AlphaPilot MFM
Control Panel APH-5 / APH-7

Operation Manual

www.alphatronmarine.com

Document history

Revision	Date	Modifications	Author
A01	February, 2017	Document was created and reviewed	VS
B01	June, 2017	Document completely revised	MK
C01	March, 2021	Ch.2 Control panel descriptions are updated, 4.3 "Follow-up Override" control mode is added, Ch.5 Menu description is updated, Ch.7 "Hardware" is added, App. A "Alert list" is updated, App. B "Structure Diagram" is added	LP, MO
C02	May, 2021	Ch.3 "Turning On/Off and Restart" is updated	LP
C03	June, 2021	Item 7.2.6 "INS Sensor (Work with INS)" and Appendix A "Alert List" are updated	LP
C04	July, 2021	Item 6.2.2 "Alert Indicators" and Appendix A "Alert List" are updated	LP

Contents

Abbreviations

AC	Alternating current		**HCS**	Heading Control System
ACK	Acknowledge		**HDG**	Heading
ADC	Analog to digital converter		**IMO**	International Maritime Organization
AP	Autopilot		**INS**	Integrated navigational system
APM	Controller module for main control unit		**JP**	Joystick Pilot System
APP	Controller module for all control units except main control unit		**MAGN**	Magnetic Compass (NMEA sensor)
AUTO	Automatic (Heading Control mode)		**MAS**	Mandatory Alarm System
BAM	Bridge Alert Management		**NFU**	Non-Follow-Up
CALC	Calculated value ("C" in some fields)		**RAD**	Steering Radius
CAM	Central Alert Management		**RFU**	Rudder Feedback Unit
COG	Course over ground		**ROT**	Rate of turn
COM	Serial data port		**SG**	Steering Gear
CU	Control Unit		**SMS**	Steering Mode Selector
DC	Direct Current		**SOG**	Speed over ground
ECDIS	Electronic chart display and information system		**SS**	Steering System
ECS	Electronic chart systems		**STW**	Speed through water
EEPROM	Electrically Erasable Programmable Read-Only Memory (PCB)		**TCS**	Track Control System
FFU	Full-Follow-Up		**THD**	Transmitting Heading Device
GPS	Global Positioning system		**WP**	Way Point

Chapter 1

Introduction

1.1   General

- The Autopilot is designed to control displacement-type ships and high-speed crafts in the open sea. "Fail-to-safety" principle is implemented in the Autopilot design, i.e. any failure leads to the least critical of any possible new conditions.

- Navis NavAP is easy to install and maintain on the vessel. However, AP is a sophisticated electronic device, which performance affected by sea conditions, hull shape and size, vessel speed.

- Navis NavAP main control station should be installed in the wheelhouse. Network AP stations (up to 5 units) can be installed on the wings (indoor installation by default). Some AP units can be installed near the Steering Gear / Steering System compartment.

- Navis NavAP Heading control system can be an integrated part of the Navis NJoy Advanced Joystick control system in case of ordering and delivery of NJoy system to the Customer.

- Please read this Manual thoroughly prior to start operating Navis NavAP Heading control system.

⚠ **WARNING**

Autopilot is a very useful navigational aid, but it does not replace a human navigator under any circumstances. Do not use automatic steering in the following conditions:

- In heavy traffic areas or in narrow waters

- In poor visibility or extreme sea conditions;

- When in areas where use of Autopilot is prohibited by the law.

When using Autopilot:

- Do not leave the helm unattended;

- Do not place any magnetic material or equipment near heading sensor used in the Autopilot system;

- Verify at regular intervals course and position of the vessel;

- Always switch to Standby mode in due time to avoid hazardous situations

1.2   Compliance

Heading control system hereinafter referred to as the Autopilot has DNV type examination for the compliance with:

- IMO Res. A.342 (IX)
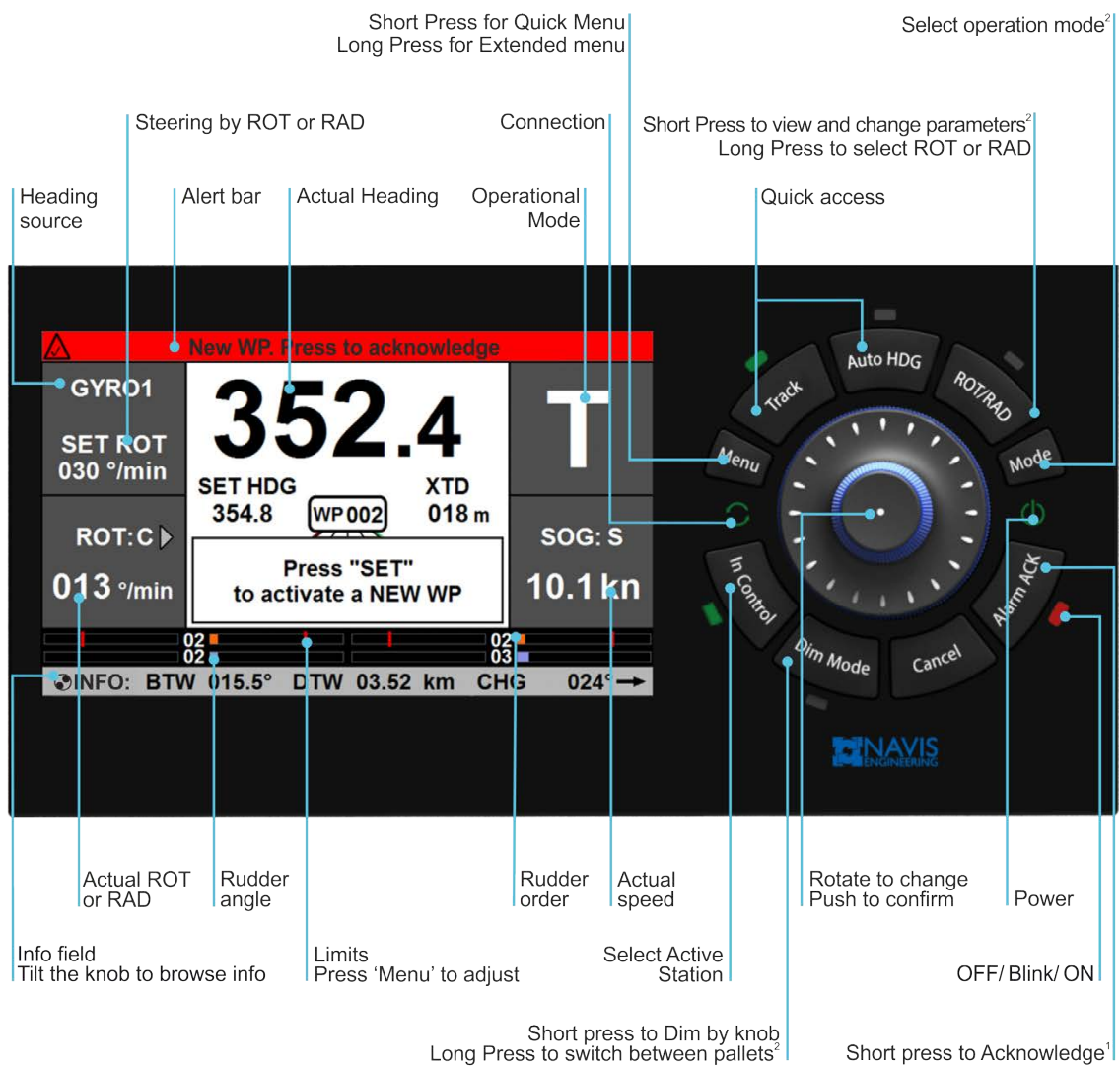- IMO Res. MSC. 64(67) Annex 3
- IMO Res. A694 (17)

Autopilot is also compliant with:

- IMO Res. A.822 (19) and ISO11674 (2019) /16329 (2003) for High Speed Crafts
- IEC 62065 ed2 Track Control System
- IEC 62288:2014 Presentation of navigation-related information on shipborne navigational displays
- IEC62923 ed1.0(2018)
- DNV Rules for Classification of Ships (additional requirements NAUT-AW notation)

Chapter 2

Control Panel

2.1 APH-7 Control Panel

Short Press for Quick Menu
Long Press for Extended menu

Select operation mode[2]

Steering by ROT or RAD

Connection

Short Press to view and change parameters[2]
Long Press to select ROT or RAD

Heading source

Alert bar

Actual Heading

Operational Mode

Quick access

New WP. Press to acknowledge

GYRO1

SET ROT
030 °/min

352.4

SET HDG   XTD
354.8   018 m

WP 002

Press "SET"
to activate a NEW WP

ROT: C ▶
013 °/min

T

SOG: S
10.1 kn

INFO: BTW 015.5° DTW 03.52 km CHG   024°

Track   Auto HDG   ROT/RAD

Menu   Mode

In Control   Alarm ACK

Dim Mode   Cancel

NAVIS ENGINEERING

Actual ROT or RAD

Rudder angle

Rudder order

Actual speed

Rotate to change
Push to confirm

Power

Info field
Tilt the knob to browse info

Limits
Press 'Menu' to adjust

Select Active Station

OFF/ Blink/ ON

Short press to Dim by knob
Long Press to switch between pallets[2]

Short press to Acknowledge[1]

[1] that button has additional functionality
[2] this actions have to be confirmed by the knob

Cancel   press 'Cancel' to exit

2.1.1 Buttons

Button View	Name	Function
Menu	Menu	Used to enter into user "Mode Menu", which enables changing of the Navis NavAP operating parameters. Single press the button to enter into Quick menu "Parameters". Long press the button to enter into Extended menu.
Track	Track	Used for immediate change-over into "Track" Heading control mode from the current autopilot mode.
Auto HDG	Auto HDG	Used for immediate change-over into "Auto" Heading control mode from the current autopilot mode.
ROT/RAD	ROT/RAD	Used to change a "Steering by" method and its operational parameters ("SET ROT" or "SET RAD") using knob. Single press the button to change the value. Long press the button to change the "Steering by" parameter between "SET ROT" or "SET RAD".
Mode	Mode	Used to select the required control mode. Press the button single or several times to select the new control mode. Then press knob to confirm choice.
Alarm ACK	Alarm ACK	Used for alert acknowledgement and scrolling. Single press the button to acknowledge an active alert. Press the button several times to scroll all active alerts in the list. Long press the button to enter into "Alarm Settings".
Cancel	Cancel	Used for immediate switch to the initial screen.
Dim Mode	Dim Mode	Used for dimming LEDs and Display. Press the button and rotate the knob clockwise to increase the high-light level and rotate counterclockwise to decrease the level. Long press the button to switch from Night mode to Dusk mode and to Day mode.
In Control	In Control	Used to transfer control (for the network configuration only).
(rotary knob)	Rotary knob	Turning knob clockwise changes heading/rudder angle order to the right (Stbd), counterclockwise — to the left (Port). Knob tilt left/right switches Info field, up/down — ignored. Knob also has a pushbutton, which is used for confirmation new setting of heading and other functions.

2.1.2 Meanings of Light Notifications

In Control
- ⚪ Is off — Control station is inactive
- ◉ Blinks green — APH panel is in control transfer mode
- 🟢 Lights green — Control station is active

Track, Auto HDG, ROT/RAD
- 🟢 Lights green — the mode is active
- ⚪ Off — the mode is not activated

Alarm ACK
- ⚪ Is off — there are no alarms
- ◉ Blinks red — there are one or more unacknowledged alarms
- 🔴 Lights red — there are one or more acknowledged active alarms

Dim Mode
- 🟢 Blinks green — Dimming mode is active. Select the desired brightness level by rotating the knob
- ⚪ Is off — Dimming mode is not activated

Power State ⏻
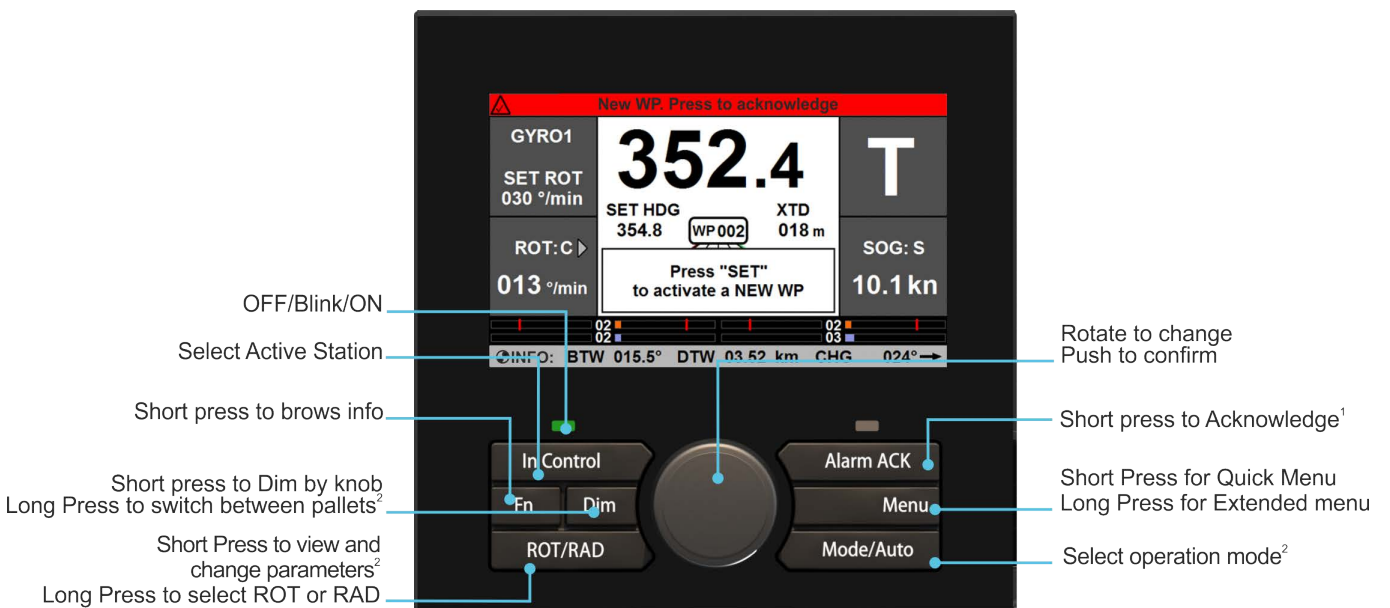- 🟢 Lights green — APH panel is powered and power supply parameters are within limits
- 🟠 Lights orange — Power supply at one of the inputs is lost (PWR1 or PWR2)

CAN Connection State ⟳
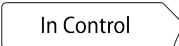- 🟢 Lights green — connection is OK
- 🔴 Lights red — connection is failed
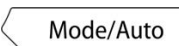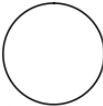
2.2 APH-5 Control Panel

[1] that button has additional functionality
[2] this actions have to be confirmed by the knob

9

2.2.1 Buttons

Button View	Name	Function
In Control	In Control	Used to transfer control (for the network configuration only).
Fn	Fn	Used for switching "Info Field".
Dim	Dim	Used for dimming LEDs and Display. Press the button and rotate the knob clockwise to increase the high-light level and rotate counterclockwise to decrease the level. Long press the button to switch from Night mode to Dusk mode and to Day mode.
ROT/RAD	ROT/RAD	Used to change a "Steering by" method and its operational parameters ("SET ROT" or "SET RAD") using knob. Single press the button change the value. Long press the button to change the "Steering by" parameter between "SET ROT" or "SET RAD".
Alarm ACK	Alarm ACK	Used for alert acknowledgement and scrolling. Single press the button to acknowledge an active alert. Press the button several times to scroll all active alerts in the list. Long press the button to enter into "Alarm Settings".
Menu	Menu	Used to enter into user "Mode Menu", which enables changing of the Navis NavAP operating parameters. Single press the button to enter into Quick menu "Parameters". Long press the button to enter into Extended menu.
Mode/Auto	Mode/Auto	Used for immediate change-over into "Auto" Heading control mode from the current autopilot mode and for selection of the required control mode as well. When operating in "Auto" mode press the button single or several times to select the new control mode. Then press knob to confirm choice.
◯	Rotary Knob	Turning knob clockwise changes heading/rudder angle order to the right (Stbd), counterclockwise — to the left (Port). Knob also has a pushbutton, which is used for confirmation new setting of heading and other functions.

