Engineering Flow Solutions

Pumps for Oil & Gas Upstream Applications

API 610 / ISO 13709:2009




Upstream


TROLL A
31/6 STATOIL

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 of 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

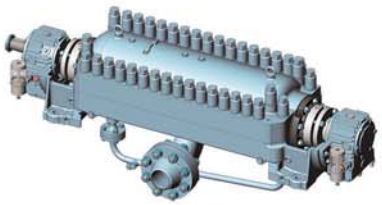
High requirements to the pumps design and operating parameters are set by the system of standards and recommendations of the American Petroleum Institute (API).

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.

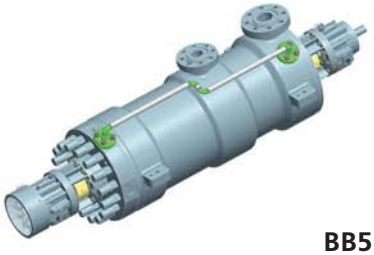
OH1, OH2

BB2



BB3

BB4



BB5

VS6

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

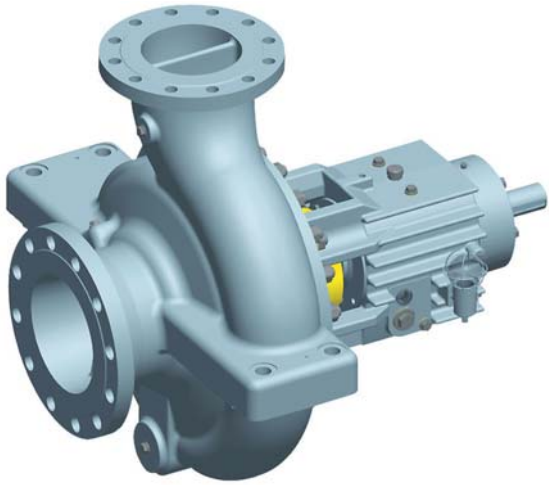
OVERHUNG SINGLE STAGE RADIALLY SPLIT PUMPS

OH1, OH2

KRH, KRHA, KRHL / KRPO, KRP / KRPH, NK

APPLICATION

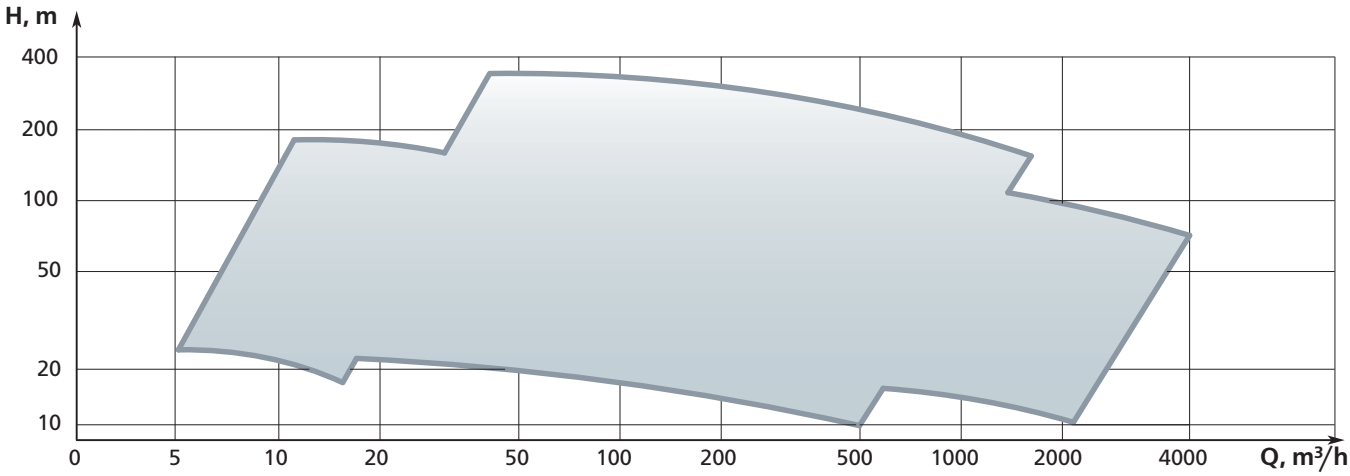
- Handling of crude oil, oil products and liquefied gases in upstream processes including offshore
- Pressure boosting
- Water supply (sea and produced water)
- Fuel gas purification



