



Electronic Traveller (eMIP)

A transparent tool for production monitoring

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On behalf of MSC-QA team
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Monneron
Support of EN-IM team

Outline

- What is a MIP
- Motivation and objectives
- Implementation
- Building an eMIP
- Future plans and features

What is a MIP

- Reference document to ensure that manufacturing was properly done
- Lists manufacturing steps, inspection steps, and versions of procedures/drawings used for production
- Implemented at CERN for HL-LHC project
- From nuclear industry (complex, reliable)

MIP Example



EDMS NO. 1582708 REV. 4.0 VALIDITY RELEASED
 REFERENCE: LHC-MBH_C-FP-0007

No	ACTIVITY / OPÉRATION	APPL. STANDARD DS / NORMES APPL.	APPLICABLE DOCUMENTS / DOCUMENTS APPLICABLES	REV. DOC.	INSPECTION / CONTRÔLE						NOTES / COMMENTAIRES		
					Contractor's QA/QC (Contract Number S197)		CERN/ CHECK (LMF-QA)		3 rd PARTY/SURVEILLANCE (WPL or WPE)			INSPECTION REPORT	REV. DOC.
					Code	Signature/Date	Code	Signature/Date	Code	Signature/Date			
B COMPONENTS PRÉPARATION DES SOUS COMPOSANTS													
B.1	Prepare the components Préparer les sous composants		Procedure LHC-MBH_C-FP-0003 Control LHC-MBH_C-FP-0006 File LHC-MBH_C-FP-0014	7.0 0.4 6.0	R	ANDREINI nichel 17/05/18							
C WINDING / BOBINAGE													
C.1	Winding of the inner layer Bobiner la couche interne		Procedure LHC-MBH_C-FP-0003 Drawing LHCMBH_C0011 Control LHC-MBH_C-FP-0006 File LHC-MBH_C-FP-0014	7.0 A 0.4 6.0	H/R	ANDREINI nichel 17/05/18			1975154				
C.2	Curing of the inner layer Polymériser la couche interne		Procedure LHC-MBH_C-FP-0004 Control LHC-MBH_C-FP-0006 File LHC-MBH_C-FP-0014	6.0 0.4 6.0	H/R	ANDREINI nichel 23/05/18	W	HOUSIAUX 22/05/18 RAS	1976415				
C.3	Winding of the outer layer Bobiner la couche externe		Procedure LHC-MBH_C-FP-0003 Drawing LHCMBH_C0012 Control LHC-MBH_C-FP-0006 File LHC-MBH_C-FP-0014	7.0 A 0.4 6.0	H/R	Deubault GÉVÉSTIER 30/05/18			1981858				

Description of the operation

Documentation traceability

Validation

CERN Controls

3rd party (if any)

