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PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

Maritime navigation and radiocommunication equipment and systems – Digital interfaces –
Part 103: Single talker and multiple listeners – New and amended sentences and Talker IDs

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INTERNATIONAL
ELECTROTECHNICAL
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CONTENTS

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 103: Single talker and multiple listeners – New and amended sentences and Talker IDs

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IEC PAS 61162-103 has been processed by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
80/985/DPAS	80/992/RVDPAS

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of 2 years starting from the publication date. The validity may be extended for a single period up to a maximum of 2 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

INTRODUCTION

This document is circulated as an IEC Publicly Available Specification (IEC/PAS). This agreed process allows the new information needed to implement new sentences in a shorter time-scale than revising the appropriate international standards. This document provides information on sentences to support more functionality than available in the published 5th edition of IEC 61162-1.

This PAS has been developed in conjunction with the IEC TC 80 WG6 and the NMEA.

This PAS will be replaced at a future date by, or be included within, a revision of IEC 61162-1.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 103: Single talker and multiple listeners – New and amended sentences and Talker IDs

1 Scope

IEC 61162-1:2016 supports the transfer of data between various equipment. This document specifies more equipment Talker IDs, amends existing sentences and introduce new sentences to facilitate more functionality between equipment.

2 New content to IEC 61162-1

2.1 Field definitions

Additional field definitions are indicated in Table 1.

Table 1 – Talker identifier mnemonics

Talker device	Identifier
Automation – Alarm and monitoring system	JA
Automation – Reefer monitoring system	JB
Automation – Power management system	JC
Automation – Propulsion control system	JD
Automation – Engine control console	JE
Automation – Propulsion boiler	JF
Automation – Auxiliary boiler	JG
Automation – Electronic governor system	JH
Night vision	NV
Electronic record book	RB
Rudder angle indicator	RI
Steering control system/device	SC
System managament	SM
Track control system	TC

2.2 Approved sentences

2.2.1 DDC – Display dimming control

The DDC sentence provides controls for equipment display dimming presets. display brightness percentage and selection of colour palette.

Transmitting and receiving equipment may support unidirectional or bidirectional communications as determined by the manufacturer.

When this sentence is sent as a command and not supported or not accepted by the recipient, the receiving equipment may generate a NAK sentence response providing an appropriate "reason code". Additionally the receiving equipment may generate a DDC status report sentence which provides the current dimming state of the receiving equipment.

NOTE   The following luminance values are the preferred values to allow uniform dimming with one DDC transmitter, without the need to pre-compute and store a brightness and colour palette value for every display in a multi-display system. These values are in conformance with IEC 62288 Presentation of navigation-related information on shipborne navigational displays (ECDIS colour brightness requirements). A device with a monochrome display may adjust its display brightness to respect the colour palette selection, to match the luminance of a device with a colour display for each selected colour palette. The value 49, center position on the brightness scale, represents the calibrated position for calibrated displays.
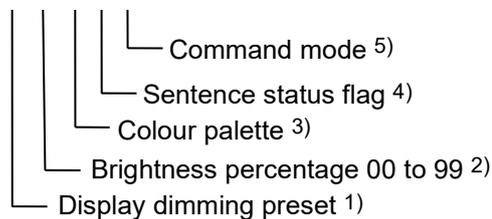
D = Day time setting, with a luminance of the brightest colour of 80 cd/m^2 at brightness percentage value 49

K = Dusk setting, with a luminance of the brightest colour of 36 cd/m^2 at brightness percentage value 49

N = Night time setting, with a luminance of the brightest colour of 5 cd/m^2 at brightness percentage value 49

O = Non-luminous setting, without luminance at any brightness percentage value

$--DDC,a,xx,a,a,a*hh<CR><LF>

      Command mode [5]
     Sentence status flag [4]
    Colour palette [3]
   Brightness percentage 00 to 99 [2]
  Display dimming preset [1]

Comments:

1) The display dimming preset field contains an indicator that may be associated with a preset dimmed level consisting of both brightness and colour palette in the receiving equipment.

