Base Load Power Hub (BLPH)

MPS (Manufacturing Process System)

Document Number: 1724000344-QC-PRO-00005

Document Class: 2

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01	26/03/2025	Accepted for Construction (AFC)	Ainhoa Lasa	Ainhoa Lasa	Urtzi Landa
00	05/04/2024	Issue for Review (IFR)	Ainhoa Lasa	Ainhoa Lasa	Urtzi Landa

GRI Flanges Iraeta

FIHI Forging Industry S.L.



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Revision / Change Log

Rev.	Description
00	Issue for Review (IFR)
01	Accepted for Construction (AFC)

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1. SCOPE

The scope of this plan is to describe the manufacturing and control operations carried out by FIHI Forging Industry with destination Rosseti Marino.

2. PROJECT INFORMATION & APPLICABLE DOCUMENTATION

2.1 CUSTOMER ORDER INFORMATION
Order nº: 1724000344
Project: Special Flange
Customer: Rosetti Marino
Project: 123A90 Base Load Power Hub Platform
Drawing: 123A90-ddl-st-dd-90083 Rev.02

2.2 CUSTOMER SPECIFICATIONS

Code	Rev.	Title
Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2	1	STRUCTURAL MATERIAL SPECIFICATION FOR FLANGE AND BOLTS
SPC-PRO-01	2024-00	COMPANY's GENERAL TERMS AND CONDITIONS FOR THE SUPPLY OF RAW MATERIALS
123A90-DDL-ST-SP-90118_IFA	REV.02 (05032024)	Tender Doc Form Tech. Excep-Deviations-Comment

2.3 APPLICABLE STANDARD

Code	Title
DNVGL-OS-C401	Fabrication and testing offshore structures
EN 1090-2	Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures
EN 10025-2	Hot rolled products of structural steels-Part 2: Technical delivery conditions for non-alloy structural steels.
EN 10025-3	Hot rolled products of structural steels-Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels.
UNE-EN ISO 14732	Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials
UNE-EN ISO 15609-1	Specification and qualifications of welding procedures for metallic materials. Welding procedure specification Part 1: Arc welding
UNE-EN ISO 15614-1	Specification and qualifications of welding procedures for metallic materials. Welding procedure test. Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys.
UNE-EN ISO 9606-1	Qualification test of welders. Fusion welding. Part 1: Steels.
UNE EN ISO 23279	Non-destructive testing of welds - Ultrasonic testing - Characterization of discontinuities in welds
UNE-EN ISO 9712	Non-destructive testing. Qualification and certification of NDT personnel. General principles
UNE-EN ISO 11666	Non-destructive examination of welds. Ultrasonic examination of welded joints. Acceptance levels.
UNE-EN ISO 17640	Non-destructive examination of welds. Ultrasonic examination of welded joints.
UNE-EN ISO 23277	Non-destructive testing of welds. Penetrant testing of welds. Acceptance level
EN 17637	Non-destructive examination of fusion welds. Visual examination.
EN ISO 17638	Non-destructive examination of fusion welds. Magnetic Particle examination.
EN ISO 23278	Non-destructive examination of fusion welds. Magnetic Particle examination. Acceptance levels.
UNE EN ISO 5817	Welding. Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded)
UNE EN 22768-1	General tolerances. Part 1 Tolerances for linear and angular dimensions without individual tolerance indications.
UNE EN 10160	Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method).
UNE-EN 10308	Non-destructive testing - Ultrasonic testing of steel bars
UNE-EN ISO 9934-1	Non-destructive testing - Magnetic particle testing - Part 1: General principles
EN1090-1	Execution of steel structures and aluminum structures - Part 1: Requirements for conformity assessment of structural components
EN1011-2	WELDING - RECOMMENDATIONS FOR WELDING OF METALLIC MATERIALS - PART 2: ARC WELDING OF FERRITIC STEELS.
ISO 15614-13	Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 13: Upset (resistance butt) and flash welding
ISO 10675-1	Non-destructive testing of welds - Acceptance levels for radiographic testing - Part 1: Steel, nickel, titanium and their alloys
EN 10029	Hot-rolled steel plates 3 mm thick or above - Tolerances on dimensions and shape
EN 10163-1	Delivery requirements for surface condition of hot-rolled steel plates, wide flats and sections - Part 1: General requirements
EN 10025-1	Hot rolled products of structural steels - Part 1: General technical delivery conditions
ISO 643	Steels - Micrographic determination of the apparent grain size
ISO 9001	Quality management systems - Requirements
EN 10164	Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions

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Code	Title
UNE-EN ISO 6892-1	Metallic materials - Tensile testing - Part 1: Method of test at room temperature
ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories
UNE-EN ISO 148-1	Metallic materials - Charpy pendulum impact test - Part 1: Test method
ISO 3611	Geometrical product specifications (GPS) - Dimensional measuring equipment: Micrometers for external measurements - Design and metrological characteristics
ISO 14978	Geometrical Product Specifications (GPS) - General concepts and requirements for GPS measuring equipment
ISO 14253-1	Geometrical product specifications (GPS) - Inspection by measurement of workpieces and measuring equipment - Part 1: Decision rules for proving conformity or nonconformity with specification
ISO 11666	Non-destructive testing of welds - Ultrasonic testing - Acceptance levels
ISO 6506-1	Metallic materials - Brinell hardness test - Part 1: Test method
ISO 6508-1	Metallic materials - Rockwell hardness test - Part 1: Test method

