

GENERAL SPECIFICATION

ROTATING MACHINERY

GS EP MEC 242

**Special Purpose Gear Units for Petroleum, Chemical
and Gas Service Industries According to
API Standard 613**

04	10/2012	Update
03	01/2012	Complete re-write according to API Std 613
02	01/2011	Complete re-write according to ISO 13691
01	10/2008	Second issue
00	10/2005	First issue
Rev.	Date	Purpose of the revision

Owning entity: DEV/TEC

Managing entity: DEV/TEC/MTH



General Specification		GS EP MEC 242
Special Purpose Gear Units for Petroleum, Chemical and Gas Service Industries According to API Standard 613		
Rev.: 04	Effective date: 10/2012	Page: 2 of 30

Contents

1. Scope	3
2. Reference documents.....	3
3. Comments to API Std 613.....	5
Appendix 1 Data Sheet	26

General Specification		GS EP MEC 242
Special Purpose Gear Units for Petroleum, Chemical and Gas Service Industries According to API Standard 613		
Rev.: 04	Effective date: 10/2012	Page: 3 of 30

1. Scope

This specification clarifies how to use the recommendations of [API Std 613](#) for the supply to Company of special purpose gear units for use in the petroleum, chemical, and gas industries service.

This specification only applies to parallel shaft gears but not to planetary gears.

The purpose of this specification is to clarify the requirements of [API Std 613](#) standard fifth edition, February 2003.

Technical proposal shall be supported by DS EP MEC 243 part of the Appendix 1 of this specification.

This document modifies or complements some requirements of [API Std 613](#) standard, when deemed necessary considering Company experience.

The paragraph numbering is identified in the same way as in [API Std 613](#) except for additional requirements, which may be presented with new paragraph numbers. The summary sheet at front indicates where to find the information for each paragraph of [API Std 613](#) shown with a bullet.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
API Std 613	Special Purpose Gear Units for Petroleum, Chemical and Gas Industry Services
API Std 614	Lubrication, Shaft-sealing and Oil-control Systems and Auxiliaries
API Std 670	Machinery Protection Systems
API Std 671	Special-Purpose Couplings for Petroleum, Chemical, and Gas Industry Services
ISO 3746:2010	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane
ISO 14635-1	Gears - FZG test procedures - Part 1: FZG test method A/8,3/90 for relative scuffing load-carrying capacity of oils



General Specification		GS EP MEC 242
Special Purpose Gear Units for Petroleum, Chemical and Gas Service Industries According to API Standard 613		
Rev.: 04	Effective date: 10/2012	Page: 4 of 30

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP MEC 281	Lubrication, Shaft Sealing, and Oil Control Systems and Auxiliaries according to ISO 10438 / API Standard 614

3. Comments to API Std 613

API	GS
1. General	
A bullet (●) at the beginning of a paragraph indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on the data sheets (see Appendix A); otherwise it should be stated in the quotation request or in the order.	Refer to this specification and to the data sheets template in Appendix 1 of this specification.
New paragraph	1.5.39 Pitch Line Velocity All criteria referring to the pitch line velocity shall be considered at the MCS (Maximum Continuous Speed).
1.7 Standards The purchaser shall specify whether the equipment supplied to this standard shall comply with the applicable ISO standard or applicable U.S. standards.	Apart from projects based on American codes and standards, ISO standards shall be substituted wherever possible to the documents specified in this section, unless their requirements are not equivalent. Vendor having the complete package responsibility shall submit the list of documents to Company for approval prior to the order.
1.8 Units of measure The purchaser shall specify whether data, drawings, gear unit name plate, hardware (including fasteners) and equipment supplied to this standard shall use the SI or U.S. customary or both systems of unit.	Apart from projects based on American codes and standards, SI units shall be used.
2. Basic Design	
2.1 General	
2.1.4 The purchaser shall specify the equipment's normal operating point.	Refer to Project Data Sheets
2.1.5 The purchaser shall indicate if the input or output speed is specified (that is, must be exactly adhered to by the vendor) and which is nominal (that is, permits some variation). An S shall be used to indicate the specified speed, and an N shall be used to indicate the nominal speed. The purchaser shall also indicate on the datasheets the	This paragraph is applicable.

Special Purpose Gear Units for Petroleum, Chemical and Gas
Service Industries According to API Standard 613

Rev.: 04

Effective date: 10/2012

Page: 6 of 30

API	GS
allowable percentage variation in the designated gear ratio. Note: In selecting the number of teeth for the pinion and gear wheel, it is often impractical for the vendor to match exactly both the rated input and the rated output speed designated on the datasheets.	
2.1.6 Control of the sound pressure level (SPL) of all equipment furnished shall be a joint effort of the purchaser and the vendor having unit responsibility. The equipment furnished by the vendor shall conform to the maximum allowable sound pressure level specified. In order to determine compliance, the vendor shall provide both maximum sound pressure and sound power level data per octave band of the equipment.	Control of sound pressure level method shall be in accordance to the subject Rotating Machine Package Specification requirement. Proposal from the Vendor having the complete package responsibility shall include curves of guaranteed sound pressure level as a function of frequency for the specified operating conditions. Refer to the subject Rotating Machine Package Specification for the maximum allowable sound pressure level.
2.1.7 Equipment shall be designed to run safely to the trip speed setting indicated in Table 1. Unless otherwise specified, rotors for turbine-driven gear units shall be designed to operate safely at momentary speeds up to 130% of the rated speed.	The gear unit shall be designed to handle any maximum torque transmissions during any transient condition under the required operating conditions.
2.1.10 Motor, electrical components, and electrical installations shall be suitable for the area classification (class, group and division zone) specified by the purchaser and shall meet the requirements of the applicable sections of IEC 60079-0 (NFPA 70, Articles 500,501 and 505) as well as local codes specified and furnished on request by the purchaser. Note: Refer to Appendix B table of standards for a listing of typical electric codes.	Refer to the subject Rotating Machine Package Specification,
2.1.12 The gear unit shall perform on the test stand and on its permanent foundation within the specified acceptance criteria. After installation, the performance of the combined units shall be the joint responsibility of the purchaser and the vendor who has unit responsibility.	After installation, the site performance of the combined units shall be the responsibility of the Vendor having the complete package responsibility.
2.1.13 Many factors (such as piping, loads, alignment at operating condition, supporting structure, handling during shipment, and	This paragraph is applicable.

