

## Quotation

To

Company : Siemens AG  
City / Country : Duisburg / Germany  
Name : Stoverink Simon  
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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                                                                                  |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 15 | Driver: Rated _____ Max _____ kW                                                                                                 |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 16 | Normal transmitted power (2.2.2) _____ kW                                                                                        |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 17 | Gear unit rated power (2.2.1) <u>6800</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):                                                                                                             |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 22 | Input <u>1800</u> rpm <input type="radio"/> Specified <input checked="" type="radio"/> Nominal                                   |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 23 | Output <u>7285</u> rpm <input type="radio"/> Specified <input checked="" type="radio"/> Nominal                                  |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 24 | Allow var in gear ratio (2.1.5) (+) (-) _____ %                                                                                  |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 25 | Max continuous speed (1.5) <u>1800 / 7285</u> rpm                                                                                |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 26 | Trip speed (1.5) (2.1.7) <u>1980 / 8013,5</u> rpm                                                                                |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 27 | Gear service factor (2.2.3.1) <u>1,4 API 613/2003 5 TH</u> (min)                                                                 |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 28 | Hardness (2.2.3.2) Pinion _____ Gear _____                                                                                       |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 29 | Shaft assembly designation (2.1.18) <u>L/R</u>                                                                                   |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 30 | HS shaft rot fac'g cpl'g (2.1.20.2) <input checked="" type="checkbox"/> CW <input type="checkbox"/> CCW                          |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 31 | LS shaft rot fac'g cpl'g (2.1.20.2) <input checked="" type="checkbox"/> CW <input type="checkbox"/> CCW                          |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 32 | External loads (2.1.16) _____                                                                                                    |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 33 | Other operating conditions (2.2.2) (2.6.1.3) _____                                                                               |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 34 |                                                                                                                                  |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 35 | <b>○ INSTALLATION DATA (2.1.14)</b>                                                                                              |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 36 | <input type="checkbox"/> Indoor <input type="checkbox"/> Heated <input type="checkbox"/> Under roof                              |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 37 | <input checked="" type="checkbox"/> Outdoor <input type="checkbox"/> Unheated <input type="checkbox"/> Partial slides            |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 38 | <input type="checkbox"/> Grade <input type="checkbox"/> Mezzanine <input checked="" type="checkbox"/> <b>ONSHORE</b>             |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 39 | <input type="checkbox"/> Winterization required <input type="checkbox"/> Tropicalization required                                |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 40 | Electrical area (2.1.10) Class _____ Grp _____ Div _____                                                                         |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 41 | Electrical area (2.1.10) Zone <u>2</u> Grp <u>IIA</u> Temp <u>T1</u> °C                                                          |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 42 | Max allow SPL (2.1.6) _____ dB(A) @ _____ m                                                                                      |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 43 | Elevation _____ m Barometer _____ kPa abs                                                                                        |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 44 | Range of ambient temperatures:                                                                                                   |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 45 | Dry bulb _____ Wet bulb _____                                                                                                    |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 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"/>                                                                                                         |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|    |                                                                                                                                  |                                                | Mechanical rating (1.5.16) <u>9520</u> kW @ <u>1800 / 7309,1</u> rpm<br>Gear service factor (2.2.3.1) <u>1,44 API 613/2003 5 TH</u> (actual)<br>Full load gear unit power loss <u>66</u> kW<br>Gear Unit Mechanical efficiency <u>99,03</u> %<br>Rating speed Pinion <u>7.309,1</u> Gear <u>1.800,0</u> rpm<br>Hardness used for<br>Rating, (HB or Rc) Pinion <u>58 HRC</u> Gear <u>58 HRC</u><br>Tooth pitting Index, "K" (2.2.4.1) (2.2.4.2)<br>Allowable <u>2,17</u> Actual <u>2,10</u> MPa<br>Material index number (Fig 3, Table 4) <u>3,03</u> MPa<br>Bending stress number, "S <sub>t</sub> " (2.2.5.1) (2.2.5.2)<br>Pinion: Allowable <u>265,4</u> Actual <u>256,0</u> MPa<br>Gear: Allowable <u>265,4</u> Actual <u>246,0</u> MPa<br>Pitch line velocity <u>77,1</u> m/s<br>Anticipated SPL (2.1.6) <u>82</u> dB(A) @ <u>1</u> m<br>WR <sup>2</sup> referred to LS shaft <u>126,12</u> kgm <sup>2</sup><br>Breakaway torque <u>412</u> Nm @ LS Shaft<br>Pinion teeth hardness range <u>58 - 63 HRC</u><br>Pinion teeth hardening method <u>CARBURIZED</u><br><input type="checkbox"/> HS shaft separate hardness range _____<br>Gear teeth (rim) hardness range <u>58 - 63 HRC</u><br>Gear teeth hardening method <u>CARBURIZED</u><br>Gear hub:<br><input checked="" type="checkbox"/> Forged cylinder <input type="checkbox"/> Forged & Copied <input type="checkbox"/> Fabricated<br>Gear to Shaft fit method (2.5.3.2)<br><input type="checkbox"/> Integral <input type="checkbox"/> Keyed interference <input checked="" type="checkbox"/> Keyless interference<br>Rim attachment (2.5.3.2) <u>FORGED GEAR WHEEL</u><br>LS shaft hardness range <u>HB 230 - 274</u><br>Journal static weight loads (2.6.6.3)<br>Pinion <u>128</u> / <u>42</u> kg Gear <u>842</u> / <u>707</u> kg<br>Total gear unit assembled weight <u>4000</u> kg<br>NOTES: _____<br>_____<br>_____ |

