

MQP Working Instruction

ITER Numbering System for Components and Parts

This document describes the numbering systems to be used as to define the identifiers for components and parts in the ITER project, and thus rigorously ensuring the traceability of each item throughout the ITER Project life cycle.

This document is Level-3 procedure belongs to the Level-2 procedure for Identification and Controls of Items [U344WG]. This document is applicable to all components and parts designed and procured for the ITER project.

The scope of this document is to establish tagging notions for:

- System Components tagged with Functional Reference, FR
- Type References tagged with Part Number of ITER, PNI
- Physical Items tagged with Serial (/ Lot/ Batch) Numbers, SN

The described ID-code schema are to be applied for the following aims, individually:

1. FR: Identifier to uniquely established all System Components present in the ITER system physically, geographically, in diagrams and/or in 3D and control rooms on the ITER site.
2. PNI: Identifier to establish all Type References of items designed, manufactured (or procured), assembled, commissioned and subject to maintenance on the ITER... (Please see complete abstract on document metadata.)

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ITER Numbering System for Components and Parts (28QDBS)			
Version	Latest Status	Issue Date	Description of Change
v1.0	Approved	09 Oct 2007	This procedure specifies the structure of ITER numbering for parts and components.
v1.1	Signed	23 Jun 2008	This procedure specifies the structure of ITER numbering for parts and components.
v1.2	Signed	11 Jul 2008	This procedure specifies the structure of ITER numbering for parts and components.
v1.3	Approved	04 Sep 2008	This procedure specifies the structure of ITER numbering for parts and components.
v2.0	Approved	26 May 2011	Incorporated the definition of part number and revised ITER PBS document
v3.0	Revision Required	23 Aug 2018	v3.0 include : Detailing of Functional Reference usage Introduction of Additional Referencing Capability : Component in Component concept Instrumentation Referencing Naming of Interface locator/ Nozzle /Spool / Part Tag Detailing of Part Number of ITER : PNI Encoding of various Type of Part Number of ITER Classification of PNI within ITER Material Database Strategy for custom fit marking on Physical Items (SN) Relationship between FR/PNI/SN Guideline for Referencing
v3.1	In Work	11 Oct 2018	1) General, FR “System Component” tagged with FR. Note that the word “Component” was used for various meanings in the previous version. 2) General, TTT In Appendix-G, TTT-codes are grouped into 1) Process Functional and 2) Non Process Functional 3) Page 3, Foot note Definition of Individually Distinguishable Item, IDI is added 4) General Main context is shortened. Basic concept, formats, and flowchart are the main elements in it. All supplemental codes are shifted to Appendix-D 5) PNI Format, Page 6, Para. 6.1 Unified format of PNI, “IXXXXXXX” is only explained in the main context 6) Page 7 3BM-diagram associated with Control Gates is added. 7) Pages 7 to 10 Flowchart and the process steps are describes associated with the Control Gates 8) Page 11, Sec. 8 Responsibility Assignment is simplified associated with SOA [2EXFXU] 9) Appendix-A All instructive parts for FR are described in Appendix-A. The word “Implied Item” is discarded. In contrast, some explanations for PBS-codes, FR’s (parent & child) , allocation of delivered item to PBS-L3 or FR, etc. are explained. 10) Appendix-B All instructive parts for PNI are described in Appendix-B. PNI’s generated by CATIA/Enovia or Smart Plant are explained. Other Frequently Asked Questions (FAQs) are answered 11) Appendix-B, B2.3 (and D9) MN Manufacturer Part Number, MN is defined clearly

			<p>12) B2.4 to B2.6 Granularity of PNI and grouping, i.e. Kitting taken into account of site-assembly process clarified.</p> <p>13) B2.8 Spare Spare is moved to Appendix B</p> <p>14) B2.9 Version control of design by PNI associated with Tech Spec (and/or Drawing) No. and the rev. num. is explained</p> <p>15) Appendix-C Clear diagram for Tagging Construction Shite and Warehouse. Fig. 14 was difficult to understand in the previous version .</p> <p>16) Appendix-D All supplemental codes are moved into this Appendix-D (respecting KBR's comment)</p> <p>17) D10 The formula of "PNI = Commodity Code + Dimensions" is added.</p> <p>18) Appendix-G TTT-code is explained in short. The detail is to be defined in [2FJMPY] at next revision.</p> <p>19) Appendix-H All defined ID-codes are summarized in one page.</p>
v3.2	Approved	11 Oct 2018	Some figures are broken at the previous IDM load.

Table of Contents

1	PURPOSE	3
2	SCOPE.....	3
3	DEFINITIONS AND ACRONYMS	3
3.1	ACRONYMS	3
4	RELATED DOCUMENTS.....	4
4.1	APPLICABLE DOCUMENTS	4
4.2	REFERENCE DOCUMENTS	4
5	BASIC PRINCIPLES.....	4
6	ID-CODE SCHEMA – FORMAT -	5
6.1	FUNCTIONAL REFERENCE, FR	5
6.1.1	<i>PBS Code, PPPPPP.....</i>	<i>6</i>
6.1.2	<i>Function Category Designator, TTT-Code.....</i>	<i>6</i>
6.1.3	<i>Index Number, NNNN</i>	<i>6</i>
6.1.4	<i>Example.....</i>	<i>6</i>
6.2	PART NUMBER OF ITER, PNI.....	6
6.3	SERIAL NUMBER, SN	7
7	FLOW CHART	7
7.1	ENGINEERING DESIGN	8
7.2	MANUFACTURING, E.G. PA EXECUTION	9
7.3	CONSTRUCTION.....	9
8	RESPONSIBILITIES FOR TAGGING TIMELINE	11
9	LINK WITH OTHER PROCESSES.....	11
9.1	LINK WITH OUTPUT FROM OTHER PROCESS	11
9.2	LINK AS INPUT TO OTHER PROCESSES	11
10	OUTPUTS	12
APPENDIX-A INSTRUCTION FOR FR.....		13
A1	EXAMPLES AND USE CASES OF FRs	13
A2	FAQ FOR FR.....	15
A2.1	<i>Item Tagged with FR - Envelope of System Component -</i>	<i>15</i>
A2.2	<i>PBS Level-1 to 3 Codes and FR</i>	<i>15</i>
A2.3	<i>Parent and Child FR's.....</i>	<i>16</i>
A2.4	<i>Allocation of Delivered Item to FR – Installation -.....</i>	<i>17</i>
APPENDIX-B INSTRUCTION FOR PNI		19
B1	EXAMPLES AND USE CASES OF PNIs	19
B2	FAQ FOR PNI	19

<i>B2.1 ITER Catalogue</i>	19
<i>B2.2 CAD-Ticket to Request for New PNI's</i>	19
<i>B2.3 Manufacturer Part Number, MN</i>	20
<i>B2.4 Shipment of Items</i>	20
<i>B2.5 Kitting</i>	20
<i>B2.6 Parent and Child PNI's</i>	21
<i>B2.7 Standard Parts and Bulk Item</i>	22
<i>B2.8 Spare</i>	22
<i>B2.9 Version Control (TBD)</i>	22
APPENDIX-C TAGGING IN CONSTRUCTION SITE AND WAREHOUSE	23
APPENDIX-D SUPPLEMENTARY ID-CODE SCHEMA	24
D1 PART INDEX	24
D2 ISA REFERENCE	24
D3 TRIAL FIT AT SUPPLIER'S PREMISES	27
D4 PRE-ASSIGNMENT FIELD	27
D5 INTERFACE LOCATOR	27
D6 PIPING RELATED REFERENCING	28
<i>D6.1 Pipe Spool Address</i>	28
<i>D6.2 Piping Line Piece Index</i>	29
<i>D6.3 Nozzle Naming</i>	30
D7 REFERENCING ELECTRICAL ENCLOSURE	31
D8 REFERENCING WALL OPENINGS AND PENETRATION	33
D9 MANUFACTURE PART NUMBER, MN	33
D10 COMMODITY CODE	33
D11 LOT / BATCH NUMBER AND HEAT NUMBER	34
APPENDIX E TAGGING EXAMPLE FOR INSTRUMENTATION	35
APPENDIX F TAGGING EXAMPLES FOR MECHANICAL CASES	36
APPENDIX-G FUNCTION CATEGORY DESIGNATOR, TTT-CODE	38
APPENDIX-H SUMMARY OF IDENTIFIERS IN [28QDBS]	39

1 Purpose

This document describes the numbering systems to be used as to define the identifiers for components and parts in the ITER project, and thus rigorously ensuring the traceability of each item throughout the ITER Project life cycle.

2 Scope

This document is Level-3 procedure belongs to the Level-2 procedure for Identification and Controls of Items [U344WG]. This document is applicable to all components and parts designed and procured for the ITER project.

The scope of this document is to establish tagging notions for:

- System Components tagged with Functional Reference, FR
- Type References tagged with Part Number of ITER, PNI
- Physical Items tagged with Serial (/ Lot/ Batch) Numbers, SN

The described ID-code schema are to be applied for the following aims, individually:

1. FR: Identifier to uniquely established all System Components present in the ITER system physically, geographically, in diagrams and/or in 3D and control rooms on the ITER site.
2. PNI: Identifier to establish all Type References of items designed, manufactured (or procured), assembled, commissioned and subject to maintenance on the ITER site.
3. SN: Identifier to established individual physical item manufactured and/or procured.

3 Definitions and Acronyms

3.1 Acronyms

Acronym	Definition
3BM	3-Ball Model
CCR	Construction Completion Review
COTS	Commercial Off-The-Shelf parts
CRR	Construction Readiness Review
DA	Domestic Agency
DRR	Delivery Readiness Review
EDB	Engineering Database
Eng	Engineering
FAQ	Frequently Asked Questions
FDR	Final Design Review
FR	Functional Reference
HO	Handover
IDI ¹	Individually Distinguishable Item
IEEE	Institute of Electrical and Electronics Engineers
ISA	International Society of Automation
MN	Manufacturer Part Number
MRR	Manufacturing Readiness Review

¹ IDI: Item (to be) delivered and/or handled by IO or any other item designated by IO-CT subject to control. All IDIs shall be tagged with PNIs

PBS	Plant Breakdown Structure
PDR	Preliminary Design Review
PIC	Protection Important Component
PID	Piping and instrumentation diagram
PLM	Product Lifecycle Management Software
PNI	Part Number of ITER
RE	Responsible Engineer
RO	Responsible Officer
SN	Serial Number
TTT Code	Commonly used for the Function Category Designator

4 Related Documents

4.1 Applicable Documents

- 1) Procedure for Identification and Item Control [U344WG v1.2] ²
- 2) Sign-Off Authority for Project Documents [2EXFXU v4.0]

4.2 Reference Documents

- 1) ITER Plant Breakdown Structure [28WB2P]
- 2) ITER PBS Structure [2FBMWF]
- 3) ITER Function Category and Type for ITER Numbering System [2FJMPY]
- 4) Function Category Designators [43WDW9]
- 5) ISA 5.1-2009: Instrumentation Symbols and Identification
- 6) IEC 81346-2:2009: Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 2: Classification of objects and codes for classes
- 7) Procedure for Cataloguing Type References[UYGU3S] (To be MQP document)
- 8) Procedure for Labelling on Physical Items [VYJ7U2]
- 9) Signal and plant system I&C Variable Naming Convention [2UT8SH]

5 Basic Principles

ITER Numbering System has several principles:

- Based on the concept of Three Ball Model [U344WG];
- An item in any situation, e.g. as-designed, as-delivered, as-installed, shall be tagged with one or more 3-Ball-Model (3BM) identifiers.
- Three identifiers, FR, PNI and SN, of an item shall be determined, 1) as component in the ITER System called as “System Component,” 2) as-designed Type Reference, i.e. “design solution” of item, and 3) as Physical Item, respectively;
- For each 1) to 3), there may be supplementary identifiers as shown in Appendixes;
- Requirements on each identifier are as follows;
FR:
 - FR shall be used to provide a unique number corresponding to a single System Component in a unique place within ITER facility.

² To be revised in consistent with this L3 procedure.

- FR shall be determined in accordance with the following criteria:
 - Process functional item appearing in a diagram and/or actual control monitor screen, e.g. control valves;
 - Items subjected to regular inspection, maintenance, etc.;
 - Item subjected to be identified and distinguished, e.g. a custom-machined shim in the specific location of the ITER system.

PNI:

- Any item or group, e.g. kit of items delivered to the ITER site shall be identified and tagged with PNI. Note that the items or the groups of items are called as Individually Distinguishable Items, IDIs;
- Item without PNI shall not be issued from the warehouse;
- All items identified with PNI's shall be registered in "ITER Catalogue [UYGU3S (TBD)]," from which design specification of an interested item can be found;
- Physical items tagged with the same PNI shall be interchangeable;
- PNI shall be controlled by IO-CT in a centralized manner, so as that quality of this key identifier is guaranteed.
- PNI shall be always provided to IO-Eng-RO³, DA, Manufacturer, etc. by IO-CT.
- Since PNI represents a design solution of the item, the version of the design solution shall be controlled with version numbers of the Tech. Spec., the Drawing and/or even the Engineering Dossier;

SN:

- IDI delivered to the ITER site shall be identified with SN (or Lot/Batch Num.)
- Item without SN shall not be delivered to the ITER site,
- SN, Lot Num., etc., shall be discretion of the manufacturer.

- All 3 identifiers could be alphanumeric All the coding shall use uppercase letters and/or western style numbers.

For further understanding, detailed explanations for FR, PNI, and SN and other identifiers (See Appendix), the use cases and the Frequently Asked Questions, FAQ's are also described in the various Appendixes.

6 ID-Code Schema – Format -

6.1 Functional Reference, FR

FR is encoded with 12 or 13 alphanumeric uppercase characters, split into three fields separated by hyphens:

Functional Reference														
P	P	P	P	P	P	-	T	T	T	-	N	N	N	N
PBS-L3 Code						TTT-Code				Index Number				

The three consecutive elemental-codes are described below.

³ IO-Eng-RO means any technical RO, e.g. TRO, PBS-RO from IO-CT.

6.1.1 PBS Code, P P P P P P

- The PBS Level-3 (L3) code within the FR omits the dot (.) separators, which are commonly used between PBS levels.

6.1.2 Function Category Designator, TTT-Code

- This identification field is a short field build of 2 or 3 uppercase alphabetic letters (or, under specific conditions, 2 uppercase alphabetic letters and one digit of number);
- The possible values of the Function Category Designators, TTT-codes for pumps, tanks, etc. are listed in [43WDW9], and shall strictly be used to define the FR;
- MQP document [2FJMPY] describes TTT-code and the creation process. (See Appendix-G, also.)

