CLIENT:	GS ENG. & CONST. CORP.
PROJECT TITLE:	Bahrain LNG Import Terminal
JOB NUMBER:	KKSL16-0106
EQUIPMENT NUMBER:	P-1005A/B
EQUIPMENT SERVICE:	Potable Water Pumps
SERIAL NUMBER:	
REQ / SPEC NO:	
PURCH ORDER NO.	

COMMENTS:

	DATASHEETS	
	ITEM No.	ATT
PUMP	P-1005A/B	O
MOTOR		O
GEAR		O
TURBINE		O

APPLICABLE OVERLAY STANDARDS

Rev	Date	Description	Prepared By
	02/29/2016	ISSUED FOR	Sang-Ho Lee

CENTRIFUGAL PUMP DATASHEET API 610 11TH EDITION

DATASHEET No.

CENTRIFUGAL PUMP DATASHEET API 610 11TH EDITION

Metric

APPLICABLE TO:				APPLICABLE NTL/INTNTL STANDARD:	
FOR	SOCAR AEGEAN REFINERY			UNIT	
SITE	Turkey			SERVICE	Liquid Sulphur Transfer pumps
NO. REQ	3	PUMP SIZE	2x4-9	TYPE	No. STAGES
MANUFACTURER	ITT GOULDS PUMPS ICI			MODEL	3700 SERIAL NO

LIQUID CHARACTERISTICS

	Units	Maximum	Minimum	Note
LIQUID TYPE OR NAME:	Liquid Sulphur			Max & min values refer only to the property listed
VAPOR PRESSURE:	kg/cm² abs			
RELATIVE DENSITY:		1.790		
SPECIFIC HEAT:	J/(Kg*K)			
VISCOSITY:	cp	10.000		

SERVICE:
IF INTERMITTENT NO. OF STARTS:
PUMPS OPERATE IN:
CORROSION DUE TO: (6.12.1.9)
EROSION DUE TO: (6.12.1.9)
H2S CONCENTRATION (ppm): (6.12.1.12)
CHLORIDE CONCENTRATION (ppm):
PARTICULATE SIZE (DIA IN MICRONS)
PARTICULATE CONCENTRATION (ppm)

OPERATING CONDITIONS (6.1.2)

	Units	Maximum	Rated	Normal	Minimum
NPSHA Datum:					
PUMPING TEMPERATURE:	deg C		163.0		
FLOW:	m³/hr	53.1	37.2		12.7
DISCHARGE PRESSURE: (6.3.2)	kg/cm² g	5.5	5.0		5.4
SUCTION PRESSURE:	kg/cm² g	1.2			
DIFFERENTIAL PRESSURE:	kg/cm² g	4.3	5.1		4.2
DIFFERENTIAL HEAD:	m	31.4	28.8		23.7
NPSHA:	m		4.5		
HYDRAULIC POWER:	kW		5.2		

SITE AND UTILITY DATA

LOCATION:

MOUNTED AT :
ELECTRIC AREA CLASSIFICATION : 6.1.22 DIVISION
GROUP TEMP CLASS
TROPICALIZATION REQ

SITE DATA :
ELEVATION (MSL) m BAROMETER : 1.0 kg/cm² abs
RANGE OF AMBIENT TEMPS: MIN / MAX / 41.8 deg C
RELATIVE HUMIDITY: MIN / MAX / %
UNUSUAL CONDITIONS :
- SPECIFY OTHER:

UTILITY CONDITIONS :

ELECTRICITY:	DRIVERS	HEATING	CONTROL	SHUTDOWN
VOLTAGE	400			
PHASE	3-phase			
HERTZ	50			

COOLING WATER :

