casing and bracket feet are flat and parallel within 150 µm/m (0.002 in./ft) of distance between them.                                                                                                    |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Upper side of mounting feet are spot faced parallel to the mounting surface for superior alignment.                                                                                                       |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | The casing, head and bracket are designed with an additional 3 mm (0.12 in.) corrosion allowance over and above the casing thickness needed for the maximum allowable casing pressure (MACP).             |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Nameplate – includes item number, serial number, pump size and type, minimum and maximum allowable design limits and rating data, MAWPs and temperatures, hydrostatic test pressures and critical speeds. |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Metal Port Covers – protects pump internals prior to installation.                                                                                                                                        |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Tight shaft tolerances lower vibration: +0.0000 / -.0005 on H-LS sizes; +.0000/ -.0010 on Q-RS sizes.                                                                                                     |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Rectangular keyways transmit more torque because the keyseat is stronger.                                                                                                                                 |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Keyway fillet radii conforming to ASME B17.1 to reduce stress concentration.                                                                                                                              |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Tapered shaft hub on R and larger sizes to reduce the clearances between the shaft and the coupling bore.                                                                                                 |

## WHY SHOULD YOU CHOOSE A VIKING API PUMP?

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### REDUCED RISK OF LEAKAGE

- Static O-ring sealed joints provided improved sealing vs. flat gaskets
- Additional metal thickness around tapped holes at least half the bolt diameter
- Non-Destructive Evaluation of castings to ensure quality
- Lab certified hydrostatic testing to validate integrity of pressure containing parts and seals
- Cast-in casing drain reduces leakage when opening pump or removing for service



### REDUCED RISK OF VOC EMISSIONS

- Fully compliant API 682 seals have established maximum vapor emission rates
- Double seals with API seal plans available to further reduce VOC emissions
- API 682 seal box dimensions enable the use of plant-standard API 682 seals
- Raised face Class 300 flange connections up to 2X API 676 specified forces and moments limits



### REDUCED RISK OF CORROSION FAILURE

- Additional 3mm corrosion allowance over MACP on pressure-containing components
- Other alloys available including 316SS, NACE compliant materials, low temperature carbon steel, alloy 20, etc.
- Pump externals painted with environment-specific paint system
- Unpainted machined surfaces protected with rust preventative before shipping
- Ports covered with gaskets and blind flange covers suitable for long term storage



### REDUCED RISK OF OVERPRESSURE FAILURE

- Average of 80% more metal in full API 676 compliant models than in other equivalent models
- Higher grade metals used in full API 676 compliant models
- High strength fasteners with grade and manufacturer stamp



### REDUCED RISK OF UNPLANNED DOWNTIME

- API 682 Seal designed to operate continuously for 25,000 hours
- Thrust bearings designed for minimum 25,000 hour L-10 life at maximum speeds and pressures
- Lab certified performance testing to validate performance at the customer's conditions of service, reducing the risk of failure at startup
- Operation at relatively lower speeds than screw or centrifugal pumps, extending pump, bearing, and seal life
- Optional hardened parts available for longer life on abrasive service including hard face seals, tungsten carbide bushings, and hardened steel gears, etc.

## TYPICAL LOCATIONS



Offshore Oil Platforms



Oil Terminals



Oil Refineries



Petrochemical Plants

## TYPICAL LIQUIDS

### UPSTREAM

- Light Crude
- Heavy Crude
- Sour Crude
- Naptha (Diluent)
- Feed Stock
- Resid

### MIDSTREAM

- Crude Oil
- Lube Oil
- Fuel Oils (all grades)
- Waxes
- Molten Sulfur
- Natural Gas Liquids
- LPG

