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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 a Client installation to be connected to
the public HV distribution grid of a Belgian DSO

Edition 2 – DPC (10.2023)

29 **Version management**

30

1.0	First edition, published 06.2020
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31

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44 **1 Introduction**

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

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

50 **2 DSO specific requirements**

51 **2.1 Fluvius**

52 See Annex 1 of this document

53 **2.2 Sibelga**

54 Under study

55 **2.3 ORES**

56 Under study

57 **2.4 Resa**

58 Under study

59 **2.5 AIEG**

60 Under study

61 **2.6 AIESH**

62 Under study

63 **2.7 REW**

64 Under study

65 **Annex 1: Specific requirements of DSO Fluvius**

66



C2-113-5

67 Fluvius_251023.docx

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

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

(edition 1 - 10.2023)

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1 ADDITIONAL TECHNICAL REQUIREMENTS ON THE 2 SYNERGRID TECHNICAL SPECIFICATION C2/113-3

3 1 Object and scope

4 1.1 Object

5 1.2 Scope

6 2 Instructions for composition of the technical dossier

7 2.1 File structure (folders and subfolders) and file names

8 2.2 Test reports and declarations

9 2.3 Test reports

10 3 Instructions to complete the conformity assessment 11 guide

12 4 General requirements

13 4.1 Standards and reference documents

14 4.2 Ratings

15 For connection to the distribution grid of Fluvius, Fluvius only allows switchgear with the following
16 rating:

17

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

18 VT's shall have the following minimum ratings:

Accuracy class	0.2
Burden	10 VA
Burden range	I

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

21 **5 Specific test specifications**

22 **5.1 General**

23 **5.2 Folder B - EN 62271-200 - Dielectric Test**

24 **5.3 Folder D - EN 62271-200 § 7.6 - Short-time withstand current and**
25 **peak withstand current tests**

26 **5.4 Folder E - EN 62271-200 § 7.7. - Verification of the degrees of**
27 **protection IP and IK codes**

28 **5.5 Folder F - NBN EN 62271-200 §7.8 and EN 60068-2-17 §8.5.2 -**
29 **Tightness test at 40°C**

30 **5.6 Folder L – EN 62271-200 §7.102 Mechanical endurance tests and**
31 **Operating force**

32 **5.7 Folder M - Mechanical and electromechanical interlocks**

33 **5.8 Folder P - NBN EN 62271-200 §7.104.3 - Measurement of leakage**
34 **currents**

35 **5.9 Folder Q - EN 62271-200 § 6.106 - Internal arc test - Test criteria by**
36 **category and IAC class**

37 **5.10 Folder S - NBN EN 62271-213 - Voltage detecting and indicating**
38 **system (VDIS)**

39 **5.11 Folder W – Testing of a complete protection chain for MV circuit**
40 **breakers equipped with a protection relay without auxiliary supply**
41 **or with dual power supply**

42

43 **6 Specific test specifications for Metering panel**

44 **6.1 Introduction**

45 **6.2 Folder O - NBN EN 62271-200 §7.103.1 - Pressure withstand test for**
46 **gas-filled compartments**

47 **6.3 Folder Q - NBN EN 62271-200 §7.105 - Internal arc test - criteria by**
48 **AA category and IAC**

49 **6.4 Folder X – EN 61869-2 - Current transformer (CT)**

50 **6.5 Folder Y – EN 61869-3 - Voltage transformer (VT)**

51

52

53 **ADDITIONAL TECHNICAL REQUIREMENTS ON THE** 54 **SYNERGRID SPECIFICATION C2/113-4**

55 **1 Object and scope**

56 **2 General**

57 **3 References**

58 **4 MAN-MACHINE INTERFACE**

59 **4.1 General**

60 **4.2 Basic rules**

61 **4.3 Composition**

62 **4.4 Lines**

63 **4.5 Symbols**

64 **4.6 Indicators**

65 **4.7 Control interfaces and control buttons**

66 **4.7.1 General**

67 The maximum height of the operation interface of a lever shall not exceed 1.7 meter above the
68 level for operating. This distance takes into account the base frames used to meet other
69 requirements. If necessary, measures should be included in the manuals and installation
70 instructions to achieve this maximum height.

