

HL-LHC: Quality Manufacturing and Inspection Plan

Project: HL-LHC		Work Package: WP4		Supplier: CERN (EN-MME)		Item Code: ACFHC001		Asset Code: CR000001 (HOM)			
No	ACTIVITY	APPLICABLE STANDARD	REF. DOCUMENT	INSPECTION						NOTES	
				SUPPLIER		CERN		3 rd PART (If any)			INSPECTION REPORT ID
				Code	Signature/Date	Code	Signature/Date	Code	Signature/Date		
1	QUALIFICATIONS WELDING TESTS										
1.1	EB Welding Procedure Qualification Record	EN-15614-11	Engineering Specification (E.S) EDMS N° 1389669	H						PQR EDMS N°	
1.2	EB welding procedure Specification	EN-15614-11	Engineering Specification (E.S) EDMS N° 1389669	H						WPS EDMS N°	
1.3	Brazing Procedure Qualification Record	EN-13134	Engineering Specification (E.S) EDMS N° 1389669	H						BPQR EDMS N°	
1.4	Brazing Procedure Specification	EN 13585	Engineering Specification (E.S) EDMS N° 1389669	H						BPS EDMS N°	
2	PHASE 1. FABRICATION HOOK MACHINING Gamme Id. 2346		Drawing N° LHCACFHC0016								
2.1	Procurement of niobium material		CERN Material Technical Specification N°3300	H						Material Certificates EDMS N°	
2.2	Cutting & Machining Gamme Id:2347-2349		Drawing N° LHCACFHC0003	H						-	
2.3	Degreasing (max.3 days after machining) Gamme Id: 2350		CERN procedure	H						-	
2.4	Metrology control Gamme Id: 2351		Drawing N° LHCACFHC0003	H						Test Report EDMS N°	
2.5	Degreasing + BCP (30µm) Gamme Id 2352		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
2.6	Metrology control Gamme Id: 2353		Drawing N° LHCACFHC0003	H						Test Report EDMS N°	
2.7	Degreasing + BCP (30µm) Gamme Id: 2354		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	

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2.8	Metrology control Gamme Id: 2355		Drawing N° LHCACFHC0003	H						Test Report EDMS N°	
2.9	Machining Gamme Id: 2356		Drawing N° LHCACFHC0023	H						-	
2.10	Degreasing (max. 3 days after machining) Gamme Id: 2357		CERN procedure	H						-	
2.11	Metrology control Gamme Id: 2358		Drawing N° LHCACFHC0023	H						Test Report EDMS N°	
2.12	Degreasing + BCP (10µm) Gamme Id: 2359		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
2.13	Cutting & Machining Gamme Id: 2360-2361- 2362		Drawing N° LHCACFHC0002	H						-	
2.14	Degreasing (max.3 days after machining) Gamme Id: 2363		CERN procedure	H						-	
2.15	Metrology control Gamme Id: 2364		Drawing N° LHCACFHC0002	H						Test Report EDMS N°	
2.16	Degreasing + BCP (30µm) Gamme Id: 2365		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
2.17	Metrology control Gamme Id: 2366		Drawing N° LHCACFHC0002	H						Test Report EDMS N°	
2.18	Degreasing + BCP (30µm) Gamme Id: 2367		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
2.19	Metrology control Gamme Id: 2368		Drawing N° LHCACFHC0002	H						Test Report EDMS N°	
2.20	Machining Gamme Id: 2369		Drawing N° LHCACFHC0015	H						-	
2.21	Degreasing (max.3 days after machining) Gamme Id: 2370		CERN procedure	H						-	

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2.22	Metrology control Gamme Id: 2371		Drawing N° LHCACFHC0022	H						Test Report EDMS N°	
2.23	Degreasing + BCP (10µm) Gamme Id: 2372		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
2.24	Welding W010 Gamme Id: 2375		WPS & Drawing N° LHCACFHC0015	H						Welding book EDMS N°	
2.25	Visual Inspection W010 Gamme Id: 2376	EN ISO 13919-2 Level B	E.S section 4.3.2.1 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
2.26	Machining Gamme Id: 2379		Drawing N° LHCACFHC0016	H						-	
2.27	Degreasing (max.3 days after machining) Gamme Id: 2380		CERN procedure	H						-	
2.28	Metrology control Gamme Id: 2381		Drawing N° LHCACFHC0016	H						Test Report EDMS N°	
2.29	Machining Gamme Id: 2382		Drawing N° LHCACFHC0004	H						-	
2.30	Degreasing (max.3 days after machining) Gamme Id: 2383		CERN procedure	H						-	
2.31	Metrology control Gamme Id: 2384		Drawing N° LHCACFHC0004	H						Test Report EDMS N°	
2.32	Degreasing + BCP (30µm) Gamme Id: 2385		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
2.33	Metrology control Gamme Id: 2386		Drawing N° LHCACFHC0004	H						Test Report EDMS N°	
2.34	Degreasing + BCP (30µm) Gamme Id: 2387		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
2.35	Metrology control Gamme Id: 2388		Drawing N° LHCACFHC0004	H						Test Report EDMS N°	
2.37	Machining Gamme Id: 2389		Drawing N° LHCACFHC0024	H						-	

