IEC/IEEE 80005-2

Edition 1.0 2016-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Utility connections in port –
Part 2: High and low voltage shore connection systems – Data communication for monitoring and control

Alimentation des navires à quai –
Partie 2: Systèmes de connexion à quai à haute et basse tensions – Description de l'interface de communication de données dédiées au suivi et contrôle

IEC/IEEE 80005-2:2016-06(en-fr)

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It is published as a triple logo (IEC, ISO and IEEE) standard.

The text of this standard is based on the following IEC documents:

FDIS	Report on voting
18/1490/FDIS	18/1495/RVD

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

International standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

Texts in italics in this standard are for signals of the data packets.

A list of all parts in the IEC 80005 series, published under the general title *Utility connections in port*, can be found on the IEC website.

The IEC Technical Committee, the ISO Subcommittee and the IEEE Technical Committee have decided that the contents of this 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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[1] A list of IEEE participants can be found at the following URL: http://standards.ieee.org/downloads/80005-2/80005-2-2016/80005-2-2016_wg-participants.pdf

INTRODUCTION

Onshore power supply systems need communication between the ship side and the shore side. Different kinds of communication have to be distinguished, see Clause 3.

This Part 2 of IEC/IEEE 80005 series deals with the non-safety related communication. It covers the requirements of the HVSC systems described in Part 1 and is also intended to cover the requirements of a forthcoming standard for LV shore connection systems.

UTILITY CONNECTIONS IN PORT –

Part 2: High and low voltage shore connection systems – Data communication for monitoring and control

1 Scope

This part of IEC/IEEE 80005 describes the data interfaces of shore and ships as well as step by step procedures for low and high voltage shore connection systems communication for non-emergency functions, where required. This standard specifies the interface descriptions, addresses and data type. This standard also specifies communication requirements on cruise ships, in Annex A.

Application of this standard relates to annexes of IEC/ISO/IEEE 80005-1.

This standard does not specify communication for emergency functions as described in IEC/ISO/IEEE 80005-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC/ISO/IEEE 80005-1:2012, *Utility connections in port – Part 1: High Voltage Shore Connection (HVSC) Systems – General requirements*

3 Terms, definitions and abbreviations

For the purposes of this document, the terms and definitions given in IEC/ISO/IEEE 80005-1, as well as the following apply.

3.1
communication for emergency function
hard wired signals that trip the feeding circuit breakers (ship side and shore side)

3.2
communication for non-emergency function
data exchange between shore and the ship for informational purposes

Note 1 to entry: If such data exchange requires tripping of the circuit breaker it will also be communicated via the pilot loop.

3.3
register
16 bit location for storing data

3.4
High Byte
HB
high byte of a register, the leftmost eight bits

3.5
Low Byte
LB
low byte of a register, the rightmost eight bits

3.6
big endian format
High Byte is stored firstly in the memory, Low Byte in a subsequent position

3.7
Most Significant Bit
MSB
leftmost bit

3.8
Least Significant Bit
LSB
rightmost bit

3.9
bypass key
keyed selector switch that allows data communication to be switched on or off

3.10
alarm
activation of an event that shows a critical state

3.11
warning
announcing a situation or condition requiring attention but no immediate attention or action and presented for precautionary reasons to make personnel aware of changed conditions which are not immediately hazardous, but may become so, if no forward-looking decision is made or action is taken

3.12
Co
command

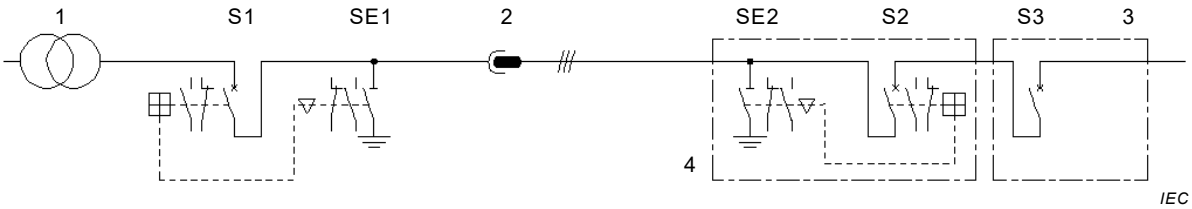
3.13
ESD-1
emergency shutdown initiated when the ship moves past the warning range of allowable motion forward, aft or outward from the dock, and which initiates an LNG ship – ESD signal from shore to ship

3.14
ESD-2
emergency shutdown initiated when the ship moves past the maximum range of allowable motion forward, aft or outward from the dock, and which initiates loading arm disconnection on shore

4 General

4.1 Power connection single line diagram

Figure 1 shows the connection cables with the designation of the main switches used in this standard.