		INLET	RETURN	DESIGN
TEMP	deg C		MAX	
PRESS	kg/cm² g		MIN	

SOURCE
COOLING WATER CHLORIDE CONCENTRATION: ppm
INSTRUMENT AIR MAX kg/cm² g MIN kg/cm² g
STEAM

		DRIVERS	HEATING
TEMP deg C	Max		
	Min		
PRESS kg/cm² g	Max		
	Min		

PERFORMANCE

PROPOSAL CURVE NO.	6688-0	RPM	2,950	
As Tested Curve No.				
IMPELLER DIA RATED	158	MAX. 235	MIN. 152	mm
RATED POWER	9.7 kW	EFFICIENCY	53.5	(%)
RATED CURVE BEP FLOW (at rated impeller dia)			45.4	m³/hr
MIN FLOW: THERMAL	gpm	STABLE	12.7	m³/hr
PREFERRED OPERATING REGION (6.1.12)	31.8	to	54.5	m³/hr
ALLOWABLE OPERATING REGION	12.7	to	53.1	m³/hr
MAX HEAD @ RATED IMPELLER		31.4		m
MAX POWER @ RATED IMPELLER (6.8.9)		11.3		kw
NPSHr AT RATED FLOW:		1.2		m
CL PUMP TO U/S BASEPLATE				m
NPSH MARGIN AT RATED FLOW:		3.3		m
SPECIFIC SPEED (6.1.9)	m³/hr,m	1,110		
SUCTION SPECIFIC SPEED LIMIT		13,000		
SUCTION SPECIFIC SPEED	m³/hr,m	11,595		
MAX. ALLBLE SOUND PRESS.LEVEL REQD (6.1.14)				(dBA)
EST MAX SOUND PRESS.LEVEL		61.5		(dBA)
MAX. SOUND POWER LEVEL REQ'D (6.1.14)				
EST MAX SOUND POWER LEVEL				

DRIVER (7.1.5)

Driver Type	ElectricMotor
GEAR	○
VARIABLE SPEED REQUIRED	○
SOURCE OF VARIABLE SPEED	
OTHER	
MANUFACTURER	Pump mfg's Choice
NAMEPLATE POWER	15.0 kw
Nominal RPM	3,000
RATED LOAD RPM	2,950
FRAME OR MODEL	160L42
ORIENTATION	Horizontal
LUBE	
BEARING TYPE (RADIAL)	Ball
BEARING TYPE (THRUST)	Ball
RADIAL	
THRUST	
STARTING METHOD	
SEE DRIVER DATASHEET	

DATASHEET No. Rev :

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Metric

CONSTRUCTION

API PUMP TYPE: OH2 [Based on API 610 definitions]

NOZZLE CONNECTIONS: (6.5.5)

	Size	Facing	Rating	Position
SUCTION	4 in	RF (Raised Face)	Class 300	End
DISCHARGE	2 in	RF (Raised Face)	Class 300	Top

PRESSURE CASING AUX.CONNECTIONS: (6.4.3.2)

	No.	Size	Type
BALANCE/LEAK OFF			
DRAIN		3/4 in	
VENT			
PRESS GAUGE			
TEMP GAUGE			
WARM-UP LINE			

	Rating	Posn.	Facing
BALANCE/LEAK OFF			
DRAIN			
VENT			
PRESS GAUGE			
TEMP GAUGE			
WARM-UP LINE			

Drain Valve Supplied By
DRAINS MANIFOLDED O
VENT Valve Supplied By
VENTS MANIFOLDED O
THREADED CONS FOR PIPELINE SERVICE & < 50°C (6.4.3.2) O
SPECIAL FITTINGS FOR TRANSITIONING (6.4.3.3) O
CYLINDRICAL THREADS REQUIRED (6.4.3.8) O
GUSSET SUPPORT REQUIRED O
MACHINED AND STUDDED CONNECTIONS (6.4.3.12) O
VS 6 DRAIN
DRAIN TO SKID EDGE O

CASING MOUNTING: Centerline
CASING TYPE: (6.3.10) Volute - single
OH3 BACKPULLOUT LIFTING DEVICE REQD. (9.12.6) O
CASE PRESSURE RATING:
MAWP : (6.3.6) 45.8 kg/cm² g @ 163.0 deg C
HYDROTEST : 78.0 kg/cm² g @ 163.0 deg C