6.1.3 Index Number, N N N N

- This is a 4 digits of western-style numbers between 0001 and 9999;

Depending on the nature of each system (process centric, mechanical centric or civil engineering centric), IO Engineers shall establish and document the numbering schema.

6.1.4 Example

Functional Reference														
3	1	C	R	C	P	-	P	K		-	0	0	1	2
PBS Code L3 for Cryostat Cryopump						TTT for Cryopump				Index Number, "12"				

6.2 Part Number of ITER, PNI

PNI identification shall be done as early as possible after the Preliminary Design Review (PDR) and it becomes mandatory before Manufacturing Design review (MRR).

PNI format consists of Prefix letter, "I" followed by 8 alphanumeric characters.

I	X	X	X	X	X	X	X	X
Prefix "I"	8 alphanumeric characters							

There are two IT systems, i.e. CATIA/Enovia and SPMAT to generate PNI's, depending on nature of Type Reference of item:

PNI generated and catalogued by CATIA/Enovia (and CADENAS⁴)

- Format of PNI tagging to Type Reference of a mechanically designed item is shown below;
- CAD-Uid consists of 6 alphanumeric characters following the prefix, "I00."

I	0	0	A	A	A	A	A	A
Prefix "I"	"00" (numeric)		CAD-Uid 6 alphanumeric characters					

PNI generated and catalogued by Smart Plant

⁴ <https://www.cadenas.de/products>

- Format of PNI tagging to Type Reference of item in SPMAT is shown below;
- Regarding piping components designed with PDMS (AVEVA)⁵, this format of PNI is mostly used.

I	N	N	N	N	N	N	N	N
Prefix "I"	8 numeric characters							

Generation of PNI and the delivery to user are the responsibility of IO-CT (CIO/DO and CST/CMG,) therefore users are not necessary to be concerned about this difference in format. Users are just to request for necessary PNI's via CAD-ticket system, then to obtain and to use them [UYGU3S (TBD)].

6.3 Serial Number, SN

- There is a no format. SN, Lot Num., etc., shall be discretion of the manufacturer;
- This identifier will be a SN, a batch number or a lot number, depending on whether a single individual product (SN) or a set of them (batch, lot) is being identified;
- The manufacturer will ensure traceability of manufacturing with this SN, and have an associated record related to the manufacturing, the testing and the inspection, e.g. Mill certificates, Test reports, As-Built Drawings.

7 Flow Chart

How to determine FR, PNI, and SN, and to tag items and associated data / documents with those identifiers?

The IO-Eng-RO is the main performer of this process. The IO-Eng-RO shall also ensure that each material delivered at IO is physically labelled/tagged with the PNI, for its proper reception, storage and installation.

Figures 1 and 2 illustrates the three types of 3BM identifiers and their lifecycle, and the process flowchart respectively. Six Control Gates and two control points, i.e. PA-signed and Hanover (HO) are specified. Detailed definitions of following Control Gates are to be specified:

PDR	Preliminary Design Review
FDR	Final Design Review
MRR	Manufacturing Readiness Review
DRR	Delivery Readiness Review
CRR	Construction Readiness Review
CCR	Construction Completion Review

Evolution of tagging is illustrated in the bottom of Figure 1, which is to be explained with the flowchart later.

⁵ https://www.aveva.com/en/Solutions/Product_Finder/AVEVA_Everything3D/

There are three phases:

1) **Engineering Design**

Responsible: IO-Eng-RO (and DA for Functional Specification, FS PA)

2) **Manufacture (including PA Execution)**

Responsible: DA and/or Manufacturer

3) **Construction**

Responsible: IO-CT with CMA

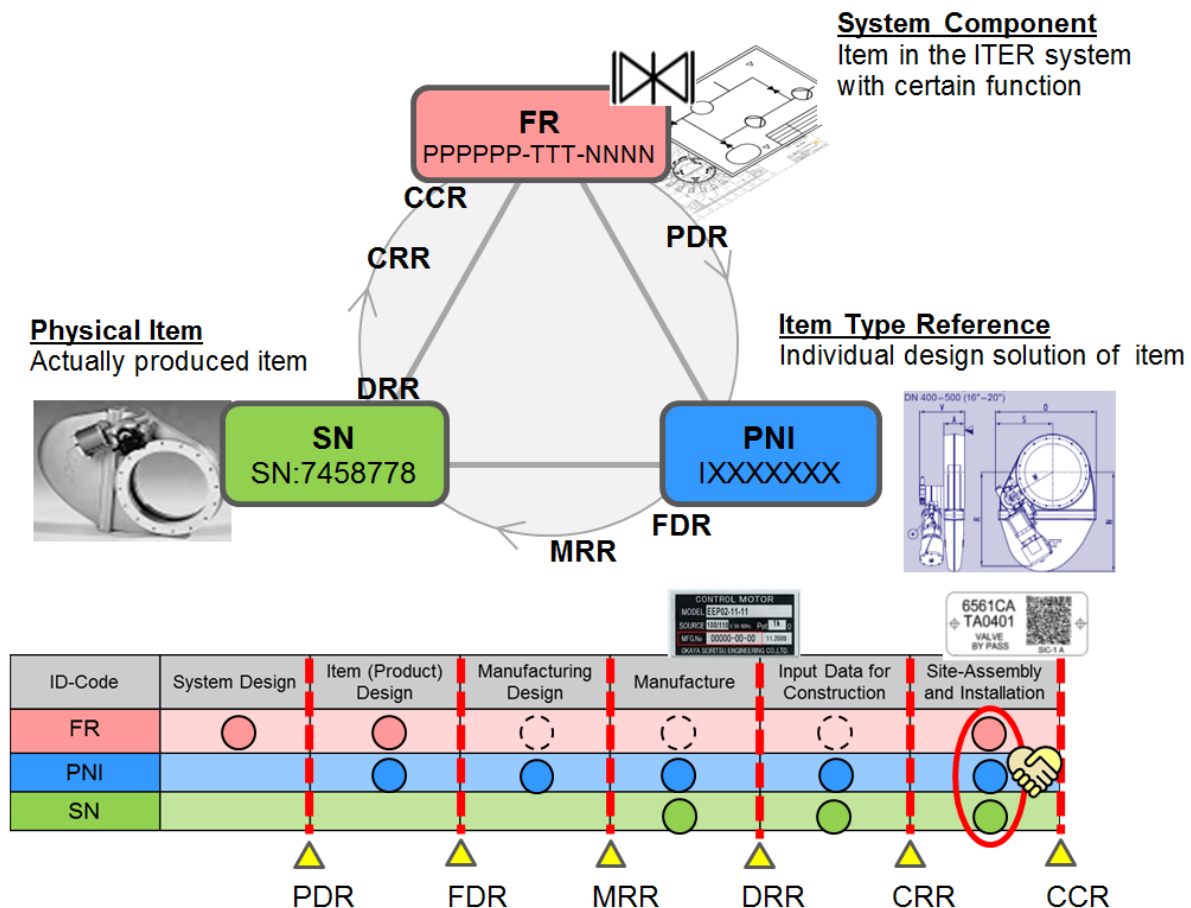


Figure 1 3-Ball Model [U344WG]

7.1 Engineering Design

- 1.1) Starting at system design, all System Components shall be identified first either on Diagrams (PID, Cabling) and/or in 3D Mock-up/Drawings (civil layout, mechanical assembly), then tagged with FR's. This action can take place once the topology or the architecture of the PBS level-3 is stabilized.
- 1.2) In Final Design Phase, Type References of items should be tagged with PNI's.
- 1.3) The PNIs shall be registered in ITER Catalogue associated with other design properties, e.g. physical dimensions, the technical specification as reference [UYGU3S (TBD)].
- 1.4) Make a group of PNI's taken into account of assembly process steps. Adding necessary quantities and other technical information, it will be an Issue For Construction, IFC-BOM associated with the Assembly Drawing.
- 1.5) All designed items shall be listed in Expected Delivery List as a part of the contractual document, e.g. PA-Annex-B.

Those listed above shall be completed at latest FDR.

7.2 Manufacturing, e.g. PA Execution

- 2-1) Items in Manufacturing Design Documents, e.g. BOM, Manufacturing Drawing, shall be tagged with PNIs and MN⁶, and the quantities shall be specified taken into account of necessary spares.
- 2-2) IO-Eng RO to provide additional PNI's to DA/Manufacturer, as necessary. For instance, in case of an expected IDI by IO-CT split into two IDI's for material-handling reason.
- 2-3) DA/Manufacturer to generate Planned Delivery List, where IDI's shall be tagged with PNI
- 2-4) DA/Manufacturer to tag / label to manufactured item with both PNI and SN.
- 2-5) Packing: DA/Manufacturer to ensure Shipping Label, Packing List, etc. comprising PNI, MN, and SN, adequately⁷.
- 2-6) Authorization for shipment by IO-CT (DRR clearance)

7.3 Construction

- 3-1) IO-Eng-RO to prepare Handover Data Packages including Assembly Drawing, IFC-BOMs, etc., those describes items with PNI and FR
- 3-2) Handover [TEL7TY]
Note: Reception of the delivered items can be before or after the Handover.
- 3-3) IO-CST w/ CMA to prepare the EWP and CWP.
- 3-4) Construction:
 - Physical items are delivered to the site, and installed at one of its potential final locations. Installed items are then physically tagged with FR's in relation to their chosen locations.
 - A relationship between the FR, PNI and SN is established and recorded within SmartPlant[®], which is an IT database as a part of ITER Centralized Material Database.
 - System Components tagged with all the 3BMidentifiers are to be commissioned, inspected, operated, maintained, etc.

Finally, some rules for tagging in the timeline are as follows:

- Before generation of FR's, PBS-code structure shall be approved. FR identification schemes of discipline technical area also shall be generated and approved before;
- Major Equipment and trunk lines should be tagged with FR before PDR;
- All System Components shall be tagged with FRs at latest FDR.;
- Tagging with PNIs shall be completed as early as possible after PRD and shall be mandatory before MRR:
- The actions above (including any modification) shall be completed by MRR, regarding any IDI to be delivered to the ITER premises.

⁶ Manufacturer Part Numbers, MN's shall tag to any item designed and manufactured/procured by manufacturer respecting the Quality Plan, for full traceability. If an item is tagged with PNI, MN is not always necessary. See B2.3 and D8, also.

⁷ As-Built BOM for IDI's, which only lists items to be delivered, is similar to the Packing List.

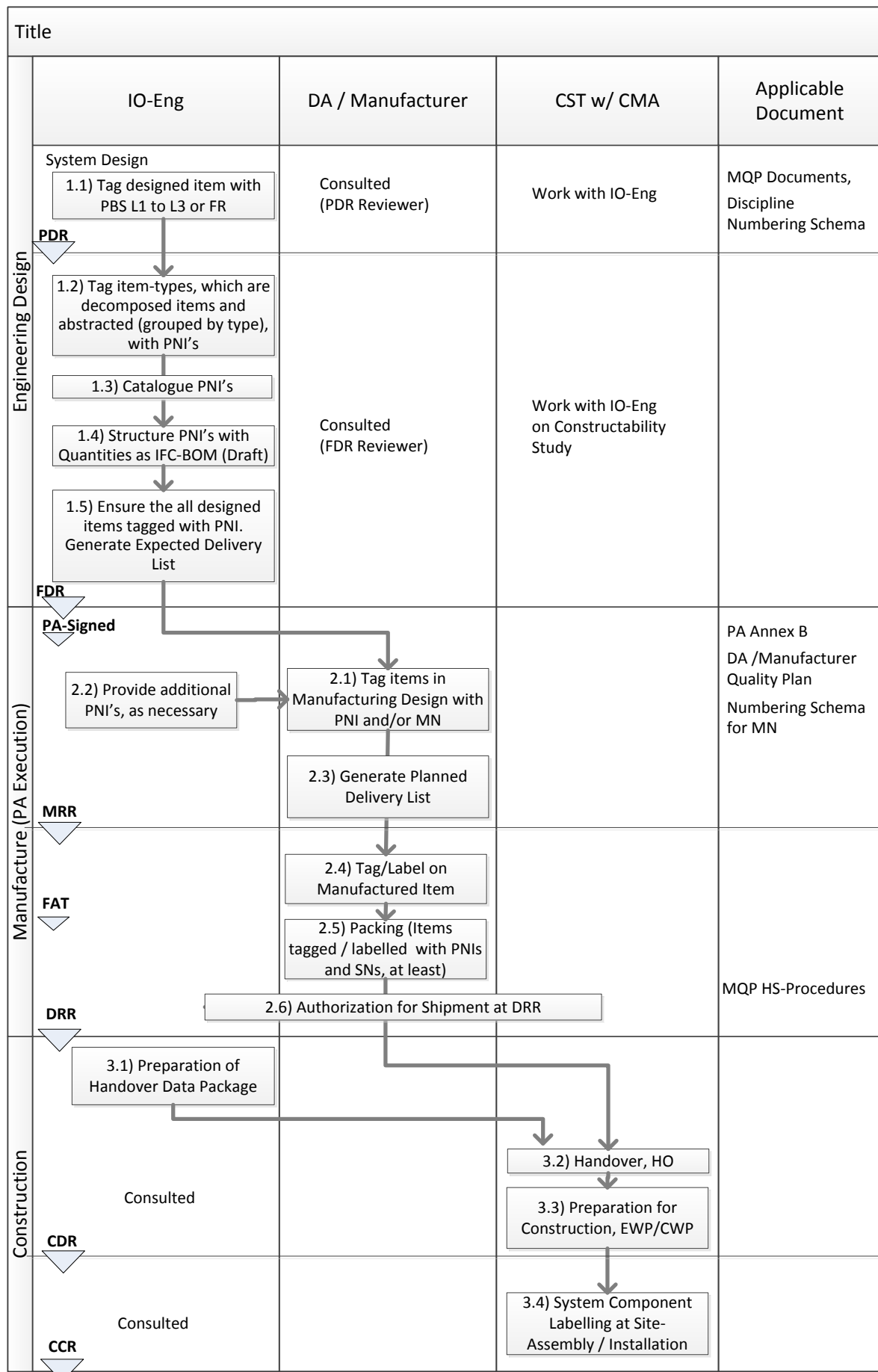


Figure 2 Flowchart for Tagging Process

8 Responsibilities for Tagging Timeline

The table below indicates the general responsibility assignment for 3BM-identifiers. Note that this table defines the responsibility of item identification and generation of an ID number. After the formalization, anybody can use the ID-code.