2.4 RAW MATERIAL SUPPLIER

SUPPLIER	PRODUCT	LOCATION	ADDRESSES	RAW MATERIAL FORMAT
Acciaierie bertoli Safau (ABS Spa)	Steel Bars	Italy	Via Buttrio, 28, 33050 Pozzuolo del Friuli UD, Italy	Bloom 310, 405, 500, 600, 700 (CC Diameter)
Sidenor	Steel Bars	Spain	Ctra. Zumárraga s/n 20720 Azkoitia (Guipúzcoa) Spain	Bloom 350x470 (Square cross section) Bloom 525 (CC Diameter)
Venete	Steel Bars	Italy	VIA PUISLE, 4 38051 BORGO VALSUGANA (TN) italy	Bloom 500 & 600 mm (CC Diameter)
FIHI Hot Rolling Mill (Using raw material suppliers listed in this point 2.4 of this MPP)	Steel Bars	Spain	Meagako errepidean S/N 20740 Zestoa Guipuzcoa Spain	According to “MPP/PQP-Hot Rolling”

NOTE: This list is based on the ***GRI supplier portal Fullstep,*** which includes all the approved suppliers of FIHI.

2.5 FIHI INTERNAL DOCUMENTATION LIST

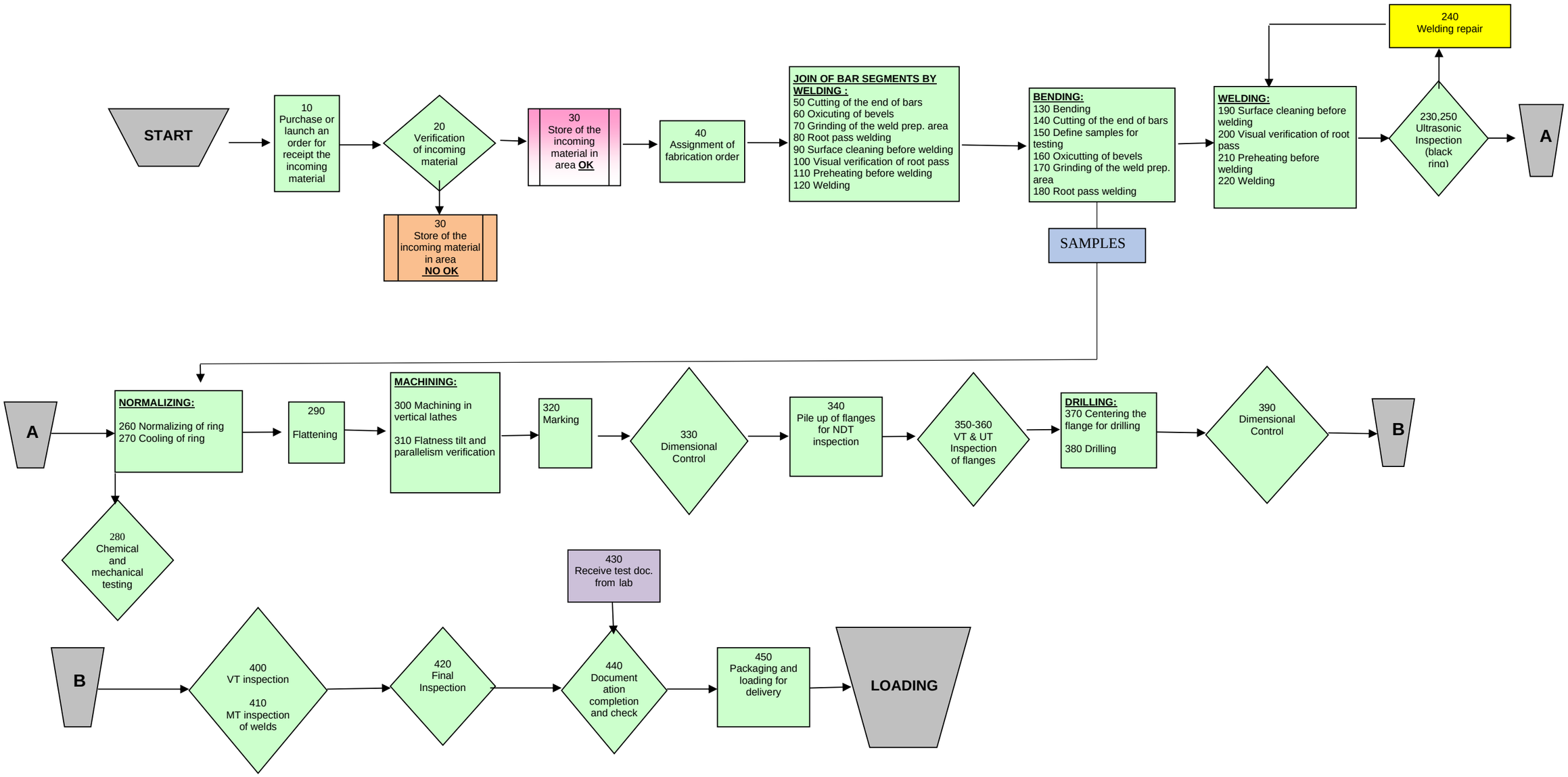
CODE	DOC. NAME
IN_FIR_IL_01_01	INSTRUCTION CONTROL OF RECEPTION OF RAW MATERIAL
SP_PRD_04_02_01	SPECIFICATION TECHNICAL PURCHASE SPECIFICATION OF STEEL BARS FOR WIND TOWER FLANGES
SP_PRD_04_02_05	SPECIFICATION TECHNICAL PURCHASE SPECIFICATION STEEL BARS FOR EOLIC TOWER FLANGES SIDENOR
SP_PRD_04_02_04	SPECIFICATION TECHNICAL PURCHASE SPECIFICATION STEEL BARS FOR EOLIC TOWER FLANGES ABS
SP_PRD_04_03_01	SPECIFICATION IDENTIFICATION OF THE RAW MATERIAL IN THE WAREHOUSE
IN_PRD_03_01_01	INSTRUCTION OPENING, LAUNCHING AND CLOSING OF MANUFACTURING ORDER
IN_FIR_PT_06	INSTRUCTION OF BENDING
IN_FIR_PR_01	INSTRUCTION EXTRACTION OF THE WITNESS SPECIMENS
IN_FIR_LB_01_20	SAMPLE MANAGEMENT
IN_FIR_LB_01_14	INSTRUCTION METALLOGRAPHIC POLISHING
IN_FIR_LB_01_08	INSTRUCTION MAQCHINING OF SPECIMENS
IN_PRD_05_01_06	INSTRUCTION FOR WELDING BY ROBOT PROCESS
IN_PRD_05_01_38	INSTRUCTION FOR WELDING BY MANUAL PROCESS
IN_FIR_PT_04	INSTRUCTION NORMALIZING HEAT TREATMENT
IN_FIR_PT_11	TUS INSPECTION INSTRUCTION
IN_FIR_PT_12	SAT INSPECTION INSTRUCTION
SP_FIR_LB_01	SPECIFICATION OF LABORATORY TESTS
IN_PRD_05_01_33	INSTRUCTION FLAT / ROUNDED
IN_FIR_PT_13	INSTRUCTION OF MACHINING
IN_FIR_PT_17	INSTRUCTIONS OF MARKS
IN_FIR_PT_05	INSTRUCTION OF DIMENSIONAL CONTROL
IN_FIR_PT_20	INSTRUCTION OF DRILLING
IN_PRD_05_01_32	INSTRUCTION VISUAL INSPECTION AND REPAIR OF THE FINISHED PRODUCT
IN_PRD_05_01_35	INSTRUCTION HANDLING AND LOADING OF FLANGES
F_PRD_05_01_01_01	CONTROL IN RECEPTION OF RAW MATERIAL