HYDROTEST OH PUMP AS ASSEMBLY O
SUCT'N PRESS. REGIONS DESIGNED FOR MAWP O
ROTATION: (VIEWED FROM COUPLING END) Counterclockwise
- IMPELLERS INDIVIDUALLY SECURED : O
- BOLT OH 3/4/5 PUMP TO PAD / FOUNDATION : O
- PROVIDE SOLEPLATE FOR OH 3/4/5 PUMPS O

ROTOR:
SHAFT FLEXIBILITY INDEX (SFI) (9.1.1.3)
First Critical Speed Wet (Multi stage pumps only) O
COMPONENT BALANCE TO ISO 1940-1, G1.0 O
SHRINK-FIT-LIMITED MOVEMENT IMPELLERS (9.2.2.3) O

COUPLING: (7.2.3) (7.2.13.f)
MANUFACTURER Metastream
MODEL TSKS 0013 w/metric fasteners
RATING (BHP/100 RPM) 1.71
SPACER LENGTH 127.0 mm
SERVICE FACTOR
RIGID O
COUPLING WITH HYDRAULIC FIT (7.2.10)
COUPLING BALANCED TO ISO 1940-1 G6.3 (7.2.3) O
COUPLING WITH PROPRIETARY CLAMPING DEVICE (7.2.11) O

COUPLING IN COMPLIANCE WITH (7.2.4) API 610
COUPLING GUARD STANDARD PER (7.2.13.a)
Window on Coupling Guard O

MATERIAL (6.12.1.1)

APPENDIX H CLASS S-5 (steel)
MIN DESIGN METAL TEMP (6.12.4.1) -28.9 deg C
REDUCED-HARDNESS MATERIALS REQ'D (6.12.1.12.1) O
Applicable Hardness Standard (6.12.1.12.3)
BARREL :
CASE: Carbon steel
DIFFUSERS:
IMPELLER: Carbon steel
IMPELLER WEAR RING: 12% Chrome
CASE WEAR RING: 12% Chrome
SHAFT: 316SS
Bowl (if VS-type)
Inspection Class

BEARINGS AND LUBRICATION (6.10.1.1)

BEARING (TYPE / NUMBER): (6.11.4)
RADIAL / 6212 C3
THRUST / 7312 BEGAM
REVIEW AND APPROVE THRUST BEARING SIZE : (9.2.5.2.4) O

LUBRICATION : (6.10.2.2) (6.11.3) (9.6.1) Ring oil
PRESSURE LUBE SYSTEM STANDARD
(9.2.6.5) O
ISO 10438 DATASHEETS ATTACHED
Pressurized Lube Oil System mtd on pump baseplate O
Location of Pressurized Lube Oil System mounted on baseplate:

INTERCONNECTING PIPING PROVIDED BY
OIL VISC. ISO GRADE VG
CONSTANT LEVEL OILER: Constant level oiler

BASEPLATE

API BASEPLATE NUMBER :
BASEPLATE CONSTRUCTION (7.3.14)
BASEPLATE DRAINAGE (7.3.1)
MOUNTING :
NON-GROUT CONSTRUCTION : (7.3.13) O
VERTICAL LEVELING SCREWS : O
LONGITUDINAL DRIVER POSITIONING SCREWS : O
SUPPLIED WITH : • GROUT AND VENT HOLES O
• DRAIN CONNECTION O
MOUNTING PADS SIZED FOR BASEPLATE LEVELING (7.3.5) O
MOUNTING PADS TO BE MACHINED (7.3.6) O
PROVIDE SPACER PLATE UNDER ALL EQUIPMENT FEET O
OTHER

REMARKS :

DATASHEET No. Rev :

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Metric

INSTRUMENTATION

SEE ATTACHED API-670 DATASHEET

ACCELEROMETER (7.4.2.1)

Number of Accelerometers

Mounting Location of Accelerometers

PROVISION FOR MTG ONLY (6.10.2.10) ○

Number of Accelerometers

Mounting Location of Accelerometers

FLAT SURFACE REQUIRED (6.10.2.11) ○

Number of Accelerometers

Mounting Location of Accelerometers

VIBRATION PROBES (7.4.2.2)

