Snamprogetti

CLIENTE - Customer: NAGARJUNA FERTILIZERS & CHEM. Ltd.
LOCALITA' Plant location: KAKINADA - INDIA
IMPIANTO - Unit: KAKINADA FERTILIZERS COMPLEX

COMMESSA - Job: 808200 | IMPIANTO - Unit: 01
SPC. No MA-E: 30311 6142
FG - Sh / DI - of: 1 / 11
Rev: 0 1 2 3 4 — 5

FOGLIO DATI PER POMPE CENTRIFUGHE ORIZZONTALI
HORIZONTAL CENTRIFUGAL PUMP DATA SHEET

1		SERVIZIO Service: H.P. CARBONATE SOLUTION PUMP	SIGLA Item No: 01-P-102 A/B	
2		FUNZIONAMENTO Operation:	CONT/DISC Cont./disc	N° UNITA' PRINC./RISERVA No of units main/spare: 1/1
3		COSTRUTTORE Pump Mfr: SUNDSTRAND	MODELLO Type: HMP 3512	TIPO MOTRICE: PRINC./RISERVA Driver type: main/spare: Induction elec. motor
4		ORDINE N° Purchase order No: 808200/92/00026	API 610 6TH ED (WITH EXCEPTIONS ATTACHED)	
5	CONDIZIONI OPERATIVE Operating conditions	LIQUIDO POMPATO Liquid handled: CARBONATE SOLUTION		
6		PORTATA Capacity m³/h: MIN 15	PROG Rated 65 (1)	
7		COMP. CORROSIVI/EROSIVI Corrosive/Erosive compounds: ☒ SI Yes ☐ NO No	% SOLIDI % Solids: NO	TOSSICI Toxic: ☒ SI Yes ☐ NO No
8		TEMPER. POMP. MIN./ESERCIZIO Suction temperature min./oper. °C	60 / 72	
9		PESO SPECIFICO A TEMP. MIN./ESERCIZIO Specific gravity at min./oper. temperature	093 ÷ 1	
10		VISCOSITA' CINEM. A TEMP. MIN./ESERCIZIO Viscosity at min./oper. temperature	cps < 3	
11		PRESSIONE ALL'ASPIRAZIONE Suction pressure: Kg/cm² abs.	MIN 15 NORM 18 MAX 24 (2)	
12		PRESSIONE ALLA MANDATA Discharge pressure: Kg/cm² abs.	NORM 15.5 (4)	
13		TENSIONE VAPORE ALLA TEMP. ESERCIZIO Vap. pressure at operating temperature: Kg/cm² abs.		
14		PRESSIONE DIFFERENZIALE Differential pressure: Kg/cm² abs. 13.7	PREVALENZA Head m. 14.75	N.P.S.H. DISP. N.P.S.H. avail m. 10
15		POTENZA ASSORBITA ALL'ASSE STIMATA Estimated BHP kW <58 (η = 0.53)		
16		REGOLAZIONE PORTATA Flow control	CONT/DISCONTINUA Cont./disc	AUTOMATICA/MANUALE Manual/automatic
		SISTEMA DI REGOLAZIONE Flow control type: by throttling on discharge and by-pass		CAMPO Range % 25 ÷ 100
17		TIPO TENUTA ESERC. Seal type operation: mechanical (JOHN CRANE)		TIPO TENUTA AVVIAM. Start-up: mechanical
18		FLUIDO RISCALDANTE TIPO Heating fluid type: L.P. steam	PRESS. NORM./PROG. Press. norm./des Kg/cm² abs. 4.5	TEMP. °C Temp 147
19		FLUIDO REFRIGERANTE TIPO Cooling fluid type: C.W.	PRESS. NORM./PROG. Press. norm./des Kg/cm² abs.	TEMP. °C 35/45 ΔP max Kg/cm²
20		FLUIDO FLUSSAGGIO TIPO Flusing fluid type: D.W.	PRESS. NORM./PROG. Press. norm./des Kg/cm² abs. 6	TEMP. °C 40°
21		RIACCELERAZIONE Reacceleration ☐ SI Yes ☒ NO No	AVV. AUTOMATICO Automatic start-up ☐ SI Yes ☒ NO No	
22		MATERIALE LINEE MONTE/VALLE POMPA Piping material upstream/downstream: AISI 316 *	☐ SUPPORTO Bracket	☐ IN LINE
23	CARATTERISTICHE COSTRUTTIVE Construction characteristics	CASSA Casing — TIPO SUPPORTAZIONE Mounting: ☐ MEZZERIA Centerline ☐ PIEDI Foot	TIPO DIVIS. Split: ☐ ASSIALE Axial	☒ RADIALE Radial
		TIPO VOLUTA Volute: ☐ SINGOLA Single ☐ DOPPIA Double ☒ DIFFUSORE Diffuser	ASPIRAZIONE Suction: ☒ SINGOLA Single	☐ DOPPIA Double
		ATTACCHI PER Connections for: ☐ DRENAGGIO Drain ☐ SFIATI Vents ☐ MANOMETRI Press. gages	GIOCHI API API Clearance: ☐ SI Yes ☐ NO No	
		SPESS. CASSA MIN/MAX Thickness min./max mm MIN 20.6	SOVRASP. CORROS. Corros. allowance mm 3	AUTOADESCANTE Selfpriming: ☐ SI Yes ☐ NO No
		ANELLI USURA Wear rings: ☐ LATO INGRESSO Suction side ☐ LATO CASSA STOPPA Stuffing box side	☐ SOLO CASSA Casing only	☐ CASSA E GIRANTE Casing & impeller
24		ASPIRAZIONE LINEA DIAM. Suction line dia 8" RATING ANSI ANSI rating 300 RF	BOCCHELLI Nozzle size 3" RATING ANSI ANSI rating 600 FLANGE Facing RF POSIZ. Location SIDE	
		MANDATA LINEA DIAM. Discharge line dia 6" RATING ANSI ANSI rating NOTE (3)	BOCCHELLI Nozzle size 3" RATING ANSI ANSI rating (3) SEE NOTE FLANGE Facing LENS POSIZ. Location SIDE	
25		GIRANTI. TIPO Impellers type: OPEN	DIAM. PROG./MIN/MAX Dia. des./min./max. mm 1st St. 101.6/151.45/175.26 2nd St. 101.6/151.45/175.26	MONTATE Mounting ☐ TRA CUSCINETTI Between bearings ☒ A SBALZO Overhung
26		CUSCINETTI RADIALI TIPO Bearings radial: 4 PLAIN JOURNALS	REGGIS. TIPO Thrust: 3 FLAT PLATE TYPE (EXTERNAL) + 1 TILTING PAD TYPE (INTERNAL)	
27		GIUNTO: TIPO/COSTR. Coupling type/Mfr. 1 35 JTNS / METASTREAM LIMITED END FLOAT	BASAMENTO ☐ SEPARATO Baseplate	☒ COMUNE A MOTRICE Common with driver
28		TENUTA MECC. TIPO/COSTR. Mech. seal type/Mfr. STG 1: SINGLE / JOHN CRANE STG 2: TANDEM / JOHN CRANE	CODICE: Code: CRANE BAB STATIC FACE - CARBON GRAPHITE ROTATING FACE - TUNGSTEN CARBIDE	API PLAN: PLAN 32, 61 API plan: PLAN 52, 32, 61.
29		VALV. AUTOM. SFIORO Automatic relief valve	TIPO LUBRIFICAZIONE Lubrification type ☐ A SBATTIM. Oil splash ☒ FORZATA Forced	☐ AD ANELLO Ring oil

