I. TECHNICAL DATA SHEET FOR PUMPING UNITS

ORDER No._____ ITEM No. _____H-106_____
PURCHASE ORDER No._____DATE_____
INQUIRY No._____

For: _
Object name: ___heavy residue treatment complex

Installation: delayed coking unit 21-10/7
Purpose: turbulising water feed

Note: information is filled out by Customer
Manufacturer*
Manufacturer and Customer

OPERATING CONDITIONS

Quantity: 1 Operating: 1 Standby:

Automatic start
Yes No

Operating mode:
continuous (hours/year) 7680

	Min.	Norm.	Max.
Flow rate (m3/h)	*0.61*	*0.81*	*5.0*
Delivery head (m)			*350*
NPSH R (m)			*10.3*

Intake pressure max/rated: *0.07/-0.069* (Mpa)
Discharge pressure max/rated : *4.22/3.527* (Mpa)

Liquid

Fluid type or name	Water steam condensate

Hazardous / **Highly flammable liquid** / Flammable liquid

	Min.	Norm.	Max.
Pumping temperature (°C)	*40*	*50*	*90*
Vapor pressure (MPa)		*0.0123*	
Density (kg/m3)	*993*	*988*	*964*
Viscosity (mPa*s)	*0.654*	*0.547*	*0.315*

Specific heat, Cp_____ (kJ/kg K)
H2S concentration: _____ % mass
Size(mm) concentration(%) of solid particles _____/_____

MATERIALS
Materials Class under API 610 __S-5_____
Min. design temperature of metals: minus 25 (◦C)

INFORMATION ABOUT PLACE OF INSTALLATION

Placement: **Under cover**
Explosive mixture category and group: **IIB-T3**
Data about installation:
El. above sea level: 15 m
Barometer Pressure: **100 (k**Pa)
Ambient temperature range: min/max. **-35 / + 43** °C
Relative humidity: min/max. **52 / 85** %
Special conditions:

Utilities

Electricity: Voltage	Phase number	Frequency
Drives 380	3	50
Heating 220	1	50

DRIVE TYPE

Electric motor

ELECTRIC DRIVE MOTOR

Manufacturer
Power: _____
Rotation frequency (rot. per min)
Explosion protection: **not less than 1Exd IIB**
Mechanical protection:
Cooling: **Active**/Passive/Forced
Voltage/phase number/frequency: **380 / 3 / 50**
Type: to be offered by Supplier (to be agreed upon with Customer)
Min. startup voltage: **342** V

SEALING

Single mechanical seal
Piping plan per API 682: 11 (recommended)

CASING

Pump type acc. to API 610/685: **BB-4*** **or OH-4**
Support: □ Axial □ Console □ Stand pipe □ Vertical Other___

Split: □Axial □ Slotted □ Radial □ Flat

Type:□ Single volute □ Double volute □ Diffusor □ Other_____

Position: **Horizontal** **Verical**

Impeller's installation □ Between bearings' supports □ Console

*- it is not admissible to use bypass for steady operation

Scope of supply: Pumping unit assembled on a frame, including: – Counter flanges (type of sealing surface – "male-female") made of steel 20, gaskets and fasteners; – Bearings for pump and electric motor SKF or FAG; – Flexible disk coupling; – Coupling guards; – Foundation bolts; – Adjustment bolts on base frame for units alignment; – Explosion-proof cable gland on entry to electric motor; – Temperature sensors for pump bearings for each bearing item. – Temperature sensors for electric motor bearings; – Motor winding temperature sensors (necessity TBD by Supplier); – Automatic anti-condensation electric heat tracing system for stator winding of pump el. motor; – Electric heat tracing system of pump body with heat insulation. Maintained temperature: plus 5°C; – Spare parts kit for startup, warranty period and two (2) years of operation. The scope of spare parts should include one (1) mechanical seal assembly for each item, spare parts kit for each seal, 5 sets of gaskets for pumping units overhaul, set of retaining rings, a bearings set.	Yes

Special requirements.

