C2/113
Homologation procedure for MV switchgear according to the technical prescription C2/112

Part 5
DSO specific requirements for HV switchgear, intended for use in an installation connected to the public HV distribution loop of a Belgian DSO

Edition 2.2 (02.2025)

Version management

1.0	First edition, published 06.2020
2.0	Second edition, published 03.2024
2.1	Second edition - revision 1, published 07.2024 Page 6: - Word icons have been removed - Edition and PDF page numbers (from – to) for each -5 have been added
2.2	Second edition - revision 2, published 02.2025 Due to the publication of version 2.1 of the C2/113-3, -4 & -7, all the documents with the specific requirements of the DSO's are also adapted.

Table of contents

1 Introduction

This document defines the DSO specific requirements for the functional units (FUs) of HV metal enclosed switchgear according to EN 62271-200, indented to be used in an installation connected to the public HV distribution loop of the Belgian DSO(s) of concern.

The DSO specific requirements shall be considered in addition to those specified in documents C2/113-3, -4 and -7.

Here under a summary table listing the paragraphs in the above mentioned documents C2/113-3, -4 & -7 where the DSO's have additional requirements.

C2/113-3	Fluvius	Ores	Sibelga	Resa
4.2	x	x	x	x
5.2.2	x			
5.10				x
C2/113-4	**Fluvius**	**Ores**	**Sibelga**	**Resa**
1	x			
4.2	x			
4.7.1	x	x		
4.8.4				
5	x	x	x	x
6			x	
6.1	x	x		x
6.2.1		x		x
6.2.2		x		
6.2.3		x		
6.2.4		x		x
7.1	x	x	x	x
7.2	x	x		x
7.2.1			x	
7.3		x		x
8.1	x			
8.3	x			
9.1	x	x	x	x
9.2	x			
9.5		x		x
10.1	x			
10.2	x		x	x
10.3		x		
10.3.2	x			x
10.3.3	x			
10.4		x		
10.4.2				x
10.5		x		
10.5.2				x
10.5.3	x			
10.6		x		
10.6.2				x
11.1	x	x		x
11.2	x			
11.3	x			
	12.1			
	12.2			
C2/113-7	**Fluvius**	**Ores**	**Sibelga**	**Resa**
3.3	x			
3.7	x		x	
4.3	x			
4.5	x		x	

2 DSO specific requirements

2.1 Fluvius

See Annex 1 of this document

2.2 Sibelga

See Annex 2 of this document

2.3 ORES

See Annex 3 of this document

2.4 Resa

See Annex 4 of this document

2.5 AIEG

Under study

2.6 AIESH

Under study

2.7 REW

Under study

Annex 1: Specific requirements of DSO Fluvius

Ed.3 – 02.2025 : pages 7 to 31 (24 pages)

Annex 2: Specific requirements of DSO Ores

Ed.2 – 02.2025 : pages 32 to 45 (13 pages)

Annex 3: Specific requirements of DSO Sibelga

Ed.1 – 02.2025 : pages 46 to 62 (16 pages)

Annex 4: Specific requirements of DSO Resa

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Part 5
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(edition 3 - 02.2025)
(changes are indicated in green)

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1.1 Object

1.2 Scope

2 Instructions for composition of the technical dossier

2.1 File structure (folders and subfolders) and file names

2.2 Test reports and declarations

3 Instructions to complete the conformity assessment guide

4 General requirements

4.1 Normative references and Synergrid specifications

4.2 Ratings

The ratings listed in C2/113-3 and hereafter are to be considered as minimum ratings for Fluvius and might differ for DSO-purposes.
E.g. Circuit-breaker FUs DxNx: Class M2
For connection to the distribution grid of Fluvius, Fluvius only allows switchgear with one of the following ratings[1]:

Rated Voltage Ur (kV)	Rated peak/Short-time current withstand Ip(kÂ)/Ik(kA)-tk(s)
12	62.5/25-1
24	50/20-1
24	62.5/25-1
24 / 12 (dual)	50/20-1 / 62.5/25-1 (dual)

~~Internal arc classification IAC:~~

- ~~Rated arc fault current (IA, IAe) and rated arc fault duration (tA, tAe)~~
  - ~~Switchgear of category AA1x & AA2x:~~
    - ~~Cables compartment:~~
      ~~Internal arc fault test IAC A FL (or A FLR) 20 kA 1s with 2-phases arc ignition according to IEC 62271-200~~

VT's shall have the following minimum ratings:

Accuracy class	0.2
Burden	10 VA
Burden range	I

The burden range for every VT must be attested for by a routine test report present in the FU-M. This report must also be present in the technical file of the installation and available on site.

[1] *Having solely a "single rating" can impair the (full) access to the distribution loop of Fluvius.*

5 Specific test specifications

5.1 General

5.2 Folder B - EN 62271-200 - Dielectric Test

5.2.1 Partial discharge tests

5.2.2 Dielectric test on cable testing circuits

~~If Ur = 17.5 kV, the dielectric test on the cable testing circuits is covered by the power frequency voltage withstand test across the isolating distance if Ud is equal to 60 kV.~~
The tests shall be performed in accordance with the standard EN 62271-200, clause 7.2.101.
If Ur = 24kV, the dielectric test Uct (DC) @ 36kV – 0,1Hz – 60 min on cable testing circuits with simultaneous application of Ur/fr on the busbar is applicable.
Fluvius applies VLF test voltages for cosine-rectangular waveform or for sinusoidal waveform.

5.3 Folder D - EN 62271-200 § 7.6 - Short-time withstand current and peak withstand current tests

5.4 Folder E - EN 62271-200 § 7.7. - Verification of the degrees of protection IP and IK codes

5.5 Folder F - NBN EN 62271-200 §7.8 and EN 60068-2-17 §8.5.2 - Tightness test at 40°C

5.6 Folder L – EN 62271-200 §7.102 Mechanical endurance tests and Operating force

5.7 Folder M - Mechanical and electromechanical interlocks

5.8 Folder P - NBN EN 62271-200 §7.104.3 - Measurement of leakage currents

5.9 Folder Q - EN 62271-200 § 6.106 - Internal arc test - Test criteria by category and IAC

5.10 Folder S - NBN EN 62271-213 - Voltage detecting and indicating system (VDIS)

~~Folder S shall also be submitted for FU T.~~

5.11 Folder W – Testing of a complete protection chain for MV circuit breakers equipped with a protection relay without auxiliary supply or with dual power supply

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6.2 Folder O - NBN EN 62271-200 §7.103.1 - Pressure withstand test for gas-filled compartments

6.3 Folder Q - NBN EN 62271-200 §7.105 - Internal arc test - criteria by AA category and IAC

6.4 Folder X – EN 61869-2 - Current transformer (CT)

6.5 Folder Y – EN 61869-3 - Voltage transformer (VT)

ADDITIONAL TECHNICAL REQUIREMENTS ON THE SYNERGRID SPECIFICATION C2/113-4

1 Object and scope

Functional units connected to the distribution loop shall be free of maintenance during its expected lifetime.

2 General

3 References

4 MAN-MACHINE INTERFACE

4.1 General

4.2 Basic rules

The use of explanatory notes in text form is not allowed on the external parts of the switchgear.

4.3 Composition

4.4 Lines

4.5 Symbols

4.6 Indicators

4.7 Control interfaces and control buttons

4.7.1 General

The maximum height of the operation interface of a lever shall not exceed 1.7 meter above the floor level for operating. This distance takes into account the base frames used to meet other requirements. If this maximum height is exceeded, countermeasures should be included in the manuals and installation instructions.