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2.5 FIHI INTERNAL DOCUMENTATION LIST	
CODE	**DOC. NAME**
F_FIR_PT_06_01	FORMAT OF BENDING
F_FIR_PT_04_01	HEAT TREATMENT CONTROL FORMAT
F_FIR_LB_01_08_01	NOTCH VERIFICATION
F_FIR_LB_01_08_02	CONTROL OF SAMPLES
F_FIR_LB_01_08_03	SPECIMEN EXTRACTION DRAWINGS
F_PRD_05_01_06_01	AUTOMATIC WELD REGISTER
F_PRD_05_01_38_01	MANUAL WELD REGISTER
F_FIR_IP_01_01_02	ULTRASONIC INSPECTION FORMAT
F_FIR_PT_04_02	HEAT TREATMENT CERTIFICATE
F_FIR_PT_04_03	HEAT TREATMENT CERTIFICATE
F_FIR_LB_01_07_01	TENSILE TEST FORMAT
F_FIR_LB_01_06_01	IMPACT TEST FORMAT
F_SOP_13_01_08_01	METALLOGRAPHY TEST FORMAT
F_FIR_IP_01_01_01	ULTRASONIC AND VISUAL INSPECTION REPORT
F_FIR_IP_01_03_01	VISUAL INSPECTION REPORT
F_PRD_05_01_14_03	DAILY PART OF FINISHED WAREHOUSE WORK
F_FIR_IP_01_04_01	MAGNETIC PRTICLE EXAMINATION REPORT
F_PRD_05_01_34_04	CONTROL OF PRODUCT TO BE SHIPPED
F_PRD_05_01_34_05	MARKING MODIFICATION CONTROL FORM

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2.6 FLOW DIAGRAM OF THE OPERATIONS



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3. DESCRIPTION OF OPERATIONS

