

## 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 : 16.03.2015

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 kgm<sup>2</sup>
- 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 kgm<sup>2</sup>

## 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: <input checked="" type="radio"/> Proposal <input type="radio"/> Purchase <input type="radio"/> As Built           |                                                                                                                                        | <input type="radio"/> US Standards (1.7) <input checked="" type="radio"/> ISO Standards (1.7)                                                                                                                                                       |
| 2  | For <u>Siemens AG Duisburg</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  | <b>NOTE: Numbers within ( ) refer to applicable API standard 613 paragraphs</b>                                                  |                                                                                                                                        |                                                                                                                                                                                                                                                     |
| 9  | <input type="radio"/> Information To be completed by purchaser <input type="radio"/> Information to be completed by manufacturer |                                                                                                                                        |                                                                                                                                                                                                                                                     |
| 10 | <b>○ UNITS OF MEASUREMENT</b>                                                                                                    |                                                                                                                                        | <b>■ BASIC GEAR DATA</b>                                                                                                                                                                                                                            |
| 11 | <input type="radio"/> US Customary units                                                                                         |                                                                                                                                        | <input checked="" type="radio"/> Single stage <input type="radio"/> Single helical<br><input type="radio"/> Double stage <input checked="" type="radio"/> Double helical<br><input type="radio"/> Epicyclic <input type="radio"/> horizontal offset |
| 12 | <input checked="" type="radio"/> SI units                                                                                        |                                                                                                                                        |                                                                                                                                                                                                                                                     |
| 13 | <b>○ RATING REQUIREMENTS</b>                                                                                                     |                                                                                                                                        |                                                                                                                                                                                                                                                     |
| 14 | Driven equip. (2.1.4): Norm. _____ Max _____ kW                                                                                  | Mechanical rating (1.5.16) <u>9520</u> kW @ <u>1800 / 7309,1</u> rpm                                                                   |                                                                                                                                                                                                                                                     |
| 15 | Driver: Rated _____ Max _____ kW                                                                                                 | Gear service factor (2.2.3.1) <u>1,44</u> API 613/2003 5 TH (actual)                                                                   |                                                                                                                                                                                                                                                     |
| 16 | Normal transmitted power (2.2.2) _____ kW                                                                                        | Full load gear unit power loss <u>66</u> kW                                                                                            |                                                                                                                                                                                                                                                     |
| 17 | Gear unit rated power (2.2.1) <u>6800</u> kW                                                                                     | Gear Unit Mechanical efficiency <u>99,03</u> %                                                                                         |                                                                                                                                                                                                                                                     |
| 18 | Torque @ max cont speed _____ Nm                                                                                                 | Rating speed Pinion <u>7.309,1</u> Gear <u>1.800,0</u> rpm                                                                             |                                                                                                                                                                                                                                                     |
| 19 | Max torque (2.2.1) _____ Nm @ _____ rpm                                                                                          | Hardness used for                                                                                                                      |                                                                                                                                                                                                                                                     |
| 20 | <input type="radio"/> Reducer <input checked="" type="radio"/> Increaser                                                         | Rating, (HB or Rc) Pinion <u>58 HRC</u> Gear <u>58 HRC</u>                                                                             |                                                                                                                                                                                                                                                     |
| 21 | Rated speed (2.1.5):                                                                                                             | Tooth pitting Index, "K" (2.2.4.1) (2.2.4.2)                                                                                           |                                                                                                                                                                                                                                                     |
| 22 | Input <u>1800</u> rpm <input type="radio"/> Specified <input checked="" type="radio"/> Nominal                                   | Allowable <u>2,17</u> Actual <u>2,10</u> MPa                                                                                           |                                                                                                                                                                                                                                                     |
| 23 | Output <u>7285</u> rpm <input type="radio"/> Specified <input checked="" type="radio"/> Nominal                                  | Material index number (Fig 3, Table 4) <u>3,03</u> MPa                                                                                 |                                                                                                                                                                                                                                                     |
| 24 | Allow var in gear ratio (2.1.5) (+) (-) _____ %                                                                                  | Bending stress number, "S <sub>t</sub> " (2.2.5.1) (2.2.5.2)                                                                           |                                                                                                                                                                                                                                                     |
| 25 | Max continuous speed (1.5) <u>1800 / 7285</u> rpm                                                                                | Pinion: Allowable <u>265,4</u> Actual <u>256,0</u> MPa                                                                                 |                                                                                                                                                                                                                                                     |
| 26 | Trip speed (1.5) (2.1.7) <u>1980 / 8013,5</u> rpm                                                                                | Gear: Allowable <u>265,4</u> Actual <u>246,0</u> MPa                                                                                   |                                                                                                                                                                                                                                                     |
| 27 | Gear service factor (2.2.3.1) <u>1,4</u> API 613/2003 5 TH (min)                                                                 | Pitch line velocity <u>77,1</u> m/s                                                                                                    |                                                                                                                                                                                                                                                     |
| 28 | Hardness (2.2.3.2) Pinion _____ Gear _____                                                                                       | Anticipated SPL (2.1.6) <u>82</u> dB(A) @ <u>1</u> m                                                                                   |                                                                                                                                                                                                                                                     |
| 29 | Shaft assembly designation (2.1.19) <u>L/R</u>                                                                                   | WR <sup>2</sup> referred to LS shaft <u>126,12</u> kgm <sup>2</sup>                                                                    |                                                                                                                                                                                                                                                     |
| 30 | HS shaft rot fac'g cpl'g (2.1.20.2) <input checked="" type="checkbox"/> CW <input type="checkbox"/> CCW                          | Breakaway torque <u>412</u> Nm @ LS Shaft                                                                                              |                                                                                                                                                                                                                                                     |
| 31 | LS shaft rot fac'g cpl'g (2.1.20.2) <input checked="" type="checkbox"/> CW <input type="checkbox"/> CCW                          | Pinion teeth hardness range <u>58 - 63 HRC</u>                                                                                         |                                                                                                                                                                                                                                                     |
| 32 | External loads (2.1.16) _____                                                                                                    | Pinion teeth hardening method <u>CARBURIZED</u>                                                                                        |                                                                                                                                                                                                                                                     |
| 33 | Other operating conditions (2.2.2) (2.6.1.3) _____                                                                               | <input type="checkbox"/> HS shaft separate hardness range _____                                                                        |                                                                                                                                                                                                                                                     |
| 34 |                                                                                                                                  | Gear teeth (rim) hardness range <u>58 - 63 HRC</u>                                                                                     |                                                                                                                                                                                                                                                     |
| 35 | <b>○ INSTALLATION DATA (2.1.14)</b>                                                                                              | Gear teeth hardening method <u>CARBURIZED</u>                                                                                          |                                                                                                                                                                                                                                                     |
| 36 | <input type="checkbox"/> Indoor <input type="checkbox"/> Heated <input type="checkbox"/> Under roof                              | Gear hub:                                                                                                                              |                                                                                                                                                                                                                                                     |
| 37 | <input checked="" type="checkbox"/> Outdoor <input type="checkbox"/> Unheated <input type="checkbox"/> Partial slides            | <input checked="" type="checkbox"/> Forged cylinder <input type="checkbox"/> Forged & Copied <input type="checkbox"/> Fabricated       |                                                                                                                                                                                                                                                     |
| 38 | <input type="checkbox"/> Grade <input type="checkbox"/> Mezzanine <input checked="" type="checkbox"/> <b>ONSHORE</b>             | Gear to Shaft fit method (2.5.3.2)                                                                                                     |                                                                                                                                                                                                                                                     |
| 39 | <input type="checkbox"/> Winterization required <input type="checkbox"/> Tropicalization required                                | <input type="checkbox"/> Integral <input type="checkbox"/> Keyed interference <input checked="" type="checkbox"/> Keyless interference |                                                                                                                                                                                                                                                     |
| 40 | Electrical area (2.1.10) Class _____ Grp _____ Div _____                                                                         | Rim attachment (2.5.3.2) <u>FORGED GEAR WHEEL</u>                                                                                      |                                                                                                                                                                                                                                                     |
| 41 | Electrical area (2.1.10) Zone <u>2</u> Grp <u>IIA</u> Temp <u>T1</u> °C                                                          | LS shaft hardness range <u>HB 230 - 274</u>                                                                                            |                                                                                                                                                                                                                                                     |
| 42 | Max allow SPL (2.1.6) _____ dB(A) @ _____ m                                                                                      | Journal static weight loads (2.6.6.3)                                                                                                  |                                                                                                                                                                                                                                                     |
| 43 | Elevation _____ m Barometer _____ kPa abs                                                                                        | Pinion <u>128</u> / <u>42</u> kg Gear <u>842</u> / <u>707</u> kg                                                                       |                                                                                                                                                                                                                                                     |
| 44 | Range of ambient temperatures:                                                                                                   | Total gear unit assembled weight <u>4000</u> kg                                                                                        |                                                                                                                                                                                                                                                     |
| 45 | Dry bulb _____ °C Wet bulb _____ °C                                                                                              | NOTES: _____                                                                                                                           |                                                                                                                                                                                                                                                     |
| 46 | Normal _____ °C _____ °C                                                                                                         |                                                                                                                                        |                                                                                                                                                                                                                                                     |
| 47 | Maximum <u>82</u> °C _____ °C                                                                                                    |                                                                                                                                        |                                                                                                                                                                                                                                                     |
| 48 | Minimum <u>0</u> °C _____ °C                                                                                                     |                                                                                                                                        |                                                                                                                                                                                                                                                     |
| 49 | Unusual conditions <input type="checkbox"/> Dust <input type="checkbox"/> Fumes                                                  |                                                                                                                                        |                                                                                                                                                                                                                                                     |
| 50 | <input type="checkbox"/> _____                                                                                                   |                                                                                                                                        |                                                                                                                                                                                                                                                     |