30	MATERIALE (*) Material	ASTM code (*) TO PREVENT GALLING COPPER ALLOYS ARE NOT ALLOWED	31 MOTORE ELETTRICO Electric motor item MR102A/B	32 TURBINA VAPORE Steam turbine ITEM	
	CODICE API 610 API 610 Code		COSTR. Mfr	TIPO Type	COSTR. Mfr / TIPO Type
	INTERNAL PARTS	S.S	POTENZA NOM. Rated power kW 450	POLI N° Poles No. 2	GIRI/1' r.p.m.
	CASSA Case	316 LSS CONTAINS LESS THAN 0.8% CARBIDE	FORMA Frame	ESECUZIONE Execution B3	kW
	GIRANTI Impellers	" " "	TIPO ALIM Power feed ☒ NORM. Norm. ☐ PREF. Pref. ☐ C.C. D.C.		VAPORE INGR. Inlet steam bar a °C
	DIFFUSER	" " "	VOLTS/FASI/CICLI Volts/Phase/Cycles 3300 / 3 / 50		VAPORE USC Exhaust ata bar a °C
	SLEEVE	NITRONIC 50	TIPO OLIO Lube		TIPO CUSCINETTI Bearings
	ALBERO Shaft	4140	TIPO CUSCINETTI Bearings		TIPO OLIO Lube
	SEAL PARTS	316 SS			
	BASAMENTO / STUDS Baseplate	C.S. / A193-B7	FORNIT. DA Supplied by OTHERS		FORNIT. DA Supplied by