71 **4.7.2 Control zone**72 **4.7.3 Content of the control zone**73 **4.7.4 Control buttons**74 **4.7.5 Motorized/Automatic control**75 **4.8 Information (other indicators)**76 **4.8.1 Name plate**77 **4.8.2 Holder for feeder Identification**78 **4.8.3 Service voltage range for the Voltage Detector and Indicating System**79 **4.8.4 Additional requirements for the Fault Current Indicator (FCI)**

80 The fault current indicators (FCI) are installed by Fluvius or his subcontractor on site when
 81 performing the connection of the DSU installation to the distribution grid. The number of FCI
 82 installed equals the number of FU-K's connected to the distribution grid. In case only two FU-K's
 83 are connected to the distribution grid, only one FCI will be installed. The brand and model of the
 84 FCI installed by Fluvius is the Horstmann Compass A.

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

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

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91 The picture below gives an illustration of what is required.

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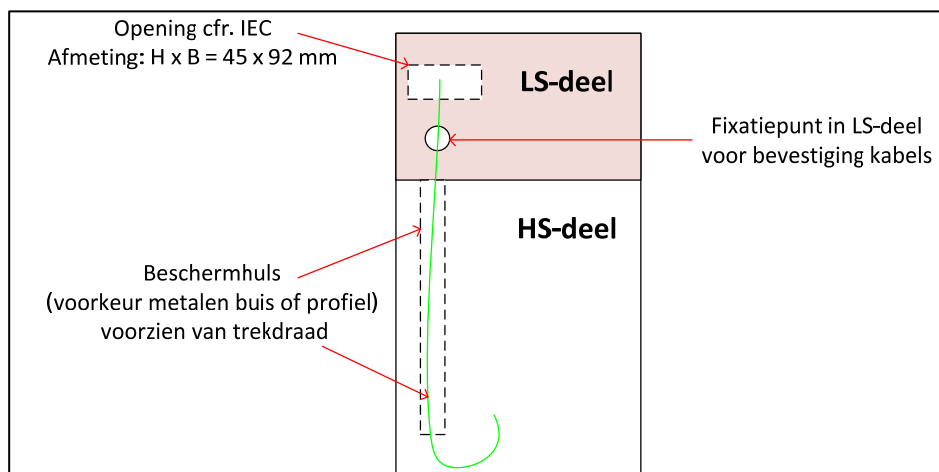
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Figuur 1

107 **5 VOLTAGE DETECTION AND INDICATING SYSTEM (VDIS)**

108 The brand and model of the VDIS installed by the switchgear manufacturer in the functional units
109 connected to the distribution grid are imposed by Fluvius. For an FU-K Horstmann Wega 1 is used
110 and for an FU-D Horstmann Wega 2 is used.

111 In all other functional units the DSU must use a Horstmann type Wega 1.
112 DSU specific components that use a signal of the VDIS as input shall not be connected to the VDIS
113 installed on a FU connected to the distribution grid.

114 In case a VDIS is present on the busbar, a manufacturer is not required to integrate any position
115 contacts of a load break switch in an automatic recloser system.

116 **6 SPECIFIC REQUIREMENTS FOR A HV BILLING METERING** 117 **FUNCTION**

118 An extra set of nameplates for the VT's en CT's must be present on the outside of the HV billing
119 metering function.

120 Technicians must be able to open the LV compartment of the billing metering function intuitively,
121 easily and alone.

122 **7 PRACTICAL REQUIREMENTS FOR CABLE CONNECTIONS**

123 **7.1 General**

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

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

130 Examples of long-term failures are:

- 131 • Deformations of interlocks
- 132 • Alignment problems between components
- 133 • ...