Reports

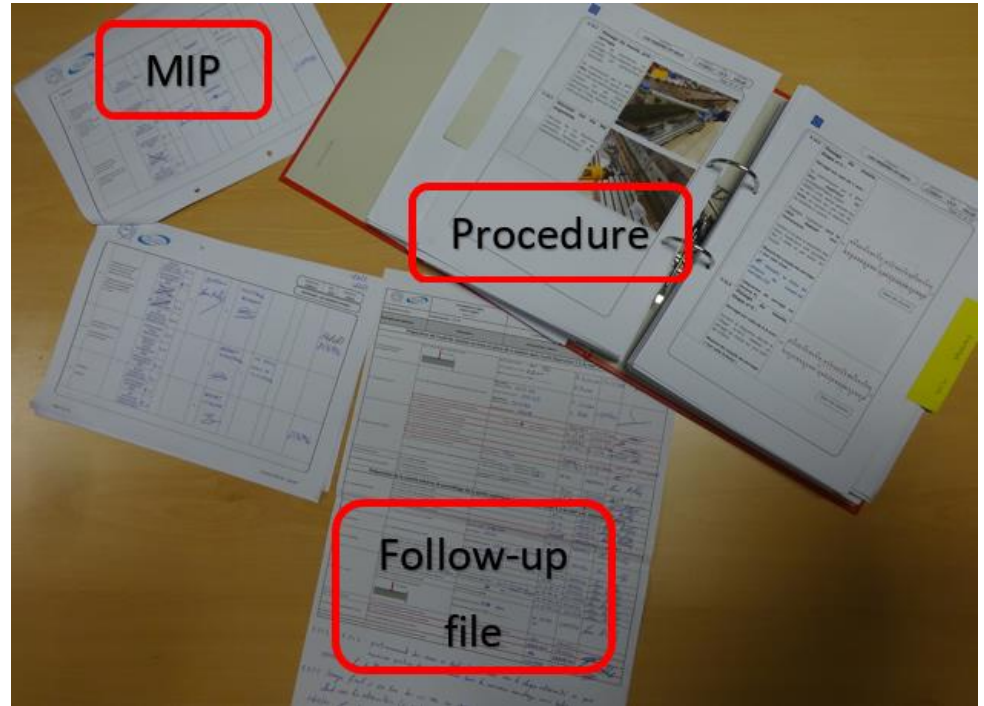
Additional Comments

© Olivier Housiaux



MIP in field

- Follows the production
- “Travels” with the assembly



© Olivier Housiaux

Motivation for electronic MIP

- Paperless CERN
 - Traceability, security, accessibility
 - GL + TE-MS-C-QA initiative
- Propagation of changes
 - Direct access to latest version of procedure, drawings and follow-up file
 - Automatic data recording
 - Notifications
- Data analysis
 - KPIs, summaries, as needed

- → Introducing the eMIP

Objectives - Technical

- Robust
- Simple in administration
- Flexible and secure
- Adaptable to requirements from production & management.
- Using CERN infrastructure (EAM, EDMS)
 - Support from EAM team
- Generic
 - Avoid customization for each eMIP
 - benefit for other teams

Objectives - User

- Access to documentation during production
 - procedures, drawings, checklists, manuals, standards
- Access to documentation as used during assembly (back engineering)
- Digitally signing of performed steps
- Integrated checklists

Objectives - Management


- Real-time access to current state of production
- Traceability of responsibilities with signatures
- Notification on milestone steps
- Summary reports, KPIs

Implementation - eMIP



- A collection of reports, tools and features
- A recipe for creating Workorders, Taskplans and Checklists

eMIP Technologies Used

- EAM/MTF
 - Production steps and checklists
 - EAMLight as user interface in field
 - Pentaho
 - Report generation
 - EDMS
 - Storing and referencing documents
- 
- EN-IM team support
- **No custom software (within TE-MS)**

eMIP Hardware

- Dedicated hardware station
 - Computer, touchscreen, barcode scanner
- Or Tablet / Phone
 - EAMLIGHT mobile support



First Step – Prototyping (2021)

- Technical concept and prototyping
 - Test stations for hardware
- Implementation of all features
 - Holding points, blocking points,
 - E-signing,
 - Custom reports
 - Notifications

Prototyping – Lessons Learned

- Too much hardcoding and customization
 - Not robust, hard to administer, hard to change, hard to maintain
- Be aware of complexity
 - Hard to track errors and permission problems
- Blocking points are dangerous
 - Stops work on eMIP until issue is resolved
 - Use procedural holding points instead of technical ones
- Better simple and working than complex and breaking
- Need to keep everyone involved

New Version – “Production”

- Take what worked from prototype, discard what failed
- Incrementally build up features
- Keep reusability in mind
 - generic over customization
 - New ideas take time to generalize and validate

The eMIP Provides



Infor EAM Reporting - Pentaho - CMI QA
 Equipment: HCQBRDP004-CR000001
 Extracted on: 11/10/2022 10:41

Electronic MIP for HCQBRDP004-CR000001

A - Production Start-up (CMI)

	Document	Version	Executing Entity	Supplier	Client	3rd Party	Reports/NCRs	Comments
A.1 - Prod.Start-Up:Val. parts,calc. margins,assign parts to assembly	Assembly Procedure LHC-QBRD-FP-0004	1.1	IH	JAMIL RIZWAN 23-MAY-22			NCR: LHC-QBRDP-QN-0001	A. Seller digitally signed on behalf of R. Jamil initially due to access issues with EAM light. R. Jamil has signed the paper copy. Now the access issue has been resolved and signed again by R. Jamil.