Item type	3BM Identifier	Responsible (Generate)	Review	Accountable (SOA)
System Component	FR	IO-Eng-RO (FSPA-DA-RO)	CIO/ DO, CMD*, related Engineers	Accountable for Equipment List, etc., according to SOA
Type Reference	PNI	IO-Eng-RO (FSPA-DA-RO)	CIO/ DO, CMD*, CST	Accountable for Equipment Type List, etc. (i.e. ITER Catalogue) according to SOA
Physical Item	SN	Manufacturer	DA	Manufacturer

*) Regarding a delta part of those list, e.g. ITER Catalogue, CIO/CMD's acceptance (recommendation on IDM) is necessary

Other responsibilities are:

- Discipline PBS RO shall establish specific FR numbering schema. Normally within the NNNN part, certain logic is implemented.
- Each technical department shall be responsible for proposing and defining the TTT-codes and to request integration into the central listing: [02. Function Category Designators : TTT-code\[43WDW9\]](#) using the [IO CAD Ticket System](#)⁸
Queue: ITER NUMBERING SYSTEM ;
Service: TTT code following 2FJMPY]

9 Link with Other Processes

9.1 Link with Output from Other Process

CM Process to provide the set of PBS codes as:

1. [ITER_D_28WB2P - ITER Plant Breakdown Structure \(PBS\)](#)
2. [ITER_D_2FBMWF - ITER Plant \(PBS\)](#)

9.2 Link as Input to Other Processes

Identification codes, the rules and the processes are applicable for any other MQP Processes.

For instance, Software Control and Model Development, SW-Process refers to this document in following documents:

1. [ITER_D_24SNC9 - CAD Manual 09 - Drawing Best Practices](#)
2. [ITER_D_35CY6V - CAD Manual 14 - Diagram Guidelines](#)
3. [ITER_D_R7SAGV - 1 - How to use SSD](#)
4. [ITER_D_3434CN - 07. SSD PFD Application Presentation](#)
5. [ITER_D_33JVK9 - 10. SSD P&ID Application Presentation](#)

⁸ Link: <https://jira.iter.org/projects/IOCAD/issues/>

6. [ITER_D_UHR2AY - Management of Functional References in CATIA for Plant Components](#)
7. [ITER_D_6T9JVL - How To FILL FUNCTIONAL REFERENCE \(PPPPPP-TTT-NNNN\)](#)

10 Outputs

The execution of this document requires the following outputs:

Type of output	Format (Template, form, checklist)	Location of output	Document type	Responsible for managing the output	Retention period
FR	PPPPPP-TTT-NNNN	ITER Centralized Material Database Including CAD Authoring Tools	Diagrams, 3D Models, Drawings, Item Lists, etc.	CIO and IO-Eng-RO	historical meta data / till dismantling
PNI	IXXXXXXXXX	ITER Centralized Material Database Including CAD Authoring Tools	3D Models, Drawings, Item Lists, etc.	CIO, CST and IO-Eng-RO	historical meta data / till dismantling
SN	No specific format	ITER Centralized Material Database	Item Lists (As-Built)	DA / Manufacturer (IO-Eng-RO)	historical meta data / till dismantling

Appendix-A Instruction for FR

A1 Examples and Use Cases of FRs

Example of FR is shown below. Combining PBS-L3 code, TTT and Index Number, necessary FR is created.

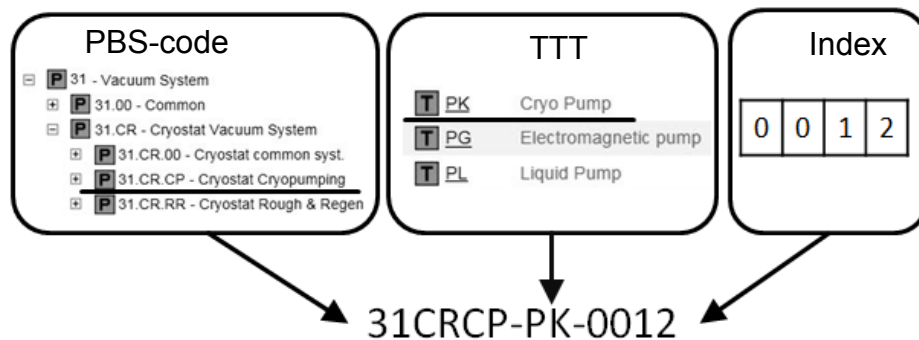


Figure A1 FR for Cryo Pump No. 12 of the Vacuum Cryostat Cryopumping sub-system

On Diagrams

The following snapshot shows a portion of a PID belonging to PBS level 3 76PHVV:

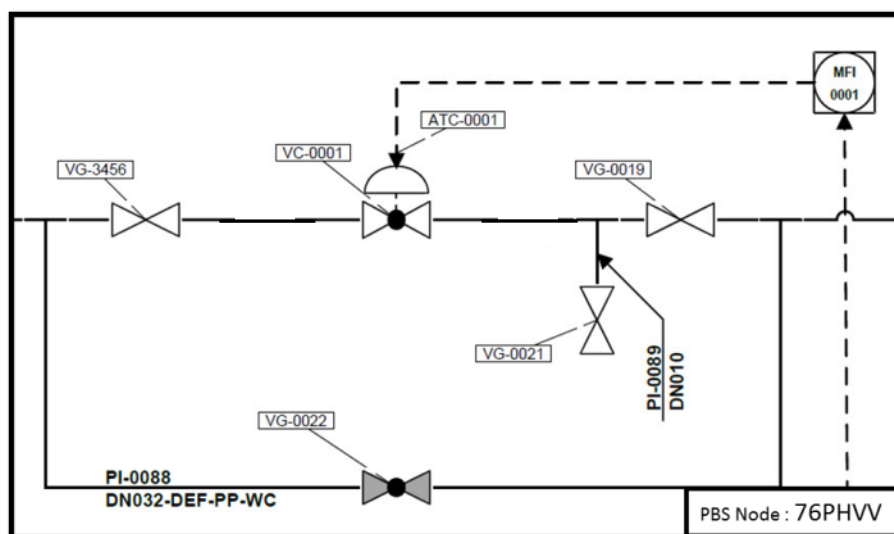


Figure A2 Label for FR on Diagrams

PBS level 3 is defined in the Diagram title block.

All System Components shown in the diagram belong to this PBS unless recalled from another PBS for interfacing. As such, all System Components in this diagram have a shortened label for their FR omitting the PBS Identifier. The label for the Piping Line, Ventilation Duct or Cable is built of the FR, followed by properties such as piping specification or fluid type.

On Layout Drawing and GA

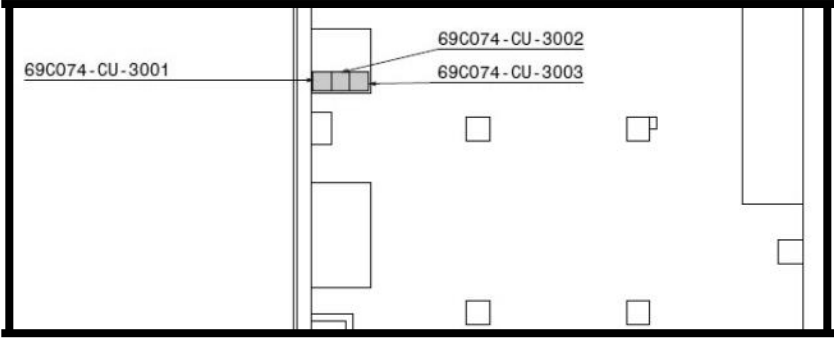


Figure A3 Label for FRs on Layout Drawing

The complete FR is required to be displayed. A label built of the complete FR followed by properties (such as PIC value) can be also used.

On Mechanical Drawings

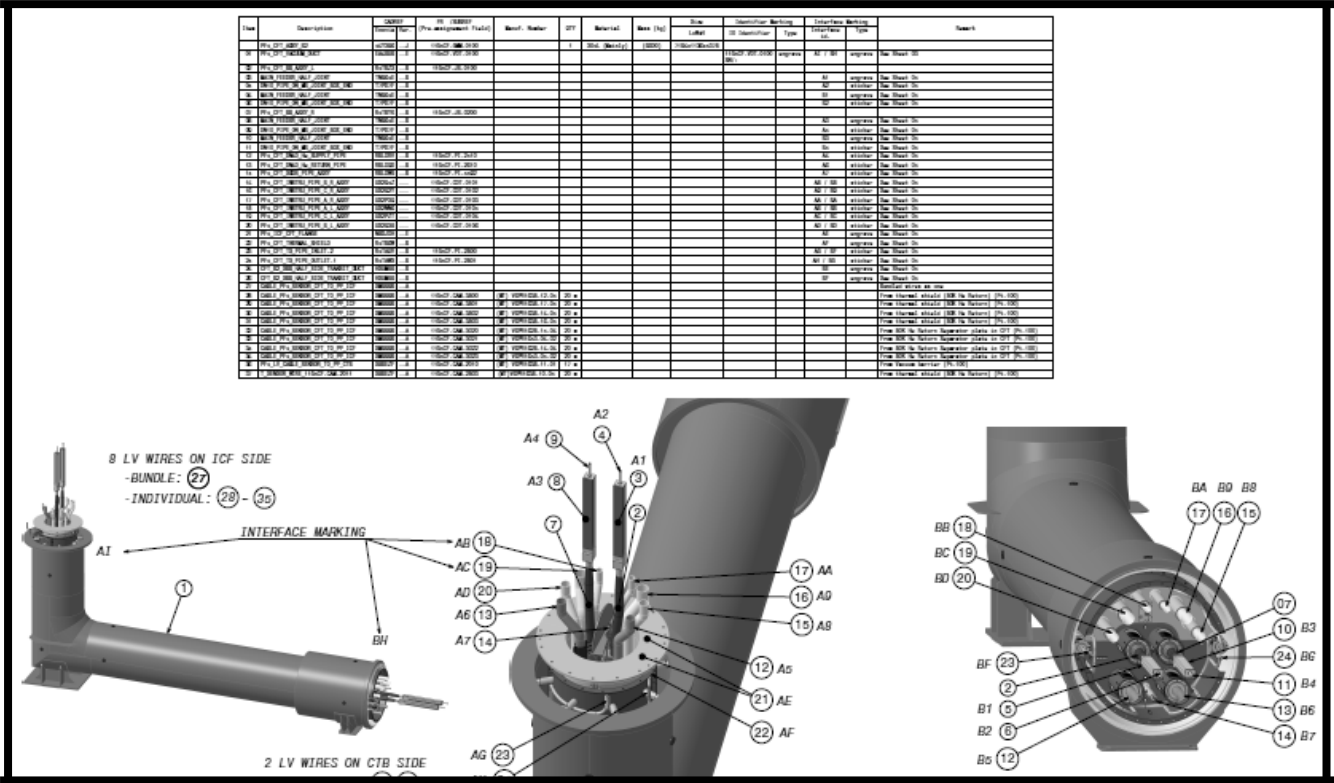


Figure A4 Callout for 3BM-Identifiers on Mechanical Identification Drawing

In a Mechanical Design, some Assembly Drawings shall be used to provide the FR, PNI, CAD part Name and Interface locators using call-outs and tables. In this example, since Cryostat Feedthrough (CFT) of PF4 Feeder is a unique Process-Functional Complex Component, several FR's tag to items before installation.

Refer to Appendix-E for examples of identification.

A2 FAQ for FR

In paragraphs A2.1 to A2.4, additional explanations for FR, are described.

A2.1 Item Tagged with FR - Envelope of System Component -

- A System Component, which is a functional and/or IO-interested component in the ITER System, is tagged with Functional Reference (FR). The FR is the unique “address” within the ITER System from functional (not geometry) point of view;
- FRs appear in diagrams, e.g. P&ID, layout drawing, 3D CAD models, tagging to pipe, valve, fluid equipment, instrumentation, cubicle, transformer, etc. ;
- Some non-process-functional components, e.g. Embedded Plates, Assembly Platform are also tagged with the FR’s;
- A FR can also tag to System Component physically realized, in 3D Model, in drawing, etc.;
- Envelope of FR is difficult to determine, because FR may tag to “an abstract item on Diagram and/or Control / Monitor Screen.” In addition, FR’s do not exhaustively tag all items composing the whole ITER system. Finally, many assembled parts are not tagged with FR (See A2.2);
- Consistency among the Diagram, the 3D CAD design and the physical item is necessary, but the envelopes of the 3D model and the actual item are not necessary to be determined accurately.

A2.2 PBS Level-1 to 3 Codes and FR

Relationship between PBS Level-1 to 3 Codes and FR is explained.

- FR is equivalent to PBS-L4 code, therefore a System Component tagged with FR is associated with the parent PBS-L3;
- Figure A5 shows the hierarchy structure PBS-L1 to 3 nodes and FR’s;
- FR is recognized as PBS-L4 code, but the nature is not as same as PBS-L1 to L3;
- The summation of PBS-L1 nodes is equal to the “ITER System”;
- Similarly, the summation of PBS-L2 nodes or PBS-L3 nodes is also equal to the “ITER System.” Consequently, PBS-nodes are always “exhaustive”⁹;
- In contrast, since FR’s tag to only selected “System Components,” the summation of all FR’s does not represent the ITER System.

The boundary between PBS-nodes are clear, because responsibility assignment shall be done with Interface Control Document and Interface Sheet (ICD/IS). In addition, each CAD model shall be tagged with PBS-code. While, FR is abstract, because it is extracted from a diagram as a “symbol.” Finally, to define an envelope of FR exactly is not concluded as a reasonable effort.

⁹ Reality of the current PBS code tree is not as same as presented in this figure. Criteria for the individual levels are not always System / Sub-System / Loop or Assembly, at present.

