Pumps for Pipelines and Transportation
API 610 / ISO 13709:2009
Midstream

The main volume of the oil transit accounts for the pipeline transport. Around 97% of produced oil is pumped through the oil-trunk pipeline system.

For the oil pipeline equipment higher requirements are set in regards of the pipelines safety, ecological compatibility of applied technologies and solutions, including high corrosion protection and temperature drop resistance.

HMS Group offers state-of-the-art API 610 (11th edition) pumping equipment for infield, interfield and trunk transport of crude oil and oil products:

- **Trunk pumps** for crude oil and oil products transportation by the pipelines
- **Booster pumps** for supply of crude oil and oil products to the trunk pumps inlets to ensure their cavitation-free operation
- **Pumps for handling crude oil/oil products spills** and supply into the inlet pipeline of the oil pumping station
- **Loading/Unloading pumps for tank farms and storages** of crude oil and oil products
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
SINGLE-/DOUBLE-STAGE AXIALLY SPLIT DOUBLE SUCTION PUMPS
ZMK / ZKMV, NM, NGPN-M, NCN-E

APPLICATION
— Transportation of crude oil and oil products
— Pressure boosting
— Oil supply from buffer tanks and vessels into trunk pipelines

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

- Q = 80...12500 m³/h
- H = 20...380 m
- T = up to 150 °C

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<tr>
<th>Project</th>
<th>Parameters</th>
<th>Features and Application</th>
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<tr>
<td>ESPO-1 Pipeline System</td>
<td>Q = 10000 m³/h</td>
<td>Trunk pumps NM 10000-380 series</td>
</tr>
<tr>
<td>Customer: Transneft Russia, 2012</td>
<td>H = 380 m</td>
<td>Application: crude oil transportation</td>
</tr>
<tr>
<td></td>
<td>P = 11 MW</td>
<td>Options: frequency invertors/ fluid couplings;</td>
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<tr>
<td></td>
<td></td>
<td>interchangeable rotors</td>
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<tr>
<td></td>
<td></td>
<td>Material: alloy steel</td>
</tr>
<tr>
<td>ESPO-2 Pipeline System</td>
<td>Q = 10000 m³/h</td>
<td>Trunk pumps NM 10000-250 series</td>
</tr>
<tr>
<td>Customer: Transneft Russia, 2012</td>
<td>H = 250 m</td>
<td>Application: crude oil transportation</td>
</tr>
<tr>
<td></td>
<td>P = 8 MW</td>
<td>Options: frequency invertors; interchangeable rotors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Material: alloy steel</td>
</tr>
<tr>
<td>Baltic Pipeline System</td>
<td>Q = 4000 m³/h</td>
<td>Booster pumps NGPN-M 4000-125 series</td>
</tr>
<tr>
<td>Customer: Transneft Russia, 2012</td>
<td>H = 125 m</td>
<td>Application: crude oil supply to main trunk pumps</td>
</tr>
<tr>
<td></td>
<td>P = 1.6 MW</td>
<td>Options: oil bath lubricated bearings</td>
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<tr>
<td></td>
<td></td>
<td>Material: alloy steel</td>
</tr>
<tr>
<td>Purpe-Samotlor Pipeline System</td>
<td>Q = 700 m³/h</td>
<td>Trunk pumps NM 7000-250 series</td>
</tr>
<tr>
<td>Customer: Transneft Russia, 2011</td>
<td>H = 250 m</td>
<td>Application: crude oil transportation</td>
</tr>
<tr>
<td></td>
<td>P = 5.5 MW</td>
<td>Options: frequency invertors; double mechanical seals</td>
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<tr>
<td></td>
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<td>Material: alloy steel</td>
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</table>
**SINGLE-/TWO-STAGE DOUBLE SUCTION RADIALLY SPLIT PUMPS**

**ZPR, KGR / KGRD**

**APPLICATION**
- Transportation of crude oil, oil products and liquefied gases
- Pressure boosting
- Tank farm oil pumping

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

- $Q = 100...950 \text{ m}^3/\text{h}$
- $H = 50...640 \text{ m}$
- $T = \text{up to } 400 ^\circ C$

![Graph showing performance characteristics of pumps](image-url)
MULTISTAGE AXIALLY SPLIT PUMPS

ZMP, NPS

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
- Interchangeable impellers for different capacities