OP Nº	OPERATION	OPERATION DESCRIPTION	EQUIPMENT	CUSTOMER SPEC.	STANDARDS	FIHI DOCUMENTS	QTY. RECORD	CONT. TYPE	CONT. FREC.	RESP.	ACCEPTANCE CRITERIA	ACTION IF DEVIATION
10	**PURCHASE, OR LAUNCH AN ORDER, FOR RECEIPT THE INCOMING MATERIAL**	The raw material is hot rolled steel bars. The quality of the steel is S420JR / J2 (As Rolled). The steel will be fully killed, and the chemical composition must comply with the S420NL according to EN10025-3. The testing samples will be normalized by supplier, and the results of the tests must comply with the requirements of the steel, according to applicable standards and FIHI internal specifications. The bars must be UT certified by the supplier, also serialized, according to purchase order and FIHI internal specifications. The purchase and launched orders define the material. The purchase and launched orders are issued to the qualified suppliers included in the “Register of evaluated and qualified list of suppliers “	NA	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	EN 10025-1 EN 10025-2 EN 10025-3	IN_FIR_IL_01_01 SP_PRD_04_02_01 SP_PRD_04_02_05 SP_PRD_04_02_04 SP_PRD_04_03_01 SAP	Fullstep	DOC.	100% POs	Purchase / Quality	NA	Claim to Supplier / Rejection material if needed
20	**VERIFICATION OF INCOMING MATERIAL**	Verification of traceability. Load in SAP system Verification of dimensions Verification of certificates	Measurement devices	NA	EN 10025-1 EN 10025-2 EN 10025-3 EN 10204	IN_FIR_IL_01_01 SP_PRD_04_02_01 SP_PRD_04_03_01 SAP Record	F_PRD_05_01_01_01	DOC DIM	100%	Quality / Production	Acc. To FIHI specs.	Claim to Supplier / Rejection material if needed
30	**STORE OF INCOMING MATERIAL**	STORE Identification of material according to internal SAP traceability by Fixolit and storage	NA	NA	NA	IN_FIR_IL_01_01	F_PRD_05_01_01_01	NA	100%	Production	Acc. To FIHI internal instruction	Internal NCR
40	**ASSIGMENT OF FABRICATION ORDER**	A fabrication order is assigned in SAP trough a route defined for the material	NA	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	MPP/PQP IN_PRD_03_01_01 SAP	NA	DOC	100%	Technical	Acc. To FIHI internal instruction	Internal NCR
50	**JOIN OF BAR SEGMENTS BY WELDING** **CUTTING OF THE END OF BARS**	For each batch. A batch is considered as raw rings manufactured from the same heat of ingot steel, the same thickness range & max. 60Tn.. A material sampling and testing procedure shall be issued, and sample location and frequency shall as minimum meet the basic material standard EN10025-1 and -3. Marking of samples.	Vertical lathes	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	EN 10025-1 EN 10025-2 EN 10025-3	IN_FIR_PR_01	F_FIR_PT_04_01	DIM DOC VISUAL	1 per heat, 60Tn. and thickness range	Production / Quality	Sample from base material	Internal NCR. Inform to customer if impact on product.
60	**JOIN OF BAR SEGMENTS BY WELDING** **OXICUTTING OF BEVELS**	Bevels according to WPS /WPQR and internal instructions	Automatic Oxicutting Machine	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	DIM	100%	Production	Bevel dimension acc. To WPS	Repair or Rejection / Internal NCR

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OP Nº	OPERATION	OPERATION DESCRIPTION	EQUIPMENT	CUSTOMER SPEC.	STANDARDS	FIHI DOCUMENTS	QTY. RECORD	CONT. TYPE	CONT. FREC.	RESP.	ACCEPTANCE CRITERIA	ACTION IF DEVIATION
70	**JOIN OF BAR SEGMENTS BY WELDING** **GRINDING OF WELD PREPARATION AREA**	The bending operator grinds the oxicut area before doing the root pass welding	Grinding Machine	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	VISUAL	100%	Production	Bevel areal acc. To WPS	NA
80	**JOIN OF BAR SEGMENTS BY WELDING** **ROOT PASS WELDING**	The root pass welding is done in the bending machine with a semi-automatic welding machine, tubular wire and protective gas following the welding specification	Semi-automatic welding equipment	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	NA	100%	Production	NA	NA
90	**JOIN OF BAR SEGMENTS BY WELDING** **SURFACE CLEANING BEFORE WELDING**	All the surfaces that are to be welded are ground prior to welding to avoid any defect in the welding area.	Air Brushing / grinding Pneumatic hammer	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	NA	100%	Production	NA	NA
100	**JOIN OF BAR SEGMENTS BY WELDING** **VISUAL INSPECTION OF ROOT PASS**	Welders verifies any misalignment of the welds, any slag, etc	NA	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 ISO 5817	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	VISUAL	100%	Production	ISO 5817-B Internal procedures / WPS	Repair

