Pumps for Oil & Gas Upstream Applications
API 610 / ISO 13709:2009
ONSHORE

The world’s main oil & gas deposits are located onshore. As fields with easy accessible oil being depleted, oil production has been shifting to the more remote areas with very challenging climate and environment conditions setting up higher requirements to the pumping equipment.

HMS Group offers the extensive range of pumps for oil production, infield transportation and processing.

BY DESIGN:
— overhung
— horizontal
— vertical
— submersible

BY APPLICATION:
— water injection systems
— process pumps
— auxiliary processes and systems
— drainage

The pumps comply with API 610.

OFFSHORE

Safety and reliability requirements, applied to the pumps operated at the sea platforms, are extremely high as the offshore production and processing are technologically sophisticated processes claimed as serious risks to environment.

On the offshore fields in extreme temperatures the pumps made by the HMS Group provide optimal performance and maximal safety of the processes.

HMS Group offers a wide range of pumps compliant with API 610 for offshore oil production:
— pumps for sea/produced water intake and handling
— process pumps for oil, gas and water handling, multiphase pumps
— high pressure injection pumps
— pumps for auxiliary processes and systems, including firefighting

Pumps for offshore platforms and vessels comply with appropriate NORSOK standards on materials and testing as well as pass the certification at the Russian Maritime Register of Shipping in accordance with 6.5.3 form.
API 610 STANDARD

Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries

High requirements to the pumps design and operating parameters are set by the system of standards and recommendations of the American Petroleum Institute (API).

HMS Group develops and manufactures a full range of pumps compliant with API 610. The pumps are offered in standard design and tailored in accordance with customer requirements. API 610 Standard is identical to ISO 13709:2009 one.

API 610 standard sets requirements to the centrifugal pumps regarding their reliability, safety, service & upgrade procedures as well as increase of the overall operational efficiency of the pumping system.

KEY BENEFITS & ADVANTAGES OF API 610 PUMPS

— Long service life: at least 20 years with at least 3 years of uninterrupted operation

— High pressure casing: minimum rated pressure of 4 000 kPa (40 bar) (600 psi) at 38 °C (100 °F)

— Closed type cast impeller and high rigidity shaft

— Shaft sealing according to API 682

— Flanges according to DIN/ANSI/ISO

— Shaft run-out limited by 0.025 mm

— Replaceable wear rings to reduce wear of casing and axial running clearances

— Vibration limit up to 3.0 mm/s in BEP, up to 3.9 mm/s in the rest of the operating range

— Dynamic balancing of impellers:
  — Single-/two-stage pumps: to ISO 1940-1 grade G1
  — Multistage pumps: flow part – ISO 1940-1 grade G1, rotor – ISO 1940-1 grade G2.5

— Long-life bearings: at least 25000 hours with continuous operation at rated conditions

— Standardized baseplates for the maximal alignment of the pump and drive shafts, as well as for increased reliability of the whole pumping unit. Drain rims to catch and keep all leakage within the baseplate

— Stringent requirements to hydraulic test: pressure shall exceed the maximum admissible working pressure (MAWP) by 1.5
OVERHUNG SINGLE STAGE RADially SPLIT PUMPS
KRH, KRHA, KRHL / KRPO, KRP / KRPH, NK

APPLICATION
— Handling of crude oil, oil products and liquefied gases in upstream processes including offshore
— Pressure boosting
— Water supply (sea and produced water)
— Fuel gas purification

DESIGN FEATURES
— Flanges according to DIN/ANSI/ISO
— Mechanical seals according to API 682
— Optional inducer for lower NPSHa
— Interchangeable impellers for different capacities

