MYRRHA phase 1 implementation

MINERVA

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Signal Database

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1	2022-06-09		G. Donoso (GDO)	A.M Hernandez (AHA)	S. Reyes (SRU)	

CLASSIFICATION

Contains information for the design of structures, systems or components: Yes ☐ No ☒
Design verification : Not applicable ☐ Head of OU/Supervisor ☒ Verifier Level 1 ☐ Level 2 ☐

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PRELIMINARY OR PENDING INFORMATION

Issue	Paragraphs	Subject	Status
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Consortium Tractebel Engie – Empresarios Agrupados
Boulevard Simon Bolivar 34, 1000 Brussels, Belgium
c/ Magallanes, 3 – 28015 Madrid - Spain

www.tractebel-engie.be
www.empresariosagrupados.es

Stichting van Openbaar Nut - Fondation d'Utilité Publique - Foundation of Public Utility

Registered Office:
Avenue Herrmann Debroux 40 - 1160 Brussel – Belgium

Research Centres:
Boeretang 200 - 2400 Mol - Belgium
Chemin du Cyclotron 6 - 1348 Ottignies-Louvain-la-Neuve - Belgium

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Table of Content

1 Introduction

The MINERVA project is embedded in the overall MYRRHA programme. Following the phased MYRRHA implementation strategy, the first facility that will be constructed at SCK•CEN, Mol (Belgium) will be the first part of the 600 MeV MYRRHA LINAC that will deliver intense proton beams up to 100 MeV. The 100 MeV accelerator together with the proton target facility is named MINERVA (MYRRHA Isotopes production coupling the linear accelerator to the Versatile proton target Facility).

Tractebel together with its Consortium Partner Empresarios Agrupados will act as Design Engineer of all the Structures, Systems and Components (SSC) necessary to operate the MINERVA Accelerator, and covered under the term Accelerator Nuclear Facilities (ACC NF), except for the accelerator systems themselves, which are excluded from the Design. The Design Engineer mission covers the Design, Assistance with procurement and support during Construction.

The framework and more details about this project can be found in the "Project Execution Plan" Ref. [2].

2 Objective and scope

The purpose of this document is to define the design criteria to be applied to the Balance of Plant (BOP) Process Systems and Equipment of MINERVA ACC, as well as to describe the general characteristics of the involved process systems and equipment.

3 Acronyms

The complete list of acronyms used in the MINERVA project is included in the SCK CEN document "Abbreviations, Glossary and symbols" [Ref.4].

4 Hardwared I/O data base fields description

The following table defines for every record associated to a hardware I/O to the DCS the meaning of its fields, assigning a field name, field data type, field size and a field description of each defined parameter. The data base structure following covers digital and analog signals.

Index	Column Name	Data Type	Field Size	Description	Responsibility (Note 1)
1	OWNER	Text	10	Responsible party for IO point. Examples are: EA-E, EA-I&C, SIEMENS, WOOD, etc.	PE
2	SIGNAL ID	Text	17	Signal ID (Key field)	PE
3	FLD_DEV	Text	12	Device tag name (1st and 2nd KKS level identification)	PE
4	3_KKS	Text	5	3rd KKS level	PE
5	DESC (Note 2)	Text	40	Device description	PE
6	ACTIVE (Note 2)	Text	10	For booleans, logic “1” description	PE
7	INACTIVE (Note 2)	Text	10	For booleans, logic “0” description	PE
	FAILSAFE POSITION				
8	EST	Text	1	For booleans, enter "1" for give an alarm in the DCS for the ACTIVE status or "0" for the INACTIVE status. If left blank no alarm is required in the DCS	PE
9	PRI	Text	1	Priority level alarm in DCS	PE
10	SIG_TYPE	Text	2	Select from the following types: DI: Digital input DO: Digital output AI: Analog input AO: Analog output	PE
11	SIG_LEVEL	Text	10	Input voltage level for SIG_TYPE: 4-20 mA, 24 VDC, NAMUR, TCE (Thermocouple type E), TCK (Thermocouple type K), RTD, etc.	PE
12	PWR_SRC	Text	1	Signal power source: F: for field wetted signals S: (system) for DCS powered signals	PE
13	LINE MONITORING	Yes/No	-	If empty no line monitoring required	PE
14	LOCATION	Text	25	Physical location where the DCS Cabinet and associated termination board is located. A	PE

