1. ☐ APPROVED

2. ☐ APPROVED AS NOTED (WITH COMMENTS)

3. ☐ NOT APPROVED

4. ☐ FOR INFORMATION

This approval does not relieve the vendor of his responsibility to meet purchase order conditions relating to duty, specifications, materials, design, construction and delivery requirements.

Date	CHKD	REVD	APPD

4	2013.05.13	FOR FINAL	X.B.ZHANG	I.H.DO	K.Y.LEE	B.J.KWUN
3	2013.04.09	FOR FINAL	X.B.ZHANG	I.H.DO	K.Y.LEE	B.J.KWUN
2	2013.01.02	FOR APPROVAL	X.B.ZHANG	I.H.DO	K.Y.LEE	B.J.KWUN
1	2012.10.26	FOR APPROVAL	X.B.ZHANG	I.H.DO	K.Y.LEE	B.J.KWUN
0	2012-09-04	ISSUED FOR APPROVAL	X.B.ZHANG	I.H.DO	K.Y.LEE	B.J.KWUN
Rev. No.	Date	Description	DRWN	CHKD	REVD	APPD

Client :

SKSOL LUBE BASE OILS S.A.

Project :

CARTAGENA LUBE BASE OIL COMPLEX

Contractor :

SK engineering & construction

Vendor :

HYOSUNG GOOD SPRINGS

Title :

PUMP DATA SHEET

Drawn By	X.B.ZHANG	Vendor DOC. No.			
Checked By	I.H.DO	**SKR01-YP0314-002**			
Reviewed By	K.Y.LEE	Purchaser DOC. No.			
Approved By	B.J.KWUN	**SKR01-VD-Y-P0314-002**			
Job. No.	SKR-01	Scale	A4	Date	2013.05.13
PO No.	**11244D-ME-MR-MF110**				

SK engineering & construction

CENTRIFUGAL PUMP MECHANICAL DATA SHEET

API STANDARD 610, 11TH EDITION

PROJECT NO. 11244D
PROJECT NAME CARTAGENA LUBE BASE OILCOMPLEX
ITEM NO. Y-P0314 Q'TY. 1
SERVICE OFF SPEC TRANSFER PUMP
DOC.NO. SKR01-YP0314-002 REV. 4

APPLICABLE TO : ○ PROPOSALS ○ PURCHASE ● AS BUILT
FOR SK LUBRICANTS AND REPSOL PETRóLEO UNIT UTILITIES / OFFSITE
SITE CARTAGENA, SPAIN SERVICE OFF SPEC TRANSFER PUMP
NOTES: INFORMATION BELOW TO BE COMPLTED ○ BY PURCHASER ☐ BY MANUFACTURER ◯ BY MANUFACTURER OR PURCHASER

● **DATA SHEETS**

	ITEM NO.	ATTACHED	DATA SHEET NO.
PUMP	Y-P0314	●	SKR01-YP0314-002
MOTOR	Y-MP0314	●	
GEAR		○	
TURBINE		○	

APPLICABLE OVERLAY STANDARD(S):

MANUFACTURER: **HYOSUNG GOOD SPRINGS**
SERIAL NO.: 1201244-029
NO. REQ'D (WORKING 1 STAND-BY TOTAL 1)
NO. STAGES: 1
PUMP SIZE & TYPE: USP80-400 / OH2

● **OPERATING CONDITIONS (5. 1. 3)**

FLOW, NORMAL 59.1 (m^3/h) RATED 65 (m^3/h)
OTHER

SUCTION PRESSURE MAX./RATEI 1.6 / -0.2 (kg/cm2G)
DISCHARGE PRESSURE 13.6 (kg/cm2G)
DIFFERENTIAL PRESSURE 13.8 (kg/cm2G)
DIFF. HEAD 166 (m) NPSHA@Imp.Eye 7 (m)
PROCESS VARIATIONS (5.1.4)
STARTING CONDITIONS (5.1.4)
SERVICE : ● CONT. ○ INTERMITTENT(STARTS/DAY)
○ PARALLEL OPERATION REQ'D(5.1.13)

● **SITE DATA (5.1.3)**

LOCATION : (5.1.30)
○ INDOOR ○ HEATED ● OUTDOOR ○ UNHEATED
○ UNDER ROOF ○ PARTIAL SIDES ○ GRADE
● ELECTRICAL AREA CLASS IF LOCATION (5.1.24 / 6.1.4)
Zone 2 GR IIA & IIB Temp. rise T3
○ WINTERIZATION REQ'D ○ TROPICALIZATION REQ'D.