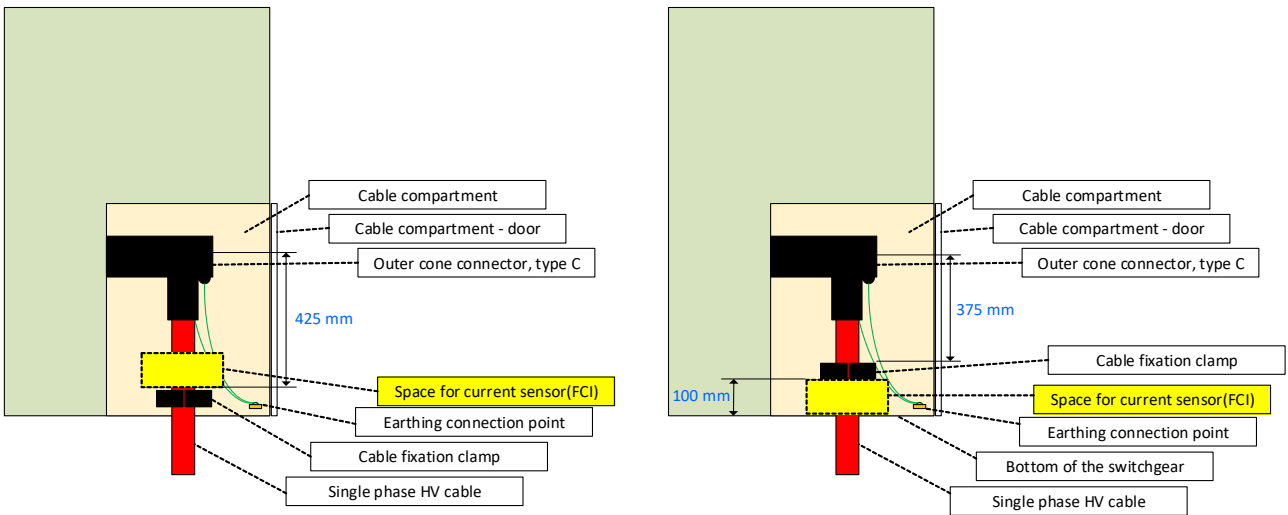
134 For substations connected to the distribution grid of Fluvius a minimum connection height of 800
135 mm above floor level for the HV distribution cables connected to FU-K's is mandatory. Riser base
136 frames can be used to achieve this height.

137 The maximum cable section of the HV cables of the Fluvius distribution grid are 400 mm². The FU-
138 K and FU-D, together with their possible accessories (e.g. base frames,...) shall be designed to

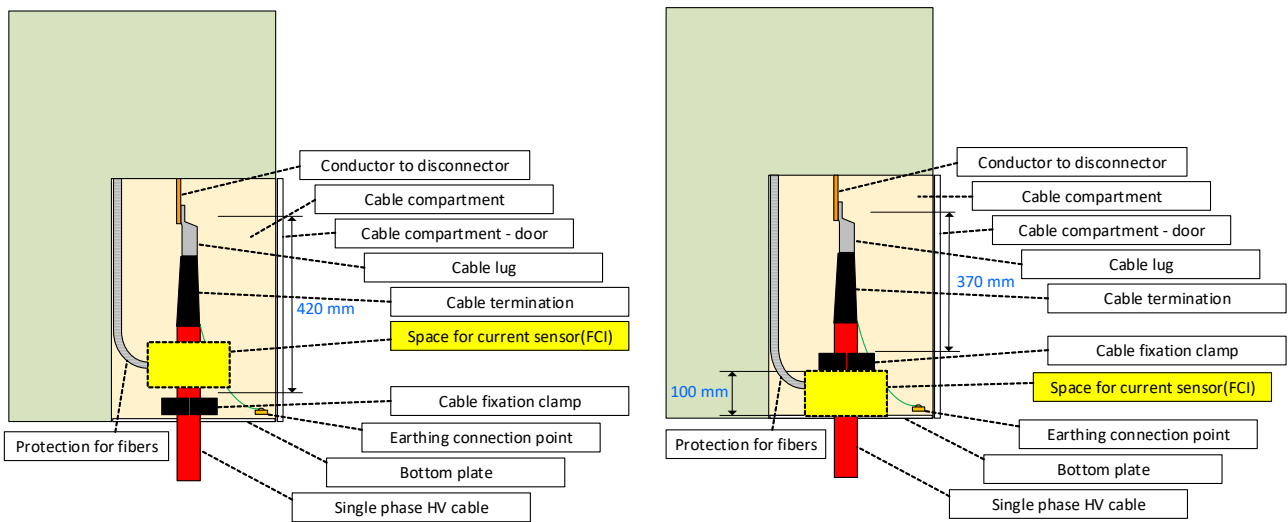
139 accommodate this cable section. The minimum distances in the cable compartment have to be
 140 adapted to integrate this cable section including plugs, See figures 1, 2 and 3.

Figure 1 : dimensions in a cable compartment for switchgear GIS FU-K with cables till 400 mm².