1. **Structure of pump and electric motor should not provide for water or kerosene cooling.**
2. Shutoff pressure shall not exceed 4.22 MPa (g) at maximum suction pressure.
3. NPSH shall not exceed 9 m at maximum flow rate.
4. Maximum design medium temperature – plus 150 °C.
5. Corrosion allowance – 3 mm.
6. Electric motor power shall be brought to compliance with API 610. In case of supply of a pumping unit of domestic manufacture, power margin of electric motor shall be determined by Supplier in accordance with Russian regulations.
7. Provide with o-lets for periodic control of vibration level of pump and electric motor bearings.
8. Equipment shall be supplied along with counter flanges (sizes of counter flanges necks) under GOST 33259-2015, hardware and gaskets. Counter flange should match pipes of standard size range under GOST 8732 in compliance with GOST 16037-80 without adapters. OD and thickness TBD at the stage of detailed design.
9. Type of gasket material is to be agreed with the Customer.
10. Climatic category – У2 (moderate 2), protection rating – not lower than IP54.
11. Electric motor shall be supplied c/w terminal boxes, explosion-proof cable glands and stuffing boxes. Inside terminal boxes there should be provided earthing bolt for cable armour grounding.
12. Take into account loads on nozzles not less than under GOST 32601-2013 (ISO 13709:2003 (API610)) with ratio 1.5.
13. Heat treatment of welded joints is required.
14. Estimated service life – 20 years.
15. In order to implement import substitution program, it is necessary to use lubricants of brand names *LUKOIL, TEBOIL, OMV.*

16. Service live before overhaul - 20000÷25000 hours, mean time to failure - 6300÷8000 hours.
17. Preservation period shall not be less than two (2) years from the date of shipment to the Customer.
18. Rotors should be of rigid type.
19. The Supplier shall provide with information regarding anti-corrosion protection.
20. There shall be oil-lubricated bearing assemblies and constant level oilers.
21. Bearing assemblies of the pump unit with consistent lubrication shall be equipped with grease cups readily obtainable for maintenance.
22. Pumping unit shall be c/w standard connections for grounding facilities.
23. All pressure values shall be in MPa(g), except for pressure of saturated vapours of the handled medium.
24. Pumping units shall comply with the requirements of GOST 32601-2013 *Centrifugal pumps for petroleum, petrochemical and natural gas industries. General specifications.*
25. Shaft seals of pumps shall comply with the requirements of GOST 32600-2013 *Shaft sealing systems for centrifugal and rotary pumps.*
26. Main parts of pumping unit (pump, seal piping system, mechanical seal, electric motor) shall have Customs Union certificates CU TR 012 and CU TR 010.
27. Technical offer shall include the following:
    - Performance curves of pumps with indicated of head, delivery, power, NPSH, efficiency;
    - Indicate operation capacity range of pumps in performance curves (H-Q);
    - GA drawing with indication of outline dimensions of pumping unit, location of suction and discharge connections, assembly drawing, coupling box drawing.
28. Pumping units shall comply with the requirements of *Technical specifications for supply of centrifugal pumps and pumping units for oil and gas processing and petrochemical facilities*
29. Pumping units shall comply with the requirements of *Safety rules for oil and gas processing facilities* under Order No.125 dated 29th March, 2016.

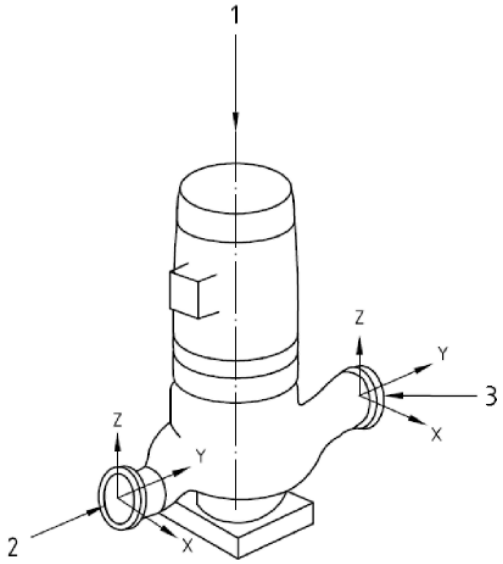
Attachment 1
(mandatory)
Allowable loads on pump nozzles under GOST 32601-2013 (ISO 13709:2003 (API610))

