



Engineering Flow Solutions

## PUMPS FOR OIL & GAS MIDSTREAM ANSI/API STANDARD 610 (ISO 13709:2009)









HMS Group offers an extensive range of state-of-the-art pumps for transportation of liquid hydrocarbons such as crude oil, petroleum products, natural gas condensate and other liquids via pipelines and other ways of transport:

- **Trunk pumps** for mainline and service pipelines
- **Booster pumps** for cavitation-free operation of the trunk pumps
- **Sump pumps** for controlled spills, leaks, and drains supply back into the pipelines or to the storage tanks
- **Loading/unloading pumps** for tank farms, shipping and rail terminals, and storage facilities

The pumps are designed and manufactured in compliance with API 610 standard of 11<sup>th</sup> edition and other international and national industry standards as ISO, DIN, ANSI, ASME, NORSOK, NACE.

Engineering of pumps is performed by own R&D centers of HMS Group located in Russia, CIS and Europe with centralized management and application of the latest 3D design software based on SolidWorks, ANSYS CFX and other platforms.

Production of pumps and pumping systems is carried out at the major pumps manufacturing companies of HMS Group: APOLLO Goessnitz (Germany), HMS Livgidromash (Russia) and Bobruisk Machine Building Plant (Belarus).

The pumps supplied by HMS Group are successfully operated within years at large midstream facilities in Russia, Europe, Middle East, Africa, and Asia.

# API 610 STANDARD

## CENTRIFUGAL PUMPS FOR PETROLEUM, PETROCHEMICAL AND NATURAL GAS INDUSTRIES

API 610 standard, being identical to ISO 13709:2009 one, sets the requirements to centrifugal pumps regarding their reliability, safety, service & retrofit procedures as well as overall operation efficiency of the pumping system in general.

### API 610 PUMPS BENEFITS & ADVANTAGES

- Service life: at least 20 years with at least 3 years of uninterrupted operation
- Pressure casing: minimum rated pressure of 4,000 kPa (40 bar/ 600 psi) at 38 °C (100 °F)
- Closed type cast impellers and high rigidity shaft
- Shaft seals according to API 682
- Flanges according to ASME/ANSI/DIN/EN
- Shaft run-out limited by 0.025 mm
- Replaceable wear rings to reduce wear of casing and axial running clearances
- Vibration limit below 3.0 mm/sec in the best efficiency point, below 3.9 mm/sec in the rest of the operating range
- Dynamic balancing of impellers:
  - Single-/two-stage pumps: ISO 1940-1 grade G1
  - Multistage pumps: flow part – ISO 1940-1 grade G1, rotor – ISO 1940-1 grade G2.5
- Bearings units lifetime: at least 25,000 hours with continuous operation at rated conditions
- Standard API-compliant baseplates for maximal alignment of pump and drive shafts to increase overall reliability of the pumping unit; the drain rims shall be provided to keep all leakages within the baseplate
- Stringent requirements to hydraulic test: pressure shall exceed the maximum allowed working pressure (MAWP) by 1.5
- External nozzles loads and moments in full compliance with API 610 11th edition requirements



