DATA SHEET
FOR
RECIPROCATING COMPRESSORS
P 310A/B NEW

00	06/07/2012	EMISSIONE FINALE IN ACCORDO COMMENTI HAZOP	A.De Michele	F.Alese	P.Carosi
REV.	DATA	DESCRIPTION	PREP.	CONTR.	APPR.

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CLIENT: ENI S.p.A.
LOCATION: Porto Marghera (VE)
PLANT: Nuovo Stoccaggio GPL/Propano Porto Marghera, FEED 1° fase

FORM.	PROJECT	DOCUMENT	PAGE			REV
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APPLICABLE TO: ● PROPOSAL ○ PURCHASE ○ AS-BUILT

SERVICE: PROPANE/GPL REFRIGERATED STORAGE SYSTEM (1) N° REQ'D: 2

NOTE: ○ INDICATES INFO. TO BE COMPLETED BY PURCH. ☐ BY MANUFACTURER WITH PROPOSAL ▽ BY MANUFACTURER AFTER ORDER ☒ BY MANUFACTURER OR PURCH. AS APPLICABLE

COMPR. MANUFACTURER ____ TYPE MODEL ____ SERIAL NO ____

COMPR. THROWS: TOTAL NO. ____ NO. WITH CYLS. ____ NOMINAL FRAME RATING ____ kW @ RATED RPM OF ____

DRIVER MANUFACTURER ____ DRIVER NAMEPLATE kW/OPERATING RPM ____ / ____

DRIVER SYSTEM: ○ DIRECT COUPLED ○ GEARED AND COUPLED ○ V-BELTS (2)

TYPE OF DRIVER ● IND. MOTOR ○ SYN MOTOR ○ STEAM TURBINE ○ GAS TURBINE ○ ENGINE ○ OTHER ____

NO NEGATIVE TOLERANCE APPLIES: ○ YES ... PURCHASER TO FILL IN "REQUIRED CAPACITY" LINES. CYLINDERS: ○ LUBE
(NNT) ○ NO ... PURCHASER TO FILL IN "MFGR'S RATED CAPACITY" LINES ○ NON - LUBE

OPERATING CONDITIONS (EACH MACHINE)

●	SERVICE / ITEM NO.	PROPANE				GPL			
●	STAGE	(2)				(2)			
●	NORMA. OR ALT. CONDITION	Alternative				Normal			
●	MOLECULAR WEIGHT AT INTAKE	44.1				47.7			
●	Cp/Cv (K) @ ~~65°C OR~~ ____ °C	1,172 @ - 42,2° C				1,148 @ -23,4°C			

INLET CONDITIONS: AT INLET TO. ○ PULSATION SUPP. DEVICES ○ COMPR. CYLINDER FLANGES
○ SIDE STREAM TO ____ STAGE(S), THESE INLET PRESS. ARE FIXED

●	PRESS (barg) @ PULS. SUPP. INLET	0				0			
☒	PRESSURE (barA) @ CYL. FLANGE								
●	TEMPERATURE (°C)	-42.2				-23.4			
○	ACTUAL DISCHARGE								
☐	COMPRESSIBILITY (Z_S)								

INTERSTAGE: ΔP INCLUDES: ○ PULS. SUPP. DEVICES ○ PIPING ○ COOLERS ○ SEPARATORS ○ OTHERS ____

☒ ΔP BEETWEEN STAGES, % / BAR	/	/	/	/	/

DISCHARGE CONDITIONS: AT OUTLET FROM ○ PULS. SUPP. DEVICES ○ COMPR. CYL FLANGES ○ OTHERS ____

☒	PRESSURE (BARA) @ CYL FLANGE								
●	PRESS. (barg) @ SUPP. OUTLET	15.2				15.2			
☐	TEMP. ADIABATIC °C	(2)				(2)			
▽	TEMP. PREDICTED °C	(2)				(2)			
☐	COPRESSIBILITY (Z_D)								

