PETROBRAS

N-1921	REV. C	ENGLISH	08 / 2013

Special Purpose Gear - Data Sheet

Standardization

This Standard replaces and cancels its previous revision.

The CONTEC - Authoring Subcommittee provides guidance on the interpretation of this Standard when questions arise regarding its contents. The Department of PETROBRAS that uses this Standard is responsible for adopting and applying the sections, subsections and enumerates thereof.

Technical Requirement: A provision established as the most adequate and which shall be used strictly in accordance with this Standard. If a decision is taken not to follow the requirement ("non-conformity" to this Standard) it shall be based on well-founded economic and management reasons, and be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by imperative nature.

Recommended Practice: A provision that may be adopted under the conditions of this Standard, but which admits (and draws attention to) the possibility of there being a more adequate alternative (not written in this Standard) to the particular application. The alternative adopted shall be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by verbs of a nonmandatory nature. It is indicated by the expression: **[Recommended Practice]**.

Copies of the registered "non-conformities" to this Standard that may contribute to the improvement thereof shall be submitted to the CONTEC - Authoring Subcommittee.

Proposed revisions to this Standard shall be submitted to the CONTEC - Authoring Subcommittee, indicating the alphanumeric identification and revision of the Standard, the section, subsection and enumerate to be revised, the proposed text, and technical/economic justification for revision. The proposals are evaluated during the work for alteration of this Standard.

CONTEC
Comissão de Normalização Técnica

SC - 11
Machines

Introduction

PETROBRAS Technical Standards are prepared by Working Groups - WG (consisting specialized of Technical Collaborators from Company and its Subsidiaries), are commented by Company Units and its Subsidiaries, are approved by the Authoring Subcommittees - SCs (consisting of technicians from the same specialty, representing the various Company Units and its Subsidiaries), and ratified by the Executive Nucleus (consisting of representatives of the Company Units and its Subsidiaries). A PETROBRAS Technical Standard is subject to revision at any time by its Authoring Subcommittee and shall be reviewed every 5 years to be revalidated, revised or cancelled. PETROBRAS Technical Standards are prepared in accordance with PETROBRAS Technical Standard N-1. For complete information about PETROBRAS Technical Standards see PETROBRAS Technical Standards Catalog.

Foreword

This Standard is the English version (issued in 08/2013) of PETROBRAS N-1921 REV. C 08/2013. In case of doubt, the Portuguese version, which is the valid document for all intents and purposes, shall be used.

1 Scope

1.1 This Standard covers special purpose gear data sheet to be used in PETROBRAS designs.

1.2 This Standard shall be applied to supplies beginning from its issue date.

1.3 This Standard contains only Technical Requirements.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

PETROBRAS N-381 - Execution of Drawing and Other General Technical Documents;

PETROBRAS N-1521 - Identification of Industrial Equipment;

API STD 613 - Special Purpose Gear Units for Petroleum, Chemical, and Gas Industry Services.

NOTE For documents referred in this Standard and for which only the Portuguese version is available, the PETROBRAS department that uses this Standard should be consulted for any information required for the specific application.

3 Basic Considerations

3.1 The Annex A is the data sheet to be used to special purpose gear for SI units, according to API STD 613.

3.2 The Annex B is the data sheet to be used to special purpose gear for Technical System units.

3.3 These data sheets shall be attached to a RM (Material Requisition), to be considered a purchasing document.

3.4 These data sheets shall be considered a lasting document of the equipment after they have been fulfilled (as built) by the Manufacturer or Engineering Company.

3.5 The heading and footnotes shall be filled in accordance with PETROBRAS N-381.

3.6 The tag number of the equipment shall be written in an outstanding position as per PETROBRAS N-1521.

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	JOB:	
	AREA:	
	TITLE: SPECIAL PURPOSE GEAR	

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DATA SHEET

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SHEET 2 of 6

TITLE:

SPECIAL PURPOSE GEAR

APPLICABLE TO: ☐ PROPOSAL ☐ PURCHASE ☐ AS BUILT

FOR:	UNIT:
SITE:	SERVICE:
No. REQ'D:	MANUFACTURER:
MODEL:	VENDOR:
SIZE / TYPE	DRIVER / DRIVEN – (TYPE):
SERIAL No.:	MANUFACTURER No.