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2.38	Degreasing (max.3 days after machining) Gamme Id: 2390		CERN Procedure	H						-	
2.39	Metrology control Gamme Id: 2391		Drawing N° LHCACFHC0024	H						Test Report EDMS N°	
2.40	Degreasing + BCP (10µm) Gamme Id: 2392		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
2.41	Welding W040 Gamme Id: 2393		WPS & Drawing N° LHCACFHC0001	H						Welding book EDMS N°	
2.42	Visual Inspection W010 Gamme Id: 2394	EN ISO 13919-2 Level B	E.S section 4.3.2.1 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
3.	PHASE 2. FABRICATION DN63 MACHINING Gamme Id. 2346		Drawing N° LHCACFHC0005	H						-	
3.1	Procurement of niobium material		CERN Material Technical Specification N°3300	H						Material Certificates EDMS N°	
3.2	Cutting & Machining Gamme Id: 2396-2397-2398-2400-2401		Drawing N° LHCACFHC0005	H						-	
3.3	Degreasing (max.3 days after machining) Gamme Id: 2402		CERN Procedure	H						-	
3.4	Metrology control Gamme Id: 2403		Drawing N° LHCACFHC0005	H						Test Report EDMS N°	
3.5	Degreasing + BCP (30µm) Gamme Id: 2404		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
3.6	Metrology control Gamme Id: 2405		Drawing N° LHCACFHC0005	H						Test Report EDMS N°	
3.7	Degreasing + BCP (30µm) Gamme Id: 2406		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
3.8	Metrology control Gamme Id: 2407		Drawing N° LHCACFHC0005	H						Test Report EDMS N°	

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3.9	Machining Gamme Id: 2408-2409-2410		Drawing N° LHCACFHC0027 & 0031	H						-	
3.10	Metrology control Gamme Id: 2411		Drawing N° LHCACFHC0027	H						Test Report EDMS N°	
3.11	Degreasing + BCP (10µm) Gamme Id: 2412		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
3.12	Cutting & Machining Gamme Id: 2413-2414		Drawing N° LHCACFHC0006	H						-	
3.13	Degreasing (max.3 days after machining) Gamme Id: 2415		CERN procedure	H						-	
3.14	Metrology control Gamme Id: 2416		Drawing N° LHCACFHC0006	H						Test Report EDMS N°	
3.15	Degreasing + BCP (30µm) Gamme Id: 2417		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
3.16	Metrology control Gamme Id: 2418		Drawing N° LHCACFHC0006	H						Test Report EDMS N°	
3.17	Degreasing + BCP (30µm) Gamme Id: 2419		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
3.18	Metrology control Gamme Id: 2420		Drawing N° LHCACFHC0006	H						Test Report EDMS N°	
3.17	Machining Gamme Id.:2421		Drawing N° LHCACFHC0026	H						-	
3.18	Degreasing (max.3 days after machining) Gamme Id: 2422		CERN procedure	H						-	
3.19	Metrology control Gamme Id: 2423		Drawing N° LHCACFHC0026	H						Test Report EDMS N°	
3.20	Degreasing + BCP (10µm) Gamme Id: 2424		CERN procedure & E.S section 3.8 EDMS N° 1389669	H							
3.21	Cutting & Machining Gamme Id: 2425-2426-2427-2428		Drawing N° LHCACFHC0008	H							