PROVISIONS FOR VIB. PROBES ○

NUMBER PER RADIAL BEARING

NUMBER PER AXIAL BEARING

PROVISION FOR MTG ONLY ○

MONITORS AND CABLES SUPPLIED BY (7.4.2.4)

TEMPERATURE (7.4.2.3)

PROVISIONS FOR TEMP PROBES ○

RADIAL BEARING TEMP. ○

NUMBER PER RADIAL BEARING

THRUST BEARING TEMP. ○

NUMBER PER THRUST BEARING ACTIVE SIDE

NUMBER PER THRUST BEARING INACTIVE SIDE

TEMP. GAUGES (WITH THERMOWELLS) (9.1.3.6) ○

PRESSURE GAUGE TYPE

Remarks

SEAL SUPPORT SYSTEM MOUNTING

SEAL SUPPORT SYSTEM MOUNTED ON PUMP BASEPLATE (7.5.1.4) ○

IDENTIFY LOCATION ON BASEPLATE

INTERCONNECTING PIPING BY

MECHANICAL SEAL (6.8.1)

SEE ATTACHED ISO 21049/API 682 DATASHEET

ADDITIONAL CENTRAL FLUSH PORT (6.8.9) ○

HEATING JACKET REQ'D (6.8.11) ○

HEATING AND COOLING (6.1.17)

COOLING REQ'D ◉

COOLING WATER PIPING PLAN API Plan M

COOLING WATER PIPING FITTINGS Galvanized pipe

COOLING WATER PIPING MATERIALS CS

COOLING WATER REQUIREMENTS:

BEARING HOUSING m³/hr

HEAT EXCHANGER m³/hr

TOTAL COOLING WATER m³/hr

HEATING MEDIUM

OTHER

HEATING PIPING

PIPING & APPURTENANCES

MANIFOLD PIPING FOR PURCHASER CONNECTION (7.5.1.6)

VENT ○

DRAIN ○

COOLING WATER ○

TAG ALL ORIFICES (7.5.2.4) ○

SOCKET WELD CONN ON SEAL GLAND (7.5.2.8) ○

DATASHEET No. _____ Rev : _____

CENTRIFUGAL PUMP DATASHEET API 610 11TH EDITION

Metric

SURFACE PREPARATION AND PAINT

MANUFACTURER'S STANDARD
OTHER (SEE BELOW)
SPECIFICATION NO.

PUMP:

PUMP SURFACE PREPARATION
PRIMER
FINISH COAT

BASEPLATE:

BASEPLATE SURFACE PREPARATION
PRIMER: Goulds zinc primer
FINISH COAT
DETAILS OF LIFTING DEVICES

SHIPMENT: (8.4.1)

EXPORT BOXING REQUIRED: Export boxing
OUTDOOR STORAGE MORE THAN 6 MONTHS: ◉

SPARE ROTOR ASSEMBLY PACKAGED FOR:

ROTOR STORAGE ORIENTATION (9.2.8.2)
SHIPPING & STORAGE CONTAINER FOR VERT STORAGE (9.2.8.3): ○
N2 PURGE (9.2.8.4): ○

SPARE PARTS:

START-UP: ○
NORMAL MAINTENANCE: ○

MASSES kg

ITEM No	PUMP	DRIVER
640G-011A/B/C	196.8	149.7

GEAR	BASE	TOTAL
		349.2

OTHER PURCHASER REQUIREMENTS

COORDINATION MEETING REQUIRED (10.1.3): ○
MAXIMUM DISCHARGE PRESSURE TO INCLUDE:
MAX RELATIVE DENSITY: ○
OPERATION TO TRIP SPEED: ○
MAX DIA. IMPELLERS AND/OR NO OF STAGES: ○
CONNECTION DESIGN APPROVAL (9.2.1.4): ○
TORSIONAL ANALYSIS / REPORT (6.9.2.10): ○
PROGRESS REPORTS: ◉
OUTLINE OF PROC FOR OPTIONAL TESTS (10.2.5): ○
ADDITIONAL DATA REQUIRING 20 YEARS RETENTION (8.2.1.1): ○
LATERAL ANALYSIS REQUIRED (9.1.3.4) (9.2.4.1.3): ○
MODAL ANALYSIS REQUIRED (9.3.9.2): ○
DYNAMIC BALANCE ROTOR (6.9.4.4): ○
INSTALLATION LIST IN PROPOSAL (10.2.3.l): ○
VFD STEADY STATE DAMPED RESPONSE ANALYSIS (6.9.2.3): ○
TRANSIENT TORSIONAL RESPONSE: ○
BEARING LIFE CALCULATIONS REQUIRED (6.10.1.6): ○
IGNITION HAZARD ASSMT TO EN 13463-1 (7.2.13.e): ○
CASING RETIREMENT THICKNESS DRAWING (10.3.2.3): ○
FLANGES RQD IN PLACE OF SKT WELD UNIONS (7.5.2.8): ○
INCLUDE PLOTTED VIBRATION SPECTRA (6.9.3.3): ○
CONNECTION BOLTING (7.5.1.7)
CADMIUM PLATED BOLTS PROHIBITED: ○
VENDOR TO KEEP REPAIR AND HT RCDS (8.2.1.1.c): ○
VENDOR SUBMIT TEST PROCEDURES (8.3.1.1): ○
SUBMIT INSPECTION CHECK LIST (8.1.5): ○

TEST

SHOP INSPECTION (8.1.1): ○
PERFORMANCE CURVE & DATA APPROVAL PRIOR TO SHIPMENT: ◉
TEST WITH SUBSTITUTE SEAL (8.3.3.2.b)
MATERIAL CERTIFICATION REQUIRED (6.12.1.8): CASING ◉, IMPELLER ◉, SHAFT ◉, OTHER
CASTING REPAIR WELD PROCEDURE APPR REQD (6.12.2.5) (6.12.3.1): ○
INSPECTION REQUIRED FOR CONNECTION WELDS (6.12.3.4.d) (6.12.3.4.e): MAG PARTICLE ○, RADIOGRAPHY ○, LIQUID PENETRANT ◉, ULTRASONIC ○