REQUIRED CAPACITY RATED FOR PROCESS, AT INLET TO COMPRESSOR, NO NEGATIVE TOLERANCE (-0%)

●	CAPACITY kg/h ○ WET ● DRY	3400 (3) / 4400 (4)				3140 (3) / 4400 (4)			
○	Nm3/h								

MFGR'S RATED CAPACITY (AT INLET TO COMPRESSOR) & kW @ CERTIFIED TOLERANCE OF ± 3% FOR kW

☒	CAPACITY kg/h NORM. ○ WET ○ DRY								
☒	INLET kg / h MAX.								
☒	Nm3/h								
☐	BREAK HP / STAGE								
☐	TOTAL kW @ COMPRESSOR SHAFT BKW (W/GEARLOSS)								
☐	TOTAL kW INCLUDING ALL LOSSES								

CAPACITY FOR NNT

MANUFACTURER'S = REQUIRED ÷ 0.97

REQUIRED = MANUFACTURER'S x 0.97

NOTES:
1) Compression of Propane /GPL vapour released from a refrigerated storage system
2) To be defined by Vendor
3) Mass flow rate for each compressor (P-310ANEW or P-310BNEW) during peak operating conditions. Both compressors will operate in parallel.
4) Peak operating conditions during manteinance/failure of one compressor (P-310 A or B) shall be guaranteed.

○ REPRESENTS PURCHASER'S MIN. REQUIREMENTS. VENDOR TO COMPLETE REMINDER IF UNFILLED AND APPLICABLE

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GAS ANALYSIS AT OPERATING CONDITIONS

% BY WEIGHT

● SERVICE / ITEM NO ○ STAGE ○ NORMAL OR ALT.		M.W.	PROPANE	GPL				
PROPANE	C_3H_8	44.1	100	69				
N-BUTANE	C_4H_{10}	58.1	0	31				
TOTAL			100	100				
■ AVERAGE MOL WT.			44.1	47.7				
■ CP / CV (K) @ ~~65°C~~ OR ____ °C			1.172 @ -42.2°C	1.148 @ -23.4°C				

NOTE: IF WATER VAPOR IS PRESENT, EVEN MINUTE TRACES, IN THE GAS BEING COMPRESSED, IT MUST BE INCLUDED ABOVE.

NOTES

APPLICABLE SPECIFICATIONS

● API 618 III EDIT.- RECIPROCATING COMPRESSORS FOR GEN. REFINERY SERVICE

● SITE / LOCATION CONDITIONS

ELEVATION 2.7 (1) m BAROM. ____ mmHg DESIGN TEMP. 40 (2) °C AMBIENT TEMPER. MAX. 36°C (3) MIN -15 (3) °C

RELATIVE HUMIDITY: MAX. 90% MIN. 80% %

COMPRESSOR LOCATION : ○ INDOOR ○ HEATED ○ UNHEATED ○ AT GRADE LEVEL ○ ELEVATED ____ m

● OUTDOOR ○ NO-ROOF ○ UNDER ROOF ○ PARTIAL SIDES ○ PLATFORM ○ ON-SHORE

○ OFF-SHORE ○ WEATHER PROTECTION REQUIRED ○ TROPICALIZATION REQUIRED

○ WINTERIZATION PROVIDED

UNUSUAL CONDITION ○ DUST ○ FUMES ○ OTHER ____

● HAZARDOUS ○ NON HAZARDOUS

SITE ELECTRICAL CLASSIFICATION : ____

NOTES:

(1) ASML to be confirmed during detailed engineering phase.

(2) Design temperature for electrical equipment (Dry bulb temperature).

(3) Dry Bulb temperature.