Rev	DESCRIZIONE - Description	PRC	Date	MAC	PREPAR	Date	APP	Date
4	REVISED WHERE MARKED				G.T.	RWC	RWC	29-7-89
3	REVISED WHERE MARKED				G.G.B.	RWC	RWC	12-9-89
2	CLIENT COMMENTS ADDED				[illegible]	9/3/89		
1	GENERAL REV - ISSUED FOR ORDER ON SUNDSTRAND				[illegible]			10.10.89
0	EMISSIONE - Issue				[illegible]			9/2/89

DATM - 8012 - Rev. 1

Snamprogetti

FOGLIO DATI PER POMPE CENTRIFUGHE ORIZZONTALI
HORIZONTAL CENTRIFUGAL PUMP DATA SHEET

SPC. No MA-E-[illegible]

FG - Sh - Di - of: 2 / 11

Rev: 0 1 2 3 4 5

CARATTERISTICHE COSTRUTTIVE E MATERIALI
CONSTRUCTION FEATURES AND MATERIALS

33 CURVA CARATTERISTICA DI OFFERTA N / Offer characteristic curve No: H88047-BE — HEAD SPLIT ON PUMP 50/50 BETWEEN STAGES

34 NPSH RICHIESTO (ACQUA) / NPSH required (water): m 8.4 RATED / 6.4 AT MIN FLOW — INDICE CAVITAZIONE / Suction specific speed: 18302 IN US UNITS

35 N. DI STADI / No. of stages: TWO — GIRI / r.p.m: 13010 — RENDIM / Efficiency: 59.3 — POTENZA ASSORBITA / Absorbed power: kW 408.4

36 POTENZA MAX CON GIRANTE PROGETTO / Max. BHP with design impeller: kW 447.6 — PREVAL MAX CON GIRANTE PROGETTO / Max. head with design impeller: m 1603.40 — rpm 13010

37 PORTATA MIN CONTINUA / Min. continuous capacity: m³/h 34.7 PROCESS MIN FLOW. SEE NOTE 8 — ROTATION VIEWED FROM COUPLING END: ☒ CW

38 ACQUA RAFFREDDAMENTO / Cooling water: PER PUMP 16.6 M³/H — MATERIALE TUBAZIONI / Piping material: 304SS

☐ CUSCINETTI / Bearings 5.7 M³/h ☐ CAMERA TENUTA / Stuffing box ☐ BASAMENTO / Pedestal ☐ PREMISTOPPA / Gland ☐ SCAMB. FLUIDO FLUSSAGGIO / Flushing fluid exchanger 10.9. M³/hr.

TOTALE ACQUA RICHIESTA / Total cooling water req'd: m³/h — FLUIDO ESTERNO RAFFR. TENUTA / Seal external cooling fluid: ☐ VAP / Steam ☐ GAS / Gas ☐ ACQUA / Water

39 TENUTA MECCANICA / Mechanical seal: ☒ SINGOLA / Single 1ST STAGE ☐ DOPPIA / Double ☒ TANDEM / Tandem 2ND STAGE — TENUTA AUSILIARIA / Auxiliary seal: ☐ SI / Yes ☐ NO / No

40 FLUSSAGGIO TENUTA INTERNA / Flushing int. seal: ☐ DALLA MANDATA / From discharge nozzle ☐ ESTERNO / External m³/h — PRESS / Press Kg/cm²g

