

Quotation

To

Company : Siemens AG
City / Country : Duisburg / Germany
Name : Stoverink Simon
Dept :
Tel :
Fax :
E-mail :

Name : N. HOST
Dept : Sales Dept.
Tel : +33 (0)3 69 20 51 50
Fax : +33 (0)3 88 67 60 75
E-mail : nhost@flender-graff.com
Page(s) : 19
Copy :
Date : 16.03.2016

Y/ref : Khursaniyah Al Fadhili - D43-K-1801 -
O/ref : D41104 quotation number 3

In response to your inquiry referenced above, we are pleased to confirm our quotation as follows :

ITEM A 1 : Flender Graffenstaden (FG) High Speed increaser, model **TX50/4C**

- *Rating conditions :* Rated power at **6800 kW**
Driven by a electric motor at **1800.0 rpm** (specified : 1800.0 rpm)
Driving a centrifugal compressor at **7309.1 rpm** (specified : 7285.0 rpm)
Service factor **1.45** according to **API613/03** (required : > 1.4)
- *Technical description :* Double helical
Manufacturing according to API standard
Flange on LS shaft end
Flange on HS shaft end
Estimated Weight : 4000 kg
- *Bearings description :* 2 cylindrical bearings on LS shaft
2 offset bearings on HS shaft
1 double acting tilting pad thrust bearing on low speed shaft non driven end
- *Mechanical running test :* Full speed, no load test during 4 hours according to the API 613 5th Edition standard.
- *Lubrication conditions :* 164 l/min of Oil ISO VG 46 at 60°C and 2.5 bar at inlet (calculated values only)
- *Miscellaneous:* Efficiency at full load : 99.03 %
Power losses at full load : 66 kW (calculated value only)
Anticipated Sound Pressure Level: 82.0 ± 2dB(A) at 1 meter

Base price : **117 900 EUR** each gear box
Delivery time : **36 weeks** after the FG acknowledgement of the order
Quantity : **8 gearboxes**

Comments :

- Coupling data taken into account on HS Shaft:
 - o Weight: 26.6 kg
 - o Center of gravity position from shaft end: 30.9 mm
 - o Inertia: 0.266 kgm²
- Coupling data taken into account on LS Shaft:
 - o Weight: 87.5 kg
 - o Center of gravity position from shaft end: 40.9 mm
 - o Inertia: 0.875 kgm²

Including :

- Customer witness of test
- After test disassembly and inspection
- Noise level test report
- Lateral analysis undamped
- Documentation : downloadable electronic file in english

Instrumentation (see the complete package on additional technical data sheet):

- *Temperature package*
12 RTD's PT100 Duplex 3 wires from Thermo Electric Company Inc.
(2 per bearing and thrust bearing side) not wired with terminal heads..... Price included
- *Bently Nevada vibration package*
8 radial (4 per shaft) & 2 axial (on LS shaft) vibration probes, 2 accelerometers (1 per shaft), 2
keyphasors (1 per shaft) not wired Price included

Spare parts (Prices are net valid only if spares are ordered together with the gearbox):

- *Commissioning Spares*
2 RTD's, 2 BN vibration probes, 2 BN accelerometers 7 900 EUR Lot Net
- *2 Years Normal Operation Spares*
2 set of bearings with RTD's, 1 set of oil seals 48 420 EUR Lot Net
- *Strategic Spare Parts*
One complete set of rotating elements consisting of one pinion and one gear.
Tested if ordered together with the main gearbox according to API613/03
Full Speed, No Load, with Test Report..... 51 500 EUR Lot Net
- *Container for horizontal spare rotors storage painted according FG standard..... 17 100 EUR Lot Net*

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

Job No. 41104 Item No. A
P.O. No. _____ Date _____
Requisition No. _____
Inquiry No. _____
Revision 1 Date 06.03.2015 By HNI

1	Applicable To: ☒ Proposal ☐ Purchase ☐ As Built	☐ US Standards (1.7) ☒ ISO Standards (1.7)
2	For <u>Siemens AG Dulsburg</u>	Manufacturer <u>FLENDER-GRAFFENSTADEN</u>
3	Site <u>Khursanlyah Al Fadhill</u>	Model No. <u>TX50/4C</u>
4	Unit <u>STC-SV 08-4-A</u>	Serial No. _____
5	Service <u>EM/CC</u>	Driver type <u>electric motor</u>
6	No. required <u>9</u>	Driven equipment <u>centrifugal compressor</u>
7		
8	NOTE : Numbers within () refer to applicable API standard 613 paragraphs	
9	☐ Information to be completed by purchaser ☐ Information to be completed by manufacturer	
10	○ UNITS OF MEASUREMENT	■ BASIC GEAR DATA
11	☐ US Customary units	
12	☒ SI units	
13	○ RATING REQUIREMENTS	
14	Driven equip. (2.1.4): Norm. _____ Max _____ kW	☒ Single stage ☐ Single helical
15	Driver: Rated _____ Max _____ kW	☐ Double stage ☒ Double helical
16	Normal transmitted power (2.2.2) _____ kW	☐ Epicyclic ☐ horizontal offset
17	Gear unit rated power (2.2.1) <u>6800</u> kW	Mechanical rating (1.5.16) <u>9520</u> kW @ <u>1800 / 7309,1</u> rpm
18	Torque @ max cont speed _____ Nm	Gear service factor (2.2.3.1) <u>1,44</u> API 613/2003 5 TH (actual)
19	Max torque (2.2.1) _____ Nm @ _____ rpm	Full load gear unit power loss <u>66</u> kW
20	☐ Reducer ☒ Increaser	Gear Unit Mechanical efficiency <u>99,03</u> %
21	Rated speed (2.1.5):	Rating speed Pinion <u>7,309,1</u> Gear <u>1,800,0</u> rpm
22	Input <u>1800</u> rpm ☐ Specified ☒ Nominal	Hardness used for
23	Output <u>7285</u> rpm ☐ Specified ☒ Nominal	Rating, (HB or Rc) Pinion <u>58 HRC</u> Gear <u>58 HRC</u>
24	Allow var in gear ratio (2.1.6) (+) (-) _____ %	Tooth pitting index, "K" (2.2.4.1) (2.2.4.2)
25	Max continuous speed (1.5) <u>1800 / 7285</u> rpm	Allowable <u>2,17</u> Actual <u>2,10</u> MPa
26	Trip speed (1.5) (2.1.7) <u>1980 / 8013,5</u> rpm	Material index number (Fig 3, Table 4) <u>3,03</u> MPa
27	Gear service factor (2.2.3.1) <u>1,4</u> API 613/2003 5 TH (min)	Bending stress number, "S _t " (2.2.5.1) (2.2.5.2)
28	Hardness (2.2.3.2) Pinion _____ Gear _____	Pinion: Allowable <u>265,4</u> Actual <u>256,0</u> MPa
29	Shaft assembly designation (2.1.10) _____ L/R	Gear: Allowable <u>265,4</u> Actual <u>240,9</u> MPa
30	HS shaft rot fac'g cpl'g (2.1.20.2) ☒ CW ☐ CCW	Pitch line velocity <u>77,1</u> m/s
31	LS shaft rot fac'g cpl'g (2.1.20.2) ☒ CW ☐ CCW	Anticipated SPL (2.1.6) <u>82</u> dB(A) @ <u>1</u> m
32	External loads (2.1.16) _____	WR ² referred to LS shaft <u>126,12</u> kgm ²
33	Other operating conditions (2.2.2) (2.6.1.3) _____	Breakaway torque <u>412</u> Nm @ LS Shaft
34		Pinion teeth hardness range <u>58 - 63 HRC</u>
35	○ INSTALLATION DATA (2.1.14)	Pinion teeth hardening method <u>CARBURIZED</u>
36	☐ Indoor ☐ Heated ☐ Under roof	☐ HS shaft separate hardness range _____
37	☒ Outdoor ☐ Unheated ☐ Partial sides	Gear teeth (rim) hardness range <u>58 - 63 HRC</u>
38	☐ Grade ☐ Mezzanine ☒ ONSHORE	Gear teeth hardening method <u>CARBURIZED</u>
39	☐ Winterization required ☐ Tropicalization required	Gear hub:
40	Electrical area (2.1.10) Class _____ Grp _____ Div _____	☒ Forged cylinder ☐ Forged & Copped ☐ Fabricated
41	Electrical area (2.1.10) Zone <u>2</u> Grp <u>IIA</u> Temp <u>T1</u> °C	Gear to Shaft fit method (2.5.3.2)
42	Max allow SPL (2.1.6) _____ dB(A) @ _____ m	☐ Integral ☐ Keyed interference ☒ Keyless interference
43	Elevation _____ m Barometer _____ kPa abs	Rim attachment (2.5.3.2) <u>FORGED GEAR WHEEL</u>
44	Range of ambient temperatures:	LS shaft hardness range <u>HB 230 - 274</u>
45	Dry bulb _____ Wet bulb _____	Journal static weight loads (2.6.6.3)
46	Normal _____ °C _____ °C	Pinion <u>128 / 42</u> kg Gear <u>942 / 707</u> kg
47	Maximum <u>82</u> °C _____ °C	Total gear unit assembled weight <u>4000</u> kg
48	Minimum <u>0</u> °C _____ °C	NOTES: _____
49	Unusual conditions ☐ Dust ☐ Fumes	_____
50	☐ _____	_____