2.2.2 Meanings of Light Notifications

In Control
- ⚫ Is off — Control station is inactive
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Alarm ACK
- ⚫ Is off — there are no alarms
- ◉ Blinks red — there are one or more unacknowledged alarms
- 🔴 Lights red — there are one or more acknowledged active alarms

2.3 Panel Interface

2.3.1 Field Descriptions

Field Name	Description
Current control mode	Displays the identification symbol of current operating mode
Set control mode	Displays the name of selected operating mode. The field is displayed during mode selection only.
Active/Locked	Displays the panel status (Active/Locked). If the control panel is locked, then "Key" symbol or "Locked" text is displayed.
Current Heading	Displays actual heading. Set Heading and input resolution (1° or 1/10°) are shown below the actual "Current Heading". Set Heading can be changed by turning knob: CW — increase, CCW — decrease. Press knob to confirm. Input resolution (1° or 1/10°) can be changed by long pressing knob (2 seconds).
Compass in use	Displays device type from which the actual heading is taken: • GYRO1, GYRO2 — Gyrocompass 1/2 (NMEA) • THD — True Heading Device (i.e. Satellite Compass, NMEA) • MAGN — Magnetic compass (NMEA) • HMS "ID1" — ID of the Master Compass from an external HMS system (ID1 from incoming NMEA HMR sentences) • INS — Integrated Navigational System (NMEA)
Steering by method	Displays Steering method in different control modes: • SET ROT — Steering By Rate of Turn. Operating ROT value is shown in degrees per minute • SET RAD — Steering By Radius. Operating Radius value is shown in nautical miles also used in "Track" control mode

Field Name	Description
Speed data	Displays Speed data source and speed value in knots: • SOG: S — from Sensor • SOG: C — calculated SOG using incoming GLL/GGA/VTG sentences • STW — Speed Through Water from Speed Log or from ECDIS • SPD MAN — Manual input (not recommended)
Thruster data	Displays the direction and force of tunnel thruster(s), when "Low Speed Heading" control mode is activated
Rudder and Set Rudder scale	Displays values of rudder order and rudder angle as bar charts. • Top bar — Set rudder. Red mark indicates the operational "Rudder Limits". • Bottom bar — Rudder feedback. The bar is not displayed if RFU is not connected
Alert bar	Displays current active alert message. Detailed descriptions of alerts see in Chapter 6.
Info field	Displays different sensor information (depends on connected sensors), Track control data, HDG monitoring in different autopilot control modes. Selection of displayed data is provided by knob tilt (left/right) on APH-7 control panel / Fn button pressing on APH-5 panel. Displayed data depend on the current operating mode (Auto, Track, Fu, River Pilot, etc.). Empty default bar is available in all control modes. The spinner always runs if the APH panel is not frozen. Available fields are specified in the table below.

2.3.2 Info Field

Info Field Name	Example	Description
Ship position	LAT 24° 54.2466' N LON 049° 42.1009' E	Available in all control modes, if position source is available from GPS or ECDIS
COG-SOG data and its type	COG 325.0° SOG 07.2 kn SENS	Available in all control modes, if COG/SOG data is available from GPS or ECDIS
Relative Wind data and its type	REL WIND 003° P SPD 10.1 kn SENS	Available in all control modes excepting "Wind Vane", if Wind Sensor is connected to Navis NavAP
True Wind data and its type	TRUE WIND 020° SPD 01.2 kn CALC	Available in all control modes excepting "Wind Vane", if Wind Sensor is connected to Navis NavAP
HDG Error	HDG ERROR 000.1° →	Available in "Auto" Heading control mode. HDG error and its direction to Actual Heading value are displayed
Previously set HDG	PREVIOUSLY SET HDG 268.1°	Available in "Auto" Heading control mode. Previous "SET HDG" value is displayed during knob movement (to set a new commanded HDG)
Way point	WP001 BTW 085.2° DTW 12.15 NM	Available in "Auto", "CTS Pilot" and "Track" control modes if WP data is available from ECDIS or GPS from the incoming NMEA sentences APB and BWC (or BWR)
New WP. Confirm Turn	BTW 085.2° DTW 12.15 NM CHG 149° →	Available in "Track" control mode only, during WP changing in the external ECDIS/ECS system
COG Error	COG ERROR 002.5° →	Available in "CTS Pilot" control mode. COG keeping error and direction to actual COG value are displayed
Previously set COG	PREVIOUSLY SET COG 270.0°	Available in "CTS Pilot" control mode. Previous "SET COG" value is displayed during knob movement (to set a new commanded COG)
HMS	HMS GYRO1 350.6° GYRO2 350.6° DELTA 000.0°	Available in all control modes, if more than one Heading source is connected to Navis NavAP or Heading Source is the external Heading Monitor System (HMS)
Route Leg	ROUTE LEG 268.1°	Available in "Track" (Ti) control mode only, when TCS Category C is adjusted in the Installation Menu as "ExtTRS" or "ExtHTC"
Curves	CURVE1	Available when "Curves" (custom function) was ordered and configured
Drift	DRIFT 90.0° (T) 0.9 kn	Available when NMEA sentences received from navigational equipment
Gyro Correction	HDG 297.3° CORRECTION ADDED 0.2° (SPD/LAT + DYNAMIC)	Available when receiving HCR (Heading correction report) messages from Gyro

2.4   Control Transfer

The **In Control** button is used for the network control transfer and operating in the network configuration only. The following control transfer methods are available (adjustable in the **Installation Menu**):

• Def — default method, see below;

• Conv — conventional method, see below;

• Off — for single control station;

• DI — the method is provided by discrete input of the APH panel and reserved for enhanced configuration with hardwired station selector;

• Ext — for logically linked joystick controller, reserved for joystick configurations.

When Navis NavAP includes several control panels, only one is active (in control) at the time. The rest control panels are disabled for vessel control (locked), i.e. buttons and knobs are inactive and "Key" symbols are shown in Active/Locked fields on these displays.

Default control transfer

Press the **In Control** button on any network locked panel. The previous active control panel becomes locked, i.e. buttons and knob are inactive (excepting "Menu", "Dim Mode" and "Alarm ACK" buttons). The previous active control panel generates time limited audible signal and displays warning message "Control Transfer".

Conventional control transfer

At first perform "Give" function from the current active station by pressing its **In Control** button. **In Control** buttons on all locked panels start blinking by their green LEDs and "Key" symbol is also presented on all locked panels. Next step is to confirm the selection of the new station by pressing **In Control** button.

NOTE

• If parameter "Appointed St" set as "P HS" in the Installation menu, this station becomes active by default after switching to "Auto HDG" mode. Otherwise, the latest active station remains in control in any control mode.

• If station is named as "P HS" in the Installation menu (arranged as main helm's station) and control transfer is set as "Conv" (Conventional), **In Control** button pressing makes P HS station active unconditionally.

2.5 Alarm Acknowledgement

Press the button to acknowledge incoming alarm

NOTES

- When a failure is detected, audible signal is generated and the corresponding alert is displayed in the Alert bar.

- The alarm acknowledgement is available only through the active control panel.

- The "Alarm ACK" button can be used for alarm silencing only at any locked control panel.

See Chapter 6 for alert indicators and Appendix A for alert descriptions.

Chapter 3

Turning On/Off and Restart
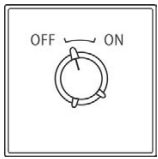
Set mode selector to **off** position and select Standby mode

Turning On

- Turn On main power supply PWR1 and PWR2

Turning Off

- Turn Off main power supply PWR1 and PWR2

Software Reset

2s
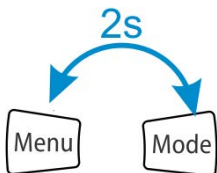
Long press buttons to reboot all controllers.
It will not cause restart of APH operating system.

Chapter 4

Operational Modes

4.1 Modes Overview

Mode Indication	Mode	Description
S	Standby	Auto Pilot is not in control
A	Auto HDG	Automatic heading control
T	Track (Category A/B)	Track control on straight legs
T$_I$	Track (Category C)	Full track control on straight legs and turns
C	CTS Pilot	Automatic Course control (Course-Over-Ground)
F$_U$	Fu	Short-term switchover to the manual rudder control via knob
F$_O$	Follow-up Override	Short-term switchover to the manual FU steering by external FFU override tiller (option)
R	River Pilot	Automatic steering by Rate-Of-Turn
V	Wind vane	Automatic steering by set Relative Wind angle
A$_D$	Dodge	Avoidance of obstacles without leaving the autopilot mode

4.2 Operational Mode Selection

Quick Access to Operational Modes

2s

Auto HDG — Long press the button to enter Auto HDG mode

Track — Press the button to enter Track mode

Operational Mode Selection

Mode — Press the button to view mode

Rotate the knob to navigate between modes

Push the knob to choose the mode
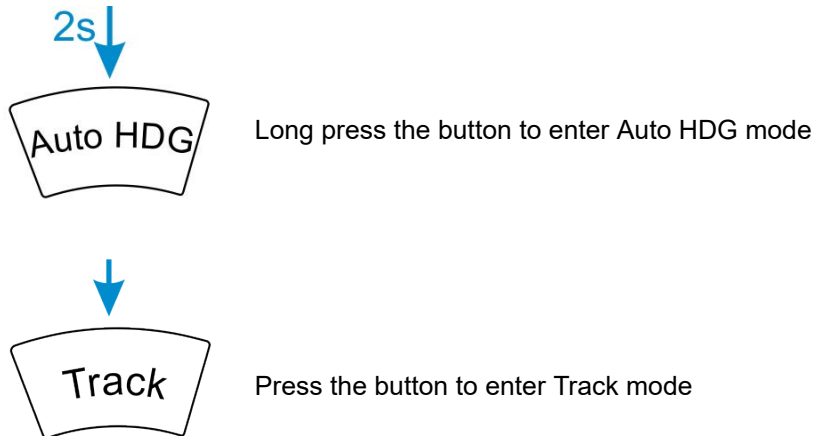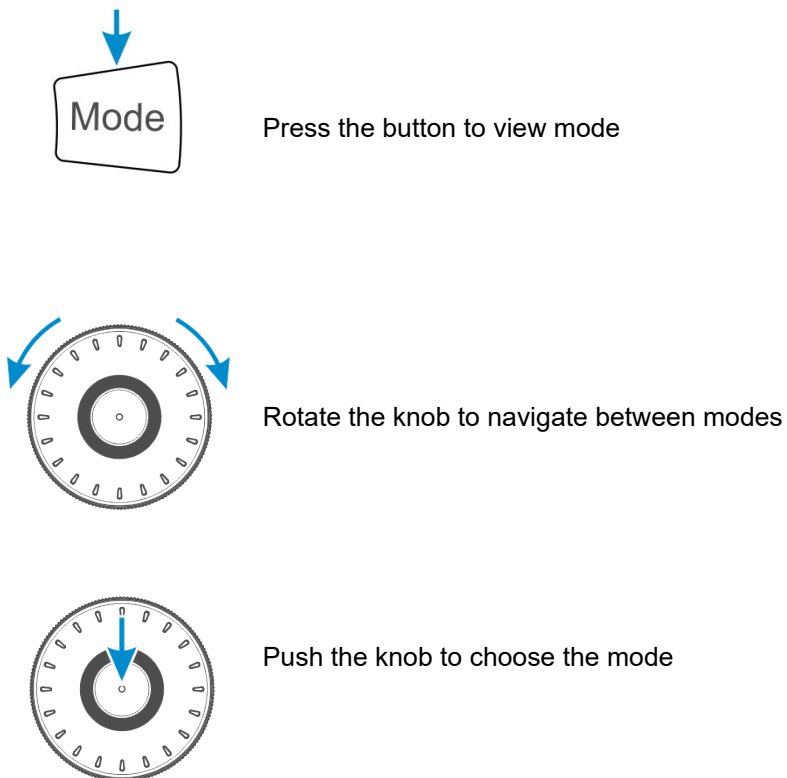
NOTE

• If **Mode** button is pressed, but there is no confirmation of selected mode within 20 seconds, Navis NavAP remains in the current control mode.

4.3 Operational Modes Descriptions

"Auto HDG" operational mode

1 Actual and set Heading

2 Offset direction and angle

3 Long press the knob for several seconds to switch between full degree and tenth of a degree

2 s

STBD FEEDBACK FAIL

234.5° A

SET HDG

1 **250.5°**

3 1/10°   2 +16→

15 ▭
10 ▭

INFO: SET RUDDER: 15º STBD FEEDBACK:10ºSTBD

Operating principle of "Auto HDG" mode

Wind/Current

Rotate the knob to set a new value of heading 1

Push knob to confirm
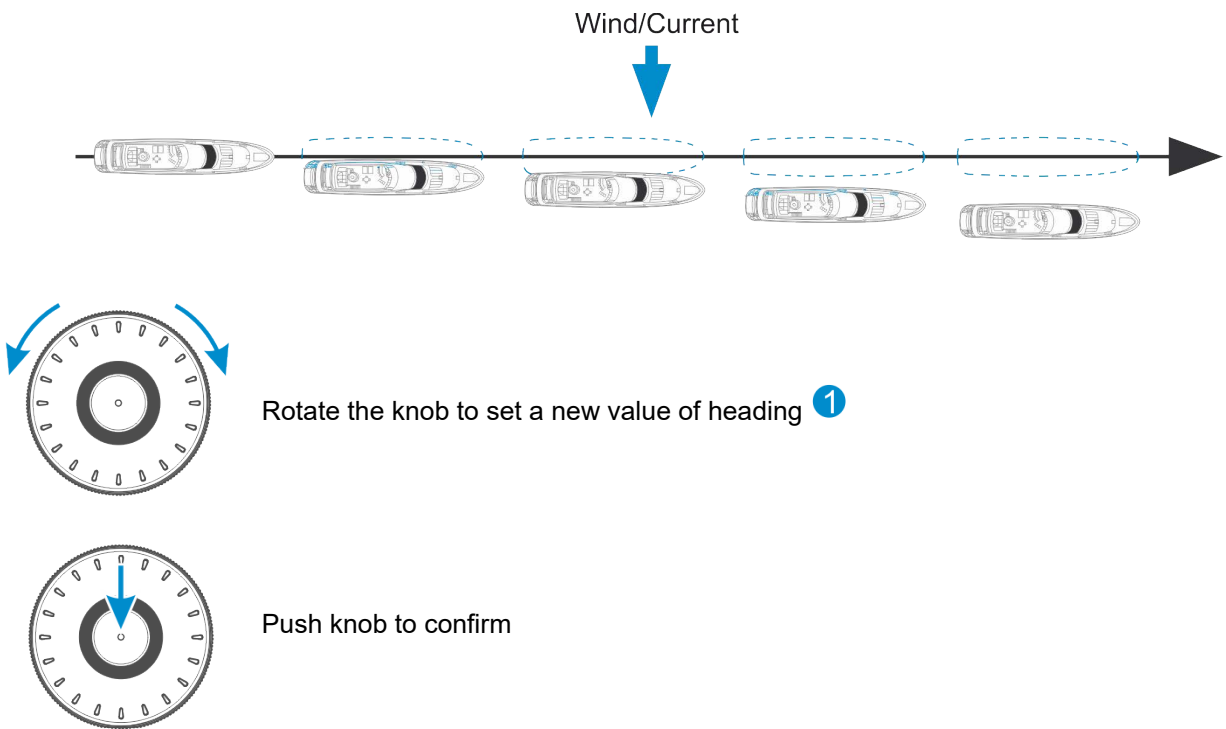
"Low Speed Heading" operational mode ("Auto HDG" submode)

1 Actual and set Heading

2 Offset direction and angle

3 Long press the knob for several seconds to switch between full degree and tenth of a degree

2 s

4 Thruster command (in %) and Ready state

GYRO1 SET ROT 090 °/min	**234.5**°	**A**
ROT:C ▷ 005 °/min	SET HDG ①**250.5**° ③1/10° ②+16➡	④ 34■ ⬤ –
	15▭ 10▭	

Selection of "Low Speed Heading" mode

- In "Standby" mode open Quick Menu and choose "AP Type": TT or TTR (**Parameters → AP Type**)
- Then go to "Auto HDG" mode