 D = Day time setting

 K = Dusk setting

 N = Night time setting

 O = Non-luminous (i.e.backlighting off) setting

Actual display brightness levels for the display dimming preset indicators above are dependant upon the capabilities provided by the manufacturer of the equipment. Upon receipt of the DDC sentence, the device shall switch its display brightness and may switch to the preset value the operator or manufacturer had determined for the corresponding indicator value. If the equipment had no brightness or dimming preset capability this field would be ignored.

NOTE 1   If the receiving equipment has preset capability and this field contains a valid value the content of separate brightness percentage and colour palette fields transmitted within the same sentence can be ignored by the receiving equipment.

NOTE 2   If the receiving equipment has no preset capability a DDC transmitting device can populate brightness and palette fields to use the brightness percentage and colour palette fields as an alternative to using stored presets in the receiving equipment.

2) The brightness percentage field contains a value from zero to ninety nine. The value zero, provided as 00, indicates that the display's brightness shall be set to its most dimmed level, as determined by the capabilities of the equipment. The value ninety nine, provided as 99, indicates that the display brightness shall be set to the brightest level, as determined by the capabilities of the equipment. Values between 0 and 99 correspond to some percentage of brightness, as determined by the equipment receiving this sentence, such as a gamma 2.2 corrected brightness curve. Where the colour palette filed is supported, the actual display luminance is always a combination of this value and the colour palette field.

3) The colour palette field contains an indicator that may be associated with the selected colour palette in the receiving equipment.
 D = Day time setting

 K = Dusk setting

 N = Night time setting

 O = Non-luminous (i.e.backlighting off) setting

If the receiving equipment does not support colour palettes it may ignore values in this field rather than discard sentences where this field is not a null field. This way a display controller can by default send sentences where the colour palette field is not a null field, thus avoiding unnecessary per-display configuration.

4) This field is used to indicate a sentence that is a status report of current settings or a configuration command changing settings. This field shall not be a null field.

R = Sentence is a status report of current settings (use for a reply to a query).

C = Sentence is a configuration command to change settings. A sentence without "C" is not a command.

The DDC sentence may be sent as a report of settings (i.e. R flag set); in response to a standard query sentence, as an unsolicited notification e.g. on start-up or after the brightness or colour palette has been adjusted by other means, in response to a valid command sentence or in response to an invalid command sentence.

When the Sentence status flag is set to "R" and the Command mode is set to "O" then the DDC sentence is a report of the current operational dimming state.

When the Sentence status flag is set to "R" and the Command mode is set to "P" then the DDC sentence is a report of the settings for the preset specified in the display dimming preset field. If there are multiple preset settings to be conveyed, then there shall be multiple DDC sentences of this form, each with the appropriate data fields populated to convey each setting.

The standard query sentence has no means to identify a specific DDC setting and therefore the response from the display equipment may consist of multiple sentences where stored presets are provided and/or a single sentence indicating the current state. If no presets are provided by the receiving equipment only a single sentence indicating the current state is provided.

5) This field is used to indicate that this sentence is used to change the stored settings or used to change the current state of the receiving equipment. This field shall not be a null field.

O = Sentence is relevant to current operational settings

P = Sentence is relevant to stored 'Preset' settings

Examples and guidance for device manufacturers:

>> indicates Controller sends to Display.

<< indicates Display sends to Controller.

In these examples the 'Dimming controllers' typically have talker IDs of "II" and "IN".

In these examples the 'Displays' have talker IDs of "EI", "GN" and "GP".

In some of these examples the responses from the Displays are omitted for brevity.