INSPECTION REQUIRED FOR CASTINGS: MAG PARTICLE ○, RADIOGRAPHY ◉, LIQUID PENETRANT ○, ULTRASONIC ○
HARDNESS TEST REQUIRED (8.2.2.7)
ADDNL SUBSURFACE EXAMINATION (6.12.1.5) (8.2.1.3): ○
FOR
METHOD
PMI TESTING REQUIRED (8.2.2.8): ◉
COMPONENTS TO BE TESTED: Aux Fluid Piping
RESIDUAL UNBALANCE TEST (J.4.1.2): ○
NOTIFICATION OF SUCCESSFUL SHOP PERFORMANCE TEST (8.1.1.c) (8.3.3.5): ○
BASEPLATE TEST (7.3.21)
HYDROSTATIC: Non-witnessed
HYDRO TEST OF BOWLS & COLUMN (9.3.13.2)
PERFORMANCE TEST: Witnessed
TEST IN COMPLIANCE WITH (8.3.3.2)
TEST DATA POINTS TO (8.3.3.3)
TEST TOLERANCES TO (8.3.3.4)
NPSH (8.3.4.3.1) (8.3.4.3.4)
NPSH-1ST STG ONLY (8.3.4.3.2)
NPSH TESTING TO HI 1.6 OR ISO 9906 (8.3.4.3.3)
TEST NPSHA LIMITED TO 110% SITE NPSHA (8.3.3.6): ○
RETEST ON SEAL LEAKAGE (8.3.3.2.d)
RETEST REQ AFTER FINAL HEAD ADJ (8.3.3.7.b)
COMPLETE UNIT TEST (8.3.4.4.1)
SOUND LEVEL TEST (8.3.4.5): Witnessed
CLEANLINESS PRIOR TO FINAL ASSEMBLY (8.2.2.6): Non-witnessed
LOCATION OF CLEANLINESS INSPECTION
NOZZLE LOAD TEST
CHECK FOR CO-PLANAR MOUNTING PAD SURFACES
MECHANICAL RUN TEST UNTIL OIL TEMP STABLE: Non-witnessed
4 HR. MECH RUN AFTER OIL TEMP STABLE (8.3.4.2.1)
4 HR. MECH RUN TEST (8.3.4.2.2)
TRUE PEAK VELOCITY DATA
BRG HSG RESONANCE TEST (8.3.4.7)
STRUCTURAL RESONANCE TEST (9.3.9.2)
REMOVE / INSPECT HYDRODYNAMIC BEARINGS AFTER TEST (9.2.7.5)
AUXILIARY EQUIPMENT TEST (8.3.4.6)
EQUIPMENT TO BE INCLUDED IN AUXILIARY TESTS
LOCATION OF AUXILIARY EQUIPMENT TEST
IMPACT TEST (6.12.4.3): PER EN 13445, PER ASME SECTION VIII
REMOVE CASING AFTER TEST