Operating principle of "Low Speed Heading" mode

Wind/Current

Rotate the knob to set a new value of heading ①

Push knob to confirm
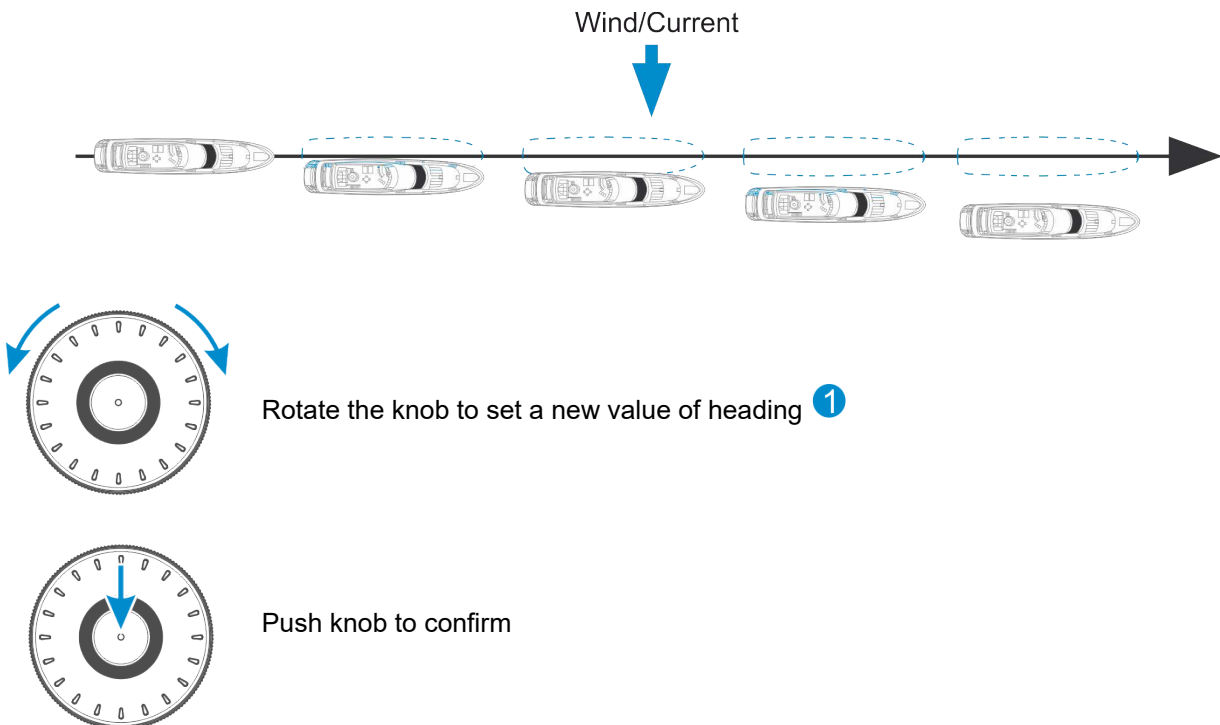
"Track" (Category A/B)

❶ Actual and set Heading
❷ Cross-track distance
❸ Waypoint ID
❹ Bearing to waypoint
❺ Remaining distance to the waypiont
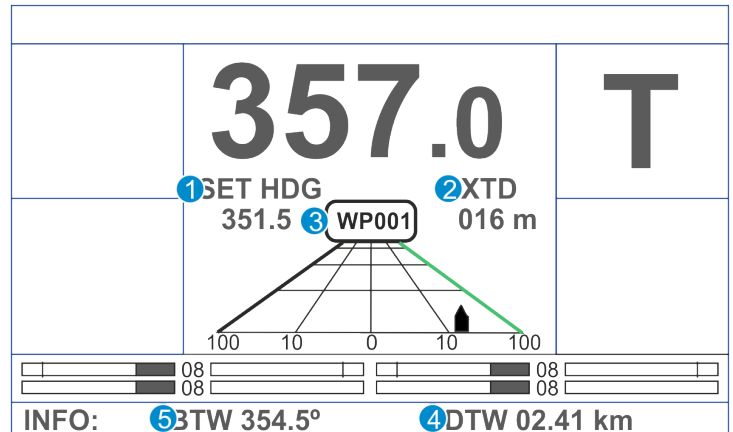
Operating principle of "Track" mode (Category A/B)
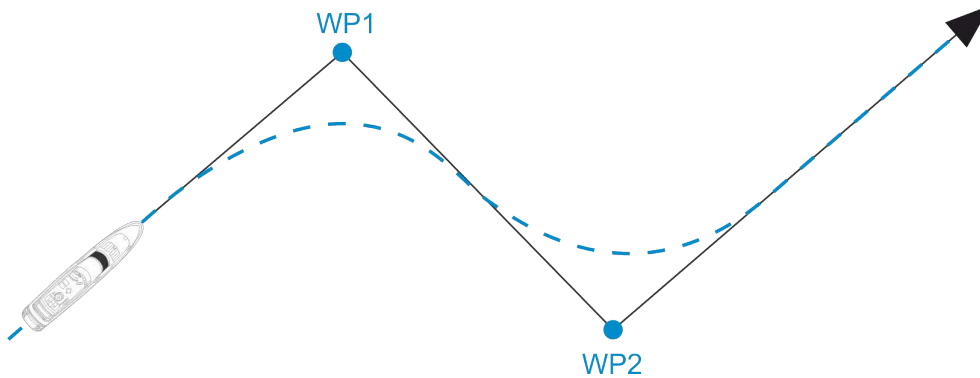
NOTE

- You will hear sound signal and warning message "New WP. Press to acknowledge" when approaching to a new waypoint. Press "Alarm ACK" button to turn off signal sound. Then push the knob to confirm a new waypoint.

- Only RAD turn method is used in "Track" mode. It will be activated automatically when "Track" mode is selected.

- Speed data source must be set as "SOG". Otherwise "Track" mode will not be activated with alarm "Change speed source". Select "Standby" mode and change the speed data source: "SOG" (**Set device → Speed**), then restart "Track" mode.

"Track" operational mode (Category C)

❶ HTS/HSC - incoming message from ECDIS

❷ Rate-of-turn - calculated data

$$359.7 \quad T_N$$

COMMANDED

HTS   ROT

__❶.-°   __❷°/min

03
03
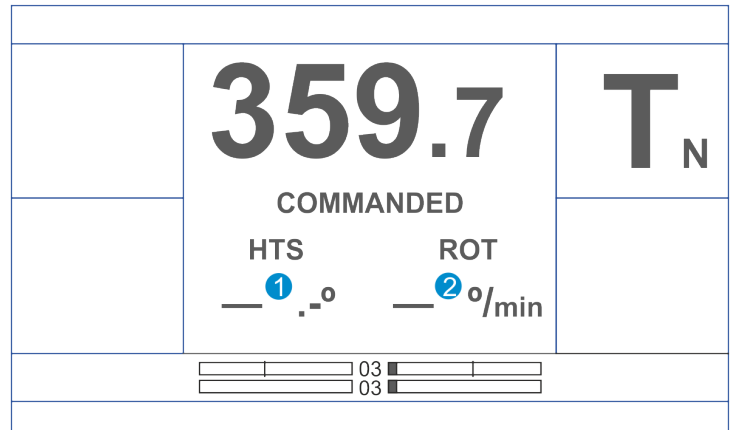
NOTE

- Message "Change speed source" means, that speed value has been set manually before activate "Track" (Cat. C) mode

- Select "Standby" mode and change the source of speed LOG or GPS (SOG) (**Set device → Speed**), then restart "Track" (Cat. C) mode

---

Screen in "Track" mode (Category C)

234.0°/1.6 NM

122.5°/1.3 NM

241.7°/1.2 NM

147.2°/1.2 NM

1 NM

N
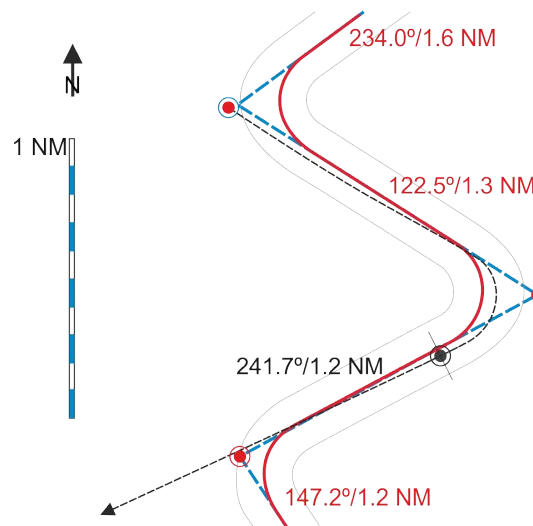
⚠ **WARNING**

- Autopilot parameters such as: Rudder limit, SET ROT, SET RAD are not used in "Track" (Cat. C) mode

"CTS Pilot" operational mode

❶ Course-to-steer order
❷ Course-over-ground
❸ Press the knob for some seconds to switch between full degree and tenth of a degree

2 s

359.5 **C**

SET COG   COG:S

❶007.8   ❷007.8º

❸1/10º

02
02

NOTE

- **COG:C** — calculated data from GPS or ECDIS (longitude and latitude)

- **COG:S** — raw data from GPS or ECDIS

Operating principle of "CTS pilot" mode

Actual heading - 45º

CTS-55º

Wind/Current
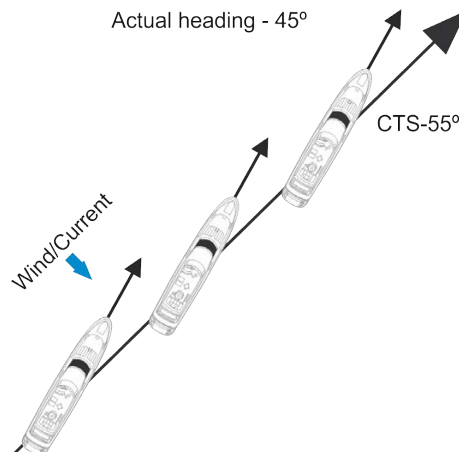
NOTE

- Only RAD turn method is used in "CTS Pilot" mode. It will be activated automatically when "CTS Pilot" mode is selected.

- Data of position and speed from GNSS are required in this mode.

- Speed data source must be set as "SOG". Otherwise "CTS pilot" mode will not be activated with alarm "Change speed source". Select "Standby" mode and change the speed data source: "SOG" (**Set device → Speed**), then restart "CTS pilot" mode.

"Fu" operational mode

❶ Rudder order and rudder angle
Rotate the knob to change angle

	048.5	F U
	SET RUDDER	
	❶11º ▷	

03
03
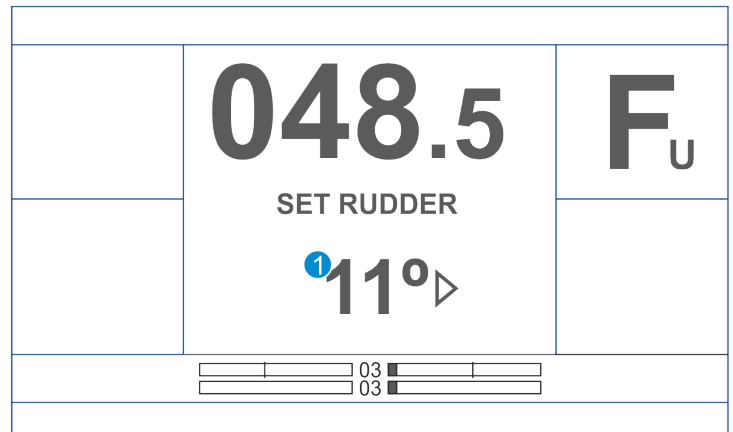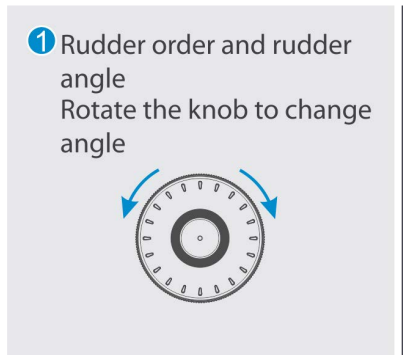
NOTE

- After switchover back to "Auto HDG" mode from "Fu" mode actual heading is taken as set heading.

- Some configurations of the autopilot are working with independent rudders. In "Fu" mode knob turn issues the synchronous rudder order for both ones.

Operating principle of "Fu" mode

Set rudder 0°

Set rudder 20°

20°
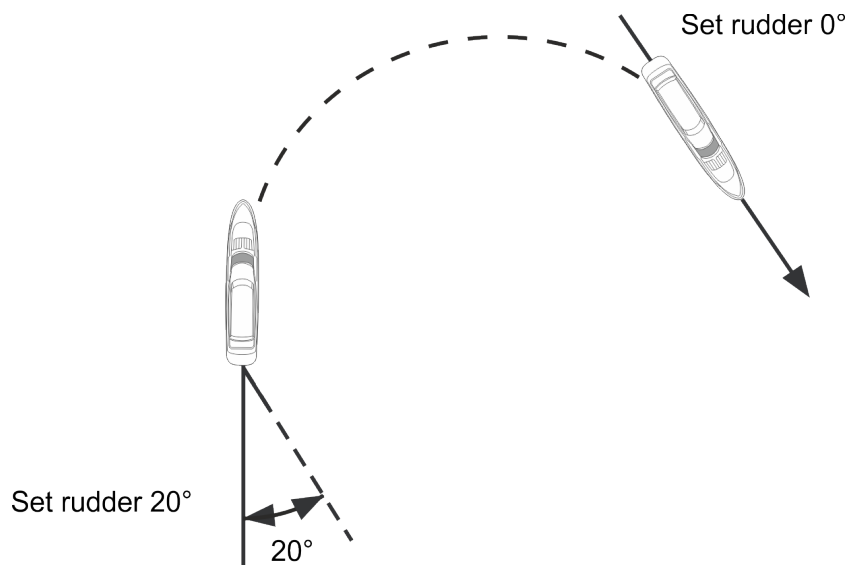
⚠ **WARNING**

- Operational parameters ROT/RAD and Rudder limit are not used in "Fu" mode

---

"Follow-up Override" operational mode

❶ Rudder order and rudder angle
Turn the lever to change angle

GYRO1	**006**.4		F_o
	SET RUDDERS		
ROT:C	**00°** ❶ **00°**		SOG:S
000 °/min			052.2 kn

08   08

NOTE

- After switchover back to "Auto HDG" mode from "Follow-up Override" mode actual heading is taken as set heading.

- Some Navis NavAP configurations operate with independent rudders. In "Follow-up Override" mode lever turn issues the synchronous rudder order for both ones.

Operating principle of "Follow-up Override" mode

Set rudder 0°

Set rudder 20°

20°
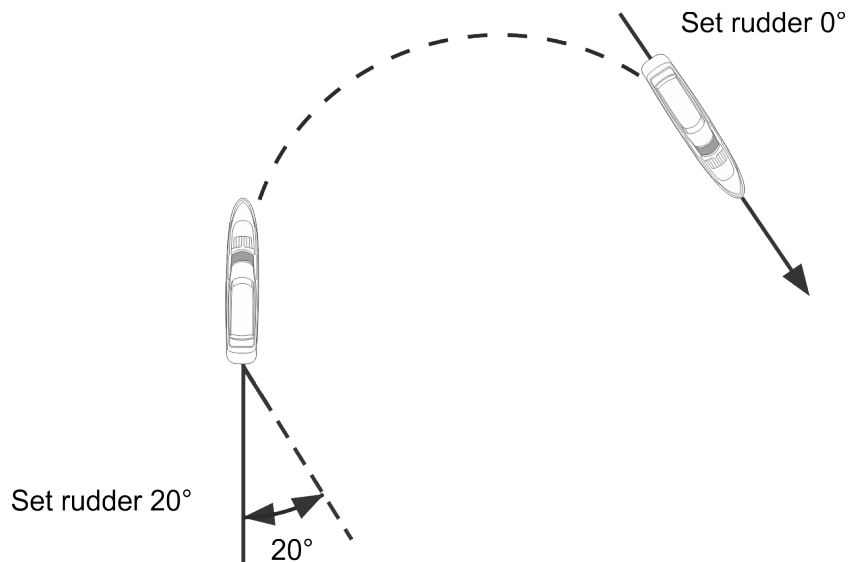
⚠ **WARNING**

- Operational parameters ROT/RAD and Rudder limit are not used in "Follow-up Override" mode

"River pilot" operational mode

1 Heading
2 Speed-Over-Ground
3 Rate-Of-Turn order
4 Actual Rate-Of-Turn
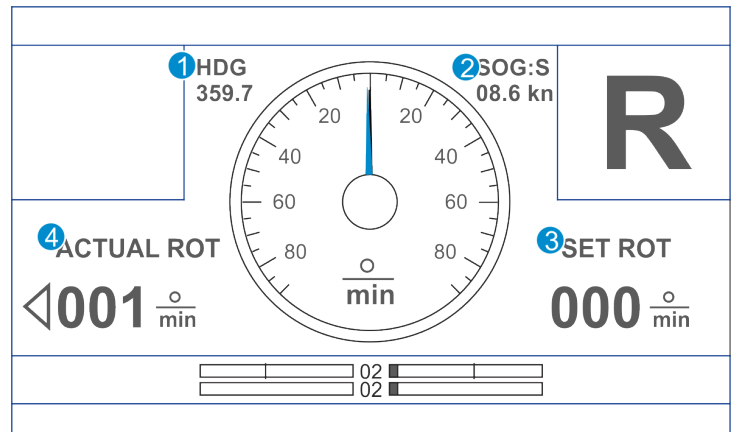
NOTE

- You can select this mode by pressing "Mode" button and knob rotation (then confirm by pressing the knob) if no ROT tiller is installed. Otherwise you can activate the mode by pressing the corresponding button on ROT tiller only.