BB1



BB2



BB3



BB4



BB5

VS1  
VS6

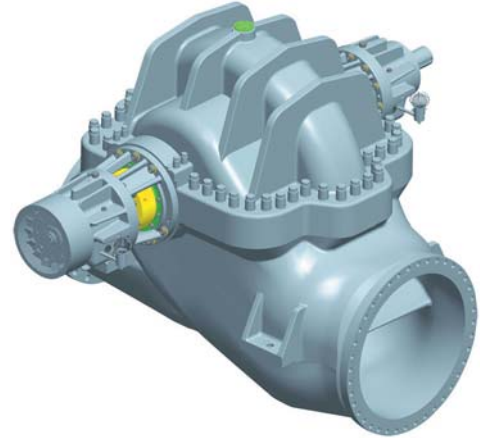
## AXIALLY SPLIT, ONE- AND TWO-STAGE, BETWEEN-BEARINGS PUMPS

# BB1

**PUMP SERIES: ZMK/ZKMV, ND, NM, NGPN-M, NCN-E**

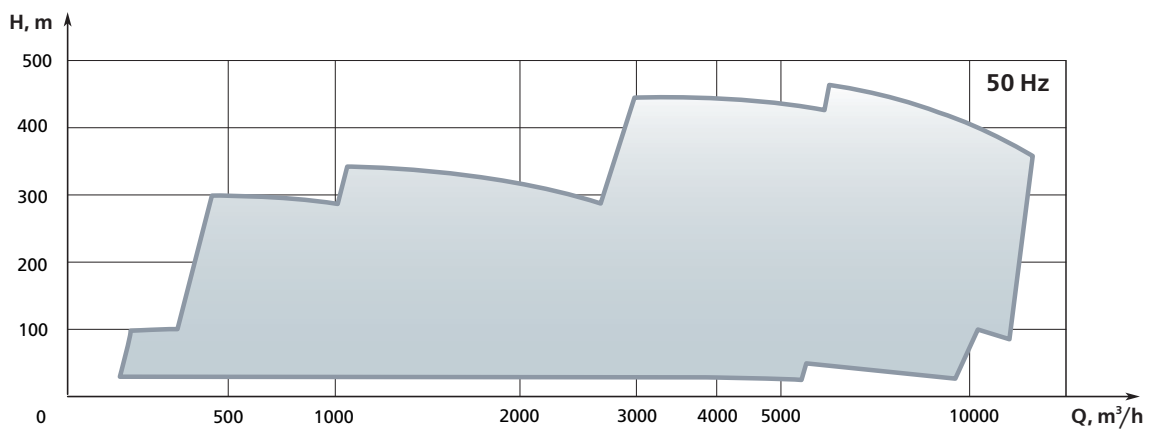
### APPLICATION

- Transportation of crude oil and petroleum products
- Pressure boosting
- Oil supply from buffer tanks and vessels into trunk pipelines
- Handling petroleum products at depots and terminals



### DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN or welded connection
  - Seals according to API 682
  - Horizontal or vertical installation
  - Interchangeable impellers for different capacities
- Q: 80 ... 12,500 m<sup>3</sup>/h ■ H: 20 ... 460 m ■ T: -80 ... +150 °C



Selected Projects Examples	Parameters	Application & Features
<b>South-West Trunk Pipelines</b> Customer: Transneft Russia, 2015	Q: up to 3,600 m <sup>3</sup> /h H: up to 230 m	<b>Application:</b> transportation of light oil products via trunk pipelines <b>Features:</b> stainless steel pumps material
<b>Urals &amp; Siberian Trunk Pipelines</b> Customer: Transneft Russia, 2014	Q: up to 1,700 m <sup>3</sup> /h H: up to 300 m	<b>Application:</b> crude oil transportation via trunk pipelines <b>Features:</b> stainless steel pumps material
<b>ESPO-1 Trunk Pipeline</b> Customer: Transneft Russia, 2014	Q: 12,000 m <sup>3</sup> /h H: 360 m	<b>Application:</b> crude oil transportation <b>Features:</b> maximum pumps pressure up to 100 bar; variable frequency drives (VFD), interchangeable rotors and flow paths

