

# PROCESS PUMPS AND SYSTEMS



- OIL & GAS INDUSTRY
- OFFSHORE
- PETROCHEMISTRY
- POWER PLANT ENGINEERING

**APOLO**  
Pumps | Pumping Systems

APOLLO was established in 1863 as Machine building Company and Foundry. Since over 100 years APOLLO is developing and manufacturing Pumps. 1990 we have established a new company division – the System Engineering Division.

APOLLO was celebrating its 150th anniversary in 2013.

With our strategy – Manufacture of high-quality Process Pumps in connection with pump-specific Plant Systems – we provide complete solutions of high reliability and low operational cost for our Customers.

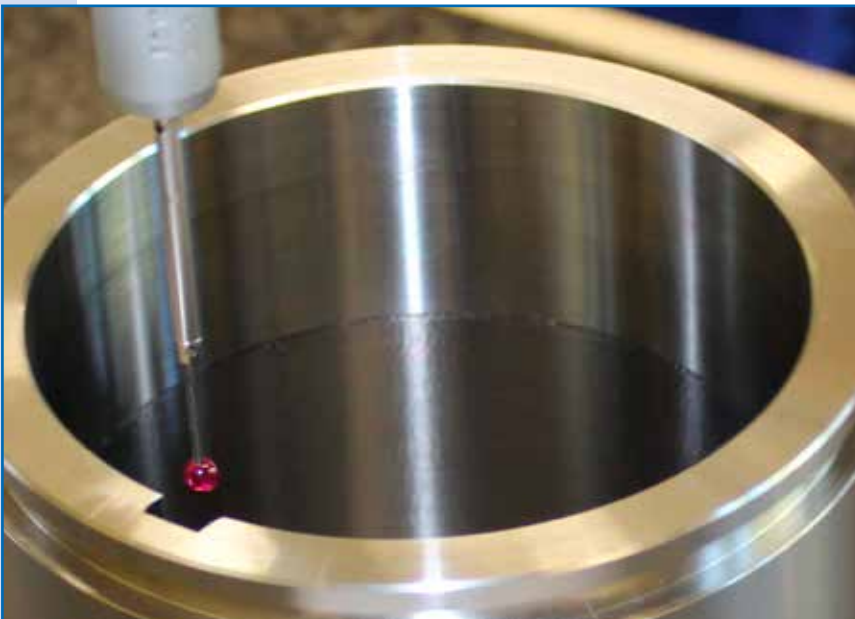


- Vertical, multistage APOLLO-process pump for power plant application on the test field.

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Modern Test Field Units ensure test conditions close to real operating conditions.

- frequency range: 50-/60-Hz
- high power ranges up to 14 MW
- tests with voltage levels of 400 V up to 13 KV with variable operation via Frequency Converter



- Quality Assurance also in local application by means of flexible portable 3D-Coordinates Measuring Unit possible.

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Quality Assurance in all Company Divisions is part of our central tasks.

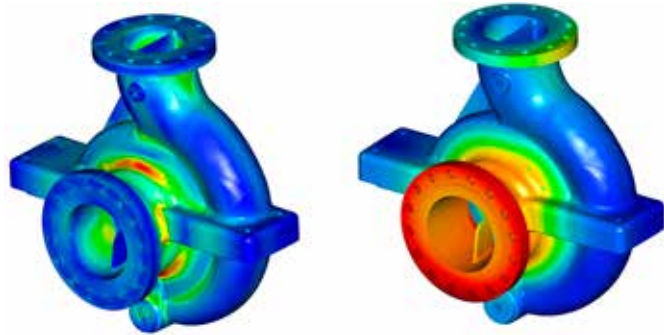
APOLLO is certified by TÜV Thüringen e.V. according to ISO 9001.



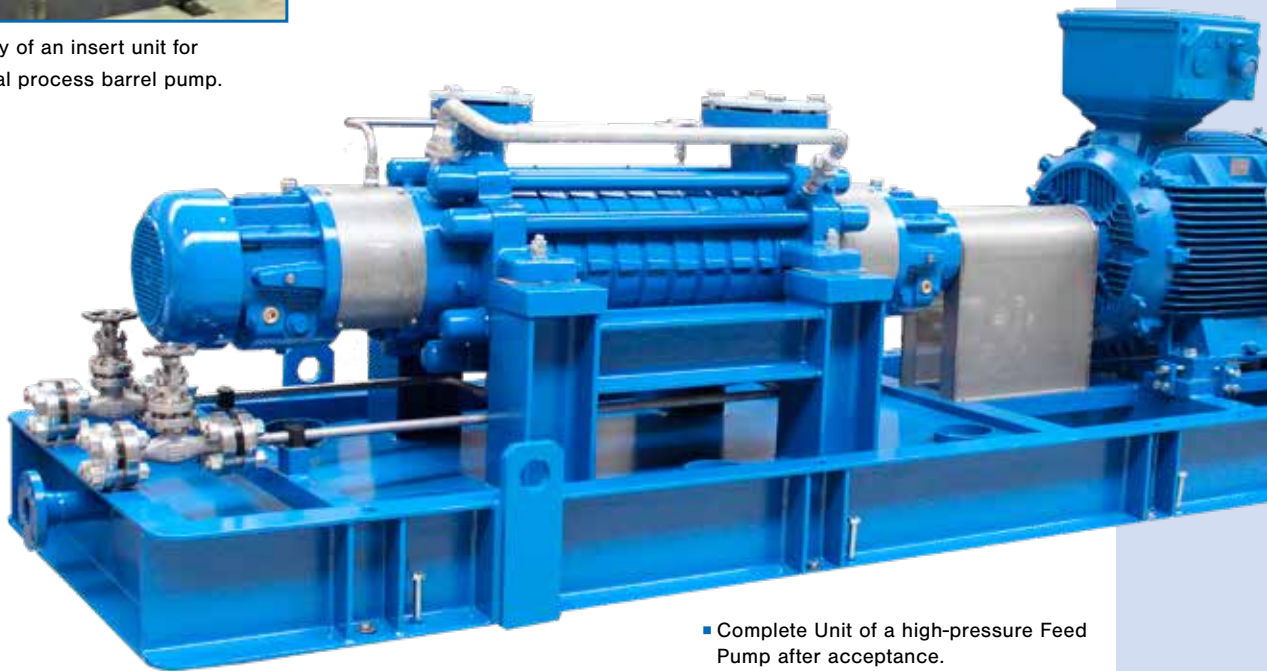
■ Assembly of an insert unit for horizontal process barrel pump.

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Up-to-date development methods of Design, like continuous hydraulic design by means of CFD software, an interface 3D-CAD/CAM for fabrication of casting patterns and modern CNC manufacture ensure high Quality Safety and quick lead time.



■ FEM Analysis of volute casing of a heavy-duty process pump of type KRH.



■ Complete Unit of a high-pressure Feed Pump after acceptance.



■ Apollo guarantees quick service worldwide.

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We offer our customers a full range of service starting from commissioning of complete pump skids, repair, retrofit, maintenance and delivery of spare parts and technical support. Furthermore we consult our customers in operating our pumps and systems.

### Range of Application

- Refineries
- Offshore
- High-temperature applications
- Power plant engineering
- Petrochemical plants

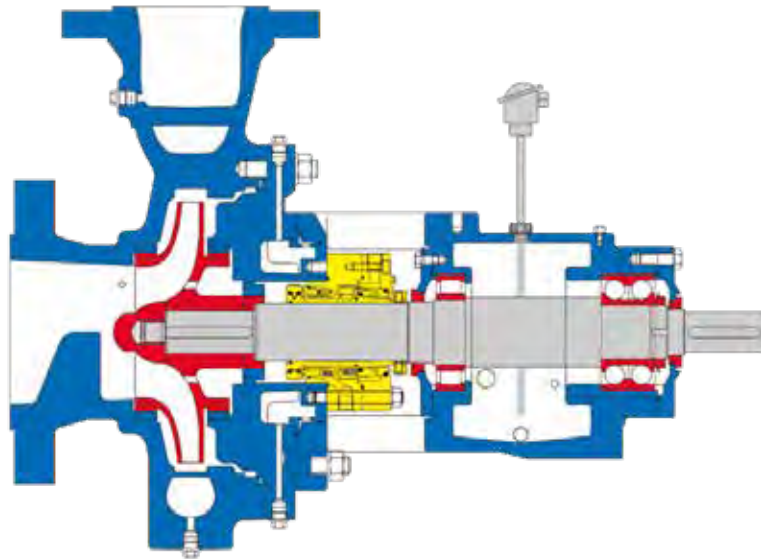
### Operating Data

	KRH	KRHA
Q (m <sup>3</sup> /h)	1000	5000
H (m)	320	220
P (bar)	55/90	55
T (°C)	+450	+450



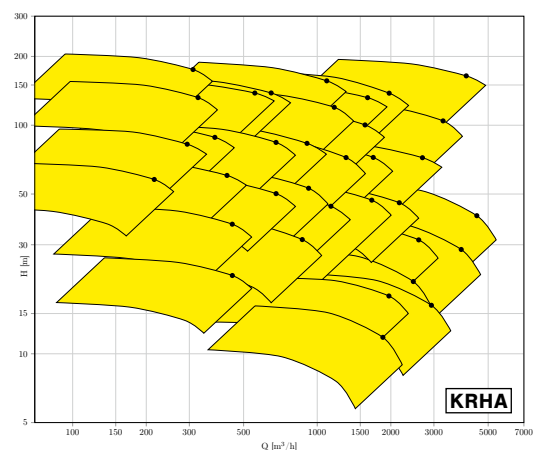
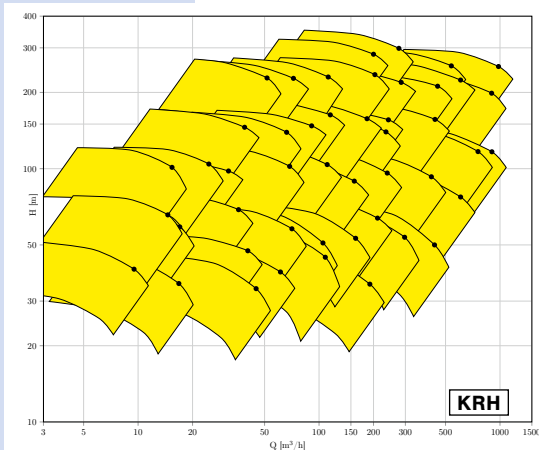
### Design features

