SLOVENSKI STANDARD
SIST EN 61158-2:1998/A2:2001

01-april-2001

Fieldbus standard for use in industrial control systems - Part 2: Physical layer specification and service definition

Fieldbus standard for use in industrial control systems -- Part 2: Physical layer specification and service definition

Feldbus für industrielle Leitsysteme -- Teil 2: Spezifikation der Bitübertragungsschicht (Physical layer) und Definition deren Dienste

Bus de Terrain utilisé dans les systèmes de contrôle industriels -- Partie 2: Spécification de la couche physique et définition du service

Ta slovenski standard je istoveten z: **EN 61158-2:1994/A2:1996**

ICS:

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
35.100.10	Fizični sloj	Physical layer
35.110	Omreževanje	Networking

SIST EN 61158-2:1998/A2:2001 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61158-2/A2

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UDC 681.3.02:681.5
ICS 25.040.40; 35.100.10

Descriptors: Industrial control systems, digital communications, fieldbus, physical layer specification, physical layer service definitions

English version

Fieldbus standard for use in industrial control systems Part 2: Physical layer specification and service definition (IEC 1158-2:1993/A2:1996)

Bus de Terrain utilisé dans les systèmes de contrôle industriels Partie 2: Spécification de la couche physique et définition du service (CEI 1158-2:1993/A2:1996)

Feldbus für industrielle Leitsysteme Teil 2: Spezifikation der Bitübertragungsschicht (Physical layer) und Definition deren Dienste (IEC 1158-2:1993/A2:1996)

This amendment A2 modifies the European Standard EN 61158-2:1994; it was approved by CENELEC on 1996-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 65C/158/FDIS, future amendment 2 to IEC 1158-2:1993, prepared by SC 65C, Digital communications, of IEC TC 65, Industrial-process measurement and control, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 61158-2:1994 on 1996-10-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-08-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) -

Annexes designated "normative" are part of the body of the standard.
In this standard, annex ZA is normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 2:1996 to the International Standard IEC 1158-2:1993 was approved by CENELEC as an amendment to the European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

Addition:

Publication	Year	Title	EN/HD	Year
IEC 364-4-41 (mod)	1992	Electrical installations of buildings Part 4: Protection for safety Chapter 41: Protection against electric shock	HD 384.4.41 S2	1996
IEC 364-5-54 (mod)	1980	Part 5: Selection and erection of electrical equipment -- Chapter 54: Earthing arrangements and protective conductors	HD 384.5.54 S1	1988

FOREWORD

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

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

FDIS	Report on voting
65C/158/FDIS	65C/169/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.

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CONTENTS

Add the titles of the following new clauses as follows:

19 (Under consideration)
20 (Under consideration)
21 Medium attachment unit (MAU): current mode (1A), wire medium

Add, on page 5, to the table list, the titles of tables 47 to 50 as follows:

47 Transmit level specification summary for current-mode MAU
48 Transmit timing specification summary for current-mode MAU
49 Receive circuit specification summary for current-mode MAU
50 Network power supply requirements for the 1,0 Mbit/s, 1,0 A current-mode MAU

Add, on page 9, to the figure list, the titles of figures 41 to 46 as follows:

41 Test configuration for current-mode MAU
42 Output waveform
43 Transmitted bit cell jitter (zero crossing point deviation)
44 Receiver sensitivity and noise rejection
45 Noise test circuit for current-mode MAU
46 Received bit cell jitter

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Insert, in the list, the title of the following standards:

2 Normative references

IEC 364-4-41: 1992, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock*

IEC 364-5-54: 1980, *Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 54: Earthing arrangements and protective conductors*

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12.3 *Transmit circuit specification for 1,0 Mbit/s voltage-mode MAU*

Replace, page 119, the existing tables 13 and 14 by the following:

Table 13 – Transmit level specification summary for 1,0 Mbit/s voltage-mode MAU

Transmit level characteristics, values referred to trunk (but measured using test load as shown in figure 16)	Limits for 1,0 Mbit/s voltage mode
Output level (peak-to-peak, see figure 17) With test load (0,5 nominal Z_0 of trunk cable)	5,5 V to 9,0 V 75 Ω ± 1%
Maximum positive and negative amplitude difference (signalling bias) as shown in figure 18	±0,45 V
Output level with one terminator removed (peak-to-peak) With test load (nominal Z_0 of trunk cable)	5,5 V to 11,0 V 150 Ω ± 1 %
Output level; open circuit (peak-to-peak)	5,5 V to 30,0 V
Maximum output signal distortion; i.e., overvoltage, ringing and droop (see figure 17)	±10 %
Quiescent transmitter output; i.e. transmitter noise (measured over the frequency band 1 kHz to 4 MHz)	≤5 mV (r.m.s.)