Operating principle of "River pilot" mode
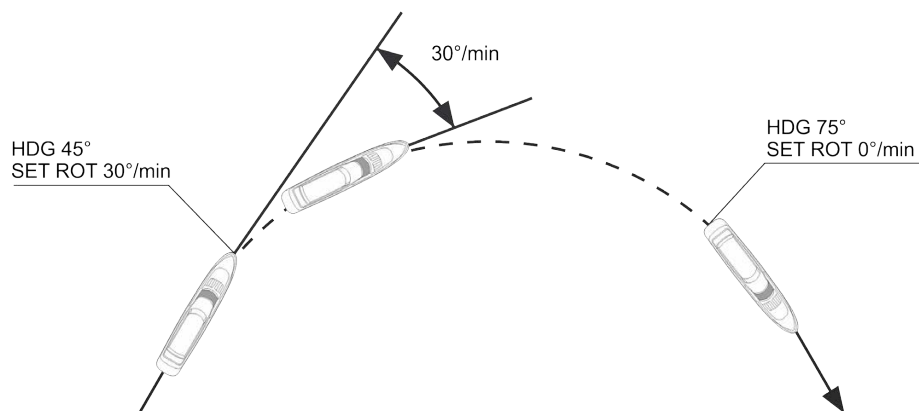
"Wind vane" operational mode

❶ Heading
❷ Speed-Over-Ground
❸ Set relative angle of the wind
❹ Calculated wind data
❺ Wind data from sensor

❶HDG
359.3

❷SOG:S
08.6 kn

V

180

90 056° 90

❹TRUE WIND: CALC
280°   19.4 kn

❸SET ANGLE
056°PORT

❺REL WIND: SENS
056°P 21.6 kn

180

02
02
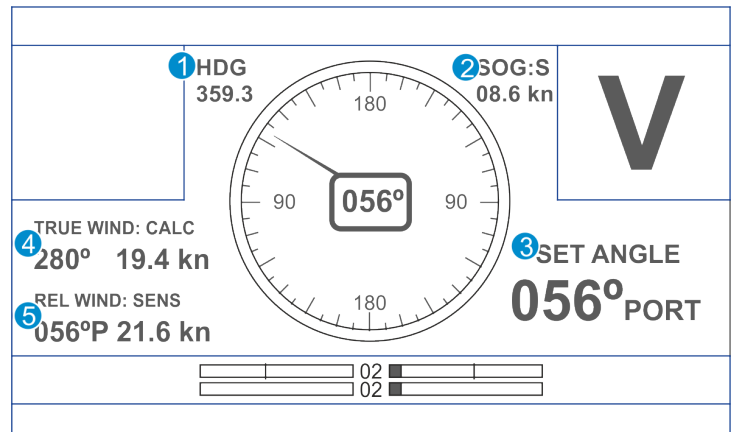
Operating principle of "Wind vane" mode

WIND
Relative: 45° STBD

WIND
True: 60°

Boat Heading: 315°
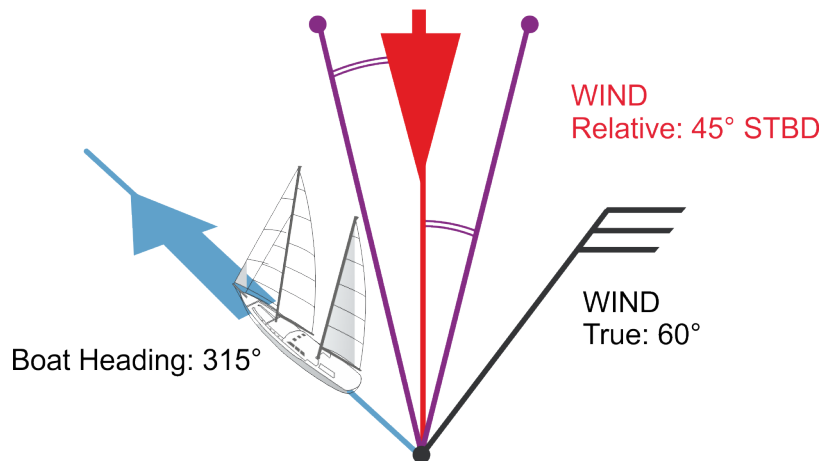
Indicators of wind direction

• **S** — starboard side

• **P** — port side

"Dodge" operational mode

① Actual and set heading

② The stored value of the preset heading

③ Offset direction and angle

Turn the lever to change heading

017.0 A_D

①SET HDG

028.6

PREV SET: 013.6° ← +3.2° ③

② 08 08 08 08
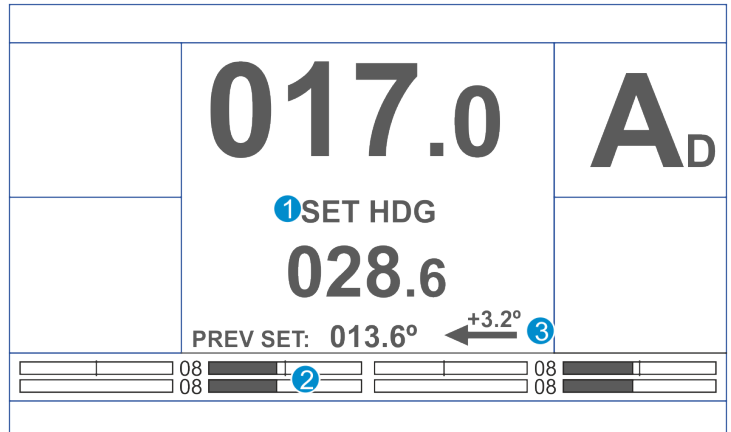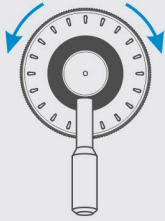
Operating principle of "Dodge" mode

0°

30°

0°

30°
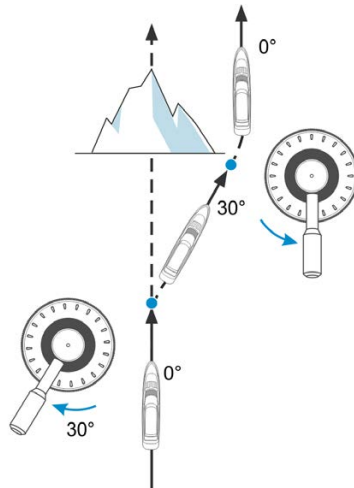
Selection of "Dodge" mode
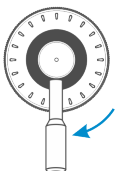
Set tiller in a position "Dodge" mode

28

Chapter 5

Menu Overview

5.1 Quick Menu

5.1.1 Menu Access
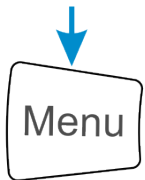
Press the button to open Parameters dialog
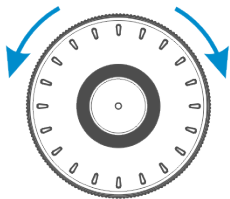
Use knob to navigate between menu items
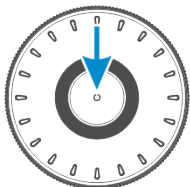
Push knob to confirm

NOTE
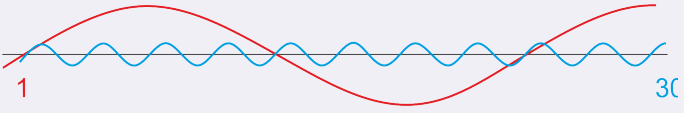
- Press **Menu** or **Cancel** button to exit from any Menu

5.1.2 Menu "Parameters"

PARAMETERS	
Heading Low Sns	05
Rudder Limit	35
Course Precision	10
Wind Precision	05
Wind Shift	150
AP Type	TTR
AP Tuning num	Set1

This menu is used to change main Autopilot operational settings.

Menu view and set of items depend on the system configuration and used control modes.

Parameter	Description
Heading sense / Heading Low Sns Range: 1 (low) – 30 (high)	Rudders activity: • **Decrease parameter** — a more "inert" steering • **Increase parameter** — a more "energetic" steering Parameter name depends on set AP Type: • **Heading sense** — AP • **Heading Low Sns** — TT/TTR
Rudder Limit Range: 5 (low) – Max*	Rudder angle limit
Course precision Range: 1 (low) — 30 (high)	Strictness of heading maintenance to compensate XTD or keep set COG. The parameter is available if "Track" or "CTS" mode is activated in Installation menu.
Wind Precision Range: 1–9	The parameter determines with which ROT (how fast) AP will compensate difference between set and actual wind. The parameter is available if "Wind Vane" mode is activated in Installation menu.

⚠ **WARNING**

• * — Maximal Rudder Angles are set by service engineer during Rudder Order/Feedback calibration

Parameter	Description
Wind Shift* Range: Off, 2, 10, 15, 30, 50, 90°	Max. allowed difference between set and actual relative wind. The parameter is available if "Wind Vane" mode is activated in Installation menu.
AP Type Range: TT, TTR, AP	Types of steering the vessel: • **TT** — only thruster(s) • **TTR** — thruster(s) and rudder(s) • **AP** — only rudder(s)
AP Tuning num	Number of tuning set. Applicable if more than one tuning set was created during commissioning procedure

⚠ **WARNING**

- * — When difference between set and actual wind angle exceeds the limit, AP system is switched to "Auto HDG" mode and "Wind shift. Check settings" alert is generated. Alert can be disabled if parameter "Wind Shift" set as "Off".

- Parameter "Wind Shift" also limits a new set wind value in "Wind Vane" mode.

5.2   Extended Menu

5.2.1   Extended Menu Access

Long press button to open Menu dialog

MENU
Set Devices
Panel Settings
AP Regulators
Alert Logs
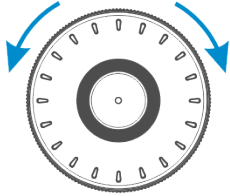
Use knob to move cursor over the menu items
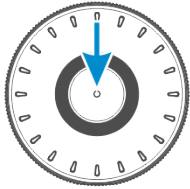
Push knob to confirm

5.2.2   Extended Menu Tree

MENU

1. Set Devices
- **1.1. Set Compass**
  - 1.1.1. Master
  - 1.1.2. HDG Monitor
- 1.2. Compass
- 1.3. GPS Data
- 1.4. Speed
- 1.5. ROT
- 1.6. COG/SOG
- **1.7. Local Time**
  - 1.7.1. Local Time
  - 1.7.2. 12/24 hour

2. Panel Settings
- 2.1. Active Palette
- 2.2. Custom Setting
- **2.3. Custom Setting**
  - **2.3.1. Day Brightness**
    - 2.3.1.1. LCD
    - 2.3.1.2. Buttons
  - **2.3.2. Night Brightness**
    - 2.3.2.1. LCD
    - 2.3.2.2. Buttons
- **2.4. Skin Selection**
  - 2.4.1. Day Skin
  - 2.4.2. Night Skin
- 2.5. Button Click
- 2.6. Alarm Test
- 2.7. Measure

3. JP Tuning*
- 3.1. Joystick Gain
- 3.2. Ahead
- 3.3. Curve Num
- **3.4. Alloc Tuning**
  - 3.4.1. Range X
  - 3.4.2. Range Y
  - 3.4.3. AS Prop Fix
  - 3.4.4. Range ER
- **3.5. Alloc Mode**
  - 3.5.1. Balancing
  - 3.5.2. Step Vx
  - 3.5.3. Step Vy
  - 3.5.4. Duty Rate
- **3.6. Bal Eng/Rudd**
  - 3.6.1. Rudder Bal
  - 3.6.2. Rudder Max
  - 3.6.3. K Prop Zero
  - 3.6.4. K Prop Bal
  - 3.6.5. K Prop Max

4. Power Limits*
- 4.1. Bow Thruster
- 4.2. St Azi THR movers

5. JP Regulators*
- 5.1. Current Sens X
- 5.2. Current Sens Y
- 5.3. Speed Sens X
- 5.4. Speed Sens Y

6. AP Regulators**
- 6.1. H Filter
- 6.2. ROT
- 6.3. Rudder
- 6.4. ROT ramping

7. JP Parameters*
- 7.1. Turn Rate
- 7.2. Heading Sens
- 7.3. Position Sens
- 7.4. High HDG Sens

8. Alert Logs
- 8.1. UserAlertList
- 8.2. UserAlertLog
- 8.3. SystemAlertList
- 8.4. SystemAlertLog

NOTE

- Menu view and set of items depend on the system configuration and used control modes

- * — for Navis NavJP only. See NavJP User Guide for details.

- ** — The parameters are set during Navis NavAP installation. It is strongly recommended NOT to change the values after commissioning.

5.2.3 Parameter Descriptions

Parameter	Description
Set Devices	
Set Compass Range: Slave, Master, HDG monitor	This menu is only available if more than one Heading source is connected to Navis NavAP.
Set Compass → Slave	For information purposes only. If the "Heading monitoring" is activated, the name of slave compass is shown in this line.
Set Compass → Master Range: GYRO N, THD, HMS ID1, MAGN	Select device that sends the heading data used for Navis NavAP operation: • **GYRO1, GYRO2** — Gyro compass(-es) • **THD** — GNSS principles (Satellite Compass) • **HMS ID1** (**HMS ID2** is Slave always) — ID of the Master and Slave compasses from an external HMS system (5 first letters of ID1 and ID2 fields from incoming HMR sentences) • **MAGN** — magnetic compass with NMEA output
Set Compass → HDG monitor Range: OFF, 2, 3, 5, 8, 10, 15	Monitoring of the actual heading sensor (Master) by an independent second heading source (Slave): • **OFF** — heading monitoring is disabled and the alert "Heading Monitor off" is disabled as well • **2, 3, 5, 8, 10, 15** — heading monitoring is enabled, on exceeding this value, the alert "HDG Monitor. Deviation from second source" is generated. The heading monitoring is a mandatory function for all ship where 2 or more heading sensors are required. If more than one compass was installed during installation procedure then heading monitoring is enabled automatically otherwise it is disabled.
Compass Range: GYRO N, THD, MAGN	Indicate device that sends the actual heading data to Navis NavAP (default menu): • **GYRO1, GYRO2** — Gyro compass(-es) • **THD** — GNSS principles (Satellite Compass) • **MAGN** — Magnetic compass with NMEA output

⚠ **WARNING**

• The alert "Magnetic Compass in use" is generated when magnetic compass is selected for heading control as Master Compass. This alert remains active (i.e. kept in alert list and "Alarm ACK" button kept with steady red back-light) until an appropriate heading source (GYRO1, GYRO2 or THD) is re-selected.