Special Purpose Gear Units for Petroleum, Chemical and Gas
Service Industries According to API Standard 613

Rev.: 04

Effective date: 10/2012

Page: 7 of 30

API	GS
handling and assembly at the site) may adversely affect site performance. To minimize the influence of these factors, the vendor shall review and comment on purchaser's baseplate and foundation drawings. In addition, the vendor's representative may be requested to check alignment at the operating temperature and may be requested to be present during initial alignment check and the tooth contact check.	
• 2.1.14 The equipment, including all auxiliaries, shall be suitable for operating under the environmental conditions specified by the purchaser. These conditions shall include whether the installation is indoors (heated or unheated) or outdoor (with or without roof), maximum and minimum temperatures, unusual humidity, and dusty or corrosive conditions.	Refer to the subject Rotating Machine Package Data sheet and Specification.
• 2.1.16 The gear unit shall be designed to withstand all internal and external loads inherent to geared, rotating machinery systems. The gear unit shall be capable of withstanding the specified external loads (thrust, lube oil piping, and so forth) transmitted across the gear mesh while the gear unit is operating at the rated power specified by the purchaser.	Refer to the subject Rotating Machine Package Datasheet.
• 2.1.18 Spare and replacement parts for the machine and all furnished auxiliaries shall meet all the criteria of the standard.	If a spare gear set is required, all testing applicable to the main gear set shall also be applicable to the spare gear set and witnessed by Company.
• 2.1.19 The purchaser shall specify the appropriate shaft assembly designation selected from combinations listed in Table 2 and illustrated in Figure 1. The purchaser may alternatively circle one or more of the assembly designations on a copy of Figure 1 and submit the copy with the quotation request. If the shaft arrangement has not been finalized at the time of the quotation request, the purchaser shall designate all of the combinations under consideration.	It is up to the Vendor having the complete package responsibility to select the shaft assembly designation.
• 2.1.20.2 The purchaser shall specify the	It is up to the Vendor having the complete

Special Purpose Gear Units for Petroleum, Chemical and Gas
Service Industries According to API Standard 613

Rev.: 04

Effective date: 10/2012

Page: 8 of 30

API	GS
rotational direction of both the high-speed and the low-speed shaft. When either or both shafts have an extension at each end, the purchaser may alternatively indicate the rotational directions on the appropriate assembly designation (see Figure 1) and submit a copy of the figure with the quotation request.	package responsibility to specify the shaft rotational direction of both the high-speed and the low-speed shaft. Speed-increasing gears shall preferably be upward meshing, and speed-reducing gears shall preferably be downward meshing.
New paragraph	2.1.21 Gear shall be double helical. Any other configuration shall be submitted to the Company for approval.
New paragraph	2.1.22 Up to a gear ratio of 1:9,2 one-stage speed increasers or reducers shall be used. The use of higher gear ratios, which shall utilise two-stage speed, is subject to the approval of the Company.
2.2 Rating	
2.2.1 Gear Unit Rated Power The gear unit power shall be specified by the purchaser. For gear units located next to the driver, the minimum gear unit rated power shall be the maximum installed power of the driver. For electric motor drivers, the gear unit rated power shall be the motor nameplate rating multiplied by the motor service factor. All modes of normal and abnormal operations shall be examined. Modes of operation may include the number of starts per unit of time, reduced load, removal, reversed load, reduced speed, and overload and over speed conditions. For gear units between two items of driven equipment, the power rating of such units should normally be not less than item a or b, whichever is greater: a) 110% of the maximum power required by the equipment driven by the gear unit. b) The maximum power of the driver prorated between the driven equipment, based on normal power demands. If the maximum transmitted torque occurs at an operating speed other than the maximum continuous speed, this torque and its corresponding speed will be specified by the purchaser and	This Paragraph is applicable.

API	GS
shall be the basis for sizing the gear unit.	
2.2.2 Normal Transmitted Power For optimal gear unit design (rotordynamics, lead modification), the purchaser should specify the normal transmitted power and any special operating conditions (such as load reversals), in addition to the gear unit rated power.	This paragraph is applicable.
2.2.3 Gear Service Factor	
2.2.3.1 The minimum gear service factor (SF) shall be specified by the purchaser on the datasheets based on the application, as listed in Table 3.	Service factor as per API Std 613 shall be applied.
2.2.6 Scuffing To avoid scuffing, the gear shall meet the requirements of ANSI/AGMA 6011-C98, Annex B. To avoid dependency on extreme pressure additives, unless otherwise specified, the gear unit shall be designed for use with an oil meeting ISO 14635-1 load stage 5. When an alternative oil is requested, the vendor shall provide calculations and an experience list to support a request for an alternate oil selection. Alternate calculating methods can be used based on supplier experience. Notes: - Refer to AGMA 925 for additional information. - When high speed gears are subject to highly loaded conditions and high sliding velocities the lubricant film may not adequately separate the surfaces. This localized damage to the tooth surface is referred to as "scuffing" (sometimes incorrectly called scoring). Scuffing will exhibit itself as a dull matte or rough finish usually at the extreme end regions of the contact path or near the points of a single pair of teeth contact resulting in severe adhesive wear. Scuffing is not a fatigue phenomenon and may occur instantaneously. The risk of scuffing damage varies with the material of the gear, the lubricant being used, the viscosity of the lubricant, the surface roughness of the tooth flanks, the sliding velocity of the mating gear set under load and the geometry of the gear teeth. Changes in any or all of these factors can reduce scuffing risk.	The gear unit shall be designed for use with an oil meeting ISO 14635-1 load stage ≥ 7 .

API	GS
2.3 Casing	
2.3.1.1 Gear casings shall be either cast or fabricated and shall be designed and constructed to maintain rotor alignment under all load conditions.	In addition, the stiffness of the casing shall be such that no distortion can be induced by shimming the mounting surface. Twisting the casing by shimming the mounting surface to correct or to improve the gear meshing is strictly prohibited. As a minimum, the thickness of the main plates supporting the bearings and the thickness of the lateral plates shall be at least two third of the bearing length. The use of adjustable radial bearings to correct the gear meshing is also strictly prohibited.
2.3.1.8 Where internal space does not permit the use of DN15, DN20, or DN25 (1/2-, 3/4-, or 1-in.) ASTM A 312 pipe, seamless steel tubing conforming to ASTM A 192 with stainless steel fittings, or stainless steel tubing conforming to ASTM A 269 with stainless steel fittings may be furnished. Tubing thicknesses shall meet the requirements of Table 6. The make and model of fittings shall be subject to the purchaser's approval.	All required piping and nozzles shall be AISI 316 stainless steel. If internal space does not permit the use of pipe, stainless steel tubing and flanges conforming to Table 7 with forged AISI 316 stainless steel compression fittings shall be used.
2.3.1.14 Permanent coatings or paint shall not be applied to the interior of the casing unless the purchaser approves in advance the material and method of application.	Permanent coatings or paint shall not be applied to the interior of the casing. Special protective oil shall be applied by continuous vaporization for preservation purpose.
2.4 Casing Connections	
2.4.3 When specified, casings shall be provided with an inlet purge connection at least NPS ½ in., located to assure a sweep of purge gas across the casing to the filter-breather.	This paragraph is not applicable.
2.4.6 Oil inlet and drain connections shall be flanged or machined and studded, oriented as specified and not less than DN20 (NPS ¾). Where flanged or machined and studded openings are impractical, threaded openings in sizes DN20 (NPS ¾) through DN40 (NPS 1 ½) are permissible. These threaded openings shall be installed as specified in 2.4.6.1	Oil inlet and drain connections shall be mandatory flanged whatever the size.