**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

| ■ 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                                                                                             | <input type="checkbox"/> | <input type="checkbox"/> |  |
| Normal diametral pitch                                                                             | 4,62     | in <sup>-1</sup> | ■ SHAFT END DETAIL (2.5.4.2)                                                                                            |                          |                          |  |
| Helix angle                                                                                        | 25,00    | deg              | Shaft end detail specified by: <input checked="" type="radio"/> Purchaser <input type="radio"/> 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               | Pinion Gear                                                                                                             |                          |                          |  |
| Pinion L/D                                                                                         | 1,71     |                  | Tapered / Keyless <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>               |                          |                          |  |
| Face overlap ratio                                                                                 | 6,36     |                  | Tapered / 1-Key <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>                 |                          |                          |  |
| Transverse contact ratio                                                                           | 1,45     |                  | Tapered / 2-Keys <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>                |                          |                          |  |
| AGMA 6011 service factor                                                                           | 2,64     |                  | Cylindrical / 1-Key <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>             |                          |                          |  |
| Rating based on ANSI/AGMA 6011 with SF=1.0                                                         |          |                  | Cylindrical / 2-Keys <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>            |                          |                          |  |
| Durability Power                                                                                   | 21442    | kW               | Other <u>Flanged</u> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |                          |                          |  |
| Strength Power                                                                                     | 17946    | kW               | Shaft diameter <u>120,0</u> <u>190,0</u> mm                                                                             |                          |                          |  |
| Tooth Surface Finish, Ra                                                                           | 0,4      | µm               | (If integral flange use diameter immediately adjacent to flange)                                                        |                          |                          |  |
| Tooth Generation Process                                                                           | Hobbling |                  | ■ RADIAL BEARINGS                                                                                                       |                          |                          |  |
| Tooth Finishing Process                                                                            | Grinding |                  | Pinion Gear                                                                                                             |                          |                          |  |
| Lead modification (2.2.4.6) <input checked="" type="radio"/> Not Req'd <input type="radio"/> Req'd |          |                  | Type <u>OFFSET / OFFSET</u> <u>CYL. / CYL.</u>                                                                          |                          |                          |  |
| Calculated Total Lead Mismatch                                                                     |          | µm               | Diameter <u>130 / 130</u> <u>200 / 200</u> mm                                                                           |                          |                          |  |
| ■ SCUFFING DATA (2.2.6)                                                                            |          |                  | Length <u>130 / 130</u> <u>100 / 100</u> mm                                                                             |                          |                          |  |
| Scuffing Data per ANSI/AGMA 926-A03                                                                |          |                  | Journal velocity <u>49,8 / 49,8</u> <u>18,8 / 18,8</u> m/s                                                              |                          |                          |  |
| Scuffing Risk (2.2.6) <u>&lt;=5% (Low)</u> Calculation Method <u>AGMA925</u>                       |          |                  | Loading <u>2,78 / 2,81</u> <u>2,87 / 2,71</u> N/mm²                                                                     |                          |                          |  |
| Composite surface roughness, σx                                                                    | 0,57     | µm               | Clearance (min-max)                                                                                                     |                          |                          |  |
| Specific film thickness, EHL λmin                                                                  | 3,31     | µm               | Span <u>550</u> <u>550</u> mm                                                                                           |                          |                          |  |
| Tooth temperature, θm                                                                              | 82       | °C               | Power loss each bearing <u>13,8 / 13,8</u> <u>3,0 / 3,0</u> kW                                                          |                          |                          |  |
| Maximum contact temperature, θBmax                                                                 | 101      | °C               | Oil flow each bearing <u>42,0 / 42,0</u> <u>10,0 / 10,0</u> l/min                                                       |                          |                          |  |
| ■ MATERIALS                                                                                        |          |                  | ■ THRUST BEARINGS                                                                                                       |                          |                          |  |
| Gear casing <u>Steel</u> Oil seals <u>aluminium</u>                                                |          |                  | Location <u>FLENDER</u> <u>FLENDER</u>                                                                                  |                          |                          |  |
| Pinion(s) <u>18CrNiMo7-6</u>                                                                       |          |                  | Manufacturer <u>FLENDER</u> <u>FLENDER</u>                                                                              |                          |                          |  |
| Gear rim(s) <u>18CrNiMo7-6</u>                                                                     |          |                  | Type <u>NO</u> <u>COMB.TAP.LANDS</u>                                                                                    |                          |                          |  |
| HS Shaft <u>Integral</u> LS Shaft <u>42CrMo4</u>                                                   |          |                  | Size <u>BPK LEG 6"</u>                                                                                                  |                          |                          |  |
| Radial bearings <u>Babbitt</u> Backing <u>Steel</u>                                                |          |                  | Area <u>11615</u> mm²                                                                                                   |                          |                          |  |
| Thrust bearing(s) <u>Babbitt</u> Backing <u>Steel</u>                                              |          |                  | Loading <u>1,14</u> MPa                                                                                                 |                          |                          |  |
| ○ SHAFT END DETAIL                                                                                 |          |                  | Rating <u>1,50</u> MPa                                                                                                  |                          |                          |  |
| <input checked="" type="checkbox"/> Gear shaft end for coupling integral flange (2.5.4.2)          |          |                  | Int. thrust load                                                                                                        |                          |                          |  |
| <input checked="" type="checkbox"/> Pinion shaft end for coupling integral flange (2.5.4.2)        |          |                  | Ext. thrust load <u>4.050</u> <u>9.200</u> N                                                                            |                          |                          |  |
| <input checked="" type="checkbox"/> Other : <u>WITHOUT BOLTS</u>                                   |          |                  | Power loss each <u>0,0</u> <u>6,0</u> kW                                                                                |                          |                          |  |
|                                                                                                    |          |                  | Oil flow each bearing <u>0,0</u> <u>20,0</u> l/min                                                                      |                          |                          |  |
|                                                                                                    |          |                  | NOTES : _____                                                                                                           |                          |                          |  |

**SPECIAL PURPOSE GEAR UNITS**  
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**DATA SHEET SI UNITS**

| <div style="border: 1px solid black; padding: 5px;"> <p><b>○ LUBRICATION REQUIREMENTS</b></p> <p><input type="checkbox"/> Oil system furnished by (2.8.3) _____</p> <p><input type="checkbox"/> Other _____ <input type="checkbox"/> Gear vendor _____</p> <p><input type="checkbox"/> Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6)</p> <p><input type="checkbox"/> ISO Grade _____ Load stage (2.2.6) <b>5,0</b></p> <hr/> <p style="text-align: center;"><b>■ MESH</b></p> <p>Mesh and windage power loss <b>26,4</b> kW</p> <p>Oil flow, mesh <b>40,0</b> l/min</p> <hr/> <p style="text-align: center;"><b>■ LUBRICATION REQUIREMENTS</b></p> <p>Min. startup oil temperature <b>20,0</b> °C</p> <p>Normal oil inlet temperature <b>60,0</b> °C</p> <p>Maximum oil inlet temperature <b>65,0</b> °C</p> <p>Unit oil flow (total) <b>164,0</b> l/min</p> <p>Unit oil pressure <b>2,5</b> bar</p> <p><input type="checkbox"/> Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6)</p> <p><input type="checkbox"/> ISO Grade <b>46</b> Load stage (2.2.6) <b>5,0</b></p> <hr/> <p style="text-align: center;"><b>■ PIPING CONNECTIONS</b></p> <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> <p>* Casing drain is 'dead bottom' housing drain, not lube oil outlet</p> <hr/> <p style="text-align: center;"><b>○ MOUNTING PLATES</b></p> <p><input type="checkbox"/> Gear furnished with (3.3.1.1)</p> <p><input type="checkbox"/> Baseplate <input type="checkbox"/> Soleplate <input type="checkbox"/> Subplate(s) (3.3.2.10)</p> <p><input type="checkbox"/> Mounting plates(s) furnished by (3.3.1.1) _____</p> <p><input type="checkbox"/> Baseplate leveling (3.3.2.3) _____</p> <p><input type="checkbox"/> Baseplate with leveling pads (3.3.2.3)</p> <p><input type="checkbox"/> Baseplate suitable for column mounting (3.3.2.4)</p> <p><input type="checkbox"/> Vendor review of purchaser's foundation dwgs. (2.1.13)</p> <p><input type="checkbox"/> Grout type (3.3.1.2.4) _____</p> <hr/> <p style="text-align: center;"><b>○ CONTRACT DATA</b></p> <p><input type="checkbox"/> Test data prior to shipment _____</p> <p><input checked="" type="checkbox"/> Progress report (5.3.3) _____</p> <p><input type="checkbox"/> Vendor signoff of inspector checklist (4.1.1.3)</p> <p><input checked="" type="checkbox"/> Information retained for 20 years (4.2.1.1) (4.2.2.6.1)</p> <p><input type="checkbox"/> Technical manual (5.3.5.4)</p> <p><input checked="" type="checkbox"/> PAINTING (4.4.3.1) <input checked="" type="checkbox"/> <b>Flender standard RAL5015 (blue)</b></p> <p><input checked="" type="checkbox"/> Painting housing interior not allowed (2.3.1.14)</p> <hr/> <p style="text-align: center;"><b>○ SHIPMENT</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Contract unit</th> <th>Spares</th> </tr> </thead> <tbody> <tr> <td>Export boxing</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Domestic boxing</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Outdoor storage over 6 mos.</td> <td><input type="checkbox"/></td> <td>3 years indoor <input type="checkbox"/> (4.4.3.9)</td> </tr> </tbody> </table> </div> | 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 |  |  |  |  | Contract unit | Spares | Export boxing | <input type="checkbox"/> | <input type="checkbox"/> | Domestic boxing | <input type="checkbox"/> | <input type="checkbox"/> | Outdoor storage over 6 mos. | <input type="checkbox"/> | 3 years indoor <input type="checkbox"/> (4.4.3.9) | <div style="border: 1px solid black; padding: 5px;"> <p>Job No. <b>41104</b> Item No. <b>A</b></p> <p>P.O. No. _____ Date _____</p> <p>Requisition No. _____</p> <p>Inquiry No. _____</p> <p>Revision <b>1</b> Date <b>06.03.2015</b> By <b>HNI</b></p> <hr/> <p style="text-align: center;"><b>○ ADDITIONAL REQUIREMENTS</b></p> <hr/> <p style="text-align: center;"><b>○ VIBRATION DETECTORS</b></p> <p><b>RADIAL</b> (3.4.2.1) (2.7.4.5) (2.7.4.6)</p> <p><input checked="" type="checkbox"/> Manufacturer <b>BENTLY NEVADA</b> <input checked="" type="checkbox"/> Total No. <b>8</b></p> <p><input checked="" type="checkbox"/> X-Y probes pinion bearings <input checked="" type="checkbox"/> Coupling end <input checked="" type="checkbox"/> Blind end</p> <p><input checked="" type="checkbox"/> X-Y probes gear bearings <input checked="" type="checkbox"/> Coupling end <input checked="" type="checkbox"/> Blind end</p> <p><input type="checkbox"/> Other _____</p> <p><b>AXIAL</b> (3.4.2.1) (2.7.4.5) (2.7.4.6)</p> <p><input checked="" type="checkbox"/> Manufacturer <b>BENTLY NEVADA</b> <input checked="" type="checkbox"/> Total No. <b>2</b></p> <p><input type="checkbox"/> Dual probes at each thrust bearing</p> <p><input type="checkbox"/> Single probe any shaft without thrust bearing</p> <p><input type="checkbox"/> Other _____</p> <p><b>ONE EVENT PER REVOLUTION PROBE</b> (2.7.4.5) (2.7.4.6)</p> <p><input checked="" type="checkbox"/> Manufacturer <b>BENTLY NEVADA</b> Total No. <b>2</b></p> <p><input checked="" type="checkbox"/> One on input shaft <input checked="" type="checkbox"/> One on output shaft</p> <p><input type="checkbox"/> Other _____</p> <p><b>ACCELEROMETER</b> (3.4.2.1) (2.7.4.5) (2.7.4.6)</p> <p><input checked="" type="checkbox"/> Manufacturer <b>BENTLY NEVADA</b> <input checked="" type="checkbox"/> No. required <b>2</b></p> <p><input checked="" type="checkbox"/> Pinion coupling end <input checked="" type="checkbox"/> Gear coupling end</p> <p><input type="checkbox"/> Other _____</p> <hr/> <p style="text-align: center;"><b>○ TEMPERATURE DETECTORS</b></p> <p><input type="checkbox"/> Dial type thermometers (3.4.2.7) _____</p> <p><input checked="" type="checkbox"/> Type brg. temp. sensors (3.4.2.7) (2.7.1.3) <b>PT100</b></p> <p><input type="checkbox"/> RTD <input type="checkbox"/> Thermocouple <input type="checkbox"/> Simplex <input checked="" type="checkbox"/> Duplex</p> <p>Calibration <b>Yes</b></p> <p><input checked="" type="checkbox"/> HSLS bearings no. sensors each <b>2</b> / <b>2</b></p> <p><input checked="" type="checkbox"/> Thrust number of sensing elements each face <b>2</b></p> <hr/> <p style="text-align: center;"><b>○ OTHER VIBRATION AND TEMPERATURE</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>(3.4.2.5) (3.4.2.6)</th> <th>Other</th> <th>Gear vendor</th> </tr> </thead> <tbody> <tr> <td>Oscillator demodulator supplied by</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Vibration monitor supplied by</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Vibration shutdown delay time _____ seconds</td> <td></td> <td></td> </tr> <tr> <td>Temperature monitor supplied by</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Oscillator demodulator J-box by</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Temp. sensor termination J-box by</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>J-box type _____ Mount _____</td> <td></td> <td></td> </tr> </tbody> </table> <hr/> <p style="text-align: center;"><b>○ MISCELLANEOUS</b></p> <p><input checked="" type="checkbox"/> Undamped critical analysis report (2.6.2.1)</p> <p><input type="checkbox"/> w/ dampd rtr resps analys rpt (2.6.2.4.3) (2.6.2.6)</p> <p>Torsional analysis by (2.6.5.2) <input type="checkbox"/> Gear vendor <input checked="" type="checkbox"/> Other</p> <p><input type="checkbox"/> Spare set of gear rotors (4.3.2.4)</p> <p><input type="checkbox"/> Gear case furnished with inlet purge connection (2.4.3)</p> <p><input type="checkbox"/> Orientation of oil inlet &amp; drain conns. (2.4.6) _____</p> <p><input checked="" type="checkbox"/> Filter breather location (2.3.1.12) <b>Prov. on upper casing</b></p> <p><input type="checkbox"/> Torsional device provisions (2.5.4.5) _____</p> <p><input type="checkbox"/> Rotor vertical storage provisions (2.5.4.8) _____</p> <p><input type="checkbox"/> Rotor vertical storage fixture(s) (3.6.2) _____</p> <p><input type="checkbox"/> Vendor service rep. on site (2.1.13)</p> </div> | (3.4.2.5) (3.4.2.6) | Other | Gear vendor | Oscillator demodulator supplied by | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Vibration monitor supplied by | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Vibration shutdown delay time _____ seconds |  |  | Temperature monitor supplied by | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Oscillator demodulator J-box by | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Temp. sensor termination J-box by | <input checked="" type="checkbox"/> | <input type="checkbox"/> | J-box type _____ Mount _____ |  |  |
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| Lube oil inlet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Lube oil outlet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Casing drain *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Casing purge                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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| Export boxing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| Domestic boxing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Outdoor storage over 6 mos.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <input type="checkbox"/>            | 3 years indoor <input type="checkbox"/> (4.4.3.9) |              |      |                |   |       |              |                 |   |       |              |                |  |  |  |      |   |         |              |              |  |  |  |  |               |        |    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| (3.4.2.5) (3.4.2.6)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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| Oscillator demodulator supplied by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| Vibration monitor supplied by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| Vibration shutdown delay time _____ seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| Temperature monitor supplied by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Oscillator demodulator J-box by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Temp. sensor termination J-box by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| J-box type _____ Mount _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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**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