- pump meets all requirements of API 610
- horizontal, single-stage, radial-split, heavy-duty design
- axial suction nozzle, radial discharge nozzle
- centre-supported
- back-pull-out version
- design with inducer possible



### Materials

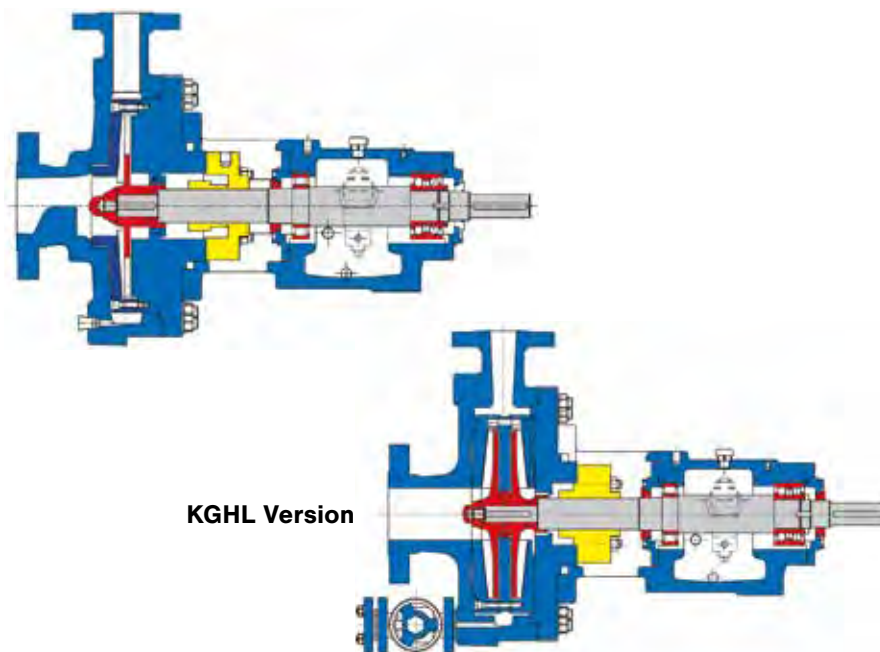
- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Titanium
- Special alloys according to NORSOK, NACE



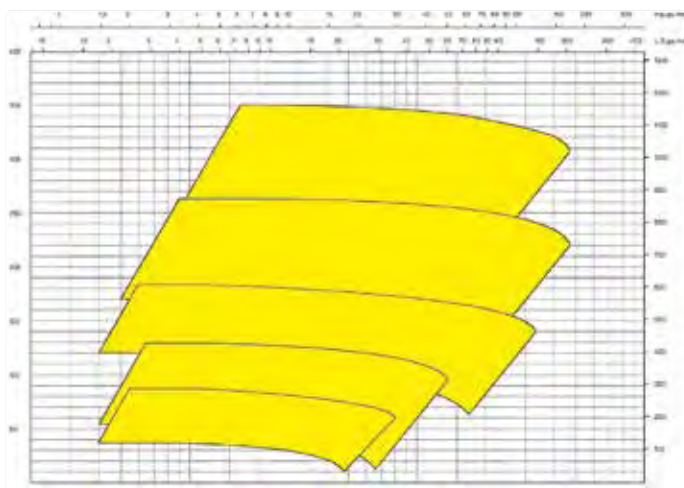
# KRHL / KRPO / KGHL

Horizontal, single-stage/two-stage process pump with semi-open impeller according API 610 – Type OH2

# APOLO



KGHL Version



## Range of Application

- Refineries
- Offshore
- High-temperature applications
- Power plant engineering
- Petrochemical plants

## Operating Data

	KRHL	KRPO	KGHL
Q (m <sup>3</sup> /h)	45	25	45
H (m)	270	210	350
P (bar)	50	50	50
T (°C)	+450	+450	+450

## Design features

- pump meets all requirements of API 610
- version for low capacity and high head
- single-stage, one-flow, normal priming ring-section pump; two-stage KGHL version
- semi-open impeller with straight vanes
- optionally: exchangeable wear plate and inducer
- antifriction bearings with oil lubrication

## Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Titanium
- Special alloys according to NORSOK, NACE

### Range of Application

- Refineries
- Offshore
- Power plants
- Gas process plants
- Petrochemical plants

### Operating Data

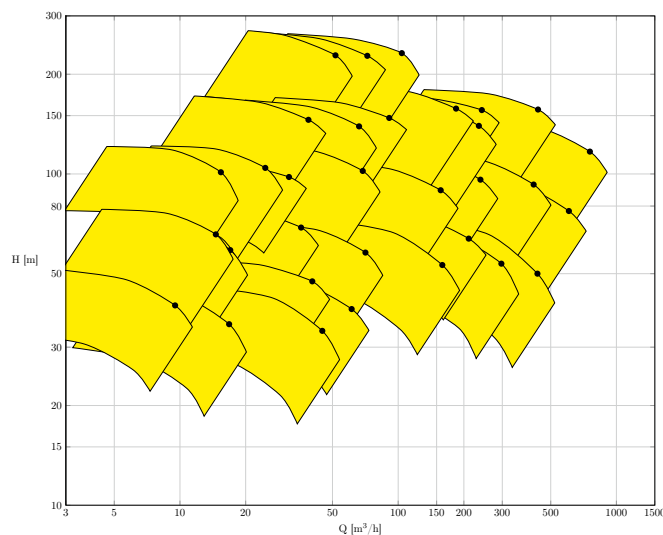
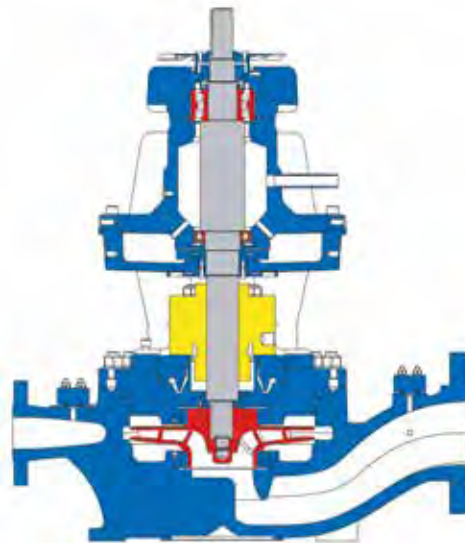
	KRI	KRIL
Q (m <sup>3</sup> /h)	800	45
H (m)	270	270
P (bar)	55	50
T (°C)	+250	+250

### Design features

- pump meets all requirements of API 610
- vertical, normal priming, single-stage pump of process design
- discharge and suction nozzle are of inline arrangement
- KRIL as version for low capacity
- with grease or oil lubrication

### Materials

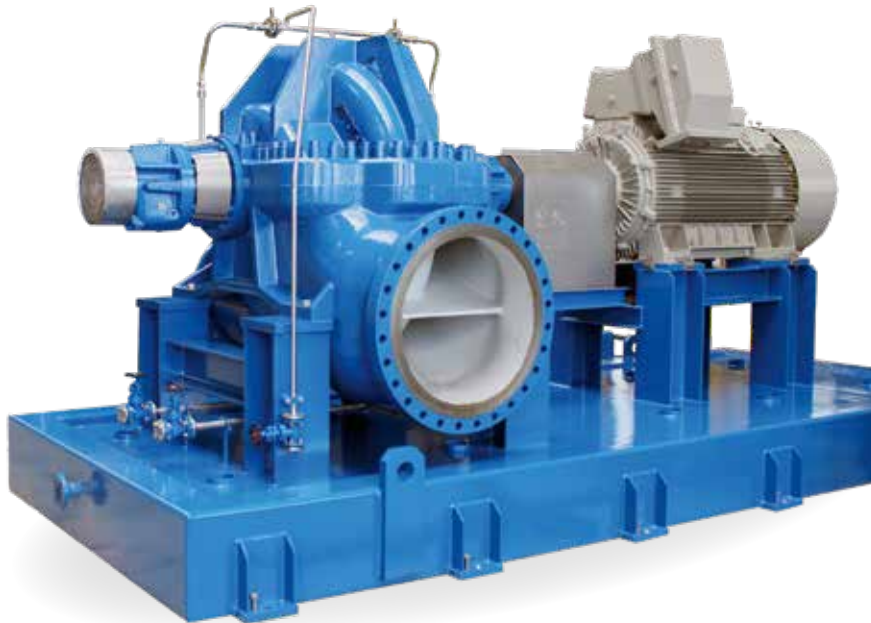
- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Titanium
- Special alloys according to NORSOK, NACE



# ZMK / ZMKV

Heavy-duty, axially split, single-stage process pump,  
between-bearings version according to API 610 – Type BB1