FLUSSAGGIO TENUTA ESTERNA / Flushing ext. seal: ☐ CON BARILOTTO / From reservoir ☐ ESTERNO / External m³/h — PRESS / Press

41 CARICHI AMMISS. SU FLANGE / Allow. loads on flanges

		PARALL. ALBERO / Parall. to shaft	VERTICALE / Vertical	ORIZZ. 90° ALBERO / Horiz. 90° to shaft
ASPIRAZIONE / Suction	FORZA/MOMENTO / force/torque N Nm	1892	1432	946
MANDATA / Discharge	FORZA/MOMENTO / force/torque N Nm	1892	1432	946

(1st ACCEPTABLE WITH API 610 CASE)

42 SPINTA ASSIALE SULL'ALBERO / Axial thrust on shaft: N DIRECTION STG1 VARIES NOT DETERMINED UNTIL PUMP DESIGN STG. — DIREZIONE / Direction: STG2 AWAY FROM INLET

43 AREA OCCHIO GIRANTE / Eye area: = cm² — DIAMETRO / Diameter: mm — VELOCITÀ SPECIFICA / Specific speed

V ASSOLUTA / Inlet Outlet abs. vel.: m/sec INGRESSO USCITA — COPPIA ALL'AVVIAM. / Starting torque ☐ NORM / Norm N.m

V RELATIVA / Inlet Outlet rel. vel.: m/sec INGRESSO USCITA — PD² WK² Nm²

44 COLLAUDI / Shop tests: ACCORDING TO SPC QM-E-73415 REV 1 — RILIEVO CURVA / Performance curve: NPSH AT 4 POINTS MINIMUM — PROVA IDRAUL. / Hydrostatic test: YES — SMONTAGGIO / Strip-down: YES

PRESENZIATI / Witnessed: YES (ONE OF THE TEST POINTS TO BE AT MIN FLOW.)

NON PRESENZIATI / Non witnessed:

PRESSIONE DI PROVA IDRAULICA / Hydrostatic test pressure: Kg/cm²g STG1 146 STG2 276 — PRESS. PROG. / Des. press: Kg/cm²g STG1 97 STG2 184 — PRESS. MAX AMMISS. / Max. admiss. press: Kg/cm²abs. 180 ✓

TEMP. PROG. / Des. temp: 148 °C — TEMP. MAX. AMMISS. / Max. admiss. temp.: °C 110

45 PESI / Weights: ●Kg — POMPA / Pump: 953 — BASAMENTO / Baseplate: 1542 — MOTORE / Motor: BY OTHERS — TURBINA / Turbine: //

46 DATI CON ACQUA (IN CASO DI LIQUIDO VISCOSO) / Data with water (for viscous fluid)

CURVA OFFERTA N / Offer curve No: H 88047-BE — VISCOSITÀ / Viscosity: cst — FATTORI CORRET. / Correct. factors: CO CH CE

PORTATA / Capacity: m³/h — PREVALENZA / Head: m — RENDIMENTO / Efficiency — PESO SPECIFICO / Spec. gravity

POTENZA ASS. / Absorbed power: kW — POTENZA MOTORE / Motor power: kW

47 ESTENSIONE FORNITURA / Supply limits — ☒ (INCLUSIONI) (INCLUDED)

REFER TO SUNDSTRAND DRG PROIFA26

☒ BASAM. COM. A POMPA/MOT./VARIATORE / Common baseplate for pump, driver & gear

☒ GIUNTI / Couplings ☒ WITH SPACER

☒ SPECIAL TOOLS LISTED IN QUOTE

☒ SUCTION STRAINER PIECES AND CROSSOVER PIPING

☒ AVVIAM. AUTOM. POMPE RISERVA E EMERGENZA / Automatic starting for spare emergency pumps for lube & seal system

☒ SEPARATORI SU FLUSSAGGIO / Flushing separator SYSTEM REFER TO PG 6 OF THIS SPEC AND SUNDSTRAND P&ID PROIFA26.