Key

1 Shore side transformer

S1 Shore side circuit breaker

SE1 Shore side earthing switch, for HVSC only

2 Cable connection with plugs (single or parallel cables)

SE2 Onboard shore connection switchboard earthing switch, for HVSC only

S2 Onboard shore connection switchboard circuit breaker

S3 Onboard receiving switchboard connection point circuit breaker (synchronizing switch)

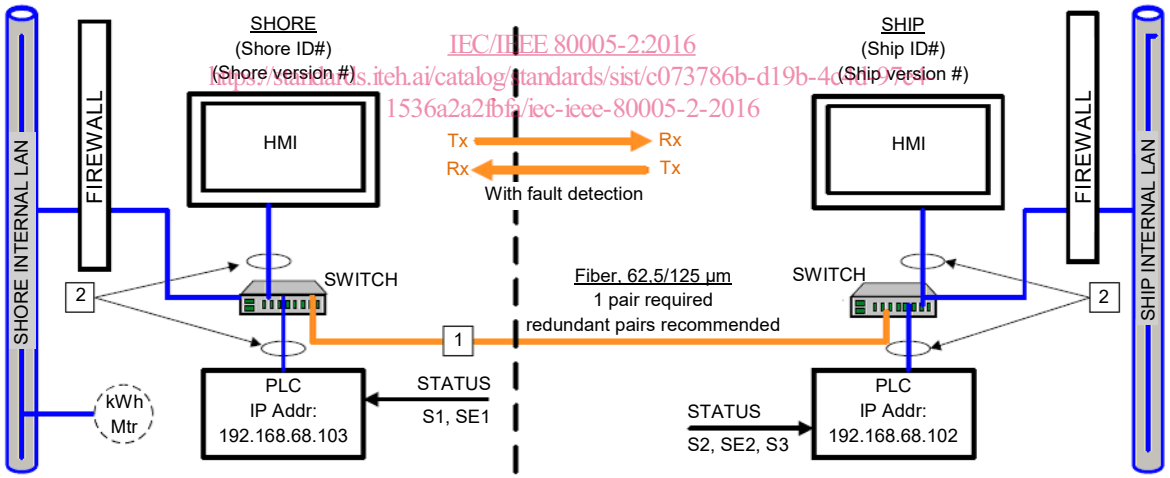
3 Onboard receiving switchboard

4 Onboard shore connection switchboard

Figure 1 – Power connection single line diagram

4.2 Data communication diagram

Figure 2 shows the general diagram of the data communication system used in this standard.



1 Fiber optic connector (IEC/ISO/IEEE 80005-1:2012, 7.3.4)

2 Typically CAT6 UTP Ethernet cabling (limited to 100 m per ANSI/TIA-568-C.2)

NOTE Assign HMI IP addresses on ship less than 192.168.68.102, on shore greater than 192.168.68.103

IEC

Figure 2 – Data communication general diagram

4.3 Physical layer

The connection of the communication control unit onshore to offshore is a point to point connection, see 7.3.4., A.2.7 of IEC/ISO/IEEE 80005-1:2012, except as noted in A.4.1 for cruise ships.

4.4 Protocol and IP-address

The ModbusTCP/IP protocol is specified for the communication between shore and ship.

The shore side polls the ship side with every cycle of the communication module (as fast as possible) with a single Modbus data packet request of 125 registers. The content of the data packet is specified in Clause 6.

The ship side also polls the shore side with every cycle of the communication module (as fast as possible) with a single Modbus data packet request of 125 registers. The content of the data packet is specified in Clause 5.

Both the shore side and the ship side will make the requests with a single Holding Register Block Read utilizing Modbus function code 0x03 with the Modbus Unit ID.

It is required that both shore side and ship side have a dedicated and reserved data block to make available information for the other side. This data block starts at the absolute register address 0 and is 125 registers long. Data blocks registers configuration shall be as described in Clauses 5 and 6 and Annex A and Annex B.

It is required that both shore side and ship side have a fixed IP address and port number for the communication via ModbusTCP/IP. In order to avoid any IP address conflict, the communication between shore side and ship side shall be on a dedicated network (other IP devices are not allowed). IP addresses and port numbers are specified as follows:

- IP-Address shore side: 192.168.66.103
- Subnet mask: 255.255.255.0
- Port number shore side: 502
- IP-Address ship side: 192.168.66.102
- Subnet mask: 255.255.255.0
- Port number ship side: 502

5 Interface shore

5.1 Shore: version number

The compatibility of the shore side may be checked on the basis of the version number high register, see Table 1.

Table 1 – Checking of compatibility of the shore side

Register	Bit	Description
0	0-7	*Shore Version Number LB* *Shore Version Number LB* identifies the interface version related to this standard (edition number of the standard), with data quantity and addresses of the data packet for which the running software was designed.
0	8-15	*Shore Version Number HB* *Shore Version Number HB* identifies the version number of the manufacturer-specific shore side software.
NOTE E.g. for edition number of the standard: 10 = 80005-2 ed. 1 and 20 = 80005-2 ed. 2 and 30 = 80005-2 ed. 3.		