# APOLO

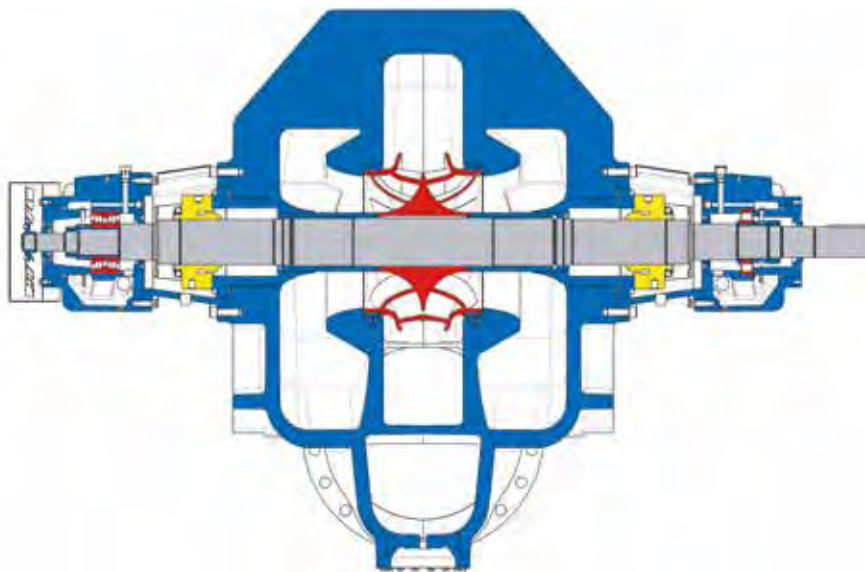


## Range of Application

- Refineries
- Offshore
- Power plant engineering
- Oil and Gas Industry
- Water supply and waste water applications

## Operating Data

	ZMK	ZMKV
Q (m <sup>3</sup> /h)	10000	5500
H (m)	140	140
P (bar)	25/40	25/40
T (°C)	+150	+150

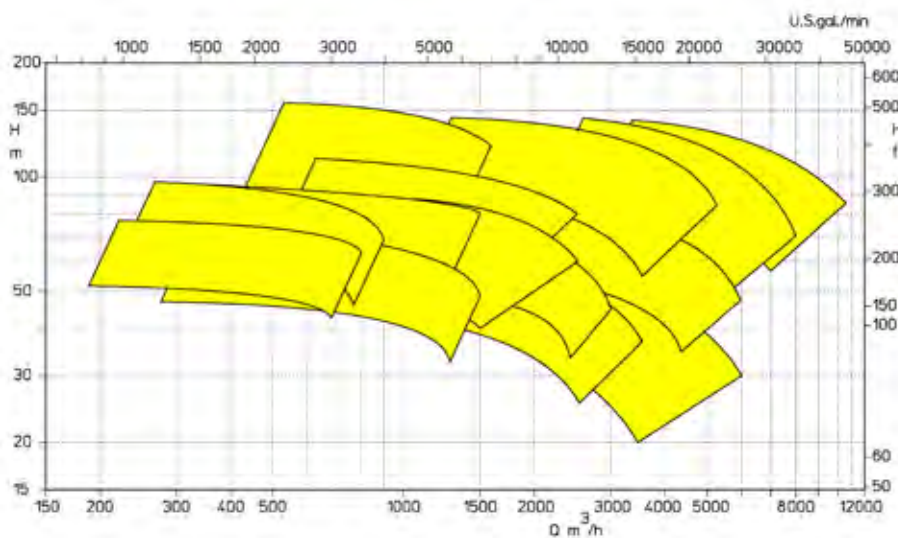


## Design features

- pump meets all requirements of API 610
- thrust compensation by double suction impeller design
- double-volute design
- replaceable wear and split rings ensure maximum maintainability and high operating safety

## Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE



### Range of Application

- Refineries
- Offshore
- Power plants
- Petrochemical plants

### Operating Data

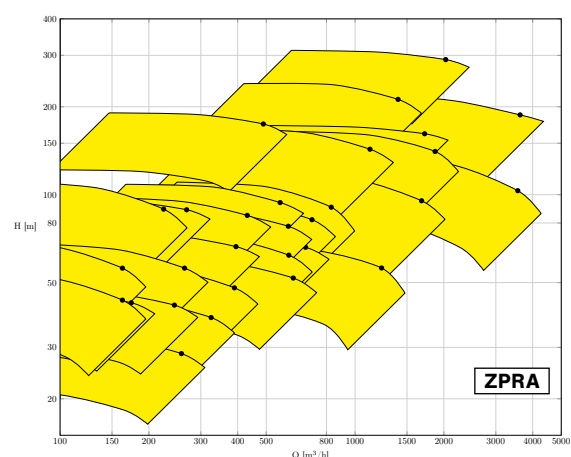
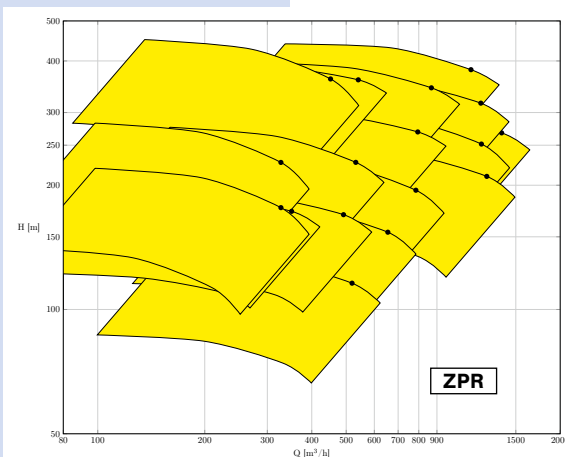
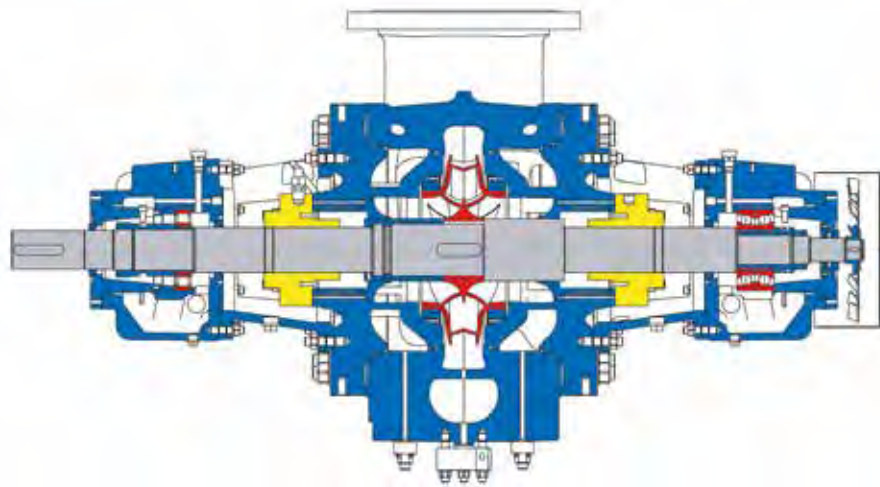
	ZPR	ZPRA
Q (m <sup>3</sup> /h)	1500	4000
H (m)	450	300
P (bar)	160	55
T (°C)	+450	+450

### Design features

- pump meets all requirements of API 610
- double suction impeller
- bearings on both sides
- radially split casing
- centre-supported
- bearing design: antifriction or slide bearings

### Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Titanium
- Special alloys according to NORSOK, NACE

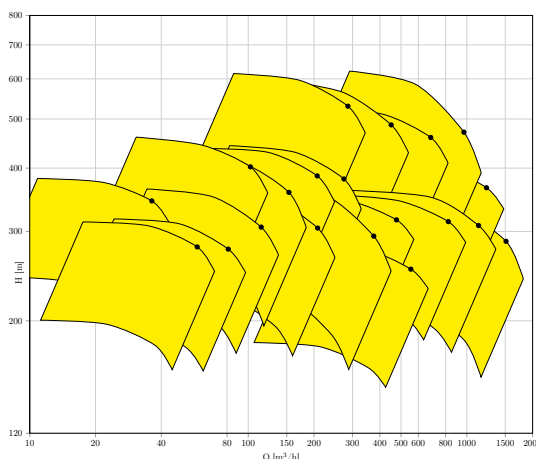
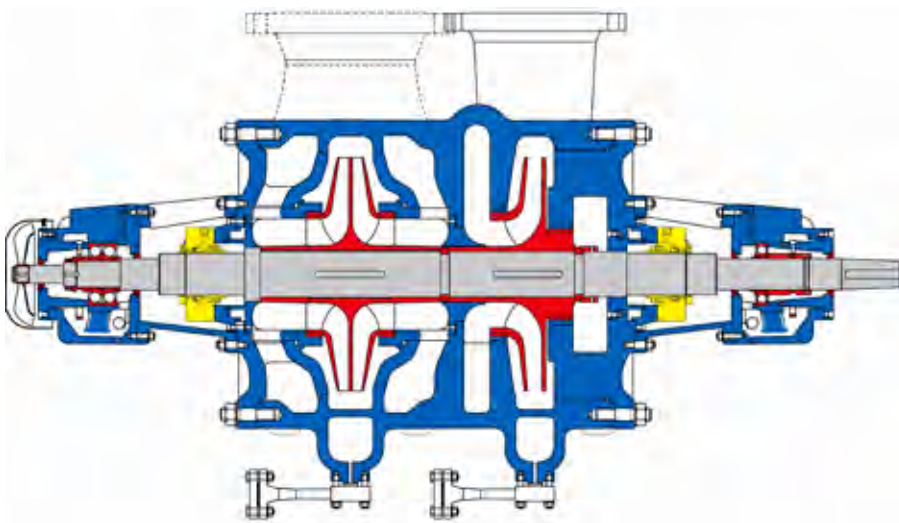




# KGR / KGRD

Heavy-duty, radially split, two-stage process pump  
between-bearings version according API 610 – Type BB2

