

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

AMENDMENT 1  
AMENDEMENT 1

Industrial networks –  
Wireless communication network and communication profiles – ISA 100.11a  
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Réseaux industriels –  
Réseau de communication sans fil et profils de communication – ISA 100.11a

IEC 62734:2014/AMD1:2019  
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## FOREWORD

This amendment has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this amendment is based on the following documents:

FDIS	Report on voting
65C/965/FDIS	65C/970/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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## GENERAL REPLACEMENTS

Throughout the document, replace references to IEEE 802.15.4:2011 as follows.

Location	Replace	With
4.6.10.2.8	"IEEE 802.15.4:2011"	"IEEE 802.15.4"
6.3.5.2, 6 <sup>th</sup> dash	"IEEE 802.15.4e"	"IEEE 802.15.4"
7.3.1.2, 1 <sup>st</sup> paragraph	"IEEE 802.15.4:2011, 7.4.1"	"IEEE 802.15.4-2015, 9.4.1"
7.3.1.2, 4 <sup>th</sup> paragraph	"IEEE 802.15.4:2011, Table 58"	"IEEE 802.15.4-2015, Table 9-6"
7.3.2.3.2, 1 <sup>st</sup> paragraph	"IEEE 802.15.4:2011, 7.4.3"	"IEEE 802.15.4-2015, 9.4.3"
7.3.2.4.10, 1 <sup>st</sup> bullet	"IEEE 802.15.4:2011, 7.3.2"	"IEEE 802.15.4-2015, 9.3.2.1"
7.3.2.5, step i), (4 times)	"IEEE 802.15.4:2011, 7.3.4"	"IEEE 802.15.4-2015, 9.3.4"
7.3.2.5, step i)1)	"IEEE 802.15.4:2011, Table 58"	"IEEE 802.15.4-2015, Table 9-6"
7.3.2.6, step f), (4 times)	"IEEE 802.15.4:2011, 7.3.5"	"IEEE 802.15.4-2015, 9.3.5"
7.3.2.6, step f)1)	"IEEE 802.15.4:2011, Table 58"	"IEEE 802.15.4-2015, Table 9-6"
7.3.2.6, step f)1)	"IEEE 802.15.4:2011, 5.2.2.2.2"	"IEEE 802.15.4-2015, 7.3.2.2"
7.3.2.6, step f)2)	"IEEE 802.15.4:2011, Table 57"	"IEEE 802.15.4-2015, Table 9-5"
7.3.3.8, step i), (4 times)	"IEEE 802.15.4:2011, 7.3.4"	"IEEE 802.15.4-2015, 9.3.4"
7.3.3.8, step i)1)	"IEEE 802.15.4:2011, Table 58"	"IEEE 802.15.4-2015, Table 9-6"
7.3.3.9, step g), (4 times)	"IEEE 802.15.4:2011, 7.3.5"	"IEEE 802.15.4-2015, 9.3.5"