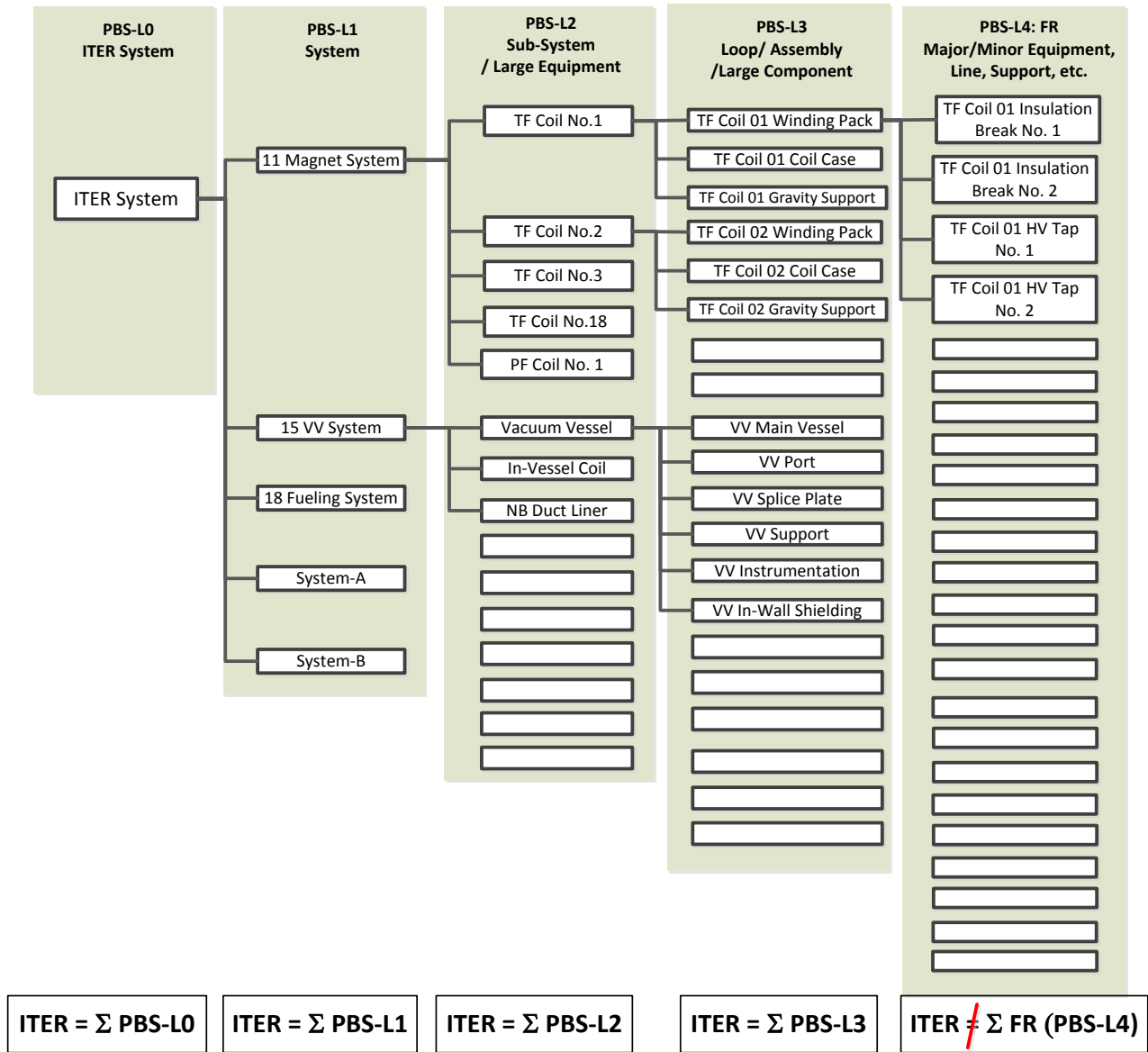


Figure A5 Hierarchy structure of PBS-L0 to L3 codes and FRs¹⁰

A2.3 Parent and Child FR’s

An enclosure is identified with a FR as a single System Component, which contains other System Components. Such Enclosing Component is called as “Complex System Component”. The TTT-code entails the *Enclosure* function.

It is highly recommended to avoid deep parent-child hierarchy structure of FR’s, except for complex cubicle infrastructure.

In Figure A6, the FR of the complex system component (26CVDL-SFU-1100) includes the beam structure and all the components attached to it (equipment, piping parts, etc.).

The complete skid will be tagged with the FR given to the enclosure. The components defined within the enclosure will also be tagged with their own FR’s.

¹⁰ Different logics of coding schema are mixed up. Some improvement without significant impact is required.

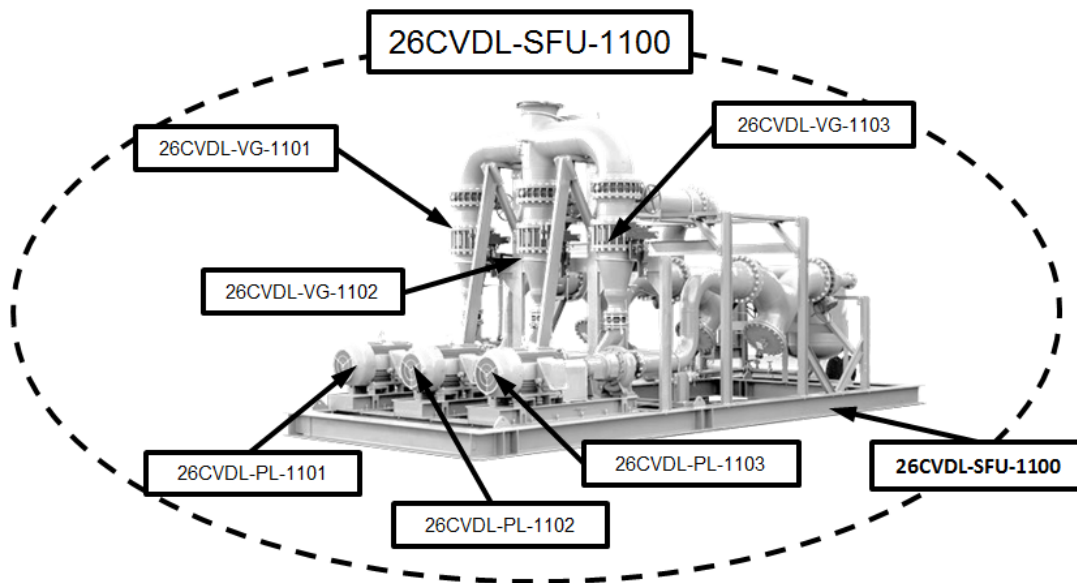


Figure A6 A Plant enclosure and its members in piping

Table A1 Sample list of TTT usable for Complex System (enclosure) Component

TTT	Title	Family	Description
GMM	General Mechanical Module	Mechanical	A mechanical structure either made of beams or panels which contain other equipment. Mechanical modules are used either to simplify logistics, or ease assembly or for constraint relative to protection of included components within.
SFU	Skid Fluid Unit	Fluid	A Skid Fluid unit is a secondary structure which embeds a set of fluid component to achieve a given function. It is delivered mounted.
GB	Glove Box	Fluid	Gas-tight box mostly made of transparent synthetic material in which certain radioactive substances can be handled by means of gloves reaching into the box.
CU	Cubicle	Electrical	

A2.4 Allocation of Delivered Item to FR – Installation -

In Figure A7, correlation between PBS-L1 to L3 nodes and FR (Equivalent to PBS-L4) is described. Items are delivered and then assembled or installation to certain position of the ITER system (PBS-L0). This story can be mentioned “As-delivered item is allocated to FR.”

Originally, FR is tagging to an "abstract" item described in a diagram such as P&ID, hence there is neither outline nor interface definition. In addition, not all items constituting PBS-L3 are tagged with FRs, as mentioned before.

For example, there is no FR tagging to interface components used to connect the pump and the pipe¹¹.

In Figure A7, five situations are presented individually.

¹¹ Sometimes, the interface components are delivered together with the main equipment, i.e. the pump, as a “kit” tagged with PNI. In that case, all those to be allocated to FR. In any case, it depends on the packaging/kitting strategy. See B2.4 and B2.5.

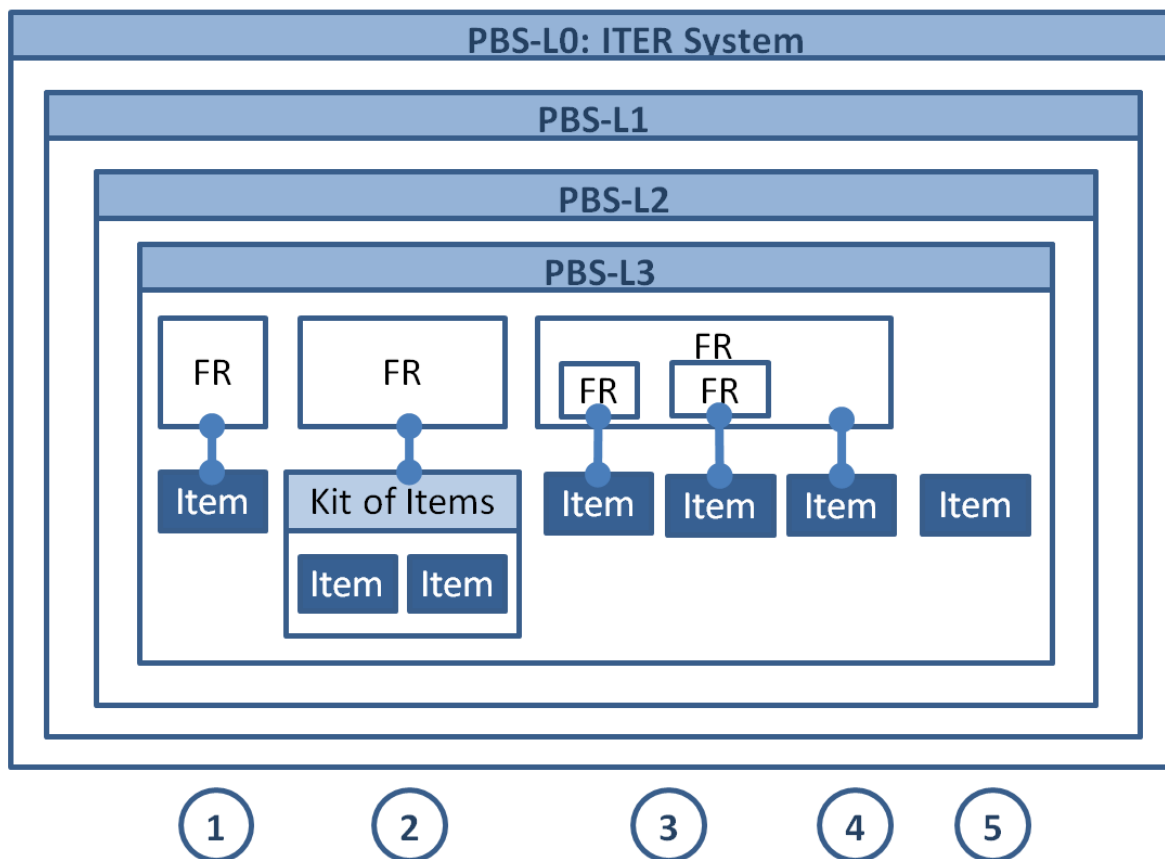


Figure A7 Allocation of delivered items to FR's within the ITER System.

- 1) One delivered item installed and tagged with FR;
- 2) One kit of multiple items assembled and tagged with FR. This can happen, for instance, an equipment plus some interface components in a kit;
- 3) and 4) show a Complex System Component, e.g. pre-fabricated valve box. One FR enclosing some other children FR's. Allocation of delivered items to FR's are sometimes one to one, but not always (See Case-4) ;
- 5) Item delivered but not installed as a System Component tagged with FR. Finally the items without FR is just a component of certain PBS-L3.

Appendix-B Instruction for PNI

Additional explanations for PNI are described in this appendix.

B1 Examples and Use Cases of PNIs

There are two IT systems, i.e. CATIA/Enovia and SPMAT to generate PNI's, depending on nature of Type Reference of item:

PNI generated and catalogued by CATIA/Enovia (and CADENAS)

- Format of PNI tagging to Type Reference of a mechanically designed item is shown below;
- CAD-Uid consists of 6 alphanumeric characters following the prefix, "I00."

I	0	0	A	A	A	A	A	A
Prefix "I"	"00" (numeric)		CAD-Uid 6 alphanumeric characters					

PNI generated and catalogued by Smart Plant

- Format of PNI tagging to Type Reference of item in SPMAT is shown below;
- Regarding piping components designed with PDMS (AVEVA), this format of PNI is mostly used.

I	N	N	N	N	N	N	N	N
Prefix "I"	8 numeric characters							

Generation of PNI and the delivery to user are the responsibility of IO-CT (CIO/DO and CST/CMG,) therefore users are not necessary to be concerned about this difference in format. Users are just to request for necessary PNI's via CAD-ticket system, then to obtain and to use them [UYGU3S (TBD)].

B2 FAQ for PNI

B2.1 ITER Catalogue

- Type References of items, i.e. Individually Distinguishable Items, IDI's tagged with PNIs are registered in the ITER Centralized Material Database as "ITER Catalogue [UYGU3S (TBD)]";
- Referred to PNI, all item design related data can be extracted from the ITER Catalogue;
- Finally, PNI is the Primary Key code within ITER Centralized Material Database;
- PNIs of standard parts are controlled with SPMAT or CADENAS.

B2.2 CAD-Ticket to Request for New PNI's

- PNI is generated and controlled by IO-CT in a centralized manner [UYGU3S (TBD)];
- Users request necessary PNI's via. CAT Ticket System. Where the PNI generator is SPMAT or CATIA;

- Consumables of general usage such as paint shall be tagged with PNI, because those are also to be issued from the warehouse.

B2.3 Manufacturer Part Number, MN

- Manufacturer or supplier shall tag all manufactured or procured items with MN¹² respecting the Quality Plan, in order to ensure the traceability;
- If an IDI is custom designed and shop-assembled, the constituting parts also shall be tagged with MN, exhaustively;
- In contrast, Commercially Off The Shelf (COTS) is not required any tagging to the constituting parts;
- One PNI for a COTS may be associated with one or several compatible Manufacturer Part Numbers, MN's;
- MN's will be recorded together with the related PNI's in the ITER Centralized Material Database;
- See Appendix-D9, also.

B2.4 Shipment of Items

- In case of unique item in the ITER system, the IDI can be tagged with FR before the shipping, in addition to the PNI;
- All physical items shall be labelled / tagged as defined in [VYJ7U2] prior to shipping. Where the label shall comprise the PN;
- IO-CT and DA to communicate with Planned Delivery List before MRR, because the as-delivered configuration can be different from the expected one by IO-CT as listed in the Expected Delivery List. New PNI's to be provided to DA/Manufacturer by IO-CT, as necessary;
- Necessary IDI's for certain Work Package in the construction are recommended to be grouped as a kit, "Kitting." For the kitting, item breakdown structure taken in to account of the construction process is required¹³.

B2.5 Kitting

- Figure B1 shows an example of kitting. Taken into account of the assembly process steps in the ITER site, delivered items are to be grouped as "Kits";
- Each kit is to be tagged with PNI, and the enclosed items can be tagged with PNI's also;
- Each kit is associated with Component (or Assembly) Drawings;
- The packaging for shipment to be systematically grouped, accordingly.

¹² If PNI is used, MN is not always necessary.

¹³ CST/FLM is generating a packing guideline.