4.7.2 Control zone

4.7.3 Content of the control zone

4.7.4 Control buttons

4.7.5 Motorized/Automatic control

4.8 Information (other indicators)

4.8.1 Name plate

4.8.2 Holder for feeder Identification

4.8.3 Service voltage range for the Voltage Detector and Indicating System

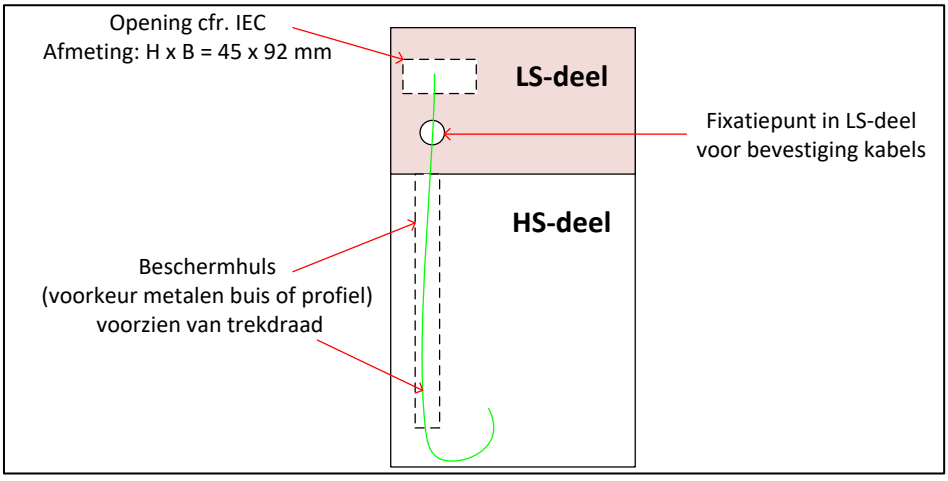
4.8.4 Additional requirements for the Fault Current Indicator (FCI)

The fault current indicators (FCI) are installed on site when connecting the DSU installation to the distribution grid. The number of FCI installed equals the number of FU-K's connected to the distribution grid. In case only two FU-K's are connected to the distribution grid, only one FCI will be installed in the first left FU-K. The brand and model of the FCI installed by Fluvius are the Horstmann Compass A or B.

The manufacturer is responsible for the necessary equipment used for installation of the FCI. This must be present on each FU-K connected to the distribution grid. The following is required for Fluvius:

- A cutout for installation of the FCI
- A tube with a pull-wire for the cables coming from the sensor of the FCI

The picture below gives an illustration of what is required.



Figuur 1

4.8.5 Remote control switch

5 VOLTAGE DETECTION AND INDICATING SYSTEM (VDIS)

The presence of a VDIS is also mandatory for FU KxUx, FU TxUx, FU DxUx. The brand and model of the VDIS installed by the switchgear manufacturer in the functional units connected to the distribution grid are sometimes imposed by Fluvius. For DSO use a Horstmann Wega 1 or Horstmann Wega 2 is used.

For client installations, if three or more FU-K are connected to the distribution grid, a Horstmann Wega 1 is imposed.

DSU specific components that use a signal of the VDIS as input shall not be connected to testing points of the VDIS installed on a FU connected to the distribution grid.

In case a VDIS is present on the busbar, a manufacturer is not required to integrate any position contacts of a load break switch in an automatic recloser system.
The same type of VDIS shall be used on all FU's in the same room.

6 SPECIFIC REQUIREMENTS FOR A HV BILLING METERING FUNCTION

6.1 General

An extra set of nameplates for the VT's en CT's must be present on the outside of the HV billing metering function and UV-resistant.

Technicians must be able to open the LV compartment of the billing metering function intuitively, easily and alone (single person).

VT's and CT's shall always be accessible after applying the 5 golden rules.
The 4-pole fuse-switch for the secondary VT circuits shall be equipped with a LV fuse with a rating of 4 A for each phase.

6.2 Design and construction

7 PRACTICAL REQUIREMENTS FOR CABLE CONNECTIONS

7.1 General

The interface between the HV cables and the switchgear (cable compartment) must always be accessible for Fluvius without the need of any tools (interlock-based).

Access to the interface must be intuitively without the need of additional actions, disassembly of interlocks,… . In case additional actions are required for opening or closing the door of the cable compartment (e.g. manually operating a switch, lever, etc…) they must not introduce an additional risk of long-term failure. This implies that a sustainable nature of the individual components prevails. Examples of long-term failures are:

- Deformations of interlocks
- Alignment problems between components
- …

For substations connected to the distribution grid of Fluvius a minimum connection height of 800 mm above floor level for the HV distribution cables connected to FU-K's is mandatory. Riser base frames can be used to achieve this height.

The maximum cable section of the HV cables of the Fluvius distribution grid are 400 mm². The FU-K and FU-D, together with their possible accessories (e.g. base frames,…) shall be designed to accommodate this cable section. The minimum distances in the cable compartment have to be adapted to integrate this cable section including plugs, …. See figures §7.2. and 7.3.

7.2 HV switchgear of category class AA1x/AA20

The center-to-center distance between two bushings in a FU-K or FU-D shall be at least 95 mm.

In case a riser base frames is used and the HV distribution cables enter from the side, the shape of this base frame must be as such that the bending radius of the HV cables can be guaranteed and the lifetime of HV cables shall not be impaired by the design where these cables enter the base frame e.g. cables laid on small edges.

7.3 HV switchgear of category class AA3x

8 ACCESSIBILITY TO COMPARTMENTS, LSC CATEGORY ~~2~~ & INTERLOCKS

8.1 Accessibility to compartments

The following accessibility requirements apply to FUs T:

- Cables compartment: interlock-based access
- Fuse compartment: interlock-based access
- Other HV compartments:
  (busbar – (switch)-disconnector - other than cables compartment)
  - sealed for life: inaccessible
  - ambient air insulated: tool-based access

8.2 LSC category

8.3 Interlocks

Key interlocks are not allowed.

8.4 Locking facilities

9 MISCELLANEOUS AND ADDITIONAL REQUIREMENTS

9.1 Arc suppression device

For switchgear with category AA20 the fail-safe principle for FU-D's must be maintained in case an insulating gas is used for breaking a short circuit current. An indication must be present on the man-machine interface indicating if the arc suppression device has operated or not. In case the activation of the arc suppression device does not share any interlocks with the switches present in the FU-D, the indication must be prominently visible. In any case, it must be impossible to perform any electrical operation on a switchgear after an internal arc has happened.

9.2 Indicating system for the dielectric withstand ability of the insulating gas for switchgear with gas insulated switching devices

According to the laws and regulations of Belgium (RD 2021, Welzijnswet), the state of the functional unit must be checked before performing any switching operation. Every functional unit that houses a sealed pressure gas-filled compartment must be equipped with a device to check the dielectric withstand of the insulating gas. This also applies to designs that use the sealed-for-life principle where losses of the insulating gas are minimal. There are external factors that can be responsible for unintended loss of the insulating gas:

- Human actions or manipulations with a risk of failure;
- During transport of the switchgear there is always a risk of damage to the switchgear;
- During installation of the switches there is a risk of damage.

9.3 Earthing arrangements

9.4 Raising base frames

9.5 Features for installation of a Fault Current Indicator (FCI)

9.6 LV terminal block for protective current transformers (CTs)

10 OPERATING MECHANISM FUNCTIONALITIES OF SWITCHING DEVICES

10.1 Scope

Magnetic drives are not allowed for all FU XXUx.

10.2 Generalities

The operation interface will always be located at the front of the FU. No operation interface may be present on top of the FU.

For every FU installed in a switchgear connected to the distribution grid, all operation handles shall be delivered together with the switchgear.

10.3 FU KKNx

10.3.1 Principle of operation of the switching devices

10.3.2 Versions

Starting from 1/1/2022 every installation connected to the distribution grid of Fluvius will be motorized. The motorization will only impact the FU's connected to the distribution grid. The manufacturer can find the necessary information regarding the motorization on the website of Fluvius, document "*Richtlijn uitrusting KC 24VDC – info fabrikant* ~~*v2.0.1*~~" latest version and the following accompanying documents:

- KCTB versie 2022 – 24VDC – 2K – FU's met Ur t.e.m. 24 kV
- KCTB versie 2022 – 24VDC – 3K – FU's met Ur t.e.m. 24 kV
- KCTB versie 2022 – 24VDC – FU's met Ur boven 24 kV

In general the "telebeheerkast" will be positioned next to the switchgear.