141



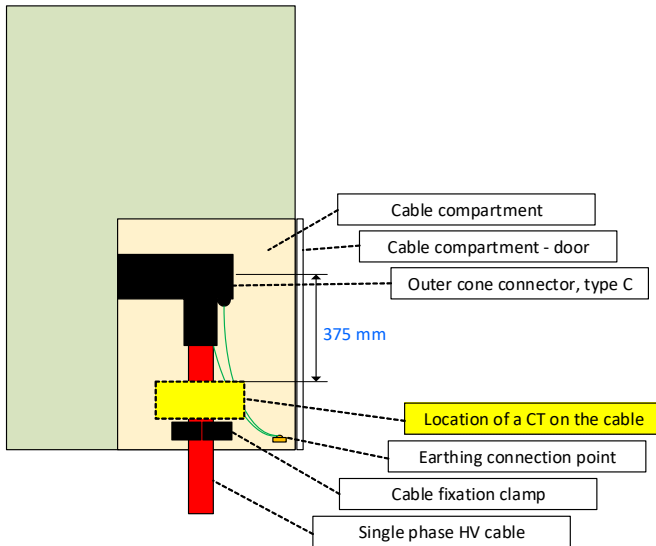
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Figure 2 : dimensions in a cable compartment for switchgear AIS FU-K with cables till 400 mm².

144



145

146

147 Figure 3 : dimensions in a cable compartment for switchgear GIS FU-D with cables till 400 mm².

148 7.2 HV switchgear of category class AA1x/AA20

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

150 In case a riser base frames is used and the HV distribution cables enter from the side, the shape of
 151 this base frame must be as such that the bending radius of the HV cables can be guaranteed. In
 152 case the entry of the HV cables is accessible for a technician present in the substation without any
 153 obstacles, this entry is equipped with the necessary accessories to prevent any pressure or hot
 154 gases from escaping through this entry.

155 **7.3 HV switchgear of category class AA3x**

156 **8 ACCESSIBILITY TO COMPARTMENTS, LSC CATEGORY 2** 157 **INTERLOCKS**

158 **8.1 Accessibility to compartments**

159 **8.2 LSC category**

160 **8.3 Interlocks**

161 **8.4 Locking facilities**

162 **9 MISCELLANEOUS AND ADDITIONAL REQUIREMENTS**

163 **9.1 Arc detection and suppression device**

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

170 **9.2 Indicating system for the dielectric withstand ability of the** 171 **insulating gas for switchgear with gas insulated switching devices**

172
173 According to the laws and regulations of Belgium (RD 2021, Welzijnswet), the state of the
174 functional unit must be checked before performing any switching operation. Every functional unit
175 that houses a sealed pressure gas-filled compartment must be equipped with a device to check
176 the dielectric withstand of the insulating gas. This also applies to designs that use the sealed-for-
177 life principle where losses of the insulating gas are minimal. There are external factors that can be
178 responsible for unintended loss of the insulating gas:

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

182 9.3 Earthing arrangements

183 9.4 Raising base frames

184 9.5 Features for installation of a Fault Current Indicator (FCI)

185 9.6 LV terminal block for protective current transformers (CTs)

186 10 OPERATING MECHANISM FUNCTIONALITIES OF 187 SWITCHING DEVICES

188 10.1 Scope

189 10.2 Generalities

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

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

- 196 • Accessories for cable testing,
- 197 • Specific tools for performing switching operations or cable installations,
- 198 • ...

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

200 10.3 FU KKNx

201 10.3.1 Principle of operation of the switching devices

202 10.3.2 Versions

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

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

- 210 • KCTB versie 2022 – 24VDC – FU's met Ur boven 24 kV

211 In general the “telebeheerkast” will be positioned next to the switchgear.

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

215 **10.3.3 Functionalities of switch-disconnector provided with a motor operation**

216 **10.4 FU TxTx**

217 **10.5 FU DKNx**

218 **10.6 FU DxGx and DxTx**

219

220 **11 INSTALLATION AND OPERATING INSTRUCTIONS**

221 **11.1 General**

222 **11.2 Installation**

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

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

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

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

233 **11.3 Operating instructions**

234 For every FU installed in a switch gear connected to the Fluvius Grid a “Quick Operation Manual”
235 shall be delivered together with switch gear.