Table 14 – Transmit timing specification summary for 1,0 Mbit/s voltage-mode MAU

Transmit timing characteristics, values referred to trunk (but measured using test load as shown in figure 16)	Limits for 1,0 Mbit/s voltage mode
Transmitted bit rate	1,0 Mbit/s ± 0,01%
Instantaneous bit time	1,0 µs ± 0,025 µs
Rise and fall times (10 % to 90 % of peak-to-peak signal, see figure 17)	≤0,2 nominal bit time
Slew rate (at any point from 10 % to 90 % of peak-to-peak signal)	≤200 V/µs
Maximum transmitted bit cell jitter (zero-crossing point deviation, see figure 18)	±0,025 nominal bit time
Transmit enable/disable time (i.e. time during which the output waveform may not meet the transmit requirements)	≤2,0 nominal bit times

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12.3.2 *Output level requirements*

Replace this subclause by the following:

NOTE – Figure 17 shows an example of the a.c. component of one cycle of a Fieldbus waveform, illustrating some key items from the transmit circuit specification. Only signal voltages are shown; this diagram takes no account of power supply voltages.

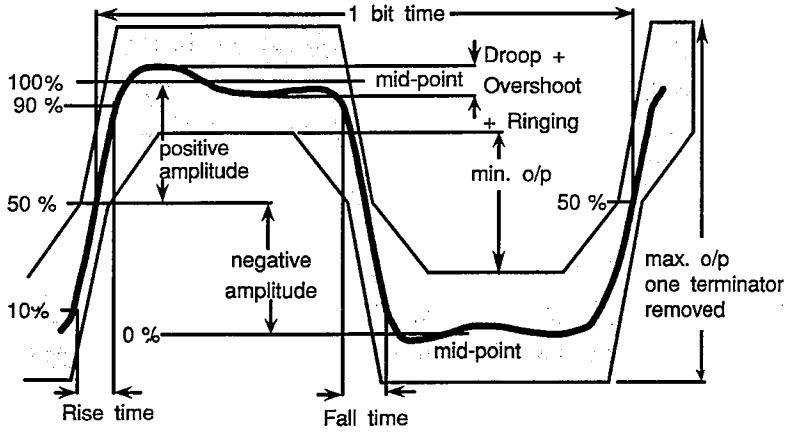

Figure 17 – Output waveform

A 1,0 Mbit/s voltage-mode MAU transmit circuit shall conform to the following output level requirements, all amplitudes being measured at the estimated mid-point between any peaks or troughs in the top and bottom of the waveform ("Mid-point" in figure 17):

a) the output voltage across the test load after transformer step up/down (if applicable) shall be between 5,5 V and 9,0 V peak-to-peak with a load resistance of 75 Ω ± 1 % ("Min. o/p" in figure 17);

b) the output voltage at the trunk, or at the transmit terminals, with a load resistance of 150 Ω ± 1 % (i.e. with one trunk terminator removed) shall be between 5,5 V and 11,0 V peak-to-peak ("Max. o/p one terminator removed" in figure 17);

c) the output voltage at the trunk, or at the transmit terminals, with any load including an open circuit shall be between 5,5 V and 30,0 V peak-to-peak. For test purposes open circuit shall be defined as a load of 100 kΩ resistance in parallel with 15 pF capacitance;

d) during transmission a device shall not suffer permanent failure when a load resistance of ≤1 Ω is applied for 1 s;

e) the difference between positive amplitude and negative amplitude, measured as shown in figure 18, shall not exceed ±0,45 V peak;

f) the output noise from a 1,0 Mbit/s voltage-mode MAU which is receiving or not powered shall not exceed 5 mV r.m.s., measured differentially over the frequency band 1 kHz to 4 MHz, referred to the trunk;

g) the differential voltage across the test load shall be such that the voltage monotonically changes between 10 % and 90 % of peak-to-peak value. Thereafter, the signal voltage shall not vary more than ±10 % of peak-to-peak value until next transition occurs. This permitted variation shall include all forms of output signal distortion, i.e. overvoltage, ringing and droop.