B - Cryostating (CMI)

	Document	Version	Executing Entity	Supplier	Client	3rd Party	Reports/NCRs	Comments
Production step	Welding Book LHC-QBRD-NOT-0004	1	IH	BARLOW GRAEME 19-JUL-22			Doc: LHC-QBRDP-FR-0004 NCR: LHC-QBRDP-QN-0007	A. Seller signed on behalf of M. A. Khedhir who performed the welding inspection on 11/05/2022
B.1 - Installation of Locking Rings	LHCQBRD_0113 LHCQBRD_0113	0	IH	BARLOW GRAEME 19-JUL-22			Reports	Comments
Procedures	Assembly Procedure LHC-QBRD-FP-0004	1.1						
Signatures	Welding Book LHC-QBRD-NOT-0004	1	IH	SELLER ALISDAIR DOUGLAS 17-MAY-22			NCR: LHC-QBRDP-QN-0008	DH160522: Welding filler not used for welding upper thermal shield, approved by D.RAMOS. DH170522: A.SELLER signed in place of N.MAROUAN (Welder)
B.2 - Installation of Upper Thermal Shield	LHCQBRD_0013 LHCQBRD_0113	0	IH	SELLER ALISDAIR DOUGLAS 17-MAY-22				
	Assembly Procedure LHC-QBRD-FP-0004	1.1						
B.3 - Cold Mass and Tooling are Ready for Cryostating	Assembly Procedure LHC-QBRD-FP-0004	1.1	IH	BARLOW GRAEME 17-MAY-22			NCR: LHC-QBRDP-QN-0003	
	Assembly Procedure LHC-QBRD-FP-0004	1.1		BARLOW				



The eMIP Provides

Direct link to step in EAMLight

The screenshot displays the EAMLight software interface. On the left, a sidebar contains a navigation menu with the following items:

- A.1 - Prod.Start-Up:Val. parts,calc. mar parts to assembly
- B.1 - Installation of Locking Rings** (highlighted with a red box)
- B.2 - Installation of Upper Thermal Shield
- B.3 - Cold Mass and Tooling are Ready for Cryostating

The main content area shows the 'EAM Light' application window for 'Work Order 30940380'. The checklist is titled '10 - MIP ELEC - B.1 - Installation of Locking Rings'. The checklist items are:


- Assembly Procedure LHC-QBRD-FP-0004 (Version: 1.1)
- LHCQBRD_0113 LHCQBRD_0113 (Version: 0)
- Welding Book LHC-QBRD-NOT-0004 (Version: 1)
- A. Seller signed on behalf of M. A. Khedhir who performed the welding inspection on 11/05/2022

The 'E-SIGNATURES' section shows the following entries:

Signature	Date	Action
CMi Production Team Graeme Barlow	19-JUL-2022 10:38	SIGN
CMi QA Team DAVID HOUSSAIS	16-MAY-2022 11:09	SIGN



The eMIP Provides

 Infor EAM Reporting - Pentaho - CMI QA
Equipment: HCOBRDP004-CR000001
Extracted on: 11/10/2022 10:41

A.1 - Prod.Start-Up:Val. parts,calc. mar parts to assembly

B.1 - Installation of Locking Rings

B.2 - Installation of Upper Thermal Shield

B.3 - Cold Mass and Tooling are Ready for Cryostating

Checklists

Work Order 31262895 | SAVE + NEW | DELETE | [Icons]

Hide filled items

20 - D.1 - Test électrique la bobine CREATE FOLLOW-UP WO ^

HCMQXFBC08-CR000128 - MQXFB prototype long coil

Winding Procedure LHC-MQXFBC-FP-0001 Ver.

Electrical test protocol LHC-MQXFBC-FP-0020 Ver.

Control Procedure LHC-MQXFBC-FP-0057 Ver.

Coil manufacturing follow-up file LHC-MQXFBC-FP-0014 Ver.

Inductance aft curing [10 kHz] mH

R(DC)(20C°) after curing mOhm

Inductance aft curing [1 Hz] mH

Inductance aft curing [100 Hz] mH

Inductance aft curing [1kHz] mH

Inductance aft curing [10Hz] mH

E-SIGNATURES

LMF Production Team SIGN

LMF QA Team SIGN

The eMIP Provides

Digital signatures

CERN Infor EAM Reporting - Pentaho - CMI QA
Equipment: HCOBRDP004-CR000001
Extracted on: 11/10/2022 10:41

A.1 - Prod.Start-Up;Val. parts,calc. mar parts to assembly

B.1 - Installation of Locking Rings

B.2 - Installation of Upper Thermal Shield

B.3 - Cold Mass and Tooling are Ready for Cryostating

Work Order 31262895 | SAVE + NEW | DELETE | [Icons]

Hide filled items

20 - D.1 - Test électrique la bobine CREATE FOLLOW-UP WO ^

HCMQXFBC08-CR000128 - MQXFB prototype long coil

Winding Procedure LHC-MQXFBC-FP-0001 Ver.

Electrical test protocol LHC-MQXFBC-FP-0020 Ver.

