



31G/290/NP

NEW WORK ITEM PROPOSAL (NP)

PROPOSER: Germany	DATE OF PROPOSAL: 2018-11-27
DATE OF CIRCULATION: 2018-11-30	CLOSING DATE FOR VOTING: 2019-02-22

IEC SC 31G : INTRINSICALLY-SAFE APPARATUS	
SECRETARIAT: United Kingdom	SECRETARY: Mr Nicholas Ludlam
NEED FOR IEC COORDINATION: SC 65C	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this NP to the TC/SC secretary
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input checked="" type="checkbox"/> SAFETY	

TITLE OF PROPOSAL:
Explosive atmospheres - Part XX: Equipment protection by 2-Wire Intrinsically Safe Ethernet concept (2-WISE)

<input type="checkbox"/> STANDARD	<input checked="" type="checkbox"/> TECHNICAL SPECIFICATION
PROPOSED PROJECT NUMBER: 60079-XX	

SCOPE
(AS DEFINED IN ISO/IEC DIRECTIVES, PART 2, 14):

This technical specification defines the details of the construction of apparatus, systems and installation practice for use with the 2-Wire Intrinsically Safe Ethernet concept (2-WISE). It is based on the 2-wire Ethernet physical layer specification 10BASE-T1L defined in IEEE 802.3cg. 10BASE-T1L segments may be DC powered or unpowered.

The constructional and installation requirements of 2-WISE apparatus and systems are determined by IEC 60079-11, IEC 60079-14, and IEC 60079-25, except as modified by this technical specification. Parts of a 2-WISE apparatus may be protected by any Type of Protection listed in IEC 60079-0, appropriate to the EPL for the intended use. In these circumstances, the requirements of this technical specification apply only to the part of the apparatus directly connected to the intrinsically safe ports.

PURPOSE AND JUSTIFICATION

INCLUDING THE MARKET RELEVANCE, WHETHER IT IS A PROPOSED HORIZONTAL STANDARD (GUIDE 108) AND RELATIONSHIP TO SAFETY (GUIDE 104), EMC (GUIDE 107), ENVIRONMENTAL ASPECTS (GUIDE 109) AND QUALITY ASSURANCE (GUIDE 102):

There is a high demand from the process automation industry to establish Ethernet communication in the instrumentation on field level in hazardous areas. The existing Fieldbus Intrinsically Safe Concept (FISCO) is nearly 20 years old and no longer state of the art (slow communication with 31.75 KHz). The new 2-WISE concept would enable the industry to use a state of the art network (10 MBit/s) based on intrinsically safety.

TARGET DATE(S)	FOR FIRST CD:	2019-12-31	FOR TS:	2021-12-31
ESTIMATED NUMBER OF MEETINGS:	FREQUENCY OF MEETINGS:	DATE OF FIRST MEETING:	PLACE OF FIRST MEETING:	
4	2 per year			
RELEVANT DOCUMENTS TO BE CONSIDERED:				
IEEE802.3cg, IEC 61158, IEC 61784				
RELATIONSHIP OF PROJECT TO ACTIVITIES OF OTHER INTERNATIONAL BODIES:				
LIAISONS WITH INTERNATIONAL BODIES:		NEED FOR ISO COORDINATION:		
DOCUMENT MATURITY:				
<input checked="" type="checkbox"/> A DRAFT IS ATTACHED FOR COMMENT* <input type="checkbox"/> AN OUTLINE IS ATTACHED				
* Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.				
CONCERNS KNOWN PATENTED ITEMS (SEE ISO/IEC DIRECTIVES, PART 2)		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
PATENT DESCRIPTION:				

WE NOMINATE A PROJECT LEADER IN ACCORDANCE WITH ISO/IEC DIRECTIVES, PART 1

LAST NAME:	FIRST NAME:	E-MAIL:	COUNTRY:
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COMMENTS AND RECOMMENDATIONS FROM TC/SC OFFICERS:**WORK ALLOCATION:**

NEW PROJECT TEAM
 NEW WORKING GROUP
 EXISTING WORKING GROUP:

IF APPROVED, THE NEXT STAGE SHOULD BE:

CD
 DTS

REMARKS FROM TC/SC OFFICERS:

A presentation was made at the SC31G plenary in Busan Republic of Korea, which is in 31G(Busan/2-WISE)6 on Ethernet Based Advanced Physical Layer for the Process Industries. There

was unanimous agreement from the delegates that the work should proceed as a TS.