# RADIALLY SPLIT, ONE- AND TWO-STAGE, BETWEEN-BEARINGS PUMPS

# BB2

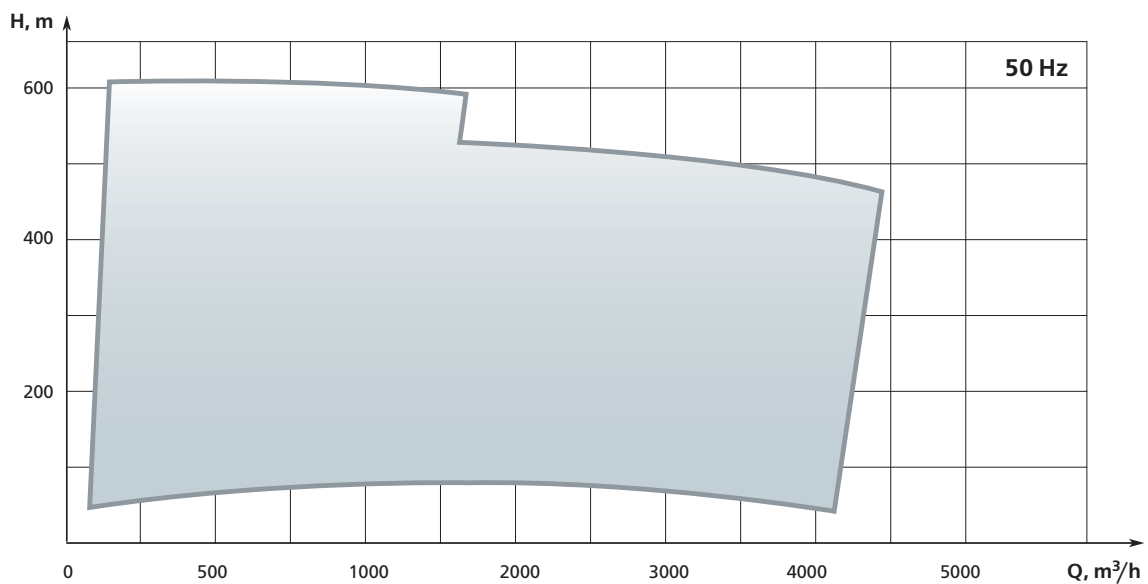
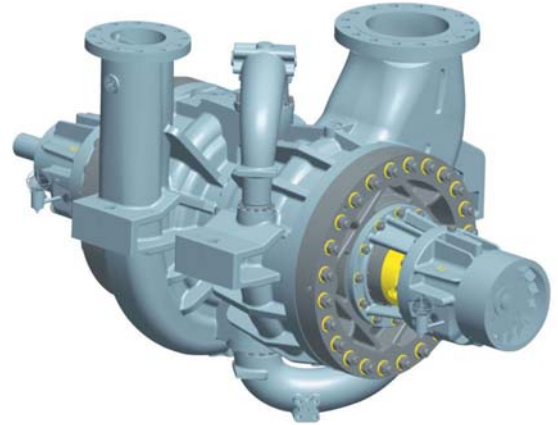
## PUMP SERIES: ZPR/ZPRA, KGR/KGRD

### APPLICATION

- Transportation of crude oil, petroleum products, gas condensate and liquefied gases
- Pressure boosting
- Handling petroleum products at depots and terminals

### DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
  - Seals according to API 682
  - Back-to-back impellers or single double entry impeller
- Q: 3 ... 4,000 m<sup>3</sup>/h   ■ H: 25 ... 600 m   ■ T: -80 ... +450 °C



Selected Projects Examples	Parameters	Application & Features
<b>Gudrun Oil &amp; Gas Field (Offshore)</b> Customer: Delta-p/AIBEL Norway, 2011	Q: 167 m <sup>3</sup> /h H: 70 m	<b>Application:</b> in-process transfer of hydrocarbon condensate at floating production, storage and offloading vessel