### DOWNSTREAM

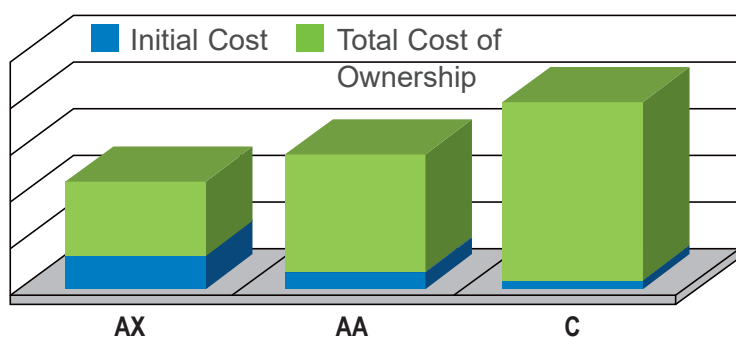
- Basic Chemicals
- Solvents
- Monomers
- Polymers
- Resins
- Asphalt / Bitumen / Pitch

## TYPICAL APPLICATIONS

- Ship and Truck Load & Unloading
- Transfer
- Circulation
- Filtering
- Sampling Pumps

## TOTAL COST OF OWNERSHIP FOR API 676 COMPLIANT PUMPS

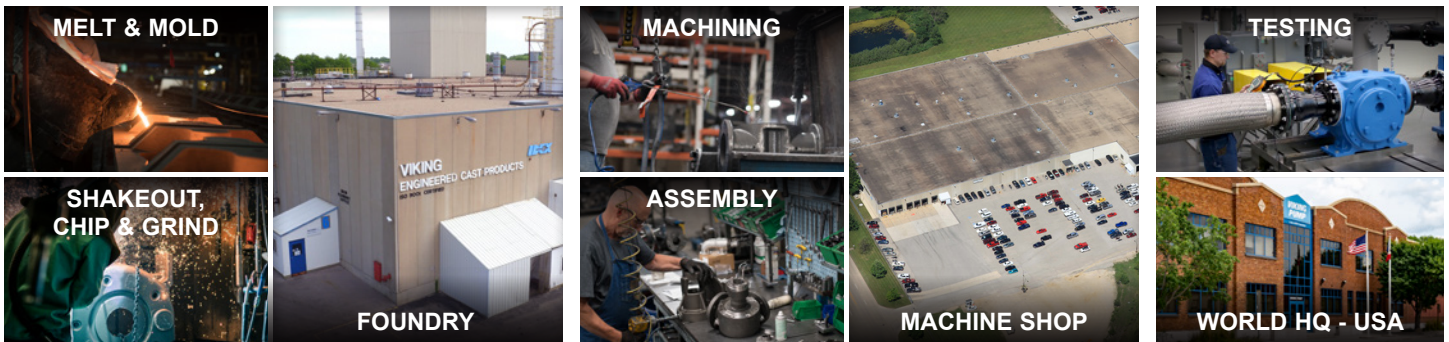
Comparison of 4223AX, AA and C models assuming 10 year operating life (other assumptions listed below)



Initial Cost is only a small part of Total Cost of Ownership. Other components include installation and startup costs, power costs for operation, maintenance costs (parts and labor), cost of lost production due to unplanned downtime, and potentially catastrophic accident and litigation costs. This graph compares Viking's three alternatives for API 676 compliance, and illustrates that the AX models have the lowest Total Cost of Ownership due to their robust design, compared to the AA models and C models.

## VERTICALLY INTEGRATED PRODUCTION PROCESS

Viking Pump operates a foundry, a 250,000+ sq. ft. machining, assembly and testing center, and an extensive product engineering and testing lab in its world headquarters in Cedar Falls, Iowa, USA. This level of vertical integration ensures maximum quality, ability to satisfy special needs, and to meet project schedules.



## LEARN MORE ABOUT VIKING API PUMPS

### LITERATURE

[VIKINGPUMP.COM/DOWNLOADS](http://VIKINGPUMP.COM/DOWNLOADS)

### WEBSITE

[VIKINGPUMP.COM](http://VIKINGPUMP.COM)

### VIDEOS

[VIKINGPUMP.COM/VIKINGTV](http://VIKINGPUMP.COM/VIKINGTV)

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GLOBAL LEADER IN POSITIVE DISPLACEMENT PUMPING SOLUTIONS: Cedar Falls, Iowa, USA | Windsor, Ontario, Canada | Shannon, Ireland | Eastbourne, United Kingdom

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