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Interested committees:

Title: Draft BS ISO 23316-4 Tractors and machinery for agriculture and forestry —

Electrical high-power interface 700 V DC / 480 V AC

Part 4: AC operation mode

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

DRAFT INTERNATIONAL STANDARD

ISO/DIS 23316-4

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Tractors and machinery for agriculture and forestry — Electrical high-power interface 700 V DC / 480 V AC —

Part 4: AC operation mode

ICS: 65.060.10

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 23, Tractors and machinery for agriculture and forestry, Subcommittee SC 19, Agricultural electronics (TC 23/SC 19/WG 9).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This document is intended to be used in conjunction with:

— *Part 1: General*

Describes the general purpose of the ISO 23316 series, provides an overview of covered systems, and specifies the common elements among the parts of the ISO 23316 series.

— *Part 2: Physical layer*

Specifies the physical electrical high-power interface 700 V DC/480 V AC (connector).

— *Part 3: Safety requirements*

Specifies electrical safety requirements for the electrical high-power interface.

— *Part 4: AC operation mode*

Specifies measures applicable to the electrical high-power interface in AC Mode

— *Part 5: DC operation mode*

Specifies measures applicable to the electrical high-power interface in DC Mode

— *Part 6: Communication parameter and signals*

Specifies the communication for the electrical high-power interface.

— *Part 7: Mechanical integration*

Specifies the mechanical integration and use of the electrical high-power interfaces.

Tractors and machinery for agriculture and forestry — Electrical high-power interface 700 V DC / 480 V AC —

Part 4: AC operation mode

1 Scope

The purpose of the ISO 23316 series is to provide design and application standards covering implementation of electrical high-power interface with a nominal voltage of 700 V DC/480 V AC for agricultural and forestry machinery. The ISO 23316 series specifies the physical and logical interface requirements that provide interoperability and cross compatibility for systems and equipment.

In order to state compliance to ISO 23316 series all applicable requirements from ISO 23316 Parts 1-7 shall be met.

It is permitted for partial systems or components to be compliant to the ISO 23316 series by applying all applicable requirements e.g. for the plug, receptacle or inverters, on a tractor or implement.

Note 1 to entry e.g. if a DC-mode only HPI is provided, it is not necessary to comply with part 4 describing AC-mode, as it is not applicable. If an AC-mode only HPI is provided, it is not necessary to comply with part 5 describing DC-mode, as it is not applicable.

The following are not within the scope of ISO 23316:

- Service, maintenance, and related diagnostics;
- Functional safety;
- Control strategies for high-power supplies and loads;
- Application-specific strategies and operational modes;
- Component design;
- Energy storage systems, e. g. supercapacitors or batteries;
- Multiple electrical power supplies to a common DC-link;

ISO 23316-4 specifies required measures applicable to the HPI AC Interface between a supply system (typically located on an agricultural tractor) and detachable electrical consumption system (typically located on an agricultural implement).

ISO 23316-4 covers the following:

- HPI system topologies;
- Interface relevant characteristics of the HPI providing AC or combined AC & DC;
- Interface relevant characteristics of the HPI AC load (for relevant characteristics of a DC load see ISO 23316-5);
- Logical, operational and electrical characteristics of the HPI:
 - Operating mode aspects, and
 - Communication parameters

NOTE The document contains simplified electrical diagrams showing specific aspects of the required functionality.

2 Normative References

The following documents refer to 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.