| O INSPECTIONS AND TESTS (4.1)                                                                             |                                                 |                                     |                          |                                     |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------|--------------------------|-------------------------------------|
| <input type="checkbox"/> Advance notice of witness testing required (4.1.3)<br>Number calendar days _____ |                                                 |                                     |                          |                                     |
|                                                                                                           | Req'd                                           | Witness                             | Observe                  | Test Log                            |
| 6                                                                                                         | Shop Inspection (4.1.1)                         | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 7                                                                                                         | Cleanliness Inspection (4.2.3.1)                | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 8                                                                                                         | Hardness Verification (4.2.3.3)                 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 9                                                                                                         | Dismantle/reassembly (4.3.2.3.1)                | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 10                                                                                                        | Contact Check (2.5.2.2)                         | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 11                                                                                                        | Contact Check Tape Lift (2.5.2.2)               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 12                                                                                                        | Gear accuracy check (2.5.2.1)                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 13                                                                                                        | Double helical axial stability (2.5.2.3)        | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 14                                                                                                        | Special testing Integral forged gears (2.5.3.3) |                                     |                          |                                     |
| 15                                                                                                        | (testing per mutual agreement)                  | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 16                                                                                                        | Residual unbalance check (2.6.6.2)              | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 17                                                                                                        | Mechanical Run Test (Main) (4.3.2)              | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 18                                                                                                        | Mechanical Run Test (Spare) (4.3.2.4)           | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 19                                                                                                        | Addtl. Mechanical Tests (4.3.2.2.16)            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 20                                                                                                        | Part or Full Load And Full Speed                |                                     |                          |                                     |
| 21                                                                                                        | Test (4.3.3.1)                                  | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 22                                                                                                        | Full torque, reduced speed (4.3.3.2)            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 23                                                                                                        | Full Torque Static Test (4.3.3.3)               | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 24                                                                                                        | Back-To-Back Locked Torque                      |                                     |                          |                                     |
| 25                                                                                                        | Test (4.3.3.4)                                  | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 26                                                                                                        | Sound Level Test (4.3.3.5)                      | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 27                                                                                                        | Additional gear tooth test (4.2.2.8)            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 28                                                                                                        | Use shop Lube System                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 29                                                                                                        | Use Job lube system                             | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 30                                                                                                        | Use shop Vibration Probes, Etc.                 | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 31                                                                                                        | Use Job Vibration Probes, Etc.                  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 32                                                                                                        | Final Assembly, Maintenance &                   |                                     |                          |                                     |
| 33                                                                                                        | Running Clearance (4.2.1.1.e)                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 34                                                                                                        | Oil System Cleanliness (4.2.3.2)                | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 35                                                                                                        | Oil System-Casing Joint                         |                                     |                          |                                     |
| 36                                                                                                        | Tightness (4.3.2.1.4)                           | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 37                                                                                                        | Warning And Protection                          |                                     |                          |                                     |
| 38                                                                                                        | Devices (4.3.2.1.5)                             | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 39                                                                                                        | Seismic Vibration Data (4.3.2.2.3)              | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 40                                                                                                        | Vibration, Phase Plots (4.3.2.2.12)             | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 41                                                                                                        | Oil Inlet Range test (4.3.2.2.13)               | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 42                                                                                                        | Tape recorded Vibration Data                    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 43                                                                                                        | (4.3.2.2.14) (4.3.2.2.15)                       | <input type="checkbox"/>            | Purchaser copy           |                                     |
| 44                                                                                                        | NON-DESTRUCTIVE TESTING (4.2.1.2) (4.2.2.1)     |                                     |                          |                                     |
| 45                                                                                                        | Surface                                         | Sub surface                         | Log                      |                                     |
| 46                                                                                                        | <input type="checkbox"/> Casing                 | <input type="checkbox"/>            |                          | <input type="checkbox"/>            |
| 47                                                                                                        | <input checked="" type="checkbox"/> Rot. Elmts. | <input checked="" type="checkbox"/> |                          | <input checked="" type="checkbox"/> |
| 48                                                                                                        | <input checked="" type="checkbox"/> Bearings    | <input checked="" type="checkbox"/> |                          | <input checked="" type="checkbox"/> |
| 49                                                                                                        | <input type="checkbox"/> Other :                | <input type="checkbox"/>            |                          | <input type="checkbox"/>            |
| 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

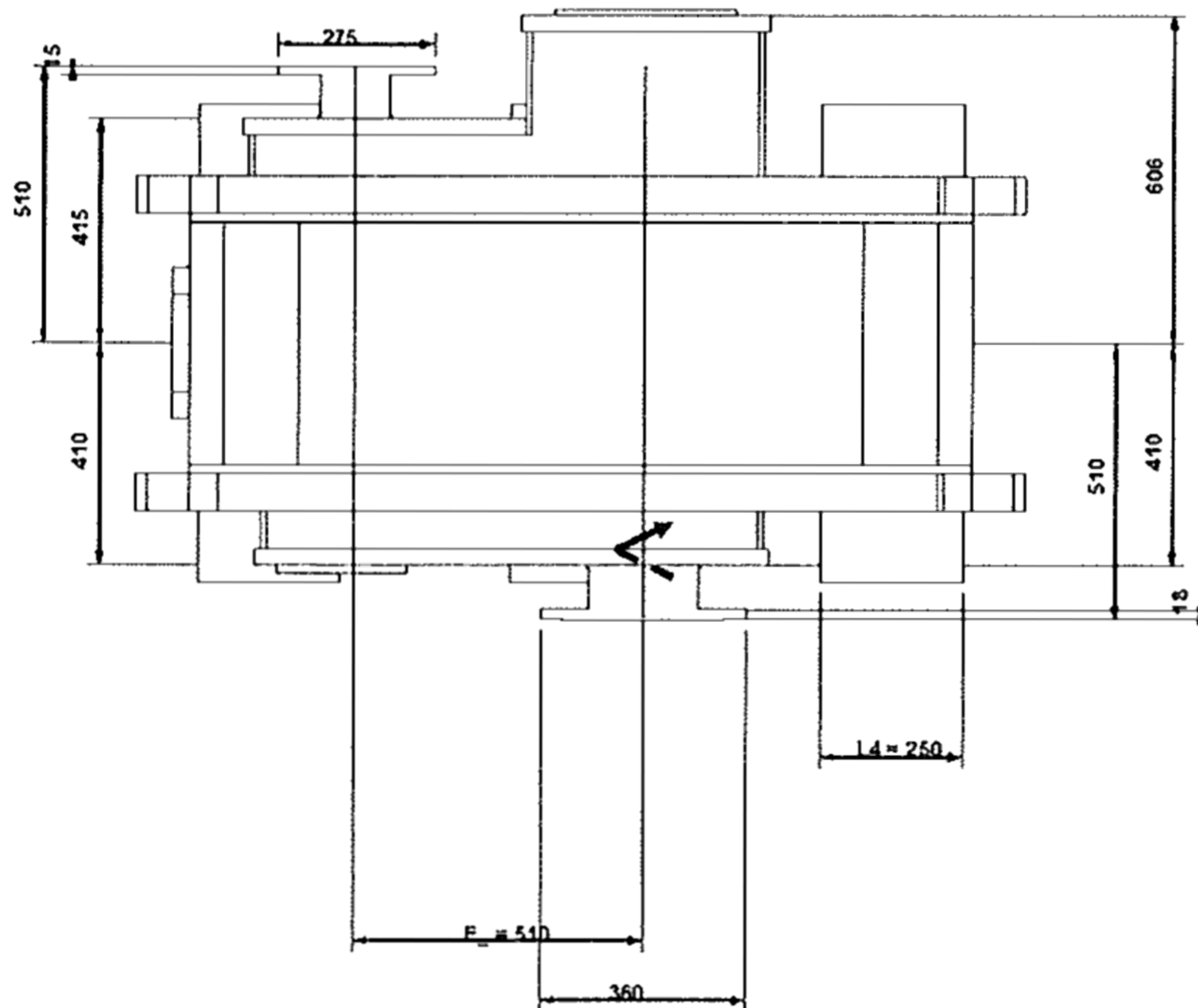
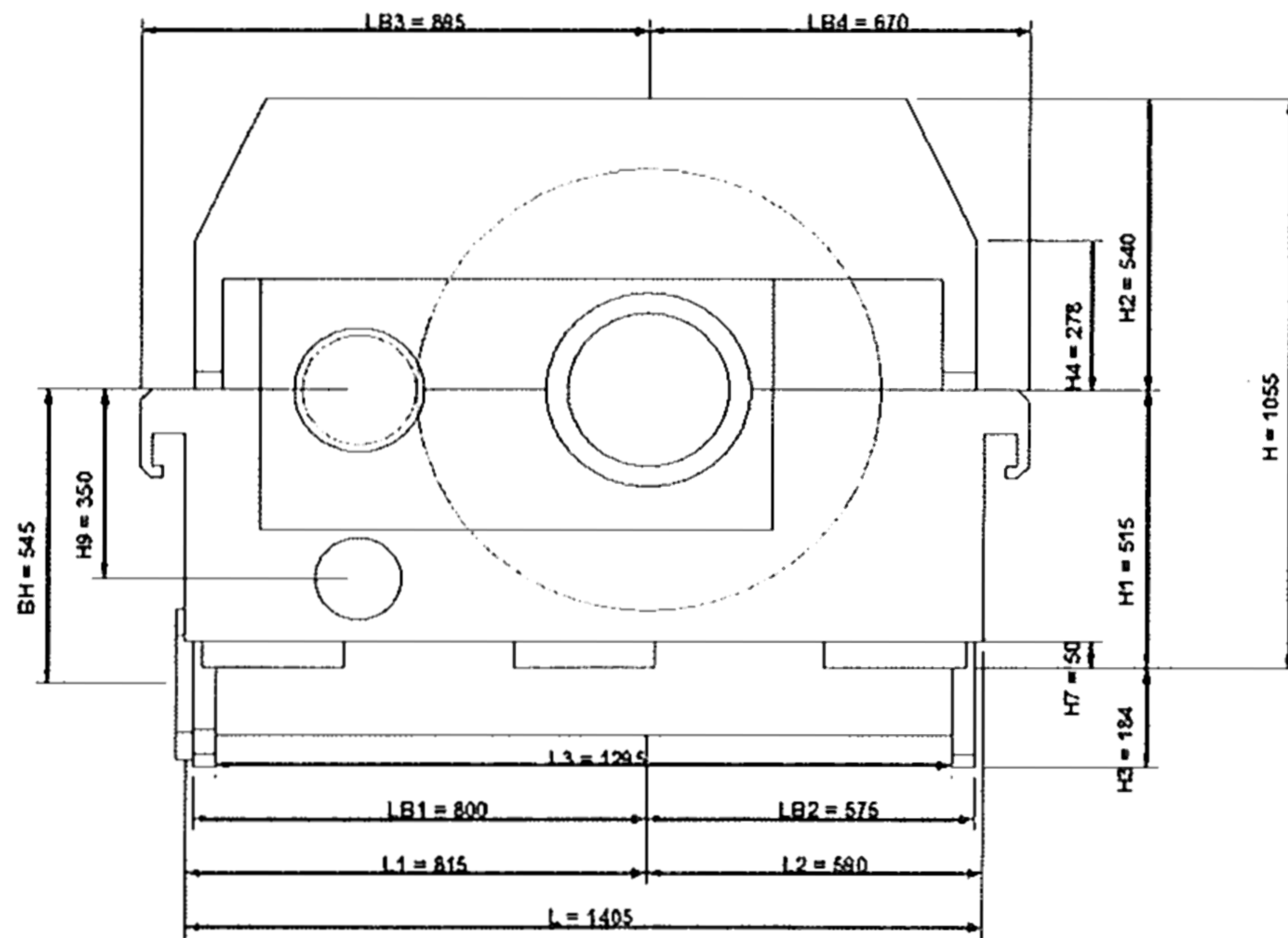
- Shaft vibration record using Job vibration probes if ordered
- Bearings temperature records
- Casing vibration measurement
- Sound level pressure measurement
- Power losses measurement at oil outlet
- Performed with oil ISO VG 32