Control Procedure LHC-MQXFBC-FP-0057 Ver.

Coil manufacturing follow-up file LHC-MQXFBC-FP-0014 Ver.

Inductance aft curing [10 kHz] mH

RDCI(20C°) after curing mOhm

Inductance aft curing [1 Hz] mH

Inductance aft curing [100 Hz] mH

Inductance aft curing [1kHz] mH

Inductance aft curing [10Hz] mH

E-SIGNATURES

LMF Production Team

LMF QA Team

E-Signature

Username *

Pasword *

CANCEL SIGN


SIGN

SIGN



The eMIP Provides

Kiosk mode, login via badge scan

 Infor EAM Reporting - Pentaho - CMI QA
Equipment: HCQBRDP004-CR000001
Extracted on: 11/10/2022 10:41

	Document
A.1 - Prod Start-Up: Val. parts, calc. margins, assign parts to assembly	Assembly Procedure LHC-QBRD-FP-0004
B.1 - Installation of Locking Rings	Welding Book LHC-QBRD-NOT-0004 LHCQBRD_0113 LHCQBRD_0113 Assembly Procedure LHC-QBRD-FP-0004
B.2 - Installation of Upper Thermal Shield	Welding Book LHC-QBRD-NOT-0004 LHCQBRD_0013 LHCQBRD_0113 Assembly Procedure LHC-QBRD-FP-0004
B.3 - Cold Mass and Tooling are Ready for Cryostating	Assembly Procedure LHC-QBRD-FP-0004
	Assembly Procedure LHC-QBRD-FP-0004

Scan your CERN badge:

Person ID:

1.1 BARLOW HOUSSAIS

The eMIP Provides

Direct link to procedure
Electronic MIP for HCQBRDP004-CR000001

Inbox - Caddie Search

2706242 v.1.1 | LHC-QBRD-FP-0004 v.1.1 Released CERN Internal

Assembly Procedure for D2 Prototype QBRD Standard Section by Ali Seller

Info

Description: External reference: QBRD (D2) Prototype Cryostat Standard Section - WP3

Keywords: QBRD (D2) Prototype Cryostat Standard Section - WP3

Details

Local administrators: [List of Administrators](#) Equipment code: LHCQBRD

Context: HL-LHC-WP3-EXT Release procedure: HL-AL

Associated Links: Context for WP3 with the QA team from bld 180 CDN Links: Fabrication, Assembly and Verification

This page <https://edms.cern.ch/document/2706242/1.1>

Files


Name	Size	Last modified date	Last modified by
LHC-QBRD-FP-0004_v1.1_-_Assembly_procedure_of_D2_prototype_02May2022.docx	72.8 MB	2022-05-02 15:29:46	ALISDAIR DOUGLAS SELLER
LHC-QBRD-FP-0004_v1.1_-_Assembly_procedure_of_D2_prototype_02May2022.pdf	3.2 MB	2022-05-02 15:29:46	ALISDAIR DOUGLAS SELLER

Page 1 of 1

[More info](#)

Assembly Procedure	Version	Author	Date	Reviewer	Date	Notes
Assembly Procedure LHC-QBRD-FP-0004	1.1	BARLOW GRAEME	17-MAY-22	HOUSSAIS DAVID	17-MAY-22	NCR: LHC-QBRD-QN-0003
Assembly Procedure LHC-QBRD-FP-0004	1.1	BARLOW		HOUSSAIS		

The eMIP Provides



Infom EAM Reporting - Pentaho - CMI QA
Equipment: HCQBRDP004-CR000001
 Extracted on: 11/10/2022 10:11

Direct link to NCR/Reports

due to access issues

again by R. Jamil.

formed the welding

er thermal shield,

d in place of

		Document	
A.1 - Prod Start-Up: Val. parts, cal margins, assign parts to assembly		Assembly Procedure LHC-QBRD-FP-0004	
		Document	
B.1 - Installation of Locking Rings		Welding Book LHC-QBRD-NOT-0004	
		LHCQBRD_0113 LHCQBRD_0113	
		Assembly Procedure LHC-QBRD-FP-0004	
B.2 - Installation of Upper Thermal Shield		Welding Book LHC-QBRD-NOT-0004	
		LHCQBRD_0013 LHCQBRD_0113	
		Assembly Procedure LHC-QBRD-FP-0004	
B.3 - Cold Mass and Tooling are ready for Cryostating		Assembly Procedure LHC-QBRD-FP-0004	
		Assembly Procedure LHC-QBRD-FP-0004	