- Q = 10...2400 m³/h
- H = 5...350 m
- T = up to 450 °C

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<th>Project</th>
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<th>Features and Application</th>
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<tr>
<td>Edvard Grieg</td>
<td>Q = 27.8 m³/h</td>
<td>KRH–50/350–618/CN pumps</td>
</tr>
<tr>
<td>Customer: Lundin Petroleum</td>
<td>H = 52 m</td>
<td>Application: LDIHP Flare KO Drum Pumps (water &amp; oil)</td>
</tr>
<tr>
<td>Main supplier: Aker Solutions</td>
<td>P = 9.5 kW</td>
<td>Material: super duplex (25% CR)</td>
</tr>
<tr>
<td>Norway, 2013</td>
<td></td>
<td>NORSOK compliance (material and test)</td>
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<tr>
<td>Valemon Platform</td>
<td>Q = 220 m³/h</td>
<td>KRH–150/350–618/CN pumps</td>
</tr>
<tr>
<td>Customer: Statoil</td>
<td>H = 31 m</td>
<td>Application: seawater booster pump</td>
</tr>
<tr>
<td>Main supplier: Technip</td>
<td>P = 26 kW</td>
<td>Material: super duplex (25% CR)</td>
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<td>Norway, 2012</td>
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<td>NORSOK compliance (material and test)</td>
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<tr>
<td>Cendor FPSO</td>
<td>Q = 265 m³/h</td>
<td>KRHA–150/500–709/CN pumps</td>
</tr>
<tr>
<td>Customer: MMHE</td>
<td>H = 100.7 m</td>
<td>Application: seawater injection booster pumps</td>
</tr>
<tr>
<td>Main supplier: Petrofac</td>
<td>P = 100 kW</td>
<td>Material: super duplex (25% CR)</td>
</tr>
<tr>
<td>Malaysia, 2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leninogorskneft oil &amp; gas production facility</td>
<td>Q = 200 m³/h</td>
<td>1HK 200/120-120 pumps</td>
</tr>
<tr>
<td>Customer: Tatneft</td>
<td>H = 120 m</td>
<td>Application: crude oil, oil products pumps for tank farms</td>
</tr>
<tr>
<td>Russia, 2012</td>
<td>P = 45 kW</td>
<td>Material: carbon steel</td>
</tr>
</tbody>
</table>
**APPLICATION**
- Handling of crude oil, oil products and liquefied gases in upstream processes, including offshore
- Pressure boosting
- Gas and gas condensate processing
- Fuel gas purification
- Water supply (sea and produced water)

**DESIGN FEATURES**
- Flanges according to DIN/ANSI/ISO
- Seals according to API 682
- Back-to-Back impellers

Q = 100...950 m³/h  ▶  H = 50...640 m  ▶  T = up to 400 °C

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### Project Parameters

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<tr>
<td>Edvard Grieg</td>
<td>Q = 389 m³/h, H = 337 m, P = 528 kW</td>
<td>ZPR-150/400 pumps&lt;br&gt;Application: SRU feed pumps Deaerated Seawater&lt;br&gt;Material: super duplex (25% CR)&lt;br&gt;NORSOK compliance (material and test)</td>
</tr>
<tr>
<td>Customer: Lundin Petroleum</td>
<td>Main supplier: Siemens Oil&amp;Gas Norway, 2013</td>
<td></td>
</tr>
<tr>
<td>OSX-3 FPSO</td>
<td>Q = 739.7 m³/h, H = 349.1 m, P = 914 kW</td>
<td>KGRD-200/660-508/CN pumps&lt;br&gt;Application: SRU feed pumps Deaerated Seawater&lt;br&gt;Material: super duplex (25% CR)&lt;br&gt;NORSOK compliance (material and test)</td>
</tr>
<tr>
<td>Customer: MODEC</td>
<td>Main supplier: Aker Solutions Brazil, 2012</td>
<td></td>
</tr>
<tr>
<td>Gudrun Platform</td>
<td>Q = 167 m³/h, H = 70.4 m, P = 24 kW</td>
<td>ZPR-150/400 pumps&lt;br&gt;Application: Wet Gas recycling pumps (Hydrocarbon condensate)&lt;br&gt;Material: super duplex (25% CR)&lt;br&gt;NORSOK compliance (material and test)</td>
</tr>
<tr>
<td>Customer: Statoil</td>
<td>Main supplier: AIBEL Norway, 2011</td>
<td></td>
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</table>
MULTISTAGE AXIALLY SPLIT PUMPS
ZMP, NPS

APPLICATION
— Handling of crude oil, oil products and liquefied gases in upstream processes, including offshore
— Water supply (sea and produced water)
— Fuel gas purification

DESIGN FEATURES
— Flanges according to DIN/ANSI/ISO
— Seals according to API 682
— Interchangeable impellers for different capacities