APPROVAL CRITERIA

- Approval of the new work item proposal by a 2/3 majority of the P-members voting;
- At least 4 P-members in the case of a committee with 16 or fewer P-members, or at least 5 P-members in the case of committees with more than 17 P-members, have nominated or confirmed the name of an expert and approved the new work item proposal.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

**Part X: Equipment protection by 2-wire intrinsically safe Ethernet concept
(2-WISE)**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS **60079-XX**, which is a technical specification, has been prepared by subcommittee 31G: Intrinsically-safe apparatus, of IEC technical committee 31: Equipment for explosive atmospheres.

The text of this International Technical Specification is based on the following documents:

DTS	Report on voting
XX/XX/DTS	XX/XX/RVD

84

85 Full information on the voting for the approval of this International Technical Specification can
86 be found in the report on voting indicated in the above table.

87 This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

88 A list of all parts in the IEC 60079 series, published under the general title Explosive
89 atmospheres, can be found on the IEC website.

90 The committee has decided that the contents of this document will remain unchanged until the
91 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to
92 the specific document. At this date, the document will be

- 93 • transformed into an International standard
- 94 • reconfirmed,
- 95 • withdrawn,
- 96 • replaced by a revised edition, or
- 97 • amended.

98 A bilingual version of this publication may be issued at a later date.

99 The National Committees are requested to note that for this document the stability date
100 is 20XX..

101 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE
102 DELETED AT THE PUBLICATION STAGE.

103

104

INTRODUCTION

105

Tbd.

EXPLOSIVE ATMOSPHERES –

Part X: Equipment protection by 2-wire intrinsically safe Ethernet concept (2-WISE)

1 Scope

This part of IEC 60079, which is a technical specification, specifies requirements for the construction, marking, documenting of apparatus, systems and installations for use with the 2-Wire Intrinsically Safe Ethernet concept (2-WISE). It is based on the 2-wire Ethernet physical layer specification 10BASE-T1L defined in IEEE 802.3cg. 10BASE-T1L segments may be DC powered or unpowered.

The requirements for construction and installation of 2-WISE apparatus and systems are determined by IEC 60079-11, IEC 60079-14, and IEC 60079-25, except as modified by this technical specification. Parts of a 2-WISE apparatus may be protected by any Type of Protection listed in IEC 60079-0, appropriate to the EPL for the intended use. In these circumstances, the requirements of this technical specification apply only to the part of the apparatus directly connected to the intrinsically safe ports.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-11:2011, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

IEC 60079-25, *Explosive atmospheres – Part 25: Intrinsically safe electrical systems*

ISO/IEC 80079-34, *Explosive atmospheres – Part 34: Application of quality systems for equipment manufacture*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0, IEC 60079-11, IEC 60079-14, IEC 60079-25 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

advanced physical layer

APL

the Advanced Physical Layer (APL) is based on 10BASE-T1L physical layer specification specified in IEEE802.3cg for 10 Mb/s Operation over Single Balanced Twisted-Pair Cabling