2754981 v.2.0 | LHC-QBRDP-QN-0007 v.2.0
Actions Underway
CERN Internal

Insulation pieces (HCQBRD_103) are not mountable on EHE line of D2 prototype by David HOUSSAIS

Info

Description: This NC is considered as "NON-CRITICAL" (Level 1) with NC type "Negligible" as described in the TE- External reference: MSC-QP NC Management procedure, EDMS 1970523. Keywords: Standard Section D2 Prototype, insulation piece, EHE/H line

Insulation pieces (HCQBRD_103) are not mountable on EHE line of D2 prototype. Contact is detected between EHE/H line tube and insulation piece when fixed in final position. No limitation of thermal conduction. Insulation piece can slide through the EHE/H line.

Special Properties

Main Cause:	Materials
Class:	Mechanical
Disposition / Action:	Repair
Importance / Criticality:	Non critical

Details

Local administrators:	List of Administrators	Equipment code:	LHCQBRDP
Context:	HL-LHC-WP3-MTF	Release procedure:	HL-NCR
Associated Links:	General context for WP3 MTF	Release procedure for HL Evaluation	
CDN Links:			

This page <https://edms.cern.ch/document/2754981/2.0>

Files

Name	Size	Last modified date	Last modified by
2754981_v2.0_insulation_pieces_are_not_mountable_on_EHE_H_line_of_D2_prototype.docx	5.1 MB	2022-09-28 15:24:45	DAVID HOUSSAIS

More info

Sub-Documents | Used In | Approval & Comments | Access rights | Versions | History

Create subdocument | Attach document | Detach | Export to Excel | Request access | Add all to Caddie | Edit Tags | Download files Hide Obsolete | Pe

#	Id	Title	Files	Status	Created on	Author	Document type	Tags
1.1		BARLOW	HOUSSAIS					



The eMIP Provides

- Reports and KPI
- Summaries
- Notifications

[LQXF-LMF] Notification for HCLQXFC001-CR-DUMMY [al...]

NR No Reply EAM
To Kevin Monneron; Sonia Mallon Amerigo 11:59 AM

Dear,
We inform you that a step is to be carried out after step D7- Install CLIQ box (CMI) on the asset HCLQXFC001-CR-DUMMY.

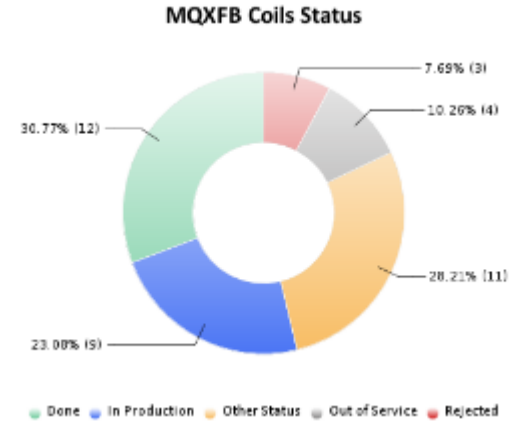
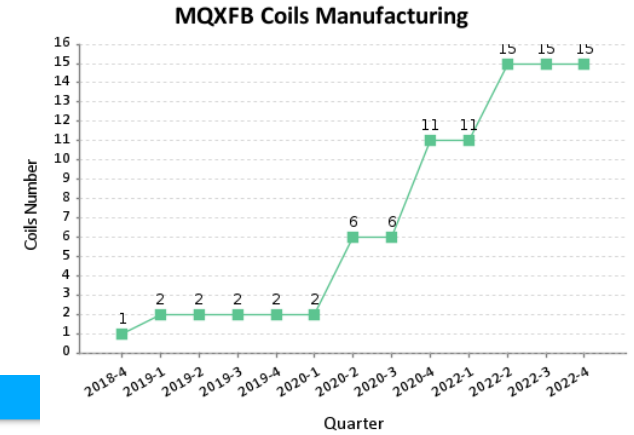
Please complete the attached checklist:
work order: <https://cmmsx.cern.ch/SSO/eamlight/workorder/30133247>

You can refer to the Electronic MIP documents for an overview of the production:
https://dir-eambi-prod.cern.ch/pentaho/api/repos/home:CERN:EAM:CMI:MIP_ELEC_CMI_prpt/viewer