☒ PREFABB. TUBAZIONI OLIO / Shop-fabrication of lube oil piping

☒ ATTREZZI E CHIAVI SPECIALI / Special tools and wrenches

☒ LIBRETTO ISTRUZ. N° 10+2 COPIE IN LINGUA / No. copies of operating manual in language: english

☒ ACCOPP. POMPA MOTORE / Assem. pump-driver ☐ IN OFFIC. / In factory ☒ IN CANT. / In field

☒ TENUTE MECCANICHE / Mechanical seals

☒ AUSILIARI TENUTE MECCANICHE / Auxiliaries for mechanical seals

☐ MANOMETRO / Pressure indicator ☐ VALV. SICUREZZA / Safety valve ☐ VALV. DI SFIORO / Relief valve

☐ PRESSOSTATO / Pressure switch ☐ INTER. DI LIVELLO / Level switch ☐ INDICATORE DI LIVELLO / Level indicator

④ ☐ MOTRICI / Driver (IN FIELD) (SEE NOTE 5)

☒ BULLONI DI FONDAZIONE SECONDO / Foundation bolts in accordance STD S P 8500-84 + ALIGNMENT DEVICES

☒ PROT. GIUNTI / Coupling guards — ANTISC. / Non-sparking ☒ SI / Yes ☐ NO / No

☒ FILTRI TEMPOR. ASPIRAZIONE / Temporary suction filters

☒ SISTEMA DI LUBRIFICAZIONE / Lube oil system REFER TO P8 OF THIS SPEC AND SUNDSTRAND P&ID PROIFA26

☒ ACCOUSTIC ENCLOSURE ☒ 0.75 KW MOTOR WITH BLOWER

☒ TUBAZIONE COLLEGAMENTO CENTRALINA LUBRIF. E POMPA / Connect piping between lube console and pump

☒ COLLAUDI OFFICINA / Shop tests (ACCORDING TO QM-E-73415) FOR PUMP

☒ PARTI RICAMBIO PER N. anni / Spare parts for years COMMISSIONING / # 2 YEARS

☒ ALL RELEVANT PIPE SUPPORTS WITHIN THE PACKAGE CONFINES

☒ SS CONDENSATE RESERVOIR WITH ASSOCIATED SS PIPING

☐ BARILOTTO / Ext. reservoir ☐ TERMOMETRO / Temperature indicator

47a PUMP / GEAR, MOTOR AND ALL ANCILLARY SYSTEMS CONTAINED WITHIN CONFINES OF BASERATE

48 NOTE / Notes

1. Capacity is based on suction conditions 2. This figure is only for mechanical reason. The max value for process condit. is 19 Kg/cm² abs.
3. DISCHARGE FLANGES SHALL BE OF SPECIAL LENS DESIGN TO SP STD TB 5002.84
4. Safety valve setting: Kg/cm²g 180 SHALL NOT BE EXCEEDED
5. Pump baseplate to be undrilled motor only, motor half coupling to be machined by motor vendor.
6. MINIMUM FLOW AT WHICH THE PUMP CAN OPERATE IS 34.7 M³/hr.
7. Seal flushing : D.W. flow shall not exceed 701 Kg/hr. CONFIRMED BY SUNDSTRAND
8. CONTROL VALVE, FV-06 SHALL BE SUPPLIED BY SP AND POSITIONED NOT MORE THAN 2.13M FROM THE PUMP