Index	Column Name	Data Type	Field Size	Description	Responsibility (Note 1)
				location may have multiple cabinets from different controllers	
15	DEV_PARTITION	Text	1	This field is used to determine which termination boards to assign an I/O point during panel layout. For example, if 3 analog inputs have an A, B and C partition, three separate I/O cards will be assigned during engineering to these points, one for each inputs. This column also applies to redundant pumps, valves, etc.	PE
16	DEVICE_LO	Number	-	For analog, 0% of the device calibration range (4 mA)	PE
17	DEVICE_HI	Number	-	For analog, 100% of the device calibration range (20 mA)	PE
18	DEVICE_UNITS	Text	8	For analog, engineering units of the device calibration range	PE
19	DISPLAY_LO	Number	-	For analog, 0% of display value	PE
20	DISPLAY_HI	Number	-	For analog, 100% of display value	PE
21	DISPLAY_UNITS	Text	8	For analog, engineering units of display value	PE
22	PRECISION	Number	-	Analog scaling precision - defines the number of decimal places. If blank will be calculated based on display low and high values.	PE
23	SOE	Yes/No	-	Use checkbox, if point is used for sequence of events.	PE
24	HIST	Yes/No	-	Use checkbox, if point signal is to be stored in the Historian.	PE
25	PID	Text	30	P&ID KKS where device/equipment is depicted	PE
26	LOGIC	Text	30	Control logic diagram KKS where device is depicted	PE
27	SCHEM	Text	30	Wiring diagram KKS where device is depicted	PE
28	HMI_SCREEN	Text	10	HMI Screen ID where the device is depicted	PE
29	IS	Yes/No	-	Indicate if Intrinsically safety barrier is required for this signal	PE

Index	Column Name	Data Type	Field Size	Description	Responsibility (Note 1)
30	IS_MODEL	Texto	16	Intrinsically safety barrier Model nº	CS
31	IS_IN_TB_1	Text	10	Intrinsically safety barrier input terminal block (+)	CS
32	IS_IN_TB_2	Text	10	Intrinsically safety barrier input terminal block (-)	CS
33	IS_OUT_TB_1	Text	10	Intrinsically safety barrier output terminal block (+)	CS
34	IS_OUT_TB_1	Text	10	Intrinsically safety barrier output terminal block (-)	CS
	SAFETY CLASS				
	RELAY NEEDED				
	TYPE OF RELAY				
	IO_GROUP				
	CUBICLE (ORIGIN)	Text			
	TERMINAL STRIP (ORIGIN)	Text			
	TERMINAL (ORIGIN)	Text			
	CABLE				
	CABLE REF				
	WIRE				
	DEVICE (DESTINATION)				
	CUBICLE (DESTINATION)				
	TERMINAL STRIP (DESTINATION)				
	TERMINAL (DESTINATION)				
	MULTICABLE TYPE				
	MULTICABLE WIRE				
35	CONTROLLER	Text	8	DCS controller ID where signal will be processed	CS
36	CARD_CABINET_ID	Text	20	DCS cabinet ID where the card associated to the signals is located	CS
37	CARD_ID	Text	16	DCS card ID within the cabinet	CS
38	CARD_TYPE	Text	15	Card model	CS
39	CARD_POINT_Nº	Number	-	I/O card point where signal will be assigned	CS

Index	Column Name	Data Type	Field Size	Description	Responsibility (Note 1)
40	TA_MODEL	Text	16	Terminal Assembly Model	CS
41	TA_TAG_ID	Text	16	Terminal Assembly tag identification	CS
42	MC_ID	Text	16	Marshalling cabinet ID where the signal from field is hardwired	CS
43	MC_TERM_STRIP_ID	Text	16	Marshalling terminal strip ID where the signal from field is hardwired	CS
44	MC_TB_N	Text	10	Marshalling terminal block 1st (+) & 2nd (-)	CS
45	MC_TB_2	Text	10	Marshalling terminal block 2nd (-)	CS
~~46~~	~~MC_TB_3~~	~~Text~~	~~10~~	~~Marshalling terminal block 3rd~~	~~CS~~
~~47~~	~~MC_TB_4~~	~~Text~~	~~10~~	~~Marshalling terminal block 4th~~	~~CS~~
48	REMARKS	Text	255	Field for general remarks	PE
49	MOD	Text	2	Modification code indicating a change occurred: A: Added M: Modified D: Deleted	PE
50	REV	Text	2	Revision - indicates the revision for the change. If the modification code has been changed this field should be also updated	PE
51	REV_COMMENT	Text	255	Revision comment. Explains the changes in the signal	PE
52	REV_DATE	Date/Time	-	Date when signal was entered or revised	PE

Note 1: CS (Control System Supplier), PE (Process Engineer).