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

■ GEAR DATA				○ COUPLINGS AND GUARDS		
		Pinion	Gear		Pinion	Gear
Number of teeth	33		134	Coupling furnished by (3.2.1)	Compr. Supplier	Compr. Supplier
Gear ratio	4,06			Mount coupling halves (3.2.2)	Compr. Supplier	Compr. Supplier
Tangential load, "Wt" (2.2.4.2)	88,155	N		Cplg. guard adapter by (3.2.3)	Gear Supplier	Gear Supplier
AGMA Geometry factor "J"	0,55		0,57	Cplg. guard furnished by (3.2.3)	Compr. Supplier	Compr. Supplier
Pitch diameter	201,56		818,44	Coupling vendor (3.2.3)		
Outside diameter	214,10		827,60	Vendor's model number (3.2.3)		
Root diameter	187,25		800,74	Coupling weight on shaft, kg	26,6	87,5
Center groove diameter	177,00		790,00	CG Inboard / outboard of shaft end	Outboard	Outboard
Normal pressure angle	20,00	deg		Hub drill template provided	☐	☐
Normal diametral pitch	4,62	in ⁻¹		■ SHAFT END DETAIL (2.5.4.2)		
Helix angle	25,00	deg		Shaft end detail specified by: ☒ Purchaser ☐ Gear vendor		
Center distance	510,00	mm		(Integral unless otherwise specified)		
Backlash min	0,34	mm		Shaft end detail if 'otherwise' specified:		
Net face width, "Fw"	260,00	mm		Tapered / Keyless	☐ ☐	☐ ☐
Pinion L/D	1,71			Tapered / 1-Key	☐ ☐	☐ ☐
Face overlap ratio	6,36			Tapered / 2-Keys	☐ ☐	☐ ☐
Transverse contact ratio	1,45			Cylindrical / 1-Key	☐ ☐	☐ ☐
AGMA 6011 service factor	2,64			Cylindrical / 2-Keys	☐ ☐	☐ ☐
Rating based on ANSI/AGMA 6011 with SF=1.0				Other <u>Flanged</u>	☒ ☐	☒ ☐
Durability Power	21442	kW		Shaft diameter	120,0	190,0 mm
Strength Power	17946	kW		(If integral flange use diameter immediately adjacent to flange)		
Tooth Surface Finish, Ra	0,4	µm	0,4	■ RADIAL BEARINGS		
Tooth Generation Process	Hobbing		Hobbing	Type	OFFSET / OFFSET	CYL. / CYL.
Tooth Finishing Process	Grinding		Grinding	Diameter	130 / 130	200 / 200 mm
Lead modification (2.2.4.6)	☒ Not Req'd	☐ Req'd		Length	130 / 130	100 / 100 mm
Calculated Total Lead Mismatch		µm		Journal velocity	49,8 / 49,8	18,8 / 18,8 m/s
■ SCUFFING DATA (2.2.6)				Loading	2,78 / 2,81	2,87 / 2,71 Nmm ²
Scuffing Data per ANSI/AGMA 925-A03				Clearance (min-max)		mm
Scuffing Risk (2.2.6) <=5% (Low)	Calculation Method	AGMA925		Span	550	550 mm
Composite surface roughness, α_x	0,57	µm		Power loss each bearing	13,8 / 13,8	3,0 / 3,0 kW
Specific film thickness, EHL λ_{min}	3,31	µm		Oil flow each bearing	42,0 / 42,0	10,0 / 10,0 l/min
Tooth temperature, θ_m	82	°C		■ THRUST BEARINGS		
Maximum contact temperature, θ_{Bmax}	101	°C		Location		OPP.CPLG.SIDE
■ MATERIALS				Manufacturer	FLENDER	FLENDER
Gear casing	Steel	Oil seals	aluminium	Type	NO	COMB.TAP.LANDS
Pinion(s)	18CrNiMo7-6			Size		BPK LEG 6"
Gear rim(s)	18CrNiMo7-6			Area		11615 mm ²
HS Shaft	Integral	LS Shaft	42CrMo4	Loading		1,14 MPa
Radial bearings	Babbitt	Backing	Steel	Rating		1,50 MPa
Thrust bearing(s)	Babbitt	Backing	Steel	Int. thrust load		N
○ SHAFT END DETAIL				Ext. thrust load	4,050	9,200 N
☒ Gear shaft end for coupling integral flange (2.5.4.2)				Power loss each	0,0	6,0 kW
☒ Pinion shaft end for coupling integral flange (2.5.4.2)				Oil flow each bearing	0,0	20,0 l/min
☐ Other:	WITHOUT BOLTS			NOTES:		