	Example Commands	Example Sentence(s)
1	Change operational dimming state of the receiving equipment. – Set to Brightness percentage '75' and 'D' Colour palette. The display may respond indicating its state.	>> $INDDC,,75,D,C,O*22<CR><LF> << $GNDDC,,75,D,R,O*3D<CR><LF>
2	Change preset dimming state of receiving equipment – Store Brightness percentage '75' and day Colour palette as preset 'D' by setting Command mode to 'P'. Optionally a receiving equipment with full or half duplex communications may respond to give positive acknowledgement. – Report stored Brightness percentage and Colour palette for preset 'D' identified by Sentence status flag 'R' and Command mode to 'P'.	>> $IIDDC,D,75,D,C,P*7E<CR><LF> << $EIDDC,D,75,D,R,P*63<CR><LF>
3	Change the preset dimming state of receiving equipment (some equipment may ignore this field). – Store the current brightness percentage and colour palette as preset 'K' i.e. store the current settings.	>> $INDDC,K,,,C,P*30<CR><LF>
4	Activate a preset (some equipment may ignore this field). For receiving equipment that supports a stored preset 'D', recall that preset; otherwise set receiving equipment palette to 'D' and retain current its current operational brightness percentage. - Activate 'D' stored preset in the receiving equipment.	>> $IIDDC,D,,,C,O*27<CR><LF>

		Example Commands	Example Sentence(s)
5		Where the receiving equipment is a colour or monochrome display with or without notion of colour palettes;	(a) >> $IIDDC,D,55,D,C,O*63<CR><LF> (b) >> $IIDDC,,55,,C,O*63<CR><LF> (c) >> $IIDDC,,49,N,C,O*20<CR><LF> (d) >> $IIDDC,,,D,C,O*27<CR><LF>
		(a) set operational dimming state to brightness percentage '55'	
		[the 'D' preset / palette is ignored if unsupported]	
		(b) set operational dimming state to brightness percentage '55'	
		[if supported receiving equipment assumes current palette]	
		(c) set the brightness percentage to '49' and the colour palette to 'N'.	
		(d) set to 'D' palette and retain current brightness percentage.	
6		Optionally query the receiving equipment using the standard query sentence.	>> $IIEIQ,DDC*32<CR><LF> << $EIDDC,,75,D,R,O*38<CR><LF> << $EIDDC,D,49,D,R,P*6C<CR><LF> << $EIDDC,K,49,K,R,P*6C<CR><LF> << $EIDDC,N,49,N,R,P*6C<CR><LF> << $EIDDC,O,00,O,R,P*61<CR><LF> (b) >> $IIGNQ,DDC*37<CR><LF> << $GNDDC,,49,,R,O*76<CR><LF> << $GNDDC,D,49,,R,P*2D<CR><LF> << $GNDDC,K,36,,R,P*2A<CR><LF> << $GNDDC,N,05,,R,P*2F<CR><LF> << $GNDDC,O,00,,R,P*2B<CR><LF>
		Example responses to that query sentence are shown for devices with bi-directional (duplex/half duplex) communications if supported;	
		(a) a calibrated colour display system and,	
		– Send standard query sentence	
		– Receiving equipment responds 'R' with its current operational state 'O' and stored presets 'P'.	
		(b) un-calibrated display system which does not support colour palettes.	
		– Send standard query sentence	
		– Receiving equipment responds with sentence status flag set to 'R' in each case and with Command mode field set to 'O' to indicate current state and set to 'P' stored presets, if supported.	
7		Optionally the receiving equipment may respond to an invalid DDC sentence with an NAK sentence and/or its current operational state.	>> $INDDC,O,99,D,C,P*70<CR><LF>
		In this example the receiving equipment, a GPS, does not support storing the values requested in this preset.	
		– Store day palette and brightness percentage '99' as 'O' palette (not supported on this equipment)	<< $GPNAK,IN,DDC,GPS1,10,PRESET NOT ACCEPTED*3A<CR><LF>
		– Receiving equipment sends NAK sentence and,	<< $GPDDC,,49,,R,O*68<CR><LF>
		– Receiving equipment responds with sentence status flag set to 'R' and with Command mode field set to 'O' to indicate current operational state.	

2.2.2   EPL – Command or report long equipment property value

The EPL sentence provides a method to command and report specific equipment settings when the "Value of property to be set" is longer than possible using a single EPL sentence. This sentence is a command sentence.