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OP Nº	OPERATION	OPERATION DESCRIPTION	EQUIPMENT	CUSTOMER SPEC.	STANDARDS	FIHI DOCUMENTS	QTY. RECORD	CONT. TYPE	CONT. FREC.	RESP.	ACCEPTANCE CRITERIA	ACTION IF DEVIATION
110	**JOIN OF BAR SEGMENTS BY WELDING** **PRE-HEATING**	The area to be welded is pre-heated at the temperature referred to in the "Welding procedure specification " This temperature is controlled by the welder using a digital thermocouple close to the welding area (Distance for measure weld + 75mm)	Natural gas burners / Digital Thermocouple	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_PRD_05_01_06 IN_PRD_05_01_38 IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	F_PRD_05_01_06_01 F_PRD_05_01_38_01	TEMP.	100%	Production	WPS	NA
120	**JOIN OF BAR SEGMENTS BY WELDING** **WELDING:**	The welding could be conducted by Semi-automatic welding with tubular wire and protective gas according to the welding specification WPS SP_FIR_PT_11_01 or Automatic welding by robot with tubular wire and protective gas according to the welding specification WPS SP_FIR_PT_09_01 The interpass temperature is controlled by the digital thermocouple Note 1: Both specifications are supported by the Welding Procedure Qualification Records according to the European Standard EN15614-1 Note 2: The welders and welding operators are qualified for the welding specification that performs according to the European Standard ISO 9606 for the welders and the ISO 14732 for the welding operators for robots.	Semi-automatic welding equipment / Robotic welding equipment / Digital Thermocouple	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_PRD_05_01_06 IN_PRD_05_01_38 IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	F_PRD_05_01_06_01 F_PRD_05_01_38_01	TEMP. VISUAL WELD PARAMETERS	100%	Production	WPS / UT ISO 5817-B	NA
130	**BENDING**	Cold bending of bars in rings.	Bending machines	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	IN_FIR_PT_06	F_FIR_PT_06_01	DIM	100%	Production	Ring dimensions	Repair or Rejection / Internal NCR
140	**CUTTING OF THE END OF BARS**	For each batch. A batch is considered as raw rings manufactured from the same heat of ingot steel, the same thickness range & max. 60Tn.. A material sampling and testing procedure shall be issued, and sample location and frequency shall as minimum meet the basic material standard EN10025-1 and -3. Marking of samples.	Vertical lathes	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	EN 10025-1 EN 10025-2 EN 10025-3	IN_FIR_PR_01	F_FIR_PT_04_01	DIM DOC VISUAL	1 per heat, 60Tn. and thickness range	Production / Quality	Sample from base material	Internal NCR. Inform to customer if impact on product.
150	**DEFINE SAMPLE FOR TESTING**	The samples are prepared according to samples drawings and customer specs. The samples are measured to check that fulfill standards requirements	Metallographic cutter Automatic polisher Saws Lathe Milling Calipers	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	EN 10025 EN 10164 ISO 148-1 EN 6892-1	IN_FIR_LB_01_20 IN_FIR_LB_01_14 IN_FIR_LB_01_08	F_FIR_LB_01_08_01 F_FIR_LB_01_08_02 F_FIR_LB_01_08_03	DIM DOC	100% samples	Quality	Samples according to ETS, Standards, and F_FIR_LB_01_08_03	Internal NCR. Inform to customer if impact on product.

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OP Nº	OPERATION	OPERATION DESCRIPTION	EQUIPMENT	CUSTOMER SPEC.	STANDARDS	FIHI DOCUMENTS	QTY. RECORD	CONT. TYPE	CONT. FREC.	RESP.	ACCEPTANCE CRITERIA	ACTION IF DEVIATION
160	**OXICUTTING OF BEVELS**	Bevels according to WPS /WPQR and internal instructions	Automatic Oxicutting Machine	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	DIM	100%	Production	Bevel dimension acc. To WPS	Repair or Rejection / Internal NCR
170	**GRINDING OF WELD PREPARATION AREA**	The bending operator grinds the oxicut area before doing the root pass welding	Grinding Machine	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	VISUAL	100%	Production	Bevel areal acc. To WPS	NA
180	**ROOT PASS WELDING**	The root pass welding is done in the bending machine with a semi-automatic welding machine, tubular wire and protective gas following the welding specification	Semi-automatic welding equipment	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	NA	100%	Production	NA	NA
190	**SURFACE CLEANING BEFORE WELDING**	All the surfaces that are to be welded are ground prior to welding to avoid any defect in the welding area.	Air Brushing / grinding Pneumatic hammer	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	NA	100%	Production	NA	NA