**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                                                                                        |                                   |                  |                                                                                                                         | O 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) _____ mm                                                                                            |                                            |                          |  |
| 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                                                                                        | Steel                             | Oil seals        | aluminum                                                                                                                | Location _____ OPP.CPLG.SIDE               |                          |  |
| Pinion(s)                                                                                          | 18CrNiMo7-6                       |                  |                                                                                                                         | Manufacturer <u>FLENDER</u> <u>FLENDER</u> |                          |  |
| Gear rim(s)                                                                                        | 18CrNiMo7-6                       |                  |                                                                                                                         | Type <u>NO</u> <u>COMB.TAP.LANDS</u>       |                          |  |
| HS Shaft                                                                                           | Integral                          | LS Shaft         | 42CrMo4                                                                                                                 | Size _____ <u>BPK LEG 6"</u>               |                          |  |
| Radial bearings                                                                                    | Babbitt                           | Backing          | Steel                                                                                                                   | Area _____ <u>11615</u> mm²                |                          |  |
| Thrust bearing(s)                                                                                  | Babbitt                           | Backing          | Steel                                                                                                                   | Loading _____ <u>1,14</u> MPa              |                          |  |
| O 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 _____ N                                                                                                |                                            |                          |  |
| <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**  
**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) <b>5,0</b></p> <p><b>■ MESH</b></p> <p>Mech and windage power loss <b>26,4</b> kW</p> <p>Oil flow, mesh <b>40,0</b> l/min</p> <p><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> <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>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> <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"/> <b>Flender standard RAL5015 (blue)</b></p> <p><input checked="" type="checkbox"/> Painting housing interior not allowed (2.3.1.14)</p> <p><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> <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 <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> <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) <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> <p><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> <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 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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| Service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No.                                 | Size                                              | Type         |      |                |   |       |              |                 |   |       |              |                |  |  |  |      |   |         |              |              |  |  |  |  |               |        |               |                          |                          |                 |                          |                          |                             |                          |         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   |                                     |                          |                                   |                                     |                          |                              |  |  |
| Lube oil inlet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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   |                                     |                          |                                   |                                     |                          |                              |  |  |
| Lube oil outlet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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   |                                     |                          |                                   |                                     |                          |                              |  |  |
| Casing drain *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Vent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1                                   | 1,5 in.                                           | ANSI 150 LBS |      |                |   |       |              |                 |   |       |              |                |  |  |  |      |   |         |              |              |  |  |  |  |               |        |               |                          |                          |                 |                          |                          |                             |                          |         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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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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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 type="checkbox"/> | <input checked="" type="checkbox"/> |
| 9 Dismantle/reassembly (4.3.2.3.1)                                                                        | <input checked="" type="checkbox"/> | <input 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"/> | <input type="checkbox"/>            |
| 11 Contact Check Tape Lift (2.5.2.2)                                                                      | <input checked="" type="checkbox"/> | <input 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"/> | <input type="checkbox"/>            |
| 13 Double helical axial stability (2.5.2.3)                                                               | <input checked="" type="checkbox"/> | <input 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"/> | <input type="checkbox"/>            |
| 16 Residual unbalance check (2.6.6.2)                                                                     | <input checked="" type="checkbox"/> | <input 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 type="checkbox"/> | <input checked="" type="checkbox"/> |
| 18 Mechanical Run Test (Spare) (4.3.2.4)                                                                  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/>            |
| 19 Addl. Mechanical Tests (4.3.2.2.16)                                                                    | <input type="checkbox"/>            | <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"/> | <input type="checkbox"/>            |
| 22 Full torque, reduced speed (4.3.3.2)                                                                   | <input type="checkbox"/>            | <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"/> | <input type="checkbox"/>            |
| 24 Back-To-Back Locked Torque                                                                             |                                     |                                     |                          |                                     |
| 25 Test (4.3.3.4)                                                                                         | <input type="checkbox"/>            | <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 type="checkbox"/> | <input checked="" type="checkbox"/> |
| 27 Additional gear tooth test (4.2.2.8)                                                                   | <input type="checkbox"/>            | <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 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"/> | <input type="checkbox"/>            |
| 40 Vibration, Phase Plots (4.3.2.2.12)                                                                    | <input checked="" type="checkbox"/> | <input 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"/> | <input type="checkbox"/>            |
| 42 Tape recorded Vibration Data                                                                           | <input checked="" type="checkbox"/> | <input 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"/>            |                          | <input type="checkbox"/>            |
| 47 <input checked="" type="checkbox"/> Rot. Elmts.                                                        | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                          | <input checked="" type="checkbox"/> |
| 48 <input checked="" type="checkbox"/> Bearings                                                           | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |                          | <input checked="" type="checkbox"/> |
| 49 <input type="checkbox"/> Other :                                                                       | <input type="checkbox"/>            | <input type="checkbox"/>            |                          | <input type="checkbox"/>            |
| 50 (Specify)                                                                                              |                                     |                                     |                          |                                     |

NOTES : \_\_\_\_\_

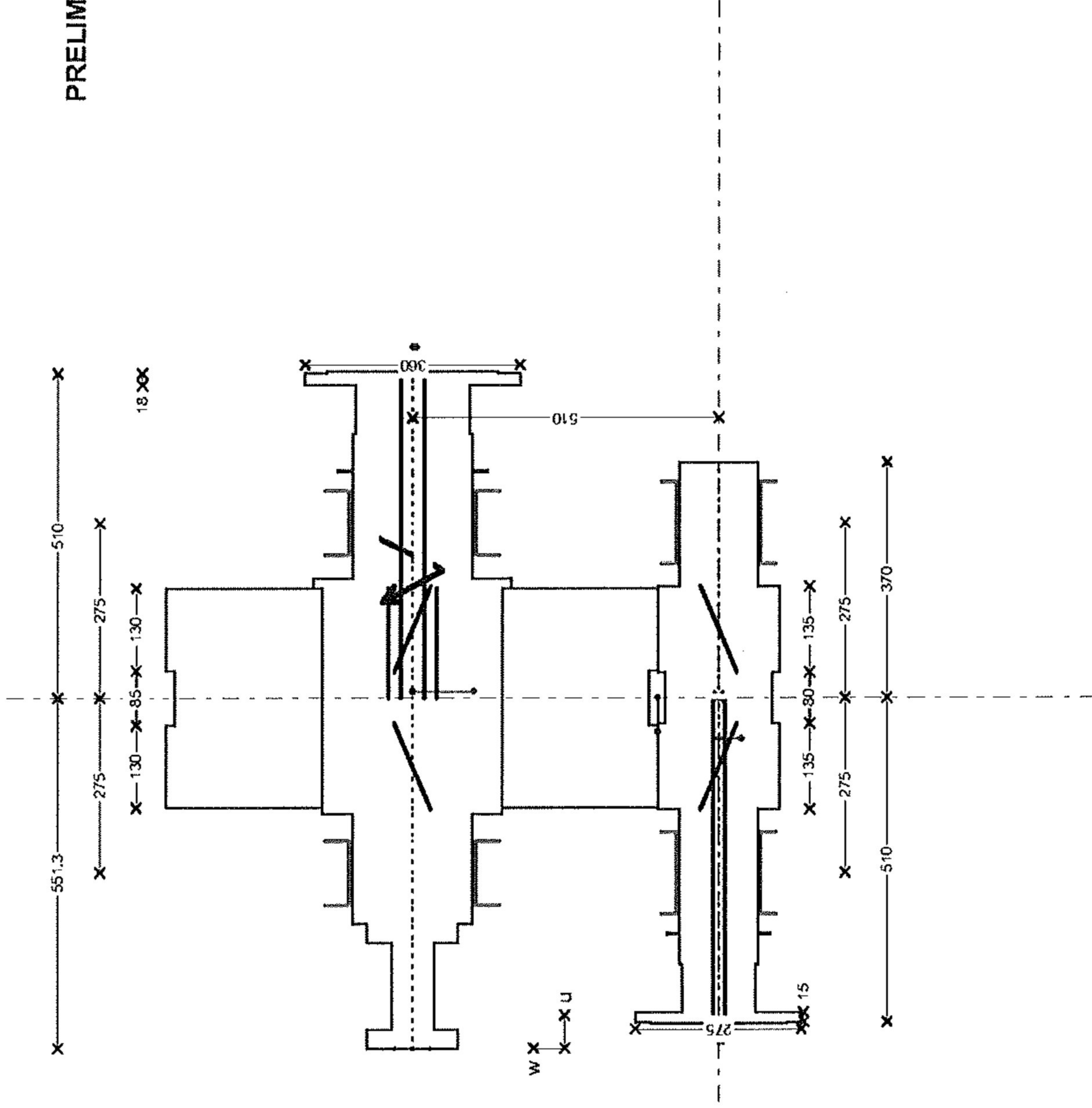
During start-up, gears can exhibit a transient spike reading of vibration levels that will exceed shutdown settings. Therefore a trip multiplier is recommended in the control system.