This sentence shall not be queried. A query for EPL sentence may result in the generation of one or more EPL messages or EPL sentences as necessary to report all configurable equipment properties and their current values.

When this sentence is sent as a command and not accepted, the receiving equipment shall generate a NAK sentence response providing an appropriate "reason code".

```
$--EPL,x.x,x.x,x.x,a,c--c,c--c.x.x,c--c*hh <CR><LF>
```

Value of property to be set [7]
Property identifier for the property to be set [6]
Unique identifier [5]
Equipment type [4]
Sentence status flag [3]
Sequential message identifier [2]
Sentence number [1]
Total number of sentences for this message [1]
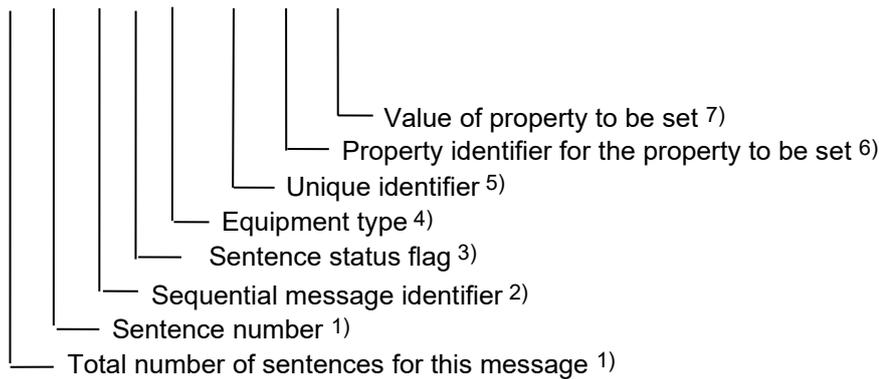
Comments:

1) The first field specifies the total number of sentences used for a message, minimum value 1. The second field identifies the order of this sentence in the message, minimum value 1. These fields are integer fields with no decimal point or decimal digits. These cannot be null fields.

2) The sequential message identifier relates all sentences that belong to a group of multiple sentences (i.e. message). Multiple sentences (see Comment 1) with the same sequential message identifier, make up one message. This field is an integer field with no decimal point or decimal digits.

3) This field is used to indicate a sentence that is a status report of current settings or a configuration command changing settings. This field shall not be null.

   R = Sentence is a status report of current settings (use for a reply to a query).

   C = Sentence is a configuration command to change settings. A sentence without "C" is not a command.

4) The equipment field contains the two character talker ID of the destination equipment when this sentence is sent as a command as designated by the "Sentence status flag" field, and identifies the device type for which the sentence is targeted. When this sentence is a report (e.g. in response to a query) as designated by the "Sentence status flag" field, the equipment type field contains the talker ID of the equipment generating the sentence.

5) The unique identifier identifies the same equipment irrespective of command versus response: For commands it identifies the equipment intended to receive the command. For responses it identifies the equipment that actually received the command. Under normal conditions the response will be received from the equipment for which the command was intended. Equipment should only send one or more response sentences in response to command sentences received and should not use response sentences for general reporting. The unique identifier may be null.

6) The property identifier is a variable length integer field that identifies a parameter that can be set as defined in an applicable equipment standard and is intended for commissioning settings.

7) The "Value of property to be set" is a variable length character string representing the intended configuration parameter value when the sentence is a command and the current value when the sentence is a report. Character strings are concatenated to form a single long character string as the Value of the property to be set. The character string may contain both valid characters, see Table 2 of IEC 61162-1:2016, and reserved characters, see Table 1 of IEC 61162-1:2016. Reserved characters shall be represented using the "^" method (see 7.1.4 of IEC 61162-1:2016).