Under exceptional circumstances the "telebeheerkast" can be placed in a different location inside the substation. In this case the manufacturer is responsible for the necessary adaptations to the communication cables (extra length).

Switching between automatic to manual control and back shall be possible with personal protective equipment in case of a non-walk-in enclosure.

Switching between automatic to manual control and back shall not impair the normal switching operations. This procedure shall be clear and unambiguous, only using the synoptics of the switchgear. The continuity of switching operations shall by guaranteed.

10.3.3 Functionalities of switch-disconnector provided with a motor operation

Fluvius will assess the Synergrid requirement as follows:

- Start condition prior to the test: earthing switch (ES) open, Load-break switch-disconnector (LBS) closed, connection compartment closed, remote/local switch set to "remote"

- Test sequence 1:

N°	State	Action	Expected behavior
1.1	LBS in closed position	Opening command (maintained)	LBS opens
1.2	LBS in opened position	Opening command (maintained) -> add a closing command (maintained)	LBS remains open
1.3	LBS in opened position	Opening and Closing command (maintained) -> remove opening command	LBS remains open

- Test sequence 2:

N°	State	Action	Expected behavior
2.1	LBS in opened position	Closing command (maintained)	LBS closes
2.2	LBS in closed position	Closing command (maintained) -> add an opening command (maintained)	LBS opens
2.3	LBS in opened position	Opening and Closing command (maintained) -> remove opening command	LBS remains open

- Test sequence 3:

N°	State	Action	Expected behavior
3.1	LBS in opened position	Opening command (maintained), followed by a closing command (maintained)	LBS remains open
3.2	LBS in opened position	Opening and Closing command (maintained) -> the opening command is removed	LBS remains open

- Test sequence 4:

N°	State	Action	Expected behavior
4.1	LBS in closed position	Closing command (maintained), followed by an opening command (maintained)	LBS opens
4.2	LBS in opened position	Opening and Closing command (maintained) -> the opening command is removed	LBS remains open

10.4FU TxGx

10.5FU DKNx

10.5.3 Functionalities of the circuit-breaker

Fluvius will assess the Synergrid requirement as follows:

- Start condition prior to the test: earthing switch (ES) open, Circuit Breaker (CB) closed and rack in, Disconnector (if present) closed, connection compartment closed.

- Test sequence 1:

N°	State	Action	Expected behavior
1.1	CB in closed position	Opening command (maintained)	CB opens
1.2	CB in opened position	Opening command (maintained) -> add a closing command (maintained)	CB remains open(*)

1.3	CB in opened position	Opening and Closing command (maintained) -> remove opening command	CB remains open

- Test sequence 2:

N°	State	Action	Expected behavior
2.1	CB in opened position	Closing command (maintained)	CB closes
2.2	CB in closed position	Closing command (maintained) -> add an opening command (maintained)	CB opens
2.3	CB in opened position	Opening and Closing command (maintained) -> remove opening command	CB remains open

- Test sequence 3:

N°	State	Action	Expected behavior
3.1	CB in opened position	Opening command (maintained), followed by a closing command (maintained)	CB remains open(*)
3.2	CB in opened position	Opening and Closing command (maintained) -> the opening command is removed	CB remains open

- Test sequence 4:

N°	State	Action	Expected behavior
4.1	CB in closed position	Closing command (maintained), followed by an opening command (maintained)	CB opens
4.2	CB in opened position	Opening and Closing command (maintained) -> the opening command is removed	CB remains open

(*) : **One (1)** reclosing cycle is allowed during this step for FU's not used as a general protection of a DSU installation or downstream of a general protection of a DSU installation. The contacts of the main circuit of the CB must open immediately as soon as they close. The Trip Coil Supervision (TCS) of the opening circuit(s) by the DSO's IED shall not be impaired by any foreign component FU.

10.6DxGx

11INSTALLATION AND OPERATING INSTRUCTIONS

11.1General

The installation and operating instructions shall include a paragraph related to “maintenance”. Herein it shall be noted and motivated which FU’s are free of maintenance.

11.2Installation

As a general rule, HV switchgear installed in a substation must be of the same brand and be the same type (uniform installation). An exemption is giving **only** to the HV metering functional unit. The HV metering functional unit can differ from the brand and type of the rest of the HV switchgear on the following conditions:

- The HV metering functional unit of the different brand and type is homologated,
- The category of the HV metering functional unit is AA10 or AA3x,
- And is of the type “cable in – cable out” (“K-K”).

The number of different brands in one installation is always limited to two.

In order to avoid possible injuries, heating elements may not be installed in the functional units of the switchgear connected to the distribution grid.

11.3Operating instructions

For every FU installed in a switchgear connected to the Fluvius Grid a “Quick User Manual” shall be delivered together with switch gear.
This quick user manual shall :

- contain “the 5 golden rules”,
- be brief, unambiguous and clear. Maximum 2 pages per operation,
- use Dutch as language if present,
- be resistant to the environmental factors present in a cabin, such as dust, moisture and UV light,
- have maximum tear resistance for intensive use during switching operations,
- are equipped with a ribbon, cord or chain so that they can be hanged from the wall, ceiling,… .

12 ADDITIONAL REQUIREMENTS CONCERNING CONTROL AND PROTECTION FOR INSTALLATION CONNECTED TO THE FLUVIUS DISTRIBUTION GRID

12.1 Fuses used in switch-fuse combinations

Each manufacturer will have a list available of fuses to be used in his own combined load break switch.

Each manufacturer shall be able to demonstrate the compatibility and proper functioning of the fuses present on his list with his combined load break switch. This argumentation must be added to the technical file of the installation. Fuses not included on this list may not be used. The manufacturer shall indicate the range of fuses applicable to his installation and provide a detailed technical explanation using the fuse with highest caliber.

Each manufacturer indicates the maximum value of the current that is allowed to flow through the fuses taking into account the possible declassification and heat dissipation of the housing of the fuses in the combined load break switch.

The maximum heat dissipation of the combined load break switch must be declared in the homologation file.

It is the responsibility of the manufacturer to investigate the compatibility of the fuse with the combined load break switch.

12.2 Protective relays

When using a circuit breaker, the protective relays used must be able to be configured to detect earth faults and other fault currents (short circuit current, overload current,…). An earth fault setting must be activated (I0 or homopolar setting). The protective relays must be able to correctly detect and interrupt an earth fault of 60 A or higher.

The protective relays must be homologated and included on the list C10/20 part A or B.

For the protective relays a constant time curve is choses by default. An inverse curve is not allowed.

Relays powered exclusively by an auxiliary power supply must additionally comply with the following 2 conditions:

- Characteristics of the CT’s:
    - The protective chain must be as such that a short circuit current of 20 kA (duration time of 1 second) correctly activates the relays.

- Ratio of the CT
  - Ratio between primary and secondary current at least 100/X;
  - Default choices for this ratio: 100/X, 200/X, 400/X, 600/X or 800/X.

- Choice of relays type
  - The protective relays must be homologated and included on the list C10/20 part B. The following conditions must also be fulfilled:
    - Only protective relays with 3 thresholds for detection are permitted (I>, I>> and I>>>).
    - Very high short circuit currents (> 8 kA) must activate the circuit breaker instantaneously (I>>>) in order to limit damage to the installation of the DSU and distribution grid. For lower values of short circuit currents a time-step approach can be considered (I>>).
    - Only protective relays equipped with a COMTRADE file (error log). Logging of an incident is activated as soon as a threshold is reached.