Parameter	Description
GPS Data Range: GPS, ECDIS	Select device that sends vessel position data to the Navis NavAP: • **GPS** — position data from D-GPS (GGA, GLL, GNS, RMC NMEA messages) • **ECDIS** — position data from navigation system (ECDIS/ECS) **NOTE** Position data is used for: • indication purposes (if GPS/ECDIS is connected to Navis NavAP) • calculation of COG/SOG by incoming GGA, GLL sentences (if VTG sentences are unavailable from GPS/ECDIS)
Speed Range: SOG, LOG, ECDIS LOG, 0–40	Select device that sends vessel speed data to the Navis NavAP: • **SOG** — speed data from GPS or ECDIS, depending on the selected item in the parameter aforementioned "Position" • **LOG** — speed data from Water Speed Log • **ECDIS LOG** — Speed Through Water data from navigation system (ECDIS, ECS) by their VHW / VBW NMEA output • **0–40** — Manual speed setting, in knots
ROT Range: SENS, CALC	Select the source for the ROT (Rate-Of-Turn) data in the Navis NavAP: • **SENS** — ROT data from an external ROT NMEA sensor • **CALC** — Calculated ROT data. Calculation based on the information from primary heading source (for example, from Master GYRO compass) Presentation Units: Degrees per minutes all the time.

⚠ **WARNING**

• Position data source can be changed only in **Standby** mode.

• Speed data source can be also changed only in **Standby** mode, excepting Manual Input (0–40 kn) for some Heading Control modes (i.e. for "Auto", "Fu", "FFU", "Follow-up Override" and "River Pilot" modes).

• Please be noted that "Track" and "CTS Pilot" control modes require "SOG" speed data source. Otherwise "Track" or "CTS pilot" mode will not be activated with alarm "Change speed source".

Parameter	Description
COG/SOG Range: SENS, CALC	Select the source for the Course-Over-Ground and Speed-Over-Ground data (COG-SOG) data in the Navis NavAP: • **SENS** — COG-SOG data from an external GPS sensor or ECDIS • **CALC** — Calculated COG-SOG data. Calculation based on the position information from GPS or ECDIS system (Latitude and Longitude) Presentation Units: Degrees and knots.
Local Time	Submenu used for local time correction for Ferry Track mode. Applicable only for Ferry Track mode.

Panel Settings	
Active Palette Range: Day, Night	Display mode: **Day** or **Night**
Custom Setting Range: Yes, No	Custom brightness settings enabling/disabling: • **Yes** — customized brightness can be adjusted • **No** — brightness is controlled in Dimming mode
Custom Setting Range: Day Brightness, Night Brightness	The customized brightness can be adjusted in that menu, if selected parameter set to **Yes** (see above): • **Day Brightness** — brightness level for Day mode • **Night Brightness** — brightness level for Night mode Use knob to set required custom brightness. Setting range of brightness from ambient conditions is presented in the table below.
Skin Selection Range: Day Skin, Night Skin	This menu item is used for selection of the presentation in **Day** and **Night** modes. Available skins: • **Day Skin** — Default, Black, SilverLight • **Night Skin** — Gray, Green
Button Click	This menu item is used to enable or disable a buttons click via internal Beeper during their usage.

Parameter	Description
Alarm Test	Press knob to generate a test alarm. Then all LEDs will be highlighted, internal Beeper will be activated and "Alarm ACK" LED will be blinking. "ALARM test. Press ALARM button for stop alarm" message will be displayed. Press **Alarm ACK** button to stop the test.
Measure Range: NM, km	Measurement unit: • **NM** — XTD is presented in meters up to 185 m, after — in NM in XX.XX NM format. DTW is always presented in NM as XX.XX NM • **km** — XTD is always presented in meters, DTW is always presented in kilometers as XX.XX km

Presetting and setting range of brightness from ambient conditions are presented in the table below.

Ambient Condition	Item	Default	Settings Range
Day	Screen (LCD)	50	1..100
	Buttons	80	1..100
Dusk	Screen (LCD)	50	1..100
	Buttons	80	1..100
Night	Screen (LCD)	50	1..100
	Buttons	50	1..100

Use knob to set required custom brightness.

⚠️ **WARNING**

• The **Panel Settings** menu is the only one menu item, which can be accessible at any locked network panels. Access to other menu items is prohibited on locked network stations.

Alert Logs	
User Alert List	Opens list of alerts visible for the operator
User Alert Log	Opens log of alerts visible for the operator
System Alert List	Opens list of all alerts (including system (invisible) ones)
System Alert Log	Opens log of all alerts (including system (invisible) ones)

5.3   Alarm Settings

Menu "Alarm Settings" is used to activate/deactivate Alert conditions and their operating parameters.

ALARM SETTINGS	
Off Heading Alarm	5°
XTD Alarm	Off
Off Course Alarm	Off

2s↓
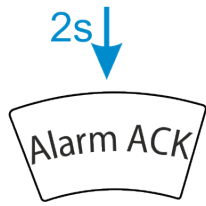
Long press the button to open Alarm Setting dialog
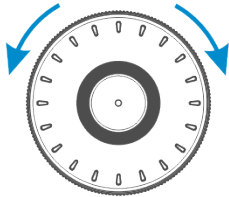
Use knob to move cursor over the menu items
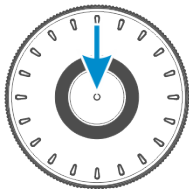
Push to confirm

Parameter	Description
Off Heading Alarm Range: 2, 3, 5, 8, 10, 15, 20°	Limit of deviation between Actual Heading and Set Heading. "Off Heading. Check control settings and limits" alert is generated when the limit is exceeded.
XTD Alarm Range: Off, 5, 10, 20, 50, 100, 185, 500 m	Limit of deviation between Current Ship's position and the leg of Route. "Off Track. Check control settings and limits" alert is generated when the limit is exceeded.
Off Course Alarm Range: Off, 2, 3, 5, 8, 10, 15, 20, 30, 40, 60°	Limit of deviation between set COG and actual COG. "Off Course. Check control settings and limits" alert is generated when the limit is exceeded in "Track" or "CTS Pilot" control mode.

⚠ **WARNING**

- "Off Heading. Check control settings and limits" alert is not operating during the turn, i.e. when new heading is confirmed by operator via knob. This Alert is only applicable for"Auto" control mode.

- "Off Track. Check control settings and limits" alert is not operating during the turn to the new leg of the Route (i.e. to new WP). This alert is applicable for "Track" control mode only. For minimize alerts on the bridge we recommend to set value more than the value set in ECDIS (as a part of TCS Category C).

- "Off Course. Check control settings and limits" alert is not operating during the turn to the new leg of the Route (i.e. to new WP) or to the new "SET COG" direction. This alert is applicable for "Track" and "CTS Pilot" control modes only.

Chapter 6

Fault Finding

6.1 Alerts Log

Menu "Alerts Log" for service purposes only. It's only available in Standby mode.
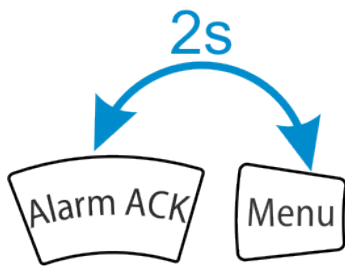
Long press buttons to open Alerts Log

UTS TIME					ALERTS LOG	PAGE 25/25
Start	Stop	Ack	Mode	ID		
22:12:42 11-08-2016	22:13:39 11-08-2016	22:12:53 11-08-2016	A	141	ROT/RAD unreachable. Change rudder limitation	
22:12:52 11-08-2016	22:13:49 11-08-2016	22:12:50 11-08-2016	A	178	Rudder on limit. Increase Rudder limitation	
11:42:32 11-08-2016	11:43:59 11-08-2016	11:42:57 11-08-2016	A	141	ROT/RAD unreachable. Change rudder limitation	
11:42:48 11-08-2016	11:42:55 11-08-2016	11:42:57 11-08-2016	A	178	Rudder on limit. Increase Rudder limitation	
			Press MENU to exit			
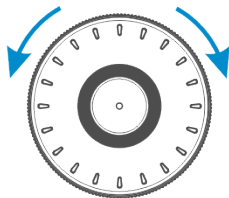
Use knob to flip pages

6.2 Alarms and Warnings

Autopilot finds the following conditions:

- Absence or loss of main power

- Excess of set off-heading limit

- Excess of set off-track limit

- Failure of any data sensor

- Deviation of heading information in use from the second heading source beyond a preset limit (heading monitor function)

- Failure of any Autopilot component

- Failure of steering gear

6.2.1 Alert Messages
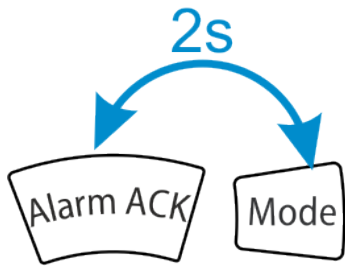
Long press buttons to open Alerts List:

UTS TIME		ALERTS LIST	PAGE 01
11-08-2016 00.00.45	🔊	ROT/RAD unreachable. Change rudder limitation	
11-08-2016 00.00.15	✅	Ship speed is too low for HDG control. Increase speed	

Press MENU to exit

6.2.2 Alert Indicators

Status	Visual indication	Symbol	Audible signal	Priority
Alarm active, not acknowledged	Red, flashing		Accompanied by an audible signal, as 3 short audible signals repeated every 7 s	High
Alarm active, silenced	Red, flashing		Silent	
Warning active, not acknowledged	Yellowish orange, flashing		Accompanied by an audible signal, as 2 short audible signals, to be repeated at least once per 5 min or be replaced by an alarm	
Warning active, silenced	Yellowish orange, flashing		Silent	
Alarm rectified, unacknowledged	Red, flashing		Silent	
Warning rectified, unacknowledged	Yellowish orange		Silent	
Alarm active, acknowledged	Red		Suppression of audible signal (silent)	
Alarm active, responsibility transferred	Red		Silent	
Warning active, acknowledged	Yellowish orange		Silent	
Warning active, responsibility transferred	Yellowish orange		Silent	
Caution active	Yellow		Silent	Low
Normal state	Empty field	None	Silent	

Alert List is presented in Appendix A

6.3   Power Failure

Navis NavAP system uses two independent power sources and does not have a built-in battery!

Loss of one of the power supplies is countered by automatic switching to the second without loss of functionality and without interrupting the current mode of operation. In case of power failure or degradation, a corresponding alert is issued on the control panel and in the alert management system.

6.3.1   Input Data Control

The excess of data age that is set for each value is a sensor failure criterion. Age of message (data) is calculated as a difference between current computer time and time of data acceptance. Data Age is reset when new adequate data is received, and new time of data acceptance is set (update moment). Data is considered as "inadequate" in the following cases:

Incoming message format is corrupted or check sum failure is detected (for serial ports):

- Parameter permitted values are exceeded;

- Parameter increment value is exceeded.

In case the incoming data is detected as inadequate, the time of the message reception is not updated, and the previous data remains unchanged. In case the data age exceeds the value set for each sensor, alert is generated. Navis NavAP reaction to sensor failure depends on sensor type and AP operating mode.

6.3.2   Steering Gear / Thruster Control Failure

The "Steering gear failure" can appear as a result of the following:

- RFU failure;

- Hardware Feedback signal from Steering System or Rudder Feedback Unit does not respond to discrepancy between set and current rudder values;

- The required and actual direction of rudder movement disagrees;

- "Ready" signal from Steering System or from tunnel thruster(s) is lost.

Chapter 7

Hardware

7.1 Main Components

7.1.1 APH-7 Control Panel

APH-7 Control Panel is supplied with the system by default (1 pc).
Up to five operator units can be supplied optionally in case of network configuration.
See Chapter 2.1 for more details.

7.1.2 APH-5 Control Panel

APH-5 Control Panel is supplied with the system by default (1 pc).
Up to five operator units can be supplied optionally in case of network configuration.
See Chapter 2.2 for more details.

7.1.3 MCU/ACU Control Unit

Main Control Unit (MCU) — Control unit combined main controller, rudder controller, thruster controller in one unit.

Additional Control Unit (ACU) — Control unit combined rudder controller, thruster controller in one unit. Used if more than one rudder required.

7.1.4 SMS-B Mode Selector (option)

Navis NavAP Heading Control System can be connected to the existed Bridge Steering Mode Selector or supplied with an optional Navis Steering Mode Selector SMS-B Type 1.

Selector has two or three positions (**AP OFF** – **AP ON** or **NFU** – **FFU** – **AUTO**) depending on availability of the FFU control mode in Navis NavAP and controls a commutation of rudder control (see table below). Steering Mode Selector must be installed in the wheel-house at the Central Navigational Bridge.

Customized or existed steering mode selector on the Navigational Bridge may be used instead of SMS-B Type 1 or 2 by customer request.
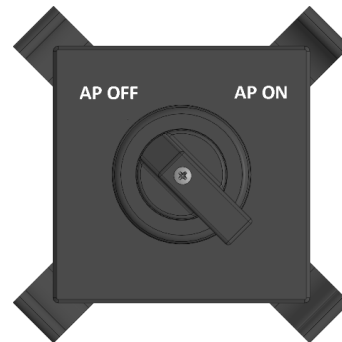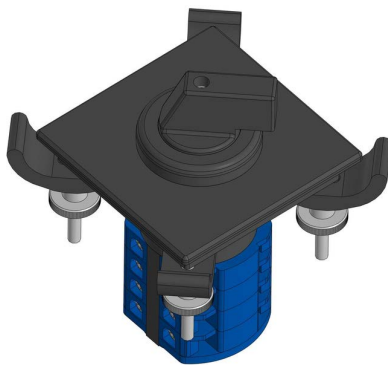
SMS Position	Description
AP OFF	Navis NavAP is in **Standby** Mode. Prefix "S" on the APH-5/APH-7 control panel
AP ON	Navis NavAP is in **AUTO** control mode (Automatic heading control) and operates as Autopilot. Prefix "A" on the APH-5/APH-7 control panel

NOTE

• **SMS-B Type 3** selector with three positions (**AP** – **STBY** – **JP**) is supplied instead of the SMS-B Type 1 if Navis NavAP Heading Control System is a part of the NJoy Advanced Joystick Control System.

7.1.5 LVR-NF-AP (option)

LVR-NF-AP panel is designed for control station/mode selection and activation various AP modes control including manual (Follow-up Override) depending on panel modification.

LVR-NF-AP panel is an extension of the APH control panel keyboard. It should be connected and located close to the APH panel.

External FFU/ROT tiller or wheel can be used instead of LVR-NF-AP panel.
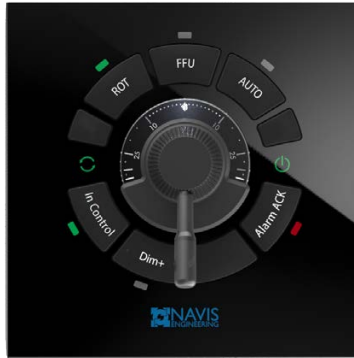
The following modifications are available for LVR-NF-AP panel:

Modification	Description
ROT-FFU-AUTO	For operation in "Follow-up Override" and "River Pilot" control modes
DODGE-FFU-AUTO	For operation in "Follow-up Override" and "Dodge" control modes
CTS-FU-AUTO	For operation in "Follow-up Override" and "CTS Pilot" control modes
Wind Vane-FFU-AUTO	For operation in "Follow-up Override" and "Wind Vane" control modes

NOTE

• FFU/ROT tiller (LVR-NF-AP) does not present any alerts. Alerts related to tiller are presented on the APH control panel.

7.1.6 IB-TCS-2 Interface Box (option)

TCS Backup Interface Box IB-TCS-2 (optional, 200 x 300 x 120 mm) is intended for vessels under requirements of DNV NAUT-AW class notation which require additional safety system (IB-TCS-2).

Rudder commands generated by APP-Master (located in the main processing unit (MCU)) and APP-Backup (located in the unit IB-TCS-2) are the same.

In case of critical failure with MCU or rudder control unit(s) (ACU) — relays located in the MCU are released, SS input "Rudder command" is disconnected from module APP-Master output and connected to APP-Backup. System will automatically maintain the instant heading if the vessel is on a straight course (leg), or the instant ROT (radius) if in a turn; turn will be completed when the vessel reaches the last set heading.