UNITS OF MEASUREMENT

☐ TECHNICAL SYSTEM UNITS
☒ SI UNITS

RATING REQUIREMENTS

DRIVEN EQUIP. kW: NORM. ____ MAX. ____
DRIVER kW: RATED ____ MAX. ____
NORMAL TRANSMITTED POWER ____ kW
GEAR UNIT RATED POWER ____ kW
TORQUE @ MAX CONT SPEED ____ N.m
MAX TORQUE ____ N.m @ ____ rpm
☐ REDUCER ☐ INCREASER
RATED SPEED, rpm:
INPUT ____ ☐ SPECIFIED ☐ NOMINAL
OUTPUT ____ ☐ SPECIFIED ☐ NOMINAL
ALLOW. VAR IN GEAR RATIO (+) (-) ____ %
MAX CONTINUOUS SPEED ____ rpm
TRIP SPEED ____ rpm
GEAR SERVICE FACTOR ____ (MIN)
HARDNESS, PINION ____ GEAR ____
SHAFT ASSEMBLY DESIGNATION ____
HS SHAFT ROT FAC'G CPL'G ☐ CW ☐ CCW
LS SHAFT ROT FAC'G CPL'G ☐ CW ☐ CCW
EXTERNAL LOADS ____
OTHER OPERATING CONDITIONS ____

INSTALLATION DATA

☐ INDOOR ☐ HEATED ☐ UNDER ROOF
☐ OUTDOOR ☐ UNHEATED ☐ PARTIAL SIDES
☐ GRADE ☐ MEZZANINE ☐ ____
☐ WINTERIZATION REQ'D ☐ TROPICALIZATION REQUIRED
ELEC. AREA: ZONE ____ GRP ____ TEMP. ____
ELEC. AREA: DIV. ____ CLASS/GRP ____ TEMP. ____
MAX ALLOW SPL ____ dBA @ ____ m
ELEVATION ____ m BAROMETER ____ kPa
RANGE OF AMBIENT TEMPERATURES:

	DRY BULB	WET BULB
NORMAL	____ °C	____ °C
MAXIMUM	____ °C	____ °C
MINIMUM	____ °C	____ °C

RELATIVE HUMIDITY, %:
UNUSUAL CONDITIONS ☐ DUST ☐ FUMES ☐ SALTY ATMOSPHERE ☐ OTHER ____

BASIC GEAR DATA

☐ SINGLE STAGE ☐ SINGLE HELICAL
☐ DOUBLE STAGE ☐ DOUBLE HELICAL
☐ EPICYCLIC ☐ ____
MECHANICAL RATING kW ____ @ ____ rpm
GEAR SERVICE FACTOR ____ (ACTUAL)
FULL LOAD GEAR UNIT POWER LOSS ____ kW
GEAR UNIT MECHANICAL EFFICIENCY ____ %
RATED SPEED, RPM PINION ____ GEAR ____
HARDNESS USED FOR
RATING, (HB OR RC) PINION ____ GEAR ____
TOOTH PITTING INDEX, "K" MPa
ALLOWABLE ____ ACTUAL ____
MATERIAL INDEX NUMBER, MPa ____
BENDING STRESS NUMBER, "St" MPa
PINION: ALLOWABLE ____ ACTUAL ____
GEAR: ALLOWABLE ____ ACTUAL ____
PITCH LINE VELOCITY ____ m/s
ANTICIPATED SPL ____ dBA @ ____ m
WR^2 REFERRED TO LS SHAFT ____ $N.mm^2$
BREAKAWAY TORQUE ____ N.m
PINION TEETH HARDNESS RANGE ____
PINION TEETH HARDENING METHOD: ____
☐ HS SHAFT SEPARATE / HARDNESS RANGE ____
GEAR TEETH (RIM) HARDNESS RANGE ____
GEAR TEETH HARDENING METHOD: ____
GEAR HUB:
☐ FORGED CYLINDER ☐ FORGED & COPED ☐ FABRICATED
GEAR TO SHAFT FIT METHOD
☐ INTEGRAL ☐ KEYED INTERFERENCE ☐ KEYLESS INTERFERENCE
RIM ATTACHMENT ____
LS SHAFT HARDNESS RANGE
JOURNAL STATIC WEIGHT LOADS
PINION ____ N GEAR ____ N
TOTAL GEAR UNIT ASSEMBLED WEIGHT ____ N

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TITLE:

SPECIAL PURPOSE GEAR

GEAR DATA

	PINION	GEAR
NUMBER OF TEETH		
GEAR RATIO		
TANGENTIAL LOAD,"Wt", N		
AGMA GEOMETRY FACTOR "J"		
PITCH DIAMETER, mm		
OUTSIDE DIAMETER, mm		
ROOT DIAMETER, mm		
LENGTH LINE OF ACTION, mm		
CENTER GROOVE DIAMETER, mm		
NORM. PRESS. ANGLE, DEGREES		
NORMAL DIAMETRAL PITCH, mm		
HELIX ANGLE, DEGREES		
CENTER DISTANCE, mm		
BACKLASH, mm		
NET FACE WIDTH, "FW", mm		
PINION L/D		
FACE OVERLAP RATIO		
TRANSVERSE CONTACT RATIO		
AGMA 6011 SERVICE FACTOR		
RATINGS BASED ON ANSI/AGMA 6011 WITH SF=1.0		
DURABILITY POWER		
STRENGTH POWER		
TOOTH SURFACE FINISH, µm RA		
TOOTH GENERATION PROCESS		
TOOTH FINISHING PROCESS		
LEAD MODIFICATION ☐ NOT REQ'D ☐ REQ'D		
CALCULATED TOTAL LEAD MISMATCH		µm