Location	Replace	With
7.3.3.9, step g)1)	"IEEE 802.15.4:2011, Table 58"	"IEEE 802.15.4-2015, Table 9-6"
7.3.3.9, step g)1)	"IEEE 802.15.4:2011, 5.2.2.2.2"	"IEEE 802.15.4-2015, 7.3.2.2"
7.3.3.9, step g)2)	"IEEE 802.15.4:2011, Table 57"	"IEEE 802.15.4-2015, Table 9-5"
8.2.2.5, 3 <sup>rd</sup> paragraph	"IEEE 802.15.4:2011, 8.1.5"	"IEEE 802.15.4-2015, 10.1.5"
8.2.3.2, 1 <sup>st</sup> paragraph	"IEEE 802.15.4:2011, Table 66"	"IEEE 802.15.4-2015, Table 10-4"
9.3.2.1, NOTE	"IEEE 802.15.4:2011"	"IEEE 802.15.4-2015"
9.3.2.1, 5 <sup>th</sup> paragraph	"IEEE 802.15.4:2011"	"IEEE 802.15.4"
9.3.3.1, 1 <sup>st</sup> paragraph	"IEEE 802.15.4:2011, 5.2.2.2"	"IEEE 802.15.4-2015, 7.3.2"
9.3.3.1, 1 <sup>st</sup> paragraph	"IEEE 802.15.4:2011, 5.2.1 and 5.2.2.2"	"IEEE 802.15.4-2015, 7.2 and 7.3.2"
9.3.3.1, 2 <sup>nd</sup> paragraph	"IEEE 802.15.4:2011, 5.2.1.2"	"IEEE 802.15.4-2015, 7.2.2"
9.3.3.1, 3 <sup>rd</sup> paragraph	"IEEE 802.15.4:2011, 5.2.3"	"IEEE 802.15.4-2015, 7.3.3"
9.3.3.1, 3 <sup>rd</sup> paragraph	"IEEE 802.15.4:2011, 5.2.1.1.8"	"IEEE 802.15.4-2015, 7.2.1.10"
9.3.3.2, 1 <sup>st</sup> paragraph	"IEEE 802.15.4:2011, 5.2.1"	"IEEE 802.15.4-2015, 7.2"
9.3.3.2, 1 <sup>st</sup> paragraph	"IEEE 802.15.4:2011, Figure 35"	"IEEE 802.15.4-2015, Figure 7-1"
9.3.3.2, field a)	"IEEE 802.15.4:2011, 5.2.1.1"	"IEEE 802.15.4-2015, 7.2.1"
11.3.2, 3 <sup>rd</sup> paragraph	"IEEE 802.15.4:2011, Annex B"	"IEEE 802.15.4-2015, Annex B"
13.11.2.6, d)	"IEEE 802.15.4:2011"	"IEEE 802.15.4"
Table B.5, 3 <sup>rd</sup> column header	"IEEE 802.15.4:2011"	"IEEE 802.15.4-2015"
H.1.4, 1 <sup>st</sup> paragraph	"IEEE 802.15.4:2011, B.3.2"	"IEEE 802.15.4-2015, B.3.2"

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## OTHER REPLACEMENTS

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### 0.3 Potentially relevant patents

*In cell d) of the table providing coordinates for the Yokogawa Electric Corporation patent holder, replace "Musashina-shi" with "Musashino-shi".*

## 2 Normative references

*Replace reference to IEEE 802.15.4™:2011 with "IEEE Std 802.15.4™-2015<sup>2</sup>, IEEE Standard for Low-Rate Wireless Networks".*

### 4.6.11.1 Overview

*Replace the existing NOTE 3 with the following note:*

NOTE 3 IEEE 802.15.4 specifies channel hopping and TSCH mechanisms that are similar to, but not identical to, many of the DL mechanisms specified in this document.

### Table 7 – ARMO attributes

*For attribute 2, 4<sup>th</sup> column, add "Valid range: –4 to 32 767".*

### Table 10 – DMO attributes

*For attribute 8, 4<sup>th</sup> column, add "Default value: null string (length zero)".*

*For attribute 27, 4<sup>th</sup> column, replace "Default value: 30 s" with "Default value: 248 s".*

For attribute 29, 4<sup>th</sup> column, replace “Default value: 30 s” with “Default value: 62 s”.

**Table 19 – Proxy\_System\_Manager\_Join method**

Add Input Argument 11 as follows:

11	Consortium_Info	Type: Unsigned8	Provides Consortium-specific information from the joining device that is not specified by this document
----	-----------------	-----------------	---

Replace existing Output Arguments 7 and 8 with the following text:

7	Assigned_Max_TSDU_Size	Type: Unsigned16	Indicates the maximum TSDU supported in octets which can be converted by the source into max APDU size by taking into account the TL, security, AL headers and TMIC sizes
8	MIC	Type: OctetString4	This value is used for protecting argument 1 through 7 with Join key. This MIC value is generated by the Security Manager. The Advertisement router shall not overwrite this value. See 7.4.4.3.3.2

**Table 23 – System\_Manager\_Join method**

Add Input Argument 11 as follows:

11	Consortium_Info	Type: Unsigned8	Provides Consortium-specific information from the joining device that is not specified by this document
----	-----------------	-----------------	---

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Replace existing Output Arguments 7 and 8 with the following text:

7	Assigned_Max_TSDU_Size	Type: Unsigned16	Indicates the maximum TSDU supported in octets which can be converted by the source into max APDU size by taking into account the TL, security, AL headers and TMIC sizes
8	MIC	Type: OctetString4	This value is used for protecting argument 1 through 7 with Join key. This MIC value is generated by the Security Manager. The Advertisement router shall not overwrite this value. See 7.4.4.3.3.2

**Table 27 – SCO method for contract establishment, modification, or renewal**

For Input Argument 16, 5<sup>th</sup> column, add “Valid range: –32 768 to 16”.