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3.22	Engrave Indication Gamme Id: 2428		Drawing N° LHCACFHC0008	H							
3.23	Welding W020 Gamme Id: 2432		WPS & Drawing N° LHCACFHC0011	H						Welding Book EDMS N°	
3.24	Visual Inspection W020 Gamme Id: 2433	EN ISO 13919-2 Level B	E.S section 4.3.2.1 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
3.25	Radiographic Inspection W020 Gamme Id: 2434	EN ISO 13919-2 Level B	E.S section 4.3.2.1 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
3.26	Cleaning before brazing Gamme Id: 2435	-	E.S section 3.8.5 EDMS N° 1389669.	H						-	
3.27	Brazing W030 Gamme Id: 2436		BPS & Drawing N° LHCACFHC0011	H						Welding Book EDMS N°	
3.28	Visual Inspection W030 Gamme Id: 2437	EN 12799 & EN ISO 18279	E.S section 4.3.2 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
3.29	Ultrasonic Inspection W030 Gamme Id: 2438	EN 12799	E.S section 4.3.2 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
3.30	Metrology control Gamme Id: 2439		Drawing N° LHCACFHC0011	H						Test Report EDMS N°	
3.31	Knife machining Gamme Id: 2440		Drawing N° LHCACFHC0012	H						-	
3.32	Metrology control Gamme Id: 2441		Drawing N° LHCACFHC0012	H						Test Report EDMS N°	
3.33	Cleaning Gamme Id: 2442		Drawing N° LHCACFHC0012	H						-	
3.34	Leak test Gamme Id: 2443	EN 13185	E.S section 4.5 EDMS N° 1389669.	H						Test Report EDMS N°	
4	PHASE 3. WELDING W040-W050 Gamme Id. 2444		Drawing N° LHCACFHC0001							-	
4.1	Degreasing + BCP (10µm) Gamme Id: 2447		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
4.2	Welding W050 Gamme Id: 2448		WPS & Drawing N° LHCACFHC0001	H						Welding Book EDMS N°	

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4.3	Visual Inspection W050 Gamme Id: 2449	EN ISO 13919-2 Level B	E.S section 4.3.2.1 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
5	PHASE 4. FABRICATION DN35 (8 PIECES) Gamme Id. 2450		Drawing N° LHCACFHC0014	H						-	
5.1	Procurement of S.S material		CERN Material Technical Specification	H						Material certificates	
5.2	Machining Gamme Id: 2451		Drawing N° LHCACFHC0007	H						-	
5.3	Degreasing (max.3 days after machining) Gamme Id: 2452		CERN procedure	H						-	
5.4	Metrology control Gamme Id: 2453		Drawing N° LHCACFHC0007	H						Test Report EDMS N°	
5.5	Degreasing + BCP (30µm) Gamme Id: 2454		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
5.6	Metrology control Gamme Id: 2455		Drawing N° LHCACFHC0007	H						Test Report EDMS N°	
5.7	Degreasing + BCP (30µm) Gamme Id: 2456		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
5.8	Metrology control Gamme Id: 2457		Drawing N° LHCACFHC0007	H						Test Report EDMS N°	
5.9	Machining Gamme Id: 2458-59		Drawing N° LHCACFHC0025&0030	H						-	
5.10	Degreasing (max.3 days after machining) Gamme Id: 2460		CERN Procedure	H						-	
5.11	Metrology control Gamme Id: 2461		Drawing N° LHCACFHC00025	H						Test Report EDMS N°	
5.12	Machining Gamme Id: 2462-63		Drawing N° LHCACFHC0009	H						-	
5.13	Metrology control Gamme Id: 2464		Drawing N° LHCACFHC0009	H						Test Report EDMS N°	
5.14	Degreasing Gamme Id: 2465		Drawing N° LHCACFHC0009	H						-	

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5.15	Degreasing + BCP (10µm) Gamme Id: 2466		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
5.16	Brazing W110 Gamme Id:2467		BPS & Drawing N° LHCACFHC0013	H						Welding book EDMS N°	
5.17	Visual Inspection W110 Gamme Id: 2468	EN 12799 & EN ISO 18279	E.S section 4.3.2 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
5.18	Ultrasonic Inspection W030 Gamme Id: 2469	EN 12799	E.S section 4.3.2 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
5.19	Machining Gamme Id: 2470		Drawing N° LHCACFHC0014	H						-	
5.20	Degreasing (max.3 days after machining) Gamme Id: 2471		Drawing N° LHCACFHC0014	H						-	
5.21	Metrology control Gamme Id: 2472		Drawing N° LHCACFHC0014	H						Test Report EDMS N°	
6.	PHASE 5. FABRICATION DN35 (8 PIECES) Gamme Id. 2473			H						-	
6.1	Procurement of Bellows Gamme Id:2474		Drawing N° LHCACFHC0010	H						Material Certificates EDMS N°	
7.	PHASE 6. FABRICATION BELLOWS STIFFENER Gamme Id. 2475		Drawing N° LHCACFHC0028	H						-	
7.1	Procurement S.S material		CERN Material Technical Specification	H						Material Certificates EDMS N°	
7.2	Machining Gamme Id: 2476		Drawing N° LHCACFHC0028	H						-	
7.3	Cleaning Gamme Id: 2477		Drawing N° LHCACFHC0028	H						-	
7.4	TTH Gamme Id: 2478		Drawing N° LHCACFHC0028	H						Test Report EDMS N°	
7.5	Machining & Cutting Gamme Id: 2479 & 2480		Drawing N° LHCACFHC0028	H						-	
8.	PHASE 7. WELDING W120 Gamme Id. 2481									-	