ADDITIONAL TECHNICAL REQUIREMENTS ON THE SYNERGRID TECHNICAL SPECIFICATION C2/113-7

1 OBJECT AND SCOPE

2 GENERAL

3 AA1X AND AA2X CATEGORIES

3.1 Common criteria for AA1x and AA2x category

3.2 AA10 category: minimized risk switchgear with gas evacuation downwards with an arc in the gas-filled compartment

~~In case of an arc in a cables compartment, the hot gases shall not directly be evacuated inside the switching room.~~

3.3 AA11 category: minimized risk switchgear with gas evacuation in the switching room with an arc in the gas-filled compartment

An AA11 category can only be assigned to switchgear with an Ia >= 25 kA and ta >= 1s, and shall not be used for FU's intended to be connected to the distribution loop

3.4 AA13 category: minimized risk switchgear with gas evacuation duct out of the switching room with an arc in the gas-filled compartment

~~In case of an arc in a cables compartment, the hot gases shall not be evacuated inside the switching room.~~

3.5 AA15 category: minimized risk switchgear with energy absorption with an arc in the gas-filled compartment

~~In case of an arc in a cables compartment, the hot gases shall not directly be evacuated inside the switching room.~~

3.6 AA20 category: minimized risk switchgear without external phenomena with an arc in the gas-filled compartment

~~In case of an arc in a cables compartment, the hot gases shall not directly be evacuated inside the switching room.~~

~~*Note: A raising base-frame can be considered as an intermediate volume for the abovementioned hot gases.*~~

3.7 HV metering functional units AA10 category

A HV metering functional unit with category AA10 can be used in combination with HV switchgear with category AA15 or AA20. The entire installation will in this case be considered as an installation with category AA15 or AA20.

4 AA3X CATEGORIES

4.1 Common criteria for AA3x category

4.2 AA30 category: limited risk switchgear with gas evacuation downwards

4.3 AA31 category: limited risk switchgear with gas evacuation upwards in the room

An AA31 category can only be assigned to switchgear with an Ia >= 25 kA and ta >= 1s, and shall not be used for FU's intended to be connected to the distribution loop

4.4 AA33 category: limited risk switchgear with gas evacuation duct out of the room

4.5 HV metering functional units AA3x category

A HV metering functional unit with category AA3x can be used in combination with HV switchgear with category AA10, AA15 or AA20. The entire installation will in this case be considered as an installation with category AA10, AA15 or AA20 on the condition that the HV metering functional unit is protected by a switch-fuse combination.

C2/113
Classification and homologation procedure for HV switchgear according to the technical prescription C2/112

Part 5
Additional requirements for FUs intended to be used in installations connected to the grid of the DSO Ores

(edition 2 – 02.2025)

TABLE DES MATIÈRES

ADDITIONAL TECHNICAL REQUIREMENTS ON THE SYNERGRID TECHNICAL SPECIFICATION C2/113-3

4 General requirements

4.1 Normative references and Synergrid specifications

4.2 Ratings

For connection to the distribution grid of Ores,

- Rated voltage
  - Ur = 24 kV is required but for AIS Ur = 17.5 kV is temporarily still accepted.
  - Ur = 12 kV is not accepted.
- Switchgear with single rating are accepted, except for the ratings 12 kV 62,5/25 kA which is not accepted.

  Switchgear with dual rating are allowed but are not required.
- Ratings for measuring CTs of billing metering function (FU M):
  - Ratio :
    CTs with the additional ratios 10/5 A and 5/5 A shall also be available.
  - Rated short-time thermal current Ith :
    The minimum required rated short-time thermal current Ith is 20 kA – 1 s.
    For CTs with a ratio of 5/5, 10/5 or 25/5, a rated short-time thermal current Ith < 20kA-1s is tolerated.
  - Instrument security factor FS :
    For CT's with a rated primary current Ipr ≤ 25 A and a rated short-time thermal current Ith ≥ 20 kA – 1s, an instrument security factor FS ≤ 20 (> FS 5) is tolerated.
- Ratings for measuring VTs of billing metering function (FU M):
  - Ratio :
    VTs with the rated primary voltages Un prim = 6600/√3 V, 11000/√3 V and 15400/√3 V shall be available.
    The VTs with Un prim = 6600/√3 V shall
    - Either have a double ratio
      6600/√3 – 11000/√3 / 110/√3 V or 6600/√3 – 15400/√3 / 110/√3 V
    - Or be accompanied by a second set of VTs in the FU M :
      1 set of VTs 6600/√3 / 110/√3 V
      + 1 set of VTs 11000/√3 / 110/√3 V or 15400/√3 / 110/√3 V
  - Rated primary terminal insulation level :
    The rated insulation level can be reduced to Ur/Ud/Up = 12/28/75 kV for VTs with a rated primary voltage Un prim = 6600/√3 V
  - Rated output : A rated output > 10 VA is also allowed.
    In this case,
    - the required burden range ~~remains~~ shall be I.
    - the burden indication on the rating plate of the VT shall be ''0 – 10 / x VA'', x being the rated output

5 Specific test specifications

5.1 General

5.2 Folder B - NBN EN 62271-200 § 7.2 - Dielectric Tests

5.3 Folder D – NBN EN 62271-200 § 7.6 - Short-time withstand and peak withstand current tests

5.4 Folder E - NBN EN 62271-200 § 7.7 - Verification of the degrees of protection IP and IK

5.5 Folder F - NBN EN 62271-200 § 7.8 and EN 60068-2-17 § 8.5.2 - Tightness test at 40°C

5.6 Folder L - NBN EN 62271-200 § 7.102 Mechanical endurance tests and Operating force

5.7 Folder M - NBN EN 62271-200 § 7.102.2 Mechanical and electromechanical interlocks

5.8 Folder P - NBN EN 62271-200 § 7.104.3 - Measurement of leakage currents

5.9 Folder Q - NBN EN 62271-200 § 7.105 - Internal arc test - Criteria by AA category & IAC

5.10 Folder S - NBN EN 62271-213 - Voltage detecting and indicating system (VDIS)

5.11 Folder W - Testing of a HV circuit breaker overcurrent protection chain

6 Specific test specifications for a billing metering function

6.1 Introduction

6.2 Folder O - NBN EN 62271-200 § 7.103.1 - Pressure withstand test for gas-filled compartments

6.3 Folder Q - NBN EN 62271-200 § 7.105 - Internal arc test - Criteria by AA category & IAC

6.4 Folder X - NBN EN 61869-2 - Current transformer (CT)

6.5 Folder Y - NBN EN 61869-3 - Voltage transformer (VT)

ADDITIONAL TECHNICAL REQUIREMENTS ON THE SYNERGRID TECHNICAL SPECIFICATION C2/113-4

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3 References

4 Man-Machine Interface

4.1 General

4.2 Basic rules

4.3 Composition

4.4 Lines

4.5 Symbols

4.6 Indicators

4.7 Control zones and control buttons

4.7.1 General

The height of the operation interface of a lever/handle shall not exceed 1.7 meter. This maximum height takes into account the base frames used to meet other requirements (standard raising base-frames for the ergonomy of the cable connection – energy absorbing base-frames, …) except the raising base-frames with a height ≥ 600 mm for switchgear with internal arc category AA1x & AA20 and the raising base-frames with a height ≥ 675 mm for switchgear with an internal arc category AA3x, for which additional specific measures are allowed to ensure safe operation.

4.7.2 Control zone

4.7.3 Content of the control zone

4.7.4 Control buttons

4.7.5 Motorized/automatic control

4.8 Information (other indicators)

4.8.1 Name plate

4.8.2 Holder for feeder Identification

4.8.3 Service voltage range for the Voltage Detector and Indicating System (VDIS)

4.8.4 Fault Current Indicator (FCI)

See § 9.5

4.8.5 Remote control switch

5 Voltage Detection and Indicating System (VDIS)

The different FUs of one family of switchgear can be homologated with the following brands and types of VDIS for use in an installation connected to the HV network of Ores:

- Kries Capdis-S1+ R4.5 or Capdis-S2+ R4.5
- Horstmann Wega 1 or Wega 2

The FUs DKNx, TKGx & DKGx of one family of switchgear for which the technical specification C2/113-4 requires a VDIS shall be homologated with the same brand(s) and type(s) of VDIS as the FU KKNx, in order to ensure that all FUs in one installation shall be fitted with the same brand of VDIS.