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



Project	Parameters	Features and Application
Edvard Grieg Customer: **Lundin Petroleum** Main supplier: **Aker Solutions** Norway, 2013	**Q** = 27.8 m³/h **H** = 52 m **P** = 9.5 kW	**KRH-50/350-618/CN** pumps **Application:** LDIHP Flare KO Drum Pumps (water & oil) **Material:** super duplex (25% CR) **NORSOK** compliance (material and test)
Valemon Platform Customer: **Statoil** Main supplier: **Technip** Norway, 2012	**Q** = 220 m³/h **H** = 31 m **P** = 26 kW	**KRH-150/350-618/CN** pumps **Application:** seawater booster pump **Material:** super duplex (25% CR) **NORSOK** compliance (material and test)
Cendor FPSO Customer: **MMHE** Main supplier: **Petrofac** Malaysia 2012	**Q** = 265 m³/h **H** = 100.7 m **P** = 100 kW	**KRHA-150/500-709/CN** pumps **Application:** seawater injection booster pumps **Material:** super duplex (25% CR)
Leninogorskneft oil & gas production facility Customer: **Tatneft** Russia, 2012	**Q** = 200 m³/h **H** = 120 m **P** = 45 kW	**1HK 200/120-120** pumps **Application:** crude oil, oil products pumps for tank farms **Material:** carbon steel

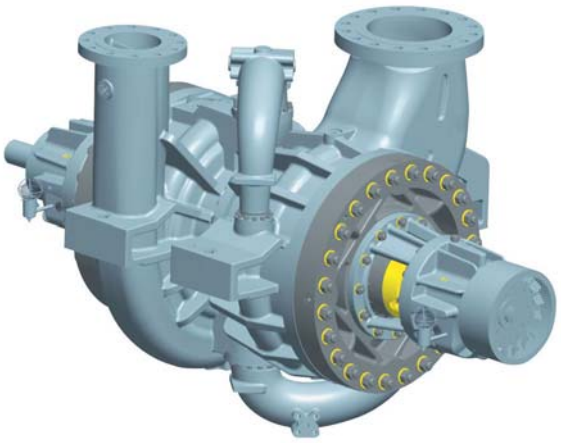
SINGLE-/ TWO-STAGE DOUBLE SUCTION RADIALLY SPLIT PUMPS

BB2

ZPR, KGR / KGRD

APPLICATION

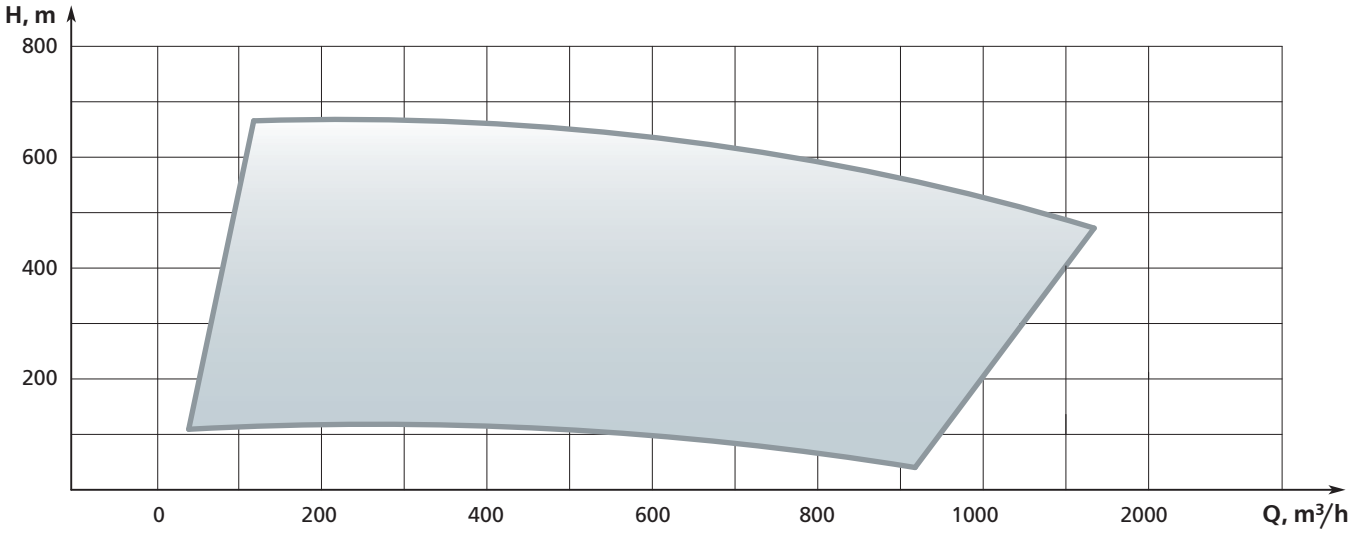
- Handling of crude oil, oil products and liquefied gases in upstream processes, including offshore
- Pressure boosting
- Gas and gas condensate processing
- Fuel gas purification
- Water supply (sea and produced water)