# APOLO



## Range of Application

- Refineries
- Offshore
- Power plants
- Petrochemical plants

## Operating Data

	KGR / KGRD
Q (m³/h)	1600
H (m)	600
P (bar)	80
T (°C)	+400

## Design features

- pump meets all requirements of API 610
- axial thrust compensation due to back-to-back arrangement of impellers
- radially split casing and centre supported
- first impeller as single-flow or double-flow version
- between-bearings version
- bearing design: antifriction or slide bearings

## Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Titanium
- Special alloys according to NORSOK, NACE

### Range of Application

- Refineries
- Offshore
- Power plants



### Operating Data

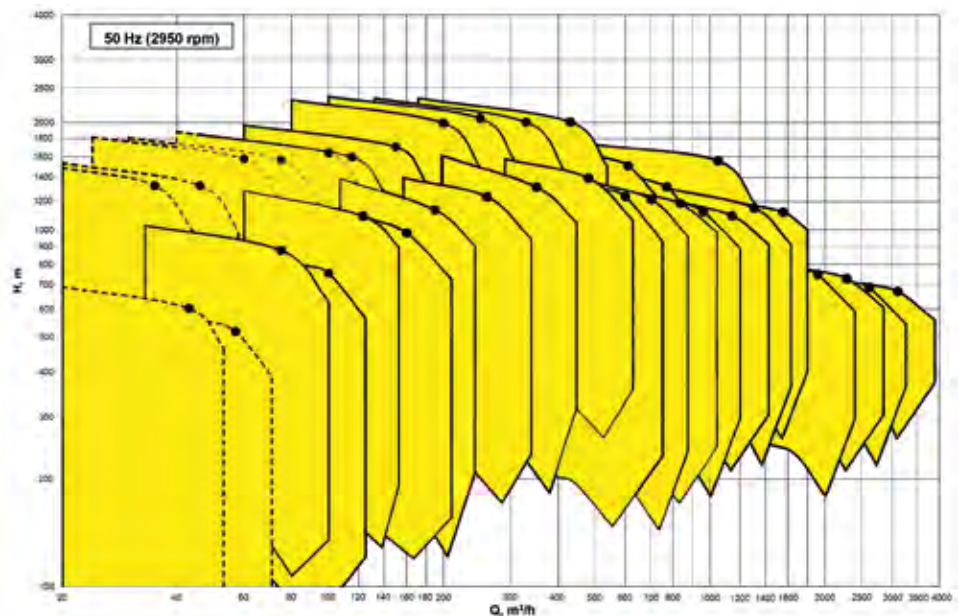
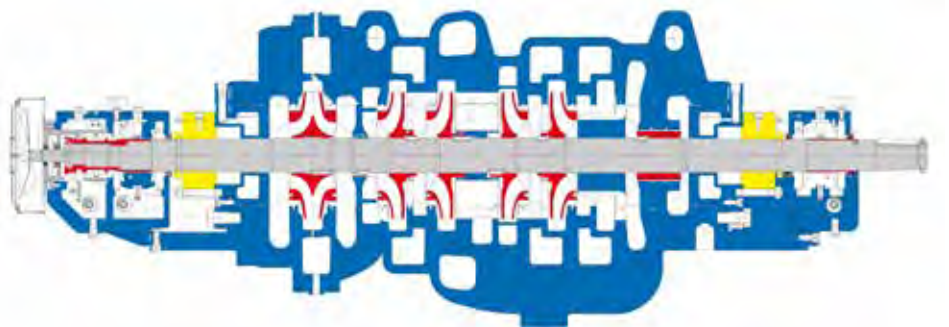
	AMG
Q (m <sup>3</sup> /h)	3200
H (m)	2200
P (bar)	265
T (°C)	+200

### Design features

- pump meets all requirements of API 610
- axially split casing and centre supported
- axial thrust compensation due to back-to-back arrangement of impellers
- special NPSH impeller in first stage
- bearing design: antifriction or slide bearings

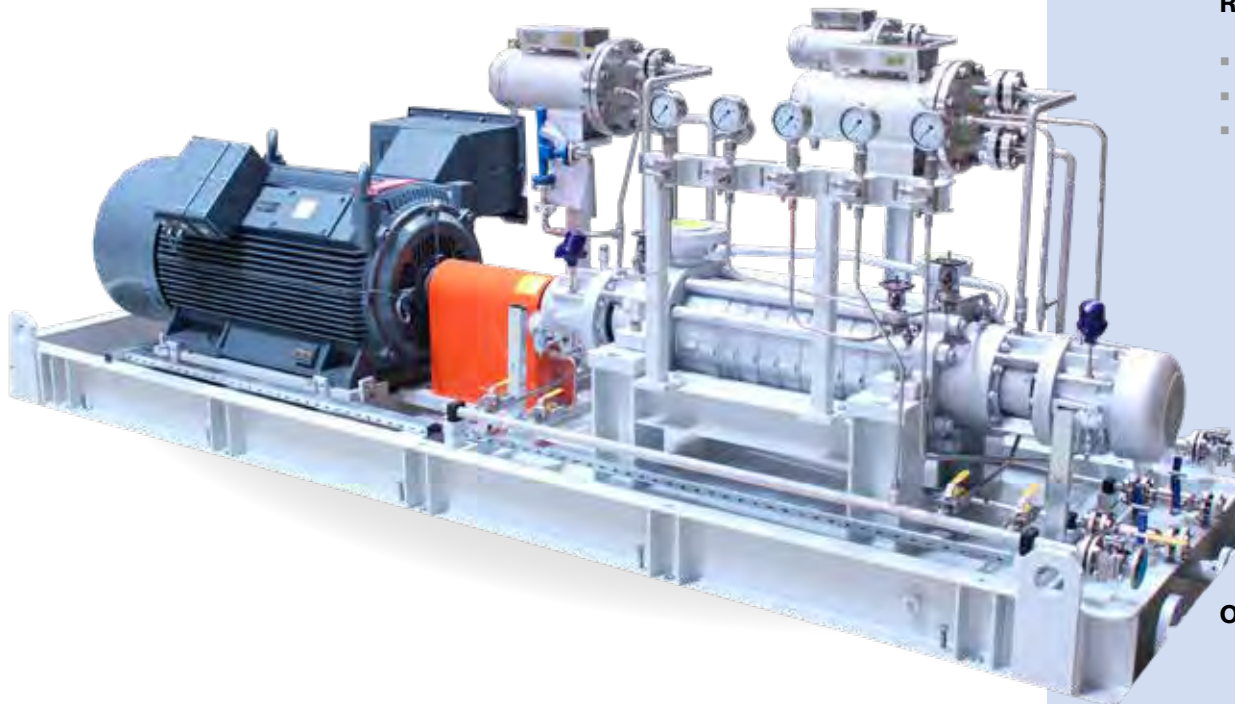
### Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE



# HP

Horizontal, multistage high-pressure pump of ring-section design according API 610 – Type BB4

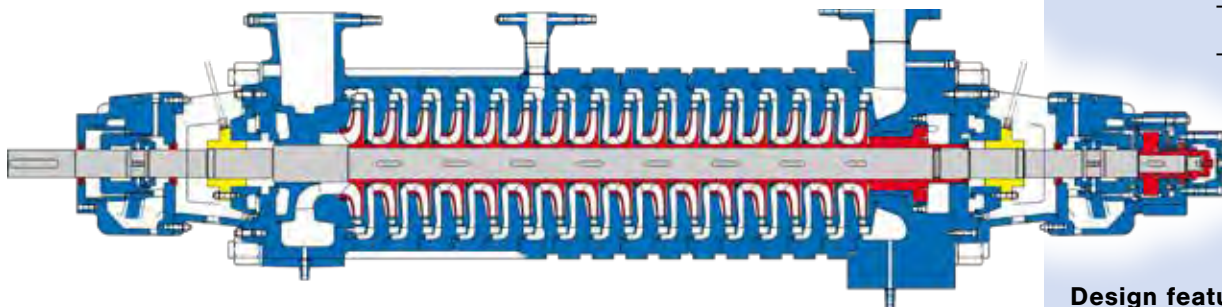


### Range of Application

- Refineries
- Power plants
- Pumping of feed water and condensate

### Operating Data

	HP
Q (m <sup>3</sup> /h)	1800
H (m)	2800
P (bar)	300
T (°C)	+200

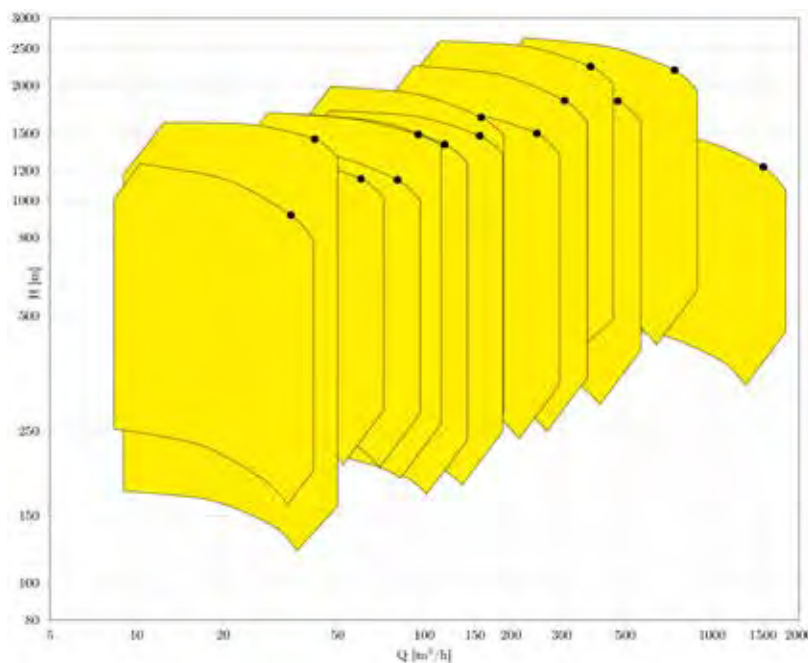


### Design features

- pump meets all requirements of API 610
- designed with intermediate take-off and optimized pressure design within the pump
- version with NPSH impeller
- axial thrust compensation via balance piston, double piston or balance disk
- low vibration values
- bearing design: antifriction or slide bearings