Examples of EPM sentence command and response:

The example shows an ECDIS (with a Talker ID of "EI") setting a configuation paprameter 1234 of an AIS transponder (with a Talker ID of "AI") for a long parameter value of "This-is-an-example-of-a-long-parameter which-continues-over-multiple-messages". In this example, the unique identifier is the value of the MMSI of the AIS "503123450" and the Sequential message identifier is 98. The ECDIS would send the following command:

$EIEPM,02,01,98,C,AI,503123450,1234,This-is-an-example-of-a-long-parameter*53<CR><LF>

$EIEPM,02,02,98,C,AI,503123450,1234,-which-continues-over-multiple-messages*09<CR><LF>

For a query from ECDIS to AIS

$EIAIQ,EPV*hh<CR><LF>

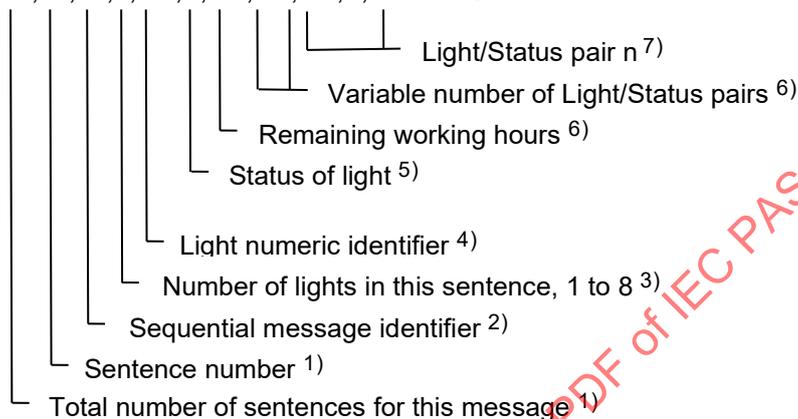The AIS would send the following response (in this example the Sequental message identifier is 25):

$EIEPM,02,01,25,R,AI,503123450,1234,This-is-an-example-of-a-long-parameter-wh*76<CR><LF>

$EIEPM,02,02,25,R,AI,503123450,1234,ich-continues-over-multiple-messages*2C<CR><LF>

2.2.3   NLS – Navigation light status

This sentence provides the status of the navigation lights as reported by a navigation lights controller. An example use case is for reporting the status of required navigation lights from the navigation lights controller to the voyage data recorder and other shipboard equipment or displays. The NLS sentence can support approximately 800 unique lights. As an example, the IMO SOLAS required number of navigation lights is typically between 32 and 64. The assignment and configuration of the light numeric identifiers are typically defined or configured within the navigation lights controller.

This sentence cannot be used to command or change the status of any navigation light. This sentence may be queried, and a response may consist of multiple NLS sentences.

```
$--NLS,xx,xx,xx,x,x.x,h,x.x,....,x.x,h,x.x*hh<CR><LF>
```

Light/Status pair n [7]

Variable number of Light/Status pairs [6]

Remaining working hours [6]

Status of light [5]

Light numeric identifier [4]

Number of lights in this sentence, 1 to 8 [3]

Sequential message identifier [2]

Sentence number [1]

Total number of sentences for this message [1]

Comments:

1) The number of Navigation Light/Status pairs reported may require multiple sentences. The "Total number of sentences for this message" field specifies the total number of sentences used for a message, range 01 - 99. This field shall not be a null field. The "Sentence number" field identifies the order of this sentence within a multi-sentence message; range 01 - 99. This field may be a null field when there is only one sentence per message, as when the "Total number of sentences for this message" field is set to a value of 01.

2) The "sequential message identifier" field is a number 00 to 99, used to identify different messages. This field identifies all sentences that belong to a group of multiple sentences (i.e. message). Multiple sentences (see comment 1) with the same sequential message identifier value make up one message. The sequential message identifier is a number, 00 to 99, used to identify different multi-sentence messages. This field may be a null field when there is only one sentence per message, as when the "Total number of sentences for this message" is set to a value of 01.

3) Number of Light/Status pairs in this sentence: indicates how many lights and their status values are provided after this parameter, within this sentence, and the light numeric identifiers ranging from 1 to 8. A different mix of single, two, or even three digit light numeric identifiers and the use of multiple sentences to make up a message will reduce the number of allowed Light/Status pairs in accordance with sentence length requirements. The actual number of Light/Status pairs must be such that the total number of characters in the sentence does not exceed the "82-character" limit. See examples below.