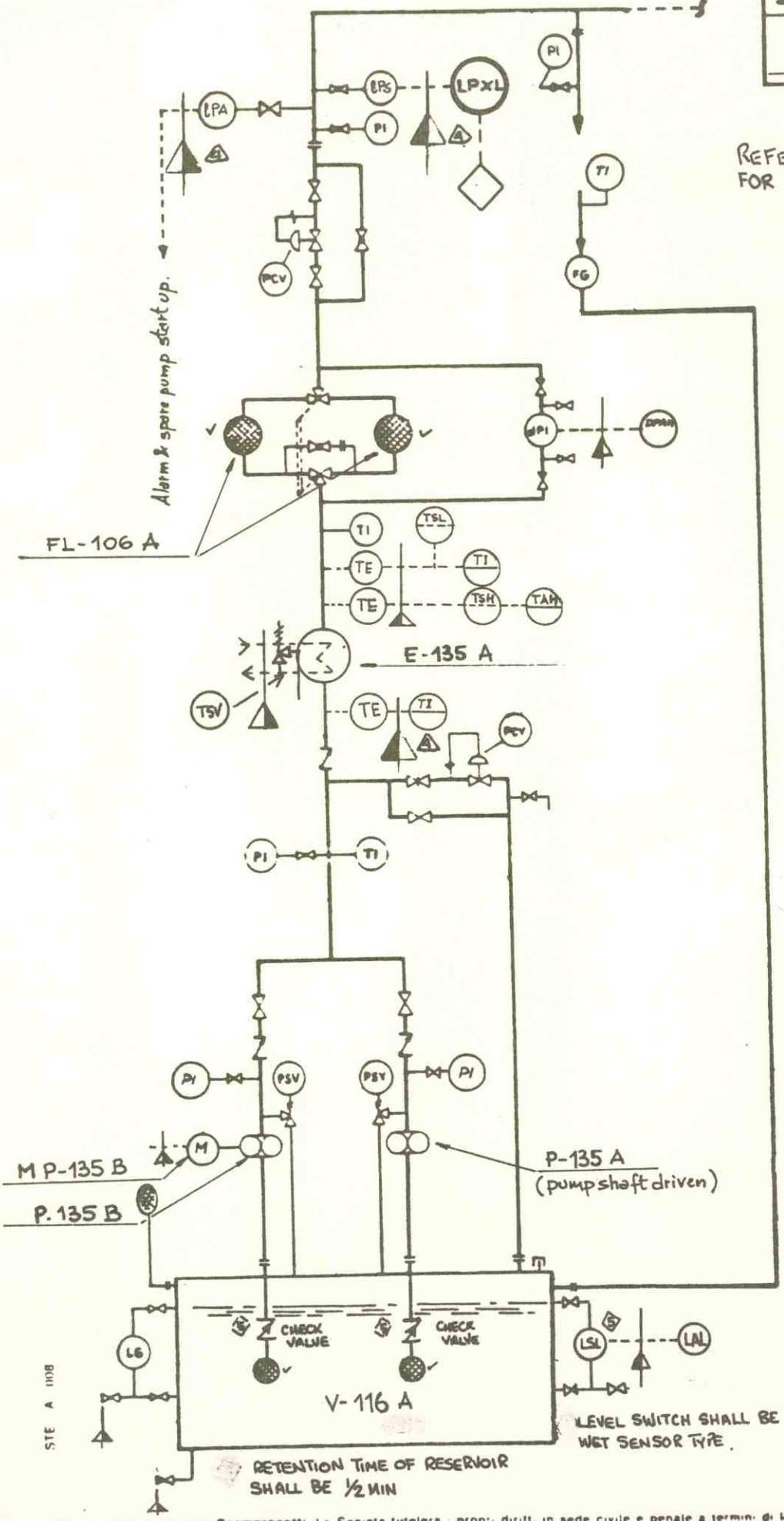
DAT/m - 0010 - Rev 1

Snamprogetti

LUBE OIL SYSTEM TYPICAL

COMMESSA NR.	
808200	01
SPC. N° MA-E-30311	
FG Sh. / Dr. of: 3 / 11	Rev.: 0 1 2 3 4 5

REFER TO SUNDSTRAND DRG PROIFA2(FOR TOTAL SCOPE



VALID FOR ONE PUMP

THE LUBE OIL SYSTEM SHALL BE TESTED DURING THE PUMP PERFORMANCE TEST.