SITE DATA (5.1.30)
● ALTITUDE (m) BAROMETER (AVERAGE) 1.03 (kg/cm2G)
● RANGE OF AMBIENT TEMPS : MIN./MAX. 1 / 34.2 (℃)
● RELATIVE HUMIDITY : MIN./MAX. 31 / 95 (%)
UNUSUAL CONDITIONS : (5.1.30) ○ DUST ○ FUMES
○ OTHER

● **DRIVER TYPE**

● INDUCTION MOTOR ○ STEAM TURBINE ○ GEAR
○ OTHER

● **MOTOR DRIVER (6.1.1 / 6.1.4)**

● MANUFACTURER HHI
■ 132 (kW) ■ 2970 (r/min)
■ FRAME 280LL ● ENCLOSURE TEFC
● HORIZONTAL ◯ VERTICAL ● SERVICE FACTOR 1.0
● VOLTS/PHASE/HERTZ 500 / 3 / 50
● TYPE Exe nA T3
● MINIMUM STARTING VOLTAGE (6.1.5) 80% of rated voltage
● INSULATION F ● TEMP.RISE B
● FULL LOAD AMPS 179
● LOCKED ROTOR AMPS 1164
● STARTING METHOD Direct on line
● LUBE Grease

BEARINGS (TYPE / NUMBER) :
■ RADIAL(DE) **Ball** / **6314 C3**
■ RADIAL(NDE) **Ball** / **6314 C3**
☐ VERTICAL THRUST CAPACITY
UP (N) DOWN (N)
REMARKS:

● **LIQUID (5. 1. 3)**

LIQUID TYPE OR NAME Lube Products
○ HARZARDOUS ○ FLAMMABLE ○ Toxic (5.1.5)

	MIN.	NORMAL	MAX.
PUMPING TEMP.(℃)	0	AMB	35
VAPOR PRESS.(kg/cm2A)		Nil	
RELATIVE DENSITY(SG)		0.833	
VISCOSITY(Cp)		46	

SPECIFIC HEAT,Cp (kCal/kg·K)
○ CHLORIDE CONCENTRATION (6.5.2.4) (mg/kg)
○ H_2S CONCENTRATION (5.12.1.12.c)
CORROSIVE / EROSIVE AGENT (5.12.1.9)

MATERIALS (5.12.1.1)

● ANNEX H CLASS (5.12.1.1) S-6
● MIN DESIGN METAL TEMPS (5.12.4.1) 0 (℃)
○ REDUCED-HARDNESS MATERIALS REQ'D. (5.12.1.12)
■ BARREL/CASE A216 Gr.WCB IMPELLER A743 Gr.CA15
■ CASE / IMPELLER WEAR RINGS A276 Ty.420 / A276 Ty.420
■ SHAFT A322 Gr.4140Q
☐ DIFFUSERS N/A

● **PERFORMANCE :**

PROPOSAL CURVE NC SKR01-YP0314-004 ■ 2970 r/min
■ IMPELLER DIA.RATED 376 MAX. 430 MIN. 321 (mm)
■ IMPELLER TYPE Closed
■ RATED POWER 72.7 (kW) EFFICIENCY 33.6 (%)
■ MINIMUM CONTINOUS FLOW :
■ THERMAL (m^3/h) STABLE 37.8 (m^3/h)
■ PREFERRED OPER.REGION 91 TO 156 (m^3/h)
■ ALLOWABLE OPER.REGION 37.8 TO 167.8 (m^3/h)
■ MAX HEAD @ RATED IMPELLER 182.2 (m)
■ MAX POWER @ RATED IMPELLER 102.7 (kW)
■ NPSHR AT RATED FLOW 2.6 (m) (5.1.10)
● MAX. SUCTION SPECIFIC SPEED : 11259.7 (m3/hr,m,rpm) (5.1.11)
● MAX. SOUND PRESS. LEVEL REQ'D Below 85 (dBA) (5.1.16)
● EST MAX. SOUND PRESS. LEVEL 85 (dBA) (5.1.16)
● EST MAX. SOUND POWER. LEVEL 85 (dBA) (5.1.16)