6 Specific requirements for a HV billing metering function

6.1 General

CTs with double winding are allowed for the measurement at the injection point in specific conditions.
Those conditions are indicated in the OPM-080-ST09.
In case of CTs with double winding,

- the second winding of the CTs complies with the following requirements :
  - Rated secondary current Isec: 1 A
  - Rated output: ≥ 5 VA
  - Rated accuracy class: 0,5
  - Instrument security factor: FS 5
- The secondary wiring (type of cable, colour of wires, section of wires, terminal block in LV compartment, earthed terminal, …) of the second winding of the CTs complies with the requirements of the secondary wiring of the first (billing) winding.

A second set of VTs or VTs with double winding are allowed for the measurement at the injection point and the decoupling protection in specific conditions. Those conditions are indicated in the OPM-080-ST09.
In case of second set of VTs or VTs with double winding,

- the winding of the second set of VTs or the second winding of the VTs has the same characteristics as the first (billing) winding.
- The secondary wiring of the second set of VTs or of the second winding of the VTs shall complies with the requirements of the secondary wiring of the first (billing) winding.

6.2 Design and construction

6.2.1 General aspects

The manufacturer of the billing metering FU places removable cylindrical link conductors (no fuses) in all 4 poles of the fuse-switch for the secondary VT circuits in the LV compartment.

The access to the LV terminal block for the secondary CT circuits, and to the 4-pole fuse-switch for the secondary VT circuits in the LV compartment is prevented by a sealable protection cover placed in the LV compartment by the manufacturer of the functional unit. The removal of this cover and the access to the terminal block and to the 4-pole fuse-switch is not possible without breaking the seal.

6.2.2 CT mounting and wiring of secondary CT circuits

When technically feasible, each wire of the LIYY or LIHH cable is connected to a secondary terminal of the CTs by the mean of an eyelet terminal. Otherwise, the connection is made with a fork terminal.

It is possible to check that the 6 cores LIYY or LIHH cable or its protective sheath is uninterrupted on its complete path between the secondary terminals of the CTs and the LV terminal block for the secondary CT circuits in the LV compartment. One mean to allow this check can be the visibility of the cable/sheath over its complete path.

If the CTs are equipped with an earthing screw on the terminal s2, this screw shall be removed and replaced by a normal screw and a Y/G earthing wire or a Y/G marked earthing bare copper conductor.

The Y/G wire or Y/G marked bare copper conductor earthing the terminal s2 of every CT is visible on its complete path from the terminal s2 to the main earth collector. The only different earthing mean allowed over this path is the CT support plate.

6.2.3 VT mounting and wiring of secondary VT circuits

When technically feasible, each wire of the LIYY or LIHH cable is connected to a secondary terminal of the VTs by the mean of an eyelet terminal. Otherwise, the connection is made with a fork terminal.

It is possible to check that the 4 cores LIYY or LIHH cable or its protective sheath is uninterrupted on its complete path between the secondary terminals of the VTs and the 4-poles fuse-switch for the secondary VT circuits in the LV compartment. One mean to allow this check can be the visibility of the cable/sheath over its complete path.

If the VTs are equipped with a earthing screws on the terminals N and/or n, those screws shall be removed and replaced by normal screw(s) and a Y/G earthing wire or a Y/G marked earthing bare copper conductor.

The Y/G wire or Y/G marked bare copper conductor earthing the terminals N and n of every VT is visible on its complete path from the terminal N or n to the main earth collector. The only different earthing mean allowed over this path is the VT support plate.

6.2.4 Nameplates and markings

The 2nd set of the rating plates of the CT's and of the VT's is placed outside the HV compartment, either inside the LV compartment, or next to the rating plate of the billing metering function.

6.2.5 Schematic diagrams

7 Practical requirements for cable connection

7.1 General

The connection of 400 mm² cables can happen in the distribution grid of Ores.

7.2 HV switchgear of category AA1x/AA20

The FUs KKNx and DKNx of switchgear of internal arc category AA1x or AA20 are designed for the connection of single phase cables with a maximum section of 240 mm².

7.3 HV switchgear of category AA3x

The FUs KKNx and DKNx of switchgear of internal arc category AA3x are designed for the connection of single phase cables with a maximum section of 400 mm². The minimum required height for the cable terminations and the required distance for the sensors of the FCI remain the same as the ones indicated in the Synergrid specification C2/113-4.

8 Accessibility to compartments, LSC category & interlocks

8.1 Accessibility to compartments

8.2 LSC category

8.3 Interlocks

8.4 Locking facilities

9 Miscellaneous and additional requirements

9.1 Arc suppression device

All FUs KKNx and DKNx, part of a switchgear with an internal arc category AA20, shall be fitted with an auxiliary contact for the signalization of the operation of the arc suppression device, regardless of whether the operation of the main switching device is manual or electrical. In the case of an electrically operable main switching device, this auxiliary contact shall be in addition to the auxiliary contact locking the electrical operation of the main switching device.

9.2 Indicating system for the dielectric withstand ability of the insulating gas for switchgear with gas-insulated switching devices

9.3 Earthing arrangements

9.4 Raising base frames

9.5 Features for installation of a Fault Current Indicator (FCI)

Every FU KKNx is designed so that it can be equipped with one of the following brands and types of FCIs mounted on the front side of the man-machine interface and the 3 associated current sensors, each mounted around every HV cable in the cables compartment :

- Kries IKI 23*
- Kries IKI 50 R2 & IKI 50 R2E
- Horstmann Sigma D*
- Horstmann Compass B

* : not allowed in FU KKNx with motorized switch-disconnector

9.6 LV terminal block for protective current transformers (CTs)

10 Operating mechanism functionalities of switching devices

10.1 Scope

10.2 Generalities

10.3 FU KKNx

A mechanism of the switch-disconnector designed to provide stored and latched energy opening operation is also allowed, if and only if the energy storage and latching is done during the previous closing operation.
A mechanism of the earthing-witch designed to provide stored and latched energy opening operation is also allowed, if and only if the energy storage and latching is done during the previous closing operation.
FUs KKNx intended to be connected to the HV distribution grid of Ores are fitted with

- an auxiliary contact signalling the status (armed or triggered) of the arc suppressor (only for switchgear with AA20 internal arc category)
- a LV terminal block with
    - terminals ensuring the interface with the above-mentionned auxiliary contact
    - 5 not-connected LV terminals, 2 for the power-supply of a smart short-circuit indicator + 3 for the modbus of a smart short-circuit indicator

FUs KKNx with motorized switch-disconnector intended to be connected to the HV distribution grid of Ores are additionally fitted with :

- 48 VDC control and motorization circuits
- auxiliary contacts signalling :
    - the opened and the closed positions of the switch-disconnector (2 separate contacts)
    - the opened and the closed positions of the earthing-switch (2 separate contacts)
    - the crossing of the insulating gas pressure alarm threshold
    - the remote control inhibition position of the remote control switch
- a LV terminal block with terminals ensuring the interface with all those control, motorization and signalling circuits

10.4 FU TxGx & TKUx

The switch-fuse combination of a FU TxGx is equipped with 2 separate auxiliary contacts, 1 signalling the closed position and the other signalling the opened position of the switch of the combination.
The switch-fuse combination of FUs TxGx and TKUx can be equipped with a time-delayed minimum voltage opening release working at an auxiliary voltage of 230 VAC.