SCUFFING DATA

SCUFFING DATA PER ANSI/AGMA 925-A03

SCUFFING RISK _____ CALCULATION METHOD _____

COMPOSITE SURFACE ROUGHNESS σ_x		µm
SPECIFIC FILM THICKNESS, EHL λ_{min}		µm
TOOTH TEMPERATURE, θ_M		°C
MAXIMUM CONTACT TEMPERATURE, $\theta_{B\,MAX}$		°C

MATERIALS

GEAR CASING		OIL SEALS	
PINION(S)			
GEAR RIM(S)			
HS SHAFT		LS SHAFT	
RADIAL BEARINGS		BACKING	
THRUST BEARING(S)		BACKING	

SHAFT END DETAIL

☐ GEAR SHAFT END FOR COUPLING INTEGRAL FLANGE

☐ PINION SHAFT END FOR COUPLING INTEGRAL FLANGE

☐ OTHER: _____

COUPLING AND GUARDS

	PINION SHAFT	GEAR SHAFT
COUPLING FURNISHED BY		
MOUNT COUPLING HALVES		
CPLG. GUARD ADAPTER BY		
CPLG. GUARD FURNISHED BY		
COUPLING VENDOR		
VENDOR'S MODEL NUMBER		
CPLG WEIGHT ON SHAFT, N		
CG IN/OUTBOARD OF SHAFT END		
HUB DRILL TEMPLATE PROVIDED		

SHAFT END DETAIL

SHAFT END DETAIL SPECIFIED BY: ☐PURCHASER ☐GEAR VENDOR

(INTEGRAL UNLESS OTHERWISE SPECIFIED)

SAHFT END DETAIL IF "OTHERWISE" SPECIFIED:	PINION	GEAR
TAPERED / KEYLESS	☐	☐
TAPERED / 1-KEY	☐	☐
TAPERED / 2-KEYS	☐	☐
CYLINDRICAL / 1-KEY	☐	☐
CYLINDRICAL / 2-KEYS	☐	☐
OTHER _____	☐	☐

SHAFT DIAMETER, mm _____ _____

(IF INTEGRAL FLANGE USE DIAM. IMMEDIATELY ADJACENT TO FLANGE)

RADIAL BEARING

	PINION	GEAR
TYPE		
DIAMETER, mm		
LENGTH, mm		
JOURNAL VELOCITY, m/s		
LOADING, kPa		
CLEARANCE MIN/MAX, mm		
SPAN, mm		
POWER LOSS EA BRG., kW		
OIL FLOW EA BRG., m^3/h		

THRUST BEARING(S)

LOCATION		
MANUFACTURER		
TYPE		
SIZE		
AREA, mm²		
LOADING, kPa		
RATING, kPa		
INT. THRUST LOAD, N (+)(-)		
EXT. THRUST LOAD, N (+)(-)		
POWER LOSS EACH, kW		
OIL FLOW EACH, m³/h		

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TITLE:

SPECIAL PURPOSE GEAR

LUBRICATION REQUIREMENTS

☐ OIL SYSTEM FURNISHED BY:
☐ OTHER _____ ☐ GEAR VENDOR
☐ OIL VISC.: _____ Pa.s@40 °C _____ Pa.s@100 °C
☐ ISO GRADE _____ LOAD STAGE _____

MESH

MESH AND WINDAGE POWER LOSS _____ kW
OIL FLOW, MESH _____ m^3/h

LUBRICATION REQUIREMENTS

MIN. START UP OIL TEMPERATURE _____ °C
NORMAL OIL INLET TEMPERATURE _____ °C
MAXIMUM OIL INLET TEMPERATURE _____ °C
UNIT OIL FLOW (TOTAL) _____ m^3/h
UNIT OIL PRESSURE _____ kPa
☐ OIL VISC.: _____ Pa.s@40 °C _____Pa.s@100 °C
☐ ISO GRADE _____ LOAD STAGE _____

PIPING CONNECTIONS

SERVICE	No.	SIZE	TYPE
LUBE OIL INLET			
LUBE OIL OUTLET			
CASING DRAIN			
VENT			
CASING PURGE			

MOUTING PLATES

☐ GEAR FURNISHED W/:
☐ BASEPLATE ☐ SOLEPLATE ☐ SUBPLATE
☐ MOUNTING PLATE(S) FURNISHED BY _____
☐ BASEPLATE LEVELING _____
☐ BASEPLATE WITH LEVELING PADS
☐ BASEPLATE SUITABLE FOR COLUMN MOUNTING
☐ VENDOR REVIEW OF PURCHASER'S FOUNDATION DWGS.
☐ GROUT TYPE: _____

CONTRACT DATA

☐ TEST DATA PRIOR TO SHIPMENT _____
☐ PROGRESS REPORTS _____
☐ VENDOR SIGNOFF OF INSPECTOR CHECKLIST
☒ INFORMATION RETAINED FOR 20 YEARS
☐ TECHNICAL MANUAL
☐ PAINTING _____
☐ PAINTING HOUSING INTERIOR NOT ALLOWED