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PART LOAD OPERATING CONDITIONS

CAPACITY CONTROL BY : ○ MFG'S CAP. CONTROL ○ PURCHASER BY - PASS ○ BOTH ○ OTHER _____

FOR: ○ PART LOAD CONDITION ○ START - UP ONLY ○ BOTH

USING : ○ FIXED VOLUME POCKET ○ SUCTION VALVE UNLOADERS ○ FINGER ○ PLUG ○ OTHER _____

ACTION ○ DIRECT (AIR TO UNLOAD) ○ REVERSE (AIR TO LOAD / FAIL SAFE)

NUMBER OF STEPS ○ ONE ○ THREE ○ FIVE ○ OTHER _____

ALL UNLOADING STEPS BASIS MANUFACTURERS CAPACITY SHOWN ON PAGE 1

INLET AND DISCHARGE PRESSURE ARE AT CYLINDER FLANGES

○	SERVICE / ITEM NO						
☒	STAGE						
☒	NORMAL OR ALTERNATE CONDITION						
○	% CAPACITY						
○	WEIGHT FLOW , kg/h						
☒	Nm3/h						
☐	POCKETS / VALVES OPERATION *						
☐	TYPE UNLOADERS, PLUG / FINGER						
☒	INLET TEMPERATURE °C						
☒	INLET PRESSURE, BARA						
☐	DISCHARGE PRESSURE, BARA						
☐	DISCHARGE TEMP. (ADIABATIC) , °C						
☐	DISCHARGE TEMP. (PREDICTED) , °C						
☐	VOLUMETRIC EFF. %HE / %CE	/	/	/	/	/	/
☐	CALC. GAS ROAD LOAD, C ** N						
☐	CALC. GAS ROAD LOAD, T ** N						
▽	CALC. GAS ROAD LOAD, C (GAS & INERTIA) N						
▽	CALC. GAS ROAD LOAD, T (GAS & INERTIA) N						
▽	ROD REV., DEGREE MIN. @ X - HD PIN						
☐	kW / STAGE						
☐	TOTAL kW @ COMPRESSOR SHAFT						
☐	TOTAL kW (ALL LOSSES INCLUDED)						

* SHOW OPERATION WITH THE FOLLOWING SYMBOLS :

HEAD END = HE
OR
CRANK END = CE

PLUS

SUCTION VALVE(S) UNLOADED = S
OR
FIXED POCKET OPEN = F
OR
VARIABLE POCKET OPEN = V

EXAMPLE : HE - F / CE - S = HEAD END FIXED POCKET OPEN / CRANK END SUCTION VALVE(S) UNLOADED.

** C = COMPRESSION T = TENSION

☐ MINIMUM PRESSURE REQUIRED TO OPERATE CYLINDER UNLOADING DEVICES, _____ BARG

○ kW VS CAPACITY PERFORMANCE CURVES OR TABLES REQUIRED FOR UNLOADING STEPS AND/OR VARIABLE SUCTION / DISCHARGE PRESSURE: ☐ YES ○ NO

NOTE AND / OR SKETCH

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○ SCOPE OF BASIC SUPPLY (Con'd)

○ CAPACITY CONTROL (☐ ○) ○ SEE DATA SHEET PAGE 3 FOR DETAILS ○ IN INSTRUMENT & CONTROL PANEL
○ SEPARATE MACHINE MOUNTED PANEL ○ SEPARATE FREE STANDING PANEL
○ PNEUMATIC ○ ELECTRIC ○ ELECTRONIC ○ HYDRAULIC
○ PROGRAMMABLE CONTROLLER

○ INSTRUMENT & CONTROL PANEL (☐ ○) ○ ONE FOR EACH UNIT ○ ONE COMMON TO ALL UNITS
○ MACHINE MOUNTED ○ FREE STANDING (OFF UNIT)
SEE INSTRUMENT DATA SHEET S FOR DETAILS OF PANELS ADDITIONAL NOTES, AND INSTRUMENTATION

NOTE: ALL TUBING, WIRING & CONNECTION BETWEEN OFF-UNIT FREE STANDING PANELS AND COMPRESSOR BY PURCASER

○ HEATERS (☐ ○) ○ FRAME LUBE OIL ○ CYL. LUBRICATORS ○ COOLING WATER ○ DRIVER(S) ○ GEAR OIL
○ ELECTRIC ○ STEAM

○ BARRING DEVICE (☐ ○) ○ MANUAL ○ PNEUMATIC ○ ELECTRIC ○ FLYWHEEL LOCKING DEVICE (☐ ○)