## AXIALLY SPLIT, MULTISTAGE, BETWEEN-BEARINGS PUMPS

### PUMP SERIES: AMG/NPS

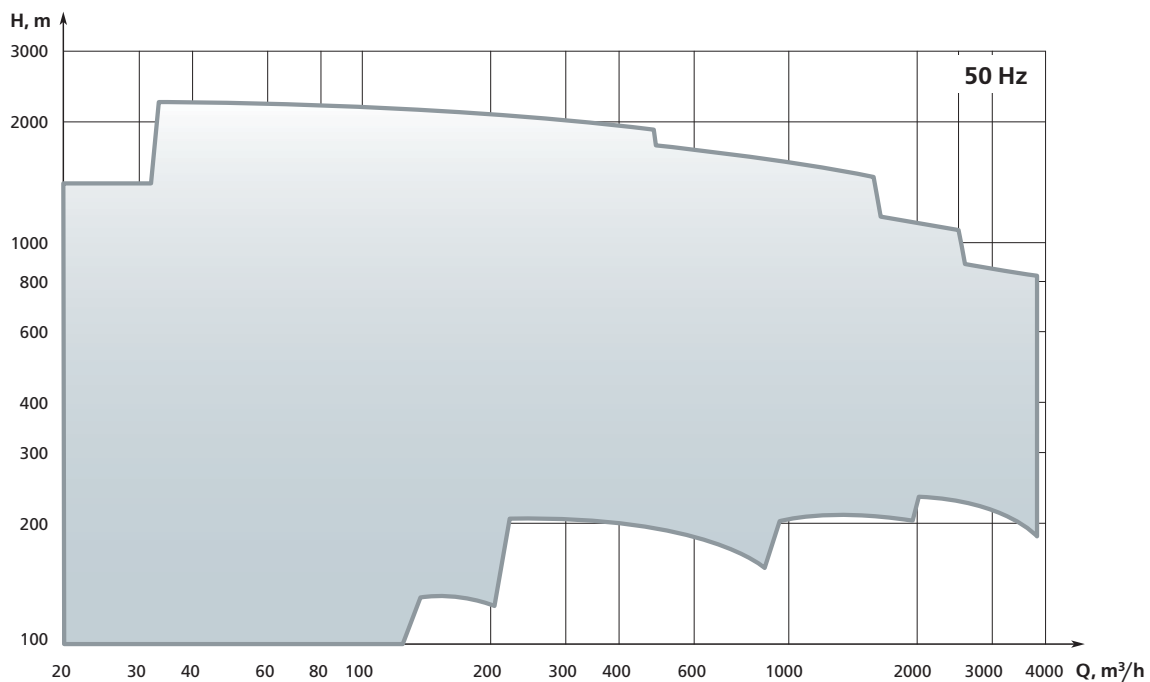
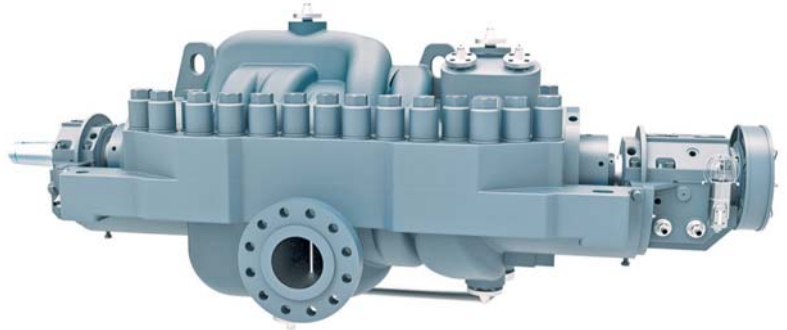
#### APPLICATION

- Transportation of crude oil, petroleum products, gas condensate, and liquefied gases
- Pressure boosting

#### DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
- Seals according to API 682
- Interchangeable impellers for different capacities
- Back-to-back arranged impellers

- Q: 32 ... 3,700 m<sup>3</sup>/h
- H: 150 ... 1,900 m
- T: -80 ... +250 °C



Selected Projects Examples	Parameters	Application & Features
<b>Gas Condensate Stabilization Unit</b> Customer: Gazprom Russia, 2016	Q: 200 m <sup>3</sup> /h H: 700 m	<b>Application:</b> transportation of deethanized gas condensate off the treatment process <b>Features:</b> 12% chromium steel pumps material
<b>Sheskharis Oil Onshore Terminal</b> Customer: Transneft Russia, 2015	Q: 65 m <sup>3</sup> /h H: 500 m	<b>Application:</b> transportation of commercial oil at tank farm handling operations <b>Features:</b> carbon steel pumps material
<b>Krotovka Railway Oil Terminal</b> Customer: Transneft Russia, 2014	Q: 200 m <sup>3</sup> /h H: 700 m	<b>Application:</b> handling of stored commercial oil mixture with water at recuperation process <b>Features:</b> carbon steel pumps material