Comment

Best regards,
CMI QA Team

HCMQXFBC08-CR000128 - WorkOrder Planning						
Equipment						
Status	▼ HCMQXFBC08-CR000128 ▼					
EQUIPMENT	DESC	INTERVENTION	September, 2022		October, 2022	
			12/09	19/09	26/09	03/10
HCMQXFBC08-CR000128	Total	8	8		Today	
HCMQXFBC08-CR000128	1 - Production start-up	1				
HCMQXFBC08-CR000128	10 - Inner layer winding	1				
HCMQXFBC08-CR000128	20 - Inner layer curing	1				
HCMQXFBC08-CR000128	30 - Outer layer winding	1				
HCMQXFBC08-CR000128	40 - Outer layer curing	1				
HCMQXFBC08-CR000128	45 - Cable core removal	1				
HCMQXFBC08-CR000128	50 - Electrical tests	1				
HCMQXFBC08-CR000128	60 - Coil validation after windi	1				
HCMQXFBC08-CR000128	100 - Reaction	0				
HCMQXFBC08-CR000128	105 - Reaction Heat Treatment	0				
HCMQXFBC08-CR000128	110 - Splicing	0				
HCMQXFBC08-CR000128	120 - Electrical tests during re	0				
HCMQXFBC08-CR000128	130 - Impregnation	0				
HCMQXFBC08-CR000128	135 - Impregnation report	0				
HCMQXFBC08-CR000128	140 - Geometrical measureme	0				
HCMQXFBC08-CR000128	150 - Final electrical tests	0				
HCMQXFBC08-CR000128	160 - Impregnated coil accept	0				



How To Build a new eMIP

- Involved EAM components
- Access rights
- Procedure and tools

How To Build a new eMIP

- Starting point: approved MIP (EDMS) + procedures, drawings
- Equipment + Item in EDMS

How To Build a new eMIP

- Standard Workorders
 - Workorder templates
 - Equal to MTF step

A - Production Start-up (CMI)

Document	Version	Executing Entity	Supplier	Client	3rd Party	Reports/NCRs	Comments
A.1 - Prod.Start-Up/val_parts.calc_margins.assign parts to assembly	Assembly Procedure LHC-OBMD-PP-0004 1.1		IN JAMIL RIZWAN 23-MAY-22			NCR: LHC-OBMD-QN-0001	A. Seller digitally signed on behalf of R. Jamil initially due to access issues with EAM light. R. Jamil has signed the paper copy. Now the access issue has been resolved and signed again by R. Jamil.

How To Build a new eMIP

- Taskplans



A - Production Start-up (CMI)

Document	Version	Executing Entity	Supplier	Client	3rd Party	Reports/NCRs	Comments
A.1 - Prod Start-Up: Val. parts, calc. margins, assign parts to assembly	Assembly Procedure LHC-Q800-PP-0204 1.1		JH JAMIL RIZWAN 23-MAY-22			NCR: LHC-Q800P-QN-0001	A. Seller digitally signed on behalf of R. Jamil initially due to access issues with EAM light. R. Jamil has signed the paper copy. Now the access issue has been resolved and signed again by R. Jamil.

- Activity templates
- Signing rights (groups)
- Notifications
- Workorder logic

How To Build a new eMIP

- Checklists

- Procedures
- Input fields
- Link to custom fields
 - MTF equipment data

A - Production Start-up (CMI)

Document	Version	Executing Entity	Supplier	Client	3rd Party	Reports/NCRs	Comments
A.1 - Prod Start-Up-Val. parts,calc. margins,assign parts to assembly	Assembly Procedure LHC-Q800-PP-0004	1.1	IH	JAMIL, RIZWAN 23-MAY-22		NCR: LHC-Q800-QN-0001	A. Seller digitally signed on behalf of R. Jamil initially due to access issues with EAM light. R. Jamil has signed the paper copy. Now the access issue has been resolved and signed again by R. Jamil.



IC3 after ILC

 mm

IR3 after ILC

 mm

Gap btw. poles after ILC

 mm

IR2 after ILC

 mm

IC4 after ILC

 mm

eMIP Creation in Practice

1. Fill out Excel Sheet
 - Defaults
 - Steps
 - Checklists
2. Generated import tables
3. Few manual adjustments
4. Checked by link person
5. CERN Upload Utility
6. Assign workflow in Equipment Generator