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

SPECIAL PURPOSE GEAR UNITS API 613 FIFTH EDITION DATA SHEET SI UNITS ☐ Oil system furnished by (2.8.3) _____ ☐ Other _____ ☐ Gear vendor _____ ☐ Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6) _____ ☐ ISO Grade _____ Load stage (2.2.6) 5,0 ■ MESH Mesh and windage power loss 26,4 kW Oil flow, mesh 40,0 l/min ■ LUBRICATION REQUIREMENTS Min. startup oil temperature 20,0 °C Normal oil inlet temperature 60,0 °C Maximum oil inlet temperature 65,0 °C Unit oil flow (total) 164,0 l/min Unit oil pressure 2,5 bar ☐ Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6) _____ ☐ ISO Grade 46 Load stage (2.2.6) 5,0 ■ PIPING CONNECTIONS <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Service</th> <th>No.</th> <th>Size</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Lube oil inlet</td> <td>1</td> <td>2 in.</td> <td>ANSI 150 LBS</td> </tr> <tr> <td>Lube oil outlet</td> <td>1</td> <td>6 in.</td> <td>ANSI 150 LBS</td> </tr> <tr> <td>Casing drain *</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Vent</td> <td>1</td> <td>1,5 in.</td> <td>ANSI 150 LBS</td> </tr> <tr> <td>Casing purge</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> * Casing drain is 'dead bottom' housing drain, not lube oil outlet ○ MOUNTING PLATES ☐ Gear furnished with (3.3.1.1) _____ ☐ Baseplate ☐ Soleplate ☐ Subplate(s) (3.3.2.10) _____ ☐ Mounting plates(s) furnished by (3.3.1.1) _____ ☐ Baseplate leveling (3.3.2.3) _____ ☐ Baseplate with leveling pads (3.3.2.3) _____ ☐ Baseplate suitable for column mounting (3.3.2.4) _____ ☐ Vendor review of purchaser's foundation dwgs. (2.1.13) _____ ☐ Grout type (3.3.1.2.4) _____ ○ CONTRACT DATA ☐ Test data prior to shipment _____ ☒ Progress report (5.3.3) _____ ☐ Vendor signoff of Inspector checklist (4.1.1.3) _____ ☒ Information retained for 20 years (4.2.1.1) (4.2.2.6.1) _____ ☐ Technical manual (5.3.5.4) _____ ☒ PAINTING (4.4.3.1) ☒ Flender standard RAL5015 (blue) ☒ Painting housing interior not allowed (2.3.1.14) _____ ○ SHIPMENT ☐ Steel rotor storage container (4.4.5) ☐ Shaft covers (4.4.4) _____ Contract unit Spares Export boxing ☐ Domestic boxing ☐ Outdoor storage over 6 mos. ☐ 3 years Indoor ☐ ○ ADDITIONAL REQUIREMENTS ○ VIBRATION DETECTORS RADIAL (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer BENTLY NEVADA ☒ Total No. 8 ☒ X-Y probes pinion bearings ☒ Coupling end ☒ Blind end ☒ X-Y probes gear bearings ☒ Coupling end ☒ Blind end ☐ Other _____ AXIAL (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer BENTLY NEVADA ☒ Total No. 2 ☐ Dual probes at each thrust bearing ☐ Single probe any shaft without thrust bearing ☐ Other _____ ONE EVENT PER REVOLUTION PROBE (2.7.4.5) (2.7.4.6) ☒ Manufacturer BENTLY NEVADA Total No. 2 ☒ One on input shaft ☒ One on output shaft ☐ Other _____ ACCELEROMETER (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer BENTLY NEVADA ☒ No. required 2 ☒ Pinion coupling end ☒ Gear coupling end ☐ Other _____ ○ TEMPERATURE DETECTORS ☐ Dial type thermometers (3.4.2.7) _____ ☒ Type brg. temp. sensors (3.4.2.7) (2.7.1.3) PT100 ☐ RTD ☐ Thermocouple / ☐ Simplex ☒ Duplex Calibration Yes ☒ HS/LS bearings no. sensors each 2 / 2 ☒ Thrust number of sensing elements each face 2 ○ OTHER VIBRATION AND TEMPERATURE (3.4.2.5) (3.4.2.6) Other Gear vendor Oscillator demodulator supplied by ☐ ☒ Vibration monitor supplied by ☒ ☐ Vibration shutdown delay time _____ seconds Temperature monitor supplied by ☒ ☐ Oscillator demodulator J-box by ☒ ☐ Temp. sensor termination J-box by ☒ ☐ J-box type _____ Mount _____ ○ MISCELLANEOUS ☒ Undamped critical analysis report (2.6.2.1) _____ ☐ w/ dampd rotr respsn analys rpt (2.6.2.4.3) (2.6.2.6) Torsional analysis by (2.6.5.2) ☐ Gear vendor ☒ Other _____ ☐ Spare set of gear rotors (4.3.2.4) _____ ☐ Gear case furnished with inlet purge connection (2.4.3) _____ ☐ Orientation of oil inlet & drain conns. (2.4.6) _____ ☒ Filter breather location (2.3.1.12) Prov. on upper casing ☐ Torsional device provisions (2.5.4.5) _____ ☐ Rotor vertical storage provisions (2.5.4.8) _____ ☐ Rotor vertical storage fixture(s) (3.6.2) _____ ☐ Vendor service rep. on site (2.1.13) _____	Service	No.	Size	Type	Lube oil inlet	1	2 in.	ANSI 150 LBS	Lube oil outlet	1	6 in.	ANSI 150 LBS	Casing drain *				Vent	1	1,5 in.	ANSI 150 LBS	Casing purge				Job No. 41104 Item No. A P.O. No. _____ Date _____ Requisition No. _____ Inquiry No. _____ Revision 1 Date 06.03.2015 By HNI
Service	No.	Size	Type																						
Lube oil inlet	1	2 in.	ANSI 150 LBS																						
Lube oil outlet	1	6 in.	ANSI 150 LBS																						
Casing drain *																									
Vent	1	1,5 in.	ANSI 150 LBS																						
Casing purge																									

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

Job No. 41104 Item No. A
P.O. No. _____ Date _____
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O INSPECTIONS AND TESTS (4.1)				
	Req'd	Witness	Observe	Test Log
☐ Advance notice of witness testing required (4.1.3)				
Number calendar days _____				
Shop Inspection (4.1.1)	☐	☐	☐	
Cleanliness Inspection (4.2.3.1)	☐	☐	☐	
Hardness Verification (4.2.3.3)	☒	☐	☐	☒
Dismantle-reassembly (4.3.2.3.1)	☒	☐	☐	☐
Contact Check (2.5.2.2)	☒	☐	☐	☐
Contact Check Tape Lift (2.5.2.2)	☒	☐	☐	☒
Gear accuracy check (2.5.2.1)	☒	☐	☐	☐
Double helical axial stability (2.5.2.3)	☒	☐	☐	☒
Special testing Integral forged gears (2.5.3.3)				
(testing per mutual agreement)	☐	☐	☐	☐
Residual unbalance check (2.6.6.2)	☒	☐	☐	☒
Mechanical Run Test (Main) (4.3.2)	☒	☐	☐	☒
Mechanical Run Test (Spare) (4.3.2.4)	☐	☐	☐	☐
Addl. Mechanical Tests (4.3.2.2.16)	☐	☐	☐	☐
Part or Full Load And Full Speed				
Test (4.3.3.1)	☐	☐	☐	☐
Full torque, reduced speed (4.3.3.2)	☐	☐	☐	☐
Full Torque Static Test (4.3.3.3)	☐	☐	☐	☐
Back-To-Back Locked Torque				
Test (4.3.3.4)	☐	☐	☐	☐
Sound Level Test (4.3.3.5)	☒	☐	☐	☒
Additional gear tooth test (4.2.2.8)	☐	☐	☐	☐
Use shop Lube System	☒	☐	☐	
Use Job lube system	☐	☐	☐	
Use shop Vibration Probes, Etc.	☐	☐	☐	
Use Job Vibration Probes, Etc.	☒	☐	☐	
Final Assembly, Maintenance &				
Running Clearance (4.2.1.1.e)	☒	☐	☐	☒
Oil System Cleanliness (4.2.3.2)	☐	☐	☐	
Oil System-Casing Joint				
Tightness (4.3.2.1.4)	☐	☐	☐	
Warning And Protection				
Devices (4.3.2.1.5)	☐	☐	☐	
Seismic Vibration Data (4.3.2.2.3)	☐	☐	☐	☐
Vibration, Phase Plots (4.3.2.2.12)	☒	☐	☐	☒
Oil Inlet Range test (4.3.2.2.13)	☐	☐	☐	☐
Tape recorded Vibration Data	☒	☐	☐	☒
(4.3.2.2.14) (4.3.2.2.15)	☐			Purchaser copy
NON-DESTRUCTIVE TESTING (4.2.1.2) (4.2.2.1)				
	Surface	Sub surface		Log
☐ Casing	☐	☐		☐
☒ Rot. Elemts.	☒	☒		☒
☒ Bearings	☒	☒		☒
☐ Other :	☐	☐		☐
(Specify)				