236 This quick operation manual shall :

- 237 • contain “the 5 golden rules”,

- 238 • be brief, unambiguous and clear. Maximum 2 pages per operation,
- 239 • use Dutch as language if present,
- 240 • be resistant to the environmental factors present in a cabin, such as dust, moisture and UV
- 241 light,
- 242 • have maximum tear resistance for intensive use during switching operations,
- 243 • are equipped with a ribbon, cord or chain so that they can be hanged from the wall,
- 244 ceiling,... .
- 245

246 **12 ADDITIONAL REQUIREMENTS CONCERNING CONTROL**

247 **AND PROTECTION FOR INSTALLATION CONNECTED TO**

248 **THE FLUVIUS DISTRIBUTION GRID**

249 **12.1 Fuses used in switch-fuse combinations**

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

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

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

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

262 For installation for DSU, it is the responsibility of the manufacturer to investigated together with
263 the DSU the compatibility of the choses fuse with the combined load break switch.

264 **12.2 Protective relays**

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

269
270 For the protective relays a constant time curve is chosed by default. An inverse curve is not
271 allowed.

272 Relays powered exclusively by an auxiliary power supply must comply with the following 3
273 conditions:

- 274 • Reliable operation: the basic principle behind this is that a relays will, by default, shutdown
275 the general protection of the installation in case a problem or failure is detected with the
276 auxiliary power supply. This also includes the wiring.
- 277 • Characteristics of the CT's:
- 278 ○ The protective chain must be as such that a short circuit current of 20 kA (duration
279 time of 1 second) correctly activates the relays.
 - 280 ○ Ratio of the CT
 - 281 ▪ Secondary winding of 1 A.
 - 282 ▪ Ratio between primary and secondary current at least 100/1;
 - 283 ▪ Default choices for this ratio: 100/1, 200/1, 400/1, 600/1 or 800/1.
- 284 • Choice of relays type
- 285 ○ The protective relays must be homologated and included on the list C10/20 part B.
286 The following conditions must also be fulfilled:
 - 287 ▪ Only protective relays with 3 thresholds for detection are permitted ($I>$, $I>>$
288 and $I>>>$).
 - 289 ▪ Very high short circuit currents (> 8 kA) must activate the circuit breaker
290 instantaneously ($I>>>$) in order to limit damage to the installation of the DSU
291 and distribution grid. For lower values of short circuit currents a time-step
292 approach can be considered ($I>>$).
 - 293 ▪ Only protective relays equipped with a COMTRADE file (error log). Logging
294 of an incident is activated as soon as a threshold is reached.
- 295

296 **ADDITIONAL TECHNICAL REQUIREMENTS ON THE** 297 **SYNERGRID TECHNICAL SPECIFICATION C2/113-7**

298 **1 OBJECT AND SCOPE**

299 **2 GENERAL**

300 **3 AA1X AND AA2X CATEGORIES**

301 **3.1 Common criteria for AA1x and AA2x category**

302 **3.2 AA10 category: minimized risk switchgear with gas evacuation** 303 **downwards with an arc in the gas-filled compartment**

304 The use of a buffer frame for the expansion of the hot gasses resulting from an internal arc and evacuation
305 of these gasses directly in the switching room through a small opening is not allowed for installations
306 connected to the distribution grid of Fluvius.

307 **3.3 AA11 category: minimized risk switchgear with gas evacuation in the** 308 **switching room with an arc in the gas-filled compartment**

309 **3.4 AA13 category: minimized risk switchgear with gas evacuation duct** 310 **out of the switching room with an arc in the gas-filled compartment**

311 **3.5 AA15 category: minimized risk switchgear with energy absorption** 312 **with an arc in the gas-filled compartment**

313 **3.6 AA20 category: minimized risk switchgear without external** 314 **phenomena with an arc in the gas-filled compartment**

315 **3.7 HV metering functional units AA10 category**

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

319 **4 AA3X CATEGORIES**

320 **4.1 Common criteria for AA3x category**

321 **4.2 AA30 category: limited risk switchgear with gas evacuation** 322 **downwards**

323 **4.3 AA31 category: limited risk switchgear with gas evacuation upwards** 324 **in the room**

325 **4.4 AA33 category: limited risk switchgear with gas evacuation duct out** 326 **of the room**

327 **4.5 HV metering functional units AA3x category**

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