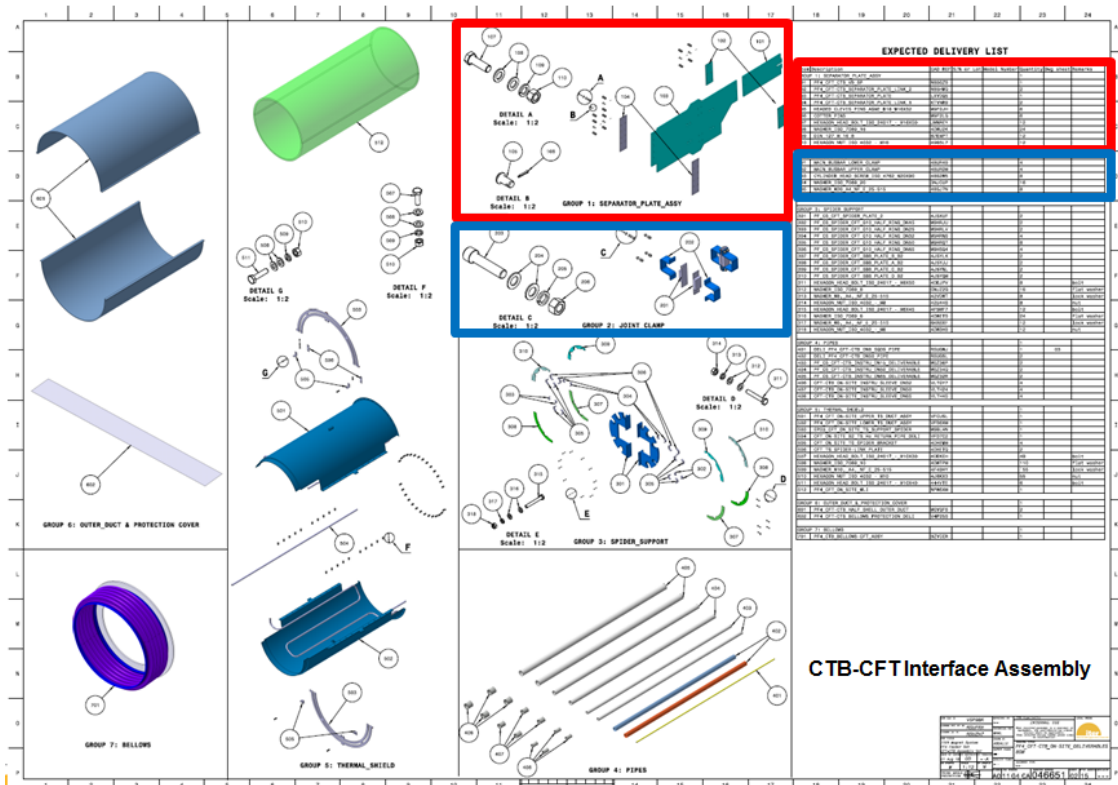


Figure B1 Example of Kitting for Magnet Feeder CTB-CFT Interface Assembly

B2.6 Parent and Child PNI's

All delivered items, i.e. IDI's shall be tagged with PNIs. However, frequently asked questions are related to the granularity or possibility of grouping. Figure B2 shows potential cases of delivered items tagged with PNIs.

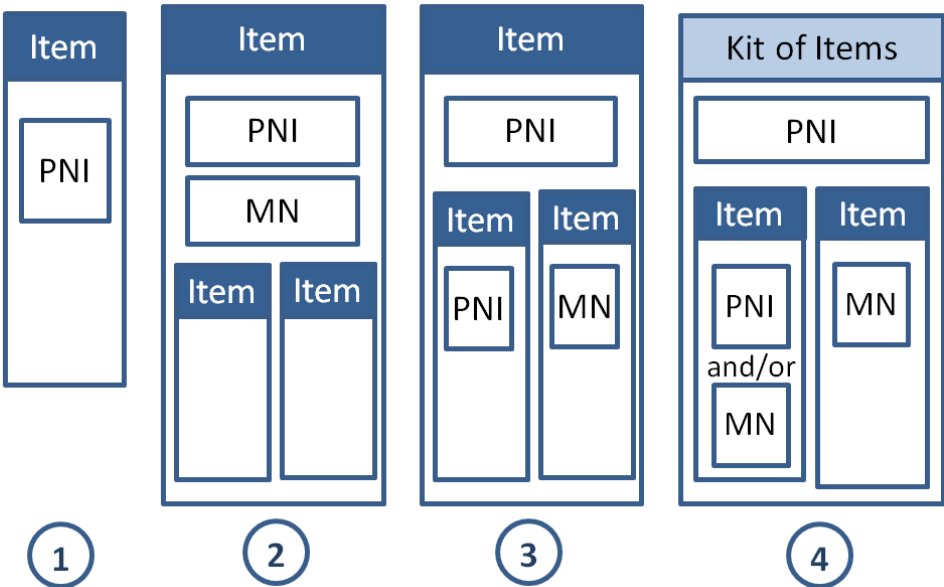


Figure B2 PNI's tagging to delivered items

- 1) Single item tagged with PNI. For instance, a motor;
- 2) An commercially available item (COTS) tagged with PNI, which consists of several parts, but identification to those interiors is not required. MN is also tagged as in the commercial catalogue.

Note: For the interior, if the item is conforming the specification, it is not necessary to tag to each part inside;

- 3) A custom designed and shop-assembled item consisting of shop-manufactured or procured items. The resultant item shall be tagged with PNI. Any part composing the resultant item shall be tagged with MN, at least. PNI can be used instead of MN;
- 4) A kit of items, which are shop-manufactured, is tagged with a PNI. The contents of items shall be all tagged with MN, at least. PNI can be used instead of, or in addition to the MN.

B2.7 Standard Parts and Bulk Item

Standard Parts :

- ITER Standard Type References are defined as any common type reference used more than 20 times and within various PBS Level-2's;
- An ITER Standard Type Reference can be either Commercial Off-The-Shelf (COTS) parts or an ITER specific standard, e.g. remote handling bolts.

Bulk Items

- Common parts can be managed as bulk items in the warehouse, e.g. stock of M16 Bolt (S304) with dedicated PNI;
- Those item can be issued from the warehouse for replacement of a damaged part (in the "Kit") as a spare part;
- Bulk items are mostly "Standard Parts."

B2.8 Spare

- All Spare Parts shall be also tagged with PNI's;
- Spare parts with the same PNI's as the one of the installed item can be used for replacement;
- At shipment, spare parts shall be separated from the ones to be used for the construction. Because, those to be used for the construction are kitted and packaged systematically taken into account of the construction process steps (not treated as "bulk").

B2.9 Version Control (TBD)

- Design of an item is changed, when a PCR or a DR approved and implemented;
- Item revision number to be controlled with the revision number(s) of the relevant design documents, e.g. Tech Spec, drawings and/or the Engineering Dossier, which define the design solution;
- PNI is a "non-self-talking" random number without Rev. Num. included. Therefore for revision control on item, relying on IT database, additional information shall be always displayed with PNI;
- For example, on ITER Centralized Material Database, to control design change initiated with PCR or DR, certain version of design solution can be found as;

PNI	-	Tech Spec	-	Drawing	Rev#
-----	---	-----------	---	---------	------

- Similarly, at a non-conformance, Non Conformity Report, NCR is issued, then approved or rejected by IO-CT. In case of approval, that NCR shall be associated with SN.

Appendix-C Tagging in Construction Site and Warehouse

- In Figure C1, correlation between PBS-L3 node, FRs (equivalent to PBS-L4) and delivered items is illustrated in the construction site or in the warehouse;
- Items are delivered and then assembled or installed to certain position of the ITER system. This story can be mentioned “As-delivered item is allocated to FR”;
- In this diagram, all items or kits are tagged with both PNIs (or MNs) and SNs. Therefore at site-assembly / installation, all 3BM identifiers are linked together;
- FR’s are abstract and not exhaustive, finally situation of 4) can occur. Where the IDI is assembled just as a part of the PBS-L3, finally no FR tagging to that.

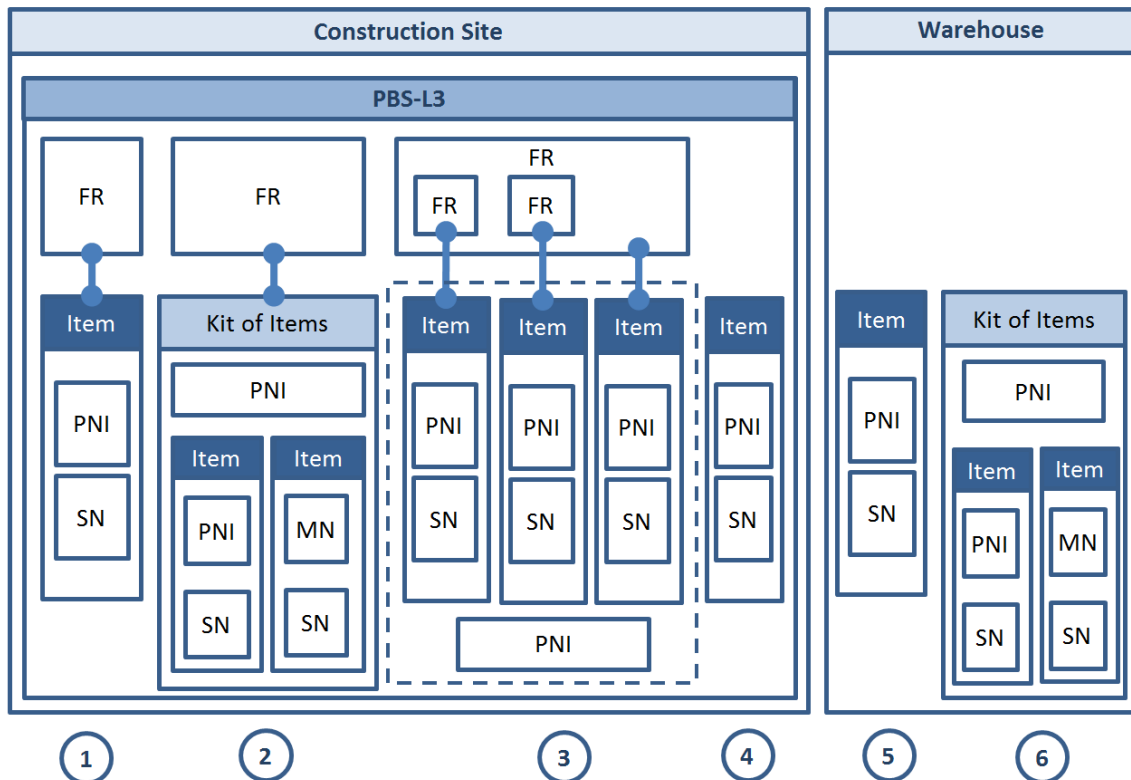


Figure C1 Correlation between PBS-L3 node, FR’s and delivered items in the construction site or in the warehouse.

1. The simplest case, an item, e.g. COTS delivered and installed;
2. Multiple items packaged as a “Kit,” which is tagged with PNI. All the items are to be assembled as a System Component tagged with FR;
3. Some items are allocated to individual FR’s, those are enclosed in the parent FR. One item (on the most right) is assembled as a part of the parent FR. An example is a valve box. Individually enclosed valves and other parts, e.g. shims in between the valve box and the Embedded Plates, EP’s, are tagged with FR’s and no identifier, respectively. The dotted line shows the Complex Component designated with the PNI in the design;
4. Assembled, but no tagging with FR;
5. One component as-stored in the warehouse (not yet on the construction site)
6. A kit stored in the warehouse as delivered.

Case 4) to be detailed in other document from data management view point. Completion of the construction is confirmed with fulfilment of related the IFC-BOM and the Assembly Drawing.

Appendix-D Supplementary ID-Code Schema

D1 Part Index

Within the detailed Diagrams or 3D models, there is a part as a specific member of a given System Component, and which should be identified.

The Part Index will be used for referencing:

- Items which may need to be located uniquely during mounting, inspection or for a maintenance procedure within a System Component.
- Custom fitted physical items, assembled at IO premises, within a System Component.
- Within very specific cases, a part which may require being identified for its specific function below the System Component itself as low voltage module within a cubicle.

In most cases, the Part Index should only need to be applied on drawings.

The Part Index syntax is:

$$A[A][N]NN$$

- An uppercase ASCII alphabetic code of 1 or 2 characters use to designate a type of part
- An integer of 2 or 3 ASCII digits. 0 may be use in front to obtain proper alphabetic order in listing.

The total length of the Part Index shall not exceed 5 characters. A given order shall be established in the sequential number following position or assembly logic. The Part Index shall be unique within a given System Component.

Format and Example

If required, an absolute address of the part Index including the concerned System Component can be used and shall be of the following syntax:

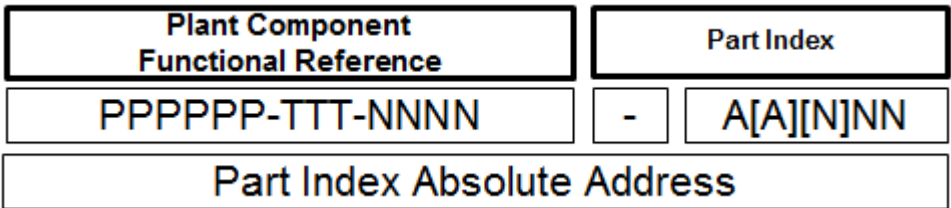


Figure D1 Absolute address of a Part Index

Note: Due to constraint over software, the – separator may be replace by / or : within these software but not on any physical marking.

D2 ISA Reference

The ISA Reference is an additional identifier which shall be used for all classes of process measurement and control instrumentation.

It is applicable to instrumentation falling under one of the following conditions:

- Instrumentation accessible during operation or maintenance.
- Instrumentation involved in Process Control or monitoring (for example a Pressure Transmitter, while the counter example would be a personal Dosimeter Reader)

- Instrumentation measuring or controlling variables of a given System Component (ex : Pressure associated to a tank)

Instrumentation function integrated within a System Component (example: on/off switches on a valve) may also be referenced using an ISA Reference and does not require a FR.

The ISA Reference of an Instrument uses the FR of the measured System Component. This enables the operator to first locate the measured System Component (generally of important dimensions) and then the related instrument, which is important for ergonomic and fast intervention.

The ISA Reference is built by application of “*ISA 5.1-2009: Instrumentation Symbols and Identification*” following the notion previously described of the PBS Identifier and Function Category.