● **UTILITY CONDITIONS (5.1.3)**

ELECTRICITY	VOLTAGE	PHASE	HERTZ
DRIVERS	500	3	50
HEATING			

SYSTEM VOLTAGE DIP ● 80% ○ OTHER (6.1.5)

STEAM	MAX.PRESS.	MAX.TEMP.	MIN.PRESS.	MIN.TEMP.
DRIVERS				
HEATING				

COOLING WATER : (5.1.19) SOURCE
SUPPLY TEMP. 30 (℃) MAX. RETURN TEMP. 45 (℃)
NORM. PRESS. 4.5 (kg/cm2G) DESIGN PRESS. 6.5 (kg/cm2G)
MIN. RET. PRESS 3 (kg/cm2G) MAX. ALLOW. D.I 1 (kg/cm2)
CHLORIDE CONCENTRATION : 800 (wt ppm)

SK engineering & construction

CENTRIFUGAL PUMP MECHANICAL DATA SHEET

API STANDARD 610, 11TH EDITION

PROJECT NO.	11244D
PROJECT NAME	CARTAGENA LUBE BASE OILCOMPLEX
ITEM NO.	Y-P0314
Q'TY.	1
SERVICE	OFF SPEC TRANSFER PUMP
DOC.NO.	SKR01-YP0314-002
REV.	4

REMARKS

1. PUMP SHALL BE TRACED WITH LP STEAM AND INSULATED
2. MINIMUM MECHANICAL DESIGN = 17.1kg/cm2G, 62℃
3. SITE & UTILITY DATA SHALL BE REFERED AS PER BEDD.
4. NPSH TEST MUST BE REQUIRED.
5. SEAL PLAN SHALL BE AS BELOW;
   1) PLAN 11 AND PLAN 52
   2) LSL, LSH, PSH, PG, LG, AND TG SHALL BE REQUIRED FOR RESERVOIR OF PLAN 52.
6. COOLING WATER IS NOT AVAILABLE. AIR COOLING TYPE SHALL BE APPLIED TO SEAL PLAN 52.

SK engineering & construction

CENTRIFUGAL PUMP MECHANICAL DATA SHEET

API STANDARD 610, 11TH EDITION

PROJECT NO. 11244D
PROJECT NAME CARTAGENA LUBE BASE OILCOMPLEX
ITEM NO. Y-P0314 Q'TY. 1
SERVICE OFF SPEC TRANSFER PUMP
DOC.NO. SKR01-YP0314-002 REV. 4

CONSTRUCTION

ROTATION : (VIEWED FROM COUPLING END) ■ CW ☐ CCW

PUMP TYPE : (4.1)

● OH2 ◯ OH3 ◯ OH6 ◯ OTHER

CASING MOUNTING :

● CENTERLINE ◯ IN-LINE ☐ OTHER

CASING TYPE :

☐ SINGLE VOLUTE ■ MULTIPLE VOLUTE ☐ DIFFUSER

CASE PRESSURE RATING :

◯ OH6 PUMP SUCTION REGION DESIGNED FOR MAWP (5.3.6)

■ MAX. ALLOWABLE WORKING PRESSURE 49.8 (kg/cm2G)

@ 35 (℃)

■ HYDROTEST PRESSURE 75 (kg/cm2G)

■ **NOZZLE CONNECTIONS : (5.4.2)**

	SIZE	FLANGE RATING	FACING	POSITION
SUCTION	6"	300#	RF	End
DISCHARGE	3"	300#	RF	Top

PRESSURE CASING AUX.CONNECTIONS : (5.4.3)