A	B	C	D	E	F
1	No	Activity	EDMS documents (comma separated)		Executing Supplier Client
2	A.0	Démontage de la production	MP LHC-MQ2FEC-PP-0047,Control Procedure LHC-MQ2FEC-PP-0056		H R
3	B.0	Vid. d. conf. des locaux au. bust. au la bob. v. d. jour en piles	Winding Procedure LHC-MQ2FEC-PP-0001,Control Procedure LHC-MQ2FEC-PP-0057		H R
4	B.1	Préparation des composants	Winding Procedure LHC-MQ2FEC-PP-0001,Control Procedure LHC-MQ2FEC-PP-0057,Prelayer Procedure LHC-MQ2FEC-PP-0018,Prelayer fabrication follow-up file LHC-MQ2FEC-PP-0052,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014		H H R
5	C.0	Feu vert pour commencer le bobinage couche interne	Checklist LHC-MQ2FEC-PP-0044,Control Procedure LHC-MQ2FEC-PP-0057		H H R H
6	C.1	Bobinage de la couche interne	Winding Procedure LHC-MQ2FEC-PP-0001,Control Procedure LHC-MQ2FEC-PP-0057,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014,Cul Drawing LHC/MQ2FEC001		H R
7	C.2	Polymerisation de la couche interne	Winding Procedure LHC-MQ2FEC-PP-0001,Polymertization Procedure LHC-MQ2FEC-PP-0011,Control Procedure LHC-MQ2FEC-PP-0057,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014		H R
8	C.3.0	Feu vert pour commencer le bobinage de la couche externe	Checklist LHC-MQ2FEC-PP-0044		H
9	C.3	Bobinage de la couche externe	Winding Procedure LHC-MQ2FEC-PP-0001,Control Procedure LHC-MQ2FEC-PP-0057,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014,Cul Drawing LHC/MQ2FEC001		H R
10	C.4	Polymerisation de la couche externe	Winding Procedure LHC-MQ2FEC-PP-0001,Polymertization Procedure LHC-MQ2FEC-PP-0011,Control Procedure LHC-MQ2FEC-PP-0057,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014		H R
11	C.5	Enlèvement de l'anneau des câbles et mise à l'ingénieur des câbles	Winding Procedure LHC-MQ2FEC-PP-0001,Control Procedure LHC-MQ2FEC-PP-0057,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014		H H
12	D.1	Test électrique la bobine	Winding Procedure LHC-MQ2FEC-PP-0001,Electrical test protocol LHC-MQ2FEC-PP-0020,Control Procedure LHC-MQ2FEC-PP-0057,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014		H R N
13	D.2	Compte et acceptation de la bobine	Control Procedure LHC-MQ2FEC-PP-0057		H R H
14	E.0	Autorisation de l'opérateur pour commencer la prép. pour la réaction	Reaction Procedure LHC-MQ2FEC-PP-0005,Control Procedure LHC-MQ2FEC-PP-0055		R N
15	E.1	Préparation de l'outil de réaction en site en place de la bobine	Reaction Procedure LHC-MQ2FEC-PP-0005,Control Procedure LHC-MQ2FEC-PP-0055,Electrical test protocol LHC-MQ2FEC-PP-0040,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014		H H
16	E.3	Prép. de la couche externe et assemblage de la partie supérieure du moule	Reaction Procedure LHC-MQ2FEC-PP-0005,Control Procedure LHC-MQ2FEC-PP-0055,Electrical test protocol LHC-MQ2FEC-PP-0040,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014		H H
17	E.4.0	Feu vert pour lancer le cycle de réaction	Reaction furnace manual EDMS 95574, Checklist for GERD long furnace LHC-MQ2FEC-PP-0003,Control Procedure LHC-MQ2FEC-PP-0055		H R
18	E.4	Reaction	Reaction Procedure LHC-MQ2FEC-PP-0005,Control Procedure LHC-MQ2FEC-PP-0055,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014		R
19	E.5	Analyse de cycle de réaction	Reaction Procedure LHC-MQ2FEC-PP-0005,Control Procedure LHC-MQ2FEC-PP-0055		R R
20	F.1	Démontage du carcan de réaction	Splicing Procedure LHC-MQ2FEC-PP-0016,Control Procedure LHC-MQ2FEC-PP-0058,Impregnation follow-up file LHC-MQ2FEC-PP-0037		H R
21	F.2	Câbles électriques en site en place des points de potentiel	Splicing Procedure LHC-MQ2FEC-PP-0016,Control Procedure LHC-MQ2FEC-PP-0058,Splicing follow-up file LHC-MQ2FEC-PP-0037,Impregnation follow-up file LHC-MQ2FEC-PP-0037		H
22	F.4	Compte de fixation des points électrique	Splicing Procedure LHC-MQ2FEC-PP-0016,Control Procedure LHC-MQ2FEC-PP-0058,Impregnation follow-up file LHC-MQ2FEC-PP-0037		H
23	G.1	Préparation de la couche interne	Preparation for impregnation Procedure LHC-MQ2FEC-PP-0017,Control Procedure LHC-MQ2FEC-PP-0060,Electrical test protocol LHC-MQ2FEC-PP-0023,Impregnation follow-up file LHC-MQ2FEC-PP-0037		H R
24	G.2	Préparation de la couche externe	Preparation for impregnation Procedure LHC-MQ2FEC-PP-0017,Control Procedure LHC-MQ2FEC-PP-0060,Cul manufacturing follow-up file LHC-MQ2FEC-PP-0014,Impregnation follow-up file LHC-MQ2FEC-PP-0037		H R
25	G.3	Tests électriques après fermeture du moule	Preparation for impregnation Procedure LHC-MQ2FEC-PP-0017,Control Procedure LHC-MQ2FEC-PP-0060,Electrical test protocol LHC-MQ2FEC-PP-0023,Impregnation follow-up file LHC-MQ2FEC-PP-0037		H R N
26	G.4	Validation de la fermeture du moule (couple de serrage, fuite de moule)	Preparation for impregnation Procedure LHC-MQ2FEC-PP-0017,Control Procedure LHC-MQ2FEC-PP-0060,Impregnation follow-up file LHC-MQ2FEC-PP-0037		R
27	G.5	Préparation machine d'impregnation et Cycle d'impregnation	Preparation for impregnation Procedure LHC-MQ2FEC-PP-0017,Control Procedure LHC-MQ2FEC-PP-0060,Impregnation follow-up file LHC-MQ2FEC-PP-0037		H R
28	G.7	Analyse du cycle d'impregnation	Injection system impregnation protocol LHC-MQ2FEC-PP-0080,Impregnation follow-up file LHC-MQ2FEC-PP-0037,Control Procedure LHC-MQ2FEC-PP-0080		R N
29	G.9	Démontage du moule d'impregnation	Preparation for impregnation Procedure LHC-MQ2FEC-PP-0017,Control Procedure LHC-MQ2FEC-PP-0060,Impregnation follow-up file LHC-MQ2FEC-PP-0037		H H
30	G.10	Pressure Géométrique	Meshing procedure LHC-MQ2FEC-PP-0005,Control Procedure LHC-MQ2FEC-PP-0060		H R N
31	G.11	Tests électriques finaux	Control Procedure LHC-MQ2FEC-PP-0060,Electrical test protocol LHC-MQ2FEC-PP-0023		H R N
32	G.12	Acceptation de la bobine impregnée	Control Procedure LHC-MQ2FEC-PP-0060		H R HN
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In Case of Changes