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



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| ADDITIONAL TECHNICAL DATASHEET                                               |  |                         |  | Job No. <u>41104</u> Item No. <u>A</u><br>P.O. No. _____ Date _____<br>Requisition No. _____<br>Inquiry No. _____<br>Revision <u>1</u> Date <u>06.03.2016</u> By <u>HNI</u> |  |                                                                                                                            |  |
|------------------------------------------------------------------------------|--|-------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------|--|
| <input checked="" type="checkbox"/> <b>ADDITIONAL GEAR DATA</b>              |  |                         |  | <input type="checkbox"/> <b>TURNING GEAR (Dimensioning is preliminary !)</b>                                                                                                |  |                                                                                                                            |  |
| <b>Efficiency</b>                                                            |  |                         |  | <b>Calculation results</b>                                                                                                                                                  |  |                                                                                                                            |  |
| Percent of rated power                                                       |  | Efficiency              |  | Required turning speed                                                                                                                                                      |  | rpm                                                                                                                        |  |
| 100%                                                                         |  | 99,03                   |  | Actual turning speed                                                                                                                                                        |  | rpm                                                                                                                        |  |
| 75%                                                                          |  | 98,92                   |  | Required breakaway torque                                                                                                                                                   |  | Nm                                                                                                                         |  |
| 50%                                                                          |  | 98,79                   |  | Actual breakaway torque                                                                                                                                                     |  | Nm                                                                                                                         |  |
| 25%                                                                          |  | 98,08                   |  | Actual maximum torque                                                                                                                                                       |  | Nm                                                                                                                         |  |
| 10%                                                                          |  | 90,80                   |  | Actual acceleration time                                                                                                                                                    |  | s                                                                                                                          |  |
| <b>Losses</b>                                                                |  |                         |  | <b>Motor</b>                                                                                                                                                                |  |                                                                                                                            |  |
| Power loss at no load                                                        |  | kW                      |  | Supplier                                                                                                                                                                    |  | _____                                                                                                                      |  |
| Heat rejection                                                               |  | kcal/h                  |  | Power                                                                                                                                                                       |  | kW                                                                                                                         |  |
|                                                                              |  |                         |  | Voltage                                                                                                                                                                     |  | V                                                                                                                          |  |
|                                                                              |  |                         |  | Frequency                                                                                                                                                                   |  | Hz                                                                                                                         |  |
| <input type="checkbox"/> <b>PUMP DETAILS (Dimensioning is preliminary !)</b> |  |                         |  | Speed                                                                                                                                                                       |  | rpm                                                                                                                        |  |
| Design : _____                                                               |  |                         |  | Electric standard                                                                                                                                                           |  | _____                                                                                                                      |  |
| Speed :                                                                      |  | rpm                     |  | <b>Turning gear</b>                                                                                                                                                         |  |                                                                                                                            |  |
| Oil flow :                                                                   |  | l/min                   |  | Type                                                                                                                                                                        |  | _____                                                                                                                      |  |
| Oil pressure :                                                               |  | bar                     |  | Ratio                                                                                                                                                                       |  | _____                                                                                                                      |  |
| NPSH :                                                                       |  | m                       |  | <b>Clutch</b>                                                                                                                                                               |  |                                                                                                                            |  |
| Safety valve :                                                               |  | _____                   |  | Type                                                                                                                                                                        |  | _____                                                                                                                      |  |
| Driving method :                                                             |  | _____                   |  | Max. allowable torque                                                                                                                                                       |  | Nm                                                                                                                         |  |
| Material :                                                                   |  | _____                   |  | <b>Miscellaneous</b>                                                                                                                                                        |  |                                                                                                                            |  |
| Flanges :                                                                    |  | _____                   |  | Starting device                                                                                                                                                             |  | _____                                                                                                                      |  |
| Testing :                                                                    |  | _____                   |  | Switch details                                                                                                                                                              |  | _____                                                                                                                      |  |
| Furniture of ATEX certificate :                                              |  | _____                   |  |                                                                                                                                                                             |  |                                                                                                                            |  |
| <input checked="" type="checkbox"/> <b>INSTRUMENTATION PACKAGE</b>           |  |                         |  |                                                                                                                                                                             |  |                                                                                                                            |  |
| <b>Thermometer</b>                                                           |  |                         |  | <b>Thermoelements</b>                                                                                                                                                       |  |                                                                                                                            |  |
|                                                                              |  | Bearing                 |  | Bearing                                                                                                                                                                     |  | Thrust bearing                                                                                                             |  |
|                                                                              |  | Thrust bearing          |  | Oil inlet/outlet                                                                                                                                                            |  | Oil inlet/outlet                                                                                                           |  |
| Qty                                                                          |  |                         |  | Type                                                                                                                                                                        |  | DUPLIX 2x3F                                                                                                                |  |
| Type                                                                         |  |                         |  | Classification                                                                                                                                                              |  | IEC60751                                                                                                                   |  |
|                                                                              |  |                         |  | Removable from the outside                                                                                                                                                  |  | NO                                                                                                                         |  |
|                                                                              |  |                         |  | ATEX                                                                                                                                                                        |  | ATEX Exia                                                                                                                  |  |
|                                                                              |  |                         |  |                                                                                                                                                                             |  | ATEX Exia                                                                                                                  |  |
| <b>Shaft vibrations</b>                                                      |  |                         |  |                                                                                                                                                                             |  |                                                                                                                            |  |
|                                                                              |  | Radial                  |  | Axial                                                                                                                                                                       |  | Keyphasor                                                                                                                  |  |
| Type                                                                         |  | B N. 3300 XL 8mm Sys 9M |  | HS                                                                                                                                                                          |  | No                                                                                                                         |  |
|                                                                              |  |                         |  | LS                                                                                                                                                                          |  | BENTLY NEVADA 3300 XL 8mm Sys 9M                                                                                           |  |
| Probe                                                                        |  | Yes                     |  | HS                                                                                                                                                                          |  | No                                                                                                                         |  |
|                                                                              |  |                         |  | LS                                                                                                                                                                          |  | Yes                                                                                                                        |  |
| Proximitor                                                                   |  | Yes                     |  | HS                                                                                                                                                                          |  | No                                                                                                                         |  |
|                                                                              |  |                         |  | LS                                                                                                                                                                          |  | Yes                                                                                                                        |  |
| Probe holder                                                                 |  | Yes                     |  | HS                                                                                                                                                                          |  | No                                                                                                                         |  |
|                                                                              |  |                         |  | LS                                                                                                                                                                          |  | Yes                                                                                                                        |  |
| Connection head                                                              |  | Yes                     |  | HS                                                                                                                                                                          |  | No                                                                                                                         |  |
|                                                                              |  |                         |  | LS                                                                                                                                                                          |  | Yes                                                                                                                        |  |
| mounting kit                                                                 |  |                         |  |                                                                                                                                                                             |  | Yes                                                                                                                        |  |
| <b>Junction box(es)</b>                                                      |  |                         |  | <b>Miscellaneous</b>                                                                                                                                                        |  |                                                                                                                            |  |
| Qty                                                                          |  | 0                       |  | Identification                                                                                                                                                              |  | <input checked="" type="checkbox"/> wire <input checked="" type="checkbox"/> conduit <input type="checkbox"/> junction box |  |
| Manufacturer                                                                 |  | _____                   |  | Conduit type                                                                                                                                                                |  | _____                                                                                                                      |  |
| Material                                                                     |  | _____                   |  | Transmitter type                                                                                                                                                            |  | Qty _____                                                                                                                  |  |
| ATEX                                                                         |  | None                    |  | Terminal block type                                                                                                                                                         |  | Qty _____                                                                                                                  |  |

# FLENDER GRAFFENSTADEN

FLENDER-GRAFFENSTADEN S.A., FRANCE  
BP 84, F-67402 ILLKIRCH-CEDEX  
1, rue du Vieux Moulin  
F-67400 ILLKIRCH-GRAFFENSTADEN

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 kgm<sup>2</sup>
- 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 kgm<sup>2</sup>