API	GS
through 2.4.6.4.	
2.4.7.4 Purchaser connections other than those covered by ISO 7005-1 or ISO 7005-2 (ASME B16.5) require the purchaser's approval. When specified, mating parts shall be furnished by the vendor.	This paragraph is applicable. Mating parts shall be furnished by the gear Vendor.
2.5 Gear Elements	
2.5.1.4 Hunting tooth combinations are required. To achieve this requirement, it may be necessary for the purchaser to adjust the exact gear ratio. If such adjustment is impractical, the purchaser and the Vendor shall negotiate a solution. Note: A hunting tooth combination is required because the intent is for every tooth on a pinion to mesh many teeth as possible on the mating gear wheel before the same teeth mesh again or repeat.	This paragraph is fully applicable. In addition, gear and pinion tooth numbers shall be "relatively prime", which is a mathematical phrase meaning that they are "prime in relation to each other" (in other words, have no common factors). It is understood that the least common multiple of both gear and pinion tooth numbers shall be equal to the product of these two numbers.
2.5.2.2 Each pair of mating gears shall be considered as a matched set and shall be checked for contact on a contact checking stand and in the job casing at the vendor's shop. The check per 2.5.2.1 cannot be used as a replacement for this check. A thin coating of color transfer material (such as Prussian blue) shall be applied at three locations 120 degrees apart to 4 or more teeth of the dry degreased gear wheel. (Layout dye shall not be used for the contact check on the checking stand.) With the gear elements held firmly on the correct center distance and with the shaft centerlines parallel within 42 µm per meter (0.0005 in./ft) with a total misalignment of not more than 25 µm (0.001 in.), the coated teeth shall be rotated through the mesh with a moderate drag torque applied in a direction that will cause the teeth to contact on the normally loaded faces. The color transfer shall show evidence of contact distributed across each helix as prescribed by the vendor. Prior to the contact tests, the vendor shall make available to the purchaser a contact drawing or vendor engineering specification that defines the acceptable contact. Unmodified leads generally show a minimum of 80% contact across the tooth length. The drawing	Each gear seat shall be checked and measured on a gear checking machine and in the job casing at the gear Vendor's shop. In case of spare part order, the original measuring protocols shall be used to produce the replica set of rotor. Prior to the test, the supplier shall provide the gear contact pattern. The results of the contact check shall be preserved by lifting the contrasting colours with adhesive tape from a tooth and applying the tape to a notated sheet of white paper. A copy of the results of the contact check shall be included in the maintenance manual.

API	GS
or specification and the results of the checking-stand and job-casing contact checks shall be preserved for at least 20 years and shall be available to the purchaser on request. The results of the contact check shall be preserved by lifting the contrasting colors from a tooth by applying and peeling off a strip of clear, adhesive tape and then applying the tape to a annotated sheet of white paper. Notes: 1. When used to support the gear elements during contact checking, runout of shaft centers or rollers may require mechanical compensation to demonstrate the true contact pattern. 2. A thin coat of cuprous oxide paste (made with mineral spirits) may be placed on the pinion to enhance visibility of the transfer.	
2.5.3 Fabrication	
2.5.3.1 Unless otherwise specifically approved by the purchaser, pinions shall be integrally forged with their shafts.	In all case, pinions shall be integrally forged with their shafts.
2.5.3.2 For pitch line velocities above 150 m/sec (30,000 ft/min.), gears shall be integrally forged with their shafts. For pitch line velocities of 150 m/sec (30,000 ft/min.) and less, gears may be integrally forged with, or separate from their shafts. Separate gears shall be forgings or shall be of fabricated construction using forged steel rims and shall be assembled on their shafts with an interference fit. The pitch line velocities listed in Table 8 shall not be exceeded without the purchaser's specific approval.	- For pitch line velocities of 150 m/s or less (corresponding at the maximum continuous speed) the forged gear may be shrunk onto the shaft. The maximum and minimum interference fit shall be clearly indicated in the data sheets. - For pitch line velocities above 150 m/s (corresponding at the maximum continuous speed) the forged gear shall be single piece with the shaft. - In any case the both helical parts of the gear shall be single piece. Gear helical assembly by brazing, welding or shrinking is strictly prohibited.
2.5.3.3 For gears integrally forged with their shafts operating at pitch line velocities above 150 m/sec (30,000 ft/min.), the purchaser and vendor will agree to material suitability an additional inspection and testing necessary to ensure quality. This may include but is not limited to:	This paragraph is fully applicable. Moreover, the gear Vendor shall provide with the offer the specification of the material as well as associated quality control.
• a. Material cleanliness in excess of ANSI/AGMA ISO 6336-5 Grade ME and MX	

API	GS
requirements. • b. Material mechanical properties at center of largest section (hardness, strength, fracture toughness). • c. Ultrasonic inspection of 100% part volume after all heat treatment is completed. • d. Wet magnetic (magnaglo) inspection of part. • e. Placing hole in center area of part (hollow shaft). • f. Forging reduction ratio in excess of normal requirements. • Note: Large changes in diameter from gear outside diameter to shaft/bearing diameters can create difficulties in forging and heat treating that can lead to unexpected stresses and material flaws that are difficult to detect. When operating at high pitch line velocities, these defects can lead to sudden failure.	
2.5.4 Shafts	
• 2.5.4.5 If specified, the vendor shall make one of the provisions specified in 2.5.4.5.1 through 2.5.4.5.3 to measure torsional response.	This paragraph is not applicable.
• 2.5.4.8 If specified, gear elements shall have provisions for vertical storage. This provision shall be capable of supporting 1.5 times the rotor weight. See 3.6.2 for provision of hanging fixture.	Provisions for vertical storage are not required.
2.6 Dynamics	
2.6.2 Lateral Analysis	
New paragraph	In case gears are equipped with a quill shaft and a rigid flanged coupling, a complete shaft lateral analysis including the quill shaft shall be performed by the Vendor having the complete package responsibility.
2.6.2.2 At least three power levels shall be analyzed for the undamped analyses, and shall include the following: a. The bearing oil film, bearing structure at 10%, 50% and 100% gear unit rated power, and gear unit casing support structure stiff	For power generation applications, at least four power levels shall be analyzed for the undamped analyses: 25%, 50% 75% and 100% of the gear unit rated power. For variable speed applications, at least four power levels defined as follows shall be