- \( Q = 20 \ldots 240 \text{ m}^3/\text{h} \)
- \( H = 350 \ldots 800 \text{ m} \)
- \( T = \text{up to } 400 \text{ °C} \)

**Project Parameters Features and Application**

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<tr>
<td>Makariel FWKO</td>
<td>( Q = 120 \text{ m}^3/\text{h} )</td>
<td>2NPS 120/65-750 pumps</td>
</tr>
<tr>
<td>Customer: Lukoil</td>
<td>( H = 750 \text{ m} )</td>
<td>Application: handling of produced water</td>
</tr>
<tr>
<td>Russia, 2011</td>
<td>( P = 400 \text{ kW} )</td>
<td>Material: CR 12% steel</td>
</tr>
</tbody>
</table>
MULTISTAGE RADially SPLIT PUMPS
GH, GMHD, HP, GP, HM, CNS, CNSp, CNSz

APPLICATION
— Handling of crude oil, oil products and liquefied gases in upstream processes, including offshore
— Pre-processing of crude oil and gas
— Hot oil injection systems
— Water injection systems (produced & sea water)
— Fuel gas purification

DESIGN FEATURES
— Flanges according to DIN/ANSI/ISO
— Seals according to API 682
— Interchangeable impellers for different capacities
— Back-to-Back or Inline impellers
— Double suction impellers or inducer at the first stage (optional) for lower NPSHa

| Q = 30...1000 m³/h | H = 400...2600 m | T = up to 200 °C |

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<th>Project</th>
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<th>Features and Application</th>
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<tr>
<td>Vankor field Central production facility Customer: Rosneft, Russia, 2012</td>
<td>Q = 163.9 m³/h H = 256.6 m P = 450 kW</td>
<td>NM 180–500 pumps Application: handling of produced water Material: CR 12% steel</td>
</tr>
<tr>
<td>Sever FWKO, Vankor field Customer: Rosneft Russia, 2012</td>
<td>Q = 567 m³/h H = 2000 m P = 5000 kW</td>
<td>CNS 500–1900 pumps Application: water injection pumps (produced water) Material: alloy steel</td>
</tr>
<tr>
<td>Jubilee FPSO Customer: Tullow/MODEC Main supplier: Aker Solutions Ghana, 2009</td>
<td>Q = 536 m³/h H = 335 m P = 677 kW</td>
<td>GMHD-2008/1+3 pumps Application: SRU-Feed-Pumps (Deaerated Seawater) Material: duplex (25% CR) NORSOK compliance (material and test)</td>
</tr>
<tr>
<td>Smart 1 FPSO Customer: Reliance Industries Main supplier: AKER KVAERNER India, 2007</td>
<td>Q = 200 m³/h H = 1076 m P = 682 kW</td>
<td>GPC-100/6 pumps Application: high pressure pumps for crude oil injection Material: alloy steel Features: back-to-back impellers Ambient temperature resistance: -20 °C ... +40 °C</td>
</tr>
</tbody>
</table>
BARREL MULTISTAGE RADially SPLIT PUMPS

TL, TG, NM

APPLICATION
— Handling of crude oil, oil products and liquefied gases in upstream processes, including offshore
— Water Injection systems (produced & sea water)
— Hot oil injection systems

DESIGN FEATURES
— Flanges according to DIN/ANSI/ISO
— Pump dismantling without separating from pipeline
— Seals according to API 682
— Back-to-Back or Inline impellers
— Double suction impeller or inducer at the first stage (optional) for lower NPSHa

- Q = up to 800 m³/h
- H = up to 3700 m
- T = up to 450 °C

### Project Parameters Features and Application

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<td>Gudrun Platform</td>
<td>Q = 40 m³/h</td>
<td>TGC-508/14-708/CN pumps</td>
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<tr>
<td>Customer: Statoil</td>
<td>H = 1315 m</td>
<td>Application: Sand Jetting Water Pump</td>
</tr>
<tr>
<td>Main supplier:</td>
<td>P = 234 kW</td>
<td>(Fresh-Produced Water)</td>
</tr>
<tr>
<td>AIBEL</td>
<td></td>
<td>Material: duplex (22% CR) Features: back-to-back impellers</td>
</tr>
<tr>
<td>Norway, 2012</td>
<td></td>
<td>NORSOK compliance (material and test)</td>
</tr>
</tbody>
</table>
VERTICALLY SUSPENDED SEMISUBMERSIBLE SINGLE / DOUBLE CASING MULTISTAGE PUMPS WITH DIFFUSERS