SHIPMENT

☐ STEEL ROTOR STORAGE CONTAINER ☐ SHAFT COVERS

	CONTRACT UNIT	SPARES
EXPORT BOXING	☐	☐
DOMESTIC BOXING	☐	☐

OUTDOOR STORAGE OVER _____ MONTHS ☐ 3 YR INDOOR ☐

VIBRATION DETECTORS

RADIAL
☐ MANUF. _____ ☐ TOTAL No. _____
☐ X-Y PROBES PINION BEAR. ☐ COUPLING END ☐ BLIND END
☐ X-Y PROBES GEAR BEAR. ☐ COUPLING END ☐ BLIND END
☐ OTHER _____

AXIAL
☐ MANUF. _____ ☐ TOTAL No. _____
☐ DUAL PROBES AT EACH THRUST BEARING
☐ SINGLE PROBE ANY SHAFT WITHOUT THRUST BEARING
☐ OTHER _____

ONE EVENT PER REVOLUTION PROBE
☐ MANUF. _____ ☐ TOTAL No. _____
☐ ONE ON INPUT SHAFT ☐ ONE ON OUTPUT SHAFT
☐ OTHER _____

ACCELEROMETER
☐ MANUF. _____ ☐ No. REQUIRED _____
☐ PINION COUPLING END ☐ GEAR COUPLING END
☐ OTHER _____

TEMPERATURE DETECTORS

☐ DIAL TYPE THERMOMETERS _____
☐ TYPE BRG. TEMP. SENSORS _____
☐ RTD ☐ THERMOCOUPLE / ☐ SIMPLEX ☐ DOUPLEX
CALIBRATION _____
☐ HS/LS BEARING No. SENSORS _____ / _____
EACH
☐ THRUST - No. OF SENSING ELEM EACH FACE _____

OTHER VIBRATION AND TEMPERATURE

	OTHER	GEAR VENDOR
OSCILLATOR DEMODULATORS SUPPLIED BY	☐	☐
VIBRATION MONITOR SUPPLIED BY	☐	☐
VIBRATION SHUTDOWN DELAY TIME	_____	SECONDS
TEMPERATURE MONITOR SUPPLIED BY	☐	☐
OSCILLATOR DEMODULATOR J-BOX BY	☐	☐
TEMP. SENSOR TERMINATION J-BOX BY	☐	☐

J-BOX TYPE _____ MOUNT: _____

MISCELLANEOUS

☒ UNDAMPED CRITICAL ANALYSIS REPORT:
☐ W / DAMPED ROTOR RESPONS ANALYS REPORT
TORSIONAL ANALYSIS BY ☐ GEAR VENDOR ☐ OTHER
☐ SPARE SET OF GEAR ROTORS
☐ GEAR CASE FURNISHED WITH INLET PURGE CONNECTION
☐ ORIENTATION OF OIL INLET & DRAIN CONNECT _____
☐ FILTER BREATHER LOCATION _____
☐ TORSIONAL DEVICE PROVISIONS _____
☐ ROTOR VERTICAL STORAGE PROVISIONS _____
☐ ROTOR VERTICAL STORAGE FIXTURE(S) _____
☐ VENDOR SERVICE REP. ON SITE _____

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TITLE:

SPECIAL PURPOSE GEAR

INSPECTIONS AND TESTS

☐ ADVANCE NOTICE OF WITNESS TESTING REQUIRED

NUMBER CALENDAR DAYS _____

	REQ	WIT	OBS	TEST LOG
SHOP INSPECTION	☐	☐	☐	☐
CLEANLINESS INSPECTION	☐	☐	☐	☐
HARDNESS VERIFICATION	☐	☐	☐	☐
DISMANTLE-REASSEMBLY	☐	☐	☐	☐
CONTACT CHECK	☐	☐	☐	☐
CONTACT CHECK TAPE LIFT	☐	☐	☐	☐
GEAR ACCURACY CHECK	☐	☐	☐	☐
DOUBLE HELICAL AXIAL STABILITY	☐	☐	☐	☐
SPECIAL TEST INTEGRAL FORGED GEARS	☐	☐	☐	☐
RESIDUAL UNBALANCE CHK.	☐	☐	☐	☐
MECHANICAL RUN TEST (MAIN)	☐	☐	☐	☐
MECHANICAL RUN TEST (SPARE)	☐	☐	☐	☐
ADD'L. MECHANICAL TEST	☐	☐	☐	☐
PART LOAD AND FULL SPEED TEST	☐	☐	☐	☐
FULL LOAD AND FULL SPEED TEST	☐	☐	☐	☐
FULL TORQUE, REDUCED SPEED	☐	☐	☐	☐
FULL TORQUE STATIC TEST	☐	☐	☐	☐
BACK-TO-BACK LOCKED TORQUE TEST	☐	☐	☐	☐
SOUND LEVEL TEST	☐	☐	☐	☐
ADDITIONAL GEAR TOOTH TEST	☐	☐	☐	☐
USE SHOP LUBE SYSTEM	☐	☐	☐	☐
USE JOB LUBE SYSTEM	☐	☐	☐	☐
USE SHOP VIBRATION PROBES ETC.	☐	☐	☐	☐
USE JOB VIBRATION PROBES ETC.	☐	☐	☐	☐
FINAL ASSEMBLY, MAINTENANCE & RUNNING CLEARANCE	☐	☐	☐	☐
OIL SYSTEM CLEANLINESS	☐	☐	☐	☐
OIL SYSTEM-CASING JOINT TIGHTNESS	☐	☐	☐	☐
WARNING AND PROTECTION DEVICES	☐	☐	☐	☐
SEISMIC VIBRATION DATA	☐	☐	☐	☐
VIBRATION, PHASE PLOTS	☐	☐	☐	☐
OIL INLET RANGE TEST	☐	☐	☐	☐
CD RECORDED VIBRATION DATA	☐	☐	☐	☐
			☐ PURCH. COPY	