For Input Argument 17, 5<sup>th</sup> column, add “Valid range: –32 768 to 16”.

For Output Argument 13, 5<sup>th</sup> column, add “Valid range: –32 768 to 16”.

For Output Argument 14, 5<sup>th</sup> column, add “Valid range: –32 768 to 16”.

For Output Argument 24, 5<sup>th</sup> column, add “Valid range: –32 768 to 16”.

For Output Argument 25, 5<sup>th</sup> column, add “Valid range: –32 768 to 16”.

**Table 30 – Contract\_Data data structure**

For element 15, 3<sup>rd</sup> column, add “Valid range: –32 768 to 16”.

For element 16, 3<sup>rd</sup> column, add “Valid range: –32 768 to 16”.

**Table 31 – New\_Device\_Contract\_Response data structure**

For element 3, 3<sup>rd</sup> column, add “Valid range: –32 768 to 16”.

For element 4, 3<sup>rd</sup> column, add “Valid range: –32 768 to 16”.

**7.3.2.6 Processing of received DPDUs**

In step e), delete “Additionally, the procedure shall verify that the 8-bit MHR sequence number is not 0xFF. If the 8-bit MHR sequence number is 0xFF, the procedure shall return with a status of INVALID\_SEQUENCE\_NUMBER.”

**7.3.3.9 Processing for received TPDUs**

In step h), replace “may decrement” with “shall decrement”.

**7.4.4.3.3.2 MIC generation for System\_Manager\_Join response**

Replace the existing formula with the following:

$$\text{MACTag} = \text{HMAC-MMOK}_{\text{join}}[\text{Output Argument number 1}, \text{number 7 in Table 23} \\ \parallel \text{EUI}_{\text{64join\_device}} \parallel \text{Challenge}_{\text{join\_device}}]$$

**Table 62 – Security\_Sym\_Join\_Request data structure**

Replace the elements in Table 62 with the following:

New_Device_EUI64	1	Type: EUI64Address Classification: Constant Accessibility: Read only
DL_Subnet_ID	2	Type: Unsigned16 Classification: Static Accessibility: Read/write
Comm_SW_Major_Version	3	Type: Unsigned8 Classification: Static Accessibility: Read only
Comm_SW_Minor_Version	4	Type: Unsigned8 Classification: Static Accessibility: Read only
128_Bit_Challenge_From_New_Device	5	Type: Unsigned128 Classification: Static Accessibility: Read/write
Algorithm_Identifier	6	Type: Unsigned8 Classification: Static Accessibility: Read only Default value: 1
MIC	7	Type: Unsigned32 Classification: Static Accessibility: Read only

#### 7.4.5.2.2 Symmetric-key join request

In the text following Table 62, after the first bullet (*New\_Device\_EUI64*), insert the following three additional bullets:

- *DL\_Subnet\_ID* is the DL subnet that the new device is trying to join; it is also the DL subnet of the advertising router.
- *Comm\_SW\_Major\_Version* is a copy of the DMO *Comm\_SW\_Major\_Version* attribute; see Table 10, Attribute 20.
- *Comm\_SW\_Minor\_Version* is a copy of the DMO *Comm\_SW\_Minor\_Version* attribute; see Table 10, Attribute 21.

In the last bullet following Table 62, replace “The MIC-32 is computed over the elements 1 through 4” with “The MIC-32 is computed over the elements 1 through 6”.

#### 7.5.4 Proxy security management object methods related to the session establishment

In the 7<sup>th</sup> bullet following Table 81, delete “assigned in the joining process”.

In the 2<sup>nd</sup> bullet following Table 82, delete “assigned during the joining process”.

#### 7.6.3 Device security management object methods related to T-key update

In the 4<sup>th</sup> bullet following Table 84, delete “assigned in the joining process”.

In the 2<sup>nd</sup> bullet following Table 85, delete “assigned during the joining process”.

#### Table 95 – Delete key method

For Input Argument number 8, last column, delete “assigned in joining process”.

#### 7.11.3.2 Additional device security management object methods to support key management

At the end of the paragraph before Table 96, add the following:

Use of the *Key\_Policy\_Update* method shall be limited to changes to *SoftLifespan\_Ratio*. More general changes of key policy are accomplished by key replacement, as described in 7.6.