Unit IB-TCS-2 has to obtain NMEA heading data from independent channel of HCS and it has an independent power supply as well.
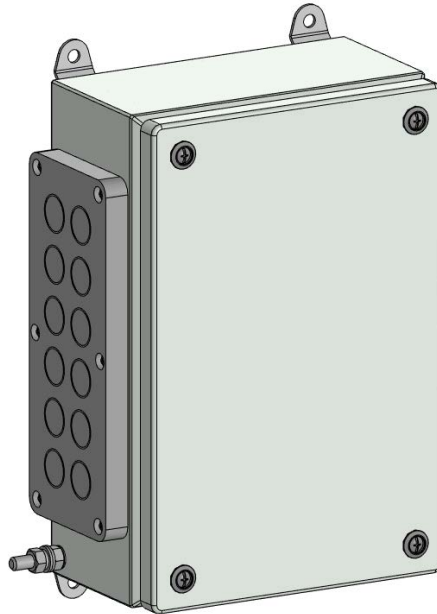
7.2 Data Sources

7.2.1 Compass

The Navis NavAP receives heading data from Gyrocompass/satellite compass (NMEA: HDT, THS messages) or magnetic compass (NMEA: HDG, HDM messages).
Gyrocompass is recommended.
Heading data update frequency is to be at least 10 Hz (100 ms).

7.2.2 Rate-of-Turn

The Navis NavAP receives Rate-Of-Turn data from Gyrocompass (if provided via the same serial port) or from the separate connected ROT sensor (NMEA: ROT messages).

NOTE

- An internal Navis NavAP heading adaptive algorithm uses only calculated ROT data. Setting **ROT=SENS** is intended only for presentation on APH panel display.

7.2.3 Water Speed LOG

Ship relative speed data (Speed-Through-Water) is used to adjust heading adaptive algorithm to control vessel in different control modes. Vessel relative speed can be received via serial port (VHW or VBW messages).

7.2.4 GPS Receiver

Speed-Over-Ground data can be used in Autopilot control modes instead of Speed-Through-Water data from the log sensor.
Position and Speed data are provided by GGA, GLL, RMC and GNS messages.
Speed-Over-Ground is obtained from incoming VTG.
GPS sensor is compulsory for operation in following control modes: "CTS Pilot" and "TRACK".
ZDA messages used for time stamp in messages for BAM (CAMS).

7.2.5 Wind Sensor

Relative Wind angle (directly from anemometer or calculated by incoming True Wind data) is used in "Wind Vane" control mode for Sailing Yachts only.
Relative Wind direction and speed can be received via serial port (VWR or MWV (Relative) messages).
True Wind direction and speed can be received via MWV (True) or MWD messages.

7.2.6 INS Sensor (Work with INS)

Heading, Speed and GNSS data come into the system from the ship's Integrated Navigation System. Additionally, the INS system sends messages about the quality of navigation information. Depending on the status of the information quality, it can be used for different control modes. The navigation information quality indicator is displayed in color.
The table below defines the marking of data that have been checked for validity, plausibility and integrity within the INS.

Vali-dity check	Plausi-bility check	Integrity monitoring	INS data marking			Remark
			Validity flag or Status flag or Mode indicator (e.g. GLL)	Plausibi-lity sta-tus (e.g. NSR)	Integrity status (e.g. NSR)	
Fail	Fail	Not possible	Invalid	No	Failed	Data are marked in yellowish-orange or displayed with yellowish-orange dashes. The data cannot be used for any function.
Fail	Pass	Not possible	Invalid	Yes	Failed	
Pass	Fail	Not possible	Invalid	No	Failed	
Pass	Pass	Not possible due to lack of second sensor, source or method	Valid	Yes	Doubtful	The data are marked by yellow. The data can only be used for the Heading control mode.
Pass	Pass	Fail	Valid	Yes	Failed	
Pass	Pass	Pass	Valid	Yes	Passed	Data are suitable for any con-trol mode

7.2.7 Track Control System

⚠️ **WARNING**

- This functionality is not compliant to the SOLAS convention before approved as part of a Track Control System

Autopilot track control mode available in Navis NavAP: "TRACK":

"TRACK" — Full track control on straight legs and turns. Navis NavAP receives commanded Heading-To-Steer and commanded Rate-Of-Turn from TCS and takes them as a preset heading and preset rate of turn (HTC or HSC messages). AP operates as a part of TCS Category C.

NOTE

- Only one Track Control Mode can be configured at once only by the Service Engineer on board (using **Installation Menu**, setting **Track mode**). Track Control Mode and its interface should be specified during installation of the Navis NavAP Heading Control System.

7.2.8 Rudder Feedback Unit

The Navis NavAP can be connected to a Rudder feedback unit (RFU) with analog output.

RFU type is specified at the time of Navis NavAP installation on the vessel. If MCU/ACU is interfaced with Steering system (SS) via valves / proportional valves, RFU (Feedback signal) is compulsory to perform rudder follow-up control.

7.3 Data Sent Out

Autopilot provides the following output sentences approved according to IEC 61162-1 "Maritime navigation and radio communication equipment and system — Digital Interfaces — Part 1: Single talker and multiple listeners" (Edition 4.0, 2010-11).

Output messages are shown in the table below.

Output NMEA sentences (Ports "ECDIS OUT", "VDR" and "NMEA OUT")	
NMEA Sentence	**Description**
HTD	Heading/track control data
RSA	Rudder sensor angle
ROR	Rudder order angle
ALR	BNWAS Back-up navigator call
EVE	BNWAS Operator activity
HMS	Heading Monitor Data (Navis NavAP operates as the HMS for other systems)
HMR	Heading Monitor Limit (Navis NavAP operates as the HMS for other systems)
HDT or HTD	Retransmission of the incoming HDT messages from the Master compass
ALF, ALC, ARC	Communication with CAM System
AGALR, AGEVE	Communication with BNWAS System

Transmission interval — 0.1 sec or 1.0 sec (selectable in the **Installation Menu**).

Appendix A

Alert List

Explanations to the alert table:

1. Cautions have no escalation.

2. Warnings are escalated to warnings. The escalation time is 300 seconds.

   The exception is an **Off heading warning** ID3025, if not confirmed or rectified during 30 seconds it is escalated to an **Off heading alarm** ID3024.

3. Alarms have no escalation. Repeating sounds every 7 seconds.

   The exceptions are Lost of Heading control alarms. They are escalated after 30 seconds to the level of activating of Back-up Navigator call to BNWAS.

4. For NavAP and AlphaPilot MFM Category A alerts can't be acknowledged from CAMS.

   If alert can't be acknowledged from CAMS, we send respond to CAMS with an ARC sentence of refusal when receiving an ACN for acknowledge request.

5. Autopilot system supports transfer of responsibility for alerts. If a transfer of responsibility is supported for a particular alert, then system will transfer responsibility. If the transfer of responsibility for the alert is not supported, then to the transfer of responsibility request, system will forward a response to the CAMS with an ARC proposal to refuse transfer of responsibility and alert will be present on the screen in accordance with Alert List. The transfer of responsibility is programmed at the stage of the integrated navigation bridge programming design. See also item 6.2.2.

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
–	1	**Begin NMEA test** *NMEA test during installation	Begin NMEA test	Begin NMEA test	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (C) Notification (C) Notification (C)	–
–	2	**Finish NMEA test** *NMEA test during installation	Finish NMEA test	Finish NMEA test	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (C) Notification (C) Notification (C)	–
10003 A	3	**ALARM test. Press ALARM button for stop alarm** *Test alarm, auto confirm 30s	ALARM test	Press ALARM button for stop alarm	STBY AUTO CC or TC FFU OVR	Alarm Alarm Alarm Alarm Alarm	✓

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
–	4	**Fluxgate calibrating** *Obsolette, used for backward comparibility	FG calibrating	Fluxgate calibrating	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (C) Notification (C) Notification (C)	–
–	5	**Fluxgate calibrating OK** *Obsolette, used for backward comparibility	FG calibr OK	Fluxgate calibrating OK	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (C) Notification (C) Notification (C)	–
–	6	**Fluxgate calibrating fail** *Obsolette, used for backward comparibility	FG calibr fail	Fluxgate calibrating fail	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (C) Notification (C) Notification (C)	–
10007 B	7	**PS Rudder Feedback fail. Switch to MANRudder fixed** *In case of direct valve control, check feedback connection	PS Feedback fail	Rudder order is fixed. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning Warning	✓
10008 B	8	**SB rudder Feedback fail. Switch to MANRudder fixed** *In case of direct valve control, check feedback connection	SB Feedback fail	Rudder order is fixed. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning Warning	✓
–	9	**Bad calibration table. Recalibration is required** *Installation only	Bad Table	Recalibration is required	STBY AUTO CC or TC FFU OVR	– Notification (W) Notification (W) Notification (W) Notification (W)	–
3007 B	10	**Lost HDG control. MCU fail. Switch to MANRudder fixed** *General fail, try restart by power	Lost HDG control	MCU fail. Switch to Man	STBY AUTO CC or TC FFU OVR	– Alarm Alarm Alarm Alarm	✓

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
10011 B	11	**PS Helm fail. Check Helm connections** *Check connection, if ok - try to recalibrate	PS Helm fail	Check Helm connections	STBY AUTO CC or TC FFU OVR	– – – Alarm –	–
10012 B	12	**SB Helm fail. Check Helm connections** *Check connection, if ok - try to recalibrate	SB Helm fail	Check Helm connections	STBY AUTO CC or TC FFU OVR	– – – Alarm –	–
10013 B	13	**Control Panel Pilot House fail. Check connection** *Check connection, try to restart by power	CTRL PAN PH fail	Main Control Panel fail	STBY AUTO CC or TC FFU OVR	Notification (W) Warning Warning Warning Warning	–
3065 B	14	**Ship speed is too low for HDG control. Increase speed** *Ship speed is too low for HDG control. Increase speed	Low speed	Ship speed is too low	STBY AUTO CC or TC FFU OVR	– Warning Warning – –	–
3061 B	19	**Mode Switch fail. Switch to MAN** *Set mode switch to MAN	Mode Switch fail	Switch to Man Mode	STBY AUTO CC or TC FFU OVR	– Alarm Alarm Alarm Alarm	✓
10020 B	20	**Helm fail. Check Helm connections. Switch to NFU** *Check connection, if ok - try to recalibrate	Helm fail	Check Helm connections. Switch to NFU	STBY AUTO CC or TC FFU OVR	– – – Alarm –	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
10021 B	21	**Rudder Feedback fail. Rudder fixed. Switch to MAN** *In case of direct valve control, check feedback connection*	Rd Feedback fail	Rudder order is fixed. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning Warning	–
10022 B	22	**Set mode selectr to STBY or MAN** *Set mode switch to MAN*	Switch to STBY	Set mode selectr to STBY or MAN	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm Alarm	–
3156 B	23	**No SPD adaptive due to no speed inputs** *Select other speed source*	No SPD adaptive	due to no speed inputs.	STBY AUTO CC or TC FFU OVR	– Caution Caution – –	–
3007 B	24	**GYRO fail Rudder fixed. Switch to MAN** *Check connection to Gyro*	Lost HDG control	GYRO fail. Switch to Man	STBY AUTO CC or TC FFU OVR	– Alarm Alarm – –	✓
10025 B	25	**Fluxgate fail** *Obsolette, used for backward comparibility*	Fluxgate fail	Fluxgate fail	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3007 B	26	**MAG sensor fail . Rudder fixed. Switch to MAN** *Check connection to Magnetic Compass*	Lost HDG control	MAG sensor fail. Switch to Man	STBY AUTO CC or TC FFU OVR	– Alarm Alarm – –	✓
3014 B	27	**Fail Position from GNSS. No TRACK and CTS modes** *Check GNSS output*	GNSS POSN fail	from GNSS. No TRACK and CTS modes	STBY AUTO CC or TC FFU OVR	– – Alarm – –	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3014 B	28	**Fail COG SOG from GNSS. No TRACK and CTS modes** *Check GNSS output*	COG SOG fail	from GNSS. No TRACK and CTS modes	STBY AUTO CC or TC FFU OVR	– – Alarm – –	–
3007 B RT (BM)	29	**Heading sensor fail. Rudder fixed. Switch to MAN** *Check connection to heading distribution system*	Lost HDG control	Heading sensor fail	STBY AUTO CC or TC FFU OVR	– Alarm Alarm – –	✓
–	30	**Begin Autotuning** *Installation only*	Begin Autotuning	Begin Autotuning	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–
–	31	**Autotuning finished OK** *Installation only*	Autotuning OK	Autotuning OK	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–
–	32	**Autotuning fail. Check settings and rpt** *Installation only*	Autotuning fail	Autotuning fail. Check settings and rpt	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–
–	33	**Control transfer** *Info*	Control transfer	Control transfer	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–
10034 B	34	**Control Panel Bridge 1 fail. Select other panel** *Check connection, try to restart by power*	CTRL BR 1 fail	Control Panel Br 1 fail. Select other	STBY AUTO CC or TC FFU OVR	Notification (W) Warning Warning Warning Warning	–
–	35	**Control overridden at the FFU tiller** *Info*	FFU Override	Control overridden at the FFU tiller	STBY AUTO CC or TC FFU OVR	– – – – Notification (C)	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3025 B	36	**Off Heading. Check control settings and limits** *Check control settings	Off Heading	Check control settings and limits	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning – –	–
3038 A	38	**New WP. Press to acknowledge** *New gals after confirm	New WP	New WP. Press to acknowledge	STBY AUTO CC or TC FFU OVR	– – Warning – –	–
3113 B	40	**Mastercompass switched to secondary** *Check Master compass connection	HDG in fallback	Switched to secondary	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3062 B	57	**Rudder control unit fail** *Not last rudder controller fail, try restart by power	Rudder fail	Rudder control unit fail	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning Warning	–
3062 B	58	**PS Rudder control unit fail** *Not last rudder controller fail, try restart by power	PS RRUDD fail	PS Rudder control unit fail	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning Warning	–
3062 B	59	**SB Rudder control unit fail** *Not last rudder controller fail, try restart by power	SB RUDD fail	SB Rudder control unit fail	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning Warning	–
10060 B	60	**Joystick Pilot House fail** *JP Only	Joystick PH fail	Joystick Pilot House fail	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3062 B	66	**Rudder system not ready** *Not last rudder system connction fail, check conncetion*	RUDD not ready	Rudder system not ready	STBY AUTO CC or TC FFU OVR	Notification (W) – – – –	–
3062 B	67	**PS Rudder system not ready** *Not last rudder system connction fail, check conncetion*	PS RUDD not RDY	PS Rudder system not ready	STBY AUTO CC or TC FFU OVR	Notification (W) – – – –	–
3062 B	68	**SB Rudder system not ready** *Not last rudder system connction fail, check conncetion*	SB RUDD not RDY	SB Rudder system not ready	STBY AUTO CC or TC FFU OVR	Notification (W) – – – –	–
10072 B	72	**Control Panel Bridge 2 fail. Select other panel** *Check connection, try to restart by power*	CTRL PAN 2 fail	Select other panel	STBY AUTO CC or TC FFU OVR	Notification (W) Warning Warning Warning Warning	–
10073 B	73	**Control Panel Bridge 3 fail. Select other panel** *Check connection, try to restart by power*	CTRL PAN 3 fail	Select other panel	STBY AUTO CC or TC FFU OVR	Notification (W) Warning Warning Warning Warning	–
10074 B	74	**Control Panel Bridge 4 fail. Select other panel** *Check connection, try to restart by power*	CTRL PAN 4 fail	CTRL Panel Bridge 4 fail	STBY AUTO CC or TC FFU OVR	Notification (W) Warning Warning Warning Warning	–
10075 B	75	**Joystick Bridge 1 fail. Select other Joystick** *JP Only*	JOY BR1 fail	Select other Joystick	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
10076 B	76	**Joystick Bridge 2 fail. Select other Joystick** *JP Only*	JOY BR2 fail	Select other Joystick	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
10077 B	77	**Joystick Bridge 3 fail. Select other Joystick** *JP Only*	JOY BR3 fail	Select other Joystick	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
10078 B	78	**Joystick Bridge 4 fail. Select other Joystick** *JP Only*	JOY BR4 fail	Select other Joystick	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
10079 B	79	**Switch to Manual mode.** *Set mode switch to MAN*	Switch to MAN	Switch to Man mode	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	✓
10080 B	80	**Switch to Manual Joystick mode** *JP Only*	Switch to JMAN	Switch to Man Joystick mode	STBY AUTO CC or TC FFU OVR	Notification (C) – – – –	–
10081 B	81	**Switched to AUTO** *System is automaticaly switched to AUTO, for example, end of track*	Switched to AUTO	Switched to AUTO	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning Warning	–
3008 B	82	**Track fail. Switched to AUTO** *Check ECDIS track data and parameters*	Track fail	Switched to AUTO	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning –	–
10083 B	83	**Ferry autocrossing track complete** *JP Only*	Finish autocross	Ferry autocrossing track complete	STBY AUTO CC or TC FFU OVR	Notification (C) – – – Warning	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3012 B	84	**Doubtful heading. Compass fail** *Check data from slave compass	Doubtful HDG	Compass fail	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning – –	–
–	88	**Panel connection fail. Check connections** *Check CAN bus connection	Connection fail	Check Panel connections	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–
3012 B	89	**Doubtful HDG. Deviation betveen sources** *Check all gyro sources	Doubtful HDG	Deviation from second source	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning – –	–
3024 B	90	**Off Track Check control settings and limits** *Check control settings	Off Track	Check control settings and limits	STBY AUTO CC or TC FFU OVR	Notification (C) – Alarm – –	–
3032 B	91	**Off Course. Check control settings and limits** *Check control settings	Off Course	Check control settings and limits	STBY AUTO CC or TC FFU OVR	Notification (C) – Warning – –	–
10093 B	93	**Magnetic Compass in use** *Info. Track control is not available	MAG COMP in use	Magnetic Compass in use	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution – –	–
10094 B	94	**Override Tiller fail. Check connections** *Check connection, try to restart by power	Tiller fail	Override Tiller fail. Check connections	STBY AUTO CC or TC FFU OVR	Notification (C) – – Caution Warning	–
–	98	**Set opposite HDG** *JP Only	Set opposite HDG	Set opposite HDG	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
10099 B	99	**Override Tiller 1 fail. Select other control** *Check connection, try to restart by power*	Tiller 1 fail	Select other control. Check connections	STBY AUTO CC or TC FFU OVR	Notification (C) – – Caution Warning	–
10100 B	100	**Override Tiller 2 fail. Select other control** *Check connection, try to restart by power*	Tiller 2 fail	Select other control. Check connections	STBY AUTO CC or TC FFU OVR	Notification (C) – – Caution Warning	–
10101 B	101	**Override Tiller 3 fail. Select other control** *Check connection, try to restart by power*	Tiller 3 fail	Select other control. Check connections	STBY AUTO CC or TC FFU OVR	Notification (C) – – Caution Warning	–
10102 B	102	**Override Tiller 4 fail. Select other control** *Check connection, try to restart by power*	Tiller 4 fail	Select other control. Check connections	STBY AUTO CC or TC FFU OVR	Notification (C) – – Caution Warning	–
10103 B	103	**Override Tiller 5 fail. Select other control** *Check connection, try to restart by power*	Tiller 5 fail	Select other control. Check connections	STBY AUTO CC or TC FFU OVR	Notification (C) – – Caution Warning	–
3063 B	104	**Rudder command signal fail. Check steering** *Not last rudder command problem (internal diagnostics). Try restart by power*	RUD command fail	Check output to steering system	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3063 B	105	**PS Rudder command signal fail. Check steering** *Not last rudder command problem (internal diagnostics). Try restart by power*	PS RUD CMD fail	Check output to steering system	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3063 B	106	**SB Rudder command signal fail. Check steering** *Not last rudder command problem (internal diagnostics). Try restart by power*	SB RUD CMD fail	Check output to steering system	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
10107 B	107	**WIND VANE mode fail Switched to AUTO** *Check control settings for WIND-WAVE mode*	WIND VANE fail	WIND VANE mode fail. Switched to AUTO	STBY AUTO CC or TC FFU OVR	Notification (C) – – – –	–
10108 B	108	**Wind shift. Check settings** *Too large wind course difference, check control settings*	Wind shift	Check settings	STBY AUTO CC or TC FFU OVR	Notification (C) – – – –	–
10109 B	109	**Low Wind speed. Select other control mode** *Too small wind speed for WIND-WANE mode*	Low Wind speed	Select other control mode	STBY AUTO CC or TC FFU OVR	Notification (C) – – – –	–
10133 B	133	**Safety system fail HDG backup function unavailable** *Check power supply and connection of safety system*	Backup unit fail	Heading backup function unavailable	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
–	139	**Control overridden at the NFU control** *Info*	NFU Override	Control overridden at the NFU control	STBY AUTO CC or TC FFU OVR	– Notification (C) Notification (C) Notification (C) Notification (C)	–
10141 B	141	**ROT/RAD unreachable. Change rudder limitation** *Check control settings (ROT/RAD)*	ROT/RAD UNREACH	Check ROT/RAD settings and rudder limit	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning –	–
3007 B	143	**Lost HDG control HCS Rudder fixed. Switch to MAN** *Check data from external HMS*	Lost HDG control	Rudder order is fixed. Switch to Man	STBY AUTO CC or TC FFU OVR	– Alarm Alarm – –	✓
10144 B	144	**Change Speed source** *Not proper speed source for selected mode*	Change SPD SRC	Change Speed source	STBY AUTO CC or TC FFU OVR	– Caution Caution – –	–
–	145	**Perform Autopilot Tuning procedure** *Installation procedure not completed*	Perform AP TUNI	Perform Autopilot Tuning procedure	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
–	159	**GYRO1 low frequency data. Check Gyro** *10 Hz data update recommended*	GYRO1 Low FREQ	Check Gyro	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Notification (C) –	–
–	160	**GYRO2 low frequency data. Check Gyro** *10 Hz data update recommended*	GYRO2 low FREQ	Check Gyro	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Notification (C) –	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
–	161	**Magnetic compass low frequency data** *10 Hz data update recommended*	MAG low FREQ	Magnetic compass low frequency data	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Notification (C) –	–
–	162	**Gyro low frequency data. Check gyro** *10 Hz data update recommended*	THD low FREQ	Gyro low frequency data	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Notification (C) –	–
–	163	**VTG low frequency data. Check Data source** *1 Hz data update recommended*	VTG low FREQ	VTG low frequency data	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Warning Notification (C) –	–
–	164	**External Keyboard fault. Check connection** *Check power and connection with extern keyboard*	EXT KBD fault	External Keyboard fault	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–
–	165	**Forbidden Mode for Track loading** *Special type of route data*	Change Mode	Forbidden Mode for Track loading	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–
–	166	**RTE-type Track loading Error** *Special type of route data*	Track load ERR	RTE-type Track loading Error	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (W) Notification (W) Notification (W) Notification (W)	–
–	167	**RTE-type Track successfully loaded** *Special type of route data*	Track loaded	RTE-type Track successfully loaded	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (C) Notification (C) Notification (C)	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
–	172	**ENTER item to save or up level Menu to skip** *Install only	ENTER for save	or up level Menu to skip	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (C) Notification (C) Notification (C)	–
10178 B	178	**Rudder on limit. Increase Rudder limitation** *Check control settings and limits	Increase RUD LIM	Rudder long time on limit	STBY AUTO CC or TC FFU OVR	– Warning Warning – –	–
–	179	**COM Safety System OK** *Install only	COM SAFE SYS OK	COM Safety System OK	STBY AUTO CC or TC FFU OVR	Notification (C) – – – –	–
–	180	**COM Safety System fail. Check connection** *Check gyro connection and data for safety system	COM SAFE SYS FLT	COM Safety System fail	STBY AUTO CC or TC FFU OVR	Notification (C) – – – –	–
10181 B	181	**ZDA Data lost. Check GNSS connection** * Check ZDA data source	ZDA Data lost	ZDA Data lost. Check GNSS connection	STBY AUTO CC or TC FFU OVR	– – – – Caution	–
10182 B	182	**Rudder under control of safety system** *Info, safety system activated, control settings from panel are not available	Rud under SafSys	Rudder under control of safety system	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning Warning	–
10183 B	183	**Autopilot stopped. Safety system activated** *Info, safety system activated, control settings from panel are not available	SafSys activated	HCS stopped. Safety system activated	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm Alarm	✓