- Modify Standard WO/Taskplans
- Existing eMIP not touched
- Only future Assets affected
- Changes in already created eMIP possible
 - Only affects specific eMIP
- Direct modification of structure
 - > Made by link person
- Procedure/Document Update transparent (over EDMS version)
- Access rights for signing transparent (not bound to eMIP directly)

User Access Control

- Signing Rights linked to groups
 - M-CMI-P -> Production team of CMI
 - Linked to e-group
- Badge access linked to e-groups

Current State

- Current implementation in use for assemblies (D2 proto cryostat, Q2b cryostat, MQXFB coils and Magnets)
- Tested viability of different scenarios
 - Creating new eMIP from MIP template
 - modifying prototype eMIP to production eMIP
 - Adapting already created assets to eMIP
- Slowly adding features bit by bit in production
 - Quick reaction in case of problems
 - Clear source of new problems

Outlook

- Simplify inputs
 - Interface for creating new eMIP
 - Input for notifications and recipients
- Extend automatic reports
 - Automatic generation on specific events
 - Summary reports
- Open for everyone
 - Same structure easily adapted to other processes
 - Mutual benefit of EN-IM developments
 - Central place for overview/statistics/information (EAM)

Outlook – Operation

- eMIP managed by QA teams
 - Creation of new eMIP
 - Asset generation
 - Managing of access rights
- Link person
 - For issues and new features
 - Final check of eMIPs (structure, new features, improvements)
 - Coordination with EN-IM team
 - Collection and feasibility check of required features

Thanks

- Promoted by group (TE-MSc GL) and TE-MSc QA team (pushing initiative)
- CMI and LMF production teams for their patience, help and inputs
- EN-IM team for their quick response and effective help to adopt solutions