DATASHEET No. _____ Rev: _____

Model: 3600	Size: 4x6-10D	50Hz	RPM: 2975	Stages: 10

Job/Inq.No. : G22450505
Purchaser : TECNICAS REUNIDAS
End User : SOCAR & TURCAS
Item/Equip.No. : 120G-001 A/B
Service : FEED PUMPS
Order No. :

Issued by : Panos Katsiris
Quotation No. : STAR-G505-BB2
Certified By :

Rev. : 0
Date : 10/20/2013

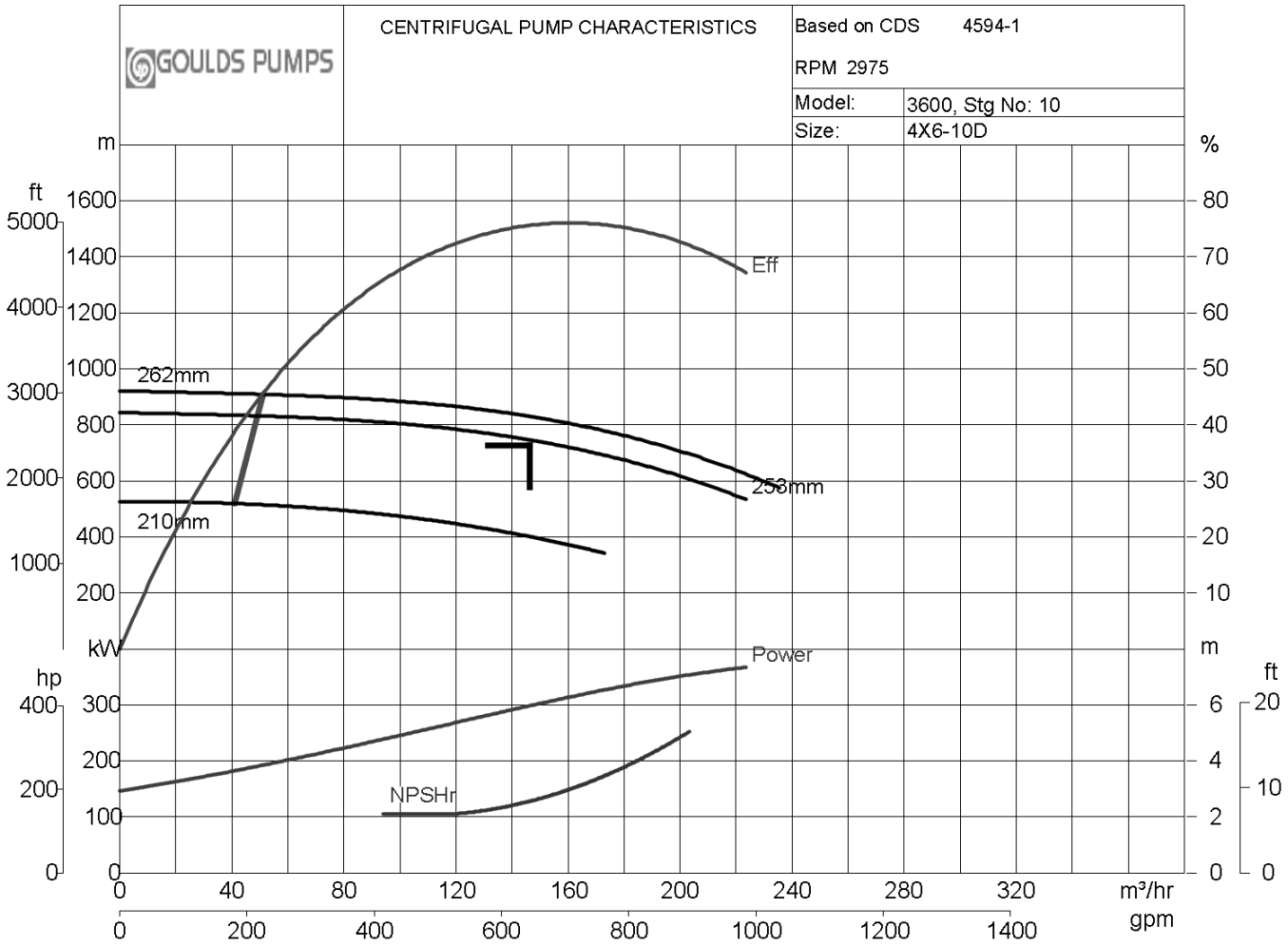
Operating Conditions

Liquid:	HYDROCARBON
Temp.:	66.0 deg C
S.G./Visc.:	0.760/0.460 cp
Flow:	147.40 m³/hr
TDH:	737.00 m
NPSHa:	3.86 m
Solid size:	
Vapor Press:	3.00 bar abs

Pump Performance

Published Efficiency:	77.5 %	Suction Specific Speed:	11,230 m³/hr,m
Rated Pump Efficiency:	75.5 %	Min. Hydraulic Flow:	49.27 m³/hr
Rated Total Power:	299.80 kW	Min. Thermal Flow:	N/A
Non-Overloading Power:	366.95 kW		
Imp. Dia. First 1 Stg(s):	253 mm	Imp. Dia. Adl Stg(s):	253 mm
NPSHr:	2.59 m	Shut off Head:	843.70 m
Max. Solids Size:	0.25 mm	% Susp. Solids (by wtg):	

Notes: 1. Elevated temperature effects on performance are not included.