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



Project	Parameters	Features and Application
Edvard Grieg Customer: **Lundin Petroleum** Main supplier: **Siemens Oil&Gas** Norway, 2013	**Q** = 389 m³/h **H** = 337 m **P** = 528 kW	**ZPR-150/400** pumps **Application:** SRU feed pumps Deaerated Seawater **Material:** super duplex (25% CR) **NORSOK** compliance (material and test)
OSX-3 FPSO Customer: **MODEC** Main supplier: **Aker Solutions** Brazil, 2012	**Q** = 739.7 m³/h **H** = 349.1 m **P** = 914 kW	**KGRD-200/660-508/CN** pumps **Application:** SRU feed pumps Deaerated Seawater **Material:** super duplex (25% CR) **NORSOK** compliance (material and test)
Gudrun Platform Customer: **Statoil** Main supplier: **AIBEL** Norway, 2011	**Q** = 167 m³/h **H** = 70.4 m **P** = 24 kW	**ZPR-150/400** pumps **Application:** Wet Gas recycling pumps (Hydrocarbon condensate) **Material:** super duplex (25% CR) **NORSOK** compliance (material and test)

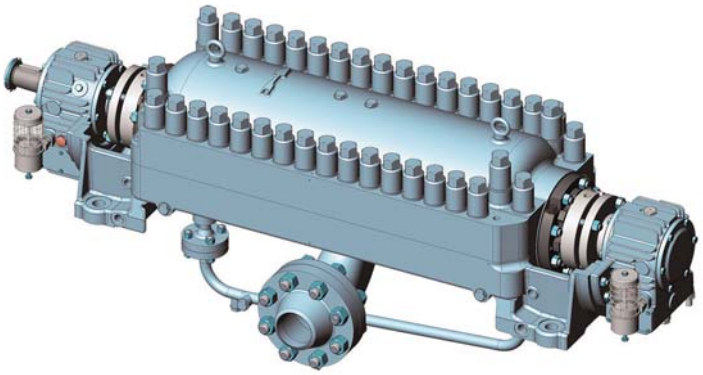
MULTISTAGE AXIALLY SPLIT PUMPS

BB3

ZMP, NPS

APPLICATION

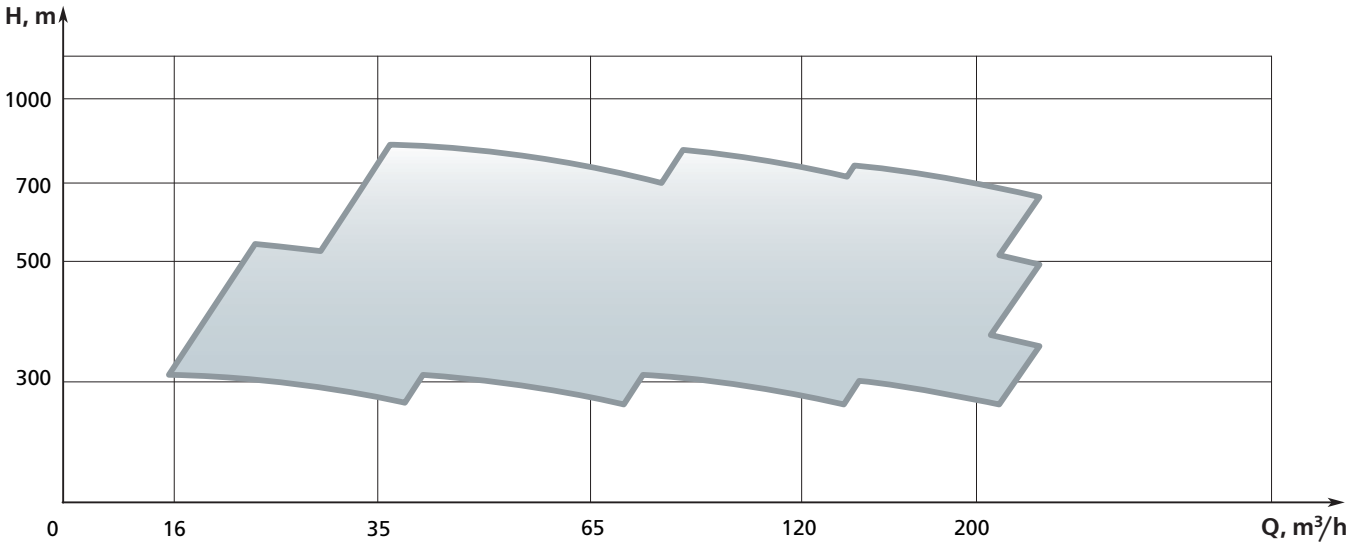
- Handling of crude oil, oil products and liquefied gases in upstream processes, including offshore
- Water supply (sea and produced water)
- Fuel gas purification



DESIGN FEATURES

- Flanges according to DIN/ANSI/ISO
- Seals according to API 682
- Interchangeable impellers for different capacities

- **Q** = 20...240 m³/h
- **H** = 350...800 m
- **T** = up to 400 °C



Project	Parameters	Features and Application
Makariel FWKO Customer: **Lukoil** Russia, 2011	**Q** = 120 m³/h **H** = 750 m **P** = 400 kW	**2NPS 120/65–750** pumps **Application:** handling of produced water **Material:** CR 12% steel