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
10184 B	184	**Rudder limit switched off** *Speed depending rudder limit is off, check speed data*	Rud lim sw off	Rudder limit switched off	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
–	186	**Data saving. Wait please** *Install only*	Data saving	Data saving. Wait please	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (C) Notification (C) Notification (C)	–
3023 B	188	**MCU Power supply 1 fail, auto switched to pwr 2** *Check MCU Power1*	MCU PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	189	**MCU Power supply 2 fail, auto switched to pwr 1** *Check MCU Power2*	MCU PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	190	**ACU SB Power supply 1 fail, auto switched to pwr 2** *Check STBD ACU Power1*	ACU SB PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	191	**ACU SB Power supply 2 fail, auto switched to pwr 1** *Check STBD ACU Power2*	ACU SB PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	192	**ACU PS Power supply 1 fail, auto switched to pwr 2** *Check Port ACU Power1*	ACU PS PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	193	**ACU PS Power supply 2 fail, auto switched to pwr 1** *Check Port ACU Power2*	ACU PS PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3023 B	194	**Panel Pilot House PWR 1 fail, auto switched to pwr 2** *Check Pilot House Panel Power1*	Panel1 PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	195	**Panel Pilot House PWR 2 fail, auto switched to pwr 1** *Check Pilot House Panel Power2*	Panel1 PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	196	**Panel Bridge 1 PWR 1 fail, auto switched to pwr 2** *Check Bridge1 Panel Power1*	Panel2 PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	197	**Panel Bridge 1 PWR 2 fail, auto switched to pwr 1** *Check Bridge1 Panel Power2*	Panel2 PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	198	**Panel Bridge 2 PWR 1 fail, auto switched to pwr 2** *Check Bridge2 Panel Power1*	Panel3 PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	199	**Panel Bridge 2 PWR 2 fail, auto switched to pwr 1** *Check Bridge2 Panel Power2*	Panel3 PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	200	**Panel Bridge 3 PWR 1 fail, auto switched to pwr 2** *Check Bridge3 Panel Power1*	Panel4 PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3023 B	201	**Panel Bridge 3 PWR 2 fail, auto switched to pwr 1** *Check Bridge3 Panel Power2*	Panel4 PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	202	**Panel Bridge 4 PWR 1 fail, auto switched to pwr 2** *Check Bridge4 Panel Power1*	Panel5 PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	203	**Panel Bridge 4 PWR 2 fail, auto switched to pwr 1** *Check Bridge4 Panel Power2*	Panel5 PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	204	**Panel Remote 1 PWR 1 fail, auto switched to pwr 2** *Check Remote Panel1 Power1*	RemPan1PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	205	**Panel Remote 1 PWR 2 fail, auto switched to pwr 1** *Check Remote Panel1 Power2*	RemPan1PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	206	**Panel Remote 2 PWR 1 fail, auto switched to pwr 2** *Check Remote Panel2 Power1*	RemPan2PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
3023 B	207	**Panel Remote 2 PWR 2 fail, auto switched to pwr 1** *Check Remote Panel2 Power2*	RemPan2PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
–	208	**Demonstration mode** *Info*	Track demo mode	Demonstration mode	STBY AUTO CC or TC FFU OVR	Notification (C) Notification (C) Notification (W) Notification (C) Notification (C)	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
10209 B	209	**Anchor Assist mode impossible**	AMAT AHDG fail	Anchor Assist mode impossible	STBY	Notification (C)	–
					AUTO	–	
					CC or TC	–	
					FFU	–	
					OVR	–	
10210 B	210	**GNSS Data low resolution** *Lat lon 4 decimal digits recommended*	GNSS Low res	GNSS Data low resolution	STBY	Caution	–
					AUTO	–	
					CC or TC	Alarm	
					FFU	–	
					OVR	–	
–	219	**Override Tiller fail. Check connections** *Check LVR NF power and CAN bus connection*	Tiller fail	Override Tiller fail. Check connections	STBY	Notification (C)	–
					AUTO	Notification (W)	
					CC or TC	Notification (W)	
					FFU	Notification (W)	
					OVR	Notification (W)	
10220 B	220	**Exit from ferry auto-crossing** *JP Only*	Exit autocross	Exit from ferry auto-crossing	STBY	Notification (C)	–
					AUTO	–	
					CC or TC	–	
					FFU	–	
					OVR	–	
10221 B	221	**Starting ferry autocrossing** *JP Only*	Start autocross	Starting ferry autocrossing	STBY	Notification (C)	–
					AUTO	–	
					CC or TC	–	
					FFU	–	
					OVR	–	
10222 B	222	**Double-ended ferry switch direction** *JP Only*	Switch ferry dir	Double-ended ferry switch direction	STBY	Notification (C)	–
					AUTO	–	
					CC or TC	–	
					FFU	–	
					OVR	–	
10223 B	223	**Track dodge mode** *JP Only*	Track dodge mode	Track dodge mode	STBY	Notification (C)	–
					AUTO	–	
					CC or TC	–	
					FFU	–	
					OVR	–	
10224 B	224	**Control overridden. Switch to STBY** *Info*	Control override	Control overridden. Switch to STBY	STBY	Alarm	–
					AUTO	Caution	
					CC or TC	Caution	
					FFU	Caution	
					OVR	Caution	
3059 B	225	**HCS unavailable due to error in main controller** *General fail, try restart by power*	HCS unavailable	due to Main controller Error	STBY	Caution	✓
					AUTO	–	
					CC or TC	–	
					FFU	–	
					OVR	–	

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3059 B	226	**HCS unavailable. Mode Switch fail** *Check mode switch and connection	HCS unavailable	due to Mode Switch fail	STBY AUTO CC or TC FFU OVR	Caution – – – –	–
3059 B	227	**HCS unavailable due to missing heading inputs** *Check gyro data and connection	HCS unavailable	due to missing heading inputs	STBY AUTO CC or TC FFU OVR	Caution – – – –	–
3059 B	228	**HCS unavailable due to missing heading inputs** *Check magnetic compass data and connection	HCS unavailable	due to missing heading inputs	STBY AUTO CC or TC FFU OVR	Caution – – – –	–
3059 B	229	**HCS unavailable due to missing heading inputs** *Check external HMS data and connection	HCS unavailable	due to missing heading inputs	STBY AUTO CC or TC FFU OVR	Caution – – – –	–
3061 B	230	**Lost HDG control. RCU fail. Switch to MAN** *Rudder controller fail, try restart by power	Lost HDG control	RCU fail. Switch to Man	STBY AUTO CC or TC FFU OVR	– Alarm Alarm Alarm –	✓
3059 B	231	**HCS unavailable due to missing last rudder** *Rudder controller fail, try restart by power	HCS unavailable	due to missing last rudder	STBY AUTO CC or TC FFU OVR	Caution – – – –	–
3061 B RT (BM)	232	**Lost HDG control. Rudder not ready Switch to MAN** *Check rudder system and connection	Lost HDG control	Rudder not ready. Switch to Man	STBY AUTO CC or TC FFU OVR	– Alarm Alarm Alarm –	✓