API	GS
nesses. b. The coupling weight to be supported by each gearbox shaft.	analyzed: a. Minimum continuous speed with associated minimum and maximum powers b. Maximum continuous speed with associated minimum and maximum powers.
• 2.6.2.6 When a damped unbalanced response analysis is required per 2.6.2.4.3, or a critical speed does not meet the requirements of 2.6.2.4.1 or 2.6.2.4.2, or if specified, it shall be conducted for each critical speed within the speed range of 0% - 125% of trip speed. Unbalance shall analytically be placed at the locations that have been determined by the undamped analysis to affect the particular mode most adversely. Unbalance representing the rotor shall be placed at the journal bearing centerline. The magnitude of the unbalance shall be 4 times the value of U as calculated by equation 6. On a pinion, unbalance, representing the potential coupling unbalance for a non-integral coupling, shall be added at the coupling half center of gravity, see Figures 7a and 7b. The magnitude of unbalance shall be equal to 4 times the value of U as calculated at the overhung, cantilevered mode shape in Figures 7a and 7b. In SI units: $U = 6350 \text{ W/N} \quad (6)$ In Customary units: $U = 4 \text{ W/N}$ Where U = input unbalance for the rotor dynamic response analysis in g-mm (oz-in.), N = operating speed nearest to critical speed of concern, in rpm, W = journal static load in kg (lb.), or for bending modes where the maximum deflection occurs at the shaft ends, the overhung mass (that is the mass of the rotor outboard of the bearing) in kg (lb.) (see Figures 7a and 7b).	This paragraph is applicable.

API	GS
2.6.5 Torsional Analysis	
2.6.5.2 If specified, the gear vendor shall conduct the torsional vibration analysis of the complete coupled train.	This paragraph is not applicable. Refer to 2.6.5.1 requirements.
2.6.5.6 When torsional resonances are calculated to fall within the margin specified in 2.6.5.4 (and the purchaser and the vendor have agreed that all efforts to remove the critical from within the limiting frequency range have been exhausted), a stress analysis shall be performed to demonstrate that the resonances have no adverse effect on the compressor train. The assumptions made in this analysis regarding the magnitude of excitation and the degree of damping shall be clearly stated. The acceptance criteria for this analysis shall be agreed upon the purchaser and the vendor.	If a torsional resonance frequency lies in the unauthorized range defined in paragraph 2.6.5.4, the Vendor having the complete package responsibility shall seek a solution using the adaptation effect of the couplings, the gearbox and the rotor. If no solution can be found, the Vendor having the complete package responsibility shall be able to demonstrate that this natural frequency cannot compromise the integrity of the shaft line. He shall supply the calculations for determining normal and alternating stresses in the various elements of the shaft line, in particular the most sensitive elements. The results of the analysis shall be submitted in the form of modified Goodman diagrams and/or life time element calculations. The excitation assumptions shall be clearly stated.
2.6.6 Vibration and Balancing	
2.6.6.5 During the shop test of the machine, assembled with the balanced rotor, operating at its maximum continuous speed or at any other speed within the specified operating speed range, the peak-to-peak amplitude of unfiltered vibration in any plane, measured on the shaft adjacent and relative to each radial bearing, shall not exceed the following value or 25 µm (1mil), whichever is less: In SI units: $A = 25.4 \sqrt{\frac{12000}{N}} \quad (10)$ In Customary units: $A = \sqrt{\frac{12000}{N}}$ where A = amplitude of unfiltered vibration, in µm (mil) true peak-to-peak,	These limits apply from 0 to Maximum Continuous Speed.

API	GS
N = maximum continuous speed, in rpm. At any speed greater than the maximum continuous speed, up to and including the trip speed of the driver, the vibration level shall not exceed 150% of the maximum value recorded at the maximum continuous speed. Note: These limits are not to be confused with the limits specified in 2.6.3 for shop verification of unbalanced response.	
2.6.6.9 Casing Vibration The overall vibration levels during testing shall not exceed the values shown in Table 9.	The overall unfiltered vibration levels reading on the bearing housing in any plane during the mechanical running test shall not exceed 2.9 mm/sec measured in the specified speed range.
2.7 Bearings and Bearing Housings	
2.7.1 General	
2.7.1.4 New paragraph	As a design criteria, alarm set point for inlet oil temperature shall not be less than 60°C. Whatever the oil inlet temperature, metal temperature of thrust and radial bearings shall not exceed 100°C under any load conditions.
2.7.1.2 Bearings shall be designed to prevent incorrect positioning.	The pinion radial bearing shall be of the tilting pad type if the peripheral speed is above 75 m/s (at maximum continuous speed) or if the journal bearing load is greater than 30 bar for any specified operating conditions. The pads shall be able to tilt around both axial and transversal axis (linear contact at the back side of the pad is strictly prohibited)
2.8 Lubrication	
2.8.3 The oil system shall be furnished by either the purchaser or the vendor, as specified.	The oil system shall be furnished either by the Vendor having the complete package responsibility or the gear Vendor.
2.8.5 Unless otherwise specified, pressurized oil systems shall conform to the requirements of Special-Purpose Oil Systems as defined in Chapters 1 and 2 of API Std 614.	Pressurized oil systems shall conform to the requirements of the GS EP MEC 281.
2.8.6 Where oil is supplied from a common system to two or more components of a machinery train (such as a compressor, a gear, and a motor), the vendor having unit	To avoid dependency on extreme pressure additives, the gear unit shall be designed for use with an oil meeting ISO 14365-1 load stage 7.

API	GS
responsibility shall ensure compatibility of type, grade, pressure and temperature of oil for all equipment served by the common system.	
3. Accessories	
New paragraph	Any noise attenuation device such as cladding or specific enclosure around the gear casing is not permitted.
3.1 General The purchaser shall specify the accessories to be supplied by the vendor.	Refer to the subject Rotating Machine Package Datasheet and Specification.
3.2 Couplings and guards	
3.2.1 Unless otherwise specified, flexible couplings and guards between drivers, gear units and driven equipment shall be supplied by the manufacturer of the driven equipment.	Flexible couplings and guards between drivers, gears and driven equipment shall be supplied by the Vendor having the complete package responsibility. Half-couplings shall be mounted by the gear Vendor.
3.2.3 Couplings and guards shall conform to API Std 671. The make, type and mounting arrangement of the coupling shall be agreed upon the purchaser and the vendors of the driver, gear units and driven equipment.	In addition to API Std 671 , coupling guards shall be of rigid type, non-sparking and sealed.
3.3 Mounting Plates	
3.3.1 General	
3.3.1.1 If specified, the gear unit shall be furnished with soleplates or a baseplate.	The gear box shall be mounted either on the driver or driven machine common baseplate. Refer to the subject Rotating Machine Package Datasheet and Specification.
3.3.1.2.8 Unless otherwise specified, anchor bolts will be furnished by the purchaser.	Anchor bolts shall be provided by the Vendor having the complete package responsibility.
6.3.2 Baseplate	
3.3.2.3 If specified, the baseplate shall be designed to facilitate the use of optical, laser-based or other instruments for accurate leveling in the field. The details of such facilities shall be agreed by the purchaser and the vendor. Where the requirement is satisfied by the provisions of leveling pads and/or targets, they shall be accessible with the baseplate on the foundation and the	This paragraph is applicable.