NOTES : _____

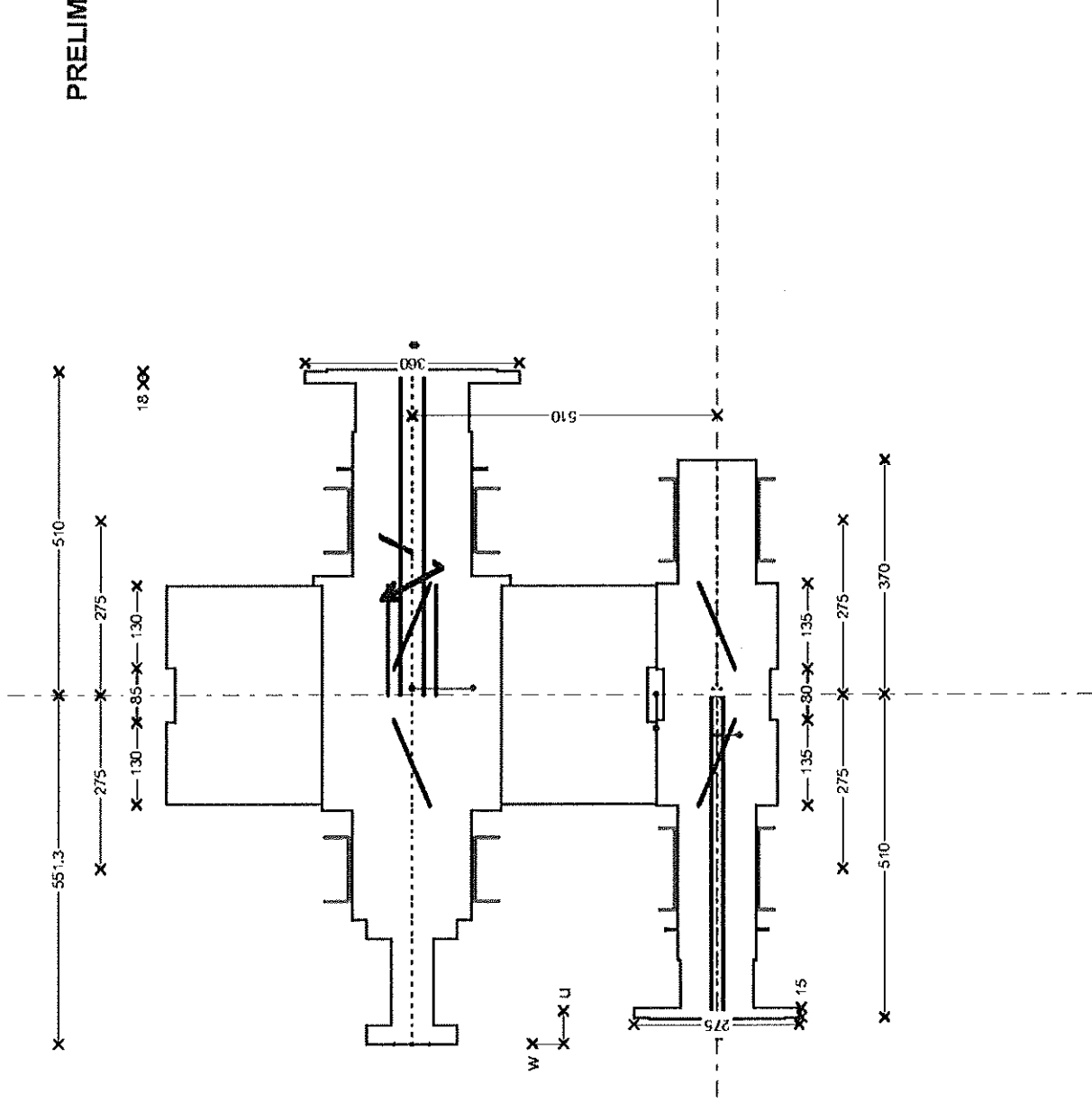
During start-up, gears can exhibit a transient spike reading of vibration levels that will exceed shutdown settings. Therefore a trip multiplier is recommended in the control system.

Mechanical running test duration 4 hours including

- Shaft vibration record using Job vibration probes if ordered
- Bearings temperature records
- Casing vibration measurement
- Sound level pressure measurement
- Power losses measurement at oil outlet
- Performed with oil ISO VG 32

Oil flow requirement and power losses are calculated values only, add normal safety margins for sizing heat exchangers.

PRELIMINARY MASSE ELASTIC DATA



Customer : Siemens AG Duisburg
Destination : Khursaniyah Al Fadhili
Purchaser order :
F-G job number : D 41104A1 OL
Type and serial N° : TX50/4C

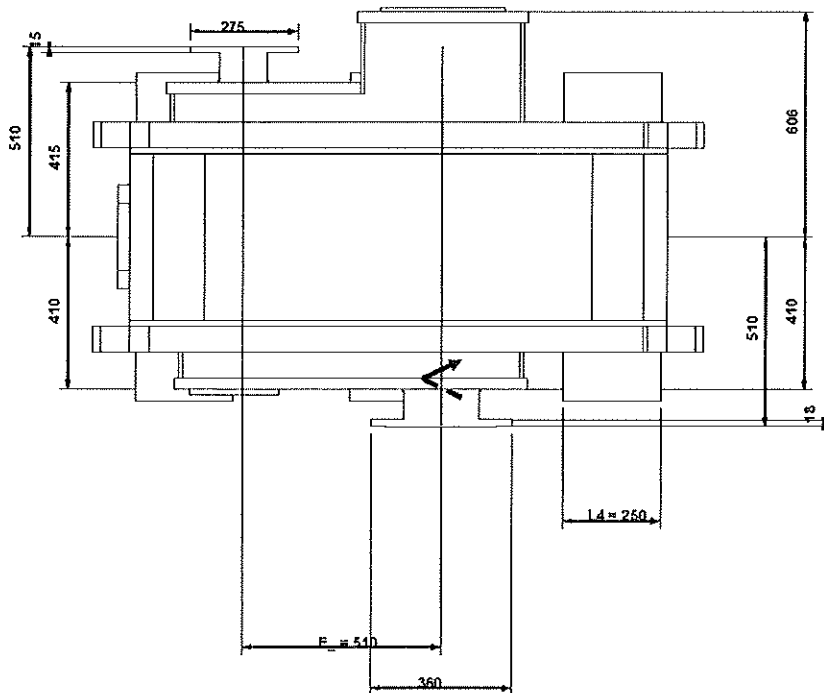
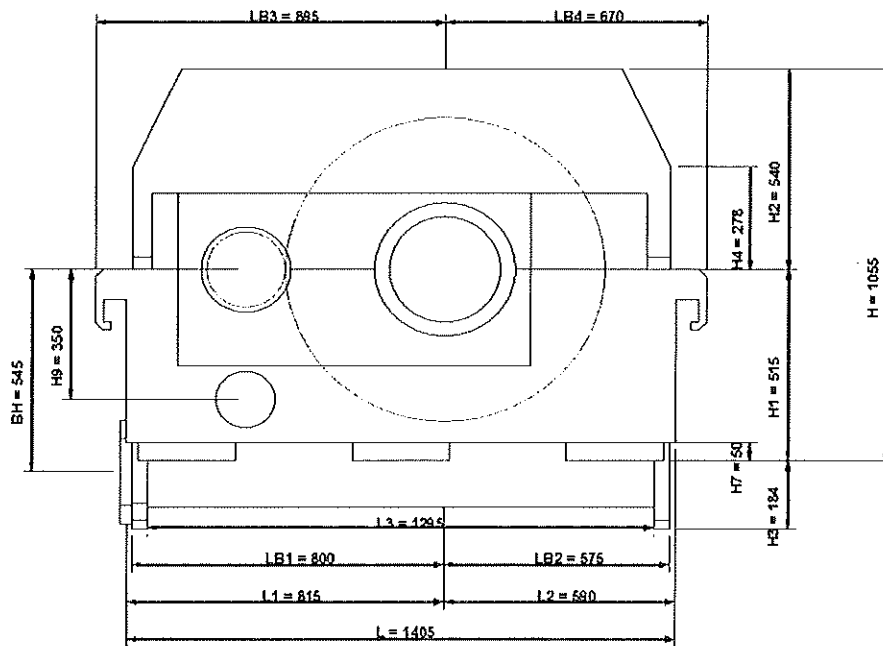
Power rating : 5800 kW
Service factor : API613403 >=1.4
Input speed : 1800 rpm
Output speed : 7309.1 rpm
Speed ratio : 4.06