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

|    |                                                                                                                        |                                                                                                                                                                                                                                                     |
|----|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Applicable To: <input checked="" type="radio"/> Proposal <input type="radio"/> Purchase <input type="radio"/> As Built | <input type="radio"/> US Standards (1.7) <input checked="" type="radio"/> ISO Standards (1.7)                                                                                                                                                       |
| 2  | For <u>Siemens AG Duisburg</u>                                                                                         | Manufacturer <u>FLENDER-GRAFFENSTADEN</u>                                                                                                                                                                                                           |
| 3  | Site <u>Khursaniyah Al Fadhlili</u>                                                                                    | Model No. <u>TX40/5C</u>                                                                                                                                                                                                                            |
| 4  | Unit <u>STC-SV 06-3-A</u>                                                                                              | Serial No. _____                                                                                                                                                                                                                                    |
| 5  | Service <u>EMCC</u>                                                                                                    | Driver type <u>electric motor</u>                                                                                                                                                                                                                   |
| 6  | No. required <u>1</u>                                                                                                  | Driven equipment <u>centrifugal compressor</u>                                                                                                                                                                                                      |
| 7  |                                                                                                                        |                                                                                                                                                                                                                                                     |
| 8  | <b>NOTE: Numbers within ( ) refer to applicable API standard 613 paragraphs</b>                                        |                                                                                                                                                                                                                                                     |
| 9  | <input type="radio"/> Information To be completed by purchaser                                                         | <input type="radio"/> Information to be completed by manufacturer                                                                                                                                                                                   |
| 10 | <b><input type="radio"/> UNITS OF MEASUREMENT</b>                                                                      | <b><input checked="" type="radio"/> BASIC GEAR DATA</b>                                                                                                                                                                                             |
| 11 | <input type="radio"/> US Customary units                                                                               | <input checked="" type="radio"/> Single stage <input type="radio"/> Single helical<br><input type="radio"/> Double stage <input checked="" type="radio"/> Double helical<br><input type="radio"/> Epicyclic <input type="radio"/> horizontal offset |
| 12 | <input checked="" type="radio"/> SI units                                                                              |                                                                                                                                                                                                                                                     |
| 13 | <b><input type="radio"/> RATING REQUIREMENTS</b>                                                                       |                                                                                                                                                                                                                                                     |
| 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 | <input type="radio"/> Reducer <input checked="" type="radio"/> Increaser                                               |                                                                                                                                                                                                                                                     |
| 21 | Rated speed (2.1.5):                                                                                                   | Mechanical rating (1.5.16) <u>2268</u> kW @ <u>1800 / 10737.9</u> rpm                                                                                                                                                                               |
| 22 | Input <u>1800</u> rpm <input type="radio"/> Specified <input checked="" type="radio"/> Nominal                         | Gear service factor (2.2.3.1) <u>1.46</u> API 613/2003 5 TH (actual)                                                                                                                                                                                |
| 23 | Output <u>10736</u> rpm <input type="radio"/> Specified <input checked="" type="radio"/> Nominal                       | Full load gear unit power loss <u>21</u> kW                                                                                                                                                                                                         |
| 24 | Allow var in gear ratio (2.1.5) (+) (-) _____ %                                                                        | Gear Unit Mechanical efficiency <u>98.70</u> %                                                                                                                                                                                                      |
| 25 | Max continuous speed (1.5) <u>1800 / 10736</u> rpm                                                                     | Rating speed Pinion <u>10737.9</u> Gear <u>1800.0</u> rpm                                                                                                                                                                                           |
| 26 | Trip speed (1.5) (2.1.7) <u>1980 / 11809.6</u> rpm                                                                     | Hardness used for                                                                                                                                                                                                                                   |
| 27 | Gear service factor (2.2.3.1) <u>1.4</u> API 613/2003 5 TH (min)                                                       | Rating, (HB or Rc) Pinion <u>58 HRC</u> Gear <u>58 HRC</u>                                                                                                                                                                                          |
| 28 | Hardness (2.2.3.2) Pinion _____ Gear _____                                                                             | Tooth pitting index, "K" (2.2.4.1) (2.2.4.2)                                                                                                                                                                                                        |
| 29 | Shaft assembly designation (2.1.19) <u>L/R</u>                                                                         | Allowable <u>2.17</u> Actual <u>2.06</u> MPa                                                                                                                                                                                                        |
| 30 | HS shaft rot fac'g opt'g (2.1.20.2) <input checked="" type="checkbox"/> CW <input type="checkbox"/> CCW                | Material index number (Fig 3, Table 4) <u>3.03</u> MPa                                                                                                                                                                                              |
| 31 | LS shaft rot fac'g opt'g (2.1.20.2) <input checked="" type="checkbox"/> CW <input type="checkbox"/> CCW                | Bending stress number, "S <sub>t</sub> " (2.2.5.1) (2.2.5.2)                                                                                                                                                                                        |
| 32 | External loads (2.1.16) _____                                                                                          | Pinion: Allowable <u>265.4</u> Actual <u>251.0</u> MPa                                                                                                                                                                                              |
| 33 | Other operating conditions (2.2.2) (2.6.1.3) _____                                                                     | Gear: Allowable <u>265.4</u> Actual <u>238.8</u> MPa                                                                                                                                                                                                |
| 34 |                                                                                                                        | Pitch line velocity <u>63.0</u> m/s                                                                                                                                                                                                                 |
| 35 | <b><input type="radio"/> INSTALLATION DATA (2.1.14)</b>                                                                | Anticipated SPL (2.1.6) <u>82</u> dB(A) @ <u>1</u> m                                                                                                                                                                                                |
| 36 | <input type="checkbox"/> Indoor <input type="checkbox"/> Heated <input type="checkbox"/> Under roof                    | WR <sup>2</sup> referred to LS shaft <u>29.88</u> kgm <sup>2</sup>                                                                                                                                                                                  |
| 37 | <input checked="" type="checkbox"/> Outdoor <input type="checkbox"/> Unheated <input type="checkbox"/> Partial sides   | Breakaway torque <u>90</u> Nm @ LS Shaft                                                                                                                                                                                                            |
| 38 | <input type="checkbox"/> Grade <input type="checkbox"/> Mezzanine <input checked="" type="checkbox"/> <b>ONSHORE</b>   | Pinion teeth hardness range <u>58 - 63 HRC</u>                                                                                                                                                                                                      |
| 39 | <input type="checkbox"/> Winterization required <input type="checkbox"/> Tropicalization required                      | Pinion teeth hardening method <u>CARBURIZED</u>                                                                                                                                                                                                     |
| 40 | Electrical area (2.1.10) Class _____ Grp _____ Div _____                                                               | <input type="checkbox"/> HS shaft separate hardness range _____                                                                                                                                                                                     |
| 41 | Electrical area (2.1.10) Zone <u>2</u> Grp <u>IIA</u> Temp <u>T1</u> °C                                                | Gear teeth (rim) hardness range <u>58 - 63 HRC</u>                                                                                                                                                                                                  |
| 42 | Max allow SPL (2.1.6) _____ dB(A) @ _____ m                                                                            | Gear teeth hardening method <u>CARBURIZED</u>                                                                                                                                                                                                       |
| 43 | Elevation _____ m Barometer _____ kPa abs                                                                              | Gear hub:                                                                                                                                                                                                                                           |
| 44 | Range of ambient temperatures:                                                                                         | <input checked="" type="checkbox"/> Forged cylinder <input type="checkbox"/> Forged & Capped <input type="checkbox"/> Fabricated                                                                                                                    |
| 45 | Dry bulb _____ °C Wet bulb _____ °C                                                                                    | Gear to Shaft fit method (2.5.3.2)                                                                                                                                                                                                                  |
| 46 | Normal _____ °C _____ °C                                                                                               | <input type="checkbox"/> Integral <input type="checkbox"/> Keyed interference <input checked="" type="checkbox"/> Keyless interference                                                                                                              |
| 47 | Maximum <u>82</u> °C _____ °C                                                                                          | Rim attachment (2.5.3.2) <u>FORGED GEAR WHEEL</u>                                                                                                                                                                                                   |
| 48 | Minimum <u>0</u> °C _____ °C                                                                                           | LS shaft hardness range <u>HB 230 - 274</u>                                                                                                                                                                                                         |
| 49 | Unusual conditions <input type="checkbox"/> Dust <input type="checkbox"/> Fumes                                        | Journal static weight loads (2.6.6.3)                                                                                                                                                                                                               |
| 50 | <input type="checkbox"/>                                                                                               | 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: _____                                                                                                                                                                                                                                        |
|    |                                                                                                                        | _____                                                                                                                                                                                                                                               |
|    |                                                                                                                        | _____                                                                                                                                                                                                                                               |

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| ■ 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           | Coupling vendor (3.2.3)                                                                                          |                          |                          |  |
| Outside diameter                                                                                   | 120,30   | 673,50           | Vendor's model number (3.2.3)                                                                                    |                          |                          |  |
| Root diameter                                                                                      | 103,05   | 656,32           | Coupling weight on shaft, kg                                                                                     | 10,4                     | 26,4                     |  |
| Center groove diameter                                                                             | 93,00    | 640,00           | CG Inboard / outboard of shaft end                                                                               | Outboard                 | Outboard                 |  |
| Normal pressure angle                                                                              | 20,00    | deg              | Hub drill template provided                                                                                      | <input type="checkbox"/> | <input type="checkbox"/> |  |
| Normal diametral pitch                                                                             | 7,26     | in <sup>-1</sup> | ■ SHAFT END DETAIL (2.5.4.2)                                                                                     |                          |                          |  |
| Helix angle                                                                                        | 24,25    | deg              | Shaft end detail specified by: <input checked="" type="radio"/> Purchaser <input type="radio"/> Gear vendor      |                          |                          |  |
| Center distance                                                                                    | 390,00   | mm               | (Integral unless otherwise specified)                                                                            |                          |                          |  |
| Backlash min                                                                                       | 0,28     | mm               | Shaft end detail if 'otherwise' specified:                                                                       |                          |                          |  |
| Net face width, *Fw*                                                                               | 130,00   | mm               | Pinion Gear                                                                                                      |                          |                          |  |
| Pinion L/D                                                                                         | 1,74     |                  | Tapered / Keyless <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>        |                          |                          |  |
| Face overlap ratio                                                                                 | 4,86     |                  | Tapered / 1-Key <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>          |                          |                          |  |
| Transverse contact ratio                                                                           | 1,45     |                  | Tapered / 2-Keys <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>         |                          |                          |  |
| AGMA 6011 service factor                                                                           | 2,87     |                  | Cylindrical / 1-Key <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>      |                          |                          |  |
| Rating based on ANSI/AGMA 6011 with SF=1.0                                                         |          |                  | Cylindrical / 2-Keys <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>     |                          |                          |  |
| Durability Power                                                                                   | 5404     | kW               | Other <input checked="" type="radio"/> Flanged <input type="radio"/> <input type="radio"/> <input type="radio"/> |                          |                          |  |
| Strength Power                                                                                     | 4652     | kW               | Shaft diameter 75,0 120,0 mm                                                                                     |                          |                          |  |
| Tooth Surface Finish, Ra                                                                           | 0,4      | µm               | (If integral flange use diameter immediately adjacent to flange)                                                 |                          |                          |  |
| Tooth Generation Process                                                                           | Hobbing  |                  | ■ RADIAL BEARINGS                                                                                                |                          |                          |  |
| Tooth Finishing Process                                                                            | Grinding |                  | Pinion Gear                                                                                                      |                          |                          |  |
| Lead modification (2.2.4.6) <input checked="" type="radio"/> Not Req'd <input type="radio"/> Req'd |          |                  | Type T.PADS / T.PADS CYL. / CYL.                                                                                 |                          |                          |  |
| Calculated Total Lead Mismatch                                                                     |          | µm               | Diameter 80 / 80 120 / 120 mm                                                                                    |                          |                          |  |
| ■ SCUFFING DATA (2.2.6)                                                                            |          |                  | Length 56 / 56 60 / 60 mm                                                                                        |                          |                          |  |
| Scuffing Data per ANSI/AGMA 925-A03                                                                |          |                  | Journal velocity 45,0 / 45,0 11,3 / 11,3 m/s                                                                     |                          |                          |  |
| Scuffing Risk (2.2.6) <=5% (Low) Calculation Method AGMA925                                        |          |                  | Loading 3,08 / 3,10 2,52 / 2,26 N/mm²                                                                            |                          |                          |  |
| Composite surface roughness, ox                                                                    | 0,57     | µm               | Clearance (min-max)                                                                                              |                          |                          |  |
| Specific film thickness, EHL Amin                                                                  | 2,54     | µm               | Span 340 340 mm                                                                                                  |                          |                          |  |
| Tooth temperature, θm                                                                              | 80       | °C               | Power loss each bearing 6,3 / 6,3 0,7 / 0,7 kW                                                                   |                          |                          |  |
| Maximum contact temperature, θBmax                                                                 | 93       | °C               | Oil flow each bearing 15,0 / 15,0 5,0 / 5,0 l/min                                                                |                          |                          |  |
| ■ MATERIALS                                                                                        |          |                  | ■ THRUST BEARINGS                                                                                                |                          |                          |  |
| Gear casing Steel Oil seals aluminium                                                              |          |                  | Location                                                                                                         |                          |                          |  |
| Pinion(s) 18CrNiMo7-6                                                                              |          |                  | Manufacturer FLENDER FLENDER                                                                                     |                          |                          |  |
| Gear rim(s) 18CrNiMo7-6                                                                            |          |                  | Type NO COMB.TAP.LANDS                                                                                           |                          |                          |  |
| HS Shaft Integral LS Shaft 42CrMo4                                                                 |          |                  | Size BPK LEG 4"                                                                                                  |                          |                          |  |
| Radial bearings Babbit Backing Steel                                                               |          |                  | Area 5160 mm²                                                                                                    |                          |                          |  |
| Thrust bearing(s) Babbit Backing Steel                                                             |          |                  | Loading 1,35 MPa                                                                                                 |                          |                          |  |
| ○ SHAFT END DETAIL                                                                                 |          |                  | Rating 1,50 MPa                                                                                                  |                          |                          |  |
| <input checked="" type="checkbox"/> Gear shaft end for coupling integral flange (2.5.4.2)          |          |                  | Int. thrust load N                                                                                               |                          |                          |  |
| <input checked="" type="checkbox"/> Pinion shaft end for coupling integral flange (2.5.4.2)        |          |                  | Ext. thrust load 2.700 4.250 N                                                                                   |                          |                          |  |
| <input checked="" type="checkbox"/> Other : WITHOUT BOLTS                                          |          |                  | Power loss each 0,0 5,0 kW                                                                                       |                          |                          |  |
|                                                                                                    |          |                  | Oil flow each bearing 0,0 15,0 l/min                                                                             |                          |                          |  |
|                                                                                                    |          |                  | NOTES :                                                                                                          |                          |                          |  |