ISO 11783, *Tractors and machinery for agriculture and forestry — Serial control and communications data network*

ISO 23316-1, **[year]** *Tractors and machinery for agriculture and forestry - Electrical high-power interface 700VDC / 480VAC - Part 1: General*

ISO 23316-2, **[year]** *Tractors and machinery for agriculture and forestry - Electrical high-power interface 700VDC / 480VAC - Part 2: Physical interface*

ISO 23316-5, **[year]** *Tractors and machinery for agriculture and forestry - Electrical high-power interface 700VDC / 480VAC - Part 5: DC operation mode*

ISO 23316-6, **[year]** *Tractors and machinery for agriculture and forestry - Electrical high-power interface 700VDC / 480VAC - Part 6: Communication signals*

IEEE 802.3bw:100BASE-T1 - 100 Mbit/s Ethernet over a single twisted pair for automotive applications

3 Terms and definitions

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

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

3.1 alternating current AC

alternating electric quantities such as voltage or current, to devices operated with these, or to quantities associated with these devices

[SOURCE: IEC 60050-151:2001, 151-15-01]

3.2 AC-load ACL

device capable of utilising AC voltage

EXAMPLE 3-phase motor, heat resistor, linear actuator.

3.3 actual value

feedback values of the electric drive's control within the agricultural application/process;

Note 1 to entry: In torque control mode, it is an estimation based on current and electric machine's model.

3.4 application APP

system of load and optional load logical box located on a consumer system

3.5**application control****APP-C**

control means to monitor and control the consumer system, typically located on the implement

3.6**controller area network****CAN**

protocol originally defined for use as a communication network for control application in vehicles

[SOURCE: ISO 17356-1:2005, 2.17]

3.7**combined AC and DC interface**

Interface be able to provide AC Mode or alternatively DC Mode functionality

3.8**connector**

receptacle or plug assembly containing socket, plug, pins or contact sockets

3.9**consumer system****CS**

physical unit consisting of one or more applications and its control instances (e.g. implement) to be connected via HPI to a supply system

3.10**electric energy converter****CNV**

device for changing one or more characteristics associated with electric energy

Note 1 to entry: Characteristics associated with energy are for example voltage, number of phases and frequency including zero frequency.

[SOURCE: IEC 60050-151-13-36]

3.11**direct current****DC**

time-independent electric quantities such as voltage or current, to devices operated with direct voltage and current, or to quantities associated with these devices

[SOURCE: IEC 60050-151:2001, 151-15]

3.12**DC link****DCLNK**

DC connection between devices (e.g. power converter) to distribute electric power

Note 1 to entry: Refers to tractors, implements, or both.

3.13**DC-load****DCL**

device capable of utilising DC voltage (e.g. power converter with inductive/resistive/capacitive load)

3.14

direction of rotation

positive values for frequency or speed related to powering the power converter phases in the sequence U V W positive torque means torque in the direction of positive speed

Note 1 to entry: If not stated otherwise (e.g. ground speed), the term 'speed' within this document refers always to rotational movement.

3.15

electronic control unit

ECU

electronic item consisting of a combination of basic parts, subassemblies and assemblies packaged together as a physically independent entity (e.g. ISOBUS job controller)

3.16

electrical high-power interface

HPI

logical and power gateway between a power providing supply system and a power consumer system used within an electrified system in the agricultural industry

3.17

fieldbus

industrial computer network protocol used for real-time distributed control (e.g. EtherCAT TM 1) using Ethernet – combined with optimized communication functions between a main fieldbus controller and a segment of fieldbus sub devices)

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.1593]

3.18

fieldbus master

device integrated within inverter onboard supply system, controls actively the communication within the fieldbus network and requests/receives data to/from the slave in a cyclically and time-wise deterministic manner

3.19

fieldbus slave

device integrated within LLB on-board consumer system receives data (e.g. requests) from and provides data (e.g. feedback) to the *fieldbus master* (3.22) passively

3.20

fundamental component

sinusoidal component of the Fourier series of a periodic quantity (e.g. sinusoidal current or PWM voltage) having the frequency of the quantity itself

[SOURCE: IEC 60050-103]

3.21

Isobus Job Controller

IJC

electronic control unit (ECU) (3.18) located on the implement taking care for controlling the implement, visualize data and operator interaction.

1) EtherCAT TM is a Tradename of Beckhoff, used as an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.