Format and Example

The syntax of the ISA Reference and related loop is built as below :

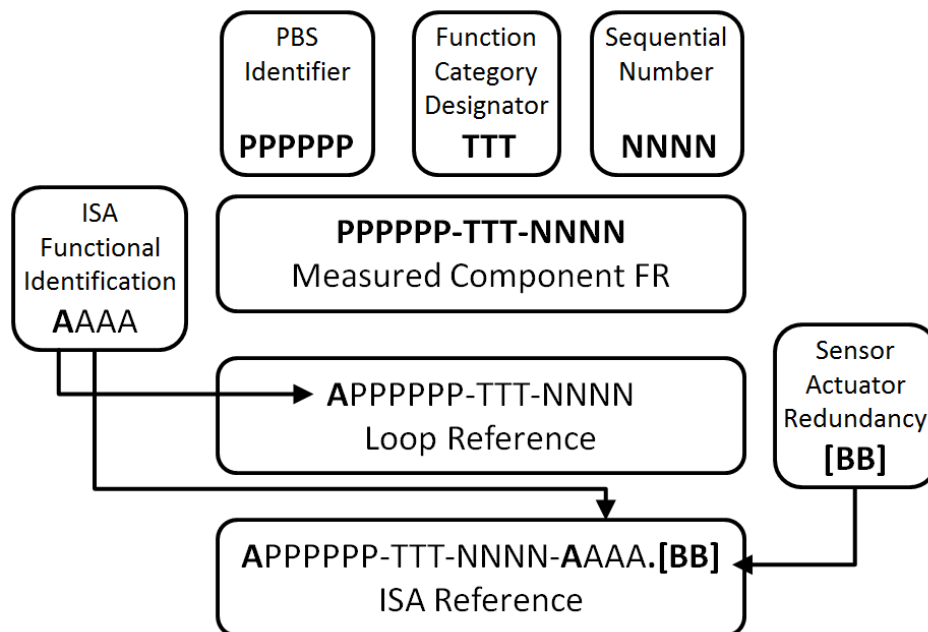


Figure D2 ISA Reference grammatical Schema

Table D1 ISA Instrument Reference Coding Table

Label	ISA Name	Description	Optional	Format
PPPPPP	System Prefix	PBS Level 3 of the Measured System Component and loop	N	6 alphanumeric uppercase ASCII characters
A	ISA Loop Variable	Measured or initialing Variable of the loop as per ISA 5.1-2009	N	1 uppercase ASCII Letter Measured or Initiating Variable
AAAA	ISA Functional Identification	functional identification of an instrument as per ISA 5.1-2009 (see AAAA Codes)	N	2 to 4 uppercase ASCII Letters including signal Level coding (H,L)
TTT	Loop Number Prefix	Main Controlled Component Function Category	N	2 or 3 ASCII uppercase letters or under specific condition 2 uppercase ASCII field and a ASCII digit
NNNN	Loop Number Counter	Main Controlled Component NNNN	N	4 alphanumeric uppercase ASCII characters
BB	Sensor Redundancy	Used for multipoint measure or a redundant sensor	Y	1-2 numeric for multipoint 1-2 ASCII uppercase letter(s) for redundant

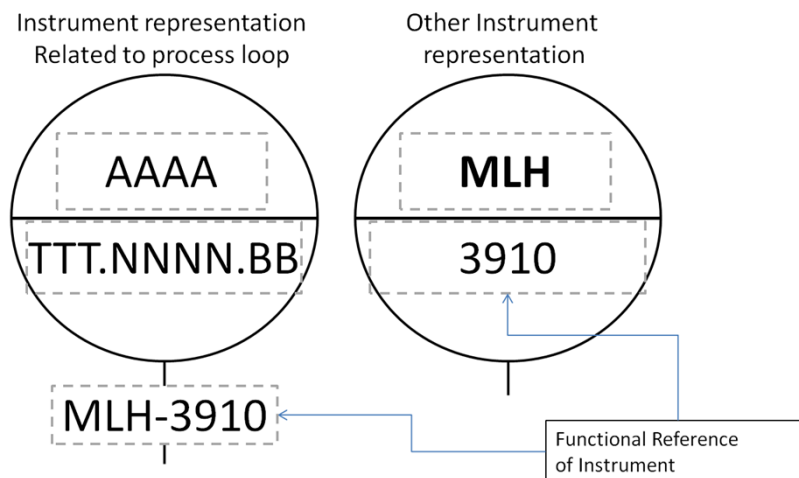


Figure D3 Instrumentation Representations

The representation of a process or function instrument in relation with a process loop is represented on left side of Figure D3. Concerning other instruments, either isolated or not directly involved in process control (earthquake measurement, analyser, etc.) this representation is shown on right side of Figure D3 shall be used.

The FR of the instrument, shown here as *PPPPPP-MLH-3910*, is required to be displayed below the symbol. An example of its application is given in Appendix-E.

The ISA Reference has common field with Signal Identification defined in [Signal and plant system I&C Variable Naming Convention \(2UT8SH\)](#).

D3 Trial Fit at Supplier's Premises

During trial fits of a specific component taking place at the manufacturer's premises, some part may be adjusted (or included electronics can be calibrated) in order to ensure preliminary qualification.

For logistical constraints, this component may be disassembled for shipping and re-assembled for installation at IO. If several components of the same type reference have been produced in the same above condition, it is needed to acknowledge which part of each trial fit goes together. Therefore, a trial fit marking will be used to differentiate them back on site.

The identification of items involved in a given trial fit will be done following the Keyword FIT- followed by an ASCII character as an identifier of the trial as shown in Figure D4.



Figure D4 Trial fit marking

A Trial Fit Marking shall be placed on each part of the component delivered, directly on the part and also on packaging. The Trial Fit Marking shall be removable.

D4 Pre-Assignment Field

The Pre-assignment Field is a partially filled-in FR or Part Index using the ASCII underscore “_” as a wildcard (example: 11F1GS-ZJ-0_00, 11__GS-ZJ-0_00).

The wildcard can replace:

- One or several characters of the PBS (PPPPPP)
- One or several characters of the Differentiating Number (NNNN)
- One or several characters of the Part Index (A[A][N]NN)

The Pre-assignment Field shall not supersede any of the 3BM identifiers.

The Pre-Assignment Field enables identification of a group of items which are strictly identical in their design (meaning that they share the same 3D design, CAD UID reference, technical definition and have an identical Type Reference within Bill of Material.)

The Pre-assignment Field shall be visible at delivery on the component if used.

The following restriction of usage shall apply to the Pre-assignment Field:

1. The field will not over constraint the possible final location, i.e. shall not represent specific FR in order not to limit flexibility of placement during construction.
2. The field will only be used for items with limited number of occurrences (<100).
3. The field will not be used for any out-of-the box components like valves, bolts or for items used by several PBS or massively instantiated.

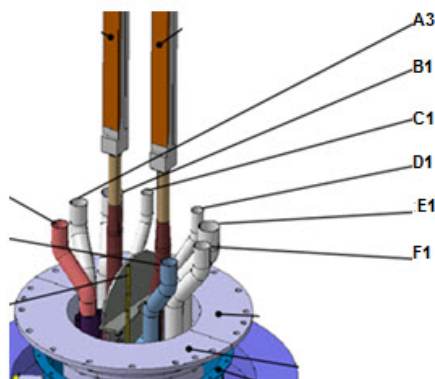
Application of Pre-Assignment Fields is given within Appendix-F

D5 Interface Locator

To ease assembly operations between components, an Interface marking or sticking on components shall be used.

The Interface locator shall be visible on the component areas that are to be assembled together, in order to identify a piece, area or edge that should be matched at assembly. The same short identifiers (example AC10, DC66...) are marked on each mechanical piece location that is supposed to be joined.

The following example shows how these locators should be specified in drawings and in the related table:



Locator	Component A	Component B	Description
A3	11G4CF-CT-1310	11G4CF-CT-2310	DN60 Schedule 10 BE
			Weld Spec : UDM4TR
B1	11G4CF-CT-1320	11G4CF-CT-0310	DN40 Schedule 10 BE
			Weld Spec : UDM4TR
H1	11G4CF-CT-1310		Lifting Ring (4 locations)

Figure D5 Example of Interface Locators and related specification

It is also to be noticed that several locations may get the same tag as for lifting ring.

General rules for the Interface Locator Identifier are as follows:

- The identifier will be the concatenation of an upper-case ASCII alphabetic string and an integer, both optional;
- The total length of the identifier will not exceed 6 digits;
- String shall refer to a connection type and/or a grid 1st address;
- An Integer shall follow a comprehensive spatial logic to ease mounting.

D6 Piping Related Referencing

D6.1 Pipe Spool Address

The Piping line¹⁴ is the breakdown for fabrication and installation into the segment call spool which can be manufactured in the shop-floor or on-field, following assembly feasibility check. All spools are welded together on-field to finalize piping line construction. The spool identifier is built as such:

Piping Line Functional Reference	Spool Number
PPPPPP-PI-NNNN	- SPLNNN
Spool address	

Figure D6 Piping Spool Address

¹⁴ Pipe spool may also be recognized as “Process-Non-Functional System Component” tagged with FR. However, it also contains several pipes belonging to pipe lines tagged with different FR’s. Where those pipelines are recognized as “Process-Functional System Components” appear in the diagrams and in the Control Monitor Screen, in future. Note that many isometric drawings for pipe spools are already tagged by Process-Non-Functional FR codes, as the drawing numbers.

With: PPPPPP-PI-NNNN signifying the piping line FR

SPL signifying the abbreviation for Spool

NNN signifying a 3 digit integer: starting by 1 at one of the extremities of the pipe.

Each Pipe spool gets assigned a PNI.

D6.2 Piping Line Piece Index

Piping line Piece Indexes are unique for a given piping line and not to the whole plant.

The Piping line Piece Index is used on spool isometric drawings for fabrication and welding maps. It is generally automatically assigned during isometric generation and is built as such:

AAAANN

With:

- The first four characters (AAAA) corresponding to an existing list of piece type codes used. It is using four ASCII uppercase characters.
- NNN being a 3 digit integer starting by 1 at one of the extremities of the piping line.

It is to be taken into account that:

- Piping line welds and gaskets will be identified on non-PIC piping line for inspection and qualification.
- Piping line pieces, welds and gaskets will be identified on PIC piping line for inspection and qualification.

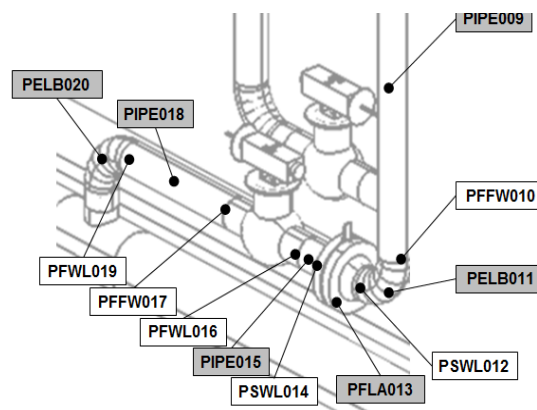


Figure D7 Piping Line Piece Index on a PIC line

The following keys will be used for naming the piping piece:

Table D2 Example of piping pieces

Key	Usage
PBRA	All Branches including the BOSS, CROSS, OLETS, LATERAL, TEE, WYE and THERMOWELL
PELB	All ELBOW and REDUCING ELBOW
PIPE	All STRAIGHT PIPE and PIPE WITH BEND
PFIT	All Fittings including the ADAPTER, CAP, PLUG, CONNECTOR, NIPPLE, REDUCER, STUB_END, SLEEVE, COUPLING, UNION, BUSHING, REDUCING INSERT, NUT, CLAMP, CLAW
PFLA	All FLANGES
PGAS	All GASKETS
PFWL	All FIELD WELD
PSWL	All SHOP WELD
PWLD	WELD (category unknown)

The following keys will be used for naming HVAC piece :

Table D3 Example of HVAC pieces

Key	Usage
HBRA	All Branches including the CROSS, LATERAL, TEE, WYE and TAP
HELB	All ELBOW
HOFT	All OFFSET
HTRA	All TRANSITION
HDUC	All ROUND DUCT AND RECTANGULAR DUCT
HFIT	All Fittings including the COUPLING, COLLAR, END CAP
HFLA	All FLANGES
HGAS	All GASKETS
HACC	All ACCESS COVER

D6.3 Nozzle Naming

Nozzle naming on a fluid System Component shall be used on diagrams, drawings and via permanent labels on physical components to secure mounting, maintenance and fulfil human engineering. Hereunder is the nozzle naming convention to be followed using one ASCII uppercase character and optionally an integer:

Table D4 Example of Nozzle Naming

Process Nozzle	Instrumentation Nozzle
FX for Inlet/Fill	LX for Level Measurement
EX for Outlet/Exit	PX for Pressure and Vacuum Measure
VX for Vent or Relief	TX for Temperature Measure
DX for Discharge and Drain	RX for Radiation Measure
PX for Rotating device (agitator/pivot)	AX for Analytical Measure
	KX for Leak Detection
MX for Maintenance and Man Hole	SX for Sight Glass

The Integer X following is optional and shall only be used if several nozzles of the same type exists.

Table D5 Example of Pping Nozzle Table for a Tank

Noozle	Noozle Description	Connected to	Description
T	Temp. Measure	76BDCF-MTS-1012	DN25 Pressure Rating 40
			EN1092-/11
I1	Nitrogen In	76BDCF-PI-1012	DN80 Pressure Rating 40
			EN1092-/11
I2	Water In	76BDCF-PI-1022	DN50 Pressure Rating 40
			EN1092-/11

D7 Referencing Electrical Enclosure

Electrical enclosure will be a System Component using (in most cases) the following TTT-codes:

CR	Cabinet, box
BJ	Box, junction or terminal
CU	Cubicle
BS	Board, switch or switchboard
CMC	Motor Control Cubicle
BP	distribution panel, Board
CUT	Cubicle, termination hardware
CX	box for radiological data treatment
BN	Board, terminal
BR	Board, relay
BD	Board, distribution

Cubicles containing any equipment playing a primary role in Instrumentation & Control System, such as PLCs, Remote I/Os, Plant System Hosts (PSHs), and Network Switches are considered as System Component. Therefore, the Cubicle acts as an enclosure for these System Components.