NON-DESTRUCTIVE TESTING

	SURFACE		SUB-SURFACE	LOG
☐ CASING	☐	☐	_____	☐
☐ ROT. ELEMTS.	☐	☐	_____	☐
☐ BEARINGS	☐	☐	_____	☐
☐ OTHER:	☐	☐	_____	☐

(SPECIFY) _____

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	AREA:		
	TITLE: SPECIAL PURPOSE GEAR		

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SHEET 2 of 6

TITLE:

SPECIAL PURPOSE GEAR

APPLICABLE TO: ☐ PROPOSAL ☐ PURCHASE ☐ AS BUILT

FOR: ____ UNIT: ____

SITE: ____ SERVICE: ____

No. REQ'D: ____ MANUFACTURER: ____

MODEL: ____ VENDOR: ____

SIZE / TYPE ____ DRIVER / DRIVEN – (TYPE): ____

SERIAL No.: ____ MANUFACTURER No. ____

UNITS OF MEASUREMENT

☒ TECHNICAL SYSTEM UNITS

☐ SI UNITS

RATING REQUIREMENTS

DRIVEN EQUIP. kW: NORM. ____ MAX. ____

DRIVER KW: RATED ____ MAX. ____

NORMAL TRANSMITTED POWER ____ kW

GEAR UNIT RATED POWER ____ kW

TORQUE @ MAX CONT SPEED ____ kgf.m

MAX TORQUE ____ kgf.m @ ____ rpm

☐ REDUCER ☐ INCREASER

RATED SPEED, rpm:

INPUT ____ ☐ SPECIFIED ☐ NOMINAL

OUTPUT ____ ☐ SPECIFIED ☐ NOMINAL

ALLOW. VAR IN GEAR RATIO (+) (-) ____ %

MAX CONTINUOUS SPEED ____ rpm

TRIP SPEED ____ rpm

GEAR SERVICE FACTOR ____ (MIN)

HARDNESS, PINION ____ GEAR ____

SHAFT ASSEMBLY DESIGNATION ____

HS SHAFT ROT FAC'G CPL'G ☐ CW ☐ CCW

LS SHAFT ROT FAC'G CPL'G ☐ CW ☐ CCW

EXTERNAL LOADS ____

OTHER OPERATING CONDITIONS ____

INSTALLATION DATA

☐ INDOOR ☐ HEATED ☐ UNDER ROOF

☐ OUTDOOR ☐ UNHEATED ☐ PARTIAL SIDES

☐ GRADE ☐ MEZZANINE ☐ ____

☐ WINTERIZATION REQ'D ☐ TROPICALIZATION REQUIRED

ELEC. AREA: ZONE ____ GRP ____ TEMP. ____

ELEC. AREA: DIV. ____ CLASS/GRP ____ TEMP. ____

MAX ALLOW SPL ____ dBA @ ____ m

ELEVATION ____ m BAROMETER ____ kgf/cm^2

RANGE OF AMBIENT TEMPERATURES:

	DRY BULB	WET BULB
NORMAL	____ °C	____ °C
MAXIMUM	____ °C	____ °C
MINIMUM	____ °C	____ °C

RELATIVE HUMIDITY, %:

UNUSUAL CONDITIONS ☐ DUST ☐ FUMES ☐ SALTY ATMOSPHERE ☐ OTHER ____

BASIC GEAR DATA

☐ SINGLE STAGE ☐ SINGLE HELICAL

☐ DOUBLE STAGE ☐ DOUBLE HELICAL

☐ EPICYCLIC ☐ ____

MECHANICAL RATING KW ____ @ ____ rpm

GEAR SERVICE FACTOR ____ (ACTUAL)