### Material

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE



### Range of Application

- Offshore
- Refineries
- Brine feed
- Water injection
- Industrial application

### Operating Data

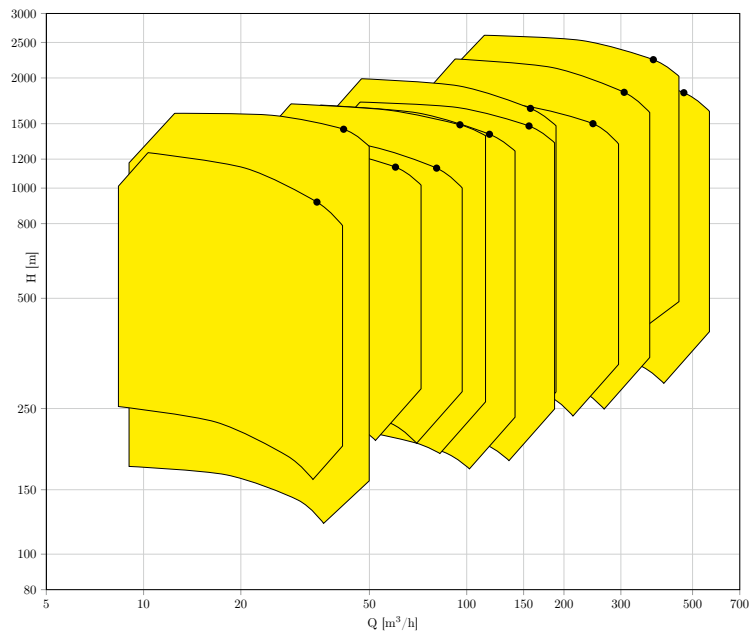
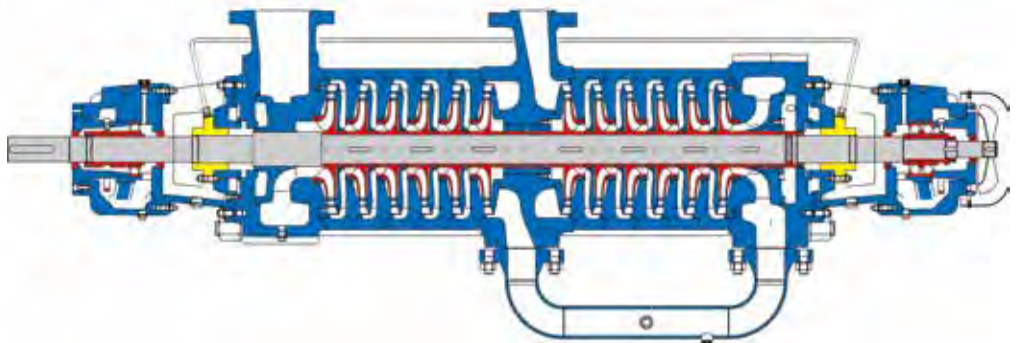
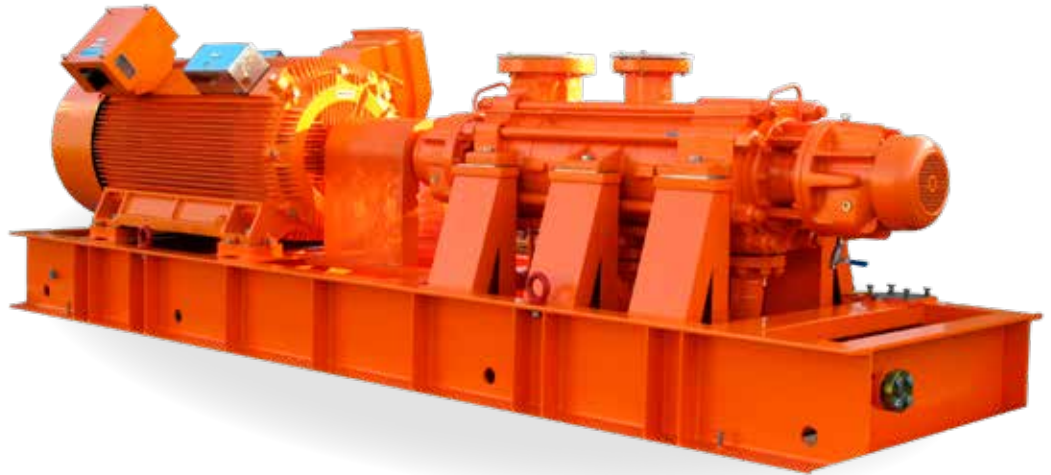
	GP
Q (m <sup>3</sup> /h)	600
H (m)	2500
P (bar)	250
T (°C)	+180

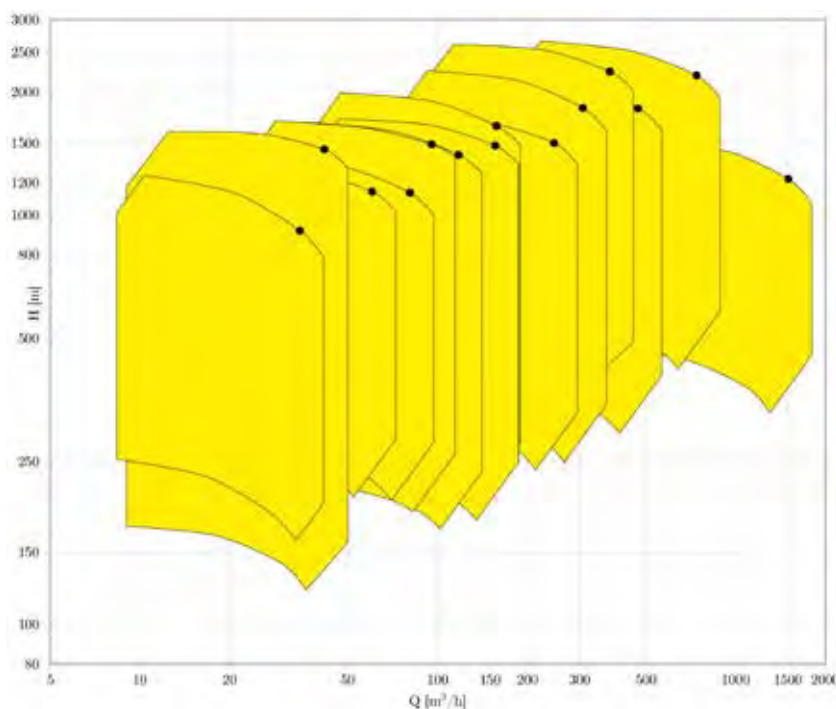
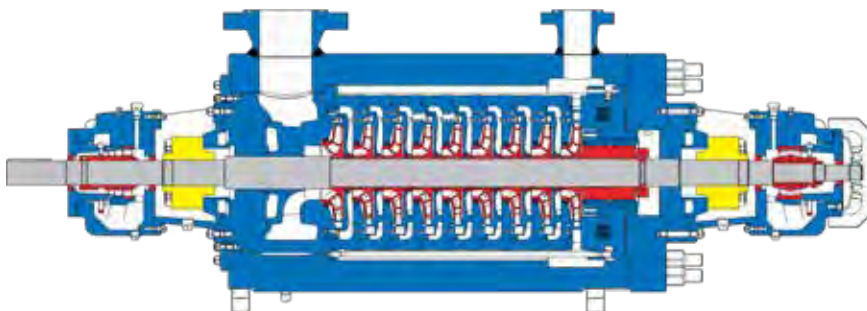
### Design features

- pump meets all requirements of API 610
- multistage radial-split high pressure pump
- first stage designed as NPSH impeller
- centre-line supported
- bearing design: antifriction or slide bearings

### Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE





### Range of Application

- Refineries
- Water injection
- Hydrocarbons
- Brine feed
- Gas-washing Systems
- Boiler feed water application

### Operating Data

	TL
Q (m³/h)	1800
H (m)	2800
P (bar)	350
T (°C)	+400

### Design features

- pump meets all requirements of API 610
- construction in pull-out version
- inline arrangement of impellers
- axial thrust compensation via balance piston, double piston or compensation disk
- first stage designed with NPSH impeller
- centre-supported
- bearing design: antifriction or slide bearings

### Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE

### Range of Application

- Refineries
- Water injection
- Hydrocarbons application
- Gas-washing systems
- Boiler feed water application
- Brine feed pump