Weight HSS : 143,5 kg
Weight pos. from teeth middle HSS : 63,4 mm
Inertia HSS : 0,585 Kg.m²
Stiffness HSS : 5,916 MN/mrad
Bearing type 1 : Orifset 130 x 130
Bearing type 2 : Orifset 130 x 130
Add. weight on brg. side 1 : 26,6 kg

Weight: LSS : 1561,2 kg
Weight: pos. from rest: middle LSS : 10,5 mm
Inertia LSS : 116,473 Kg.m²
Stiffness LSS : 39.014 MN/mrd
Bearing type 4 : Cylindrical 200 x 100
Bearing type 3 : Cylindrical 200 x 100
Add. weight on brg. side 4 : 87,5 kg

Positive direction of external

APPAREIL.xls _ Edition du :06.03.2015
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ADDITIONAL TECHNICAL DATASHEET				Job No. 41104 Item No. A																																																		
				P.O. No. _____ Date _____																																																		
				Requisition No. _____																																																		
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1	☒ ADDITIONAL GEAR DATA			☐ TURNING GEAR (Dimensioning is preliminary !)																																																		
2	<i>Efficiency</i>			<i>Calculation results</i>																																																		
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15	Design : _____ Speed : _____ rpm Oil flow : _____ l/min Oil pressure : _____ bar NPSH : _____ m Safety valve : _____ Driving method : _____ Material : _____ Flanges : _____ Testing : _____ Furniture of ATEX certificate : _____			<i>Turning gear</i>																																																		
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56	Qty 0 Manufacturer _____ Material _____ ATEX None			Identification ☒ wire ☒ conduit ☐ junction box Conduit type _____ Transmitter type _____ Qty _____ Terminal block type _____ Qty _____																																																		
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Y/ref : Khursaniyah Al Fadhili - D43-K-3801 -
O/ref : D41104 quotation number 3

ITEM B 1 : Flender Graffenstaden (FG) High Speed increaser, model **TX40/5C**

- *Rating conditions :* Rated power at **1620 kW**
Driven by a electric motor at **1800.0 rpm** (specified : 1800.0 rpm)
Driving a centrifugal compressor at **10737.9 rpm** (specified : 10736.0 rpm)
Service factor **1.47** according to **API613/03** (required : > 1.4)
- *Technical description :* Double helical
Manufacturing according to API standard
Flange on LS shaft end
Flange on HS shaft end
Estimated Weight : 1900 kg
- *Bearings description :* 2 cylindrical bearings on LS shaft
2 tilting pads bearings on HS shaft
1 double acting tilting pad thrust bearing on low speed shaft non driven end
- *Mechanical running test :* Full speed, no load test during 4 hours according to the API 613 5th Edition standard.
- *Lubrication conditions :* 64 l/min of Oil ISO VG 46 at 60°C and 2.5 bar at inlet (calculated values only)
- *Miscellaneous:* Efficiency at full load : 98.70 %
Power losses at full load : 21 kW (calculated value only)
Anticipated Sound Pressure Level: 82.0 ± 2dB(A) at 1 meter

Base price : **103 850 EUR** each gear box

Delivery time : **36 weeks** after the FG acknowledgement of the order

Quantity : **1 gearbox**

Comments :

- Coupling data taken into account on HS Shaft:
 - o Weight: 10.4 kg
 - o Center of gravity position from shaft end: 28.2 mm
 - o Inertia: 0.104 kgm²
- Coupling data taken into account on LS Shaft:
 - o Weight: 26.4 kg
 - o Center of gravity position from shaft end: 30.9 mm
 - o Inertia: 0.264 kgm²

Including :

- Customer witness of test
- After test disassembly and inspection
- Noise level test report
- Lateral analysis undamped
- Documentation : downloadable electronic file in English

Instrumentation (see the complete package on additional technical data sheet):

- *Temperature package*
12 RTD's PT100 Duplex 3 wires from Thermo Electric Company Inc.
(2 per bearing and thrust bearing side) not wired with terminal heads..... Price included
- *Bently Nevada vibration package*
8 radial (4 per shaft) & 2 axial (on LS shaft) vibration probes, 2 accelerometers (1 per shaft), 2 keyphasors (1 per shaft) not wired Price included

Spare parts (Prices are net valid only if spares are ordered together with the gearbox):

- *Commissioning Spares*
2 RTD's, 2 BN vibration probes, 2 BN accelerometers 7 900 EUR Lot Net
- *2 Years Normal Operation Spares*
1 set of bearings with RTD's, 1 set of oil seals 26 010 EUR Lot Net
- *Strategic Spare Parts*
One complete set of rotating elements consisting of one pinion and one gear.
Tested if ordered together with the main gearbox according to API613/03
Full Speed, No Load, with Test Report..... 37 100 EUR Lot Net
- *Container for horizontal spare rotors storage painted according FG standard*..... 15 850 EUR Lot Net