10.5 FU DKNx

FUs DKNx intended to be connected to the distribution grid of Ores are fitted with

- 48 VDC shunt tripping and closing releases and spring charging motor in the circuit-breaker
- auxiliary contacts signalling :
    - the opened and the closed positions of the circuit-breaker (2 separate contacts)
    - the discharged status of the spring of the circuit-breaker
    - the opened and the closed positions of the disconnector (2 separate contacts)
    - the opened and the closed positions of the earthing-switch (2 separate contacts)
    - the crossing of the insulating gas pressure alarm threshold
    - the remote control inhibition position of the remote control switch
    - the triggered status of the arc suppressor (only for switchgear with AA20 internal arc category)
- a LV terminal block with terminals ensuring the interface with all those control, motorization and signalling circuits

10.6 FU DxGx & DKUx

The circuit-breaker of a FU DxGx is fitted with 2 separate auxiliary contacts, 1 signalling the closed position and the other signalling the opened position of the circuit-breaker.
The circuit-breaker of FUs DxGx and DKUx can be equipped with a time-delayed minimum voltage opening release working at an auxiliary voltage of 230 VAC.

11 Installation and operating instructions

11.1 General

The installation and operating instructions of the FUs to be used in installations connected to the HV distribution grid of Ores shall be written in French.

11.2 Installation

11.3 Operating instructions

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Part 5
Additional requirements for connection on the DSO grid of Sibelga

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3 INSTRUCTIONS TO COMPLETE THE CONFORMITY ASSESSMENT GUIDE

4 GENERAL REQUIREMENTS

4.1 Standards and reference documents

4.2 Ratings

To connect HV equipment on the distribution grid of Sibelga, they must have the following ratings.

Rated Voltage Ur (kV)	Rated peak/Short-time current withstand Ip(kÂ)/Ik(kA)-tk(s)
24	50/20-1
24	62.5/25-1
17.5	50/20-1
17.5	62.5/25-1
17.5 / 12 (dual)	50/20-1 / 62.5/25-1 (dual)
24 / 12 (dual)	50/20-1 / 62.5/25-1 (dual)

For the specifications about the CTs et VTs for the the FU M, you can taking into account of the Sibelga technical specification BTSTB E 127-1 for the current transformers and voltage transformers, on the Sibelga Web Site (www.sibelga.be).

5 SPECIFIC TEST SPECIFICATIONS

5.1 General

5.2 Folder B - EN 62271-200 - Dielectric Test

5.3 Folder D - EN 62271-200 § 7.6 - Short-time withstand current and peak withstand current tests

5.4 Folder E - EN 62271-200 § 7.7. - Verification of the degrees of protection IP and IK codes

5.5 Folder F - NBN EN 62271-200 §7.8 and EN 60068-2-17 §8.5.2 - Tightness test at 40°C

5.6 Folder L – EN 62271-200 §7.102 Mechanical endurance tests and Operating force

5.7 Folder M - Mechanical and electromechanical interlocks

5.8 Folder P - NBN EN 62271-200 §7.104.3 - Measurement of leakage currents

5.9 Folder Q - EN 62271-200 § 6.106 - Internal arc test - Test criteria by category and IAC class

5.10 Folder S - NBN EN 62271-213 - Voltage detecting and indicating system (VDIS)

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6 SPECIFIC TEST SPECIFICATIONS FOR METERING PANEL

6.1 Introduction

6.2 Folder O - NBN EN 62271-200 §7.103.1 - Pressure withstand test for gas-filled compartments

6.3 Folder Q - NBN EN 62271-200 §7.105 - Internal arc test - criteria by AA category and IAC

6.4 Folder X – EN 61869-2 - Current transformer (CT)

See the Sibelga document BTSTB E 127-1 for the current transformers, on the Sibelga Web Site (www.sibelga.be).

6.5 Folder Y – EN 61869-3 - Voltage transformer (VT)

See the Sibelga document BTSTB E 127-1 for the voltage transformers, on the Sibelga Web Site (www.sibelga.be).

ADDITIONAL TECHNICAL REQUIREMENTS ON THE SYNERGRID TECHNICAL SPECIFICATION C2/113-4

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4.8.2 Holder for feeder identification

4.8.3 Service voltage range for the Voltage Detector and Indicating System

4.8.4 Additional requirements for the Fault Current Indicator (FCI)

5 VOLTAGE DETECTION AND INDICATING SYSTEM (VDIS)

The brand and model of the VDIS installed by the switchgear manufacturer in the functional units connected to the distribution grid are imposed by Sibelga. In all functional units the DSU must use a Horstmann type Wega 1.

DSU specific components that use a signal of the VDIS as input shall not be connected to testing points of the VDIS installed on a FU connected to the distribution grid. The DSU is responsible to provide the auxiliary voltage for the VDIS equipped with auxiliary contacts.

6 SPECIFIC REQUIREMENTS FOR A HV BILLING METERING FUNCTION

An extra set of nameplates for the VT's en CT's must be present on the inside of the HV billing metering function.
Technicians must be able to open the LV compartiment of the billing metering function intuitively, easily and alone.

6.1 General

6.2 Design and construction

7 PRACTICAL REQUIREMENT FOR CABLE CONNECTIONS

7.1 General

The interface between the HV cables and the switchgear (cable compartment) must always be accessible for Sibelga without the need of any tools (interlock-based).

Access to the interface must be intuitively without the need of additional actions, disassembly of interlocks,… . In case additional actions are required for closing the door of the cable compartment (e.g. manually operating a switch, lever, etc…) they must not introduce an additional risk for long-term failure. This implies that a sustainable nature of the individual components prevails. Examples of long-term failures are:

- Deformations of interlocks
- Alignment problems between components

7.2 HV switchgear of category class AA1x/AA20

7.2.1 Dedicated connection system for HV cables testing

Sibelga could request that all functional units type K in RMU's are equipped with a dedicated connection system for dielectric tests on HV cables.

- ***Description :***

This dedicated connection system will be used to perform the following tests:

- VLF or DC voltage injection test op U_{ctDC} on the HV cable connected to the switchgear in every pole in turn, both other poles and the frame being earthed, with the DSO's laboratory truck.
- Insulation tests at 10 kV DC on the HV cable connected to the switchgear in every pole in turn, both other poles and the frame being earthed, with a portable "Megger" by the DSO's operating staff.

It allows testing and checking of HV cables connected to the switchgear by the DSO's operating staff, without needing intervention on the elbow plug connectors of the HV cables located in the RMU's cable compartment.
The dedicated connection system does not require the use of specific tools.

- ***Design :***

The system shall consist in :

- 3 single phase female sockets in insulating material, integrated in the RMU, with each a central conductor connected respectively to the main circuit's conductors in the different phases on the cable side of the switching device, marked L1 / L2 / L3.
- 3 external single phase male plug connectors, to be introduced each in one of the female sockets to allow the connection of an external voltage source or earthing device to each phase on the cable side in the RMU.
- 3 external single phase systems to carried out the connection of an external voltage source or earthing device to each phase on the cable side in the RMU.
    - Remark:
        - The manufacturer can propose an alternative concept for validation by Sibelga deviating from this design during the homologation procedure.

- ***Characteristics :***

- The dedicated connection system for dielectric tests on cables shall be located at the front side or on the upper part of the FU K.
- The interlocks specified in C2/113-4 § 8.3 shall be present.
- An earthing connection will be present next this dedicated connection system in order to allow to connect the earthing conductor of the DSO's voltage injection system.
- The dedicated connection system for dielectric tests on HV cables shall remain connected to earth through the cable earthing-switch of the RMU

during the complete phase of connection/disconnection of the testing device.

7.3 HV switchgear of category class AA3x

8 ACCESSIBILITY TO COMPARTMENTS, LSC CATEGORY 2 INTERLOCKS

8.1 Accessibility to compartments

8.2 LSC category

8.3 Interlocks

8.4 Locking facilities

9 MISCELLANEOUS AND ADDITIONAL REQUIREMENTS

9.1 Arc detection and suppression device

An indication must be present on the man-machine interface indicating if the arc suppression device has operated or not. In any case, it must be impossible to perform an electrical operation on a motorized switchgear after an internal arc has happened.