FULL LOAD GEAR UNIT POWER LOSS ____ kW

GEAR UNIT MECHANICAL EFFICIENCY ____ %

RATED SPEED, RPM PINION ____ GEAR ____

HARDNESS USED FOR

RATING, (HB OR RC) PINION ____ GEAR ____

TOOTH PITTING INDEX, "K" kgf/cm^2

ALLOWABLE ____ ACTUAL ____

MATERIAL INDEX NUMBER, kgf/cm^2 ____

BENDING STRESS NUMBER, "St" kgf/cm^2

PINION: ALLOWABLE ____ ACTUAL ____

GEAR: ALLOWABLE ____ ACTUAL ____

PITCH LINE VELOCITY ____ m/s

ANTICIPATED SPL ____ dBA @ ____ m

WR^2 REFERRED TO LS SHAFT ____ kgf.mm^2

BREAKAWAY TORQUE ____ kgf.m

PINION TEETH HARDNESS RANGE ____

PINION TEETH HARDENING METHOD: ____

☐ HS SHAFT SEPARATE / HARDNESS RANGE ____

GEAR TEETH (RIM) HARDNESS RANGE ____

GEAR TEETH HARDENING METHOD: ____

GEAR HUB:

☐ FORGED CYLINDER ☐ FORGED & COPED ☐ FABRICATED

GEAR TO SHAFT FIT METHOD

☐ INTEGRAL ☐ KEYED INTERFERENCE ☐ KEYLESS INTERFERENCE

RIM ATTACHMENT ____

LS SHAFT HARDNESS RANGE

JOURNAL STATIC WEIGHT LOADS

PINION ____ kgf GEAR ____ kgf

TOTAL GEAR UNIT ASSEMBLED WEIGHT ____ kgf

REMARKS:

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TITLE:

SPECIAL PURPOSE GEAR

GEAR DATA

	PINION	GEAR
NUMBER OF TEETH		
GEAR RATIO		
TANGENTIAL LOAD,"Wt", kgf		
AGMA GEOMETRY FACTOR "J"		
PITCH DIAMETER, mm		
OUTSIDE DIAMETER, mm		
ROOT DIAMETER, mm		
LENGTH LINE OF ACTION, mm		
CENTER GROOVE DIAMETER, mm		
NORM. PRESS. ANGLE, DEGREES		
NORMAL DIAMETRAL PITCH, mm		
HELIX ANGLE, DEGREES		
CENTER DISTANCE, mm		
BACKLASH, mm		
NET FACE WIDTH, "FW", mm		
PINION L/D		
FACE OVERLAP RATIO		
TRANSVERSE CONTACT RATIO		
AGMA 6011 SERVICE FACTOR		
RATINGS BASED ON ANSI/AGMA 6011 WITH SF=1.0		
DURABILITY POWER		
STRENGTH POWER		
TOOTH SURFACE FINISH, µm RA		
TOOTH GENERATION PROCESS		
TOOTH FINISHING PROCESS		

LEAD MODIFICATION ☐ NOT REQ'D ☐ REQ'D

CALCULATED TOTAL LEAD MISMATCH _____ µm

SCUFFING DATA

SCUFFING DATA PER ANSI/AGMA 925-A03

SCUFFING RISK _____ CALCULATION METHOD _____

COMPOSITE SURFACE ROUGHNESS σ_x		µm
SPECIFIC FILM THICKNESS, EHL λ_{min}		µm
TOOTH TEMPERATURE, θ_M		°C
MAXIMUM CONTACT TEMPERATURE, $\theta_{B\,MAX}$		°C

MATERIALS

GEAR CASING		OIL SEALS	
PINION(S)			
GEAR RIM(S)			
HS SHAFT		LS SHAFT	
RADIAL BEARINGS		BACKING	
THRUST BEARING(S)		BACKING	

SHAFT END DETAIL

☐ GEAR SHAFT END FOR COUPLING INTEGRAL FLANGE

☐ PINION SHAFT END FOR COUPLING INTEGRAL FLANGE

☐ OTHER: _____

COUPLING AND GUARDS

	PINION SHAFT	GEAR SHAFT
COUPLING FURNISHED BY		
MOUNT COUPLING HALVES		
CPLG. GUARD ADAPTER BY		
CPLG. GUARD FURNISHED BY		
COUPLING VENDOR		
VENDOR'S MODEL NUMBER		
CPLG WEIGHT ON SHAFT, kgf		
CG IN/OUTBOARD OF SHAFT END		
HUB DRILL TEMPLATE PROVIDED		

SHAFT END DETAIL

SHAFT END DETAIL SPECIFIED BY: ☐PURCHASER ☐GEAR VENDOR

(INTEGRAL UNLESS OTHERWISE SPECIFIED)

SAHFT END DETAIL IF "OTHERWISE" SPECIFIED:	PINION	GEAR
TAPERED / KEYLESS	☐	☐
TAPERED / 1-KEY	☐	☐
TAPERED / 2-KEYS	☐	☐
CYLINDRICAL / 1-KEY	☐	☐
CYLINDRICAL / 2-KEYS	☐	☐
OTHER _____	☐	☐

SHAFT DIAMETER, mm _____ _____

(IF INTEGRAL FLANGE USE DIAM. IMMEDIATELY ADJACENT TO FLANGE)