HPTV, GSTV / GLKV, HPVX, NPV, NV-M

APPLICATION

— Transportation of crude oil, oil products and liquefied gases
— Pressure boosting

DESIGN FEATURES

— Flanges according to DIN/ANSI/ISO
— Seals according to API 682
— Single/double suction impellers
— Double suction impeller or inducer in the first stage (optional) for lower NPSHa)

\[ Q = \text{up to 3000 m}^3/\text{h} \quad H = \text{up to 1400 m} \quad T = \text{up to 300 °C} \]

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**Project**  |  **Parameters**  |  **Features and Application**
---|---|---
**Troll A Platform**  
Customer: Statoil  
Main supplier: AIBEL  
Norway, 2013  |  \( Q = 350 \text{ m}^3/\text{h} \)  
\( H = 177.5 \text{ m} \)  
\( P = 240 \text{ kW} \)  |  HPTV-150/2-618/CN pumps  
Application: Chlorinated Seawater Utility Pump  
Material: superduplex (25% CR)  
NORSOK compliance (material and test)

**Valemon Platform**  
Customer: Statoil  
Main supplier: Technip  
Malaysia, 2012  |  \( Q = 15 \text{ m}^3/\text{h} \)  
\( H = 40.5 \text{ m} \)  
\( P = 3.7 \text{ kW} \)  |  GMV-40/2-618/CN-2330 pumps  
Application: Hazardous Open Drain Transfer Pump (Oily Water)  
Material: duplex (22% CR)  
NORSOK compliance (material and test)

**EKOFISK Platform**  
Customer: Conoco Phillips  
Main supplier: Aker Solutions  
Norway, 2012  |  \( Q = 50 \text{ m}^3/\text{h} \)  
\( H = 201 \text{ m} \)  
\( P = 42 \text{ kW} \)  |  HPTV-80C/7-708/CN-1300 pumps  
Application: Flare K.O. Pumps  
Material: duplex (22% CR)  
NORSOK compliance (welding, test and fabrication)

**Degassing Station, Tuba field**  
Customer: Lukoil Overseas  
Main supplier: VN-Pumpen GmbH  
Iraq, 2012  |  \( Q = 350 \text{ m}^3/\text{h} \)  
\( H = 76.7 \text{ m} \)  
\( P = 99.4 \text{ kW} \)  |  GLKV-150C/3-508/CN pumps  
Application: Crude Oil Transfer Pump  
Material: 12% CR (C6) steel
# MATERIAL CLASS SELECTION FOR PUMP PARTS ACCORDING TO API 610 11TH ED.

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<th>Pump parts</th>
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<td>I-1</td>
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<tr>
<td>Casing</td>
<td>Cast iron</td>
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<tr>
<td>Inner casing parts</td>
<td>Cast iron</td>
</tr>
<tr>
<td>Shaft</td>
<td>Carbon steel</td>
</tr>
<tr>
<td>Impeller</td>
<td>Cast iron</td>
</tr>
</tbody>
</table>

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<td></td>
<td>S-8</td>
</tr>
<tr>
<td>Casing</td>
<td>Carbon steel</td>
</tr>
<tr>
<td>Inner casing parts</td>
<td>316 AUS</td>
</tr>
<tr>
<td>Shaft</td>
<td>316 AUS</td>
</tr>
<tr>
<td>Impeller</td>
<td>316 AUS</td>
</tr>
</tbody>
</table>

## SCOPE OF SUPPLY

- **Pump** according to API 610
- **Drive**: electric motor from SIEMENS, ABB, ELSIB and other manufacturers
- **Bearings** from the leading manufacturers
- **Shaft sealing**: stuffing box, single and double mechanical seals from John Crane, EagleBurgmann, Aesseal, TREM
- **Sensors**, auxiliary systems
- **Optional**: fluid couplings and frequency invertors from Voith, ABB, Siemens and other manufacturers
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