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3061 B	233	**Lost HDG control. Rudder command fail. Switch to MAN** *Last rudder command problem (internal diagnostics). Try restart by power*	Lost HDG control	Rudder command fail. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3059 B	234	**HCS unavailable due to missing heading inputs** *Check external HMS data and connection*	HCS unavailable	due to missing heading inputs	STBY AUTO CC or TC FFU OVR	Caution – – – –	–
3061 B	235	**Lost HDG control PS Rudder low speed. Switch to MAN** *Check steering system and connection*	Lost HDG control	PS Rudder low speed. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3061 B	236	**Lost HDG control PS Rudder not moving Switch to MAN** *Check steering system and connection*	Lost HDG control	PS Rudder not moving. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3061 B	237	**Lost HDG control PS Rudder lost control Switch to MAN** *Check steering system and connection*	Lost HDG control	PS Rudder control fail. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3061 B	238	**Lost HDG control PS Rudder lost control Switch to MAN** *Check steering system and connection*	Lost HDG control	PS Rudder lost control. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3062 B	239	**PS Gear fail Rudder low speed. Check steering** *Check steering system and connection	PS Gear fail	Rudder low speed. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning –	–
3063 B	240	**PS Gear fail Rudder hunting. Check steering** *Check steering system and connection	PS Gear fail	Rudder hunting. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution –	–
3062 B	241	**PS Gear fail Rudder not moving. Check steering** *Check steering system and connection	PS Gear fail	Rudder not moving. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning –	–
3061 B	242	**Lost HDG control. SB Rudder low speed. Switch to MAN** *Check steering system and connection	Lost HDG control	SB Rudder low speed. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3061 B	243	**Lost HDG control. SB Rudder not moving. Switch to MAN** *Check steering system and connection	Lost HDG control	SB Rudder not moving. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3061 B	244	**Lost HDG control. SB Rud control fail. Switch to MAN** *Check steering system and connection	Lost HDG control	SB Rudder control fail. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3061 B	245	**Lost HDG control. SB Rud lost control. Switch to MAN** *Check steering system and connection*	Lost HDG control	SB Rudder lost control. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3062 B	246	**SB Gear fail Rudder low speed. Check steering** *Check steering system and connection*	SB Gear fail	Rudder low speed. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning –	–
3063 B	247	**SB Gear fail Rudder hunting. Check steering** *Check steering system and connection*	SB Gear fail	Rudder hunting. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution –	–
3062 B	248	**SB Gear fail Rudder not moving. Check steering** *Check steering system and connection*	SB Gear fail	Rudder not moving. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning –	–
3061 B	249	**Lost HDG control. Rudder low speed. Switch to MAN** *Check steering system and connection*	Lost HDG control	Rudder low speed. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3061 B	250	**Lost HDG control. Rudder not moving. Switch to MAN** *Check steering system and connection*	Lost HDG control	Rudder not moving. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3061 B	251	**Lost HDG control. Rudder control fail. Switch to MAN** *Check steering system and connection*	Lost HDG control	Rudder control fail. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3061 B	252	**Lost HDG control. Rudder lost control. Switch to MAN** *Check steering system and connection*	Lost HDG control	Rudder lost control. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	✓
3062 B	253	**Gear fail Rudder low speed. Check steering** *Check steering system and connection*	Gear fail	Rudder low speed. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning –	–
3063 B	254	**Gear fail Rudder hunting. Check steering** *Check steering system and connection*	Gear fail	Rudder hunting. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution –	–
3062 B	255	**Gear fail Rudder not moving. Check steering** *Check steering system and connection*	Gear fail	Rudder not moving. Check steering	STBY AUTO CC or TC FFU OVR	Notification (C) Warning Warning Warning –	–
3023 B	256	**PWR 1 fail. HCS is working normally on backup PWR** *Check power supply1*	PWR1 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3023 B	257	**PWR 2 fail. HCS is working normally on backup PWR** *Check power supply2*	PWR2 fail	HCS is working normally on backup PWR	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution Caution	–
10258 B	258	**Rudder Feedback fail. Check steering system** *Check steering system and connection*	Rudder FB fail	Check steering system	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution –	–
10259 B	259	**PS rudder Feedback fail. Check steering system** *Check steering system and connection*	PS FB fail	PS feedback fail. Check steering system	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution –	–
10260 B	260	**SB rudder Feedback fail. Check steering system** *Check steering system and connection*	SB FB fail	SB feedback fail. Check steering system	STBY AUTO CC or TC FFU OVR	Notification (C) Caution Caution Caution –	–
3061 B	261	**Lost HDG control Rudder low speed.Switch to MAN** *Check steering system and connection*	Lost HDG control	Rudder low speed. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	–
3061 B	262	**Lost HDG control Rudder not moving.Switch to MAN** *Check steering system and connection*	Lost HDG control	Rudder not moving. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	–

ID / Category / RT	Internal ID	Text Displayed / *Decision support info	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
3061 B	263	**Lost HDG control Rudder lost control. Switch to MAN** *Check steering system and connection*	Lost HDG control	Rudder control fail. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	–
3061 B RT (BM)	264	**Lost HDG control Rudder lost control. Switch to MAN** *Check steering system and connection*	Lost HDG control	Rudder lost control. Switch to Man	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm Alarm –	–
10269 B	269	**Track fail** *JP Only*	Track fail	Track fail	STBY AUTO CC or TC FFU OVR	Notification (C) – – – –	–
3024 B	270	**Off Heading. Check control settings and limits** *Check control settings*	Off Heading	Check control settings and limits	STBY AUTO CC or TC FFU OVR	Notification (C) Alarm Alarm – –	–
10272 B RT (BM)	272	**WARNING test** *Test Alert*	WARNING test	Stop warning from menu	STBY AUTO CC or TC FFU OVR	Warning Warning Warning Warning Warning	✓

In the first column of the alert table, a mention of the possibility of using the responsibility transfer technology and the index of the device that is allowed to transfer responsibility for this alert is added. The device index is the two letters of the device ID from the NMEA message.

| ID / Category / RT	Internal ID	Text Displayed / *Decision support info*	Text BAM short	Text BAM long	Mode / Status		Sys Fail Relay
10272 B RT (BM)	272	**WARNING test** *Test Alert*	WARNING test	Stop warning from menu	STBY AUTO CC or TC FFU OVR	Warning Warning Warning Warning Warning	✓

10272 — Alert ID for CAMS

B — Alert category

RT — "Yes" for Responsibility Transfer

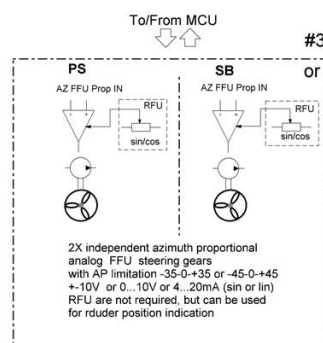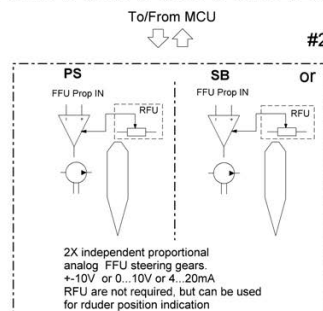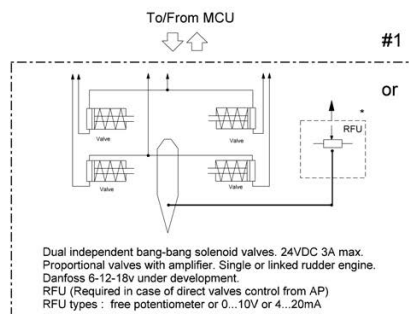**(BM)** — Devise ID from NMEA sentence for which is allowed responsibility transfer for this alert

Appendix B

Structure Diagram
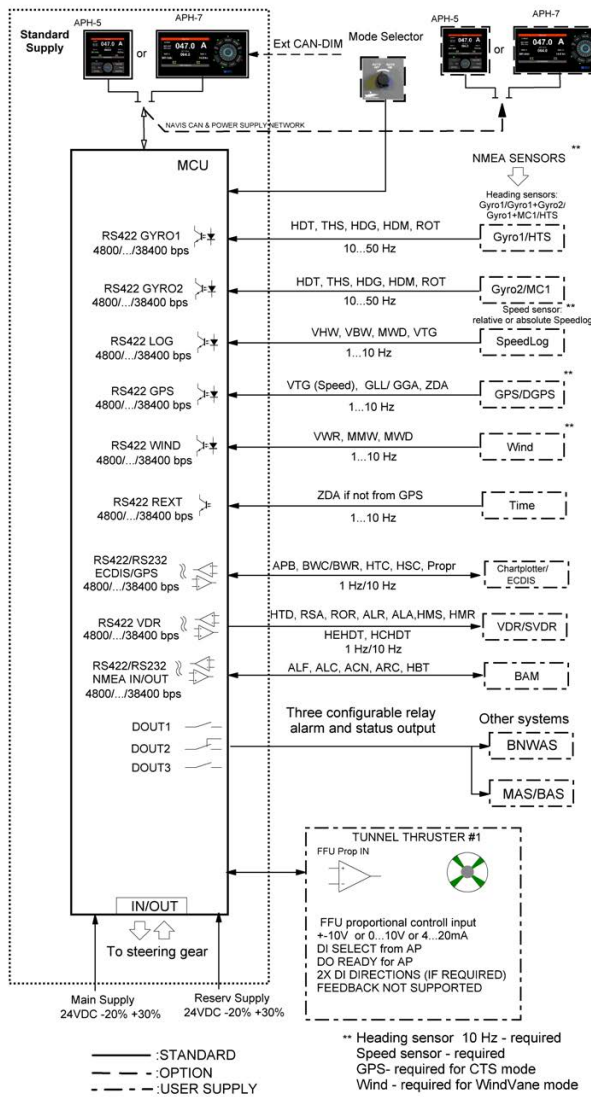
NOTE

- Navis NavAP structure depends on the ordered Autopilot configuration and options for ships with single/linked or independent rudders.
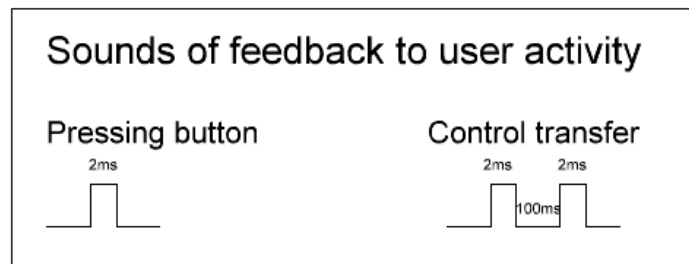
Appendix C

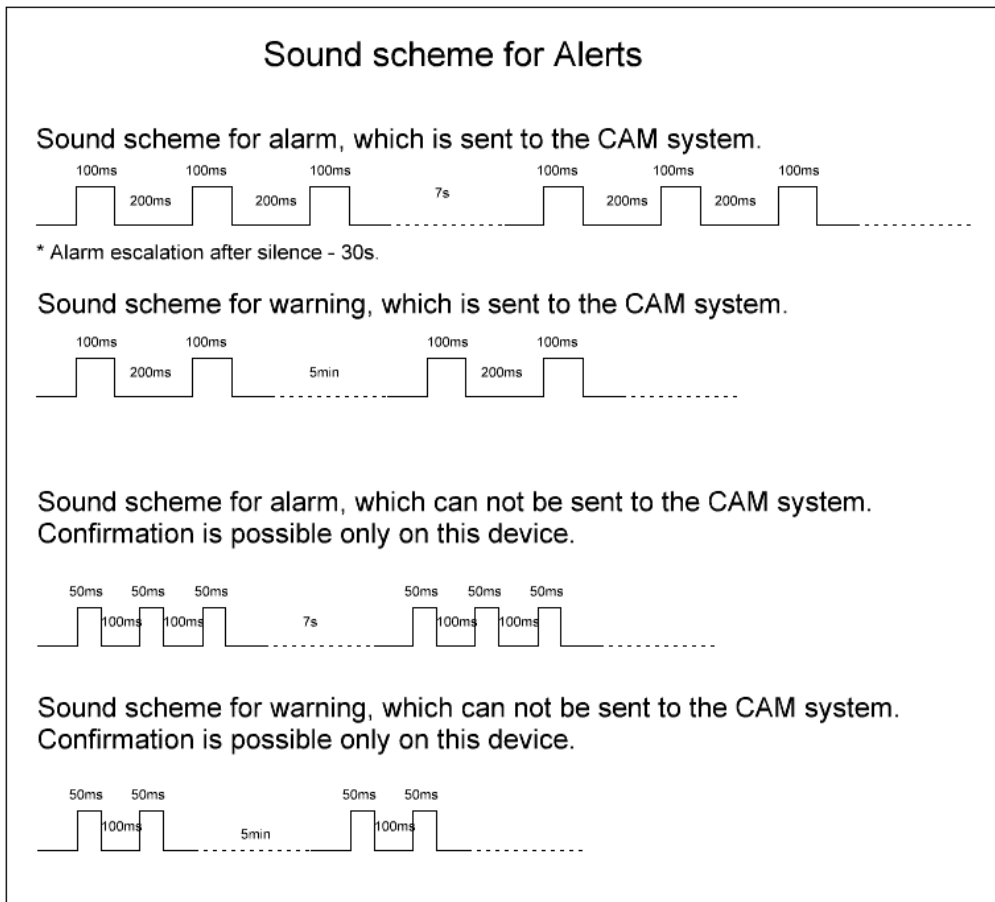# Control Panel Parameters

C.1 Display Parameters

Parameter	Value
Pixel resolution	800x480
Display colors	262,144
Nominal viewing distance	~1.0 meter

C.2 Panel Sounds

C.2.1 Pressing Buttons and Control Transfer

C.2.2 Alert Sounds

Sound scheme for Alerts

Sound scheme for alarm, which is sent to the CAM system.

* Alarm escalation after silence - 30s.

Sound scheme for warning, which is sent to the CAM system.

Sound scheme for alarm, which can not be sent to the CAM system.
Confirmation is possible only on this device.

Sound scheme for warning, which can not be sent to the CAM system.
Confirmation is possible only on this device.

Appendix D

Operating Conditions

Main operating conditions are presented in the table below. Other parameters comply with standard IEC60945 Ed.4.

Operating conditions for control panel APH-7, APH-5	
Temperature	from -25°C to +70°C
Humidity	Up to 95% relative humidity, non-condensing
Operating conditions for control units and interface boxes	
Temperature	from -15°C to +55°C
Humidity	Up to 95% relative humidity, non-condensing at 25°C, up to 75% at 45°C
Storage conditions for control panel APH-7, APH-5	
Temperature	from -40°C to +70°C
Humidity	Up to 95% relative humidity, non-condensing
Storage conditions for control units and interface boxes	
Temperature	from -30°C to +70°C
Humidity	Up to 95% relative humidity, non-condensing at 25°C, up to 75% at 45°C
Protection Degree (IP level) for control panel APH-7, APH-5	
Front side	IP56
Rear side	IP22 (if used by default without any special IPx6 enclosure)

Appendix E

Energy Saving

"Technical Regulations on the Safety of Sea Transport Items", approved by the RF Government Order No. 620 of 12 August 2010, declared following in the Paragraph 6:

"Designers, builders and manufacturers of sea transport and infrastructure items shall ensure the energy efficiency of such items".

Autopilot PCB controllers

Autopilot PCB controllers are powered by 24 VDC vessel main power supply and internal power circuit provides excessive voltage protection (suppressor and fuses) and reverse polarity protection.

Autopilot PCB controllers were developed in accordance with following Navis implementations:

- Stability during Autopilot operation;

- Quality of selected components;

- the "internal power supply circuit" module on PCB provides:

    - fused protection;

    - galvanic isolation by DC–DC;

    - conversion of the input 24 VDC voltage into necessary values, and its stabilization on PCB.

NOTE

- In fact, well tuned Heading Control System is the first fuel-saving system onboard! It allows to save a significant amount of the fuel due to accuracy of steering in "Auto HDG" or "Track" mode is much more better in comparison with an accuracy of manual steering during continuous operation! It's also reduces the load on steering gear thus saves its resource and power consumption.

E.1   Power Consumption Calculation

Below mentioned calculation is given with a three times extra power consumption, especially for APP PCB controllers. Reason of that: to calculate and select a proper power supply with some extra resources and possibility to add any optional components in the future autopilot usage — like additional "FFU Override" posts.

Navis NavAP System. Calculation of the Power consumption (Example)

- APH-5/APH-7 Control Panel: Power consumption per each: 24 W;

- MCU/ACU: Power consumption per each: 10 W

Calculation of the Power Consumption per Navis NavAP system:

$P=((24W \cdot n)+(10W \cdot m)) \cdot k$

where

- n — number of APH-5/APH-7 Control Panels,

- m — number of MCU, ACU,

- k — backup coefficient.

Example of calculation for the standard NavAP Heading Control System (i.e. without optional boxes):

$P=((24W \cdot 1)+(10W \cdot 2)) \cdot 1.2=44W \cdot 1.2=52.8$ W

Recommended Power Supply for the aforementioned example: 24 VDC, 60 W–70 W (minimum).

Appendix F

Labeling and Utilization

The label must contain following information:

- identification of manufacturer;

- equipment type number or model identification;

- serial number;

- safe distance to magnetic compass;

- power consumption and/or supply voltage.

Equipment Utilization

The product is not dangerous for life, human health and the environment after the end of exploitation.

Organizations that have the appropriate license, carry out utilization after end of life in established order. Standard methods (applied to electronic devices) can be used for utilization of product.

For utilization should be:

- Disconnect blocks (which you want to remove) from any power sources

- Take apart product and components that are connected together using standard screws, bolts and nuts

- Unsolder and remove all wires connected to boards and radioelements components

- Unsolder all radioelements from board

- Transfer metal components and parts after sorting in scrap metal

- Transfer plastic components and parts for processing to specialized enterprises

Methods of mechanical impact or special identification is to be applied to products to eliminate possibility of its further application in devices.

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