# SINGLE-CASING, RADIALLY SPLIT, MULTISTAGE, BETWEEN-BEARINGS PUMPS

# BB4

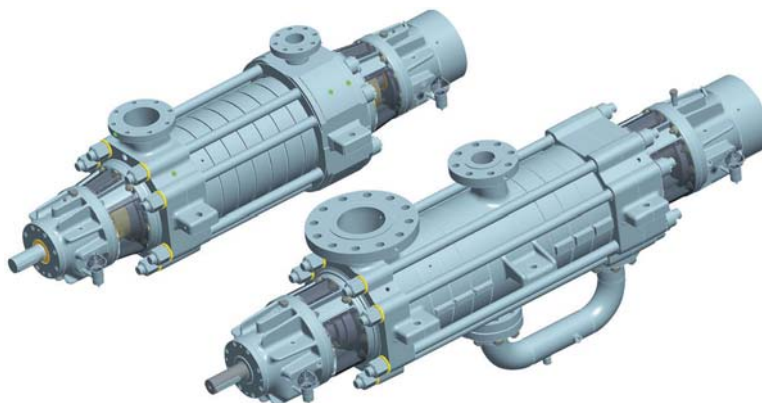
## PUMP SERIES: HP/GP, GH, GMHD, NM, CNSn

### APPLICATION

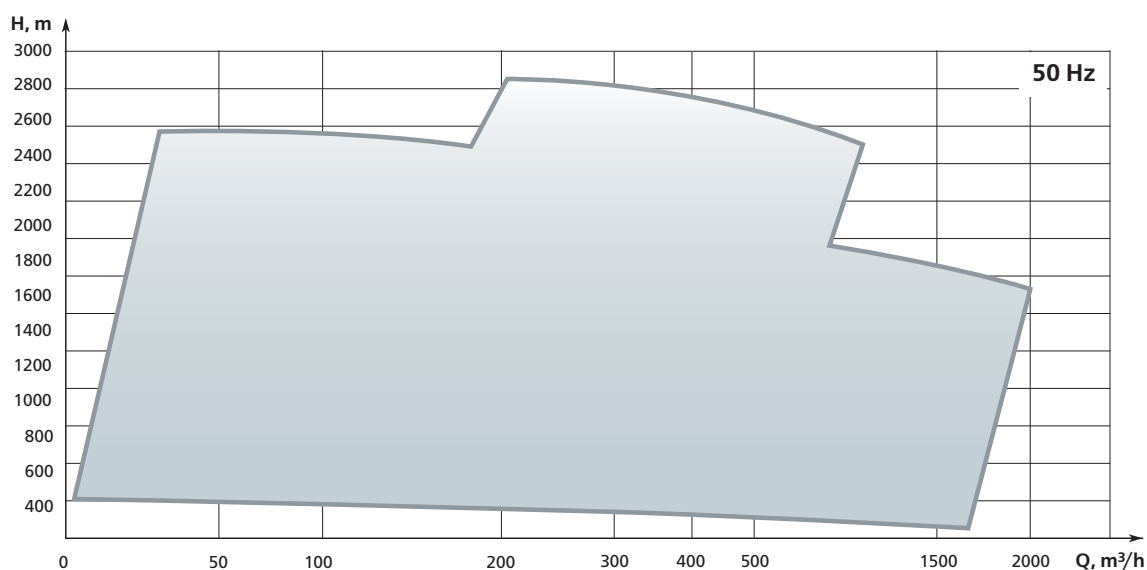
- Transportation of crude oil and petroleum products
- Pressure boosting

### DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
- 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: 10 ... 1,400 m<sup>3</sup>/h
- H: 80 ... 2,800 m
- T: -80 ... +200 °C