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OP Nº	OPERATION	OPERATION DESCRIPTION	EQUIPMENT	CUSTOMER SPEC.	STANDARDS	FIHI DOCUMENTS	QTY. RECORD	CONT. TYPE	CONT. FREC.	RESP.	ACCEPTANCE CRITERIA	ACTION IF DEVIATION
200	**VISUAL INSPECTION OF ROOT PASS**	Welders verifies any misalignment of the welds, any slag, etc	NA	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 ISO 5817	IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	NA	VISUAL	100%	Production	ISO 5817-B Internal procedures / WPS	Repair
210	**PRE-HEATING**	The area to be welded is pre-heated at the temperature referred to in the "Welding procedure specification " This temperature is controlled by the welder using a digital thermocouple close to the welding area (Distance for measure weld + 75mm)	Natural gas burners / Digital Thermocouple	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_PRD_05_01_06 IN_PRD_05_01_38 IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	F_PRD_05_01_06_01 F_PRD_05_01_38_01	TEMP.	100%	Production	WPS	NA
220	**WELDING:**	The welding could be conducted by Semi-automatic welding with tubular wire and protective gas according to the welding specification WPS SP_FIR_PT_11_01 or Automatic welding by robot with tubular wire and protective gas according to the welding specification WPS SP_FIR_PT_09_01 The interpass temperature is controlled by the digital thermocouple Note 1: Both specifications are supported by the Welding Procedure Qualification Records according to the European Standard EN15614-1 Note 2: The welders and welding operators are qualified for the welding specification that performs according to the European Standard ISO 9606 for the welders and the ISO 14732 for the welding operators for robots.	Semi-automatic welding equipment / Robotic welding equipment / Digital Thermocouple	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1 DNV-OS-C401	IN_PRD_05_01_06 IN_PRD_05_01_38 IN_FIR_PT_06 <u>ROBOT</u> WPS: SP_FIR_PT_09_01 WPQR: SP_FIR_PT_09 <u>MANUAL</u> WPS: SP_FIR_PT_11_01 WPQR: SP_FIR_PT_11	F_PRD_05_01_06_01 F_PRD_05_01_38_01	TEMP. VISUAL WELD PARAMETERS	100%	Production	WPS / UT ISO 5817-B	NA
230	**UT INSPECTION OF WELDS**	The welded surfaces are 100% inspected by according to the instruction IN_FIR_IP_01_31 "Instruction for UT inspection of welds. The inspection is performed in two steps:1º) Control of the top area / 2º) Control of the bottom area. Note: UT waiting time 48h. after welding. Note 1: This inspection is an internal inspection. The official inspection is performed as stated in 360.	UT Equipment	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	ISO 11666 ISO 17640 ISO 5817	IN_FIR_IP_01_31	F_FIR_IP_01_01_02	NDT-UT	100%	Quality	EN 11666 Level.2 EN 17640-B ISO 5817-B	Repair
240	**WELDING REPAIR (if needed)**	In case of detection of defects in the welding, it is repaired following the WPS qualified for the semi-manual welding or robotic welding. All welding are pre-heated at min. 110ºC before start welding.	Semi-automatic welding equipment / Robotic welding equipment / Digital Thermocouple	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	WPS: ISO 15609-1 WPQR: ISO 15614-1	IN_PRD_05_01_06 IN_PRD_05_01_38 WPS: SP_FIR_PT_10_01 WPQR: SP_FIR_PT_10	F_FIR_IP_01_01_02	TEMP. VISUAL WELD PARAMETERS	100%	Production	WPS / UT ISO 5817-B	NA (max. weld Repairs = 3 times)

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230	**UT INSPECTION OF WELDS**	The welded surfaces are 100% inspected by according to the instruction IN_FIR_IP_01_31 "Instruction for UT inspection of welds. The inspection is performed in two steps:1º) Control of the top area / 2º) Control of the bottom area. Note: UT waiting time 48h. after welding. Note 1: This inspection is an internal inspection. The official inspection is performed as stated in 360.	UT Equipment	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	ISO 11666 ISO 17640 ISO 5817	IN_FIR_IP_01_31	F_FIR_IP_01_01_02	NDT-UT	100%	Quality	EN 11666 Level.2 EN 17640-B ISO 5817-B	Repair
260	**HEAT TREATMENT/ NORMALIZING OF RINGS**	The furnace operator: • Verifies the identification of the rings, as confirmation of the non-normalized condition of the ring/bars. • Performs the dye stamping of the nº of normalizing treatment close to the dye stamping of the ring/bar identification • Transfers the ring/bar traceability to the register documents (OF, ring serial nº and heat nº). • Performs the normalizing at 900ºC following the instructions of the IN_FIR_PT_04 INSTRUCTION NORMALIZING HEAT TREATMENT Note: In case that we need to join the bars (op. nº50 to 110), we will proceed to normalizing the bars instead of the ring, before operation nº120 "Bending".	Heat treatment furnace	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	IN_FIR_PT_04 IN_FIR_PT_11 IN_FIR_PT_12	F_FIR_PT_04_01 F_FIR_PT_04_02 F_FIR_PT_04_03	TEMP. HOLDING TIME DOC	100% HT	Production	IN_FIR_PT_04	Internal NCR. Inform to customer if impact on product.
270	**COOLING OF RINGS**	When the treatment is complete, the cooling stage starts. The cooling process is done following the "Steel bars, plates and ring heat treatment specification". <u>Forced cooling from 900ºC to 600ºC (Furnace nºH1 & H5)</u> Accelerated cooling by air fans in range 900 ºC - 600 ºC is acceptable providing that final microstructure will consist of equiaxed ferritic/perlitic grains. <u>AIR COOLING (NOT FORCED) (Cooper furnace)</u> The cooling process is done following the "Steel bars, plates and ring heat treatment specification".	Fans	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	IN_FIR_PT_04	N/A	TIME TEMP. DOC	100%HT	Production	IN_FIR_PT_04	Internal NCR. Inform to customer if impact on product.
280	**CHEMICAL AND MECHANICAL TESTING (FIHI internal laboratory)**	FI-ENS-91 (internal code) -1 Tensile test in longitudinal direction acc. to EN 10025-3 & ISO 6892-1 - Improved properties perpendicular to the surface acc. to EN 10025-3 & ISO 10164 - Impact test in longitudinal direction @ -40 ºC acc. to EN 10025-3 & ISO 148-1 - Impact test in transverse direction @ -40 ºC acc. to EN 10025-3 & ISO 148-1 - Chemical analysis + CEV (Heat and product)	Universal testing machine Charpy pend. Cooling bath Optical emission Spectrometer	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	EN 10025 EN 6892-1 ISO 148-1 ISO10164	SP_FIR_LB_01	F_FIR_LB_01_07_01 F_FIR_LB_01_06_01 F_SOP_13_01_08_01	DOC	100% samples	Quality	Customer Specs requirements: -Tensile Test → EN 10025-3, Table 4 -Z% →Z35 -Impact test longitudinal at -40°C: -->min. 42 J av. -->min. 33 J ind. -Impact test transversal at -40°C: -->min. 28 J av. -->min. 20 J ind. -Chemical elements →EN10025-3 (in case of deviation, contact with the customer, by SDR)	Rejection / Internal NCR. Inform to customer if impact on product.