5.2 Shore communication fault detection register

The communication validity shall be confirmed by the periodic change of the value of this register, additionally of existing diagnostic of communication functions, see Table 2.

Table 2 – Detection of communication fault

Register	Bit	Description
1	*n*	*Shore communication fault detection register* The value of *Shore communication fault detection register* is incremented every second.

5.3 Shore operation modes

5.3.1 Basic operation modes

The basic operation modes indicate in which procedure and state the shore side is actually working. Only one mode out of the basic modes may be active at the same time, see Table 3.

Table 3 – Basic operation modes

Register	Bit	Description
2	0	*Shore Mode Start Up* Shore system is in start up procedure. Ship may start shore side. For details see Clause 7.
2	1	*Shore Mode Running* Shore has closed all circuit breakers and opened all earthing switches. System is powered, synchronized and is ready to transfer load.
2	2	*Shore Mode Stop* This includes ESD-1 signal, see IEC/ISO/IEEE 80005-1. Shore is in Stop procedure. For details see Clause 8. At the end of *Shore Mode Stop* system changes to *Shore Mode Standby*.
2	3	*Shore Mode Emergency Stop* This includes ESD-2 signal, see IEC/ISO/IEEE 80005-1. Shore is in emergency stop. The following actions are automatically executed: • The pilot loop is opened immediately. • The circuit breaker S1 is opened immediately After opening of the circuit breaker S1 the earthing switch SE1 may be closed, see 4.9 of IEC/ISO/IEEE 80005-1:2012. A reset of the system is required. The *Shore Mode Emergency Stop* is set if one of the following conditions is fulfilled: • Emergency stop button onshore is pressed • One alarm on shore is set • Emergency stop button onboard is pressed • One alarm on ship is set • Communication fault detection register error is detected and bypass key onshore is not in “on” position and shore is not in *Shore Mode Running.* Pilot loop is opened immediately and shore is in *Shore Mode Emergency Stop* The *Shore Mode Emergency Stop* is reset after the activating condition is eliminated, CB S1 is open, SE1 is closed and the system is acknowledged. After this acknowledgement the system changes to *Shore Mode Standby*.
2	4	*Shore Mode Standby* Shore is in standby, only system warnings, alarms and status information are monitored. If no warning is active and the switches are in initial position (CB S1 open, SE1 closed) the system is ready for start up.

5.3.2 Optional operation mode cable test

The optional operation mode cable test indicates that the shore connection system is in the procedure to perform a cable test, see Table 4. (Shore will power the cable with nominal voltage but reduced power.)

Table 4 – Optional operation mode cable test

Register	Bit	Description
2	8	*Shore Mode Optional Cable Test* Shore system is actually in the procedure for cable test. Mode is set as feedback signal for ship command *Ship Co Test Cable* (see 6.7). Mode is reset after performed cable test and required switching operations. For details see 7.2.5.

5.3.3 Operation modes synchronization

The synchronization operation mode indicates for which type of synchronization the shore side is prepared according to the choice of the ship (see 7.2.3. and 7.2.6, and IEC/ISO/IEEE 80005-1:2012), see Table 5. Only one mode out of the synchronization modes may be active at the same time.

Table 5 – Operation modes synchronization

Register	Bit	Description
3	0	*Shore Mode Synchronization A1* The operation mode is set with the choice of the synchronize mode (see 7.2.3): the ship side synchronizes to the shore side and resets at the end of the start up procedure. For details see Clause 7 (see 7.2.6.2).
3	1	*Shore Mode Synchronization A2* The operation mode is set with the choice of the synchronize mode (see 7.2.3): the shore side synchronizes to the ship side controlled from the ship and resets at the end of the start up procedure. For details see Clause 7 (see 7.2.6.3).
3	2	*Shore Mode Synchronization A3* The operation mode is set with the choice of the synchronize mode (see 7.2.3): the shore side synchronizes to the ship side and resets at the end of the start up procedure. For details see Clause 7 (see 7.2.6.4).

5.3.4 Operation mode fault

The special fault mode indicates an overcurrent situation to the ship under different conditions, see Table 6.

Table 6 – Operation mode fault

Register	Bit	Description
3	8	*Shore Mode Clear Fault* In case of an overcurrent the clear fault mode is active, if all ship generators are off (see 6.8.4). If the overcurrent is present longer than application requested the shore side trips (*Shore Mode Emergency Stop*).
3	9	*Shore Mode No Clear Fault* In case of an overcurrent the no clear fault mode is active, if at least one ship generator is connected to the ships grid (see 6.8.4). Ship shall reduce power. If the overcurrent remains the shore side trips (*Shore Mode Emergency Stop*).