Selected Projects Examples	Parameters	Application & Features
<b>Yarudeiskoye Oil Field</b> Customer: Yargeo/NOVATEK Russia, 2016	Q: 180 m <sup>3</sup> /h H: 1,050 m	<b>Application:</b> transportation of crude oil and gas condensate within and outside the field <b>Features:</b> corrosion-resistant steel pumps material, back-to-back impellers, double mechanical seals
<b>ESPO-1 Trunk Pipeline</b> Customer: Transneft Russia, 2010	Q: 500 m <sup>3</sup> /h H: 560 m	<b>Application:</b> crude oil transportation in a emergency back-up pumping station <b>Features:</b> diesel-driven pumping units with autonomous power supply of all systems
<b>Vankor Oil, Gas &amp; Condensate Field</b> Customer: Rosneft Russia, 2007	Q: 315 m <sup>3</sup> /h H: 630 m	<b>Application:</b> crude oil transportation within and outside the field <b>Features:</b> 12% chromium steel pumps material



# DOUBLE-CASING, RADIALLY SPLIT, MULTISTAGE, BETWEEN-BEARINGS PUMPS

# BB5

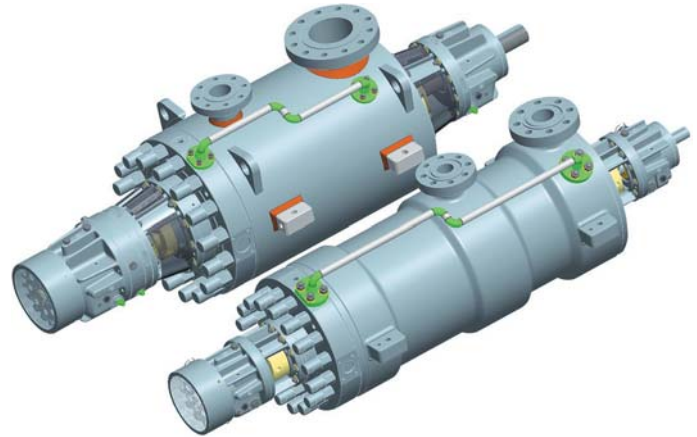
## PUMP SERIES: TL/TG, NM, TGX/TGDX, CNSDp

### APPLICATION

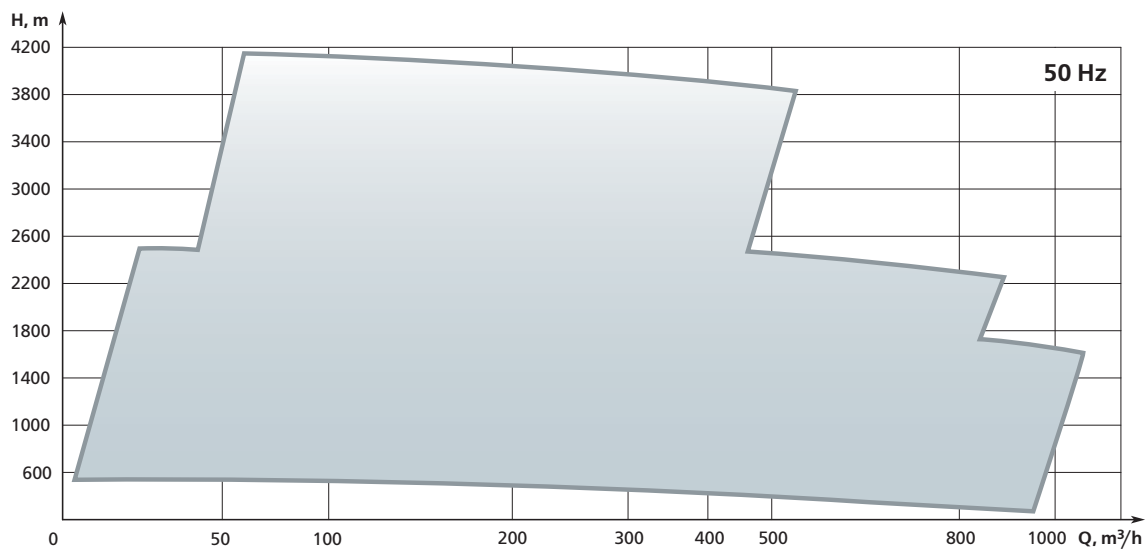
- Transportation of crude oil and petroleum products
- Pressure boosting

### DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
- Pump dismantling without separating off the 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: 8 ... 1,000 m<sup>3</sup>/h
- H: 180 ... 4,200 m
- T: -80 ... +450 °C



Selected Projects Examples	Parameters	Application & Features
<b>Cape Three Point Oil &amp; Gas Fields (Offshore)</b> Customer: Delta-p/ENI/Kanfa Ghana, 2015	Q: 300 m <sup>3</sup> /h H: 740 m	<b>Application:</b> transportation of diesel fuel at floating production, storage and offloading vessel operations <b>Features:</b> alloy steel pumps material
<b>Cherkassy Linear Operating Dispatcher Station</b> Customer: Transneft Russia, 2012	Q: 500 m <sup>3</sup> /h H: 800 m	<b>Application:</b> transportation of petroleum products via trunk pipeline <b>Features:</b> alloy steel pumps material
<b>Perm-Andreevka Oil Products Pipeline</b> Customer: LUKOIL Russia, 2008 - 2009	Q: 500 m <sup>3</sup> /h H: 800 m	<b>Application:</b> transportation of diesel fuel and petroleum product from oil refinery to a trunk pipeline <b>Features:</b> alloy steel pumps material

## SINGLE- AND DOUBLE-CASING, DIFFUSER, VERTICALLY SUSPENDED PUMPS

# VS1, VS6

**PUMP SERIES: HPV/HPTV/HPVX, GSTV/GLKV, GDV/GDTV, NOU, NPV/NPV-M, NMV**

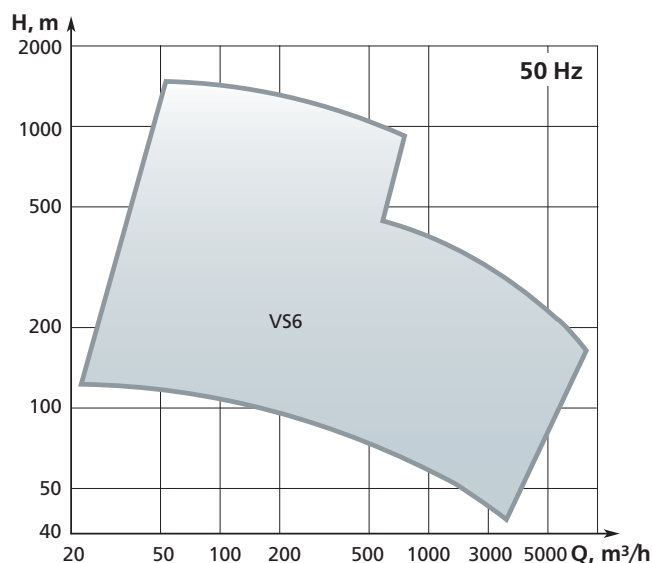
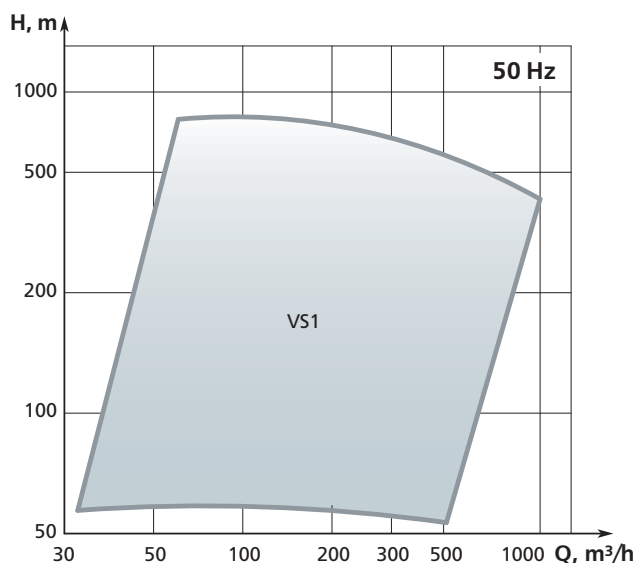
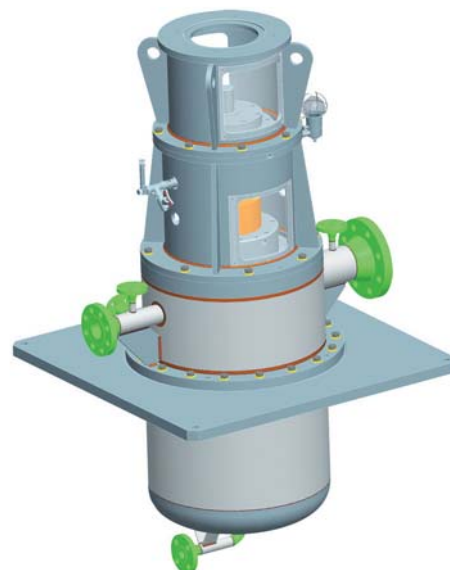
### APPLICATION