API	GS
equipment mounted. Removable protective covers shall be provided. For column-mounted baseplates (see 3.3.2.4), Leveling pads or targets shall be located close to the support points. For non-column-mounted baseplates, a pad or target should be located at each corner. When required for long units, additional pads shall be located at intermediate points.	
• 3.3.2.4 If specified, the baseplate shall be suitable for column mounting (that is, of sufficient rigidity to be supported at specified points) without continuous grouting under structural members. The baseplate design shall be agreed upon by the purchaser and the vendor.	This paragraph is applicable.
• 3.3.2.10 If specified, sub-sole plates shall be provided by the vendor.	Sub soleplates shall be provided by the Vendor having the complete package responsibility.
3.4 Controls and Instrumentation	
3.4.2 Vibration, Position, and Temperature Detectors	
New Paragraph.	Gearbox protection and monitoring system shall comply with API Std 670 requirements. In particular, Appendix H - typical System arrangement plans shall apply. Vibration and temperature monitors shall be either programmed in the package UCP or in a dedicated vibration/temperature monitoring cabinet.
3.4.2.3 Radial shaft vibration probes shall be located in the x-y positions on the input and output shaft adjacent to the bearing on the coupling side. Provision for x-y probes, including shaft runout of the target areas per paragraph 2.5.4.4, shall be provided on all radial bearings unless otherwise specified.	Each journal bearing shall be provided with shaft vibration detection and the associated monitoring system based on X and Y non contact vibration probes.
• 3.4.2.5 If specified, radial shaft vibration and axial position monitors shall be supplied and calibrated in accordance with API Std 670.	This paragraph is applicable.
• 3.4.2.6 If specified, casing vibration monitors shall be supplied, installed and	This paragraph is applicable.

API	GS
calibrated in accordance with API Std 670.	
3.4.2.7 The type of temperature detectors shall be specified. The temperature detectors shall be installed and calibrated in accordance with API Std 670.	Each journal bearing shall be provided with two temperature detectors and associated monitoring system. The two RTDs shall be fitted within two successive pads, one being the most loaded. Both RTDs shall be wired up to a skid battery limit junction box. Both outboard and inboard thrust bearings shall be provided with two temperature detectors and monitoring system. On each side, the two RTDs shall be fitted within two separate pads and wired up to a skid battery limit junction box.
3.6 Special Tools	
3.6.2 If specified, hanging fixtures shall be provided for vertical storage of the rotors. See 2.5.4.8 for shaft provisions for these fixtures.	Provisions for vertical storage are not required.
4. Inspection, Testing, and Preparation for Shipment	
4.1 General	
4.1.1 The purchaser shall specify the extent of participation in the inspection and testing.	Refer to the subject Rotating Machine Package Data Sheet.
4.1.1.3 If specified, the purchaser's representative, the vendor's representative, or both shall indicate compliance in accordance with the inspector's check list (Appendix I) by initialing, dating and submitting the completed checklist to the purchaser prior to shipment.	This paragraph is applicable.
4.1.3 The purchaser shall specify the amount of advanced notification required for a witness or observed inspection or test.	Refer to the Package Contract Terms and Conditions. Test procedures shall be approved by the Company prior to the commencement of any testing.
4.2 Inspection	
4.2.1 General	
4.2.1.1. The vendor shall keep the following data available for at least 20 years from the date of shipment of the equipment. For parts that are repaired, the data shall be kept for 20 years from the date of shipment of the	This paragraph is fully applicable.

API	GS
repaired part. This data shall be available for examination or reproduction by the purchaser or his representative upon request: - Necessary certification of materials, such as mill test reports. - Purchase specifications for all items on bills of materials. - Test data to verify that the requirements of the specification are being met. - Results of documented tests and inspections, including fully identified records of all heat treatment and radiography. - If specified, final-assembly maintenance and running clearances.	
4.2.1.2 The purchaser may specify the following: - Parts to be subjected to surface and subsurface examination. - The type of inspection required, such as magnetic particle, dye penetrant, radiographic and ultrasonic examination.	Gear Vendor standard shall apply.
4.2.2 Material Inspection	
4.2.2.1 General If radiographic, ultrasonic magnetic particles, or liquid penetrant inspection of welds or materials is required or specified, the criteria are specified in 4.2.2.2 through 4.2.2.5 shall apply, unless other criteria are specified by the purchaser. Cast iron may be inspected in accordance with 4.2.2.4 and 4.2.2.5. Welds, cast steel, and wrought material may be inspected in accordance with 4.2.2.2 through 4.2.2.5.	Gear Vendor standard shall apply.
4.2.2.6 Rotating Elements	
4.2.2.6.1 Certified information on the major rotating elements shall be kept available for 20 years from the date of shipment and shall be obtainable by the purchaser upon request. All records of work, whether performed in the normal course of manufacture or as part of a repair procedure, shall be fully identified. This information shall include the following:	This paragraph is applicable.

API	GS
a. Chemical and physical data from specimens made and heat treated with the parts. b. Records of all heat treatment and resulting hardnesses. c. Radiographs and records of ultrasonic inspections, if radiography and ultrasonic inspection are performed. d. For surface-hardened gears, hardnesses and case depths determined on coupons treated with the work pieces. e. For through-hardened gears, hardnesses determined in at least three dispersed locations in the tooth blank area.	
• 4.2.2.8 Additional Inspection Additional gear tooth inspections may be required when agreed upon by the purchaser and the vendor. These may include (but are not limited to) inspections of tooth spacing, pitch line runout, profile and lead.	This paragraph is applicable.
4.2.3 Mechanical Inspection	
• 4.2.3.2 All oil systems shall meet the cleanliness requirement of API Std 614. When specified, the purchaser may inspect for cleanliness the equipment and all piping and appurtenances furnished by or through the vendor before piping is finally assembled.	This paragraph is applicable. All oil systems shall meet the cleanliness requirements of API Std 614.
• 4.2.3.3 If specified, the hardness of parts, welds, and heat-affected zones shall be verified as being within the allowable values by testing of the parts, welds, or zones. The method, extent, documentation, and witnessing of the testing shall be agreed by the purchaser and the vendor.	Gear Vendor standard shall apply.
4.3 Testing	
4.3.1 General	
4.3.1.2 At least 6 weeks before the first scheduled running test, the vendor shall submit to the purchaser, for his review and comment, detailed procedures for all running tests, including acceptance criteria for all	Refer to the Package Contract Schedule Document Review List.