SUMP HEATER NOT REQUIRED

ALL WIRING OF SWITCHES SHALL TERMINATE AT JUNCTION BOXES

VENDOR | OTHERS

STE A 1108

Snamprogetti

Std. TB.5002

808200 | 01

SPC N° MA-E-30311

Fg. - Sh. / di - of: 4 / 11

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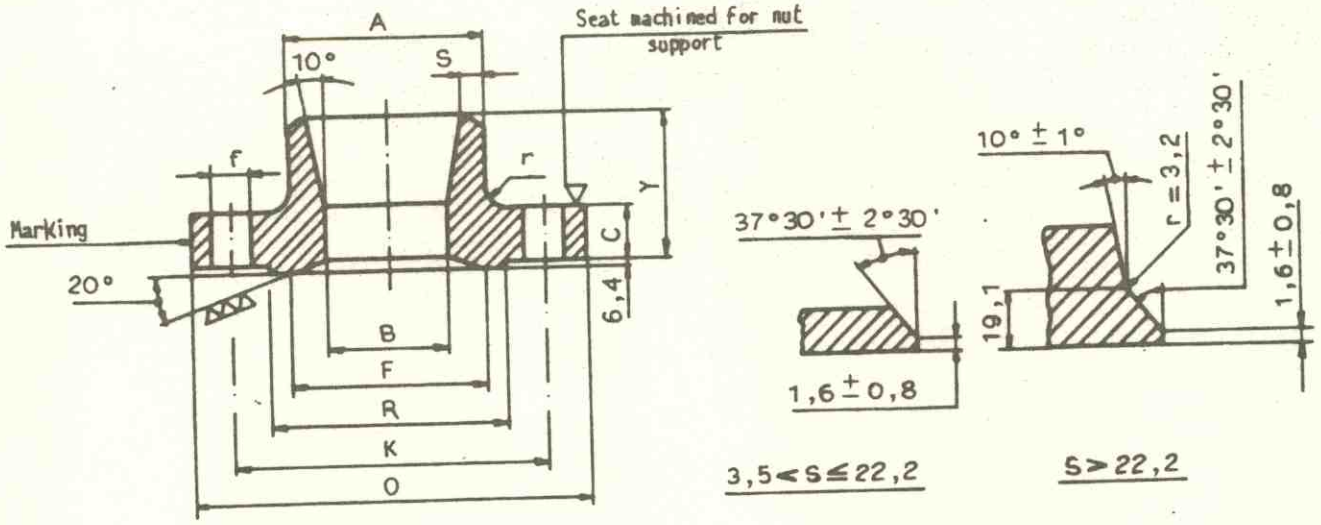
MATERIALS FOR UREA
STAINLESS STEEL WELDING NECK FLANGES



EXAMPLE OF DESIGNATION : Flange. DNP 4" x (1), per Snamprogetti Std. TB.5002, Sheet 11.
ASTM A 182 F 316L. per SPC. G510.

EXAMPLE OF MARKING : 4 - (1) / 316L - G510 / TB.5002-11.

DNP	A	B +0,5 −0	O	K	R	F	C	Y	f	r	S	N° of holes	Stud Bolts DN"	Stud Bolts Length	Mass, Kg
3/4	26.7	14,7	100	64	44	22,0	25	93,6	15,9	2	to suit pipe wall thickness	4	1/2	100	1,8
1	33,4	19.2	105	68	46	29,5	30		19.1				5/8	120	2,4
1 1/2	48.3	30,5	135	95	70	43,5	35		22,2	3			3/4	130	4,4
2	60,3	39.3	155	110	82	53,0	45		25,4	5			7/8	160	6,9
3	88,9	58,4	200	145	115	79,0	60	143,6		6		8		190	15,4
4	114,3	77,2	250	185	150	103,0	75		31,8	7			1 1/8	235	26.5
6	168,3	116,4	330	255	210	152,0	100		41,3				1 1/2	325	55.5
8	219,1	153,1	410	320	265	196,0	120	173,6	50,8				1 7/8	370	109,0
10	273,0	190,0	480	380	321	241,0	140	203,6	55,0				2	430	161,0

Dimensions in mm.

DNP, DN" = Nominal Size, Inches.

DIMENSIONS : As shown in Table.
CONSTRUCTION : Forged.
TOLERANCES : ANSI B 16.5
MATERIALS & TESTS : Per SPC. G510 and as specified in P.O.
DESIGN CONDITIONS : 292 bars at 80°C
258 bars at 150°C
221 bars at 250°C
STUD-BOLTS : Per ENI STD 0368.00

NOTES FOR PURCHASE ORDER AND MANUFACTURER

1) - State "S" thickness as specified each time.
2) - Each piece to be marked by its marking.

TUB. I

Comp. Macchi | Verif. | Appr. |