Mechanical running test duration 4 hours including

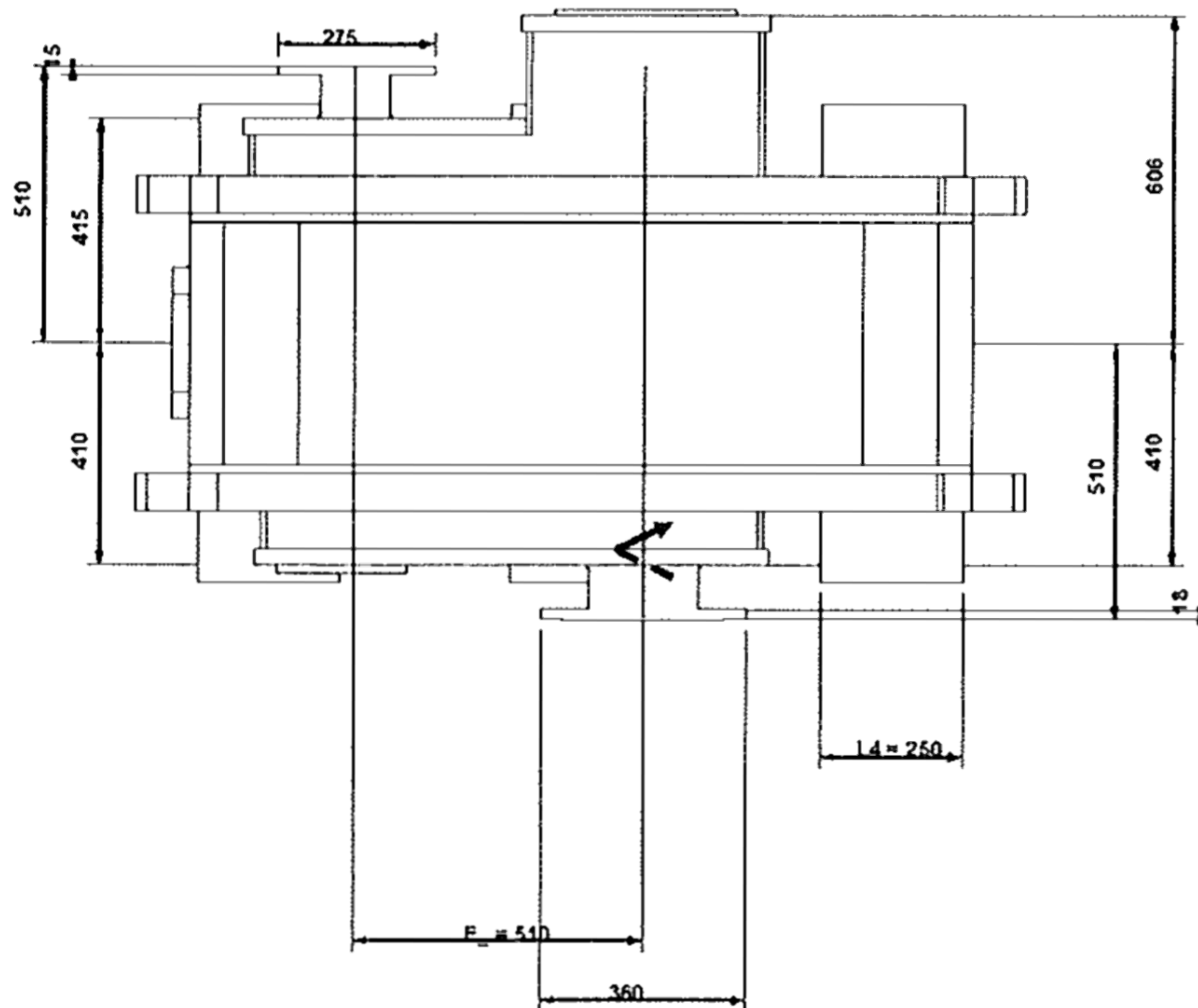
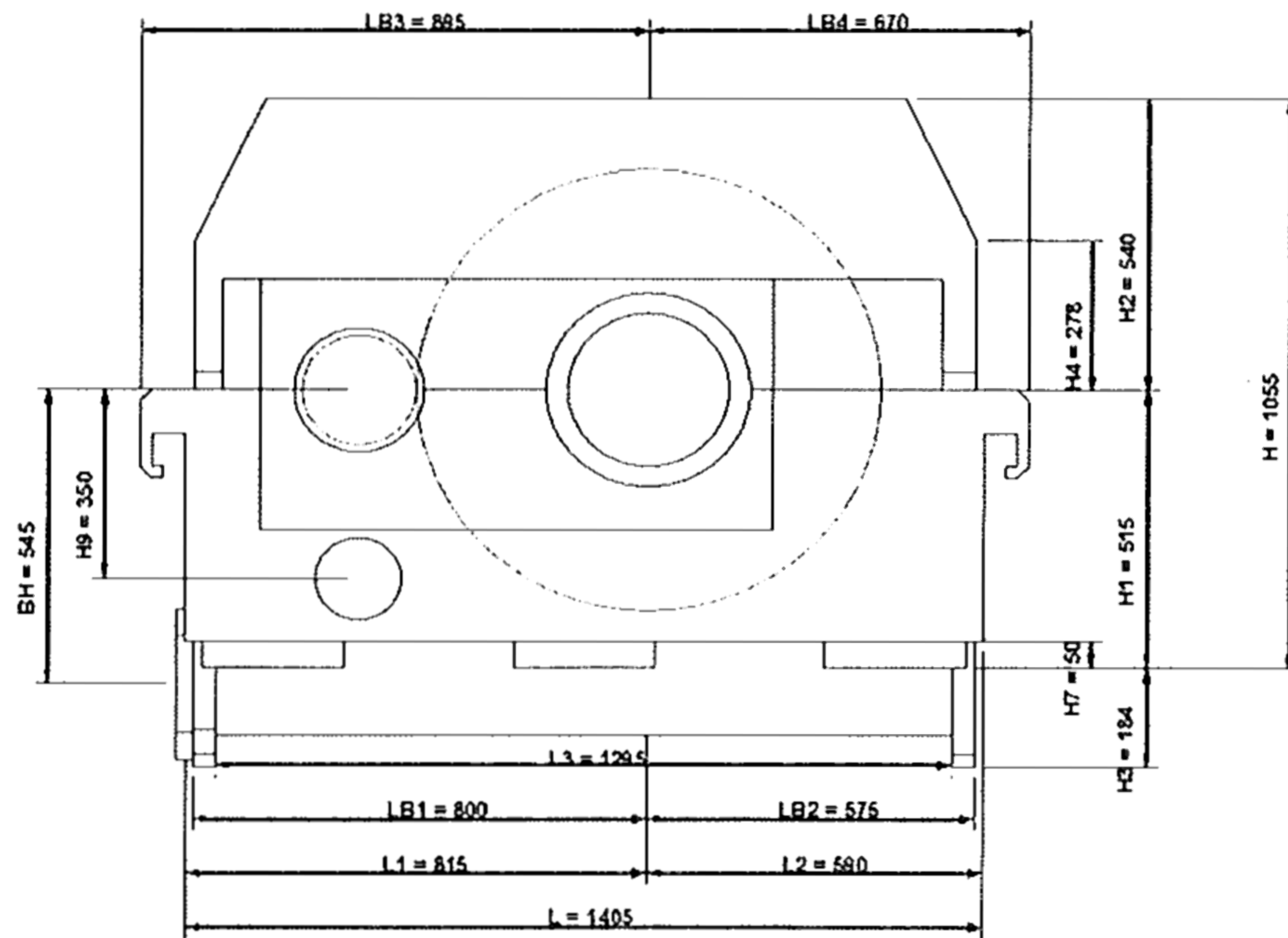
- Shaft vibration record using Job vibration probes if ordered
- Bearings temperature records
- Casing vibration measurement
- Sound level pressure measurement
- Power losses measurement at oil outlet
- Performed with oil ISO VG 32

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

**PRELIMINARY MASS ELASTIC DATA**



|                                             |     |
|---------------------------------------------|-----|
| Customer : Siemens AG Duisburg              |     |
| Destination : Khursariyah Al Fadhlili       |     |
| Purchaser order :                           |     |
| F-G job number : D 41104A1                  | OL: |
| Type and serial N° : TX50/4C                |     |
| Power rating : 6800 kW                      |     |
| Service factor : AP1613.03 $\geq 1.4$       |     |
| Input speed : 1800 rpm                      |     |
| Output speed : 7309.1 rpm                   |     |
| Speed ratio : 4.06                          |     |
| Weight HSS : 143.5 kg                       |     |
| Weight pos. from teeth middle HSS : 63.4 mm |     |
| Inertia HSS : 0.585 Kg.m²                   |     |
| Stiffness HSS : 5.916 MN/mrd                |     |
| Bearing type 1 : Offset 130 x 130           |     |
| Bearing type 2 : Offset 130 x 130           |     |
| Add. weight on brg. side 1 : 26.6 kg        |     |
| Weight LSS : 1561.2 kg                      |     |
| Weight pos. from teeth middle LSS : 10.5 mm |     |
| Inertia LSS : 116.473 Kg.m²                 |     |
| Stiffness LSS : 39.014 MN/mrd               |     |
| Bearing type 4 : Cylindrical 200 x 100      |     |
| Bearing type 3 : Cylindrical 200 x 100      |     |
| Add. weight on brg. side 4 : 87.5 kg        |     |
| Positive direction of external              | →   |
| APPAREIL.xls _ Edition du :06.03.2015       |     |
| 1/1                                         |     |



| 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**  
**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