	NO.	SIZE(DN)	TYPE
● DRAIN	1	3/4	w/Valve & Flanged
◯ VENT			
◯ WARM-UP			

◯ MACHINED AND STUDDED CONNECTIONS (5.4.3.8)

◯ CYLINDRICAL THREADS REQUIRED(5.4.3.3)

ROTOR

◯ COMPONENT BALANCE TO ISO 1940-1 G1.0 (5.9.4.4)

COUPLINGS : (6.2.2)

● MANUFACTURER THOMAS ● MODEL 71-300-ASSY

■ RATING (kW per 100 r/min) 8.58

● SPACER LENGTH 180 (mm) ● SERVICE FACTOR 1.5

◯ COUPLING BALANCED TO ISO 1940-1 G6.3 (6.2.3)

◯ COUPLING WITH PROPRIETARY CLAMPING DEVICE (6.2.11)

◯ COUPLING PER ISO 14691 (6.2.4)

◯ COUPLING PER ISO 10441 (6.2.4)

◯ COUPLING PER API 671 (6.2.4) ◯ ASME B15.1

● NON-SPARK COUPLING GUARD (6.2.14.c)

◯ COUPLING GUARD STANDARD PER (6.2.14.a)

BASE PLATES :

☐ API BASEPLATE NUMBER (ANNEX D)

◯ NON-GROUT CONSTRUCTION (6.3.13)

● OTHER "J" type anchor bolts with double nuts

MECHANICAL SEAL : (5.8.1)

● SEE ATTACHED ISO 21049 / API 682 DATA SHEET

SURFACE PREPARATION AND PAINT

◯ MANUFACTURER'S STANDARD ◯ OTHER (SEE BELOW)

● SPECIFICATION NO. ESS-82110

PUMP :

● PRIMER Per ESS-82110

● FINISH COAT Per ESS-82110

BASEPLATE : (6.3.17)

● PRIMER Per ESS-82110

● FINISH COAT Per ESS-82110

◯ DETAILS OF LIFTING DEVICES (6.3.20)

SHIPMENT : (7.4.1)

◯ DOMESTIC ● EXPORT ● EXPORT BOXING REQUIRED

◯ OUTDOOR STORAGE MORE THAN 6 MONTHS

SPARE ROTOR ASSEMBLY PACKAGED FOR :

◯ HORIZONTAL STORAGE ◯ VERTICAL STORAGE

◯ TYPE OF SHIPPING PREPARATION

HEATING AND COOLING *

◯ HEATING JACKET REQ'D (5.8.9)

◯ COOLING REQ'D

◯ COOLING WATER(C.W.) PIPING PLAN (6.5.3.1)

C.W. PIPING

◯ PIPE ◯ TUBING FITTINGS

C.W. PIPING MATERIALS :

◯ S.STEEL ◯ C.STEEL ◯ GALVANIZED

COOLING WATER REQUIREMENTS :

☐ BEARING HOUSING 1* (m^3/h)

☐ HEAT EXCHANGER (m^3/h)

TOTAL COOLING WATER (m^3/h)

HEAT MEDIUM : ◯ STEAM ◯ OTHER

HEAING PIPING : ◯ TUBING ◯ PIPE

BEARING AND LUBRICATION

BEARING (TYPE / NUMBER) (5.10.1)

■ RADIAL Ball / 6314

■ THRUST Ball / 7315 BDB

LUBRICATION (5.11.3, 5.11.4)

◯ GREASE ● OIL

◯ PURGE OIL MIST ◯ PURE OIL MIST ◯ FORCED OIL SYSTEM

● CONSTANT LEVEL OILER PREFERENCE (5.10.2.2) :

◯ OIL VISC. ISO GRADE Vendor to advise

INSTRUMENTATION

◯ ACCELEROMETER (6.4.2.1)

◯ PROVISION FOR MOUNTING ONLY (5.10.2.11)

◯ FLAT SURFACE REQ'D (5.10.2.12)

◯ TEMP. GAUGES (WITH THERMOWELLS) (8.1.3.6)

◯ PRESSURE GAUGE TYPE

REMARKS :

MASSES(kg)

PUMP	623
BASEPLATE	777
SEAL SYSTEM	100
DRIVER	1100
MASS	2600

REMARKS

1*. FAN COOLING FOR BEARING HOUSING SHALL BE REQUIRED.