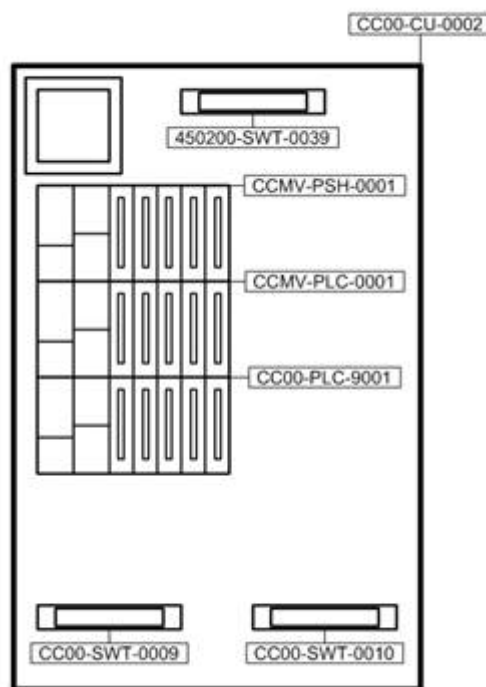


Figure D8 An electrical enclosure

Low voltage Electrical and Electronics Parts and Equipment within Electrical Enclosure such as the Low Voltage breaker, Contactor or Disconnecter shall follow the following label format:

A[AA]NN

- The first one or up to three uppercase ASCII characters (AAA) shall follow designation given in [Reference Designation Letter for Low voltage part Identification \(WEZTST\)](#) following “IEC 81346-2:2009: Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 2: Classification of objects and codes for classes.”
- The last two (NN) are Differentiating Numbers.

Within detailed electrical cubicle diagrams, the FR of the cubicle will be displayed on the title block and optionally together with the Part Index of the low voltage modules (See D1).

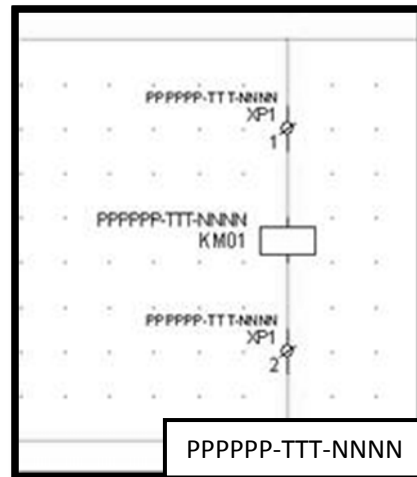


Figure D9 Label for FR and Part Index on Detailed Electrical Diagrams

D8 Referencing Wall Openings and Penetration

The Part Index shall be used to identify sub-assemblies having specific penetration and interface functions within opening. The Prefix SL for Sleeve is used and is followed by two integers.

The increment shall start from upper left to lower right by column.

Format and Example

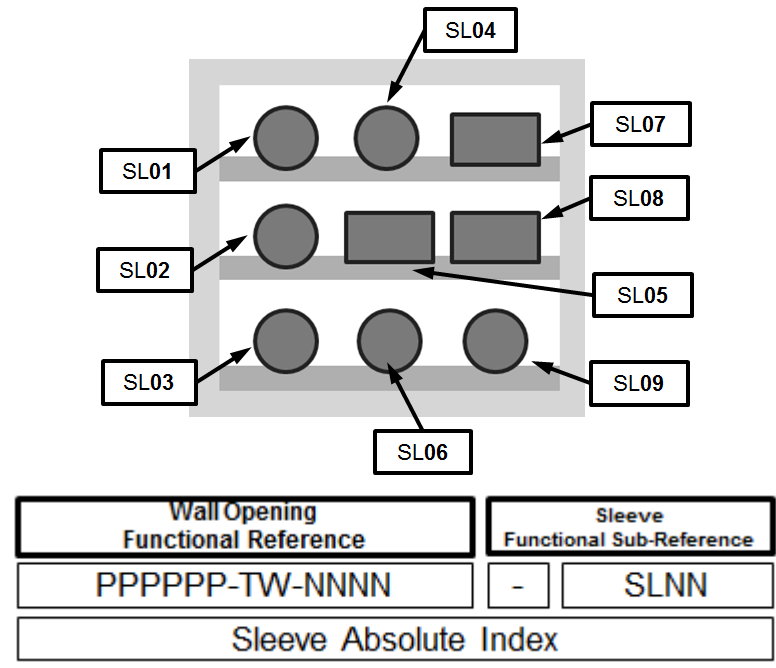


Figure D10 A Wall opening with multiple crossing sleeves

D9 Manufacture Part Number, MN

- MN is required any item managed my manufacturer regardless items to be delivered or those constituting such items;
- Numbering schema for MN is discretion of DA/Manufacturer;
- Any documentation, e.g. design document in manufacturing dossier, quality control records, shall be traceable with MNs;
- If PNI is affixed, MN is not always required. Both PNI and MN tag to the same item are allows;
- MN includes Supplier Vendor Number; Universal Product Code, coded description according to an applicable industrial code, etc.

D10 Commodity Code

Commodity code is a default feature in Smart Plant Materials (SPMat), representing item family

Format and Example

For standard parts, a part family provides all possible dimensions of a given standard (ex: Screws - Countersunk Head, Hex, DIN 7991 SS316L from M1.6 x 4mm to M12 x 120mm), as shown in Table D6. This part family is reference by a Commodity Code, which is an alphanumeric ASCII code, and a Commodity Description.

Table D6 Commodity Code and PNI of Piping parts

PNI	Commodity Code	Commodity Description	DN	Schedule
I0155208	PPPABRBEATWAAG	15 x S-10S Pipe, ASME-B36.19, BE, ASTM A376-TP316, SMLS	15	S-10S
I0155211		15 x S-40S Pipe, ASME-B36.19, BE, ASTM A376-TP316, SMLS	15	S-40S
I0155213		15 x S-5S Pipe, ASME-B36.19, BE, ASTM A376-TP316, SMLS	15	S-5S
I0155214		15 x S-80S Pipe, ASME-B36.19, BE, ASTM A376-TP316, SMLS	15	S-80S
I0155219		20 x S-10S Pipe, ASME-B36.19, BE, ASTM A376-TP316, SMLS	20	S-10S
I0155222		20 x S-40S Pipe, ASME-B36.19, BE, ASTM A376-TP316, SMLS	20	S-40S
I0155224		20 x S-5S Pipe, ASME-B36.19, BE, ASTM A376-TP316, SMLS	20	S-5S

Commodity Code is generated respecting the Commodity Description as shown in Table D7.

Table D7 Elementary codes composing a Commodity Code and the description

	Group	Part	Dim System	Dim Standard	End Prep	Material System	Material	Alias
Commodity Code	P	PP	A	BR	BE	A	TW	AAG
Commodity Description	Pipe		ASME-B36.19		BE	ASTM A376-TP316		SMLS

In Smart Plant, PNI¹⁵ is calculated from the Commodity Code, as follows:

$$\text{“PNI”} = \text{“Commodity Code”} + \text{“Physical Dimensions (e.g. DN, Schedule)”}$$

Regarding a specific custom-made mechanical item, Commodity Code can be a TTT-code, which represent a functional category of component.

D11 Lot / Batch Number and Heat Number

Discretion of DA and Manufacturer.

¹⁵ In Smart Plant, PNI is called as “Ident code.”

Appendix E Tagging Example for Instrumentation

The example in Figure E1 shows a tank, 26CVDV-TA-0040, with multiple level switches and a redundant measurement instrument for the maximum fill level. These level switches are all related to the control level loop of the tank. Their ISA References are all of the form **L26CVDL-TA-1540-LSXX.Y**, thereby clearly referencing the System Component being measured.

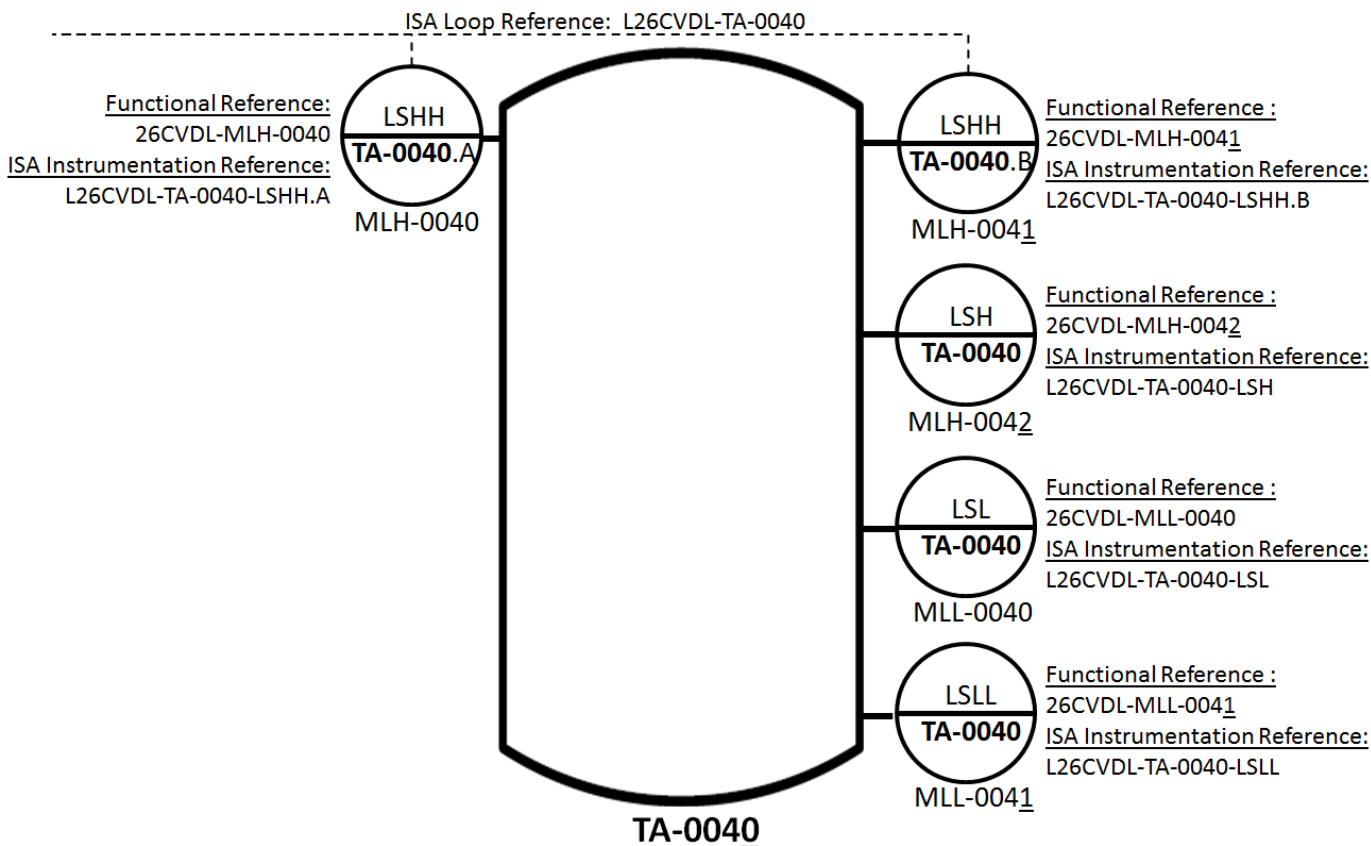
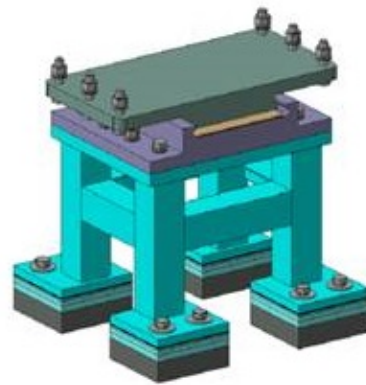


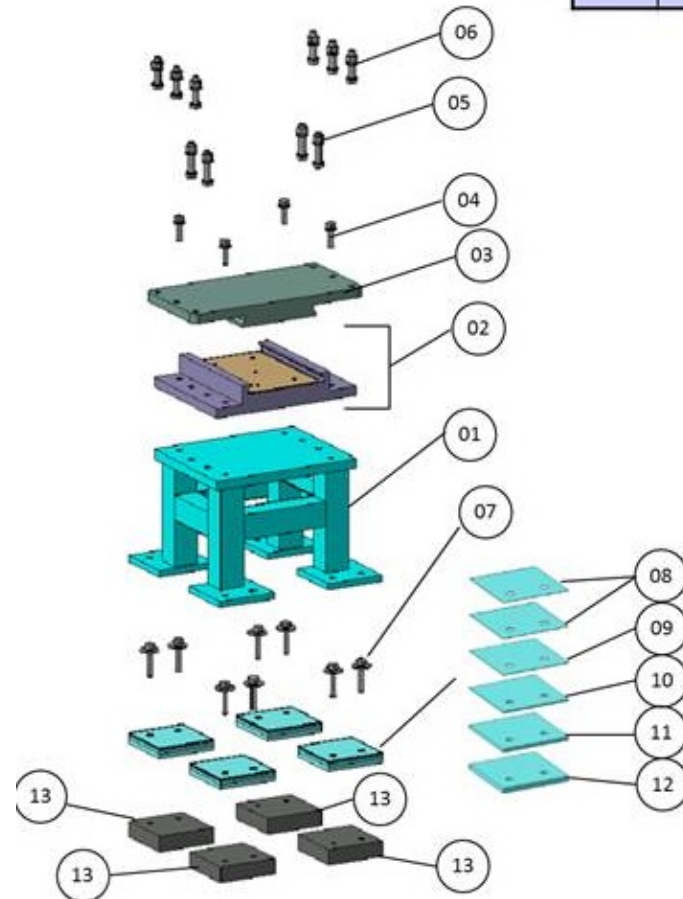
Figure E1 Example of ISA codes with FR's

Appendix F Tagging Examples for Mechanical Cases

Sample Identification using Pre-Assignment and Part Tag Field



Item	DESCR	CADREF		Pre-assignment	PNI	Commodity Code	QTY	Material	Identifier marking	
		Enovia	Ver.						IO identifier	Type
○	CFT_GRAVITY_SUPPORT_STR3_3RD	4F7BE2	--E	11_CF - ZJ - 0300	I004F7BE2	BCAPABNBEAS5ABAZ	1		11_CF-ZJ-0300 PNI: I004F7BE2 SN:	engrave
●	01 GRAVITY_SUPPORT_FRAME_STR3_3RD	42D4W4B	--F				1	304L		
●	02 DOVE_TAIL_ASSY	42D4W4E	--G				1			
●	03 G_SUPPORT_SLIDING_CONNECTION_UPR	4F593X	--C				1	304L		
●	04 BOLT_NUTS_M20X65	6TKYXS	--A				4			
●	HEXAGON_HEAD_BOLT_ISO_24017_-M20X65	6VQ75K	---		I98412548	BE4LABNBEAS5ABAZ	1	316LN		
●	WASHER_W20_A4_NF_E_25-515	UOK45Y	---		I98412579	OEBLAP2SSWAWZZZ	1	316LN		
●	WASHER_ISO_7091_20	4F45MK	---		I98412894	GSWAB9DRFAZHA1MZ	1	316LN		
...	...									
●	08 SUPPORT_SHIM_1MM_L	4F4NKF	--E				8	Q235B		
●	09 SUPPORT_SHIM_2MM_L	4F4NPH	--E				4	Q235B		
...	...									
●	13 CARBON_STEEL_BASE_PLATE	6FR38D	--D	11_CF - ZJ - 0300 /00_	I004F7BE8	GSWAB9DRFAZHA1MZ	4	Q235B	11_CF-ZJ-0300 /00_ PNI: I004F7BE8 LOT #:	engrave



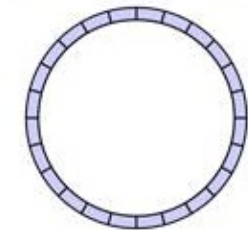
Introduction:

20 identical Gravity supports are used within a circular pattern.