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

1 Applicable To: ☒ Proposal ☐ Purchase ☐ As Built 2 For <u>Siemens AG Dulsburg</u> 3 Site <u>Khursaniyah Al Fadhlili</u> 4 Unit <u>STC-SV 06-3-A</u> 5 Service <u>EM/CC</u> 6 No. required <u>1</u>	Job No. <u>41104</u> Item No. <u>B</u> P.O. No. _____ Date _____ Requisition No. _____ Inquiry No. _____ Revision <u>1</u> Date <u>06.03.2015</u> By <u>HNI</u> ☐ US Standards (1.7) ☒ ISO Standards (1.7)
7 8 NOTE : Numbers within () refer to applicable API standard 613 paragraphs 9 ☐ Information To be completed by purchaser ☐ Information to be completed by manufacturer	
10 ☐ UNITS OF MEASUREMENT 11 ☐ US Customary units 12 ☒ SI units 13 ☐ RATING REQUIREMENTS 14 Driven equip. (2.1.4): Norm. _____ Max _____ kW 15 Driver: Rated _____ Max _____ kW 16 Normal transmitted power (2.2.2) _____ kW 17 Gear unit rated power (2.2.1) <u>1620</u> kW 18 Torque @ max cont speed _____ Nm 19 Max torque (2.2.1) _____ Nm @ _____ rpm 20 ☐ Reducer ☒ Increaser 21 Rated speed (2.1.5): 22 Input <u>1800</u> rpm ☐ Specified ☒ Nominal 23 Output <u>10736</u> rpm ☐ Specified ☒ Nominal 24 Allow var in gear ratio (2.1.5) (+) (-) _____ % 25 Max continuous speed (1.5) <u>1800 / 10736</u> rpm 26 Trip speed (1.5) (2.1.7) <u>1980 / 11809,6</u> rpm 27 Gear service factor (2.2.3.1) <u>1,4 API 613/2003 5 TH</u> (min) 28 Hardness (2.2.3.2) Pinion _____ Gear _____ 29 Shaft assembly designation (2.1.10) <u>L/R</u> 30 HS shaft rot fac'g cpl'g (2.1.20.2) ☒ CW ☐ CCW 31 LS shaft rot fac'g cpl'g (2.1.20.2) ☒ CW ☐ CCW 32 External loads (2.1.16) _____ 33 Other operating conditions (2.2.2) (2.6.1.3) _____	☒ BASIC GEAR DATA ☒ Single stage ☐ Single helical ☐ Double stage ☒ Double helical ☐ Epicyclic ☐ <u>horizontal offset</u> Mechanical rating (1.5.16) <u>2268</u> kW @ <u>1800 / 10737,9</u> rpm Gear service factor (2.2.3.1) <u>1,46</u> API 613/2003 5 TH (actual) Full load gear unit power loss <u>21</u> kW Gear Unit Mechanical efficiency <u>98,70</u> % Rating speed Pinion <u>10.737,9</u> Gear <u>1.800,0</u> rpm Hardness used for Rating, (HB or Rc) Pinion <u>58 HRC</u> Gear <u>58 HRC</u> Tooth pitting index, "K" (2.2.4.1) (2.2.4.2) Allowable <u>2,17</u> Actual <u>2,06</u> MPa Material index number (Fig 3, Table 4) <u>3,03</u> MPa Bending stress number, "S_t" (2.2.5.1) (2.2.5.2) Pinion: Allowable <u>265,4</u> Actual <u>251,0</u> MPa Gear: Allowable <u>265,4</u> Actual <u>238,8</u> MPa Pitch line velocity <u>63,0</u> m/s Anticipated SPL (2.1.6) <u>82</u> dB(A) @ <u>1</u> m WR² referred to LS shaft <u>29,88</u> kgm² Breakaway torque <u>90</u> Nm @ LS Shaft Pinion teeth hardness range <u>58 - 63 HRC</u> Pinion teeth hardening method <u>CARBURIZED</u> ☐ HS shaft separate hardness range _____ Gear teeth (rim) hardness range <u>58 - 63 HRC</u> Gear teeth hardening method <u>CARBURIZED</u> Gear hub: ☒ Forged cylinder ☐ Forged & Capped ☐ Fabricated Gear to Shaft fit method (2.5.3.2) ☐ Integral ☐ Keyed interference ☒ Keyless interference Rim attachment (2.5.3.2) <u>FORGED GEAR WHEEL</u> LS shaft hardness range <u>HB 230 - 274</u> Journal static weight loads (2.6.6.3) Pinion <u>37</u> / <u>4</u> kg Gear <u>347</u> / <u>253</u> kg Total gear unit assembled weight <u>1900</u> kg NOTES: _____ _____ _____
34 ☐ INSTALLATION DATA (2.1.14) 35 ☐ Indoor ☐ Heated ☐ Under roof 36 ☒ Outdoor ☐ Unheated ☐ Partial sides 37 ☐ Grade ☐ Mezzanine ☒ <u>ONSHORE</u> 38 ☐ Winterization required ☐ Tropicalization required 39 Electrical area (2.1.10) Class _____ Grp _____ Div _____ 40 Electrical area (2.1.10) Zone <u>2</u> Grp <u>IIA</u> Temp <u>T1</u> °C 41 Max allow SPL (2.1.6) _____ dB(A) @ _____ m 42 Elevation _____ m Barometer _____ kPa abs 43 Range of ambient temperatures: 44 Dry bulb _____ Wet bulb _____ 45 Normal _____ °C _____ °C 46 Maximum <u>82</u> °C _____ °C 47 Minimum <u>0</u> °C _____ °C 48 Unusual conditions ☐ Dust ☐ Fumes 49 ☐ _____	1/1

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

Job No.	41104	Item No.	B
P.O. No.		Date	
Requisition No.			
Inquiry No.			
Revision	1	Date	06.03.2015 By HNI

■ GEAR DATA				○ COUPLINGS AND GUARDS			
	Pinion	Gear		Pinion	Gear		
Number of teeth	29	173		Coupling furnished by (3.2.1)	Compr. Supplier	Compr. Supplier	
Gear ratio	5,97			Mount coupling halves (3.2.2)	Compr. Supplier	Compr. Supplier	
Tangential load, "Wt" (2.2.4.2)	25.731	N		Cplg. guard adapter by (3.2.3)	Gear Supplier	Gear Supplier	
AGMA Geometry factor "J"	0,52	0,54		Cplg. guard furnished by (3.2.3)	Compr. Supplier	Compr. Supplier	
Pitch diameter	111,98	668,02	mm	Coupling vendor (3.2.3)			
Outside diameter	120,30	673,50	mm	Vendor's model number (3.2.3)			
Root diameter	103,05	656,32	mm	Coupling weight on shaft, kg	10,4	26,4	
Center groove diameter	93,00	640,00	mm	CG Inboard / outboard of shaft end	Outboard	Outboard	
Normal pressure angle	20,00	deg		Hub drill template provided	☐	☐	
Normal diametral pitch	7,26	in ⁻¹		■ SHAFT END DETAIL (2.5.4.2)			
Helix angle	24,25	deg		Shaft end detail specified by: ☒ Purchaser ☐ Gear vendor			
Center distance	390,00	mm		(Integral unless otherwise specified)			
Backlash min	0,28	mm		Shaft end detail if 'otherwise' specified: Pinion Gear			
Net face width, "Fw"	130,00	mm		Tapered / Keyless ☐ ☐ ☐ ☐			
Pinion L/D	1,74			Tapered / 1-Key ☐ ☐ ☐ ☐			
Face overlap ratio	4,86			Tapered / 2-Keys ☐ ☐ ☐ ☐			
Transverse contact ratio	1,45			Cylindrical / 1-Key ☐ ☐ ☐ ☐			
AGMA 6011 service factor	2,87			Cylindrical / 2-Keys ☐ ☐ ☐ ☐			
Rating based on ANSI/AGMA 6011 with SF=1,0				Other ☒ Flanged ☐ ☐ ☐			
Durability Power	5404	kW		Shaft diameter 75,0 120,0 mm			
Strength Power	4652	kW		(If integral flange use diameter immediately adjacent to flange)			
Tooth Surface Finish, Ra	0,4	0,4	µm	■ RADIAL BEARINGS			
Tooth Generation Process	Hobbing	Hobbing					
Tooth Finishing Process	Grinding	Grinding					
Lead modification (2.2.4.6)	☒ Not Req'd	☐ Req'd					
Calculated Total Lead Mismatch		µm					
■ SCUFFING DATA (2.2.6)							
Scuffing Data per ANSI/AGMA 925-A03							
Scuffing Risk (2.2.6) <=5% (Low)	Calculation Method	AGMA925					
Composite surface roughness, ox	0,57	µm					
Specific film thickness, EHL Amin	2,54	µm					
Tooth temperature, 0m	80	°C					
Maximum contact temperature, 0Bmax	93	°C					
■ MATERIALS							
Gear casing	Steel	Oil seals	aluminum				
Pinion(s)	18CrNiMo7-6						
Gear rim(s)	18CrNiMo7-6						
HS Shaft	Integral	LS Shaft	42CrMo4				
Radial bearings	Babbitt	Backing	Steel				
Thrust bearing(s)	Babbitt	Backing	Steel				
○ SHAFT END DETAIL							
☒ Gear shaft end for coupling integral flange (2.5.4.2)							
☒ Pinion shaft end for coupling integral flange (2.5.4.2)							
☒ Other : WITHOUT BOLTS							
				NOTES :			