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12.3.3 *Output timing requirements*

Replace the text of this subclause by the following:

A 1,0 Mbit/s voltage-mode MAU transmit circuit shall conform to the following output timing requirements:

a) rise and fall times, measured from 10 % to 90 % of the peak-to-peak signal amplitude shall not exceed 0,2 nominal bit time (see figure 17);

b) slew rate shall not exceed 200 V/µs measured at any point in the range 10 % to 90 % of the peak-to-peak signal amplitude (see figure 17);

NOTE – Requirements a) and b) produce a trapezoidal waveform at the transmit circuit output. Requirement b) limits the level of interference emissions which may be coupled to adjacent circuits etc. Requirement b) is calculated from the formula:

Max. slew rate = 6 × Min. slew rate = $6 \times 0{,}8\ V_0 / 0{,}2\ T = 24 \times V_0 / T$

where V_0 is the maximum peak-to-peak output voltage (9,0 V), and T is the nominal bit time (1 µs).

c) transmitted bit cell jitter shall not exceed ±0,025 nominal bit time from the ideal zero crossing point, measured with respect to the previous zero crossing (see figure 18);

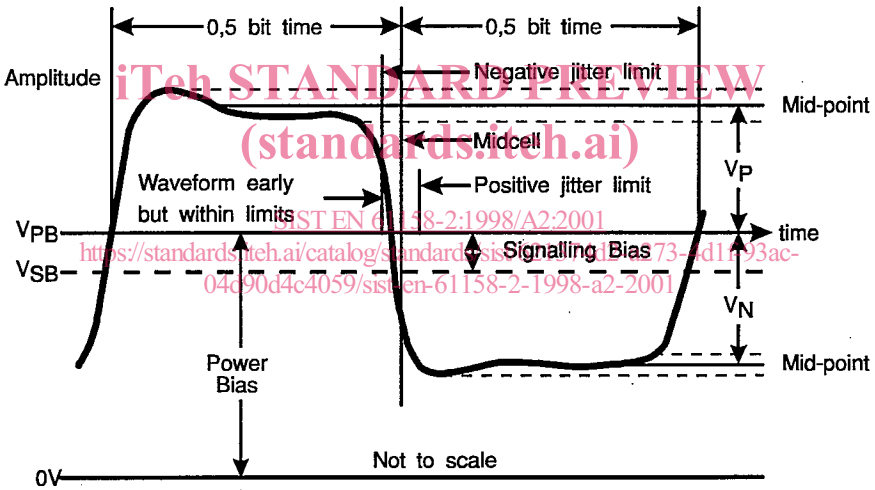

Figure 18 – Transmitted bit cell jitter (zero crossing point deviation)

d) the transmit circuit shall turn on, i.e. the signal shall rise from below the transmit circuit maximum output noise level as specified in 12.3.2 e) to full output level, in less than two nominal bit times. The waveform corresponding to the third and later bit times shall be as specified by other parts of 12.3;

e) the transmit circuit shall turn off, i.e. the signal shall fall from full output level to below the transmit circuit maximum output noise level as specified in 12.3.2 e), in less than two nominal bit times. The time for the transmit circuit to return to its off-state impedance shall not exceed four nominal bit times. For the purposes of testing, this requirement shall be met with the transmit circuit test configuration of 12.3.1 with the equivalent capacitance of a maximum length cable across the DUT terminals.

NOTE – This requirement is to ensure that the transition of the transmit circuit from active to passive leaves the line capacitance fully discharged.

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12.6.4 *Electrical isolation*

Replace the text of this subclause by the following:

All Fieldbus devices which use wire medium, whether separately powered or powered via the signal conductors, shall provide low-frequency isolation between ground and the Fieldbus trunk cable.

NOTE 1 – This may be by isolation of the entire device from ground or by use of a transformer, opto-coupler or some other isolating component between trunk cable and device.

A combined power supply and communication element shall not require electrical isolation.

For electrical installations providing different grounds, the isolation impedance measured between the shield of the Fieldbus cable and the Fieldbus device ground shall be greater than 250 kΩ at all frequencies below 63 Hz.

The isolation shall be by-passed at high frequencies by capacitance, such that the impedance measured between the shield of the Fieldbus cable and the Fieldbus device ground shall be less than 15 Ω between 3 MHz and 30 MHz.

NOTE 2 – The capacitance between ground and trunk cable shield necessary to meet both these requirements can be any value between 3,5 nF and 10,6 nF.

For electrical installations providing a common ground in conformance with IEC 364-4-41 and IEC 364-5-54, the shield of the Fieldbus cable and the Fieldbus device ground may be directly connected.

The maximum unbalanced capacitance to ground from either input terminal of a device shall not exceed 250 pF.

The breakdown requirements of the isolation of the signal circuit and the power distribution circuit from ground and from each other shall be in accordance with table 17 of IEC 1131-2.

NOTE 3 – For a device which is powered from a supply with rated voltage ≤50 V d.c. or r.m.s., the equivalent test voltages at sea-level are 444 V r.m.s., 635 V d.c. and 635 V peak impulse test. For a device which is powered from a supply with rated voltage between 150 V and 300 V r.m.s., the equivalent test voltages at sea level are 2 260 V r.m.s., 3 175 V d.c. and 3 175 V peak impulse test.