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290	**FLATTENING**	Flattening for correction of Special Flange flatness caused by normalizing process. Bending for correction of Special Flange deformation caused by normalizing process if needed.	Press machine / gauges / Flexometer	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	DIN EN 2768-1 m	IN_PRD_05_01_33	F_FIR_LB_01_07_01	DIM	100%	Production	Ring dimensions	Repair
300	**MACHINING IN VERTICAL LATHES**	Drawings received by the customer are followed in the machining area including the dimensional tolerances. It is transferred by painting the OF nº, serial nº and heat nº of the Special Flange to the outer diameter in order to ensure the traceability at any time of the process.	CNC Vertical lathes	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	DIN EN 2768-1 m	IN_FIR_PT_13	F_FIR_PT_05_02 F_PRD_05_01_07_01	DOC CNC	100%	Production	DWG / CNC Program	Repair or Rejection. Internal NCR. Inform to customer if impact on product.
310	**FLATNESS TILT AND PARALELISM VERIFICATION**	Once the Special Flange is fully machined, it is unlocked, and the indicator is in contact with the face of the Special Flange and it turns 360º measuring the flatness and parallelism. Tilt will be measured in 4 points.	Comparator Clock	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	DIN EN 2768-1 m	IN_FIR_PT_13	F_FIR_PT_05_02 F_PRD_05_01_07_01	DIM	100%	Production	DWG	NCR. Inform to customer if impact on product.
320	**MARKING**	The marking is made by dye stamping acc. To the customer requirements.	Low stress stamping	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	SAP IN_FIR_PT_17	NA	VISUAL	100%	Production	DWG / Specs	Repair
330	**DIMENSIONAL CONTROL**	The machine operator registers the dimensions of the Special Flange in the “Register of dimensional control” following the steps of the instruction IN_FIR_PT_05 and recording in SAP	Flex meters Calipers Indicator Goniometers Digital Roughmeter (roughness) Micrometers	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	DIN EN 2768-1 m	IN_FIR_PT_05 SAP RECORDING	F_FIR_PT_05_02 F_PRD_05_01_07_01	DIM	100%	Production	Acc. Customer Drawing	Repair or Rejection. Internal NCR. Inform to customer if impact on product.
340	**PILE UP OF SPECIAL FLANGE FOR NDT INSPECTION**	The Special Flange are piled up for NDT inspection. Special Flange are separated with 3 steel blocks between each HOP-ring. The piles are made using same Fabrication Order Special Flange.	Cranes	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	NA	NA	VT	100%	Production	VT	NA
350	**VISUAL INSPECTION OF WELDS**	Visual Inspection of the fully machined area per instructions and acceptance criteria of the “Instruction for Visual Testing of welds”, which stated that the surface need to be clean prior to perform the inspection.	NA	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	ISO 17637 ISO 5817	IN_FIR_IP_01_03	F_FIR_IP_01_03_01	VT	100%	Quality	ISO 17637 ISO 5817-B	Repair or Rejection. Internal NCR. Inform to customer if impact on product.