- $Q = 20...240 \text{ m}^3/\text{h}$
- $H = 350...800 \text{ m}$
- $T = \text{up to } 400 \text{ °C}$
MULTISTAGE RADIALY SPLIT PUMPS
GH, GMHD, HP, GP, NM, CNSh

APPLICATION
- Transportation of crude oil and oil products
- Pressure boosting

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

- \( Q = 30 \ldots 1000 \text{ m}^3/\text{h} \)
- \( H = 400 \ldots 2600 \text{ m} \)
- \( T = \text{up to } 200 \degree \text{C} \)

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<tr>
<td>ESPO-1 Pipeline System</td>
<td>( Q = 500 \text{ m}^3/\text{h} )  ( H = 560 \text{ m} )  ( P = 1.6 \text{ MW} )</td>
<td>NM 500–560 pumps Application: crude oil handling within portable oil pumping station Material: alloy steel</td>
</tr>
<tr>
<td>Customer: Transneft</td>
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<tr>
<td>Russia, 2010</td>
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<tr>
<td>Vankor oil and gas field</td>
<td>( Q = 315 \text{ m}^3/\text{h} )  ( H = 630 \text{ m} )  ( P = 665 \text{ kW} )</td>
<td>CNSp 315–630 pumps Application: crude oil handling Material: CR 12% steel</td>
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<tr>
<td>Customer: Rosneft</td>
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<td>Russia, 2007</td>
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</tbody>
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BARREL MULTISTAGE RADIA'LLY SPLIT PUMPS

TL, TG, NM

APPLICATION
— Transportation of crude oil and oil products
— Pressure boosting

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

- $Q = \text{up to 800 m}^3/\text{h}$  
- $H = \text{up to 3700 m}$  
- $T = \text{up to 450 °C}$

### Project Parameters

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<td>Cherkassy linear operating</td>
<td>$Q = 500 \text{ m}^3/\text{h}$</td>
<td>Trunk pumps NM 500–800 series</td>
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<tr>
<td>dispatcher station</td>
<td>$H = 800 \text{ m}$</td>
<td><strong>Application</strong>: oil products handling</td>
</tr>
<tr>
<td>Customer: Transneft</td>
<td>$P = 1.6 \text{ MW}$</td>
<td><strong>Material</strong>: alloy steel</td>
</tr>
<tr>
<td>Russia, 1990–2012</td>
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<tr>
<td>Perm Regional office</td>
<td>$Q = 500 \text{ m}^3/\text{h}$</td>
<td>Trunk pumps NM 500–800 series</td>
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<tr>
<td>Customer: Lukoil</td>
<td>$H = 800 \text{ m}$</td>
<td><strong>Application</strong>: diesel fuel handling</td>
</tr>
<tr>
<td>Russia, 2002–2009</td>
<td>$P = 1.6 \text{ MW}$</td>
<td><strong>Material</strong>: alloy steel</td>
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**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

- \( Q = \text{up to} \ 3000 \ \text{m}^3/\text{h} \)
- \( H = \text{up to} \ 1400 \ \text{m} \)
- \( T = \text{up to} \ 300 ^\circ \text{C} \)

### Project Parameters and Application

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<tr>
<th>Project</th>
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<th>Features and Application</th>
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</table>
| **ESPO Pipeline System – Khabarovsk Oil Refinery**  
Customer: NK Alliance  
Russia, 2013 | \( Q = 50 \ \text{m}^3/\text{h} \)  
\( H = 80 \ \text{m} \)  
\( P = 30 \ \text{kW} \) | NV-Mv-E 50–80 pumps  
Application: oil product pumping from tanks (highly flammable liquid)  
Material: alloy steel |
| **Oil products storage tank farm**  
Customer: Rosneft  
Russia, 2012 | \( Q = 50 \ \text{m}^3/\text{h} \)  
\( H = 50 \ \text{m} \)  
\( P = 18.5 \ \text{kW} \) | NVM 50–50 pumps  
Application: oil product pumping from tanks  
Material: alloy steel |
| **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 handling  
Material: CR 12 % steel |
MATERIAL CLASS SELECTION FOR PUMP PARTS ACCORDING TO API 610 11TH ED.

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<td>I-1</td>
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<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>
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<td>S-8</td>
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<tr>
<td>Casing</td>
<td>Carbon steel</td>
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<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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