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Applicable To: <input checked="" type="radio"/> Proposal <input type="radio"/> Purchase <input type="radio"/> As Built</p> <p>For <u>Siemens AG Duisburg</u></p> <p>Site <u>Khursaniyah Al Fadhili</u></p> <p>Unit <u>STC-SV 06-3-A</u></p> <p>Service <u>EMCC</u></p> <p>No. required <u>1</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p><input type="radio"/> US Standards (1.7) <input checked="" type="radio"/> ISO Standards (1.7)</p> <p>Manufacturer <u>FLENDER-GRAFFENSTADEN</u></p> <p>Model No. <u>TX40/5C</u></p> <p>Serial No. _____</p> <p>Driver type <u>electric motor</u></p> <p>Driven equipment <u>centrifugal compressor</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>NOTE: Numbers within ( ) refer to applicable API standard 613 paragraphs</b></p> <p><input type="radio"/> Information To be completed by purchaser <input type="radio"/> Information to be completed by manufacturer</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p><b>○ UNITS OF MEASUREMENT</b></p> <p><input type="radio"/> US Customary units</p> <p><input checked="" type="radio"/> SI units</p> <p><b>○ RATING REQUIREMENTS</b></p> <p>Driven equip. (2.1.4): Norm. _____ Max _____ kW</p> <p>Driver: Rated _____ Max _____ kW</p> <p>Normal transmitted power (2.2.2) _____ kW</p> <p>Gear unit rated power (2.2.1) <u>1620</u> kW</p> <p>Torque @ max cont speed _____ Nm</p> <p>Max torque (2.2.1) _____ Nm @ _____ rpm</p> <p><input type="radio"/> Reducer <input checked="" type="radio"/> Increaser</p> <p>Rated speed (2.1.5):</p> <p>Input <u>1800</u> rpm <input type="radio"/> Specified <input checked="" type="radio"/> Nominal</p> <p>Output <u>10736</u> rpm <input type="radio"/> Specified <input checked="" type="radio"/> Nominal</p> <p>Allow var in gear ratio (2.1.5) (+) (-) _____ %</p> <p>Max continuous speed (1.5) <u>1800 / 10736</u> rpm</p> <p>Trip speed (1.5) (2.1.7) <u>1980 / 11809,6</u> rpm</p> <p>Gear service factor (2.2.3.1) <u>1,4 API 613/2003 5 TH</u> (min)</p> <p>Hardness (2.2.3.2) Pinion _____ Gear _____</p> <p>Shaft assembly designation (2.1.19) <u>L/R</u></p> <p>HS shaft rot fac'g opt'g (2.1.20.2) <input checked="" type="checkbox"/> CW <input type="checkbox"/> CCW</p> <p>LS shaft rot fac'g opt'g (2.1.20.2) <input checked="" type="checkbox"/> CW <input type="checkbox"/> CCW</p> <p>External loads (2.1.16) _____</p> <p>Other operating conditions (2.2.2) (2.6.1.3) _____</p> <p><b>○ INSTALLATION DATA (2.1.14)</b></p> <p><input type="checkbox"/> Indoor <input type="checkbox"/> Heated <input type="checkbox"/> Under roof</p> <p><input checked="" type="checkbox"/> Outdoor <input type="checkbox"/> Unheated <input type="checkbox"/> Partial sides</p> <p><input type="checkbox"/> Grade <input type="checkbox"/> Mezzanine <input checked="" type="checkbox"/> <b>ONSHORE</b></p> <p><input type="checkbox"/> Winterization required <input type="checkbox"/> Tropicalization required</p> <p>Electrical area (2.1.10) Class _____ Grp _____ Div _____</p> <p>Electrical area (2.1.10) Zone <u>2</u> Grp <u>IIA</u> Temp <u>T1</u> °C</p> <p>Max allow SPL (2.1.6) _____ dB(A) @ _____ m</p> <p>Elevation _____ m Barometer _____ kPa abs</p> <p>Range of ambient temperatures:</p> <p>Dry bulb _____ °C Wet bulb _____ °C</p> <p>Normal _____ °C</p> <p>Maximum <u>82</u> °C</p> <p>Minimum <u>0</u> °C</p> <p>Unusual conditions <input type="checkbox"/> Dust <input type="checkbox"/> Fumes</p> <p><input type="checkbox"/></p> | <p><b>■ BASIC GEAR DATA</b></p> <p><input checked="" type="radio"/> Single stage <input type="radio"/> Single helical</p> <p><input type="radio"/> Double stage <input checked="" type="radio"/> Double helical</p> <p><input type="radio"/> Epicyclic <input type="radio"/> <u>horizontal offset</u></p> <p>Mechanical rating (1.5.16) <u>2268</u> kW @ <u>1800 / 10737,9</u> rpm</p> <p>Gear service factor (2.2.3.1) <u>1,46 API 613/2003 5 TH</u> (actual)</p> <p>Full load gear unit power loss <u>21</u> kW</p> <p>Gear Unit Mechanical efficiency <u>98,70</u> %</p> <p>Rating speed Pinion <u>10.737,9</u> Gear <u>1.800,0</u> rpm</p> <p>Hardness used for</p> <p>Rating, (HB or Rc) Pinion <u>58 HRC</u> Gear <u>58 HRC</u></p> <p>Tooth pitting index, "K" (2.2.4.1) (2.2.4.2)</p> <p>Allowable <u>2,17</u> Actual <u>2,06</u> MPa</p> <p>Material index number (Fig 3, Table 4) <u>3,03</u> MPa</p> <p>Bending stress number, "S<sub>t</sub>" (2.2.5.1) (2.2.5.2)</p> <p>Pinion: Allowable <u>265,4</u> Actual <u>251,0</u> MPa</p> <p>Gear: Allowable <u>265,4</u> Actual <u>238,8</u> MPa</p> <p>Pitch line velocity <u>63,0</u> m/s</p> <p>Anticipated SPL (2.1.6) <u>82</u> dB(A) @ <u>1</u> m</p> <p>WR<sup>2</sup> referred to LS shaft <u>29,88</u> kgm<sup>2</sup></p> <p>Breakaway torque <u>90</u> Nm @ LS Shaft</p> <p>Pinion teeth hardness range <u>58 - 63 HRC</u></p> <p>Pinion teeth hardening method <u>CARBURIZED</u></p> <p><input type="checkbox"/> HS shaft separate hardness range _____</p> <p>Gear teeth (rim) hardness range <u>58 - 63 HRC</u></p> <p>Gear teeth hardening method <u>CARBURIZED</u></p> <p>Gear hub:</p> <p><input checked="" type="checkbox"/> Forged cylinder <input type="checkbox"/> Forged &amp; Capped <input type="checkbox"/> Fabricated</p> <p>Gear to Shaft fit method (2.5.3.2)</p> <p><input type="checkbox"/> Integral <input type="checkbox"/> Keyed interference <input checked="" type="checkbox"/> Keyless interference</p> <p>Rim attachment (2.5.3.2) <u>FORGED GEAR WHEEL</u></p> <p>LS shaft hardness range <u>HB 230 - 274</u></p> <p>Journal static weight loads (2.6.6.3)</p> <p>Pinion <u>37</u> / <u>4</u> kg Gear <u>347</u> / <u>253</u> kg</p> <p>Total gear unit assembled weight <u>1900</u> kg</p> <p>NOTES: _____</p> <p>_____</p> <p>_____</p> |