4) Light numeric identifier: This field contains the assigned numeric identifier for navigation lights within the sentence. This field, the Status of the light field and Remaining working hours field (see comments 5 and 6) are repeated for each navigation light reported in the sentence, up to the maximum allowed (see comment 3).

5) Status of the lights: This field contains the current known status for each reported navigation light. All status values are not required to be supported by the navigation light controller. Values are:

   0 = Light not in use

   1 = Lights Off

   2 = Lights On

   3 = Light has error: Reason unknown

   4 = Light has error: Short circuit

   5 = Light has error: Open circuit

   6 = Light has error: Low luminosity

   9 = Light has error: Other

null field = Status not known

6) Remaining working hours. This field is intended to indicate an estimate of remaining working hours of a navigation light. Remaining working hours may not be supported by the navigation light controller. Unit is 100h, Values are:

0 = 0..98, estimate of remaining time in units of 100h. As an example a value of 27 indicates 2700h estimated remaining working hours

1 = 99, estimate of remaining time is more than 9800h

null field = Estimate of remaining time is not known

Example: Multi-sentence message with a total of 6 lights, reported by 2 sentences

$NLNLS,2,1,96,4,12,2,,3,1,,471,3,4,6,3,*68<CR><LF>

$NLNLS,2,2,96,2,32,2,,33,2,*6F<CR><LF>
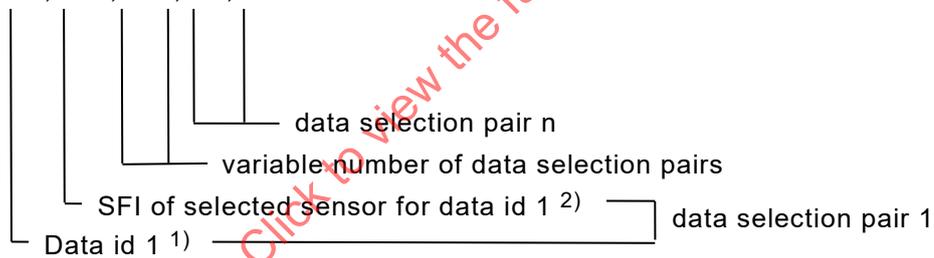
2.2.4   SEL – Selection report

This sentence is used to publish selection information, for example from a Consistent Common Reference System (CCRS) associated with an Integrated Navigation System (INS). The sentence can be evaluated by a data consumer accessing data directly from the sensors via the fast access data channel of the CCRS.

If selection information is not available for a certain type of data, the corresponding field in the sentence shall be a null field.

The SEL sentence shall be sent periodically at intervals of not exceeding 30 s and for all state changes.

Within an INS, the sentence shall be sent by the CCRS using talker ID IN.

$--SEL,ccc,c—c,……,ccc,c--c*hh

data selection pair n

variable number of data selection pairs

SFI of selected sensor for data id 1 [2)]   data selection pair 1

Data id 1 [1)]

Comments:

1)   Allowed Data ids are:

Data id	Description
POS	position
SOG	speed and course over ground
STW	speed through water
DEP	depth below keel
HEA	heading
TIM	time

2)   The unique System Function ID (SFI) is a string identifying a system function within an IEC 61162-450 network. Refer to IEC 61162-450 for guidance on the use of SFIs in a system.

2.2.5   SLM – Steering location/mode

This sentence is used to present steering location and steering mode in a conning display. The SLM sentence shall be sent by steering systems or steering devices periodically with repetition rate of 1 Hz.

```
$--SLM,x,a,a,c--c*hh
        │ │ │ └── SubMode 4)
        │ │ └── Steering mode 3)
        │ └── Steering location 2)
        └── System status 1)
```
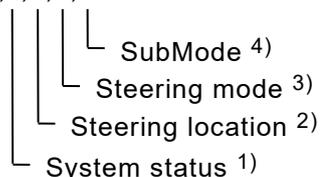
Comments:

1) System status. If system is active in control or not. This field shall not be a null field.