API	GS
monitored parameters.	
4.3.1.3 The vendor shall notify the purchaser not less than 5 working days prior to the date the equipment will be ready for testing. If the testing is rescheduled, the vendor shall notify the purchaser not less than 5 working days prior to the new date.	Refer to the Package Contract.
4.3.2 Mechanical Running Tests	
4.3.2.1.2 All oil pressures, viscosities, and temperatures shall be at the operating values recommended in the manufacturer's operating instructions for the specific unit being tested. The overall oil flow rate to the gear unit shall be recorded.	When the test bench is equipped with different oil than contractual oil, oil inlet temperature correction shall be applied to simulate the contractual oil viscosity.
• 4.3.2.2.3 If seismic test values are specified, vibration data (minimum and maximum values) shall be recorded and located (clock angle) in a radial plane transverse to each bearing centerline (if possible) using shop instrumentation during this test.	This paragraph is applicable.
• 4.3.2.2.12 Plots showing synchronous vibration amplitude and phase angle versus speed for deceleration shall be made before and after the 4-hours run. Plots shall be made of both the filtered (one per revolution) and the unfiltered vibration levels, if specified; these data shall also be furnished in polar form. The speed range covered by these plots shall be 400 rpm to the specified driver trip speed.	This paragraph is applicable. In addition, lubrication requirements (oil flows) shall be individually measured for each components (mesh, HS bearings, LS bearings, thrust bearings) and compare to expected data (refer rotating Machine Package Datasheet).
• 4.3.2.2.13 If specified, lube-oil inlet pressures and temperatures shall be varied through the range permitted in the operating manual. This shall be done during the 4-hours test.	This paragraph is applicable.
• 4.3.2.2.14 If specified, tape recordings shall be made of all real-time vibration data.	This paragraph is applicable.
• 4.3.2.2.15 If specified, the tape recordings of real-time vibration data shall be provided to the purchaser.	This paragraph is applicable.
• 4.3.2.2.16 Testing at any additional speeds, the duration of testing at each speed,	Refer to the subject Rotating Machine

API	GS
and the data to be recorded shall be specified by the purchaser at the time of purchase.	Package Specification.
4.3.2.3.3 If replacement or modification of bearings or seals, or dismantling of the case to replace or modify other parts is required to correct mechanical or performance deficiencies, the initial tests shall not be acceptable, and the final shop tests shall be run after these replacements or corrections are made.	This paragraph is fully applicable
New Paragraph	During the mechanical running tests, a sound-level test shall be performed in accordance with ISO 3746 .
New Paragraph	After the mechanical running test, the individual lube oil supply flows shall be measured at rest.
4.3.3 Optional Tests If specified, the shop test described in 4.3.3.1 through 4.3.3.5 shall be performed.	Shop tests described in 4.3.3.1 through 4.3.3.5 are not required.
4.4 Preparation for Shipment	
4.4.1 Equipment shall be suitably prepared for the type of shipment specified, including blocking of rotor when necessary (such as when the gear unit does not contain thrust bearings). The preparation shall make the equipment suitable for 6 months of outdoor storage from the time of shipment, with no disassembly required before operation. If storage for a longer period is contemplated, the purchaser should consult with the vendor regarding the recommended procedures to be followed	In case of loose delivery to Company, a 12 months outdoor storage is required.
4.4.3.9 If spare gear elements are purchased, the rotors shall be suitably prepared for unheated indoor storage for a period of at least 3 years. The rotors shall be treated with rust preventive and shall be housed in a vapor barrier envelope with a slow-release vapor-phase inhibitor. The rotors shall be crated for domestic or export shipment, as specified. A purchaser-approved resilient material 3mm (1/8-in. thick) (not	This paragraph is applicable.

API	GS
tetrafluoroethylene [TFE] or polytetrafluoroethylene [PTFE]) shall be used between the rotors and the cradle at the support areas. The rotors shall not be supported at journals (unless mounted in gear unit), probes areas, seal areas, coupling fit areas, or gear teeth. The probe target areas shall be marked "Probe Area, Do Not Cut" (see 2.5.4.8 and 3.6.2 for vertical storage provisions). Note: TFE and PTFE are not recommended as cradle support liners since they could flow and impregnate into the surface.	
• 4.4.4 If specified, metal "Top Hat" covers shall be bolted to the gear unit, totally enclosing and sealing the shaft ends to allow for purging of the gear unit with minimal leakage.	This paragraph is applicable.
• 4.4.5 If specified, a steel rotor container (s) shall be supplied. Steel rotor shipping containers shall have provisions for storage of a rotor in both a horizontal position and a vertical position. The placement of the runners should allow for a fork truck to be able to move the container and the rotor while placed in the horizontal position. Additionally, lugs should be provided to allow a crane to lift the container while the rotor is in the container. The container, valves, and connections shall be designed for a minimum of 0.35 bar (5 psig) pressure. The purge gas should be specified. Containers shall be cylindrical, horizontally split and the top is to be sealed, bolted and doweled to prevent movement and leakage. The pressure in the container is to be maintained during storage at a minimum of 0.07 bar (1 psig).	Spare rotor shall be provided with N2 pressurized container and pressure monitoring.
5. Vendor's Data	
5.3 Contract Data	
5.3.1 General	
5.3.1.1 Contract data shall be furnished by the vendor in accordance with the agreed VDDR form (see Appendix F).	Refer to the Package Contract Terms and Conditions.



General Specification		GS EP MEC 242
Special Purpose Gear Units for Petroleum, Chemical and Gas Service Industries According to API Standard 613		
Rev.: 04	Effective date: 10/2012	Page: 25 of 30

API	GS
5.3.3 Progress Reports The vendor shall submit progress reports to the purchaser at intervals specified.	Refer to the Package Contract Terms and Conditions.
5.3.5 Installation, Operation, Maintenance and Data Manuals	
5.3.5.4 Technical Data Manual When specified, the vendor shall provide the purchaser with a technical data manual within 30 days of completion of shop testing (see description of line item 26 in Appendix F for minimum requirements of this manual). Vendor may combine the technical manual with the operating and maintenance manual.	Refer to the Package Contract Terms and Conditions.