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

| ■ 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 :                                                                                                          |                          |                          |  |

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

| <p>1 <b>○ LUBRICATION REQUIREMENTS</b></p> <p>2 <input type="checkbox"/> Oil system furnished by (2.8.3) _____</p> <p>3 <input type="checkbox"/> Other _____ <input type="checkbox"/> Gear vendor _____</p> <p>4 <input type="checkbox"/> Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6)</p> <p>5 <input type="checkbox"/> ISO Grade _____ Load stage (2.2.6) <u>7,0</u></p> <p>6</p> <p>7 <b>■ MESH</b></p> <p>8 Mesh and windage power loss <u>2,0</u> kW</p> <p>9 Oil flow, mesh <u>9,0</u> l/min</p> <p>10</p> <p>11 <b>■ LUBRICATION REQUIREMENTS</b></p> <p>12 Min. startup oil temperature <u>20,0</u> °C</p> <p>13 Normal oil inlet temperature <u>60,0</u> °C</p> <p>14 Maximum oil inlet temperature <u>65,0</u> °C</p> <p>15 Unit oil flow (total) <u>64,0</u> l/min</p> <p>16 Unit oil pressure <u>2,5</u> bar</p> <p>17 <input type="checkbox"/> Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6)</p> <p>18 <input type="checkbox"/> ISO Grade <u>46</u> Load stage (2.2.6) <u>7,0</u></p> <p>19</p> <p>20 <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>27 * Casing drain is 'dead bottom' housing drain, not lube oil outlet</p> <p>28 <b>○ MOUNTING PLATES</b></p> <p>29 <input type="checkbox"/> Gear furnished with (3.3.1.1)</p> <p>30 <input type="checkbox"/> Baseplate <input type="checkbox"/> Soleplate <input type="checkbox"/> Subplate(s) (3.3.2.10)</p> <p>31 <input type="checkbox"/> Mounting plates(s) furnished by (3.3.1.1) _____</p> <p>32 <input type="checkbox"/> Baseplate leveling (3.3.2.3) _____</p> <p>33 <input type="checkbox"/> Baseplate with leveling pads (3.3.2.3)</p> <p>34 <input type="checkbox"/> Baseplate suitable for column mounting (3.3.2.4)</p> <p>35 <input type="checkbox"/> Vendor review of purchaser's foundation dwgs. (2.1.13)</p> <p>36 <input type="checkbox"/> Grout type (3.3.1.2.4) _____</p> <p>37</p> <p>38 <b>○ CONTRACT DATA</b></p> <p>39 <input type="checkbox"/> Test data prior to shipment _____</p> <p>40 <input checked="" type="checkbox"/> Progress report (5.3.3) _____</p> <p>41 <input type="checkbox"/> Vendor signoff of inspector checklist (4.1.1.3)</p> <p>42 <input checked="" type="checkbox"/> Information retained for 20 years (4.2.1.1) (4.2.2.6.1)</p> <p>43 <input type="checkbox"/> Technical manual (5.3.5.4)</p> <p>44 <input checked="" type="checkbox"/> PAINTING (4.4.3.1) <input checked="" type="checkbox"/> Flender standard RAL5015 (blue)</p> <p>45 <input checked="" type="checkbox"/> Painting housing interior not allowed (2.3.1.14)</p> <p>46 <b>○ SHIPMENT</b></p> <p>47 <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> | 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) | <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> <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> <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> | (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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| Service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No.                                 | Size                                              | Type         |      |                |   |         |              |                 |   |       |              |                |  |  |  |      |   |         |              |              |  |  |  |  |               |        |               |                          |                          |                 |                          |                          |                             |                          |                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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              |  |  |                                 |                                     |                          |                                 |                                     |                          |                                   |                                     |                          |                              |  |  |
| Lube oil inlet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1                                   | 1,5 in.                                           | ANSI 150 LBS |      |                |   |         |              |                 |   |       |              |                |  |  |  |      |   |         |              |              |  |  |  |  |               |        |               |                          |                          |                 |                          |                          |                             |                          |                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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              |  |  |                                 |                                     |                          |                                 |                                     |                          |                                   |                                     |                          |                              |  |  |
| Lube oil outlet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1                                   | 6 in.                                             | ANSI 150 LBS |      |                |   |         |              |                 |   |       |              |                |  |  |  |      |   |         |              |              |  |  |  |  |               |        |               |                          |                          |                 |                          |                          |                             |                          |                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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              |  |  |                                 |                                     |                          |                                 |                                     |                          |                                   |                                     |                          |                              |  |  |
| Casing drain *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Vent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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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. 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

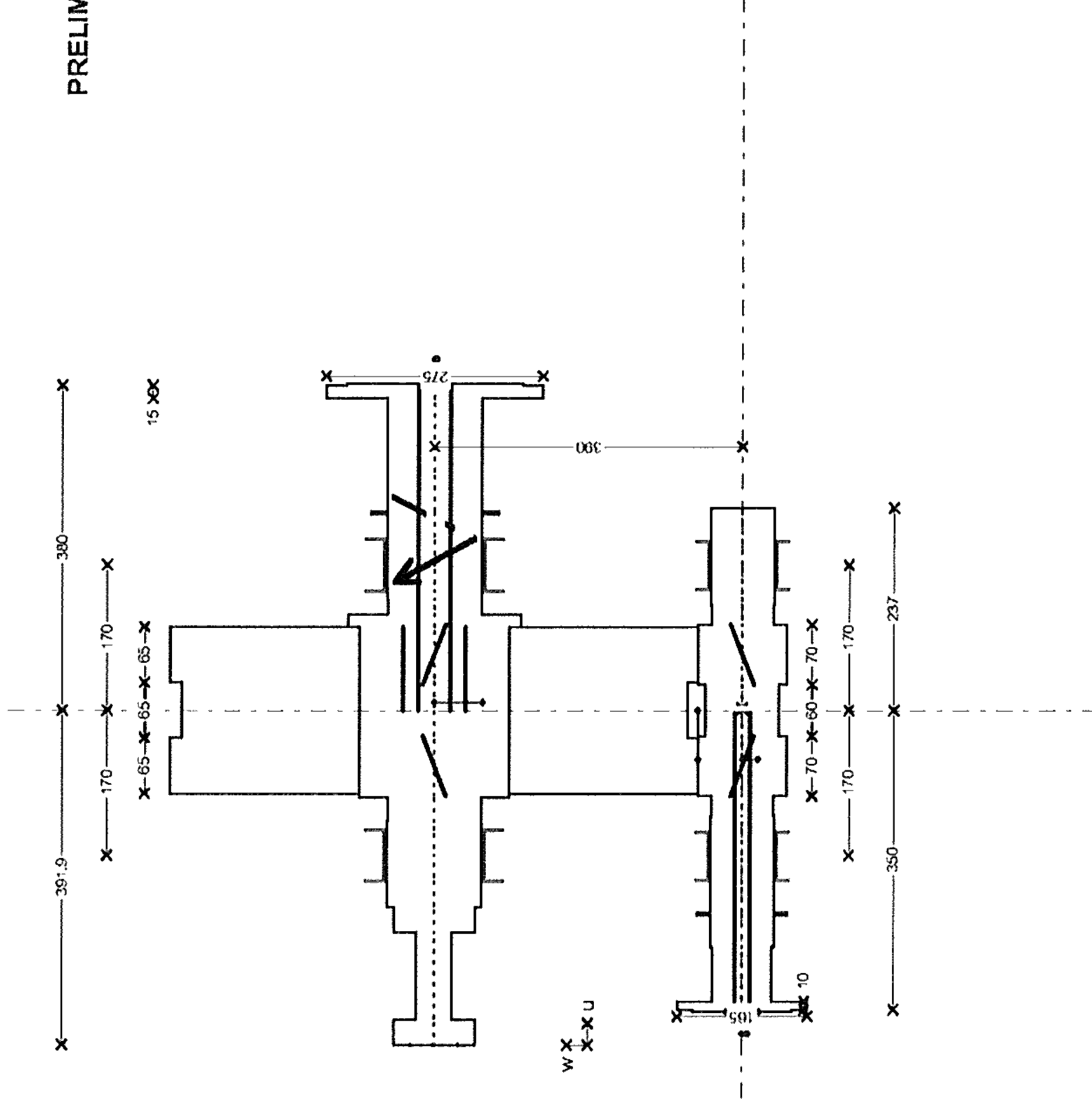
Power rating : 1620 kW  
Service factor :  $AP1613.03 \geq 1.4$   
Input speed : 1800 rpm  
Output speed : 10737.9 rpm  
Speed ratio : 5.96