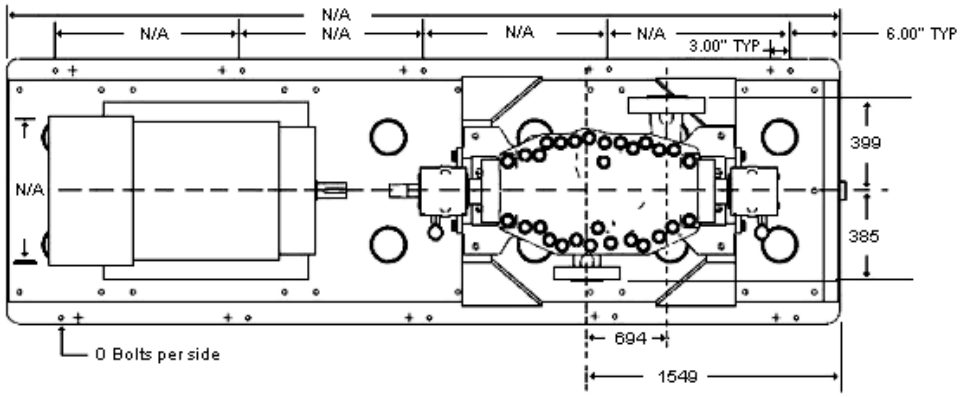
ITT

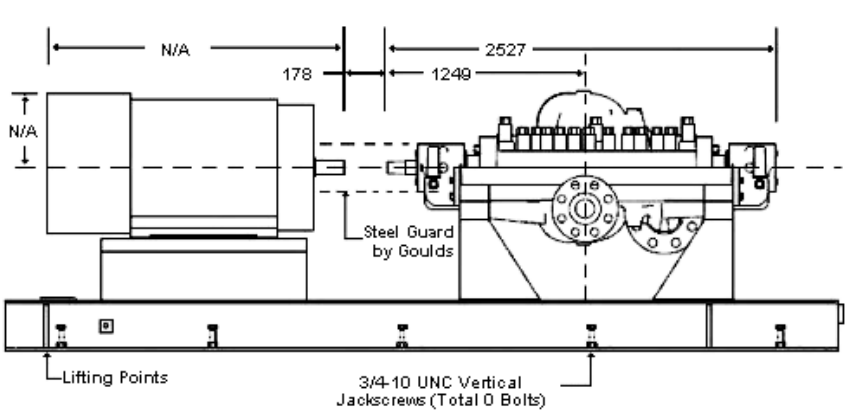
GOULDS PUMPS

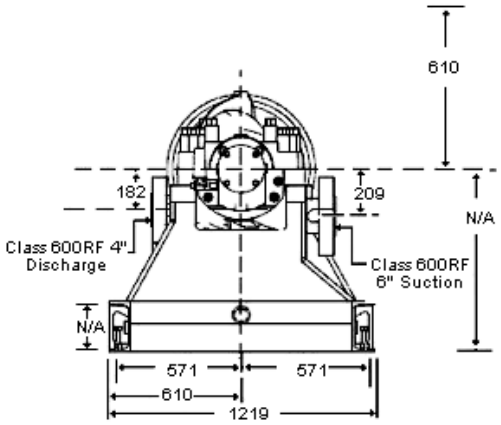
OUTLINE DRAWING

Model 3600 11th Edition (ISO 13709)
Size 4x6-10D STG 10 API610

ITT







Pump Specification

SUCT.FLANGE SIZE	*6"*	DRILLING	*ANSI 600#*	FACING	*RF*	FINISH	*SERRATED*
DISCH.FLANGE SIZE	*4"*	DRILLING	*ANSI 600#*	FACING	*RF*	FINISH	*SERRATED*
PUMP ROTATION (LOOKING AT PUMP FROM MOTOR)			*CCW*				
TYPE OF LUBRICATION	*RING OIL*					COOLED	*NO*
TYPE OF STUFFING BOX	*N/A*					COOLED	*NO*
TYPE OF SEALING	*MECHANICAL SEAL*						

Weights and Measurements

PUMP	*1,661 kg*
MOTOR	*kg*
BASEPLATE	*1,440 kg*
TOTAL	*3,101 kg*
GR.VOLUME w/BOX	*N/A*
GR.WEIGHT w/BOX	*N/A*

Motor Specification

MOTOR BY	*PUMP MFG*	MOUNT BY	*PUMP MFG*	MFG.	*PUMP MFG'S CHOICE*
FRAME	*TBA*	POWER	*370.00 kW*	RPM	*3000*
PHASE	*3*	FREQUENCY	*50 HZ*	VOLTS	*6300*
INSULATION	*F*	S.F.	*1.00*		
ENCLOSURE	*IP55 - EX NA II T3*				

Notes and References

- MTR DIMENSIONS ARE APPROXIMATE
- Actual Product May Vary From Image

Auxiliary Specification

COUPLING BY	*PUMP MFG*	CPLG TYPE	*METASTREAM TSKS 0135*
CPL GUARD BY	*PUMP MFG*	CPLG GUARD MATL	*BRASS (NON-SPARKING)*
BASEPLATE	*FABRICATED STEEL – MOTOR J/BOX MAY OVERHANG THE BASE PLATE*		
MECH.SEAL	*C2A3A1153B*		

DRAWING IS FOR REFERENCE ONLY.
NOT CERTIFIED FOR CONSTRUCTION UNLESS SIGNED.

Customer: TECNICAS REUNIDAS
Serial No:
Customer P.O. No:
Item No: 120G-001 A/B
Project No: AEGEAN REFINERY
End User: SOCAR & TURCAS
Service: FEED PUMPS

All dimensions are in mm.
Drawing is not to scale
Weights (kg) are approximate

DRAWING NO STAR-G505-BB2/120G-001 A/B