Table 1.1 – Loads on nozzles

	Flange nominal bore(DN)								
	<50	80	100	150	200	250	300	350	400
	Forces (N)								
	Each upper nozzle								
F_X	710	1070	1420	2490	3780	5340	6670	7120	8450
F_Y	580	890	1160	2050	3110	4450	5340	5780	6670
F_Z	890	1330	1780	3110	4890	6670	8000	8900	10230
F_R	1280	1930	2560	4480	6920	9630	11700	12780	14850
	Each side nozzle								
F_X	710	1070	1420	2490	3780	5340	6670	7120	8450
F_Y	890	1330	1780	3110	4890	6670	8000	8900	10230
F_Z	580	890	1160	2050	3110	4450	5340	5780	6670
F_R	1280	1930	2560	4480	6920	9630	11700	12780	14850
	Ezch lower nozzle								
F_X	890	1330	1780	3110	4890	6670	8000	8900	10230
F_Y	710	1070	1420	2490	3780	5340	6670	7120	8450
F_Z	580	890	1160	2050	3110	4450	5340	5780	6670
F_R	1280	1930	2560	4480	6920	9630	11700	12780	14850
	Moments (N×m)								
	Each nozzle								
M_X	460	950	1330	2300	3530	5020	6100	6370	7320
M_Y	230	470	680	1180	1760	2440	2980	3120	3660
M_Z	350	720	1000	1760	2580	3800	4610	4750	5420
M_R	620	1280	1800	3130	4710	6750	8210	8540	9820

NOTE 1: Each value given above is attributable to the range from minus value to plus value.

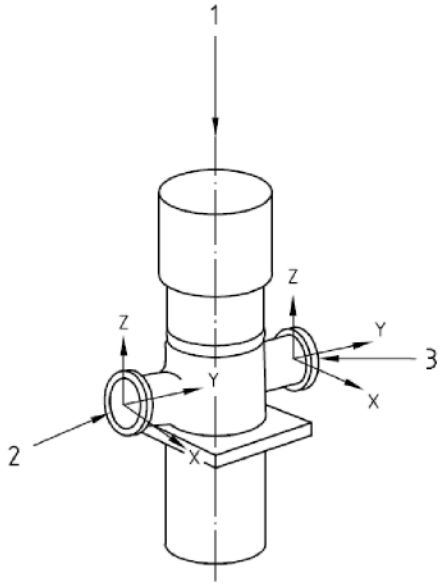
Example: value 160 corresponds to the range from - 160 to +160.
NOTE 2: To determine forces and moments given in Table 1.1, refer to coordinate systems in Fig. 1.1 ÷ 1.5.



Designations:

1 shaft central axis
2 discharge
3 suction

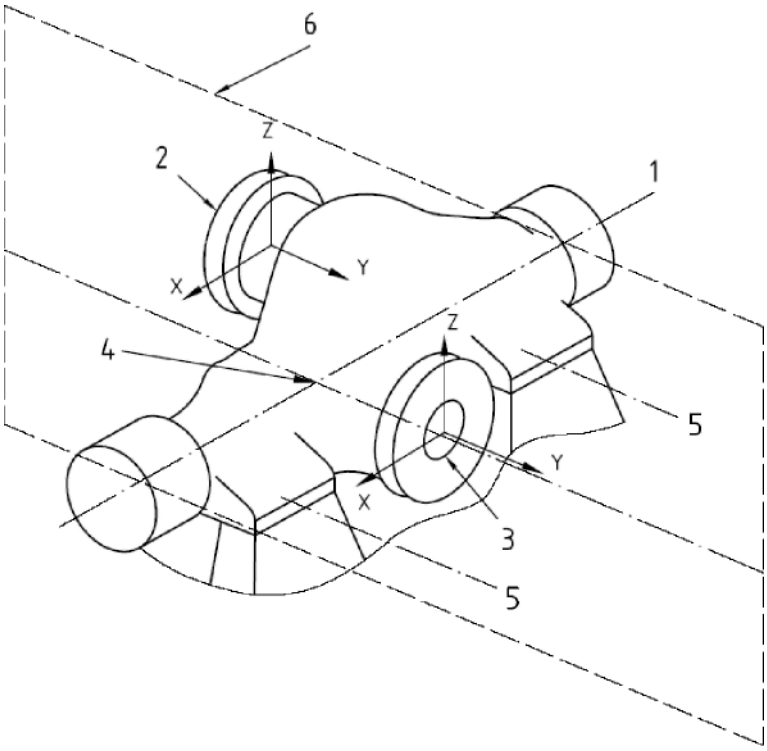
Fig. 1.1 - Coordinates system for forces and moments given in Table 1.1. In-Line Vertical Pumps



Designations:

1 shaft central axis
2 discharge
3 suction

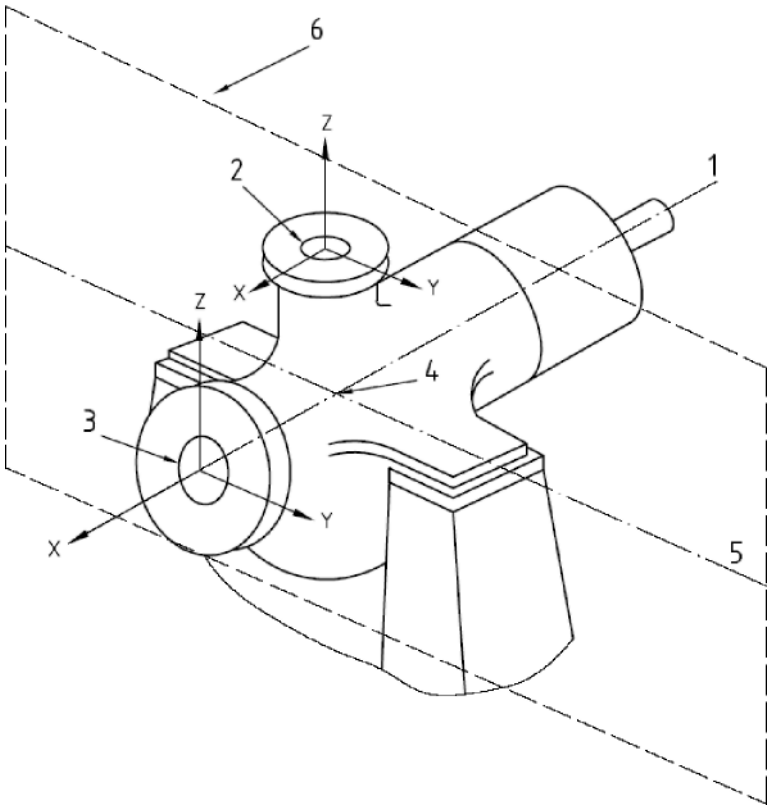
Fig. 1.2 - Coordinates system for forces and moments given in Table 1.1.Vertical barrel insert semi-submersible console pumps



Designations:

1 shaft central axis
2 suction connection (on inlet)
3 discharge connection (on outlet)
4 pump center
5 base centerline
6 vertical plane

Fig. 1.3 - Coordinates system for forces and moments given in Table 1.1. horizontal pumps with suction and discharge connection facing to the sides

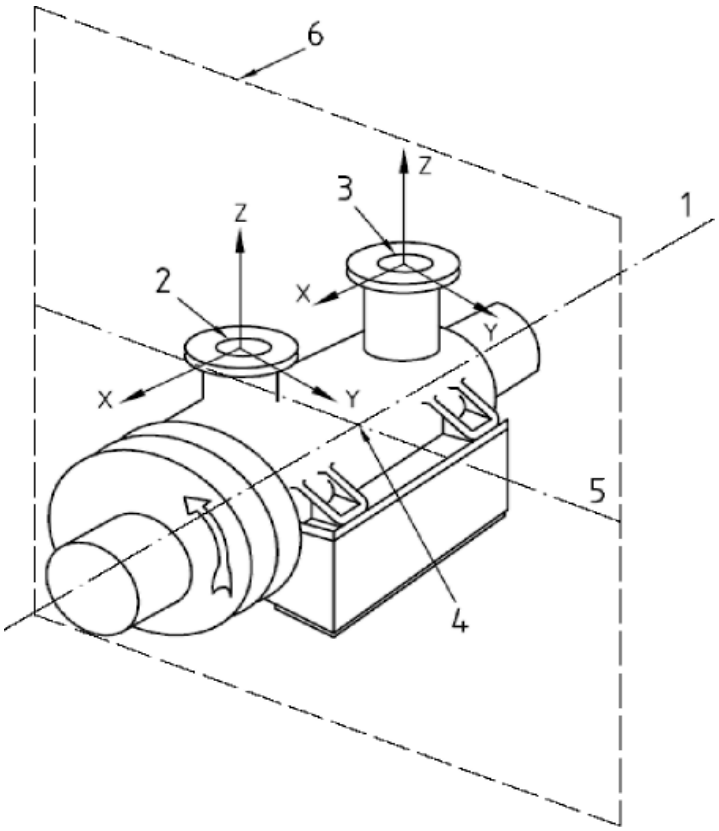


Designations:

shaft central axis

1 suction connection (on inlet)
2 discharge connection (on outlet)
3 pump center
4 base centerline
5 vertical plane

Fig. 1.4 - Coordinates system for forces and moments given in Table 1.1. Horizontal pumps with suction connection along the axis and discharge connection facing upwards



Designations:

shaft central axis

1 suction connection (on inlet)
2 discharge connection (on outlet)
3 pump center
4 base centerline
5 vertical plane

Fig. 1.5 - Coordinates system for forces and momentsa given in Table 1.1. Horizontal pumps with suction and discharge connections facing upwards