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8.1	EB Welding W120 Gamme Id: 2483		WPS & Drawing N° LHCACFHC0001	H						Welding book EDMS N°	
8.2	Visual Inspection W120 Gamme Id: 2483	EN ISO 5817 Level B	E.S section 12 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
9.	PHASE 8. FABRICATION Gamme Id. 2484									-	
9.1	Procurement S.S material		CERN Material Technical Specification	H						Material Certificates	
9.2	Rolling & Machining Gamme Id: 2489 to 2496		Drawing N° LHCACFHC0017/0018	H						-	
9.3	TIG welding POS 2 Gamme Id: 2497	EN ISO 5817 level B	WPS & Drawing N° LHCACFHC0018	H						Welding book EDMS N°	
9.4	Machining Gamme Id: 2498-2499		Drawing N° LHCACFHC0019 & 0020	H						-	
9.5	Degreasing Gamme Id: 2500		Drawing N° LHCACFHC0017-0018- 0019-0020	H						-	
9.6	EB welding W060 Gamme Id: 2501		WPS & Drawing N° LHCACFHC0001	H						-	
9.7	Radiographic Inspection W060 Gamme Id: 2502	EN ISO 13919-1 Level B	E.S section 12 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
10.	PHASE 9. ASSEMBLY Gamme Id. 2503										
10.1	EB Welding W080-W090 Gamme Id: 2505		WPS & Drawing N° LHCACFHC0001	H						Welding book EDMS N°	
10.2	Visual Inspection W080- W090 Gamme Id: 2483	EN ISO 13919-1 Level B	E.S section 12 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
10.3	Radiographic Inspection Gamme Id: 2507	EN ISO 13919-1 Level B	E.S section 12 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
10.4	EB welding W100 Gamme Id: 2509		WPS & Drawing N° LHCACFHC0001	H						Welding book EDMS N°	
10.5	Visual Inspection W100 Gamme Id: 2510	EN ISO 13919-1 Level B	E.S section 12 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	

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11.	PHASE 10. ASSEMBLY Gamme Id. 2511		Drawing N° LHCACFHC0001							-	
11.1	Degreasing + BCP (10µm) POS 1 & 2 Gamme Id: 2516		CERN procedure & E.S section 3.8 EDMS N° 1389669	H						-	
11.2	EB Welding W130 Gamme Id: 2517		WPS & Drawing N° LHCACFHC0001	H						Welding book EDMS N°	
11.3	Visual Inspection W100 Gamme Id: 2518	EN ISO 13919-2 Level B	E.S section 4.3.2.1 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
11.4	Radiographic Inspection W100 Gamme Id: 2519	EN ISO 13919-2 Level B	E.S section 4.3.2.1 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
11.5	Leak test Gamme Id: 2520	EN 13185	E.S section 4.5 EDMS N° 1389669.	H						Test Report EDMS N°	
11.6	EB Welding W140 Gamme Id: 2521		WPS & Drawing N° LHCACFHC0001	H						Welding book EDMS N°	
11.7	Visual Inspection W140 Gamme Id: 2522	EN ISO 13919-1 Level B	E.S section 12 EDMS N° 1389669.	H						Welding book & Test report EDMS N°	
11.8	TIG tack welding POS 10 Gamme Is: 2523	-	Drawing N° LHCACFHC0001	H						-	
11.9	Leak test Final Gamme Id: 2524	EN 13185	E.S section 4.5 EDMS N° 1389669.	H						Test Report EDMS N°	



EDMS NO. 0000000	REV. 0.1	VALIDITY DRAFT
QUALITY		PUBLIC

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NOTE: H = HOLD POINT N = NOTIFICATION POINT R = REVIEW AND APPROVAL OF REPORT	SUPPLIER: Approved: Date:	CERN: Approved: Date:	3rd PART (if any): Approved: Date:
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- 1- **N (Notification Point):** CERN, or its authorized representative, is informed 5 working days in advance that a specific step has been completed and that the following step in the approved work-flow will be performed. A Notification Point does not affect the work-flow. Work can continue without CERN, or its authorized representative, reply.
- 2- **H (Hold Point):** CERN, or its authorized representative, is informed that a specific step has been completed. The work-flow is stopped until CERN, or its authorized representative, provides a Hold Point Clearance. The clearance is provided within 5 working days upon submission of the quality control documentation relative to the performed step. In case of clearance the work-flow can continue. In case of rejection, a recovery plan shall be discussed with CERN and submitted to CERN for final approval within 10 working days.
- 3- **R (Review):** The quality records will be reviewed.