A single BOM is used to describe them using Pre-assignment.

The supports are to be delivered assembled except for the Carbon Steel Base Plate (13) which will be custom fitted according to civil engineering.

BOM as designed (shown), BOM as build and BOM as installed will be unique for each Gravity support with SN and FR mark-up.



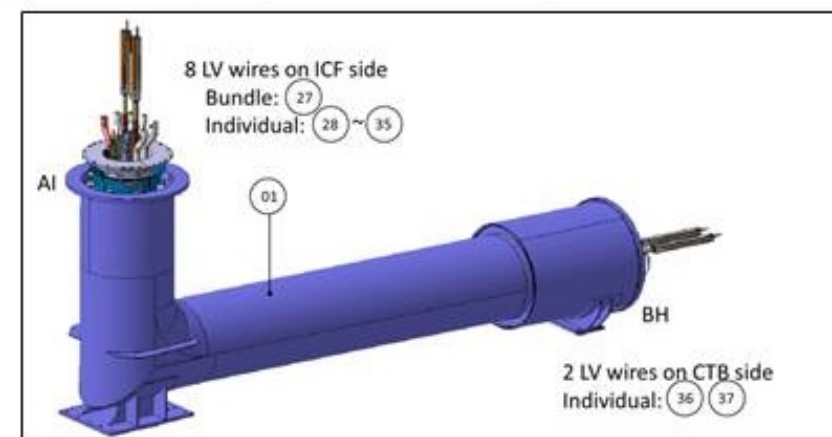
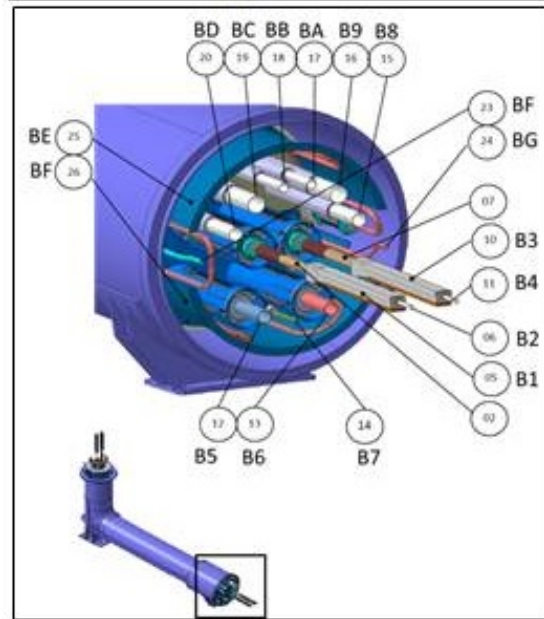
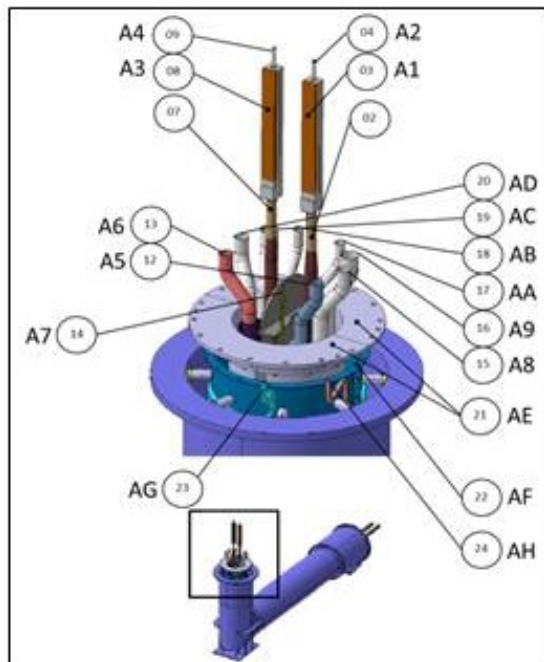
Line by line explanation:

- Top node representing one of the 20 supports with 20 possible FR values and a PNI to identify at delivery.
- Part or assembly of the gravity support; no PNI is required as the supports are delivered assembled.
- Standard Part coming from CADENAS Software. A PNI shall be provided automatically. It is not mandatory as it is delivered assembled in this case.
- Carbon steel plate is custom fitted, thus it requires a Part Tag to follow the exact final location, where once installed is no more interchangeable. As it is delivered separately, a PNI is needed.

Notes:

- Pre-assignment is optional, its marking shall not supersede PNI or FR one.
- Gravity support (top node) and Carbon Steel Base Plate (13) are Non-Standard type references – CAD UID used as PNI.

Sample Identification using Enclosure and Interface Marking



Item	Description	CADREF		Functional Reference	PNI	Commodity Code	QTY	Material	Identifier marking		Interface marking	
		Enovia	Ver.						IO identifier	Type	Interface ID.	Type
00	PF4_CFT_ASSY_B2	45Y396	--J	11G4CF - VDT - 0100	I0045Y396	MECH	1	304L (Mainly)	11G4CF-VDT-0100 PNI:I0045Y396 SN :	engrave	AI / BH	engrave
01	PF4_CFT_VACUUM_DUCT	EA5GUG	--E									
02	PF4_CFT_BB_ASSY_L	R4TBZ3	--B	11G4CF - JB - 0100								
07	PF4_CFT_BB_ASSY_R	R4TBYK	--B	11G4CF - JB - 0200								
08	MAIN_FEEDER_HALF_JOINT	TN964E	--B								A3	engrave
09	DN10_PIPE_ON_MB_JOINT_BOX_END	T7PD7F	--B								A4	sticker
12	PF4_CFT_DN50_He_SUPPLY_PIPE	RBLXRv	--B	11G4CF - PI - 2410							A5	sticker
13	PF4_CFT_DN50_He_RETURN_PIPE	RBLXQD	--B	11G4CF - PI - 2610							A6	sticker
14	PF4_CFT_SQDS_PIPE_ASSY	RBLXWG	--B	11G4CF - PI - 4492							A7	sticker
15	PF4_CFT_INSTRU_PIPE_B_R_ASSY	US2Q4Z	---	11G4CF - CDT - 0101							A8 / B8	sticker
16	PF4_CFT_INSTRU_PIPE_C_R_ASSY	US2Q2Y	---	11G4CF - CDT - 0102							A9 / B9	sticker
22	PF4_CFT_THERMAL_SHIELD	R4TB6W	--B								AF	engrave
23	PF4_CFT_TS_PIPE_INLET-2	R4TAUV	--B	11G4CF - PI - 2800							AG / BF	sticker
24	PF4_CFT_TS_PIPE_OUTLET-1	R4TAWS	--B	11G4CF - PI - 2801							AH / BG	sticker
25	CFT_B2_SBB_HALF_SIDE_TRANSIT_DUCT	HSUMGG	--B								BE	engrave
26	CFT_B2_SBB_HALF_SIDE_TRANSIT_DUCT	HSUMGG	--B								BF	engrave
27	CABLE_PF4_SENSOR_CFT_TO_PP_ICF	SM999B	--A									
28	CABLE_PF4_SENSOR_CFT_TO_PP_ICF	SM999B	--A	11G4CF - CAM - 3800	I14636685	BRECABNBEASS	20 m		11G4CF-CAM-3800 IDENT: I14636685 SN:	Laser		

Introduction:

A Cryostat Feed Through modified BOM for example.

The Feed Through is considered as an enclosure hosting crossing-through routed components with FR.

The Feed Trough is delivered assembled reducing PNI management.

This Feed Through design is unique.

Line by line explanation:

- Top node representing both the vacuum duct parts and the various components within the duct (Junction Box, Pipe and Electrical conduit). This design solution is unique, so the manufacturer can be requested to engrave the FR.
- Component within the Feed Through, normally declared on Diagrams; no PNI is required as delivered assembled.
- Mechanical Part of the Feed Through, no PNI is required as delivered assembled.
- Cable may be subject to replacement, therefore a PNI must be assigned.

PF4 feeder is the unique item in ITER system, therefore FR can be added to the BOM

Appendix-G Function Category Designator, TTT-Code

TTT-codes can be categorized into two types, i.e. 1) Process-Functional and 2) Non-Process-Functional as illustrated in Figure G1. TTT-codes are also classified per disciplines, e.g. Fluid, Instrumentation, Mechanical. MQP document [2FJMPY] describes more in detail.

Process Functional

- If a System Component is related to a process or a network, it shall be tagged directly on a diagram, with a Process Functional TTT code. For example, a Tank, a piping line, an Instrument, a cubicle, a cable;
- Those appears in a diagram, control monitor screen, etc.

Non-Process Fictional

- If a System Component is not involved in a process, it shall be tagged only in the 3D model, with a Non-Process Fictional TTT code;
- Pipe spool, special shims are in this category.

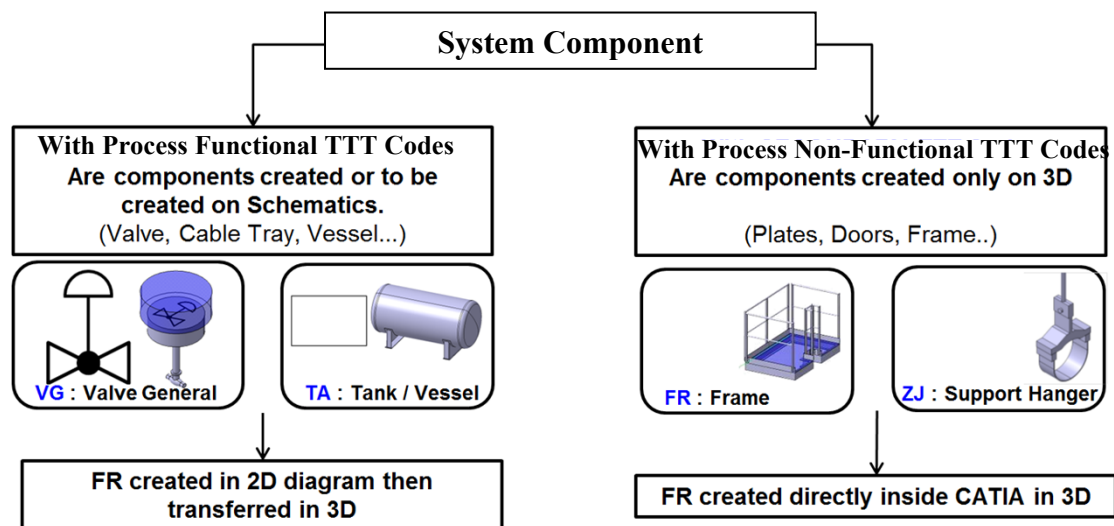


Figure G1 Function Category Designator, TTT codes

Request for New TTT

The criteria of TTT codes, which are exactly the same as for FR, are as follows:

- System components appear in diagram, operation console;
 - Any other component on which IO-CT has interest, e.g. Item to be maintained, replaced.
- Requests for new TTT-codes shall be performed via IO CAD Ticket System:
 - Queue: ITER NUMBERING SYSTEM,
 - Service: TTT code request.
 - Within a request, a description of the wished TTT-code (example: PC - Compressor) shall be provided;
 - The Request will have to follow MQP procedure [2FJMPY] and will be checked if it corresponds to a function which can be given to a component and does not overlap with the existing TTT codes.

Appendix-H Summary of Identifiers in [28QDBS]

3-Ball-Model ID-code				Supplementary ID-code and/or sub-ordinate code		
	Type of ID-code	Format	Description	Type of ID-code	Format	Description
Plant Component	FR (Functional Reference Number [Sec. 6.1])	PPPPPP-TTT-NNNN	ID-code on a System Component which locates in certain position within the ITER system having certain functionality	ISA Loop Reference [Sec. D2]	APPPPPP-TTT-NNNN	-
				ISA Reference [Sec. D2]	APPPPPP-TTT-NNNN-AAAA.[BB]	-
				Part Index [Sec. D1]	PPPPPP-TTT-NNNN-A[A][N]NN	For constituting parts
				Pipe spool address [Para. D6.1]	PPPPPP-PI-NNNN-SPLNN	Spool to be in a line
				Piping Line Piece Index [Para. D6.2]	PPPPPP-PI-NNNN-AAAAANN	For fitting, weld, etc.
				Reference electric enclosure and/or part [Sec. D7]	PPPPPP-TTT-NNNN-A[A][A]NN	Small switch in a cubicle, etc.
				Reference wall opening and penetration [Sec. D8]	PPPPPP-TW-NNNN-SLNN	For pipe sleeves within a wall opening
				Pre-Assignment Field [Sec. D4]	e.g. PP__PP-TTT-____ (* This is not ID-code)	Temporary description to be fulfilled after the installation.
Item Type Reference	PNI (Part Number of ITER [Sec. 6.2])	IXXXXXXXXX	Primary key ID-code on a Type Reference of individual item.	MN (Manufacturer Part Number) [Sec. D9]	Supplier to decide	Any part or product shall be designated with MN.
				Commodity Code [Para. D10]	SPMAT default code for item family	Mainly for Smart Plant
				Type code for pipe, valve, etc.	User to decide	As necessary
				Function Category Code, TTT [Sec. G]	TTT	[2FJMPY] to be revised
Physical Item	SN (Serial Number) [Sec. 6.3]	Manufacturer / Supplier to decide	ID-code on physically realized item. If it is unique, SN is used. If multiple, lot num., etc. are used.	Lot (or batch) number [Sec. D11]	Supplier to decide	Produced as a group of items
				Heat number	Supplier to decide	Metallic item melt at once

Index numbers to be added to some ID-codes above:

- Trial fit index [Sec. D3] <Example of ID-code> -**FIT-X**
- Interface Locator index [Sec. D5] <Example of ID-code> -**XN**
- Nozzle Index [Para. D6.3] <Example of ID-code> -**XX**

(Regarding the digits, respect the main context)