- Transportation of crude oil, petroleum products, gas condensate, and liquefied gases
- Pressure boosting

### DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
- Seals according to API 682
- Single/double suction impellers
- Double suction impeller or inducer at the first stage (optional) for lower NPSHa

- Q: 6 ... 5,000 m<sup>3</sup>/h
- H: 6 ... 1,600 m
- T: -180 ... +260 °C



Selected Projects Examples	Parameters	Application & Features
<b>Moscow Ring Oil Products Pipeline</b> Customer: Transneft Russia, 2016	Q: up to 350 m <sup>3</sup> /h H: up to 524 m	<b>Application:</b> transportation of jet fuel, gasoline, and diesel fuel <b>Features:</b> stainless steel pumps material; pumps designed for outdoor operation within -60 ... +40 °C environment temperature
<b>Central Processing &amp; Storage Facility</b> Customer: Dragon Oil Turkmenistan, 2014	Q: 40 m <sup>3</sup> /h H: 87.55 m	<b>Application:</b> transportation of condensate, process water and crude oil between process and storage facilities <b>Features:</b> pumps in a double-casing (can-type) version
<b>Tuba Oil Field Degassing Station</b> Customer: LUKOIL Iraq, 2012	Q: 350 m <sup>3</sup> /h H: 76.7 m	<b>Application:</b> transportation of crude oil between process facilities and tank farms <b>Features:</b> pumps in a double-casing (can-type) version

## MATERIAL CLASSES FOR PUMP PARTS ACCORDING TO API 610 11<sup>TH</sup> EDITION

Pump Parts	Materials Classes						
	I-1	I-2	S-1	S-3	S-4	S-5	S-6
Casing	Cast iron	Cast iron	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel
Inner Casing Parts	Cast iron	Bronze	Cast iron	Ni-Resist	Cast iron	Carbon steel	12 % CR
Shaft	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	4140 alloy steel	4140 alloy steel
Impeller	Cast iron	Bronze	Cast iron	Ni-Resist	Carbon steel	Carbon steel	12 % CR

Pump Parts	Materials Classes						
	S-8	S-9	C-6	A-7	A-8	D-1	D-2
Casing	Carbon steel	Carbon steel	12 % CR	AUS	316 AUS	Duplex	Super Duplex
Inner Casing Parts	316 AUS	Ni-Cu alloy	12 % CR	AUS	316 AUS	Duplex	Super Duplex
Shaft	316 AUS	Ni-Cu alloy	12 % CR	AUS	316 AUS	Duplex	Super Duplex
Impeller	316 AUS	Ni-Cu alloy	12 % CR	AUS	316 AUS	Duplex	Super Duplex

### SCOPE OF SUPPLY\*

- Pump according to API 610 with coupling and counter flanges
- Drive: electric motor by SIEMENS, ABB or customer-approved manufacturer
- API 682 compliant shaft seals with specified flushing plans
- Sensors, automation and instrumentation as required
- First fill lubrication, grease, etc.
- Spare parts & tools for installation, commissioning, operation, and maintenance
- Auxiliary piping, bolts, nuts, washers, gaskets

\* The scope of supply is the subject to specific supply conditions

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