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

○ LUBRICATION REQUIREMENTS ☐ Oil system furnished by (2.8.3) _____ ☐ Other _____ ☐ Gear vendor _____ ☐ Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6) ☐ ISO Grade _____ Load stage (2.2.6) <u>7,0</u> ■ MESH Mesh and windage power loss <u>2,0</u> kW Oil flow, mesh <u>9,0</u> l/min ■ LUBRICATION REQUIREMENTS Min. startup oil temperature <u>20,0</u> °C Normal oil inlet temperature <u>60,0</u> °C Maximum oil inlet temperature <u>65,0</u> °C Unit oil flow (total) <u>64,0</u> l/min Unit oil pressure <u>2,5</u> bar ☐ Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6) ☐ ISO Grade <u>46</u> Load stage (2.2.6) <u>7,0</u> ■ PIPING CONNECTIONS <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Service</th> <th>No.</th> <th>Size</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Lube oil inlet</td> <td>1</td> <td>1,5 in.</td> <td>ANSI 150 LBS</td> </tr> <tr> <td>Lube oil outlet</td> <td>1</td> <td>6 in.</td> <td>ANSI 150 LBS</td> </tr> <tr> <td>Casing drain *</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Vent</td> <td>1</td> <td>1,5 in.</td> <td>ANSI 150 LBS</td> </tr> <tr> <td>Casing purge</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> * Casing drain is 'dead bottom' housing drain, not lube oil outlet ○ MOUNTING PLATES ☐ Gear furnished with (3.3.1.1) ☐ Baseplate ☐ Soleplate ☐ Subplate(s) (3.3.2.10) ☐ Mounting plates(s) furnished by (3.3.1.1) _____ ☐ Baseplate leveling (3.3.2.3) _____ ☐ Baseplate with leveling pads (3.3.2.3) ☐ Baseplate suitable for column mounting (3.3.2.4) ☐ Vendor review of purchaser's foundation dwgs. (2.1.13) ☐ Grout type (3.3.1.2.4) _____ ○ CONTRACT DATA ☐ Test data prior to shipment _____ ☒ Progress report (5.3.3) _____ ☐ Vendor signoff of inspector checklist (4.1.1.3) ☒ Information retained for 20 years (4.2.1.1) (4.2.2.6.1) ☐ Technical manual (5.3.6.4) ☒ PAINTING (4.4.3.1) ☒ Flender standard RAL5015 (blue) ☒ Painting housing interior not allowed (2.3.1.14) ○ SHIPMENT ☐ Steel rotor storage container (4.4.5) ☐ Shaft covers (4.4.4) <table style="width:100%;"> <tr> <td></td> <td style="text-align: center;">Contract unit</td> <td style="text-align: center;">Spares</td> </tr> <tr> <td>Export boxing</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Domestic boxing</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Outdoor storage over 6 mos.</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">3 years indoor ☐ (4.4.3.9)</td> </tr> </table> <td style="width:50%; vertical-align: top;"> Job No. <u>41104</u> Item No. <u>B</u> P.O. No. _____ Date _____ Requisition No. _____ Inquiry No. _____ Revision <u>1</u> Date <u>08.03.2015</u> By <u>HNI</u> ○ ADDITIONAL REQUIREMENTS ○ VIBRATION DETECTORS RADIAL (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer <u>BENTLY NEVADA</u> ☒ Total No. <u>8</u> ☒ X-Y probes pinion bearings ☒ Coupling end ☒ Blind end ☒ X-Y probes gear bearings ☒ Coupling end ☒ Blind end ☐ Other _____ AXIAL (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer <u>BENTLY NEVADA</u> ☒ Total No. <u>2</u> ☐ Dual probes at each thrust bearing ☐ Single probe any shaft without thrust bearing ☐ Other _____ ONE EVENT PER REVOLUTION PROBE (2.7.4.5) (2.7.4.6) ☒ Manufacturer <u>BENTLY NEVADA</u> Total No. <u>2</u> ☒ One on input shaft ☒ One on output shaft ☐ Other _____ ACCELEROMETER (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer <u>BENTLY NEVADA</u> ☒ No. required <u>2</u> ☒ Pinion coupling end ☒ Gear coupling end ☐ Other _____ ○ TEMPERATURE DETECTORS ☐ Dial type thermometers (3.4.2.7) _____ ☒ Type brg. temp. sensors (3.4.2.7) (2.7.1.3) <u>PT100</u> ☐ RTD ☐ Thermocouple / ☐ Simplex ☒ Duplex Calibration <u>Yes</u> ☒ HSALS bearings no. sensors each <u>2</u> / <u>2</u> ☒ Thrust number of sensing elements each face <u>2</u> ○ OTHER VIBRATION AND TEMPERATURE <table style="width:100%;"> <tr> <td>(3.4.2.5) (3.4.2.6)</td> <td style="text-align: center;">Other</td> <td style="text-align: center;">Gear vendor</td> </tr> <tr> <td>Oscillator demodulator supplied by</td> <td style="text-align: center;">☐</td> <td style="text-align: center;">☒</td> </tr> <tr> <td>Vibration monitor supplied by</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Vibration shutdown delay time _____ seconds</td> <td></td> <td></td> </tr> <tr> <td>Temperature monitor supplied by</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Oscillator demodulator J-box by</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>Temp. sensor termination J-box by</td> <td style="text-align: center;">☒</td> <td style="text-align: center;">☐</td> </tr> <tr> <td>J-box type _____ Mount _____</td> <td></td> <td></td> </tr> </table> ○ MISCELLANEOUS ☒ Undamped critical analysis report (2.6.2.1) ☐ w/ dampd rotr resps analys rpt (2.6.2.4.3) (2.6.2.6) Torsional analysis by (2.6.5.2) ☐ Gear vendor ☒ Other ☒ Spare set of gear rotors (4.3.2.4) ☐ Gear case furnished with inlet purge connection (2.4.3) ☐ Orientation of oil inlet & drain conns. 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SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

Job No. 41104 Item No. B
P.O. No. _____ Date _____
Requisition No. _____
Inquiry No. _____
Revision 1 Date 06.03.2015 By HNI

O INSPECTIONS AND TESTS (4.1)				
☐ Advance notice of witness testing required (4.1.3) Number calendar days _____				
	Req'd	Witness	Observe	Test Log
6	Shop Inspection (4.1.1)	☐	☐	☐
7	Cleanliness Inspection (4.2.3.1)	☐	☐	☐
8	Hardness Verification (4.2.3.3)	☒	☐	☒
9	Dismantle-reassembly (4.3.2.1)	☒	☐	☐
10	Contact Check (2.5.2.2)	☒	☐	☐
11	Contact Check Tape Lift (2.5.2.2)	☒	☐	☒
12	Gear accuracy check (2.5.2.1)	☒	☐	☐
13	Double helical axial stability (2.5.2.3)	☒	☐	☒
14	Special testing integral forged gears (2.5.3.3)			
15	(testing per mutual agreement)	☐	☐	☐
16	Residual unbalance check (2.6.6.2)	☒	☐	☒
17	Mechanical Run Test (Main) (4.3.2)	☒	☐	☒
18	Mechanical Run Test (Spare) (4.3.2.4)	☐	☐	☐
19	Adm. Mechanical Tests (4.3.2.2.16)	☐	☐	☐
20	Part or Full Load And Full Speed			
21	Test (4.3.3.1)	☐	☐	☐
22	Full torque, reduced speed (4.3.3.2)	☐	☐	☐
23	Full Torque Static Test (4.3.3.3)	☐	☐	☐
24	Back-To-Back Locked Torque			
25	Test (4.3.3.4)	☐	☐	☐
26	Sound Level Test (4.3.3.5)	☒	☐	☒
27	Additional gear tooth test (4.2.2.8)	☐	☐	☐
28	Use shop Lube System	☒	☐	☐
29	Use job lube system	☐	☐	☐
30	Use shop Vibration Probes, Etc.	☐	☐	☐
31	Use job Vibration Probes, Etc.	☒	☐	☐
32	Final Assembly, Maintenance &			
33	Running Clearance (4.2.1.1.e)	☒	☐	☒
34	Oil System Cleanliness (4.2.3.2)	☐	☐	☐
35	Oil System-Casing Joint			
36	Tightness (4.3.2.1.4)	☐	☐	☐
37	Warning And Protection			
38	Devices (4.3.2.1.5)	☐	☐	☐
39	Seismic Vibration Data (4.3.2.2.3)	☐	☐	☐
40	Vibration, Phase Plots (4.3.2.2.12)	☒	☐	☒
41	Oil Inlet Range test (4.3.2.2.13)	☐	☐	☐
42	Tape recorded Vibration Data	☒	☐	☒
43	(4.3.2.2.14) (4.3.2.2.15)	☐	Purchaser copy	
44	NON-DESTRUCTIVE TESTING (4.2.1.2) (4.2.2.1)			
	Surface	Sub surface	Log	
46	☐ Casing	☐	☐	☐
47	☒ Rot. Elmts.	☒	☒	☒
48	☒ Bearings	☒	☒	☒
49	☐ Other :	☐	☐	☐
50	(Specify)			

NOTES : _____

During start-up, gears can exhibit a transient spike reading of vibration levels that will exceed shutdown settings. Therefore a trip multiplier is recommended in the control system.