RADIAL BEARING

	PINION	GEAR
TYPE		
DIAMETER, mm		
LENGTH, mm		
JOURNAL VELOCITY, m/s		
LOADING, kgf/cm^2		
CLEARANCE MIN/MAX, mm		
SPAN, mm		
POWER LOSS EA BRG., kW		
OIL FLOW EA BRG., m^3/h		

THRUST BEARING(S)

LOCATION		
MANUFACTURER		
TYPE		
SIZE		
AREA, mm²		
LOADING, kgf/cm^2		
RATING, kgf/cm^2		
INT. THRUST LOAD, kgf (+)(-)		
EXT. THRUST LOAD, kgf (+)(-)		
POWER LOSS EACH, KW		
OIL FLOW EACH, m³/h		

REMARKS:

PETROBRAS

DATA SHEET

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TITLE:

SPECIAL PURPOSE GEAR

LUBRICATION REQUIREMENTS

☐ OIL SYSTEM FURNISHED BY:
☐ OTHER _____ ☐ GEAR VENDOR
☐ OIL VISC.: _____ cP @40 °C _____ cP @100 °C
☐ ISO GRADE _____ LOAD STAGE _____

MESH

MESH AND WINDAGE POWER LOSS _____ kW
OIL FLOW, MESH _____ m^3/h

LUBRICATION REQUIREMENTS

MIN. START UP OIL TEMPERATURE _____ °C
NORMAL OIL INLET TEMPERATURE _____ °C
MAXIMUM OIL INLET TEMPERATURE _____ °C
UNIT OIL FLOW (TOTAL) _____ m^3/h
UNIT OIL PRESSURE _____ kgf/cm^2
☐ OIL VISC.: _____ cP @40 °C _____ cP @100 °C
☐ ISO GRADE _____ LOAD STAGE _____

PIPING CONNECTIONS

SERVICE	No.	SIZE	TYPE
LUBE OIL INLET			
LUBE OIL OUTLET			
CASING DRAIN			
VENT			
CASING PURGE			

MOUTING PLATES

☐ GEAR FURNISHED W/:
☐ BASEPLATE ☐ SOLEPLATE ☐ SUBPLATE
☐ MOUNTING PLATE(S) FURNISHED BY _____
☐ BASEPLATE LEVELING _____
☐ BASEPLATE WITH LEVELING PADS
☐ BASEPLATE SUITABLE FOR COLUMN MOUNTING
☐ VENDOR REVIEW OF PURCHASER'S FOUNDATION DWGS.
☐ GROUT TYPE: _____

CONTRACT DATA

☐ TEST DATA PRIOR TO SHIPMENT _____
☐ PROGRESS REPORTS _____
☐ VENDOR SIGNOFF OF INSPECTOR CHECKLIST
☒ INFORMATION RETAINED FOR 20 YEARS
☐ TECHNICAL MANUAL
☐ PAINTING _____
☐ PAINTING HOUSING INTERIOR NOT ALLOWED

SHIPMENT

☐ STEEL ROTOR STORAGE CONTAINER ☐ SHAFT COVERS

	CONTRACT UNIT	SPARES
EXPORT BOXING	☐	☐
DOMESTIC BOXING	☐	☐

OUTDOOR STORAGE OVER _____ MONTHS ☐ 3 YR INDOOR ☐

VIBRATION DETECTORS

RADIAL
☐ MANUF. _____ ☐ TOTAL No. _____
☐ X-Y PROBES PINION BEAR. ☐ COUPLING END ☐ BLIND END
☐ X-Y PROBES GEAR BEAR. ☐ COUPLING END ☐ BLIND END
☐ OTHER _____

AXIAL
☐ MANUF. _____ ☐ TOTAL No. _____
☐ DUAL PROBES AT EACH THRUST BEARING
☐ SINGLE PROBE ANY SHAFT WITHOUT THRUST BEARING
☐ OTHER _____

ONE EVENT PER REVOLUTION PROBE
☐ MANUF. _____ ☐ TOTAL No. _____
☐ ONE ON INPUT SHAFT ☐ ONE ON OUTPUT SHAFT
☐ OTHER _____

ACCELEROMETER
☐ MANUF. _____ ☐ No. REQUIRED _____
☐ PINION COUPLING END ☐ GEAR COUPLING END
☐ OTHER _____

TEMPERATURE DETECTORS

☐ DIAL TYPE THERMOMETERS _____
☐ TYPE BRG. TEMP. SENSORS _____
☐ RTD ☐ THERMOCOUPLE / ☐ SIMPLEX ☐ DOUPLEX
CALIBRATION _____
☐ HS/LS BEARING No. SENSORS _____ / _____ EACH
☐ THRUST - No. OF SENSING ELEM EACH FACE _____