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**API 613 FIFTH EDITION**  
**DATA SHEET SI UNITS**

| <div style="border: 1px solid black; padding: 5px;"> <p><b>○ LUBRICATION REQUIREMENTS</b></p> <p><input type="checkbox"/> Oil system furnished by (2.8.3) _____</p> <p><input type="checkbox"/> Other _____ <input type="checkbox"/> Gear vendor _____</p> <p><input type="checkbox"/> Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6)</p> <p><input type="checkbox"/> ISO Grade _____ Load stage (2.2.6) <u>7,0</u></p> <p><b>■ MESH</b></p> <p>Mesh and windage power loss <u>2,0</u> kW</p> <p>Oil flow, mesh <u>9,0</u> l/min</p> <p><b>■ LUBRICATION REQUIREMENTS</b></p> <p>Min. startup oil temperature <u>20,0</u> °C</p> <p>Normal oil inlet temperature <u>60,0</u> °C</p> <p>Maximum oil inlet temperature <u>65,0</u> °C</p> <p>Unit oil flow (total) <u>64,0</u> l/min</p> <p>Unit oil pressure <u>2,5</u> bar</p> <p><input type="checkbox"/> Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6)</p> <p><input type="checkbox"/> ISO Grade <u>46</u> Load stage (2.2.6) <u>7,0</u></p> <p><b>■ PIPING CONNECTIONS</b></p> <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> <p>* Casing drain is 'dead bottom' housing drain, not lube oil outlet</p> <p><b>○ MOUNTING PLATES</b></p> <p><input type="checkbox"/> Gear furnished with (3.3.1.1)</p> <p><input type="checkbox"/> Baseplate <input type="checkbox"/> Soleplate <input type="checkbox"/> Subplate(s) (3.3.2.10)</p> <p><input type="checkbox"/> Mounting plates(s) furnished by (3.3.1.1) _____</p> <p><input type="checkbox"/> Baseplate leveling (3.3.2.3) _____</p> <p><input type="checkbox"/> Baseplate with leveling pads (3.3.2.3)</p> <p><input type="checkbox"/> Baseplate suitable for column mounting (3.3.2.4)</p> <p><input type="checkbox"/> Vendor review of purchaser's foundation dwgs. (2.1.13)</p> <p><input type="checkbox"/> Grout type (3.3.1.2.4) _____</p> <p><b>○ CONTRACT DATA</b></p> <p><input type="checkbox"/> Test data prior to shipment _____</p> <p><input checked="" type="checkbox"/> Progress report (5.3.3) _____</p> <p><input type="checkbox"/> Vendor signoff of inspector checklist (4.1.1.3)</p> <p><input checked="" type="checkbox"/> Information retained for 20 years (4.2.1.1) (4.2.2.6.1)</p> <p><input type="checkbox"/> Technical manual (5.3.5.4)</p> <p><input checked="" type="checkbox"/> PAINTING (4.4.3.1) <input checked="" type="checkbox"/> Flender standard RAL5015 (blue)</p> <p><input checked="" type="checkbox"/> Painting housing interior not allowed (2.3.1.14)</p> <p><b>○ SHIPMENT</b></p> <p><input type="checkbox"/> Steel rotor storage container (4.4.5) <input type="checkbox"/> Shaft covers (4.4.4)</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Contract unit</th> <th>Spares</th> </tr> </thead> <tbody> <tr> <td>Export boxing</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Domestic boxing</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Outdoor storage over 6 mos.</td> <td><input type="checkbox"/></td> <td>3 years indoor <input type="checkbox"/> (4.4.3.9)</td> </tr> </tbody> </table> </div> | Service                  | No.                                               | Size         | Type | Lube oil inlet | 1 | 1,5 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 |  |  |  |  | Contract unit | Spares | Export boxing | <input type="checkbox"/> | <input type="checkbox"/> | Domestic boxing | <input type="checkbox"/> | <input type="checkbox"/> | Outdoor storage over 6 mos. | <input type="checkbox"/> | 3 years indoor <input type="checkbox"/> (4.4.3.9) | <div style="border: 1px solid black; padding: 5px;"> <p>Job No. <u>41104</u> Item No. <u>B</u></p> <p>P.O. No. _____ Date _____</p> <p>Requisition No. _____</p> <p>Inquiry No. _____</p> <p>Revision <u>1</u> Date <u>06.03.2015</u> By <u>HNI</u></p> <p><b>○ ADDITIONAL REQUIREMENTS</b></p> <p><b>○ VIBRATION DETECTORS</b></p> <p><b>RADIAL</b> (3.4.2.1) (2.7.4.5) (2.7.4.6)</p> <p><input checked="" type="checkbox"/> Manufacturer <u>BENTLY NEVADA</u> <input checked="" type="checkbox"/> Total No. <u>8</u></p> <p><input checked="" type="checkbox"/> X-Y probes pinion bearings <input checked="" type="checkbox"/> Coupling end <input checked="" type="checkbox"/> Blind end</p> <p><input checked="" type="checkbox"/> X-Y probes gear bearings <input checked="" type="checkbox"/> Coupling end <input checked="" type="checkbox"/> Blind end</p> <p><input type="checkbox"/> Other _____</p> <p><b>AXIAL</b> (3.4.2.1) (2.7.4.5) (2.7.4.6)</p> <p><input checked="" type="checkbox"/> Manufacturer <u>BENTLY NEVADA</u> <input checked="" type="checkbox"/> Total No. <u>2</u></p> <p><input type="checkbox"/> Dual probes at each thrust bearing</p> <p><input type="checkbox"/> Single probe any shaft without thrust bearing</p> <p><input type="checkbox"/> Other _____</p> <p><b>ONE EVENT PER REVOLUTION PROBE</b> (2.7.4.5) (2.7.4.6)</p> <p><input checked="" type="checkbox"/> Manufacturer <u>BENTLY NEVADA</u> Total No. <u>2</u></p> <p><input checked="" type="checkbox"/> One on input shaft <input checked="" type="checkbox"/> One on output shaft</p> <p><input type="checkbox"/> Other _____</p> <p><b>ACCELEROMETER</b> (3.4.2.1) (2.7.4.5) (2.7.4.6)</p> <p><input checked="" type="checkbox"/> Manufacturer <u>BENTLY NEVADA</u> <input checked="" type="checkbox"/> No. required <u>2</u></p> <p><input checked="" type="checkbox"/> Pinion coupling end <input checked="" type="checkbox"/> Gear coupling end</p> <p><input type="checkbox"/> Other _____</p> <p><b>○ TEMPERATURE DETECTORS</b></p> <p><input type="checkbox"/> Dial type thermometers (3.4.2.7) _____</p> <p><input checked="" type="checkbox"/> Type brg. temp. sensors (3.4.2.7) (2.7.1.3) <u>PT100</u></p> <p><input type="checkbox"/> RTD <input type="checkbox"/> Thermocouple / <input type="checkbox"/> Simplex <input checked="" type="checkbox"/> Duplex</p> <p>Calibration <u>Yes</u></p> <p><input checked="" type="checkbox"/> HSAS bearings no. sensors each <u>2</u> / <u>2</u></p> <p><input checked="" type="checkbox"/> Thrust number of sensing elements each face <u>2</u></p> <p><b>○ OTHER VIBRATION AND TEMPERATURE</b></p> <p>(3.4.2.5) (3.4.2.6) Other Gear vendor</p> <p>Oscillator demodulator supplied by <input type="checkbox"/> <input checked="" type="checkbox"/></p> <p>Vibration monitor supplied by <input checked="" type="checkbox"/> <input type="checkbox"/></p> <p><input type="checkbox"/> Vibration shutdown delay time _____ seconds</p> <p>Temperature monitor supplied by <input checked="" type="checkbox"/> <input type="checkbox"/></p> <p>Oscillator demodulator J-box by <input checked="" type="checkbox"/> <input type="checkbox"/></p> <p>Temp. sensor termination J-box by <input checked="" type="checkbox"/> <input type="checkbox"/></p> <p>J-box type _____ Mount _____</p> <p><b>○ MISCELLANEOUS</b></p> <p><input checked="" type="checkbox"/> Undamped critical analysis report (2.6.2.1)</p> <p><input type="checkbox"/> w/ dampd rotr respsn analys rpt (2.6.2.4.3) (2.6.2.6)</p> <p>Torsional analysis by (2.6.5.2) <input type="checkbox"/> Gear vendor <input checked="" type="checkbox"/> Other</p> <p><input checked="" type="checkbox"/> Spare set of gear rotors (4.3.2.4)</p> <p><input type="checkbox"/> Gear case furnished with inlet purge connection (2.4.3)</p> <p><input type="checkbox"/> Orientation of oil inlet &amp; drain conns. (2.4.6)</p> <p><input checked="" type="checkbox"/> Filter breather location (2.3.1.12) <u>Prev. on upper casing</u></p> <p><input type="checkbox"/> Torsional device provisions (2.5.4.5)</p> <p><input type="checkbox"/> Rotor vertical storage provisions (2.5.4.8)</p> <p><input type="checkbox"/> Rotor vertical storage fixture(s) (3.6.2)</p> <p><input type="checkbox"/> Vendor service rep. on site (2.1.13)</p> </div> |
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| Lube oil inlet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Lube oil outlet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Casing drain *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Export boxing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| Domestic boxing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| Outdoor storage over 6 mos.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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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)                                               |                                     |                                     |                          |                                     |
|-----------------------------------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|-------------------------------------|
|                                                                             | Req'd                               | Witness                             | Observe                  | Test Log                            |
| <input type="checkbox"/> Advance notice of witness testing required (4.1.3) |                                     |                                     |                          |                                     |
| Number calendar days _____                                                  |                                     |                                     |                          |                                     |
| Shop Inspection (4.1.1)                                                     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Cleanliness Inspection (4.2.3.3)                                            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Hardness Verification (4.2.3.3)                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Dismantle-reassembly (4.3.2.3.1)                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Contact Check (2.5.2.2)                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Contact Check Tape Lift (2.5.2.2)                                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Gear accuracy check (2.5.2.1)                                               | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Double helical axial stability (2.5.2.3)                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Special testing integral forged gears (2.5.3.3)                             |                                     |                                     |                          |                                     |
| (testing per mutual agreement)                                              | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Residual unbalance check (2.6.6.2)                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Mechanical Run Test (Main) (4.3.2)                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Mechanical Run Test (Spare) (4.3.2.4)                                       | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Addl. Mechanical Tests (4.3.2.2.16)                                         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Part or Full Load And Full Speed                                            |                                     |                                     |                          |                                     |
| Test (4.3.3.1)                                                              | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Full torque, reduced speed (4.3.3.2)                                        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Full Torque Static Test (4.3.3.3)                                           | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Back-To-Back Locked Torque                                                  |                                     |                                     |                          |                                     |
| Test (4.3.3.4)                                                              | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Sound Level Test (4.3.3.5)                                                  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Additional gear tooth test (4.2.2.8)                                        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Use shop Lube System                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Use job lube system                                                         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Use shop Vibration Probes, Etc.                                             | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Use job Vibration Probes, Etc.                                              | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Final Assembly, Maintenance &                                               |                                     |                                     |                          |                                     |
| Running Clearance (4.2.1.1.e)                                               | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Oil System Cleanliness (4.2.3.2)                                            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Oil System-Casing Joint                                                     |                                     |                                     |                          |                                     |
| Tightness (4.3.2.1.4)                                                       | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Warning And Protection                                                      |                                     |                                     |                          |                                     |
| Devices (4.3.2.1.5)                                                         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> |                                     |
| Seismic Vibration Data (4.3.2.2.3)                                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Vibration, Phase Plots (4.3.2.2.12)                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Oil Inlet Range test (4.3.2.2.13)                                           | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| Tape recorded Vibration Data                                                | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| (4.3.2.2.14) (4.3.2.2.15)                                                   | <input type="checkbox"/>            | Purchaser copy                      |                          |                                     |
| NON-DESTRUCTIVE TESTING (4.2.1.2) (4.2.2.1)                                 |                                     |                                     |                          |                                     |
|                                                                             | Surface                             | Sub surface                         |                          | Log                                 |
| <input type="checkbox"/> Casing                                             | <input type="checkbox"/>            | <input type="checkbox"/>            |                          | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> Rot. Elmts.                             | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                          | <input checked="" type="checkbox"/> |
| <input checked="" type="checkbox"/> Bearings                                | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                          | <input checked="" type="checkbox"/> |
| <input type="checkbox"/> Other :                                            | <input type="checkbox"/>            | <input type="checkbox"/>            |                          | <input type="checkbox"/>            |
| (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 Fadhlil  
Purchaser order :  
F-G job number : D 4110481 OL  
Type and serial N° : TX40/SC