- 150 **3.2**
151 **APL segment**
152 an APL segment consists either of one power source port and one power load port or two
153 unpowered ports connected at each end of a two-wire, shielded 100 Ω cable, optionally with a
154 maximum of two auxiliary devices
- 155 **3.3**
156 **auxiliary device**
157 device which does not include a 10BASE-T1L PHY. It may comprise a power load or introduce
158 communication signal insertion losses. A surge protector would be an auxiliary device
- 159 **3.4**
160 **auxiliary device port**
161 port of an auxiliary device
- 162 **3.5**
163 **PHY**
164 physical layer circuitry required to implement physical layer function
- 165 **3.6**
166 **port**
167 physical, two-wire and shielded electrical and mechanical interface connection from
168 equipment to an APL segment including terminals or connectors
- 169 **3.7**
170 **power source port**
171 port which feeds DC power into a segment
- 172 **3.8**
173 **power load port**
174 port which consumes DC power from a segment
- 175 **3.9**
176 **unpowered port**
177 port which does not feed DC power into a segment or consumes DC power from the segment
- 178 **3.10**
179 **spur**
180 APL segment with a maximum cable length of 200 m, optionally with a maximum of two
- 181 **3.11**
182 **trunk**
183 APL segment with a maximum cable length of 1 000 m, optionally with a maximum of two
184 auxiliary devices
- 185 **3.12**
186 **2-WISE**
187 2-WISE is the 2-Wire Intrinsically Safe Ethernet concept for APL, designed to simplify the
188 examination process for components and cable Entity Parameters within APL segments. This
189 is achieved by defining universal Entity Parameter limits for APL ports, according to location
190 and type of hazardous atmosphere, and listing a concise set of rules for the segment setup
- 191 **3.13**
192 **10BASE-T1L**
193 physical layer standard for 10 Mb/s Ethernet communication on single balanced twisted-pair
194 copper cabling with optional provision of power, standardized in IEEE 802.3cg
- 195 **4 Requirements for 2-WISE apparatus**
- 196 **4.1 General**
197 2-WISE Apparatus shall be constructed in accordance with IEC 60079-11, except as modified
198 by this technical specification. The apparatus documentation shall confirm that each 2-WISE

199 apparatus is suitable for use in a 2-WISE system in accordance with this technical
200 specification.

201 4.2 2-WISE power source ports

202 4.2.1 General

203 The intrinsically safe 2-WISE power source port shall be resistive limited for all levels of
204 protection.

205 The electrical parameters for 2-WISE power source ports shall meet the values given in IEC
206 60079-11 Table A.1.

207 The maximum unprotected internal capacitance C_i and inductance L_i shall be negligible.

208 The electrical parameters L_i , C_i , L_o and C_o must not be included neither on the certificate nor
209 in the marking. The determination of the electrical parameters of the 2-WISE power source
210 port shall take into account the possible opening and shorting of field wiring connected to the
211 port.

212 4.2.2 Additional requirements of “ic” 2-WISE power source ports

213 For Level of Protection “ic”, the output characteristic can also be trapezoidal or rectangular.

214 The circuit of a Level of Protection “ic” 2-WISE power source port shall be individually tested
215 for the successful limitation of the spark energy according to IEC 60079-11.

216 NOTE The maximum output power P_o from a Level of Protection “ic” 2-WISE power source port is not restricted.

217 4.3 2-WISE Power load ports and 2-WISE auxiliary device ports

218 The following requirements apply to 2-WISE power load ports and 2-WISE auxiliary device
219 ports connected to an intrinsically safe system whether installed inside or outside the
220 hazardous area, in addition to the relevant sections of IEC 60079-11.

221 The electrical parameters for 2-WISE power load ports and 2-WISE auxiliary device ports
222 shall meet the values given in Table 1.