General Specification		GS EP MEC 242
Special Purpose Gear Units for Petroleum, Chemical and Gas Service Industries According to API Standard 613		
Rev.: 04	Effective date: 10/2012	Page: 26 of 30

Appendix 1

Appendix 1 Data Sheet



General Specification

GS EP MEC 242

Special Purpose Gear Units for Petroleum, Chemical and Gas Service Industries According to API Standard 613

Rev.: 04

Effective date: 10/2012

Page: 27 of 30

Appendix 1

		JOB NO. _____ ITEM NO. _____
SPECIAL PURPOSE GEAR UNITS DATA SHEET (API 613-5TH) SI UNITS		PURCHASE ORDER NO. _____
		SPECIFICATION NO. _____
		REVISION NO. _____ DATE _____
		PAGE 1 OF 4 BY _____
		DS EP MEC 243
1	APPLICABLE TO: ☐ PROPSAL ☐ PURCHASE ☐ AS BUILT	☐ US STANDARDS (1.7) ☐ ISO STANDARDS (1.7)
2	FOR _____	MANUFACTURER _____
3	SITE _____	MODEL NO. _____
4	UNIT _____	SERIAL NO. _____
5	SERVICE _____	DRIVER TYPE _____
6	NO. REQUIRED _____	DRIVEN EQUIPMENT _____
7		
8	NOTE: NUMBERS WITHIN () REFER TO APPLICABLE API STANDARD 613 PARAGRAPHS.	
9	☐ INFORMATION TO BE COMPLETED BY PURCHASER	☐ INFORMATION TO BE COMPLETED BY MANUFACTURER
10	☐ UNITS OF MEASUREMENT (1.8)	☐ BASIC GEAR DATA
11	☐ US CUSTOMARY UNITS	
12	☒ SI UNITS	
13	☐ RATING REQUIREMENTS	☐ SINGLE STAGE ☐ SINGLE HELICAL
14	DRIVEN EQUIP. kW(2.1.4): NORM. _____ MAX _____	☐ DOUBLE STAGE ☐ DOUBLE HELICAL
15	DRIVER kW: RATED _____ MAX _____	☐ EPICYCLIC ☐ _____
16	NORMAL TRANSMITTED POWER (2.2.2) _____ kW	MECHANICAL RATING (1.5.16) _____ kW @ _____ RPM
17	GEAR UNIT RATED POWER (2.2.1) _____ Kw	GEAR SERVICE FACTOR (2.2.3.1) _____ (ACTUAL)
18	TORQUE @ MAX. CONT. SPEED _____ kg m	FULL LOAD GEAR UNIT POWER LOSS _____ KW
19	MAX TORQUE (2.2.1) _____ kg m @ _____ RPM	GEAR UNIT MECHANICAL EFFICIENCY _____ %
20	☐ REDUCER ☐ INCREASER	RATING SPEED, RPM PINION _____ GEAR _____
21	RATED SPEED, RPM (2.1.5):	HARDNESS USED FOR
22	INPUT ☐ SPECIFIED ☐ NOMINAL	RATING, (HB or Rc) PINION _____ GEAR _____
23	OUTPUT ☐ SPECIFIED ☐ NOMINAL	TOOTH PITTING INDEX, "K" mpa (2.2.4.1)(2.2.4.2):
24	ALLOW VAR IN GEAR RATIO (2.1.5)(+)(-) _____ %	ALLOWABLE _____ ACTUAL _____
25	MAX CONTINUOUS SPEED (1.5) _____ RPM	MATERIAL INDEX NUMBER, mpa (Fig3, Table 4) _____
26	TRIP SPEED (1.5)(2.1.7) _____ RPM	BENDING STRESS NUMBER, "SI" mpa (2.2.5.1)(2.2.5.2)
27	GEAR SERVICE FACTOR (2.2.3.1) _____ (MIN)	PINION:ALLOWABLE _____ ACTUAL _____
28	HARDNESS (2.2.3.2) PINION _____ GEAR _____	GEAR:ALLOWABLE _____ ACTUAL _____
29	SHAFT ASSEMBLY DESIGNATION (2.1.19)	PITCH LINE VELOCITY _____ m/sec
30	HS SHAFT ROT FAC'g Cp'g (2.1.20.2) ☐ CW ☐ CCW	ANTICIPATED SPL (2.1.6) _____ Dba @ _____ m
31	LS SHAFT ROT FAC'g Cp'g (2.1.20.2) ☐ CW ☐ CCW	WR ² REFERRED TO LS SHAFT _____ kg mm ²
32	EXTERNAL LOADS (2.1.16) _____	BREAKAWAY TORQUE _____ kg m
33	OTHER OPERATING COND. (2.2.2)(2.6.1.3) _____	PINION TEETH HARDNESS RANGE _____
34		PINION TEETH HARDENING METHOD: _____
35	☐ INSTALLATION DATA (2.1.14)	☐ HS SHAFT SEPARATE HARDNESS RANGE _____
36	☐ INDOOR ☐ HEATED ☐ UNDER ROOF	GEAR TEETH (RIM) HARDNESS RANGE _____
37	☐ OUT DOOR ☐ UNHEATED ☐ PARTIAL SIDES	GEAR TEETH HARDENING METHOD: _____
38	☐ GRADE ☐ MEZZANINE ☐ _____	GEAR HUB:
39	☐ WINTERIZATION REQ'D ☐ TROPICALIZATION REQ'D	☐ FORGED CYLINDER ☐ FORGED & COPED ☐ FABRICATED
40	ELECTRICAL AREA (2.1.10) CLASS GRP DIV _____	GEAR TO SHAFT FIT METHOD (2.5.3.2)
41	ELECTRICAL AREA (2.1.10) CLASS ZONE TEMP. _____	☐ INTEGRAL ☐ KEYED INTERFERENCE ☐ KEYLESS INTEFERENCE
42	MAX ALLOW SPL (2.1.6) _____ dBA @ _____ m	RIM ATTACHEMENT (2.5.3.2)
43	ELEVATION _____ m BAROMETER _____ kPa abs	LS SHAFT HARDNESS RANGE _____
44	RANGE OF AMBIENT TEMPERATURES:	JOURNAL STATIC WEIGHT LOADS (2.6.6.3)
45	DRY BULB _____ WET BULB _____	PINION _____ kg GEAR _____ kg
46	NORMAL _____ °C _____ °C	TOTAL GEAR UNIT ASSEMBLED WEIGHT _____ kg
47	MAXIMUM _____ °C _____ °C	NOTES: _____
48	MINIMUM _____ °C _____ °C	_____
49	UNUSUAL CONDITIONS ☐ DUST ☐ FUMES	_____
50	☐ _____	_____

SHT 1 OF 4

Special Purpose Gear Units for Petroleum, Chemical and Gas Service Industries According to API Standard 613