OTHER VIBRATION AND TEMPERATURE

	OTHER	GEAR VENDOR
OSCILLATOR DEMODULATORS SUPPLIED BY	☐	☐
VIBRATION MONITOR SUPPLIED BY	☐	☐
VIBRATION SHUTDOWN DELAY TIME	_____	SECONDS
TEMPERATURE MONITOR SUPPLIED BY	☐	☐
OSCILLATOR DEMODULATOR J-BOX BY	☐	☐
TEMP. SENSOR TERMINATION J-BOX BY	☐	☐

J-BOX TYPE _____ MOUNT: _____

MISCELLANEOUS

☒ UNDAMPED CRITICAL ANALYSIS REPORT:
☐ W / DAMPED ROTOR RESPONS ANALYS REPORT
TORSIONAL ANALYSIS BY ☐ GEAR VENDOR ☐ OTHER
☐ SPARE SET OF GEAR ROTORS
☐ GEAR CASE FURNISHED WITH INLET PURGE CONNECTION
☐ ORIENTATION OF OIL INLET & DRAIN CONNECT _____
☐ FILTER BREATHER LOCATION _____
☐ TORSIONAL DEVICE PROVISIONS _____
☐ ROTOR VERTICAL STORAGE PROVISIONS _____
☐ ROTOR VERTICAL STORAGE FIXTURE(S) _____
☐ VENDOR SERVICE REP. ON SITE _____

REMARKS:

PETROBRAS

DATA SHEET

No.

REV.

SHEET 5 of 6

TITLE:

SPECIAL PURPOSE GEAR

INSPECTIONS AND TESTS

☐ ADVANCE NOTICE OF WITNESS TESTING REQUIRED

NUMBER CALENDAR DAYS _____

	REQ	WIT	OBS	TEST LOG
SHOP INSPECTION	☐	☐	☐	☐
CLEANLINESS INSPECTION	☐	☐	☐	☐
HARDNESS VERIFICATION	☐	☐	☐	☐
DISMANTLE-REASSEMBLY	☐	☐	☐	☐
CONTACT CHECK	☐	☐	☐	☐
CONTACT CHECK TAPE LIFT	☐	☐	☐	☐
GEAR ACCURACY CHECK	☐	☐	☐	☐
DOUBLE HELICAL AXIAL STABILITY	☐	☐	☐	☐
SPECIAL TEST INTEGRAL FORGED GEARS	☐	☐	☐	☐
RESIDUAL UNBALANCE CHK.	☐	☐	☐	☐
MECHANICAL RUN TEST (MAIN)	☐	☐	☐	☐
MECHANICAL RUN TEST (SPARE)	☐	☐	☐	☐
ADD'L. MECHANICAL TEST	☐	☐	☐	☐
PART LOAD AND FULL SPEED TEST	☐	☐	☐	☐
FULL LOAD AND FULL SPEED TEST	☐	☐	☐	☐
FULL TORQUE, REDUCED SPEED	☐	☐	☐	☐
FULL TORQUE STATIC TEST	☐	☐	☐	☐
BACK-TO-BACK LOCKED TORQUE TEST	☐	☐	☐	☐
SOUND LEVEL TEST	☐	☐	☐	☐
ADDITIONAL GEAR TOOTH TEST	☐	☐	☐	☐
USE SHOP LUBE SYSTEM	☐	☐	☐	☐
USE JOB LUBE SYSTEM	☐	☐	☐	☐
USE SHOP VIBRATION PROBES ETC.	☐	☐	☐	☐
USE JOB VIBRATION PROBES ETC.	☐	☐	☐	☐
FINAL ASSEMBLY, MAINTENANCE & RUNNING CLEARANCE	☐	☐	☐	☐
OIL SYSTEM CLEANLINESS	☐	☐	☐	☐
OIL SYSTEM-CASING JOINT TIGHTNESS	☐	☐	☐	☐
WARNING AND PROTECTION DEVICES	☐	☐	☐	☐
SEISMIC VIBRATION DATA	☐	☐	☐	☐
VIBRATION, PHASE PLOTS	☐	☐	☐	☐
OIL INLET RANGE TEST	☐	☐	☐	☐
CD RECORDED VIBRATION DATA	☐	☐	☐	☐

☐ PURCH. COPY

NON-DESTRUCTIVE TESTING

	SURFACE		SUB-SURFACE	LOG
☐ CASING	☐	☐	_____	☐
☐ ROT. ELEMTS.	☐	☐	_____	☐
☐ BEARINGS	☐	☐	_____	☐
☐ OTHER:	☐	☐	_____	☐

(SPECIFY) _____

REMARKS:

PETROBRAS	DATA SHEET	No.	REV.
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	TITLE: SPECIAL PURPOSE GEAR		

NOTES

INDEX OF REVISIONS	
REV. A	
Affected Parts	**Description of Alteration**
1.2	Included
1.3	Included
2	Revised
3.1 até 3.3	Included
3.4 até 3.7	Revised
ANEXO A	Included
ANEXO B	Included
ANEXO C	Included
REV. B	
Affected Parts	**Description of Alteration**
	General Revision
REV. C	
Affected Parts	**Description of Alteration**
All	Revision without technical changes to alignment the versions Portuguese/English.