223 **Table 1 – Intrinsically safe parameters for 2-WISE apparatus**

		2-WISE power source port		2-WISE power load port		2-WISE auxiliary device port	
		“ia”, “ib”	“ic”	“ia”, “ib”	“ic”	“ia”, “ib”	“ic”
Maximum output voltage	U_o	17,5 V	17,5 V	N/A	N/A	N/A	N/A
Maximum output current	I_o	380 mA	380 mA	N/A	N/A	N/A	N/A
Maximum output power	P_o	1,66 W	N/A	N/A	N/A	N/A	N/A
Maximum input voltage	U_i	N/A	N/A	17,5 V	17,5 V	17,5 V	17,5 V
Maximum input current	I_i	N/A	N/A	380 mA	380 mA	380 mA	380 mA
Maximum input power	P_i	N/A	N/A	5,32 W	N/A	5,32 W	N/A
Maximum internal capacitance	C_i	~0 nF	~0 nF	5 nF	5 nF	5 nF	5 nF
Maximum internal inductance	L_i	~0 nF	~0 nF	10 µH	10 µH	200 nH	200 nH
Maximum leakage current		N/A	N/A	1 mA	1 mA	50 µA	50 µA
NOTE The values given above apply for Equipment Group IIC.							

224 The terminals of 2-WISE ports shall be isolated from earth in accordance with IEC 60079-11.

225 Under normal or fault conditions as specified in IEC 60079-11 for the respective Level of
226 Protection, the terminals of 2-WISE ports shall remain passive, that is the terminals shall not
227 be a source of energy to the system except for a leakage current not exceeding the value
228 given in Table 1

229 4.4 2-WISE unpowered ports

230 2-WISE unpowered ports shall be resistively limited.

231 The electrical parameters for 2-WISE unpowered ports, connected to an intrinsically safe
232 system, shall meet the values given in Table 2.

233 **Table 2 – Intrinsically safe parameters for 2-WISE unpowered ports**

Maximum output voltage	U_o	9 V
Maximum output current	I_o	112,5 mA
Maximum output power	P_o	254 mW
Maximum input voltage	U_i	17,5 V
Maximum input current	I_i	380 mA
Maximum input power	P_i	5,32 W
Maximum internal capacitance	C_i	~0 nF
Maximum internal inductance	L_i	~0 nF

234 The port terminals shall be isolated from earth in accordance with IEC 60079-11.

235 Note The values of U_i , I_i and P_i are defined to prevent unintentional damage of an unpowered port, if being
236 accidentally connected to a powered port.

237 4.5 Simple apparatus

238 A simple apparatus used in an intrinsically safe system shall conform to the relevant
239 requirements of IEC 60079-11.

240 The internal inductance L_i and internal capacitance C_i of each simple apparatus connected to
241 a 2-WISE system shall be negligible.

242 5 Requirements for 2-WISE systems

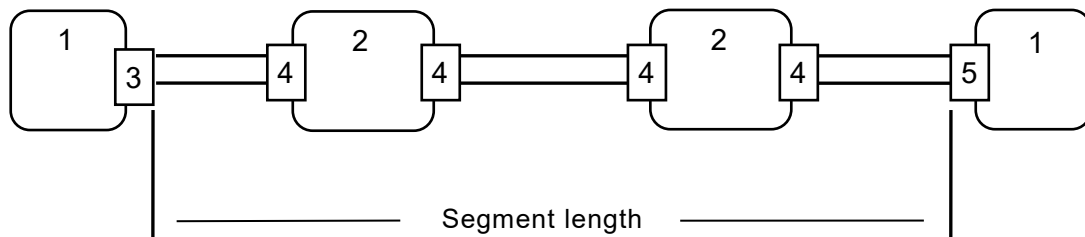
243 2-WISE systems are usually build up as illustrated in Figure 1.

244 A typical 2-WISE system comprises two 2-WISE ports connected to each end of a cable, with
245 a maximum of two disposed auxiliary devices in between. A system is classified either as a
246 trunk or a spur depending on the maximum supported cable length, which is determined by
247 the transmit amplitude defined in IEEE 802.3cg. A trunk supports up to 1 000 m cable length
248 and a spur up to 200 m cable length.