9.2 Indicating system for the dielectric withstand ability of the insulating gas for switchgear with gas insulated switching devices

9.3 Earthing arrangements

9.4 Raising base frames

9.5 Features for installation of a Fault Current Indicator (FCI)

9.6 LV terminal blocks for protective current transformers (CTs)

10 OPERATING MECHANISM FUNCTIONALITIES OF SWITCHING DEVICES

10.1 Scope

10.2 Generalities

The operation interface will always be located at the front of the FU. No operation interface may be present on top of the FU.

For every FU installed in a switchgear connected to the distribution grid, all operation handles shall be delivered together with the switchgear. A list must be present with all the handles and accessories needed for exploitation, maintenance or interventions on the installation. Examples of such accessories are:

- Accessories for cable testing on the test plugs,
- Specific tools for performing switching operations or cable installations,
- …

The list must contain the manufacturer, model and order number of this accessory.

10.3 FU KKNX

10.3.1 Principle of operation of the switching devices

10.3.2 Versions

10.3.3 Functionalities of switch-disconnector provided a motor operation

10.4 FU TxTx

10.4.1 Principle of operation of the switching devices

10.4.2 Versions

10.5 FU DKNx

10.5.1 Principle of operation of the switching devices

10.5.2 Versions

10.5.3 Functionalities of the circuit-breaker

ADDITIONAL TECHNICAL REQUIREMENTS ON THE SYNERGRID TECHNICAL SPECIFICATION C2/113-7

1 OBJECT AND SCOPE

2 GENERAL

3 AA1X AND AA2X CATEGORIES

3.1 Common criteria for AA1x and AA2x category

3.2 AA10 category: minimized risk switchgear with gas evacuation downwards with an arc in the gas-filled compartment

3.3 AA11 category: minimized risk switchgear with gas evacuation in the switching room with an arc in the gas-filled compartment

3.4 AA13 category: minimized risk switchgear with gas evacuation duct out of the switching room with an arc in the gas-filled compartment

3.5 AA15 category: minimized risk switchgear with energy absorption with an arc in the gas-filled compartment

3.6 AA20 category: minimized risk switchgear without external phenomena with an arc in the gas-filled compartment

3.7 HV metering functional units AA10 category

A HV metering functional unit with category AA10 can be used in combination with HV switchgear with category AA15 or AA20. The entire installation will in this case be considered as an installation with category AA15 or AA20.

4 AA3X CATEGORIES

4.1 Common criteria for AA3x category

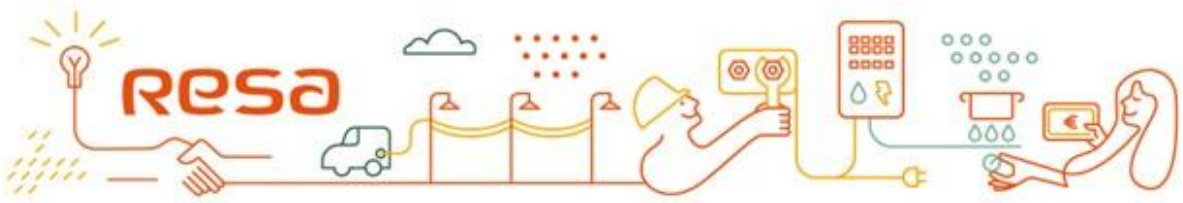
4.2 AA30 category: limited risk switchgear with gas evacuation downwards

4.3 AA31 category: limited risk switchgear with gas evacuation upwards in the room

4.4 AA33 category: limited risk switchgear with gas evacuation duct out of the room

4.5 HV metering functional units AA3x category

A HV metering functional unit with category AA3x can be used in combination with HV switchgear with category AA10, AA15 or AA20. The entire installation will in this case be considered as an installation with category AA10, AA15 or AA20 on the condition that the HV metering functional unit is protected by a switch-fuse combination.



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Part 5
Additional requirements for connection on the DSO grid of Resa

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4. General requirements

4.1. Normative references and Synergrid specifications

4.2. Ratings

For connection to the distribution loop of Resa,

- Rated voltage:
  - Ur = 24kV is required but for AIS, Ur = 17.5kV is temporarily still accepted.
  - Ur = 12kV is not accepted.

- Switchgear with single rating are accepted.

- Switchgear with dual ratings are allowed but are not required.

- Ratings for measuring VTs of billing metering function (FU M):
  - Ratio: VT's shall have the following Un: 6600/√3, 11000/√3, or 15400/√3 V.
  - VT's with double ratio or double set of VT's in the FU M shall be possible, taking in account the above mentioned Un.
  - Rated primary terminal insulation level : the rated insulation level can be reduced to Ur/Ud/Up = 12/28/75 kV for VT's with a rated primary voltage Un = 6600/√3 V.

5. Specific test specifications

5.1. General

5.2. Folder B – NBN EN 62271-200 §7.2 – Dielectric tests

5.3. Folder D - NBN EN 62271-200 §7.6 - Short-time withstand and peak withstand current tests

5.4. Folder E - NBN EN 62271-200 §7.7 - Verification of the degrees of protection IP and IK

5.5. Folder F - NBN EN 62271-200 §7.8 and EN 60068-2-17 §8.5.2 - Tightness test at 40°C

5.6. Folder L - NBN EN 62271-200 §7.102 - Mechanical endurance tests and operating force

5.7. Folder M - NBN EN 62271-200 §7.102.2 - Mechanical and electromechanical interlocks

5.8. Folder P - NBN EN 62271-200 §7.104.3 - Measurement of leakage currents

5.9. Folder Q - NBN EN 62271-200 §7.105 - Internal arc test - criteria by AA category and IAC

5.10. Folder S - NBN EN 62271-213 - Voltage detecting and indicating system (VDIS)

The standard version of the voltage detecting and indicating system (VDIS) shall cover the operating voltage range between 10 kV and 16 kV. The second version of the voltage detecting and indicating system (VDIS) shall cover the operating voltage range between 5 kV and 11 kV.

The switch from the standard to the second version shall easily be feasible by the final user by adapting the C2m module.

5.11. Folder W - Testing of a HV circuit breaker overcurrent protection chain

6. Specific test specifications for a billing metering function

6.1. Introduction

6.2. Folder O - NBN EN 62271-200 §7.103.1 - Pressure withstand test for gas-filled compartments

6.3. Folder Q - NBN EN 62271-200 §7.105 - Internal arc test - criteria by AA category and IAC

6.4. Folder X - NBN EN 61869-2 - current transformer (CT)

6.5. Folder Y - NBN EN 61869-3 - voltage transformer (VT)

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4.8. Information (other indicators)

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4.8.3. Service voltage range for the Voltage Detection and Indicating System (VDIS)
4.8.4. Fault Current Indicator (FCI)

See §9.5.

4.8.5. Remote control switch

5. Voltage Detection and Indicating System (VDIS)

The brand and model of the VDIS installed by the switchgear manufacturer in the functional units are required by Resa.

For DSO use, the CAPDIS-S1+ (R4.5) is required.

For client installation, the CAPDIS-S2+ (R4.5) is required.

DSU specific components that use a signal of the VDIS as input shall not be connected to testing points of the VDIS installed on a FU connected to the distribution grid.

6. Specific requirements for a HV billing metering function

6.1. General

CT's with double winding are allowed for the measurement at the injection point. In case of CT's with double winding:

- The second winding of the CTs complies with the following requirements :
  - Rated secondary current Isec: 5A
  - Rated output: ≥ 5 VA
  - Rated accuracy class: 0,5
  - Instrument security factor: FS 5
- The secondary wiring of the second winding of the CT's complies with the requirements of the secondary wiring of the first (billing) winding.

A second set of VT's' or VT's with double winding are allowed for the measurement at the injection point and the decoupling protection. In case of second set of VTs or VTs with double winding:

- The winding of the second set of VT's or the second winding of the VT's has the same characteristics as the first (billing) winding.
- The secondary wiring of the second set of VTs or the second winding of the VTs shall complies with the requirements of the secondary wiring of the first (billing) winding.