　0 = not in control (passive)

　1 = in control (active)

　2 = internal failure (unable to be in control)

2) Steering location. This field shall not be a null field.

　B = Bridge (Center position)

　P = Port wing

　S = Starboard wing

　A = Aft bridge

　F = Fly bridge

　G = Steering gear room

　E = Emergency steering stand

3) Steering mode. This field shall not be a null field.

　D = Direct (e.g. direct access to valves)

　M = Manual

　A = Autopilot

　P = Dynamic positioning

　J = Joystick

　G = Steering gear room

　E = Emergency steering stand

4) Additional information to Steering mode (comment 3) with up to 16 characters as SubMode. Typically Dynamic positioning and Joystick system have a great variety of modes and therefore this field contains text set by the source. This text is intended to be displayed to humans together with the steering mode.

Examples of SubModes for M (Manual)

- NFU

- FU

- NFU synchronous, for example, for double rudder installation

- NFU independent, for example, for double rudder installation

- FU synchronous, for example, for double rudder installation

- FU independent, for example, for double rudder installation

- A/P override

- Gen override

Examples of SubModes for D (Direct)

- NFU direct

- A/P override

- Gen override

Examples of SubModes for A (Autopilot)

- Heading Control

- Course Control

- Track Control

- Manual
- Nav. Mode
- Wpt Steering

Examples of SubModes for P (Dynamic Positioning)

- DP Main
- DP Backup
- Auto Heading
- Auto Position
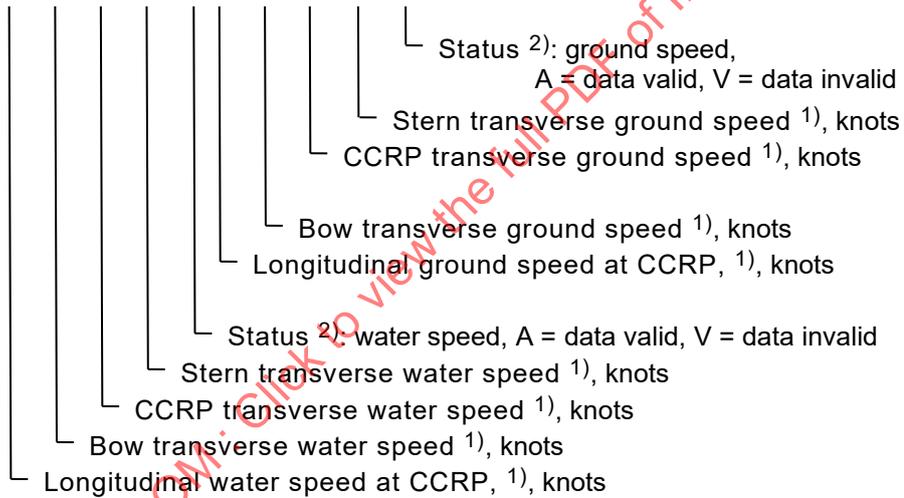- Track Control
- ROV Following

Examples of SubModes for J (Joystick)

- Manual
- Heading

2.2.6   VBC – Water-referenced and ground-referenced docking log speed data

Water-referenced and ground-referenced docking log speed data. Typically provided by Consistent Common Reference System (CCRS) function.

$--VBC,x.x,x.x,x.x,x.x,A,x.x,x.x,x.x,x.x,A*hh<CR><LF>

Status [2]: ground speed,
A = data valid, V = data invalid

Stern transverse ground speed [1], knots

CCRP transverse ground speed [1], knots

Bow transverse ground speed [1], knots

Longitudinal ground speed at CCRP, [1], knots

Status [2]: water speed, A = data valid, V = data invalid

Stern transverse water speed [1], knots

CCRP transverse water speed [1], knots

Bow transverse water speed [1], knots

Longitudinal water speed at CCRP, [1], knots

Comments:

1) Transverse speed: "-" = port,

Longitudinal speed: "-" = astern.

2) The status field shall not be a null field.