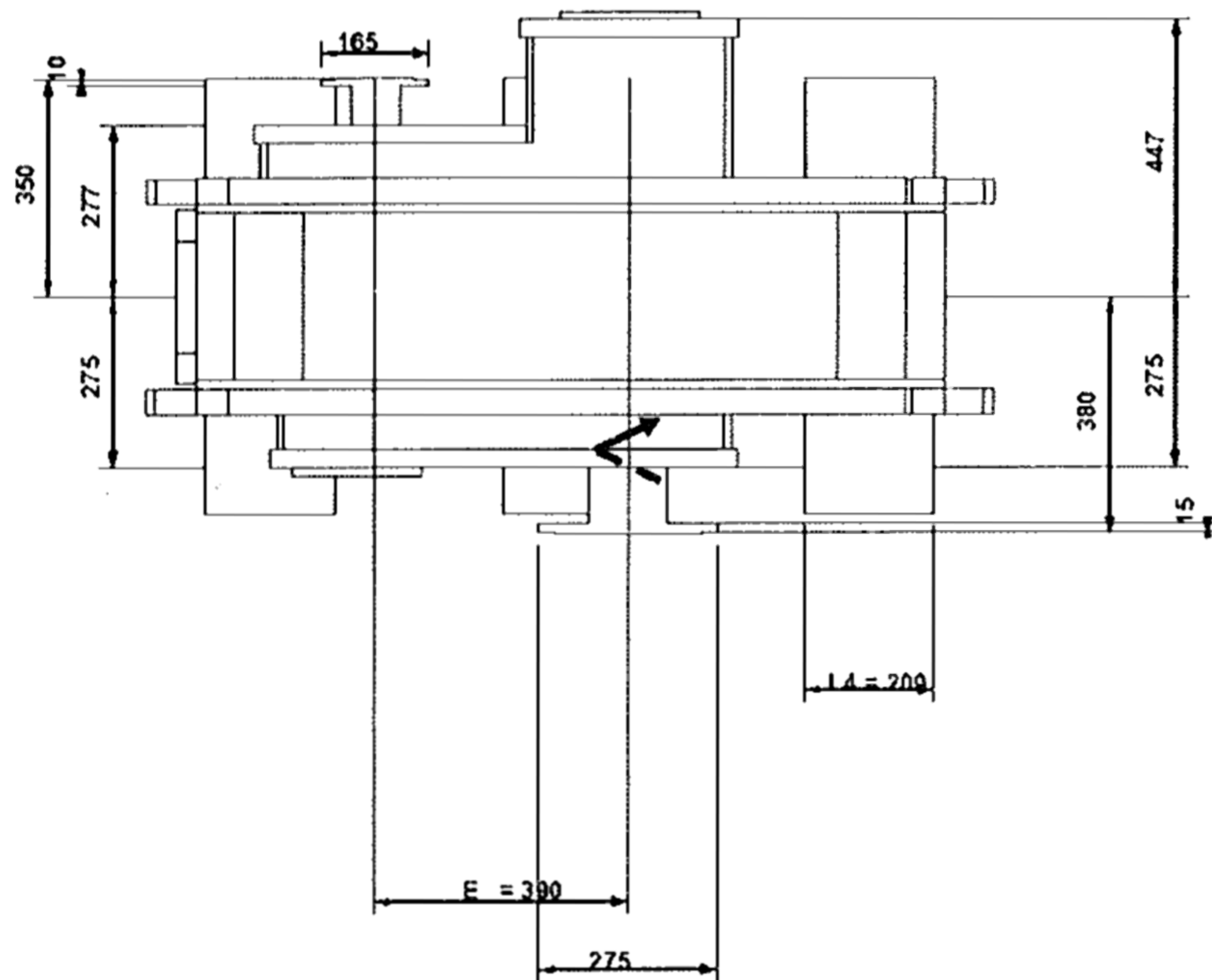
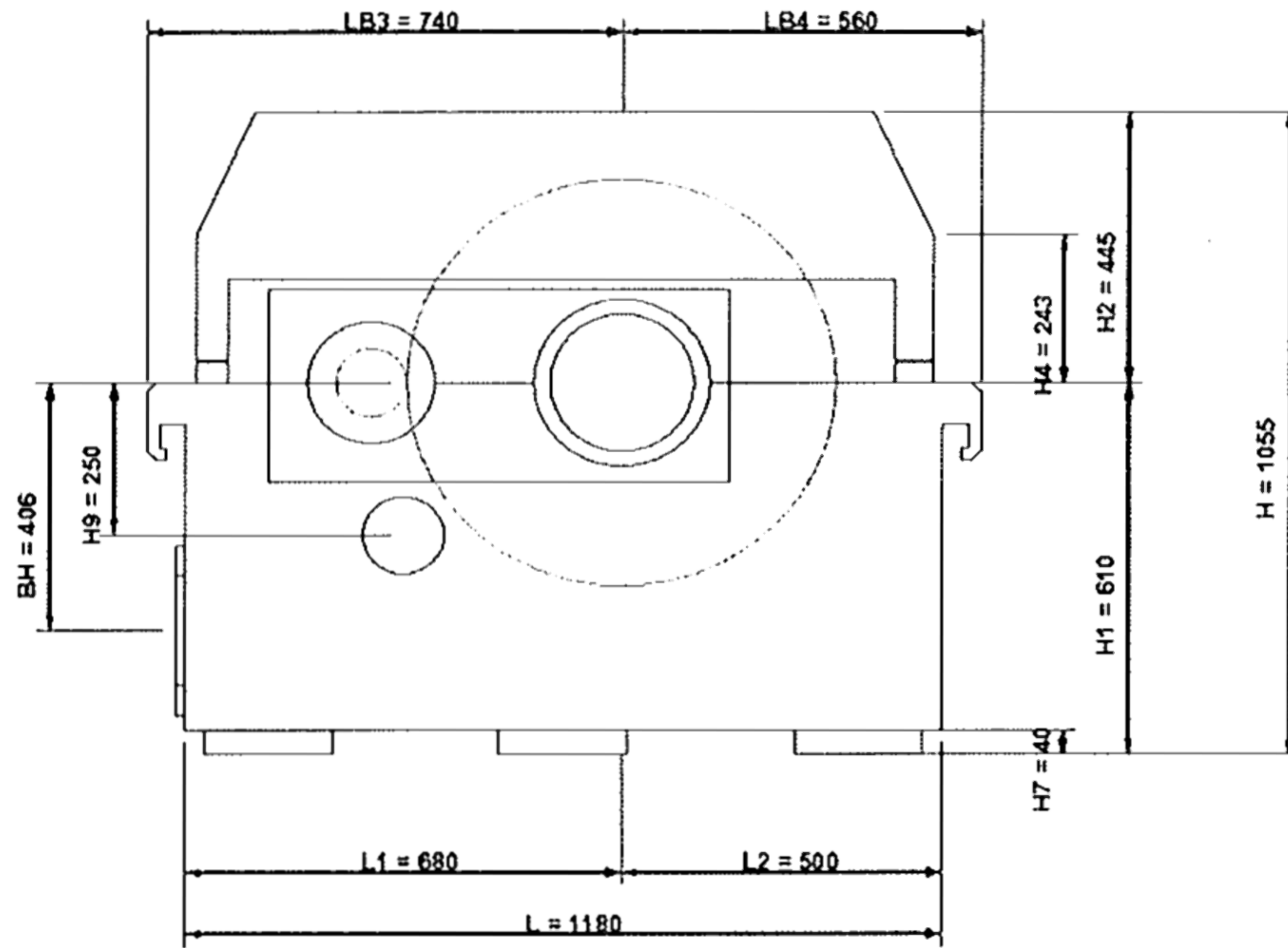
Weight HSS : 30.5 kg  
Weight pos. from teeth middle HSS : 57.5 mm  
Inertia HSS : 0.008 Kg.m<sup>2</sup>  
Stiffness HSS : 1.11 MN/mrd  
Bearing type 1 : Tilting pads 80 x 56  
Bearing type 2 : Tilting pads 80 x 56  
Add. weight on brg. side 1 : 10.4 kg