6.2. Design and construction

6.2.1. General aspects

The 4 poles of the fuse-switch for the secondary VT circuits in the LV compartment shall be equipped with a LV fuse with rating 4A for each phase.

6.2.2. CT mounting and wiring of secondary CT circuits

6.2.3. VT mounting and wiring of secondary VT circuits

6.2.4. Nameplates and markings

The second set of nameplate of the VT's and CT's shall be placed outside of the HV compartment, either inside the LV compartment, or next to the rating plate of the billing metering function.

6.2.5. Schematic diagrams

7. Practical requirements for cable connections

7.1. General

For Resa, the cable compartment must always be accessible without the need of any tools (interlock-based).

The connection of 400 mm² cables can happen in the distribution grid of Resa.

7.2. HV switchgear of category AA1x/AA20

Regarding the earthing circuit included in the cable compartment of FU KKNx and DKNx, the connection points shall be positioned as such that they are easily accessible from the opened cable compartment with the cables mounted.

7.3. HV switchgear of category AA3x

Regarding the earthing circuit included in the cable compartment of FU KKNx and DKNx, the connection points shall be positioned as such that they are easily accessible from the opened cable compartment with the cables mounted and no extension of the cable screen or earthing wire is necessary.

8. Accessibility to compartments, LSC category & interlocks

8.1. Accessibility to compartments

8.2. LSC category

8.3. Interlocks

8.4. Locking facilities

9. Miscellaneous and additional requirements

9.1. Arc suppression device

All FUs KKNx and DKNx, part of a switchgear with an internal arc category AA20, shall be fitted with an auxiliary contact for the signalization of the operation of the arc suppression device, regardless of whether the operation of the main switching device is manual or electrical.

In the case of an electrically operable main switching device, this auxiliary contact shall be in addition to the auxiliary contact locking the electrical operation of the main switching device.

9.2. Indicating system for the dielectric withstand ability of the insulating gas for switchgear with gas insulated switching devices

9.3. Earthing arrangements

9.4. Raising base frames

9.5. Features for installation of a Fault Current Indicator (FCI)

The brand and model of the FCI required by Resa is the Kries IKI-50-1F. Every FU KKNx is designed so that it can be equipped by the manufacturer with :

- a smart fault current indicator (FCI) mounted on the front side of the man-machine interface
- 3 current sensors, each mounted around every HV cable in the cables compartment.

9.6. LV terminal block for protective current transformers (CT's)

10. Operating mechanism functionalities of switching devices

10.1. Scope

10.2. Generalities

For every FU installed in a switchgear connected to the distribution grid, all operation handles shall be delivered together with the switchgear.

10.3. FU KKNx

10.3.1. Principle of operation of the switching devices

10.3.2. Versions

FUs KKNx with motorized switch-disconnector intended to be connected to the HV distribution grid of Resa are fitted with:

- 24 VDC control and motorization circuits;
- auxiliary contacts signaling:
    - the opened and the closed positions of the switch-disconnector (2 separate contacts);
    - the opened and the closed positions of the earthing-switch (2 separate contacts);
    - the crossing of the insulating gas pressure alarm threshold;
    - the remote control inhibition position of the remote control switch;
    - the status (armed or triggered) of the arc suppressor (only for switchgear with AA20 internal arc category);
- a LV terminal block with at least:
    - terminals ensuring the interface with all those control, motorization and signaling circuits;
    - 3 terminals for the modbus;
    - 2 terminals for the power supply.

10.3.3. Functionalities of switch-disconnector provided with a motor operation

10.4. FU TxGx

10.4.1. Principle of operation of the switching devices

10.4.2. Versions

FUs TxGx intended to be connected to the HV distribution grid of Resa are equipped with:

- auxiliary contacts signaling:
    - the opened and the closed positions of the switch-fuse combination (2 separate contacts);
    - the opened and the closed positions of the earthing-switch (2 separate contacts);
    - the status of the fuse;
- a LV terminal block with at least:
    - terminals ensuring the interface with all those signaling circuits;
    - 3 terminals for the modbus.

The switch-fuse combination of FUs TxGx can be equipped with a shunt release working at an auxiliary voltage of 110 VDC and 230 VAC.

10.5. FU DKNx

10.5.1. Principle of operation of the switching devices

10.5.2. Versions

FUs DKNx intended to be connected to the HV distribution grid of Resa are fitted with:

- 24 VDC shunt opening and closing releases and spring charging motor in the circuit-breaker;
- auxiliary contacts signaling :
    - the opened and the closed positions of the circuit-breaker (2 separate contacts);
    - the opened and the closed positions of the earthing-switch (2 separate contacts);
    - the opened and the closed positions of the disconnector (2 separate contacts);
    - the crossing of the insulating gas pressure alarm threshold ;
    - the remote control inhibition position of the remote control switch;
    - the status (armed of triggered) of the arc suppressor (only for switchgear with AA20 internal arc category);
- a LV terminal block with at least:
    - terminals ensuring the interface with all those control, motorization and signaling circuits;
    - 3 terminals for the modbus;
    - 2 terminals for the power supply.

10.5.3. Functionalities of the circuit-breaker

10.6. FU DxGx

10.6.1. Principle of operation of the switching devices

10.6.2. Versions

FUs DxGx intended to be connected to the HV distribution grid of Resa are fitted with:

- auxiliary contacts signaling :

- the opened and the closed positions of the circuit-breaker (2 separate contacts);
- the opened and the closed positions of the earthing-switch (2 separate contacts);
- the opened and the closed positions of the disconnector (2 separate contacts);
- the crossing of the insulating gas pressure alarm threshold;
- the triggered status of the arc suppressor (only for switchgear with AA20 internal arc category);

- a LV terminal block with at least:
  - terminals ensuring the interface with all those signaling circuits;
  - 3 terminals for the modbus.

The circuit-breaker of FUs DxGx can be equipped with a shunt release working at an auxiliary voltage of 110 VDC and 230 VAC.

11. Installation and operating instructions

11.1. General

The installation and operating instructions of the FUs to be used in installations connected to the HV distribution grid of Resa shall be written in French.

The wiring diagrams of the complete LV terminal block, and secondary CTs and VTs circuits shall be present in the LV compartment.

The installation and operating instructions shall include a paragraph related to “maintenance”.

The installation and operating instructions and the wiring instructions shall be delivered together with the FU.

11.2. Installation

11.3. Operating instructions

12. Additional requirements

12.1. Dedicated connection system for HV cables testing on HV switchgear of category class AA1x/AA20

Resa could request that FU KKNx should be equipped with a dedicated connection system for dielectric tests on HV cables. If requested, the system shall fulfill the below requirements.

12.1.1. Description

This connection system shall allow testing and checking of HV cables connected to the switchgear, without needing intervention on the elbow plug connectors of the HV cables located in the cable compartment.

This connection system shall not require the use of specific tools.

12.1.2. Design

The system shall consist in :

- 3 single phase female sockets in insulating material, integrated in the RMU, with each a central conductor connected respectively to the main circuit's conductors in the different phases on the cable side of the switching device, marked in red (for L1), yellow (for L2), and blue (for L3).
- 3 external single phase male plug connectors, to be introduced each in one of the female sockets to allow the connection of an external voltage source or earthing device to each phase on the cable side in the RMU.
- 3 external single phase systems to carried out the connection of an external voltage source or earthing device to each phase on the cable side in the RMU.

12.1.3. Characteristics

- The dedicated connection system for dielectric tests on cables shall be located at the front side of the FU K.
- The interlocks specified in C2/113-4 § 8.3 shall be present.
- An earthing connection shall be present next this dedicated connection system in order to allow to connect the earthing conductor of the DSO's voltage injection system.
- The dedicated connection system for dielectric tests on HV cables shall remain connected to earth through the cable earthing-switch of the RMU during the complete phase of connection/disconnection of the testing device.

ADDITIONAL TECHNICAL REQUIREMENTS ON THE SYNERGRID TECHNICAL SPECIFICATION C2/113-7