### Operating Data

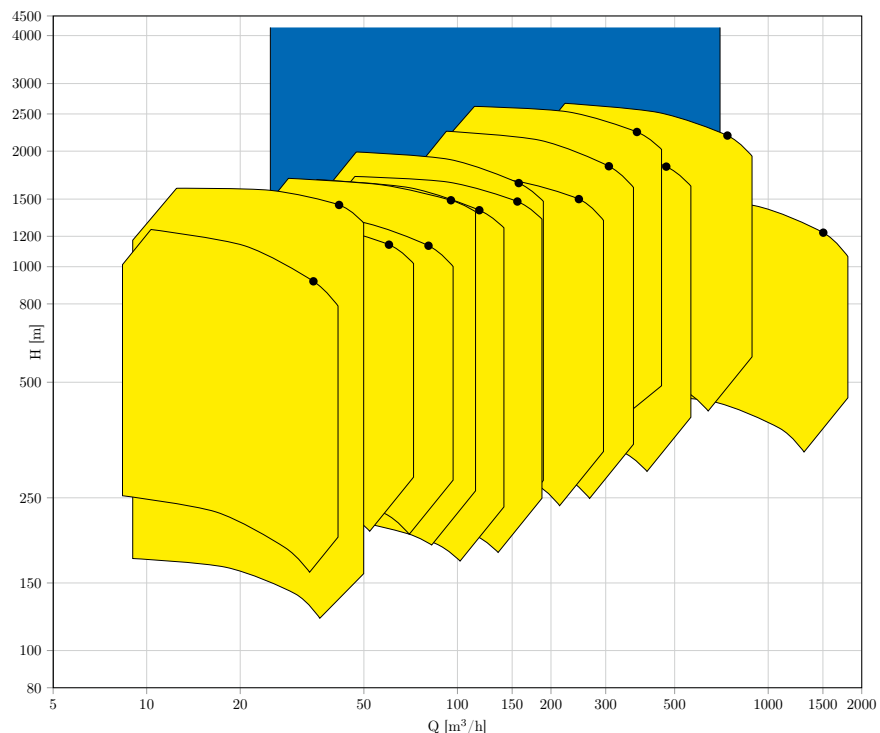
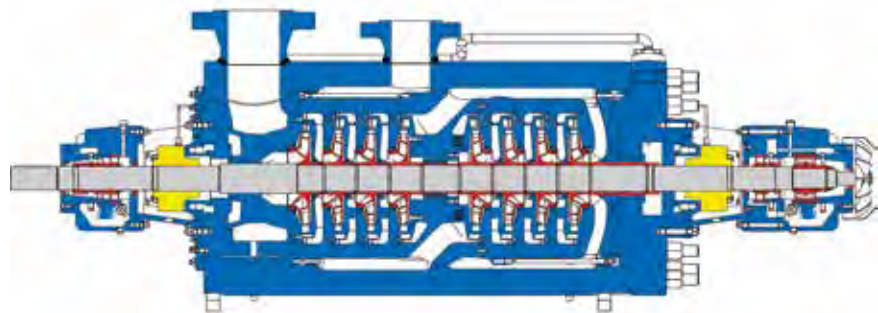
	TG	TGDX
Q (m <sup>3</sup> /h)	1800	700
H (m)	2800	4200
P (bar)	350	450
T (°C)	+420	+360

### Design features

- pump meets all requirements of API 610
- construction in pull-out version
- back-to-back arrangement of impellers, provides the smallest axial forces and very smooth running
- first stage designed as NPSH impeller
- centre-supported
- bearing design: antifriction or slide bearings

### Materials

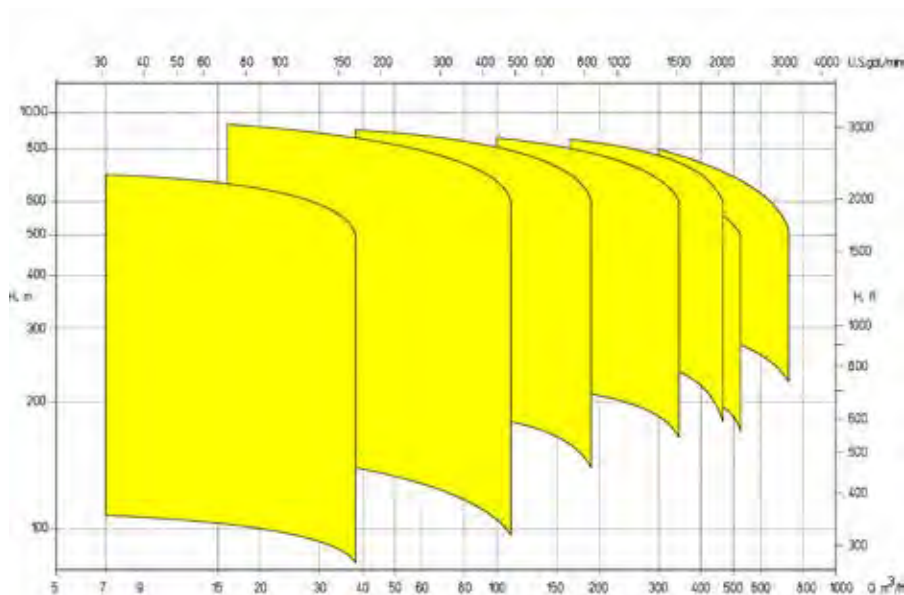
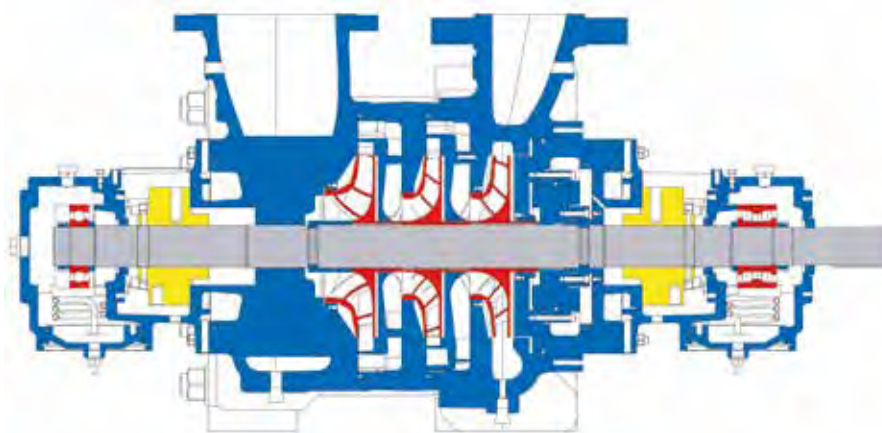
- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE



# GH

Multistage, high-pressure pump  
100-bar-version

# APOLO



## Range of Application

- Refineries
- Power Plant
- Booster application
- Sea water desalination

## Operating Data

	GH
Q (m <sup>3</sup> /h)	720
H (m)	900
P (bar)	100
T (°C)	180

## Design features

- variable arrangement of nozzles
- compact design with short bearing span
- ring-section type of modular design
- first stage designed with NPSH impeller
- version with axial inlet
- bearings on both sides – antifriction bearings with oil sump lubrication

## Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE

### Range of Application

- Offshore
- Power plants
- Pumping of condensate
- Oil and gas industry

### Operating Data

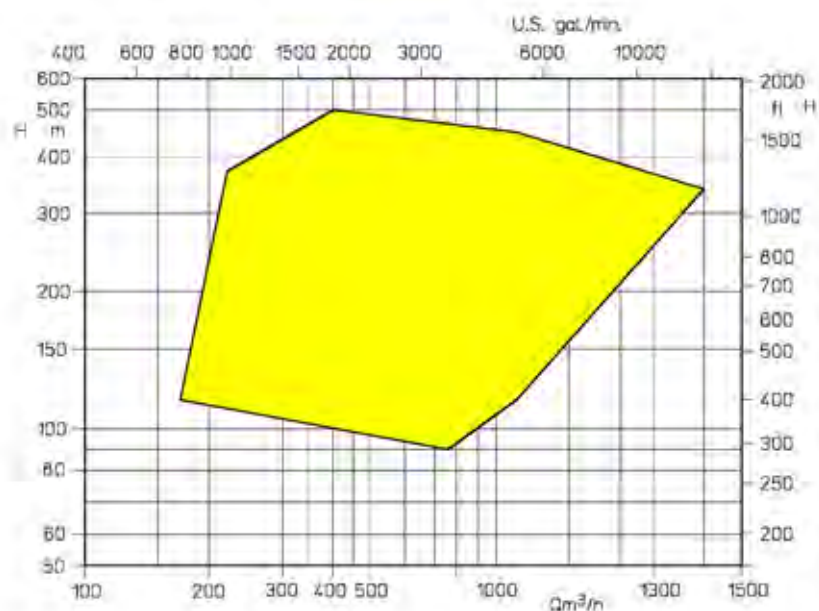
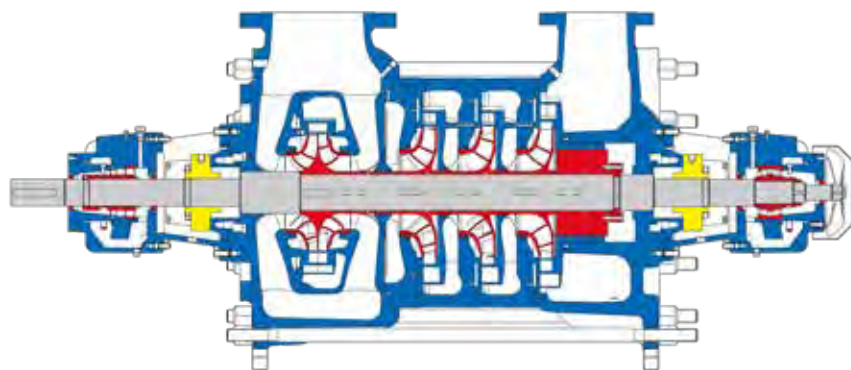
	GMHD
Q (m <sup>3</sup> /h)	1100
H (m)	320
P (bar)	63
T (°C)	+180

### Design features

- pump meets all requirements of API 610
- first stage designed as NPSH impeller
- axial thrust compensation by means of balance piston
- centre-line supported
- low vibration values
- bearing design: antifriction or slide bearings

### Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE

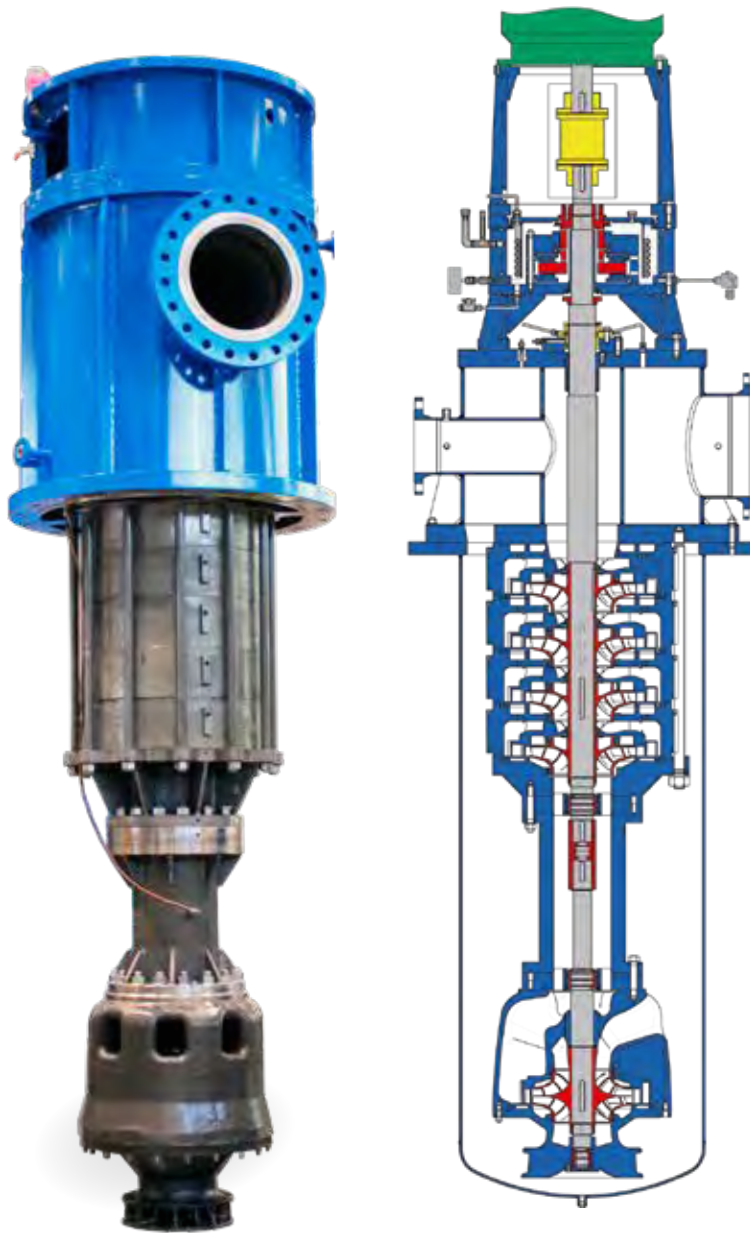




# GSTV / GLKV / GDTV

Vertical, multistage high-pressure pump of can-type design according API 610 – Type VS6

# APOLO



## Range of Application

- Refineries
- Oil and gas industry
- Pumping condensate in power stations and industrial plants

## Operating Data

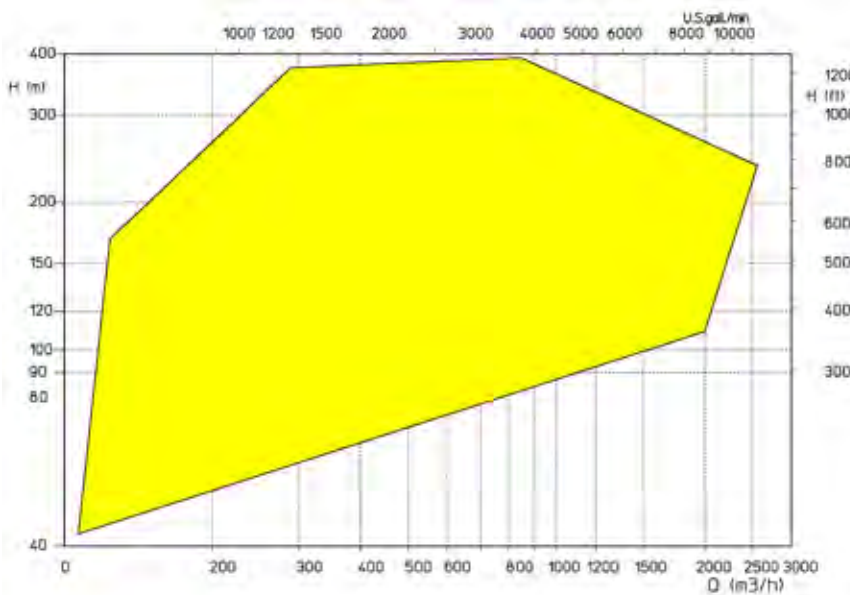
	GSTV	GLKV	GDTV
Q (m <sup>3</sup> /h)	3000	400	3200
H (m)	360	250	460
P (bar)	40/63	40	40/63
T (°C)	+160	+160	+160

## Design features

- pump meets all requirements of API 610
- axial thrust compensation by means of balancing piston
- NPSH impeller as single-flow and double-flow version
- version with diagonal impeller hydraulics for high capacity
- bearing design: antifriction bearings or combined axial-radial slide bearings

## Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE



### Range of Application

- Refineries
- Offshore
- Condensate applications
- Liquid gas / hydrocarbons
- Booster and transfer pumps

### Operating Data

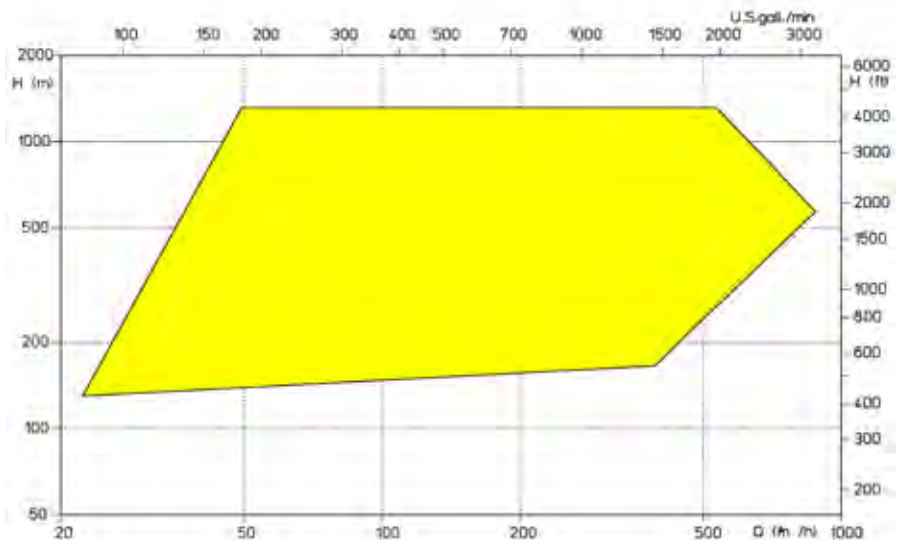
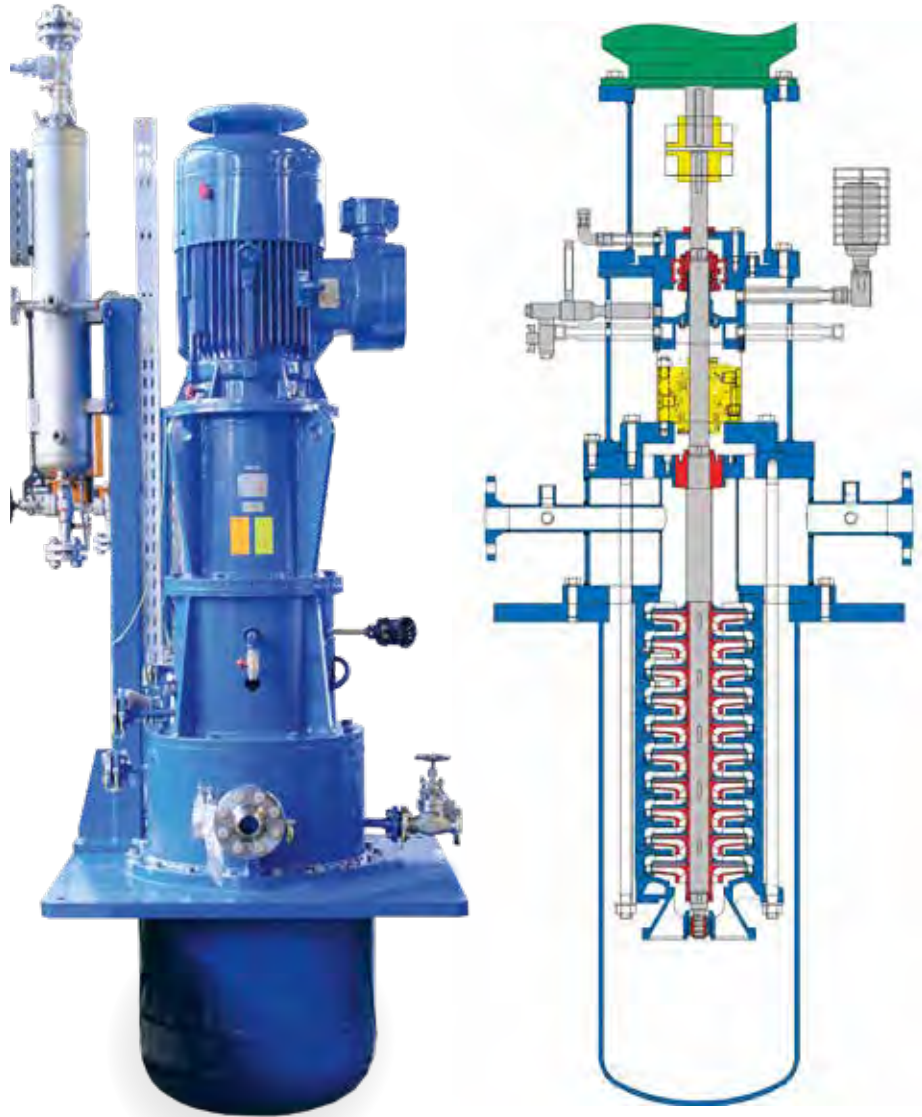
	HPTV
Q (m <sup>3</sup> /h)	550
H (m)	1400
P (bar)	140
T (°C)	-140/+260