#### Table 96 – Key\_Policy\_Update method

For Input Argument number 10, last column, delete “assigned in joining process”.

#### 9.1.9.4.3 Unicast transaction

Delete the 5<sup>th</sup> paragraph, beginning with “IEEE 802.15.4 permits CCA Mode 3”.

#### 9.1.15.6 Country code

Delete NOTE 1, change “NOTE 2” to “NOTE” (i.e., delete the number), and replace the paragraph after the deleted NOTE 1 with the following:

When Bit11, Bit13 and Bit14 (ETSI, LBT and FHSS) are all true, operation may need to switch momentarily to the non-adaptive rules of ETSI EN 300 328 v2.1.1 while sending a near-maximal-size ACK/NAK DPDU (as short control signaling) within a transaction and for the immediately following Tx-gap-time of EN-mandated non-transmission, thus



supporting mode V.4 category 6), where the exact requirements for such momentary mode-switching are specified.

**Table 117 – ACK/NAK DPDU DHR**

*In the last row, first column, replace "0..3" with "0 or 3".*

**9.3.5.2.4.2 Advertisement join links**

*In the text after Table 128, replace the text of item a) as follows:*

DauxJoinBackoff. During the join process, DauxJoinBackoff shall be used instead of MaxBackoffExp, following the exponential backoff procedure described in 9.1.8.2.

**Table 129 – Defaults for links created from advertisements**

*In the intersection of DauxJoinRx and Type\_SelectiveAllowed, replace 1 with 0 as shown:*

Field name	DauxJoinTx	DauxJoinRx	DauxAdvRx (when DauxJoinFldXmit.Bit3 =1)
Type-SelectiveAllowed	1	0	1

**9.3.5.3.1 General**

*In the penultimate paragraph, after "a solicitation's DMIC shall be built using a security key of K\_global and a nominal TAI time of zero", add "and a source address of zero".*



**Table 141 – DLMO attributes**

*For attribute 5, 4<sup>th</sup> column, replace "Default value: Null" with "Default value: 0x80".*

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*For attribute 12, 4<sup>th</sup> column, replace "Default value: 120 (30 s)" with "Default value: 248 (62 s)".*

**Table 148 – dlmo.DeviceCapability OctetString structure**

*Replace the row for Energy Design with the following:*

5-8	EnergyDesign (see Table 146)
-----	------------------------------

**9.4.2.23 DLMO device capabilities**

*In the text following Table 148, in the description of • dlmo.DeviceCapability.ClockStability (2<sup>nd</sup> bullet), replace "absence" with "presence".*

**9.4.2.27.1 General**

*In the 5<sup>th</sup> paragraph, replace "Such skipped links should be treated as equivalent to NAK for the applicable channel" with "Such skipped links should be counted as a NoACK for the applicable channel, that is, they should be counted as unacknowledged DL transmissions in the ChannelDiag diagnostic".*

**9.4.3.5.3 Superframe current timeslot state**

*Replace the formula for ChOffset (after " The timeslot offset into that channel-hopping cycle is") with the following:*

$$ChOffset = ((SlotNumAbs - ChBirth) \bmod ChCycle) / ChRate$$

**Table 184 – Values for dlmo.Link[].Schedule**

For Element encoding, 2<sup>nd</sup> column, replace "BooleanArray32" with "32-bit BitString".

**Table 188 – Diagnostic summary OctetString fields**

For ClockSigma, 2<sup>nd</sup> column, replace "Type: Integer16" with "Type: Unsigned16".

**Table 229 – TLMO attributes**

For attribute 2, 3<sup>rd</sup> column, replace in the description "Number of active ports" with "Maximum number of ports available".

Add attribute 11 as follows:

TPDUoutOfSecurityPolicies AlertDescriptor	11	Used to change the priority of the TPDUoutOfSecurityPolicies alert; this alert can also be turned on or turned off	Type: Alert report descriptor	–
			Classification: Static	
			Accessibility: Read/write	
			Initial default value: Alert report disabled = True	
			Alert report priority = 2 (journal)	
Valid value set: See type definition				

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**Table 368 – Device provisioning object**

In the latter part of Table 368, replace, in the 2<sup>nd</sup> column, attribute identifiers as follows:

Attribute name	Attribute identifier
PKI_Certificate_Type	22
PKI_Root_Certificate	18
Number of PKI_Certificates	19
PKI_Certificate	20
Current_UTC_Adjustment	21

For attribute 11, in the 4<sup>th</sup> column, replace "Default value: 0" with "Default value: 1".