○ ROD PRESSURE PACKING COOLING SYSTEM (☐ ○ : ○ SEPARATE CONSOLE ○ FILTERS
○ PURCHASER'S MAXIMUM ALLOWABLE : ○ PISTON SPEED _____ m/s ○ RPM _____
○ SPECIAL CORROSION PROTECTION ○ NO ○ YES ○ MFR'S STANDARD ○ OTHER _____

○ MECHANICAL RUN TEST ○ NO ○ YES ○ MFR'S STANDARD ○ OTHER _____
○ COMPLETE SHOP RUN TEST OF ALL MACHINE MOUNTED EQUIPMENT, PIPING, & APPURTENANCES

○ PAINTING ○ MANUFACTURER STANDARD ○ SPECIAL _____

○ SHIPMENT ○ DOMESTIC ○ EXPORT
○ STANDARD 6 MONTHS STORAGE PREPARATION (☐ ○) ; PER SPEC. _____
○ OUTDOOR STORAGE FOR OVER 6 MONTHS (☐ ○) , PER SPEC. _____

○ COMPRESSOR MANUFACTURER'S USER / INSTALLATION LIST REQUIRED ○ FOR SIMILAR SERVICE ONLY

APPLICABLE PURCHASER SPECS : ○ NO ○ YES _____
APPLICABLE USER SPECS : ○ NO ○ YES _____

NOTES:

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UTILITY CONDITIONS

ELECTRICAL POWER	AC VOLTS	PHASE	HERTZ	DC VOLTS		AC VOLTS	PHASE	HERTZ	DC VOLTS
MAIN DRIVER	380	3	50		INSTRUMENT				
AUXILIARY MOTORS					ALARM & SHUTDOWN				
HEATERS									

AREA CLASSIFICATION ○ HAZARDOUS ○ NON HAZARDOUS

INSTRUMENT AIR: TO NSP1 NORMAL PRESSURE _____ BARG MAX. / MIN. _____ / _____ BARG

STEAM FOR DRIVERS				STEAM FOR HEATERS			
INLET NORM.	MAX. / MIN.	BARG		INLET NORM.	MAX. / MIN.	BARG	
TEMP.	MAX. / MIN.	°C.		TEMP.	MAX. / MIN.	°C.	
EXHAUST NORM.	MAX. / MIN.	BARG		EXHAUST NORM.	MAX. / MIN.	BARG	
TEMP.	MAX. / MIN.	°C.		TEMP.	MAX. / MIN.	°C.	

COOLING WATER FOR COMPRESSOR CYLINDER				COOLING WATER FOR COOLERS			
MACHINERY COOLING WATER (1)				TYPE OF WATER (1)			
SUPPLY NORM. 5 (2)	MAX. / MIN.	barg		SUPPLY NORM. 5 (2)	MAX. / MIN.	barg	
TEMP. 30(2)	MAX. / MIN.	°C.		TEMP. 30 (2)	MAX. / MIN.	°C.	
RETURN NORM. (3)	MAX. / MIN.	barg		RETURN NORM. (3)	MAX. / MIN.	barg	
TEMP. (3)	MAX. / MIN.	°C.		TEMP. (3)	MAX. / MIN.	°C.	