SK engineering & construction

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SPARE PARTS (TABLE 18)

- ● START-UP ● NORMAL MAINTENANCE
- ○ Per PE-4600 (Spare Parts Spec.)

OTHER PURCHASER REQUIREMENTS

- ● COORDIANTION MEETING REQUIRED (9.1.3)
- ○ MAXIMUM DISCHARGE PRESSURE TO INCLUDE (5.3.2)
  - ○ MAX. RELATIVE DENSITY
  - ○ MAX. DIA. IMPELLERS AND/OR NO. OF STAGES
  - ○ OPERATION TO TRIP SPEED
- ○ OH3 BEARING HS6 LIFTER (8.1.2.6)
- ○ CONNECTION DESIGN APPROVAL (5.12.3.4)
- ◯ TORSIONAL ANALYSIS REQUIRED (5.9.2.1)
- ○ TORSIONAL ANALYSIS REPORT (5.9.2.6)
- ● PROGRESS REPORTS (9.3.3)
- ○ OUTLINE OF PROCEDURES FOR OPTIONAL TESTS (9.2.5)
- ○ ADDITIONAL DATA REQUIRING 20 YEARS RETENTION (7.2.1.1.f)

PIPING AND APPURTENANCES

MANIFOLD PIPING TO SINGLE CONNECTION (6.5.1.6)
- ◯ VENT ◯ DRAIN ● COOLING WATER

- ◯ MOUNT SEAL RESERVOIR OFF BASEPLATE (6.5.1.4)
- ● FLANGES REQ'D IN PLACE OF SOCKET WELD UNIONS (6.5.2.8)
- ◯ INSTALLATION LIST IN PROPOSAL (9.2.3L)

CONNECTION BOLTING
- ○ PTFE COATING ○ ASTM A153 GALVANIZED
- ○ PAINTED ○ SS

QA INSPECTION AND TESTING

- ● SHOP INSPECTION (7.1.4)
- ● PERFORMANCE CURVE APPROVAL
- ◯ TEST WITH SUBSTITUTE SEAL (7.3.3.2.b)
- ● MATERIAL CERTIFICATION REQUIRED (5.12.1.8)
  - ● CASING ● IMPELLER ● SHAFT
  - ○ OTHER _____
- ○ CASTING REPAIR PROCEDURE APPROVAL REQ'D (5.12.2.5)
- ● INSPECTION REQUIRED FOR CONNECTION WELDS (5.12.3.4.e)
  - ◯ MAG. PARTICLE ● LIQUID PENETRANT
  - ◯ RADIOGRAPHIC ◯ ULTRASONIC
- ● INSPECTION REQUIRED FOR CASTINGS (7.2.1.3 / 5.12.1.5)
  - ◯ MAG. PARTICLE ● LIQUID PENETRANT
  - ◯ RADIOGRAPHIC ◯ ULTRASONIC
- ○ HARDNESS TEST REQUIRED : _____ (7.2.2.3)
- ○ ADDITIONAL SUBSURFACE EXAMINATION FOR 7.2.1.3
  FOR _____
  METHOD _____

QA INSPECTION AND TESTING (CONT.)