Rev.: 04

Effective date: 10/2012

Page: 29 of 30

Appendix 1

				SPECIAL PURPOSE GEAR UNITS DATA SHEET (API 613-5TH) SI UNITS	
1 LUBRICATION REQUIREMENTS				ADDITIONAL REQUIREMENTS	
2 OIL SYSTEM FURNISHED BY (2.8.3):				JOB NO. _____ ITEM NO. _____	
3 OTHER _____ GEAR VENDOR _____				REVISION NO. _____ DATE _____	
4 OIL VISC. _____ cP @ 40°C _____ cP @ 100°C (2.8.6)				PAGE 3 OF 4 BY _____	
5 ISO GRADE _____ LOAD STAGE (2.2.6) _____				DS EP MEC 243	
6 _____				VIBRATION DETECTORS	
7 ☐ MESH				RADIAL (3.4.2.1) (2.7.4.5) (2.7.4.6)	
8 MESH AND WINDAGE POWER LOSS _____ kW				☐ MANUFACTURER _____ ☐ TOTAL N° _____	
9 OIL FLOW, MESH _____ m³/hr				☐ X-Y PROBES PINION BEARINGS ☐ COUPLING END ☐ BLIND END	
10 _____				☐ X-Y PROBES GEAR BEARINGS ☐ COUPLING END ☐ BLIND END	
11 ☐ LUBRICATION REQUIREMENTS				☐ OTHER _____	
12 MIN. STARTUP OIL TEMPERATURE _____ °C				AXIAL (3.4.2.1) (2.7.4.5) (2.7.4.6)	
13 NORMAL OIL INLET TEMPERATURE _____ °C				☐ MANUFACTURER _____ ☐ TOTAL N° _____	
14 MAXIMUM OIL INLET TEMPERATURE _____ °C				☐ DUAL PROBES AT EACH THRUST BEARING	
15 UNIT OIL FLOW (TOTAL) _____ m³/hr				☐ SINGLE PROBE ANY SHAFT WITHOUT THRUST BEARING	
16 UNIT OIL PRESSURE _____ kPa				☐ OTHER _____	
17 ☐ OIL VISC. _____ cP @ 40°C _____ cP @ 100°C (2.8.6)				ONE EVENT PER REVOLUTION PROBE (2.7.4.5) (2.7.4.6)	
18 ☐ ISO GRADE _____ LOAD STAGE (2.2.6) _____				☐ MANUFACTURER _____ ☐ TOTAL N° _____	
19 _____				☐ ONE ON INPUT SHAFT ☐ ONE ON OUTPUT SHAFT	
20 ☐ PIPING CONNECTIONS				☐ OTHER _____	
21 SERVICE N° SIZE TYPE				ACCELEROMETER (3.4.2.1) (2.7.4.5) (2.7.4.6)	
22 LUBE OIL INLET				☐ MANUFACTURER _____ ☐ N° REQUIRED _____	
23 LUBE OIL OUTLET				☐ PINION COUPLING END ☐ GEAR COUPLING END	
24 CASING DRAIN *				☐ OTHER _____	
25 VENT				TEMPERATURE DETECTORS	
26 CASING PURGE				☐ DIAL TYPE THERMOMETERS (3.4.2.7) _____	
27 * CASING DRAIN IS 'DEAD BOTTOM' HOUSING DRAIN, NOT LUBE OIL OUTLET				☐ TYPE BRG. TEMP. SENSORS (3.4.2.7)(2.7.1.3) _____	
28 ☐ MOUNTING PLATES				☐ RTD ☐ THERMOCOUPLE / ☐ SIMPLEX ☐ DUPLEX	
29 ☐ GEAR FURNISHED W/ (3.3.1.1)				CALIBRATION _____	
30 ☐ BASEPLATE ☐ SOLEPLATE ☐ SUBPLATE (3.3.2.10)				☐ HS/LS BEARING N°. SENSORS EACH _____ / _____	
31 ☐ MOUNTING PLATE(S) FURNISHED BY (3.3.1.1) _____				☐ THRUST - NUMBER OF SENSING ELEMENTS EACH FACE _____	
32 ☐ BASEPLATE LEVELLING (3.3.2.3) _____				OTHER VIBRATION AND TEMPERATURE	
33 ☐ BASEPLATE WITH LEVELING PADS (3.3.2.3) _____				(3.4.2.5) (3.4.2.6) OTHER GEAR VENDOR	
34 ☐ BASEPLATE SUITABLE FOR COLUMN MOUNTING (3.3.2.4) _____				OSCILLATOR DEMODULATOR SUPPLIED BY ☐ ☐	
35 ☐ VENDOR REVIEW OF PURCHASER'S FOUNDATION DWGS (2.1.13) _____				VIBRATION MONITOR SUPPLIED BY ☐ ☐	
36 ☐ GROUT TYPE (3.3.1.2.4) _____				☐ VIBRATION SHUTDOWN DELAY TIME _____ SECONDS	
37 _____				TEMPERATURE MONITOR SUPPLIED BY ☐ ☐	
38 ☐ CONTRACT DATA				OSCILLATOR DEMODULATOR J-BOX BY ☐ ☐	
39 ☐ TEST DATA PRIOR TO SHIPMENT _____				TEMP. SENSOR TERMINATION J-BOX BY ☐ ☐	
40 ☐ PROGRESS REPORT (5.3.3) _____				J-BOX TYPE: _____ MOUNT: _____	
41 ☐ VENDOR SIGNOFF OF INSPECTOR CHECKLIST (4.1.1.3) _____				MISCELLANEOUS	
42 ☒ INFORMATION RETAINED FOR 20 YEARS (4.2.1.1)(4.2.2.6.1) _____				☒ UNDAMPED CRITICAL ANALYSIS REPORT (2.6.2.1)	
43 ☐ TECHNICAL MANUAL (5.3.5.4) _____				☐ W/ DAMPD ROTR RESPNS ANALYSIS RPRT (2.6.2.4.3) (2.6.2.6)	
44 ☐ PAINTING (4.4.3.1) _____				TORSIONAL ANALYSIS BY (2.6.5.2) ☐ GEAR VENDOR ☐ OTHER	
45 ☐ PAINTING HOUSING INTERIOR NOT ALLOWED (2.3.1.14) _____				☐ SPARE SET OF GEAR ROTORS (4.3.2.4)	
46 ☐ SHIPMENT				☐ GEAR CASE FURNISHED WITH INLET PURGE CONNECTION (2.4.3)	
47 ☐ STEEL ROTOR STORAGE CONTAINER (4.4.5) ☐ SHAFT COVERS (4.4.4)				☐ ORIENTATION OF OIL INLET & DRAIN CONN. (2.4.6)	
48 CONTRACT UNIT SPARES				☐ FILTER BREATHER LOCATION (2.3.1.12) _____	
49 EXPORT BOXING ☐ ☐				☐ TORSIONAL DEVICE PROVISIONS (2.5.4.5) _____	
50 DOMESTIC BOXING ☐ ☐				☐ ROTOR VERTICAL STORAGE PROVISIONS (2.5.4.8) _____	
51 OUTDOOR STORAGE OVER 6 MOS. ☐ 3 YR INDOOR ☐ (4.4.3.9)				☐ ROTOR VERTICAL STORAGE FIXTURE(S) (3.6.2) _____	
				☐ VENDOR SERVICE REP. ON SITE (2.1.13) _____	

SHT 3 OF 4