For attribute 13, in the 4<sup>th</sup> column, replace "Default value: 1" with the following:

Default value:

0: if asymmetric key join not supported

1: if asymmetric key join supported

For attribute 16, in the 4<sup>th</sup> column, replace "Type: BitArray16" with "Type: Unsigned16".

**Table 371 – Device provisioning service object**

For attribute 8, in the 4<sup>th</sup> column, replace "Type: BitArray16" with "Type: Unsigned16".

### Table B.18 – Routing table size

For Item number RTS3, 3<sup>rd</sup> column, replace “15” with “5”.

### Table B.19 – Address table size

For Item number ATS3, 3<sup>rd</sup> column, replace “15” with “5”.

## Annex V – Compliance with ETSI EN 300 328 v1.8.1

In the annex heading, replace “v1.8.1” with “v2.1.1”.

In the 3<sup>rd</sup> paragraph, replace “at least 15 channels” with “at least  $NC$  channels, where  $NC = 5$  for non-adaptive FHSSM and  $NC = 15$  for adaptive FHSSM”.

Replace existing NOTE 3 with the following:

NOTE 3 ETSI 300 328:2016 v2.1.1 4.3.1.4 permits “blacklisting” (i.e. blocking) operation on some of the channels specified in a FHSSM frequency-hopping schedule, but does not permit the number of different hopping channels to be reduced to fewer than  $NC$  channels. Therefore inclusion of fewer than  $NC$  channels in a channel map that determines the frequency-hopping cycle of selected channels means that the only possible remaining operating regimes are those under WBM.

In NOTE 4, replace the first sentence with: “These requirements are ETSI EN 300 328:2016 v2.1.1 4.3.1.7.2 (FHSSM) and 4.3.2.6.3.2.2 (WBM) and related text.”

Under the 5<sup>th</sup> paragraph, first bullet, replace “ $\leq 1$  ms” with “ $\leq 1,056$  ms”.

Under the 5<sup>th</sup> paragraph, third bullet, replace “a given channel” with “a given channel, whether transmitting or not,”.

Replace existing NOTE 5 with the following:

NOTE 5 Tx-sequence-time and Tx-gap-time are defined in ETSI EN 300 328:2016 v2.1.1, 4.3.1.3 (FHSSM) and 4.3.2.4 (WBM). Dwell time, which applies to FHSSM, is defined in ETSI EN 300 328 v2.1.1, 3.1. Dwell time is necessarily at least as large as Tx-sequence-time. Dwell time need never be larger than the duration of one timeslot.

Replace existing 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> paragraphs with the following:

ETSI EN 300 328:2016 v2.1.1, 4.3.2.3.3 (WBM) imposes a power spectral density limit for WBM of 10 dBm/MHz EIRP. Due to the spectrum of the IEEE 802.15.4:2015 2,4 GHz DSSS modulation, this constraint limits equipment operating under ETSI EN 300 328 v2.1.1’s WBM regulations to a maximum transmit power (total for all active transmit chains after any antenna and beam-forming gain) of 20 mW (+13 dBm) EIRP.

ETSI EN 300 328:2016 v2.1.1, 4.3.1.2 (FHSSM) and 4.3.2.2 (WBM) limit maximum transmit power, after any antenna and beamforming gain, to 100 mW (+20 dBm) EIRP.

ETSI EN 300 328:2016 v2.1.1, 4.3.1.6 (FHSSM) and 4.3.2.5 (WBM) limit the Medium Utilization of non-adaptive equipment, and of adaptive equipment operating in a non-adaptive mode, so that the total energy transmitted over any observation interval as specified by EN 300 328 averages  $\leq 10$  mW (+10 dBm) EIRP. Use of adaptivity removes this restriction on average transmit power.

In the 9<sup>th</sup> paragraph, replace “2012 v1.8.1, 4.3.2.3” with “2016 v2.1.1, 4.3.2.4”.

In the 10<sup>th</sup> paragraph, replace “2012 v1.8.1, 4.3.1.2” with “2016 v2.1.1, 4.3.1.3”.