	TEST	NON-WIT	WIT	OBSERVE
●	HYDRO STATIC(7.3.2)	○	●	○
●	PERFORMANCE(7.3.3)	○	●	○
○	RETEST ON SEAL LEAKAGE (7.3.3.2.d)	○	○	○
●	NPSH (7.3.4.2)	○	●	○
○	TRUE PEAK VELOCITY DATA (7.3.3.4.d)	○	○	○
●	COMPLETE UNIT TEST (7.3.4.3)	○	●	○
●	SOUND LEVEL TEST (7.3.4.4)	○	●	○
●	CLEANLINESS PRIOR TO FINAL ASSEMBLY (7.2.2.2)	○	●	○
○	NOZZLE LOAD TEST (6.3.6)	○	○	○
○	CHECK FOR CO-PLANAR MOUNTING PAD SURFACES (6.3.3)	○	○	○
●	MECHANICAL RUN UNTIL OIL TEMP. STABLE(7.3.4.7.1)	○	●	○
○	4h MECHANICAL RUN AFTER OIL TEMP. STABLE (7.3.4.7.3)	○	○	○
○	4h MECH. RUN TEST(7.3.4.7.2)	○	○	○
○	BRG HSG RESONANCE TEST (7.3.4.6)	○	○	○
○	AUXILIARY EQUIPMENT TEST (7.3.4.5)	○	○	○
◯	IMPACT TESTING (5.12.4.3)	○	○	○
	❍ PER EN 13445			
	❍ PER ASME Ⅷ			
○		○	○	○

- ○ VENDOR KEEP REPAIR AND HT RECORDS (7.2.1.1.c)
- ● VENDOR SUBMIT TEST PROCEDURES (7.3.1.2 / 9.2.5)
- ● VENDOR SUBMIT TEST DATA WITHIN 24h (7.3.3.3.e)
- ○ INCLUDE PLOTTED VIBRATION SPECTRA (5.9.3.3)
- ○ SUBMIT INSPECTION CHECK LIST (7.1.6)

REMARKS

SK engineering & construction

CENTRIFUGAL PUMP MECHANICAL DATA SHEET

API STANDARD 610, 11TH EDITION

PROJECT NO.	11244D
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ITEM NO.	Y-P0314
Q'TY.	2 (Two)
SERVICE	OFF SPEC TRANSFER PUMP
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Centrifugal pump - References

- ☐ **PRESSURE DESIGN CODES**
- ○ **WELDING REQUIREMENTS**
- ◎ **PURCHASE-DEFINED MATERIAL INSPECTIONS**

APPLICABLE TO : ○ PROPOSALS ○ PURCHASE ● AS BUILT

FOR _____ UNIT _____

SITE _____ SERVICE _____

NOTE : INFORMATION BELOW TO BE COMPLETED ○ BY PURCHASER ☐ BY MANUFACTURER ◎ BY MANUFACTURER OR PURCHASER

PRESSURE VESSEL DESIGN CODE REFERENCES.

☐ THESE REFERENCES MUST BE LISTED BY THE MANUFACTURER

CASTING FACTORS USED IN DESIGN (5.3.4) (TABLE 3)	■ 0.8
SOURCE OF MATERIAL PROPERTIES	■ ASTM or JIS

WELDING AND REPAIRS (5.12.3)

THESE REFERENCES MUST BE LISTED BY THE MANUFACTURER (DEFAULT TO TABLE 10 IF NO PURCHASER PREFERENCE IS STATED)

○ ALTERNATIVE WELDING CODES AND STANDRADS (5.12.3.1)

Welding Requirement (Applicable code or Standard)	Purchaser defined	Default per Table 10
Welder/operator qualification	○	○
Welding procedure qualification	○	○
Non-pressure-retaining structural welding such as base plates or supports	○	○
Magnetic particle or liquid penetrant examination of the plate edges	○	○
Postweld heat treatment	○	○
Postweld heat treatment of casing fabrication welds	○	○

MATERIAL INSPECTION (7.2.2.1) (7.2.1.3)

THESE REFERENCES MUST BE LISTED BY THE PURCHASER (DEFAULT TO TABLE 13 IF NO PURCHASER PREFERENCE IS STATED)

○ ALTERNATIVE MATERIAL INSPECTIONS AND ACCEPTANCE CRITERIA (SEE TABLE 13)

Type of inspection	Methods	For fabrications	Castings
Radiography	○	○	○
Ultrasonic inspection	○	○	○
Magnetic particle inspection	○	○	○
Liquid penetrant inspection	○	○	○

REMARKS