### Design features

- pump meets all requirements of API 610
- axial thrust compensation due to balance piston
- NPSH impeller as single-flow or double-flow version
- version with suspended suction impeller possible
- bearing design: antifriction bearing or combined axial-radial slide bearings

### Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE



# HPV / HPVX

Vertical, multistage high-pressure pump as submerged pump according API 610 – Type VS1



## Range of Application

- Refineries
- Fuels
- High-temperature applications
- for crude oil as booster and transfer pumps
- Tank installations

## Operating Data

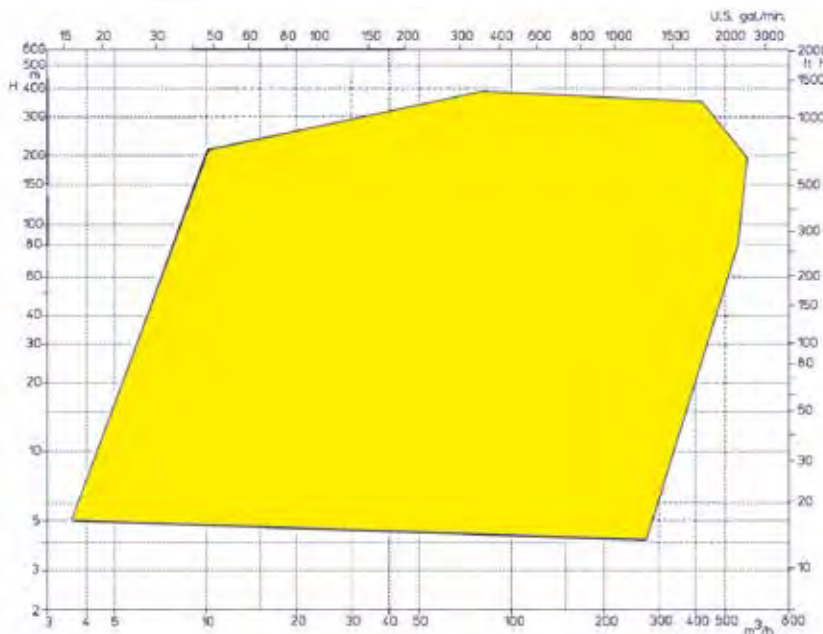
	HPV / HPVX
Q (m <sup>3</sup> /h)	600
H (m)	600
P (bar)	63
T (°C)	+180

## Design features

- pump meets all requirements of API 610
- ATEX version
- radial centrifugal pump with suspended NPSH impeller, depending on design length
- axial thrust compensation by means of balance piston
- liquid lubricated slide bearings in the pump
- bearing design: antifriction bearing or combination of axial-radial slide bearings

## Materials

- Cast steel
- Chrome steel
- Austenitic steel
- Duplex and super duplex steel
- Special alloys according to NORSOK, NACE





**APOLLO pump type:  
TGD-80C/12-308/CN**

- Multistage high pressure barrel process pump with gear box, motor and lube oil system
- Liquid: paraffin products
- $Q = 98,5 \text{ m}^3/\text{h}$
- $H = 2620 \text{ m}$
- Speed: 4400 rpm
- Material: acc. to API S-6
- Skid weight: 25000 kg



**APOLLO pump type:  
TGD-100/12-508/CN**

- 12-stage BB5 process pump with a special heating jacket
- Liquid: Carbamate
- $Q = 150 \text{ m}^3/\text{h}$
- $H = 1576 \text{ m}$
- Suction pressure: 5 bar up to 73 bar
- Design pressure: 242 bar at 130 °C
- Speed: 2980 rpm
- Skid weight: 19200 kg



**APOLLO pump type:  
KGRZ-150/450-399/CN**

- Double-stage process pump with axial inlet and open impellers
- Liquid: shale oil
- $Q = 210 \text{ m}^3/\text{h}$
- $H = 215 \text{ m}$
- Design pressure: 30 bar at 375 °C
- Design temperature: 375 °C
- solid content: up to 15 % rock ash
- Material: special wear-resistant cast iron

## Heavy Fuel Oil Pumping Station

- Complete prefabricated stations for supply of burners with heavy fuel oil including auxiliary steam and condensate processes.



## Injection Pump Module

- Complete prefabricated pump modules for high-pressure fuel supply of gas turbines with various fuels and high operation pressure.



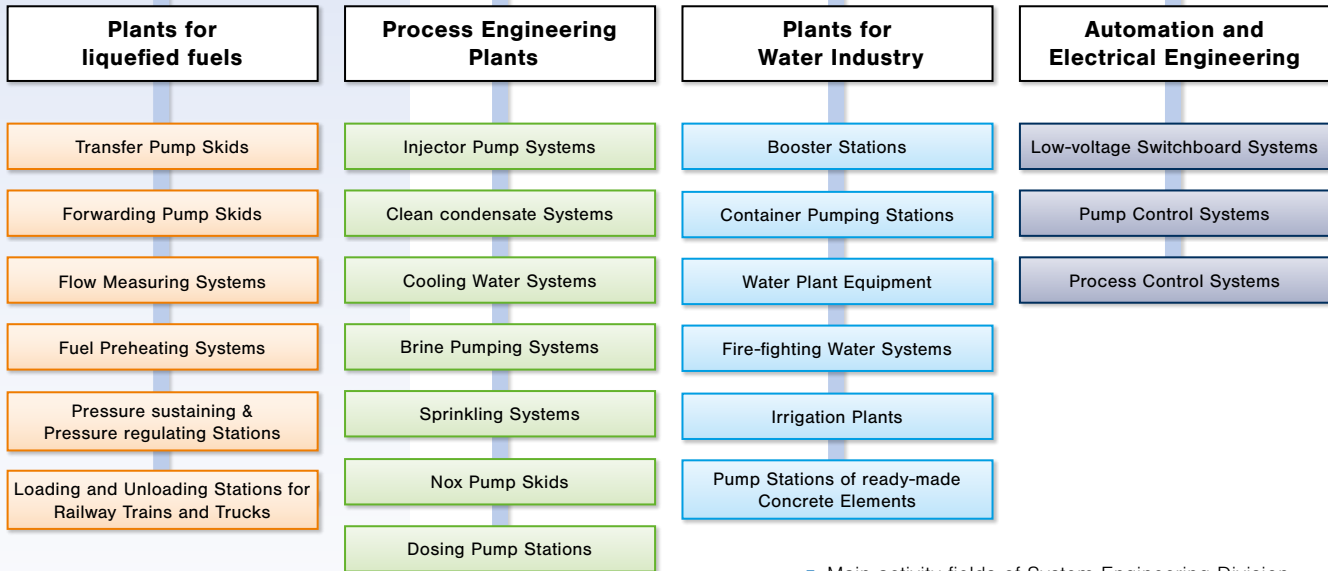
## Circulation Pump Systems

- Complete prefabricated pumping systems for circulation of heat transfer liquids, for example air preheating of gas turbines.



### System Engineering Division

Project Planning, Design and Fabrication:



■ Main activity fields of System Engineering Division

In more than 20 years Apollo has developed as Manufacturer of System Engineering Plants. The System Engineering Division combines high-quality welding standards with knowledge of fluid components functionality in complete plants.

#### Our Range of Services

- Hydraulic and process consultancy, design and fabrication of Systems for many Branches of Industry, Water Supply, Energy Sector, Environmental Technology, Raw Materials Industry etc.
- Customer specific planning, design and application programming of Control and Process Control Systems
- reliable Skid Manufacturer for leading Plant Engineering Companies

Additionally we offer our own electric design, software development and customer-specific manufacture of control cabinets. That means competence from single source.



■ Booster Station for unloading of Tankers

## Transfer Pump Skids

- They are used for circulation and transfer of all kinds of liquids.
- High operating safety is ensured by applying of Apollo's own pump series.



▪ Transfer Pump Skid

## Injector Pump Skids

- These systems are designed especially for supply of liquid fuel to gas turbines.
- The pumps are usually designed as redundant pumps in order to provide high operating safety.
- Apollo high-pressure pumps ensure high operating safety.



▪ Apollo high-pressure Pump Skid with vertical can-type pump



▪ Apollo high-pressure injector pump skid with horizontal multistage pump



▪ Apollo Lube Oil Skid of type ACS according to API 614



# ADDITIONAL APOLLO STANDARD PRODUCT TYPES

Type series	Pump designation	Design Data		
		Q (m <sup>3</sup> /h)	H (m)	Pressure (bar)
	<b>Single-stage centrifugal pumps</b>			
KRC	Chemical process pumps and additional type size	3.000	160	16/25
KRP/H	Average heavy-duty process pumps acc. to API 610	2.800	250	25/35
	<b>Multistage horizontal high-pressure pumps</b>			
GL/GLZ	Multistage centrifugal pumps with and without NPSH impeller (optionally with axial inlet)	500	320	25
GM/GMZ	Multistage centrifugal pumps with and without NPSH impeller (optionally with axial inlet)	550	550	64
	<b>Multistage vertical high-pressure pumps</b>			
GLV/X	Vertical tank-installation pump	500	250	25
GLVB	Vertical multistage centrifugal pumps with and without NPSH impeller	500	220	25
	<b>Centrifugal double-flow split-casing pumps with bearings on both ends</b>			
ZMLK	horizontal design	6.000	330	to 40
	vertical design	5.000	320	to 40
	<b>Self-priming centrifugal pumps</b>			
KSD/KCD	Self-priming side-channel pumps	30	300	25/40
KRE/S	Self-priming air volute-casing pumps	100	60	10