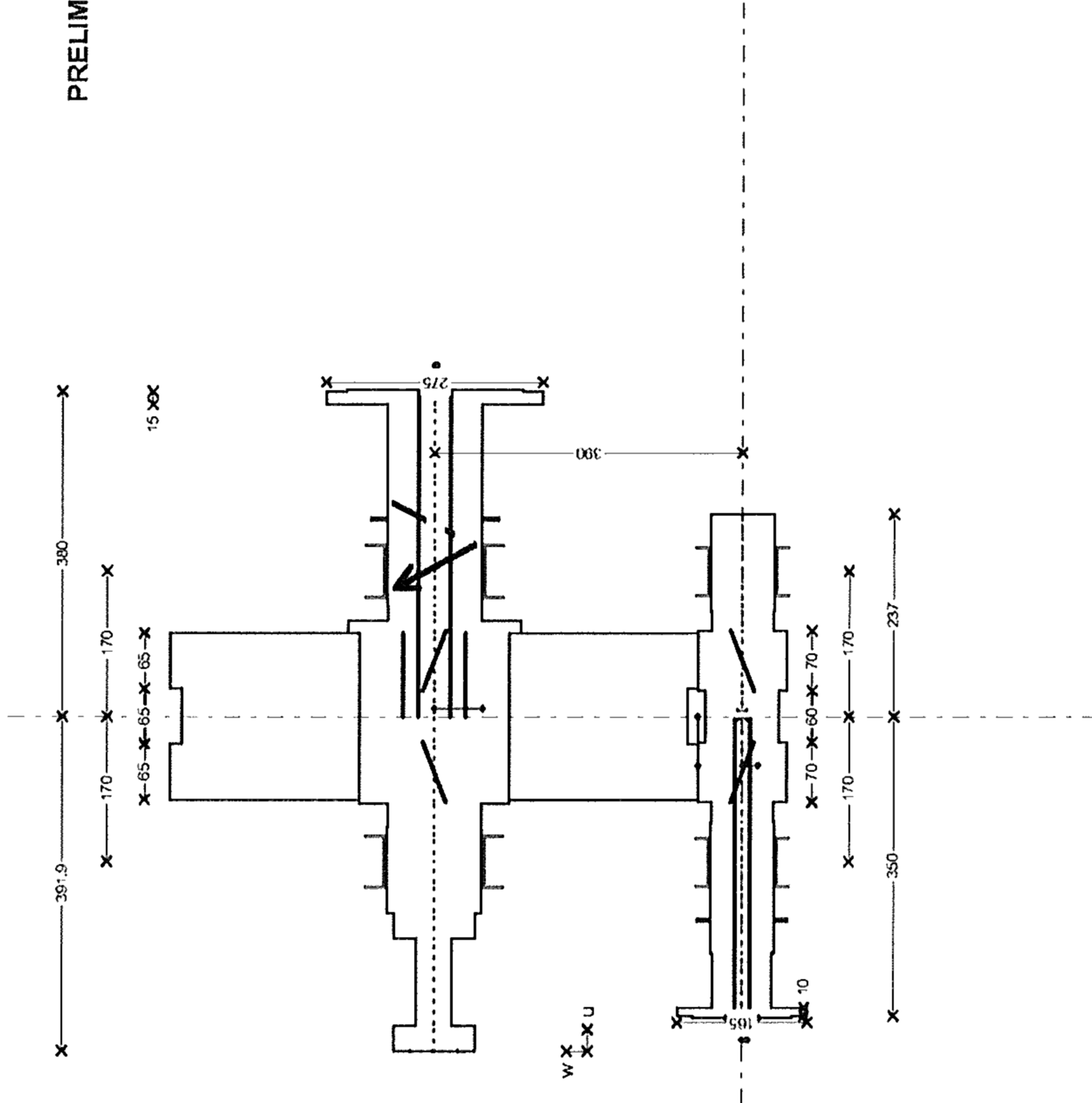
Power rating : 1620 kW  
Service factor :  $AP1613.03 \geq 1.4$   
Input speed : 1800 rpm  
Output speed : 10737.9 rpm  
Speed ratio : 5.96

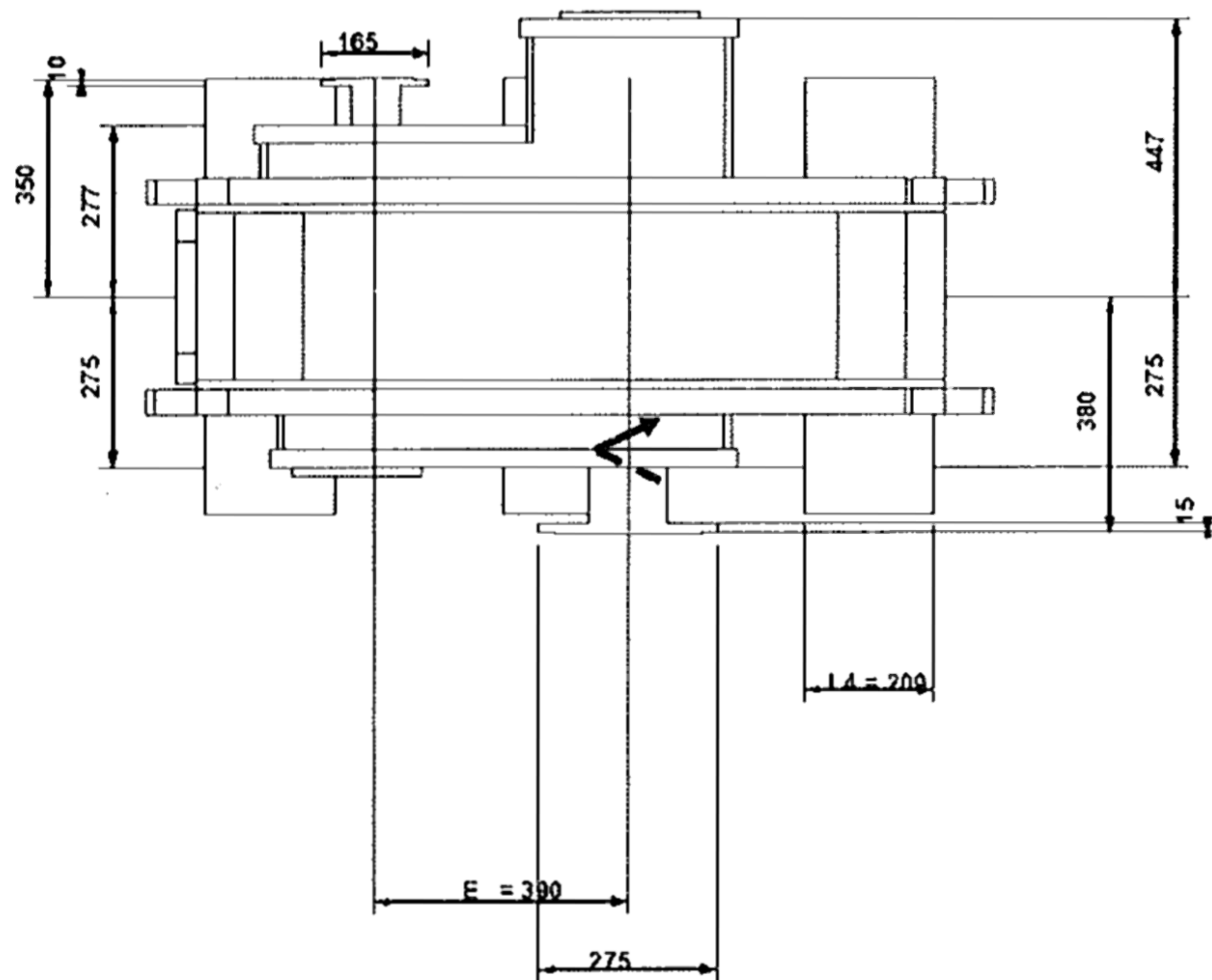
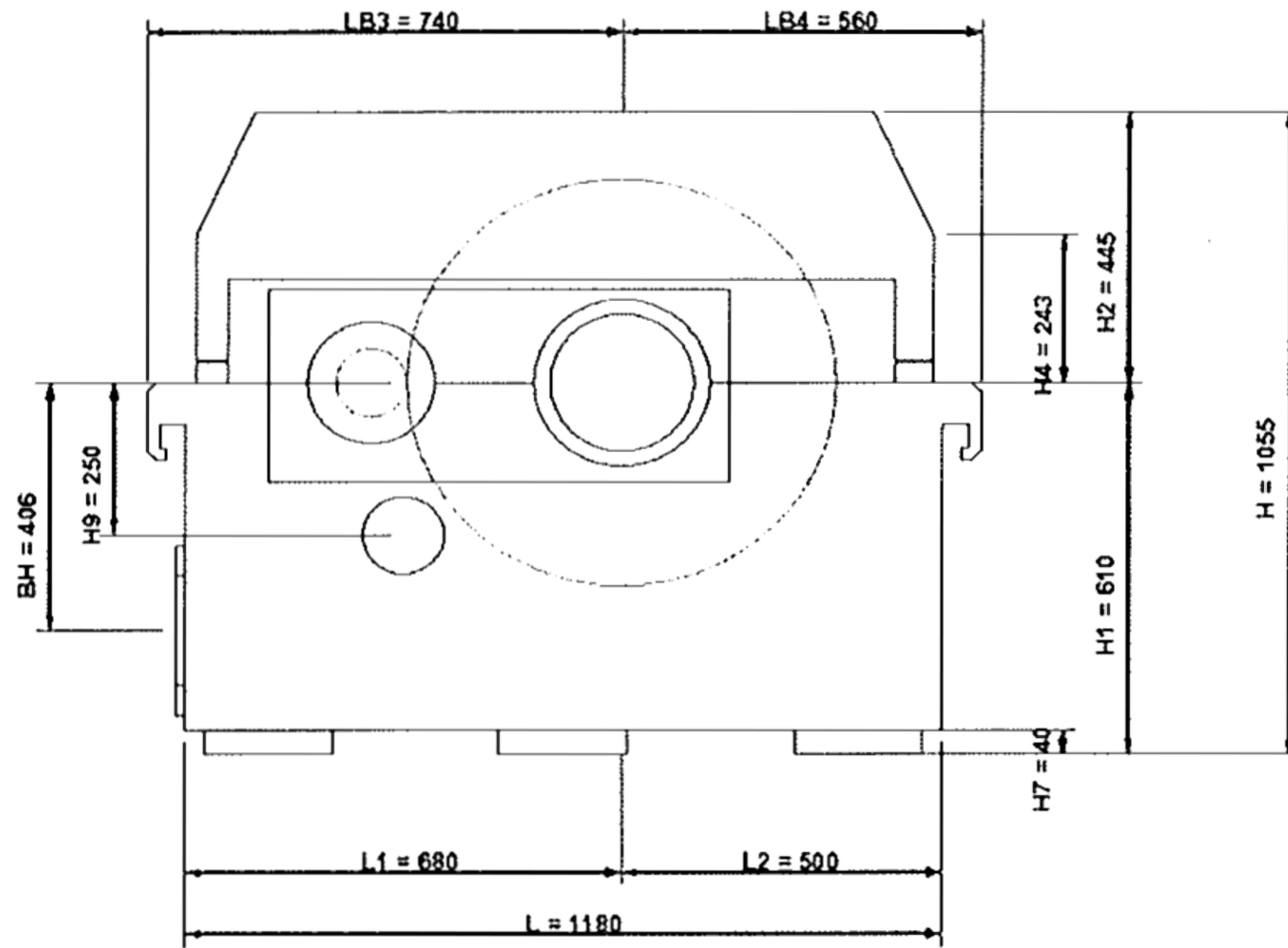
Weight HSS : 30.5 kg  
Weight pos. from teeth middle HSS : 57.5 mm  
Inertia HSS : 0.008 Kg.m<sup>2</sup>  
Stiffness HSS : 1.11 MN/mrd  
Bearing type 1 : Tilting pads 80 x 56  
Bearing type 2 : Tilting pads 80 x 56  
Add. weight on brg. side 1 : 10.4 kg