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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| <b>ADDITIONAL TECHNICAL DATASHEET</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                            | 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>                                                                                                                                                                                                            |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Efficiency</th> </tr> <tr> <th style="width: 50%;">Percent of rated power</th> <th style="width: 50%;">Efficiency</th> </tr> <tr> <td style="text-align: center;">100%</td> <td style="text-align: center;">98,70</td> </tr> <tr> <td style="text-align: center;">75%</td> <td style="text-align: center;">98,56</td> </tr> <tr> <td style="text-align: center;">50%</td> <td style="text-align: center;">98,38</td> </tr> <tr> <td style="text-align: center;">25%</td> <td style="text-align: center;">97,42</td> </tr> <tr> <td style="text-align: center;">10%</td> <td style="text-align: center;">87,68</td> </tr> </table>                                                                           |                                                                                                                            | Efficiency                                                                                                                                                                                                                                                                              |                          | Percent of rated power | Efficiency | 100%            | 98,70          | 75%                                                                                                                                                                                                                                                                                                                                                                                                                                       | 98,56            | 50%                      | 98,38                                         | 25%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 97,42                | 10%           | 87,68 | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Calculation results</th> </tr> <tr> <td style="width: 60%;">Required turning speed</td> <td style="width: 40%;">rpm</td> </tr> <tr> <td>Actual turning speed</td> <td>rpm</td> </tr> <tr> <td>Required breakaway torque</td> <td>Nm</td> </tr> <tr> <td>Actual breakaway torque</td> <td>Nm</td> </tr> <tr> <td>Actual maximum torque</td> <td>Nm</td> </tr> <tr> <td>Actual acceleration time</td> <td>s</td> </tr> </table> |                                                                                                                            | Calculation results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             | Required turning speed | rpm             | Actual turning speed | rpm | Required breakaway torque | Nm      | Actual breakaway torque | Nm               | Actual maximum torque | Nm              | Actual acceleration time | s               |                |          |              |  |                            |    |     |  |      |            |            |  |
| Efficiency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Percent of rated power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Efficiency                                                                                                                 |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| 100%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 98,70                                                                                                                      |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| 75%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 98,56                                                                                                                      |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| 50%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 98,38                                                                                                                      |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| 25%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 97,42                                                                                                                      |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| 10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 87,68                                                                                                                      |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Calculation results                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Required turning speed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | rpm                                                                                                                        |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Actual turning speed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | rpm                                                                                                                        |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Required breakaway torque                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Nm                                                                                                                         |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Actual breakaway torque                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Nm                                                                                                                         |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Actual maximum torque                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Nm                                                                                                                         |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Actual acceleration time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | s                                                                                                                          |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Losses</th> </tr> <tr> <td style="width: 60%;">Power loss at no load</td> <td style="width: 40%;">kW</td> </tr> <tr> <td>Heat rejection</td> <td>kcal/h</td> </tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                            | Losses                                                                                                                                                                                                                                                                                  |                          | Power loss at no load  | kW         | Heat rejection  | kcal/h         | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Motor</th> </tr> <tr> <td style="width: 60%;">Supplier</td> <td style="width: 40%;">kW</td> </tr> <tr> <td>Power</td> <td>V</td> </tr> <tr> <td>Voltage</td> <td>Hz</td> </tr> <tr> <td>Frequency</td> <td>rpm</td> </tr> <tr> <td>Speed</td> <td></td> </tr> <tr> <td>Electric standard</td> <td></td> </tr> </table> |                  | Motor                    |                                               | Supplier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | kW                   | Power         | V     | Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Hz                                                                                                                         | Frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | rpm         | Speed                  |                 | Electric standard    |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Losses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Power loss at no load                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | kW                                                                                                                         |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Heat rejection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | kcal/h                                                                                                                     |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Motor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
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| Speed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Electric standard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| <input type="checkbox"/> <b>PUMP DETAILS (Dimensioning is preliminary !)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                            | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Turning gear</th> </tr> <tr> <td style="width: 60%;">Type</td> <td style="width: 40%;">Ratio</td> </tr> <tr> <td>Ratio</td> <td></td> </tr> </table>                 |                          | Turning gear           |            | Type            | Ratio          | Ratio                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Turning gear                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
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| Ratio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Design : _____ rpm<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 : _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                            | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Clutch</th> </tr> <tr> <td style="width: 60%;">Type</td> <td style="width: 40%;">Nm</td> </tr> <tr> <td>Max allowable torque</td> <td></td> </tr> </table>           |                          | Clutch                 |            | Type            | Nm             | Max allowable torque                                                                                                                                                                                                                                                                                                                                                                                                                      |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
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| Max allowable torque                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
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| Miscellaneous                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
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| <b>INSTRUMENTATION PACKAGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="4" style="text-align: center;">Thermometer</th> </tr> <tr> <th></th> <th>Bearing</th> <th>Thrust bearing</th> <th>Oil inlet/outlet</th> </tr> <tr> <td>Qty</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Type</td> <td></td> <td></td> <td></td> </tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                            | Thermometer                                                                                                                                                                                                                                                                             |                          |                        |            |                 | Bearing        | Thrust bearing                                                                                                                                                                                                                                                                                                                                                                                                                            | Oil inlet/outlet | Qty                      |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      | Type          |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="4" style="text-align: center;">Thermoelements</th> </tr> <tr> <th></th> <th>Bearing</th> <th>Thrust bearing</th> <th>Oil inlet/outlet</th> </tr> <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> </table> |             | Thermoelements         |                 |                      |     |                           | 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 |  |
| Thermometer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
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| Qty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
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| Thermoelements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
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| Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DUPLEX 2x3F                                                                                                                | DUPLEX 2x3F                                                                                                                                                                                                                                                                             |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Classification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | IEC60751                                                                                                                   | IEC60751                                                                                                                                                                                                                                                                                |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Removable from the outside                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | NO                                                                                                                         | NO                                                                                                                                                                                                                                                                                      |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| ATEX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ATEX Eexia                                                                                                                 | ATEX Eexia                                                                                                                                                                                                                                                                              |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| <b>Shaft vibrations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th></th> <th>Radial</th> <th>Axial</th> <th>Keyphasor</th> <th>Accelerometer</th> </tr> <tr> <td>Type</td> <td>B.N. 3300 XL 8mm Sys. 9M</td> <td>HS No<br/>LS BENTLY NEVADA 3300 XL 8mm Sys. 9M</td> <td>B.N. 3300 XL 8mm Sys. 9M</td> <td>ACCELEROMETER BENTLY</td> </tr> <tr> <td>Probe</td> <td>Yes</td> <td>HS No<br/>LS Yes</td> <td>Yes</td> <td></td> </tr> <tr> <td>Proximitior</td> <td>Yes</td> <td>HS No<br/>LS Yes</td> <td>Yes</td> <td></td> </tr> <tr> <td>Probe holder</td> <td>Yes</td> <td>HS No<br/>LS Yes</td> <td>Yes</td> <td></td> </tr> <tr> <td>Connection head</td> <td>Yes</td> <td>HS No<br/>LS Yes</td> <td>Yes</td> <td></td> </tr> <tr> <td>mounting kit</td> <td></td> <td></td> <td></td> <td>Yes</td> </tr> </table> |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        | Radial     | Axial           | Keyphasor      | Accelerometer                                                                                                                                                                                                                                                                                                                                                                                                                             | Type             | B.N. 3300 XL 8mm Sys. 9M | HS No<br>LS BENTLY NEVADA 3300 XL 8mm Sys. 9M | B.N. 3300 XL 8mm Sys. 9M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ACCELEROMETER BENTLY | Probe         | Yes   | HS No<br>LS Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Yes                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Proximitior | Yes                    | HS No<br>LS Yes | Yes                  |     | Probe holder              | Yes     | HS No<br>LS Yes         | Yes              |                       | Connection head | Yes                      | HS No<br>LS Yes | Yes            |          | mounting kit |  |                            |    | Yes |  |      |            |            |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Radial                                                                                                                     | Axial                                                                                                                                                                                                                                                                                   | Keyphasor                | Accelerometer          |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | B.N. 3300 XL 8mm Sys. 9M                                                                                                   | HS No<br>LS BENTLY NEVADA 3300 XL 8mm Sys. 9M                                                                                                                                                                                                                                           | B.N. 3300 XL 8mm Sys. 9M | ACCELEROMETER BENTLY   |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Probe                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Yes                                                                                                                        | HS No<br>LS Yes                                                                                                                                                                                                                                                                         | Yes                      |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Proximitior                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Yes                                                                                                                        | HS No<br>LS Yes                                                                                                                                                                                                                                                                         | Yes                      |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Probe holder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Yes                                                                                                                        | HS No<br>LS Yes                                                                                                                                                                                                                                                                         | Yes                      |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Connection head                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Yes                                                                                                                        | HS No<br>LS Yes                                                                                                                                                                                                                                                                         | Yes                      |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| mounting kit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          | Yes                    |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Junction box(es)</th> </tr> <tr> <td style="width: 60%;">Qty</td> <td style="width: 40%;">0</td> </tr> <tr> <td>Manufacturer</td> <td></td> </tr> <tr> <td>Material</td> <td></td> </tr> <tr> <td>ATEX</td> <td>None</td> </tr> </table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                            | Junction box(es)                                                                                                                                                                                                                                                                        |                          | Qty                    | 0          | Manufacturer    |                | Material                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  | ATEX                     | None                                          | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">Miscellaneous</th> </tr> <tr> <td style="width: 60%;">Identification</td> <td style="width: 40%;"> <input checked="" type="checkbox"/> wire    <input checked="" type="checkbox"/> conduit    <input type="checkbox"/> junction box         </td> </tr> <tr> <td>Conduit type</td> <td></td> </tr> <tr> <td>Transmitter type</td> <td>Qty</td> </tr> <tr> <td>Terminal block type</td> <td>Qty</td> </tr> </table> |                      | Miscellaneous |       | Identification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <input checked="" type="checkbox"/> wire <input checked="" type="checkbox"/> conduit <input type="checkbox"/> junction box | Conduit type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             | Transmitter type       | Qty             | Terminal block type  | Qty |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Junction box(es)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Qty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0                                                                                                                          |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Material                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| ATEX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | None                                                                                                                       |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Miscellaneous                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Identification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <input checked="" type="checkbox"/> wire <input checked="" type="checkbox"/> conduit <input type="checkbox"/> junction box |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Conduit type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                            |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Transmitter type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Qty                                                                                                                        |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |
| Terminal block type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Qty                                                                                                                        |                                                                                                                                                                                                                                                                                         |                          |                        |            |                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                          |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |               |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |                        |                 |                      |     |                           |         |                         |                  |                       |                 |                          |                 |                |          |              |  |                            |    |     |  |      |            |            |  |