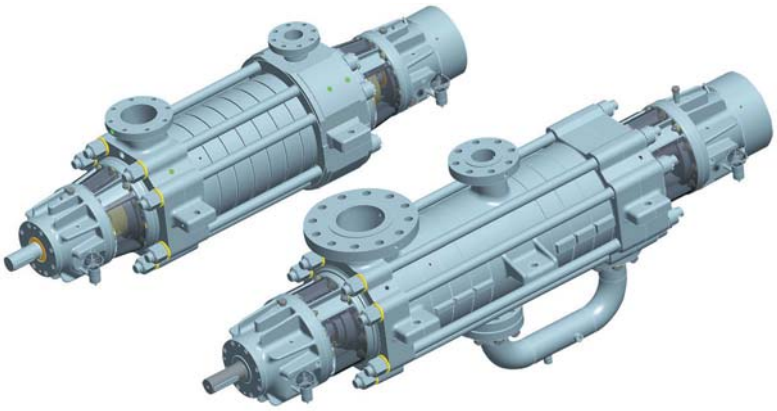
MULTISTAGE RADIALLY SPLIT PUMPS

BB4

GH, GMHD, HP, GP, HM, CNS, CNSp, CNSz

APPLICATION

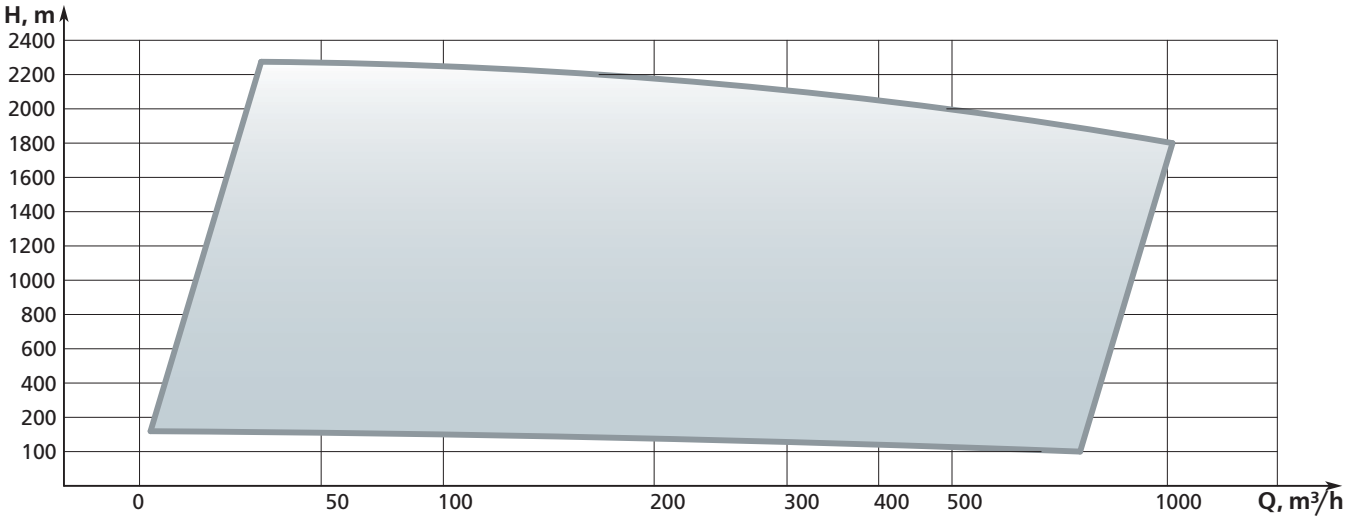
- Handling of crude oil, oil products and liquefied gases in upstream processes, including offshore
- Pre-processing of crude oil and gas
- Hot oil injection systems
- Water injection systems (produced & sea water)
- Fuel gas purification



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



Project	Parameters	Features and Application
Vankor field **Central production facility** Customer: **Rosneft,** Russia, 2012	**Q** = 163.9 m³/h **H** = 256.6 m **P** = 450 kW	**NM 180–500** pumps **Application:** handling of produced water **Material:** CR 12% steel
Sever FWKO, Vankor field Customer: **Rosneft** Russia, 2012	**Q** = 567 m³/h **H** = 2000 m **P** = 5000 kW	**CNS 500–1900** pumps **Application:** water injection pumps (produced water) **Material:** alloy steel
Jubilee FPSO Customer: **Tullow/MODEC** Main supplier: **Aker Solutions** Ghana, 2009	**Q** = 536 m³/h **H** = 335 m **P** = 677 kW	**GMHD–200B/1+3** pumps **Application:** SRU-Feed-Pumps (Deaerated Seawater) **Material:** duplex (25% CR) **NORSOK** compliance (material and test)
Smart 1 FPSO Customer: **Reliance Industries** Main supplier: **AKER KVAERNER** India, 2007	**Q** = 200 m³/h **H** = 1076 m **P** = 682 kW	**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