Attachment 2
(mandatory)
List of documents to be submitted by Supplier to the Customer along with equipment

Table 2.1 – List of documents to be submitted by Supplier to the Customer

№	Name of the document
1	List of documents submitted
2	Pump Passport (datasheet), including: • Performance curve, with mandatory indication of Minimum Continuous Stable Flow (MSCF) under API-610 • Dimensional outline drawing and installation drawing, and detailed specification • General arrangement drawing with auxiliary piping and detailed specification • Assembly drawing of pump cross section and detailed specification • Assembly drawing of coupling and detailed specification • Drawing of shaft sealing and detailed specification • Main and auxiliary sealing diagrams, detailed specification • Cooling or heating diagram and detailed specification • Electrical diagrams and instrumentation diagrams, and relevant detailed specification • Installation and electrical drawing and instrumentation drawing, and relevant list of connections • Maximum and minimum value of impeller diameter and serial number of pump • Acceptance report on manufacturing plant • Certificates of hydraulic testing • Noise chart • Vibration level during performance tests • Material certificates of main parts • Full specification for all supplied equipment and auxiliary devices.
3*	• Passport of manufacturing plant regardless the country of origin • Installation and operation manual on electric motor • Certificate of Conformity of electric motors to the standards and requirement of destination country • Explosion Protection Certificate confirming compliance to the standards and regulations of destination country
4	Operation and maintenance manual, including: • Transportation, warehousing and storage guideline • Installation guideline • Commissioning guideline • Recommendations on methods and scope of technical monitoring • List of activities regarding maintenance and repair works • List of lubricating materials • List of alarms and interlocks for every pumping unit, in accordance with the required scope of supply of instrumentation and automation devices.
5	Type Approval Certificate issued by Federal Agency on Technical Regulation and Metrology of the Russian Federation**
6	GOST R Certificate of Conformity*/ Explosion protection Certificate*
7	Technical documentation for the auxiliary equipment, parts and components supplied by subcontractors (electric motor, coupling, mechanical seal, etc.)

* only in case of supply of pumping units with electric motor.

** for oil and gas processing and petrochemical facilities

Attachment 3
(mandatory)
Technical requirements to automation and electric motor

1. For temperature control of pump bearings use platinum resistance thermometer (PRT) Pt100, W =1,3850, 3-wire connection diagram, two (2) pcs. on each bearing. Instruments shall have a fixed connection to the junction box (JB) included into the scope of supply fixed on the pump body. Conductors from resistance thermometers to the JB shall be laid in metal hoses with plastic coating and/or tubes securely fixed on the pump body. Conductors (cables) shall be led into the box via liquid tight cable glands. JB shall also be fitted with liquid tight cable entry with a facility for fastening a metal hose for external non-armoured cable with OD from 15 to 26 mm.

2. For temperature control of electric motor bearings (necessity is to be determined by Supplier and coordinated with the Customer) use platinum resistance thermometer (PRT) Pt100, W =1,3850, 3-wire connection diagram, 1 pcs. on each bearing. Instruments shall have a fixed connection to the junction box included into the scope of supply fixed on the el. motor body. Conductors from resistance thermometers to the JB shall be laid in metal hoses with plastic coating and/or tubes securely fixed on the el. motor body. Conductors (cables) shall be led into the box via liquid tight cable glands. JB shall also be fitted with liquid tight cable entry with a facility for fastening a metal hose for external non-armoured cable with OD from 10 to 18 mm.

3. For temperature control of stator winding of electric motor (necessity is to be determined by Supplier and coordinated with the Customer) use platinum resistance thermometer (PRT) Pt100, W =1,3850, 3-wire connection diagram, two (2) pcs. on each winding. Supplier shall determine whether it is necessary to use PTC thermistors in addition to the platinum resistance thermometer and their quantity and coordinate it with the Customer. Instruments shall have a fixed connection to the junction box included into the scope of supply fixed on the el. motor body. There shall be used a separate junction box for connection of these circuits. It is admissible to arrange a separate compartment in a common junction box, provided that its structure prevents any contact of power circuits with resistance thermometers' circuits. JB shall be fitted with liquid tight cable entry with a facility for fastening a metal hose for external non-armoured cable. The design engineer shall communicate the cable diameter to Supplier after receiving information regarding total number of resistance thermometers.
4. Resistance thermometers under item 1…3 shall be isolated from each other. It is not admissible to connect their circuits.
5. Manufacturers and instruments models shall be coordinated with the Customer and design engineer.