## **Commercial Conditions**

- Prices are quoted FCA Illkirch-Graffenstaden following Incoterms 2010 including packing cat 1A of SEI, 1999 issue, ind. 2.
- Progress payments : 100% at delivery.
- This quotation is subjected to the Flender Graffenstaden Standard Terms and Conditions of Sales and valid for acceptance until the 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.

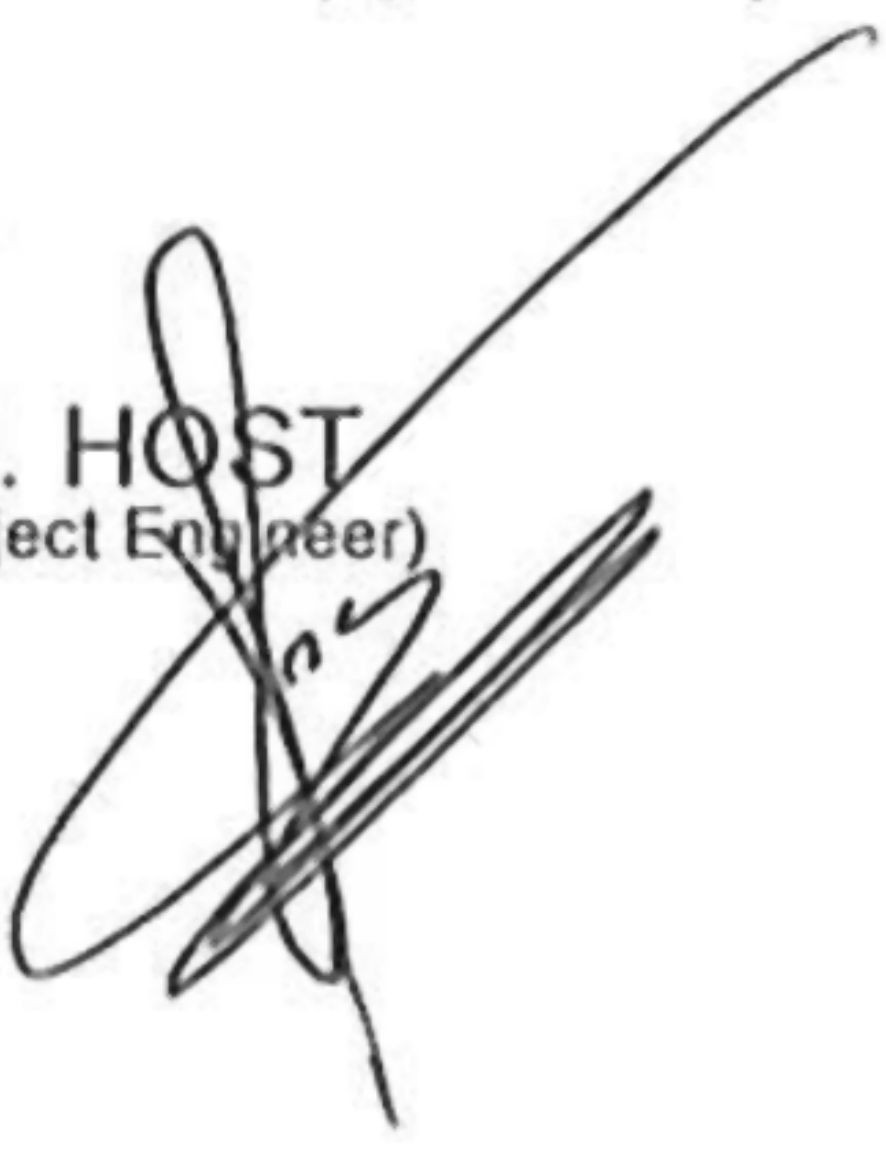
## **Applicable documents for the quotation (available on demands)**

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)



Generated with CAMEC V 4.9.5    26 Feb 2014

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