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360	**UT INSPECTION OF BASE METAL AND WELDS**	The Ultrasonic inspection is performed to the weld and base metal of the fully machined Special Flange following the instructions and acceptance criteria of the IN_FIR_IP_01_31 "Instruction for UT inspection of welds "and IN_FIR_IP_01_32 "Instructions for ultrasonic (UT) inspection of Base Material" Note: Official inspection according to ISO standards and client specifications. Note 1: Production is stopped in this process, until the approval of the UT welding instruction.	UT equipment	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	ISO 11666 ISO 17640 ISO 5817 ISO 10308	IN_FIR_IP_01_31 IN_FIR_IP_01_32	F_FIR-IP_01_01_01	UT	100%	Quality	<u>WELD:</u> ISO 11666 CL.2 ISO 17640-B <u>BM:</u> ISO 10308 CL3	Rejection. Internal NCR. Inform to customer if impact on product.
370	**CENTERING THE FLANGE FOR DRILLING**	Description: The drilling machine operator centers the flange as follows: In the drilling machines nº 2 and 3 with indicator. In the drilling machines nº 4 and 5 automatic The operator registers the flange in the "Register of dimensional control" before starting with the machining	Drilling machines:	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	IN_PRD_05_01_08	F_FIR_PT_05_02 F_PRD_05_01_07_01	DOC CNC	100%	Production	DWG / CNC Program	Rejection. Internal NCR. Inform to customer if impact on product.
380	**DRILLING**	The operator of the drilling machine follows the instruction IN_FIR_PT_20. Verifies the distance between the first and last hols, as well as the distance to the aouter wall of the HOP-ring.	Drilling machine	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	DIN EN 2768-1 m	IN_FIR_PT_20	F_FIR_PT_05_02 F_PRD_05_01_07_01	DOC. CNC	100%	Production	CNC Program	Repair or Rejection. Internal NCR. Inform to customer if impact on product.
390	**DIMENSIONAL CONTROL**	The operator registers the results of his measurements in the "Register of dimensional control".	Flex meters Calipers Indicator Goniometers Digital Roughmeter (roughness) Micrometers	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	DIN EN 2768-1 m	IN_FIR_PT_05 SAP RECORDING	F_FIR_PT_05_02 F_PRD_05_01_07_01	DOC. CNC	100%	Production	CNC Program	Repair or Rejection. Internal NCR. Inform to customer if impact on product.
400	**VISUAL INSPECTION OF WELDS**	Visual Inspection of the fully machined area per instructions and acceptance criteria of the "Instruction for Visual Testing of welds", which stated that the surface need to be clean prior to perform the inspection.	NA	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	ISO 17637 ISO 5817	IN_FIR_IP_01_03	F_FIR_IP_01_03_01	VT	100%	Quality	ISO 17637 ISO 5817-B	Repair or Rejection. Internal NCR. Inform to customer if impact on product.
410	**MAGNETIC TESTING:**	Magnetic Testing Inspection of the fully machined welding area per instructions and acceptance criteria of the "Instruction for Magnetic Testing inspection of welds" Note: all the indications out of standards criteria and client specifications criteria, will be removed by soft grinding. In case this is not possible, FIHI will ask an SDR to customer.	Yoke	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	ISO 17638 ISO 23278	IN_FIR_IP_01_04	F_PRD_05_01_14_03 F_FIR_IP_01_04_01	MT	100%	Quality	ISO 17638 ISO 23278 – 2x	Internal NCR. Inform to customer if impact on product.
420	**FINAL INSPECTION OF SPECIAL FLANGE**	The store operator performs a cleaning of Special Flange with solvent prior to visual inspection of the surface, looking for any cosmetic flaws created during production and hardness test on top and bottom surface. Verification of the identification marks are according to the requirements.	NA	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	IN_PRD_05_01_32	F_PRD_05_01_34_04 F_PRD_05_01_34_05 F_FIR-IP_01_01_01	VISUAL	100%	Production	Spec / DWG	Internal NCR. Inform to customer if impact on product

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430	**RECEIVE TESTING REPORT FROM LABORATORY**	The laboratory sends a report referring the test samples sent and control if all results are OK. The laboratory technician will introduce the results in SAP system.	SAP (ERP)	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	3.2 Certificate	3.2 Certificate	ERP	100%	Quality	Spec / DWG	Internal NCR. Inform to customer if impact on product
440	**DOCUMENTATION COMPLETION AND CHECK**	The quality technician recovers all the information of every Special Flange and checks all the documents and certificates before delivery	SAP System	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	EN 10204	DRAWINGS 3.2 CERTIFICATE SAP TOOLS	3.2 certificate (flange traceability) Cert. of conformance Raw material cert. Metal Core wire cert. Heat treat. cert. NDT report Dimensional report	VISUAL DOC	100%	Production / Quality	Spec / DWG	Internal NCR. Inform to customer if impact on product
450	**PACKAGING AND LOADING FOR DELIVERY**	The operators checks the truck loading for to avoid any damage in Special Flange acc. to “Instruction for handling, packaging and loading of HOP rings”	Cranes / Truck	Document Number: 123A90-DDL-ST-SP-90118 Document Class: 2 SPC-PRO-01 123A90-DDL-ST-SP-90118_IFA	NA	IN_PRD_05_01_35 IN_FIR_IL_01_10	F_PRD_05_01_34_04	VISUAL	100% TRUCKS	Production	Spec / Instructions	Internal NCR. Inform to customer if impact on product

REVISION CONTROL AND APPROVAL SIGNATURES

REVISION CONTROL		
REVISION	**DATE**	**REVISION DESCRIPTION**
00	05/04/2024	First edition

APPROVAL SIGNATURES			
	NAME / POSITION	**DATE**	**SIGNATURE**
PREPARED BY	Urtzi Landa *Coordinator of NDT and welding*	05/04/2024	FIHI Forging Industry S.L.
REVIEWED & APPROVED BY	Ainhoa Lasa *Product Quality Coordinator*	05/04/2024	FIHI Forging Industry S.L.
CUSTOMER APPROVAL (To be fulfilled, only if customer requires)			

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