249 2-WISE systems are either DC powered or unpowered. In a powered system, the power
250 source port supplies DC power into the system, and the power load port consumes DC power
251 from the system. Auxiliary device ports may also consume DC power from a system. In an
252 unpowered system no DC power is provided to the system. Thus 2-WISE apparatus are
253 always separately powered. An unpowered port shall not be connected to a power source
254 port.

255 Connection facilities and/or electromechanical switches according to IEC 60079-11 may be
256 added to a 2-WISE system without modifying the safety assessment.

257



258

259 Key

260 Unpowered 2-WISE system:

261 1 2-WISE apparatus

262 2 2-WISE auxiliary device

263 3 2-WISE unpowered port

264 4 2-WISE auxiliary device port

265 5 2-WISE unpowered port

266

267 Segment length

268 - Trunk up to 1000 m

269 - Spur up to 200 m

270

Figure 1 – 2-WISE system structure

271 The cable used in a 2-WISE system shall comply with the following parameters:

272 cable resistance R_c : 15 Ω /km to 150 Ω /km;

273 cable inductance L_c : 0,4 mH/km to 0,84 mH/km;

274 cable capacitance C_c : 45 nF/km to 200 nF/km;

275 maximum length of spur cable: 200 m;

276 maximum length of trunk cable: 1 000 m.

277

278 NOTE The installation and constructional requirements of individual cables and multi-circuit cables carrying more
279 than one IS circuit are contained in IEC 60079-25.

280 A DC powered 2-WISE system comprises:

281 – One power source port;

282 – One power load port;

283 – Up to two auxiliary devices;

284 – A spur cable with up to 200 m length.

285

286 An unpowered 2-WISE system comprises:

287 – Two unpowered ports;

288 – Up to two auxiliary devices;

289 – A spur cable with up to 200 m length or a trunk cable with up to 1000 m length.

290

291 A DC powered 2-WISE system shall be considered intrinsically safe if one 2-WISE source
292 port, one 2-WISE load port and up to two 2-WISE auxiliary devices are connected with a
293 cable, according to the above specification.

294 An unpowered 2-WISE system shall be considered intrinsically safe if two 2-WISE unpowered
295 ports and up to two 2-WISE auxiliary devices are connected with a cable, according to the
296 above specification.

297 The 2-WISE system shall be allocated to a Level of Protection (“ia”, “ib” or “ic”) determined by
298 the 2-WISE apparatus with the least onerous Level of Protection used in the 2-WISE system.
299 The descriptive system document according to IEC 60079-25 shall contain the allocated Level
300 of Protection.

301 The descriptive system document may be simplified, to list all 2-WISE apparatus, together
302 with the relevant 2-WISE apparatus documentation. The documentation should clearly identify
303 the Level of Protection of each part of the 2-WISE system.

304 The temperature classification of each 2-WISE apparatus shall be determined and recorded in
305 its documentation. The documentation shall contain the confirmation, that the permitted
306 maximum ambient temperature of each piece of 2-WISE apparatus is suitable for the intended
307 use.

308 **6 Instructions**

309 **Tbd**

310 **7 Marking**

311 A 2-WISE apparatus shall be marked in accordance with IEC 60079-0 and IEC 60079-11,
312 except where modified by this standard.

313 Each 2-WISE port of a 2-WISE apparatus shall be identifiable by the word “2-WISE” followed
314 by an indication of its function, as:

- 315 – 2-WISE power source port
- 316 – 2-WISE power load port
- 317 – 2-WISE auxiliary device port
- 318 – 2-WISE unpowered port

319 For 2-WISE power source ports, the electrical parameters U_o , I_o , C_o , L_o and P_o must not be
320 marked.

321 For 2-WISE power load ports, the electrical parameters U_i , I_i , C_i , L_i and P_i must not be
322 marked.

323 For 2-WISE auxiliary device ports and 2-WISE unpowered ports, the electrical parameters U_i ,
324 I_i , C_i , L_i , P_i , U_o , I_o , C_o , L_o and P_o must not be marked.

325