Mechanical running test duration 4 hours including

- Shaft vibration record using job vibration probes if ordered
- Bearings temperature records
- Casing vibration measurement
- Sound level pressure measurement
- Power losses measurement at oil outlet
- Performed with oil ISO VG 32

Oil flow requirement and power losses are calculated values only, add normal safety margins for sizing heat exchangers.

PRELIMINARY MASS ELASTIC DATA

Customer : Siemens AG Duisburg
Destination : Khursaniyah Al Fadhlili
Purchaser order :
F-G job number : D 4110481 OL:
Type and serial N° : TX40/5C

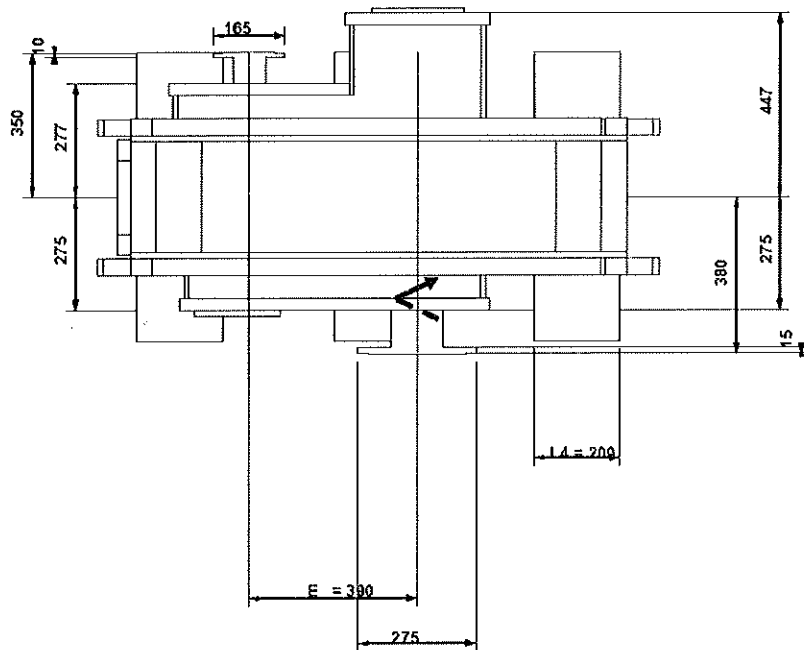
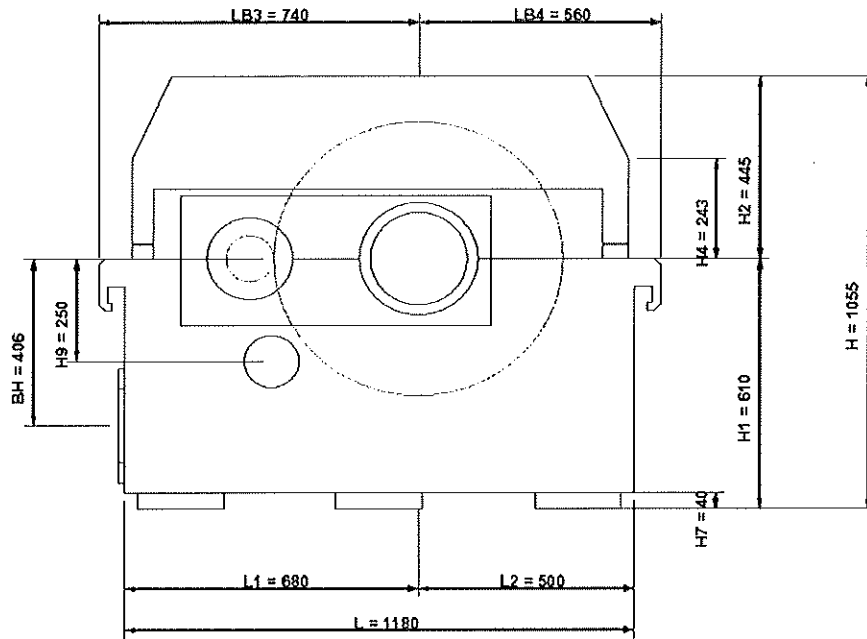
Power rating : 1620 kW
Service factor : $AP1613.03 \times \approx 1,4$
Input speed : 1800 rpm
Output speed : 10737,9 rpm
Speed ratio : 5,96

Weight HSS : 30,5 kg
Weight pos. from teeth middle HSS : 57,5 mm
Inertia HSS : 0,038 Kg.m²
Stiffness HSS : 1,11 MN/mrd
Bearing type 1 : Tilting pads 80 x 56
Bearing type 2 : Tilting pads 80 x 56
Add. weight on brg. side 1 : 10,4 kg

Weight LSS : 574,3 kg
Weight pos. from teeth middle LSS : 9 mm
Inertia LSS : 28,526 Kg.m²
Stiffness LSS : 6,5 MN/mrd
Bearing type 4 : Cylindrical 120 x 60
Bearing type 3 : Cylindrical 120 x 60
Add. weight on brg. side 4 : 26,4 kg

Positive direction of external

APPAREIL.xls _ Edition du :06.03.2015
1/1



ADDITIONAL TECHNICAL DATASHEET				Job No. 41104 Item No. B																																				
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☐ PUMP DETAILS (Dimensioning is preliminary I)			Turning gear																																					
Design : _____ Speed : _____ rpm Oil flow : _____ l/min Oil pressure : _____ bar NPSH : _____ m Safety valve : _____ Driving method : _____ Material : _____ Flanges : _____ Testing : _____ Furniture of ATEX certificate : _____			Type _____ Ratio _____																																					
			Clutch																																					
			Type _____ Max. allowable torque _____ Nm																																					
			Miscellaneous																																					
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Qty 0 Manufacturer _____ Material _____ ATEX None			Identification ☒ wire ☒ conduit ☐ junction box Conduit type _____ Transmitter type _____ Qty _____ Terminal block type _____ Qty _____																																					

Commercial Conditions

- Prices are quoted FCA Illkirch-Graffenstaden following Incoterms 2010 including packing cat 1A of SEI, 1999 issue, ind. 2.
- Progress payments : 100% at delivery.
- This quotation is subjected to the Flender Graffenstaden Standard Terms and Conditions of Sales and valid for acceptance until the 15th of July 2015.
- Where approval of drawings is required, approval must be in line with the document schedule.
- Warranty period is 18 months of operation or 24 months after delivery whichever occurs first. We recommend the supervision of our engineer for the commissioning.
- Flender-Graffenstaden SAS shall not be obligated to fulfill this agreement if such fulfillment is prevented by any impediments arising out of national or international foreign trade or customs requirements or any embargoes or other sanctions.

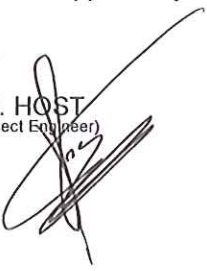
Applicable documents for the quotation (available on demands)

Documents schedule,
Quality plan
Painting standard,
Standard Terms and Conditions of Sales

We thank you for the opportunity of quoting and look forward to the pleasure of serving you.

Very truly yours,

N. HOST
(Project Engineer)



Y. FRIEDMANN
(Sales Manager)



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**** "This quotation is subject to confidentiality. Information thereof may not be shared with or forwarded to any third parties!"**