COOLING FOR ROD PACKING:

TYPE OF FLUID MACHINERY _____ _____ barg@ _____ °C RETURN _____ barg@ _____ °C

FUEL GAS: NORMAL PRESSURE _____ barg MAX / MIN _____ barg LHV _____ MJ/m3

COMPOSITION _____

CYLINDER UNLOADING MEDIUM: ○ AIR ○ NITROGEN ○ OTHER _____

PRESSURE AVAILABLE FOR CYLINDER UNLOADING DIVICES, MAX / MIN _____ / _____ barg

NOTES:

1) Cooling water supplied by cooling tower package (W 302 NEW).
2) To be confirmed during detailed engineering phase.
3) To be defined by Vendor

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☒ CONSTRUCTION FEATURE

SERVICE / ITEM	
STAGE	
CYLINDER SIZE (BORE DIAM.) mm	
ROD RUN-OUT: NORMAL COLD VERTICAL mm	
(CALCULATED VALUE(S) PER APPENDIX C.3.1)	

MATERIALS OF CONSTRUCTION

CYLINDER(S)	(1)
CYLINDER LINER(S)	
PISTON(S)	(1)
PISTON RINGS	
RIDER RINGS ○ REQUIRED	
PISTON ROD(S) : MAT./ YELD N/mm2	
THREAD ROOT STRESS @ MACRL @* X-HD END	
PISTON ROD HARDNESS ,BASE MATERIAL Rc	
PISTON ROD COATING ○ COATING	
COATING HARDNESS Rc	
VALVE SEATS / VALVE PLATE	
○ VALVE SEAT MIN. HARDNESS Rc	
VALVE GUARD (STOPS)	
VALVE DISCS	
VALVE SPRINGS	
ROD PRESSURE PACKING RINGS	
ROD PRESSURE PACKING CASE	
SEAL / BUFFER PACKING , DISTANCE PIECE	
SEAL / BUFFER PACKING , INTERMEDIATE	
WIPER PACKING RINGS	
MAIN JOURNAL BEARINGS, CRANKSHAFT	
CONNECTING ROD BEARING, CRANKPIN	
CONNECTING ROD BUSHING, X-HD END	
CROSSHEAD (X-HD) PIN BUSHING	
CROSSHEAD PIN	
CROSSHEAD	
CROSSHEAD SHOES	
○ CYLINDER INDICATOR VALVES	
○ FLUOROCARBON SPRAYED CYLINDER	
RUNNING BORE	

* MAXIMUM ALLOWABLE CONTINUOUS ROD LOAD

☒ COMPRESSOR CYLINDER ROD PACKING

- ○ FULL FLOATING PACKING W / STAINLESS STEEL SPRINGS
- ● VENTED TO : ● FLARE @ 1.5 (2) barg ○ SAFE LOCATION
- ○ SUCTION PRESSURE @ barg
- ○ FORCED LUBRICATED ○ NOT- LUBE ○ TFE
- ○ WATER COOLED STAGE(S) m3/h REQ.D
- ○ OIL COOLED STAGE(S) m3/h REQ.D
- ○ WATER FILTER
- ○ VENT/BUFFER GAS SEAL PACKING ARRANG.
- ○ BUFFER GAS PRESSURE , barg
- ○ SPLASH GUARDS FOR WIPER PACKING

NOTES:

1) Vendor shall define suitable material for all run cases
2) To be defined during detailed engineering phase

DISTANCE PIECE(S): ○ TYPE A ○ TYPE B ○ TYPE C ○ TYPE D

COVERS : ○ SOLID METAL ○ SCREEN ○ LOUVRED

○ CYLINDER COMPARTMENT
- ○ VENTED TO barg
- ○ PURGED AT barg
- ○ PRESSURIZED TO barg
- ○ WITH RELIEF VALVE barg

○ FRAME COMPARTMENT
- ○ VENTED TO barg
- ○ PURGED AT barg
- ○ PRESSURIZED TO barg
- ○ WITH RELIEF VALVE barg

○ SEAL BUFFER GAS PACKING ARRANG. Ref. : Appendix G Figure G-4
- ○ FRAME END (ADIACENT TO WIPER PACKING)
- ○ INTERMEDIATE PARTITION
  - ○ BUFFER PURGE GAS ○ N_2 ○ OTHER

○ VENT , DRAIN , PURGE PIPING BY MFG'R ○ YES ○ NO