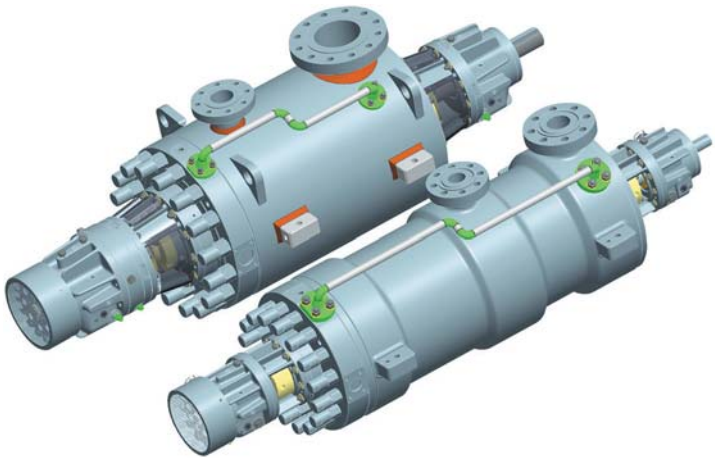
BARREL MULTISTAGE RADIALLY SPLIT PUMPS

BB5

TL, TG, NM

APPLICATION

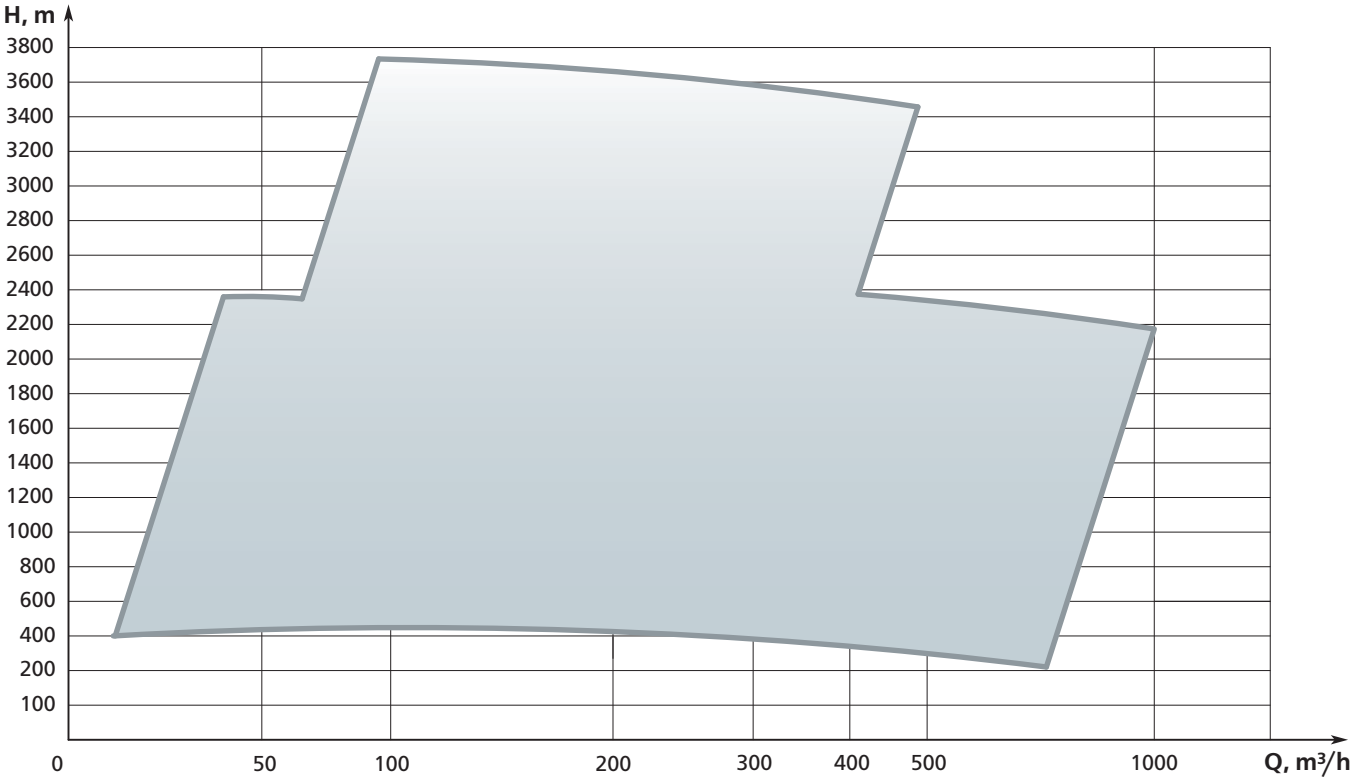
- Handling of crude oil, oil products and liquefied gases in upstream processes, including offshore
- Water Injection systems (produced & sea water)
- Hot oil injection systems