Note 2: For Booleans the description of the signal is obtained by concatenating the fields “DESC” and “ACTIVE”. For analog signals, the signal description will be the field "DESC”.

5 Datalinked I/O data base fields description

The following table defines for every record associated to a datalink I/O to the DCS the meaning of its fields, assigning a field name, field data type, field size and a field description of each defined parameter. The data base structure following covers digital and analog signals.

Index	Column Name	Data Type	Field Size	Description
1	OWNER	Text	10	Responsible party for IO point. Examples are: EA-E, EA-I&C, SIEMENS, WOOD, etc.
2	PLC_NAME	Text	50	PLC Description
3	NODO	Text	2	PLC Id. (01, 02,...)
4	Node_TCS	Text	10	Internal Id node number in a PLC's network
5	IP_ADDRESS	Text	50	Ip Address
6	Nº LINKs	Text	50	Simple, Redundant
7	PROTOCOL	Text	50	Ethernet, RS-485, RS-232, RS-422, OPC, Modbus TCP/IP
8	POINTNAME	Text	20	Signal Id
9	SIG TYPE	Text	3	Select from the following types: DID, DOD, AID, AOD
10	FLD_DEV	Text	15	Device Tag Name (1st and 2nd KKS level identification)
11	3_KKS	Text	5	3rd KKS Levels
12	DESC	Text	60	Signal Description, second language (English). Limited to 60 Characters
13	ADDRESS	Text	25	Modbus address to be read. The address should be 5 characters in length. The first number should be the areas of memory in the Modbus device ("3" for input register or "4" for holding register).
14	BIT NUMBER	Number	Simple	For Booleans, indicate the bit in the word, valid entries are 0-15
15	PARITY	Text	10	Select from the following (Odd, Even, None)
16	CONVERTER_REQ	Text	10	This documents the scope of who is supplying the converter.
17	CONVERTER_QTY	Text	5	Number of converters required (PLC and DCS side)
18	CONVERTER_TYPE	Text	10	Fiber, RS-485, etc
19	CONVERTER_MOD	Text	20	Converter Model if required (PLC and DCS side)
20	DISPLAY_LO	Number	Simple	0% of display value
21	DISPLAY_HI	Number	Simple	100% of display value
22	DISPLAY_UNITS	Text	5	Engineering units of display value
23	PRECISION	Number	Simple	Analog scaling precision - Enter the number of decimal places to display. If blank will be calculated based on display low and high values.
24	ACTIVE	Text	10	Logic "0" description
25	INACTIVE	Text	10	Logic "1" description

6 Input Data List

The following list includes all the documents that contain the different input data and/or requirements for the elaboration of the present Process System, Equipment & Piping Design Criteria document. All the input data are referred throughout the document as (ID Nº), including the number of document according the list. The status of the different requirement/criteria is defined as Valid (V) or Preliminary (P).

No.	Source Document			Requirement/Data	Status
	No.	Issue	Title		
1	SCK·CEN\29155978	01-03-19	MINERVA ACC Facility Requirements – Top Level Requirements	Lifetime installation Design requirements for facility future expansions Number of workers in the facility	V
2					V
3					V
4					V
5					V
6					V
7					V
8					V

7 Body of the document

Ejemplo de como referenciar/repetir si fuse necesario requisitos de los documentos de SCK:

According to (ID1), [Ref.1]:

- *[TLR 012] The MINERVA BOP SSC shall take into account the requirements for the 100 MeV standalone facility and shall disregard any future requirement of the 600 MeV accelerator and of the reactor. Nevertheless, when sufficient data on the 600 MeV and reactor cases are available, and if the increase of the cost of all BOP SSC together remains below 5%, an assessment of the advantages of direct construction for the 600 MeV and/or the reactor shall be carried out.*
- [TLR 013] *The installation of a second injector shall be foreseen in the MINERVA masterplan and building design; space reservations are to be provided for the second injector and its auxiliary systems, a building/room is to be constructed only when the second injector shall be installed.*

Annex A – Hardwared Signal Database

Annex B – Datalinked Signal Database

References

[1] MINERVA/4AV/0693237/000/00 - Project Execution Plan

[2] MINERVA/4NT/0691961/000/00 - Applicable Codes and Standards

[3] SCK·CEN/8905079 - Abbreviations, Glossary and Symbols

[4] SCK·CEN\29756272 MINERVA Naming Convention