Weight LSS : 574.3 kg  
Weight pos. from teeth middle LSS : 9 mm  
Inertia LSS : 28.526 Kg.m<sup>2</sup>  
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

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| ADDITIONAL TECHNICAL DATASHEET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                          |                |                                   | Job No. <u>41104</u> Item No. <u>B</u><br>P.O. No. _____ Date _____<br>Requisition No. _____<br>Inquiry No. _____<br>Revision <u>1</u> Date <u>06.03.2015</u> By <u>HNI</u>                                                                |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|-----|--------|-------|-------|-----------|---------------|------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------|----------------------|--|---------|----------------|-----------------------------------|------|-------------|-------------|-----|----------------|----------|----------|--|----------------------------|----|----|-----|------|------------|-------------|-----|----|----|-----|--|--|--|----|-----|--|--|--------------|-----|----|----|-----|--|--|--|----|-----|--|--|-----------------|-----|----|----|-----|--|--|--|----|-----|--|--|--------------|--|--|--|--|-----|
| <input checked="" type="checkbox"/> <b>ADDITIONAL GEAR DATA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                |                                   | <input type="checkbox"/> <b>TURNING GEAR (Dimensioning is preliminary !)</b>                                                                                                                                                               |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| <b>Efficiency</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Percent of rated power</th> <th style="width: 50%;">Efficiency</th> </tr> </thead> <tbody> <tr><td>100%</td><td>98,70</td></tr> <tr><td>75%</td><td>98,56</td></tr> <tr><td>50%</td><td>98,38</td></tr> <tr><td>25%</td><td>97,42</td></tr> <tr><td>10%</td><td>87,68</td></tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                          |                |                                   | Percent of rated power                                                                                                                                                                                                                     | Efficiency           | 100%           | 98,70            | 75% | 98,56  | 50%   | 98,38 | 25%       | 97,42         | 10%  | 87,68                    | <b>Calculation results</b><br>Required turning speed _____ rpm<br>Actual turning speed _____ rpm<br>Required breakaway torque _____ Nm<br>Actual breakaway torque _____ Nm<br>Actual maximum torque _____ Nm<br>Actual acceleration time _____ s                                                                                                                                                                                                                                                                                |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Percent of rated power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Efficiency               |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| 100%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 98,70                    |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| 75%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 98,56                    |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| 50%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 98,38                    |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| 25%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 97,42                    |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| 10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 87,68                    |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| <b>Losses</b><br>Power loss at no load _____ kW<br>Heat rejection _____ kcal/h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                          |                |                                   | <b>Motor</b><br>Supplier _____<br>Power _____ kW<br>Voltage _____ V<br>Frequency _____ Hz<br>Speed _____ rpm<br>Electric standard _____                                                                                                    |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| <input type="checkbox"/> <b>PUMP DETAILS (Dimensioning is preliminary !)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                          |                |                                   | <b>Turning gear</b>                                                                                                                                                                                                                        |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Design : _____<br>Speed : _____ rpm<br>Oil flow : _____ l/min<br>Oil pressure : _____ bar<br>NPSH : _____ m<br>Safety valve : _____<br>Driving method : _____<br>Material : _____<br>Flanges : _____<br>Testing : _____<br>Furniture of ATEX certificate : _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |                |                                   | Type _____<br>Ratio _____                                                                                                                                                                                                                  |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                |                                   | <b>Clutch</b>                                                                                                                                                                                                                              |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                |                                   | Type _____<br>Max allowable torque _____ Nm                                                                                                                                                                                                |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                |                                   | <b>Miscellaneous</b>                                                                                                                                                                                                                       |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          |                |                                   | Starting device _____<br>Switch details _____                                                                                                                                                                                              |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| <input checked="" type="checkbox"/> <b>INSTRUMENTATION PACKAGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| <b>Thermometer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |                |                                   | <b>Thermoelements</b>                                                                                                                                                                                                                      |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Bearing</th> <th>Thrust bearing</th> <th>Oil inlet/outlet</th> </tr> </thead> <tbody> <tr> <td>Qty</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Type</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |                |                                   |                                                                                                                                                                                                                                            | Bearing              | Thrust bearing | Oil inlet/outlet | Qty |        |       |       | Type      |               |      |                          | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Bearing</th> <th>Thrust bearing</th> <th>Oil inlet/outlet</th> </tr> </thead> <tbody> <tr> <td>Type</td> <td>DUPLEX 2x3F</td> <td>DUPLEX 2x3F</td> <td></td> </tr> <tr> <td>Classification</td> <td>IEC60751</td> <td>IEC60751</td> <td></td> </tr> <tr> <td>Removable from the outside</td> <td>NO</td> <td>NO</td> <td></td> </tr> <tr> <td>ATEX</td> <td>ATEX Eexia</td> <td>ATEX Eexia</td> <td></td> </tr> </tbody> </table> |    |                          |                      |  | Bearing | Thrust bearing | Oil inlet/outlet                  | Type | DUPLEX 2x3F | DUPLEX 2x3F |     | Classification | IEC60751 | IEC60751 |  | Removable from the outside | NO | NO |     | ATEX | ATEX Eexia | ATEX Eexia  |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Bearing                  | Thrust bearing | Oil inlet/outlet                  |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Qty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                          |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Bearing                  | Thrust bearing | Oil inlet/outlet                  |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DUPLEX 2x3F              | DUPLEX 2x3F    |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Classification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | IEC60751                 | IEC60751       |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Removable from the outside                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | NO                       | NO             |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| ATEX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ATEX Eexia               | ATEX Eexia     |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| <b>Shaft vibrations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                |                                   |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Radial                   | Axial          |                                   | Keyphasor                                                                                                                                                                                                                                  | Accelerometer        |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | B.N. 3300 XL 8mm Sys. 9M | HS             | No                                | B.N. 3300 XL 8mm Sys. 9M                                                                                                                                                                                                                   | ACCELEROMETER BENTLY |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          | LS             | BENTLY NEVADA 3300 XL 8mm Sys. 9M |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Probe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Yes                      | HS             | No                                | Yes                                                                                                                                                                                                                                        |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          | LS             | Yes                               |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Proximitior                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Yes                      | HS             | No                                | Yes                                                                                                                                                                                                                                        |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          | LS             | Yes                               |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Probe holder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Yes                      | HS             | No                                | Yes                                                                                                                                                                                                                                        |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          | LS             | Yes                               |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Connection head                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Yes                      | HS             | No                                | Yes                                                                                                                                                                                                                                        |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                          | LS             | Yes                               |                                                                                                                                                                                                                                            |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| mounting kit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                          |                |                                   |                                                                                                                                                                                                                                            | Yes                  |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| <b>Junction box(es)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          |                |                                   | <b>Miscellaneous</b>                                                                                                                                                                                                                       |                      |                |                  |     |        |       |       |           |               |      |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |                          |                      |  |         |                |                                   |      |             |             |     |                |          |          |  |                            |    |    |     |      |            |             |     |    |    |     |  |  |  |    |     |  |  |              |     |    |    |     |  |  |  |    |     |  |  |                 |     |    |    |     |  |  |  |    |     |  |  |              |  |  |  |  |     |
| Qty <u>0</u><br>Manufacturer _____<br>Material _____<br>ATEX <u>None</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                          |                |                                   | Identification <input checked="" type="checkbox"/> wire <input checked="" type="checkbox"/> conduit <input type="checkbox"/> junction box<br>Conduit type _____<br>Transmitter type _____ Qty _____<br>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 15<sup>th</sup> 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.

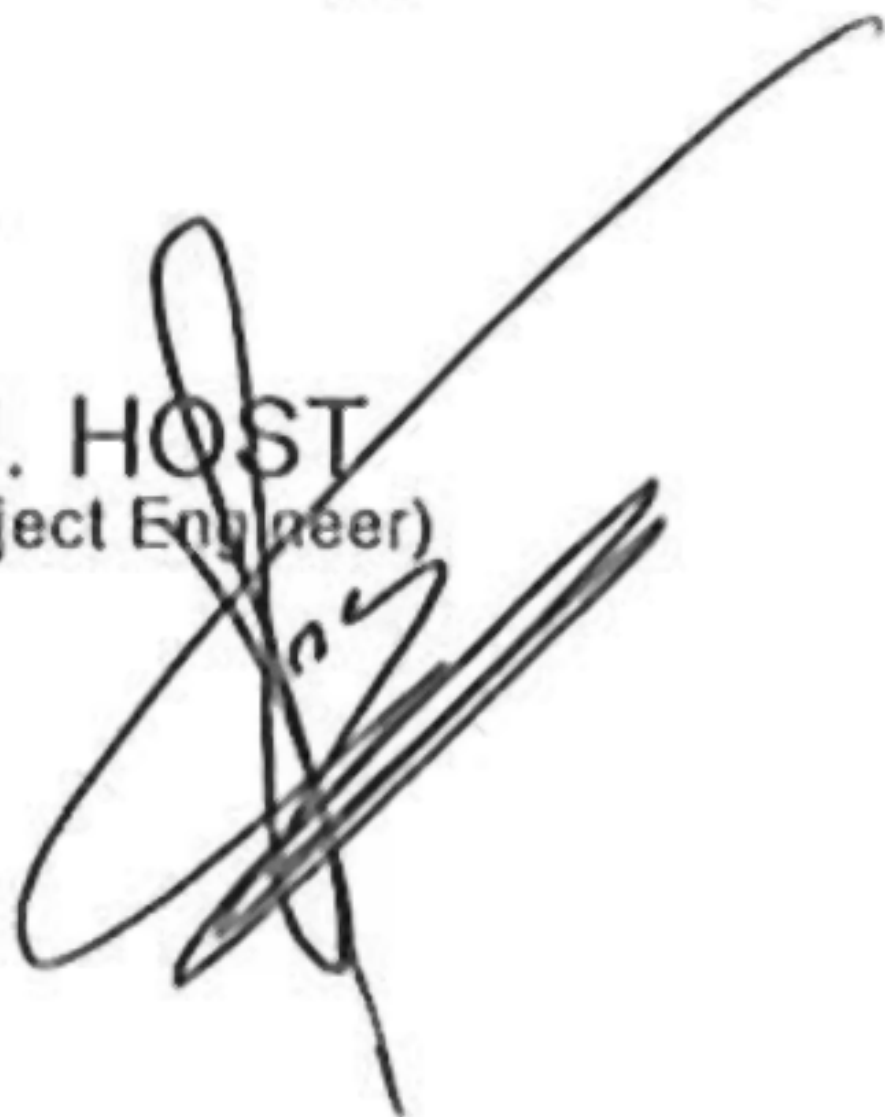
## **Applicable documents for the quotation (available on demands)**

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!"**