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

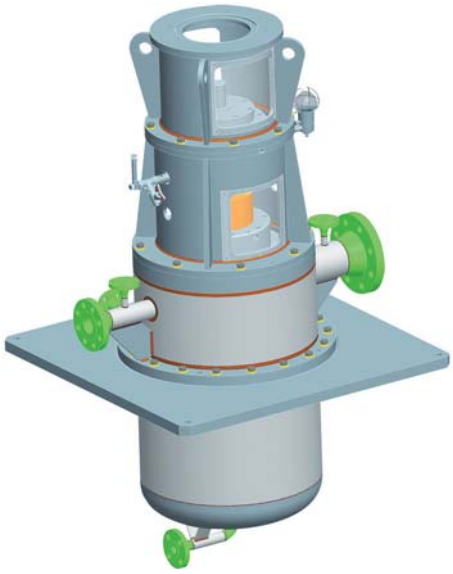


Project	Parameters	Features and Application
Gudrun Platform Customer: **Statoil** Main supplier: **AIBEL** Norway, 2012	**Q** = 40 m³/h **H** = 1315 m **P** = 234 kW	**TGC-50B/14-708/CN** pumps **Application:** Sand Jetting Water Pump (Fresh-/Produced Water) **Material:** duplex (22% CR) **Features:** back-to-back impellers **NORSOK** compliance (material and test)

VERTICALLY SUSPENDED SEMISUBMERSIBLE SINGLE / DOUBLE CASING MULTISTAGE PUMPS WITH DIFFUSERS

VS1, VS6

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



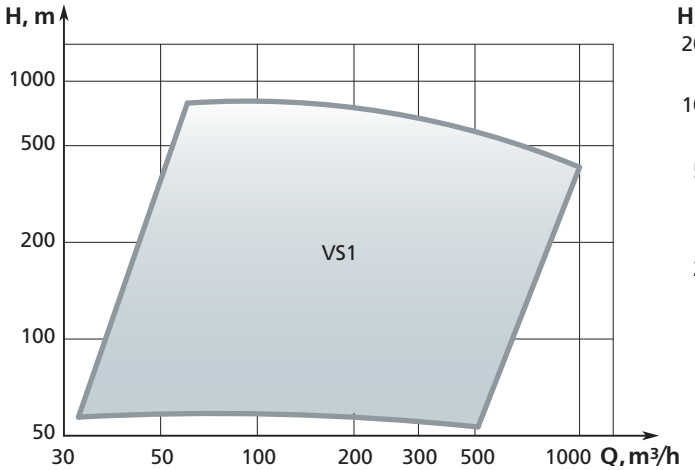
APPLICATION

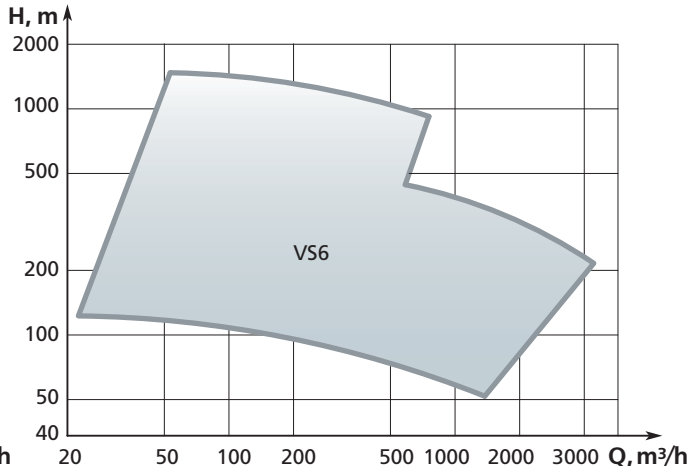
- Transportation of crude oil, oil products and liquefied gases
- Pressure boosting

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** = up to 3000 m³/h
- **H** = up to 1400 m
- **T** = up to 300 °C





Project	Parameters	Features and Application
Troll A Platform Customer: **Statoil** Main supplier: **AIBEL** Norway, 2013	**Q** = 350 m³/h **H** = 177.5 m **P** = 240 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 m³/h **H** = 40.5 m **P** = 3.7 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 m³/h **H** = 201 m **P** = 42 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 m³/h **H** = 76.7 m **P** = 99.4 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.

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	AISI 4140	AISI 4140
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
- **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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