



ALPHATRON
Marine



AlphaPilot MFM

Operation Manual

www.alphatronmarine.com

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I. Preface

The Alphasron AlphaPilot MFM system is a type approved Heading Control System (i.e. Autopilot) with self-adjusting 'Auto Tune' algorithm, designed to fit vessels of any size, including high speed crafts. It is a modern and technologically advanced digital vessel control unit that is intended to reduce the operator's workload, increase the vessel motion efficiency and improve operational safety.

The AlphaPilot MFM control unit is the main control module of the AlphaPilot MFM system. It is used for control and monitoring of autopilot operation, setting vessel heading or rudder angle, selection of autopilot operating modes.

- Thoroughly read this operation manual before operating the equipment.
- We recommend keeping this manual nearby the equipment to ensure ready access to it.

Revision History

Revision No.	Date	Description	Author
1.0	14-06-2018	First release	J. Kreeft
1.1	03-09-2018	3.1: Clarification on Track control mode. 4.2: No control message added. 5.3.2: Updated 'Active Palette' and '< Skin Selection >' Removed INS references Appendix A: Completely revised Appendix.	J. Kreeft
1.2	11-09-2018	Replaced image on page 28, 29, 32, 36, 38, 41, 58, 59, and 61.	J. Kreeft
1.3	05-10-2018	Various minor textual improvements (removed abbreviations, changed alert naming). 3.1: Added clarification for Ti and Tn. 3.8: Added warnings for non-compliance. Appendix A: Complete update.	J. Kreeft
1.4	08-10-2018	Various minor textual improvements.	J. Kreeft
1.5	23-10-2018	1: Removed 'additional requirements NAUT-AW notation'	J. Kreeft
1.6	12-02-2019	5.1: Added Loading parameter	J. Kreeft
1.7	03-07-2020	3.8.3: Added T _I mode	J. Kreeft
2.0	28-05-2021	1: Updated compliance section and clarification on parts described herein, and the Installation manual. 3: Changed M mode into F mode. 5.5: Changed 'Alarm log' into 'Alert logs'. Updated picture. 8: New chapter. Appendix A: Added. Appendix B: Moved to end of appendices. Revised completely. Other minor textual improvements	J. Kreeft
2.1	21-06-2021	Added section 4.6. Replaced Appendix B.	J. Kreeft
2.2	28-07-2021	Chapter 6: Updated table 3. Minor textual improvements. Appendix B: Replaced.	J. Kreeft
2.3	07-02-2022	Added rated current to table for Appendix: A AlphaPilot MFM control unit	T. Weghorst

Glossary

The glossary contains a list of abbreviations and a list of definitions.

Abbreviations

Abbreviations as used in this manual are explained in the table below.

AUTO	Automatic ('Heading Control mode')
APM	Main processor (inside the MCU Box)
BTW	Bearing to waypoint
CAT	Category
COG	Course over ground
DNC	Digital Nautical Charts
ECS	Electronic Chart System
ECDIS	Electronic Chart Display and Information System
ENC	Electronic Navigational Charts
FU	Follow-Up
GPS	Global Positioning System
HCS	Heading Control System
HMS	Heading Monitor System
IMO	International Maritime Organization
NFU	Non-Follow-Up
PS	Port Side
RAD	Radius
RFU	Rudder Feedback Unit
SB	Starboard Side
SOG	Speed over ground
SOLAS	Safety of Life at Sea
TCS	Track Control System
WP	Waypoint
XTD	Cross Track Distance

Definitions

The meaning of standard definitions as used in this manual are explained in the table below.

Alert	<p>Announcement of abnormal situations and conditions requiring attention. Alerts are divided in four priorities: emergency alarms, alarms, warnings and cautions:</p> <ul style="list-style-type: none"> - Emergency alarm: Highest priority of an alert. Alarms which indicate <u>immediate danger to human life or to the ship</u> and its machinery exits and require immediate action. - Alarm: An alarm is a high-priority alert. Condition <u>requiring immediate attention and action</u> by the bridge team, to maintain the safe navigation of the ship. - Warning: Condition <u>requiring immediate attention, but no immediate action</u> by the bridge team. Warnings are presented for precautionary reasons to make the bridge team aware of changed conditions which are not immediately hazardous, but may become so if no action is taken - Caution: <u>Lowest priority of an alert</u>. Awareness of a condition which does not warrant an alarm or warning condition, but still <u>requires attention</u> out of the ordinary consideration of the situation or of given information. <p>An alert provides information about a defined state change in connection with information about how to announce this event in a defined way to the system and the operator.</p> <p>Alerts are separated for the alert handling into three categories of alerts:</p> <ul style="list-style-type: none"> - Category A alerts: Alerts for which graphical information at the task station directly assigned to the function generating the alert is necessary, as decision support for the evaluation of the alert-related condition. - Category B alerts: Alerts where no additional information for decision support is necessary besides the information which can be presented at the CAM-HMI. - Category C alerts: Alerts that cannot be acknowledged on the bridge but for which information is required about the status and treatment of the alert, e.g., certain alerts from the engine.
AlphaPilot MFM	Alphatron brand name for the heading control system
Assisted turn	Manoeuvre of a vessel from one straight leg to the next automatically controlled by a pre-set radius or rate of turn but not based on the vessel's position.
Autopilot	A Heading Control System.

COG (Course Over Ground)	COG is the actual direction of progress of a vessel, between two points, with respect to the surface of the earth. The vessel's heading may differ from the COG because of wind, tide and currents.
Course	A vessel's course is the cardinal direction along which the vessel is to be steered. It is to be distinguished from the vessel's heading, which is the compass direction in which the craft's bow is pointed.
Cross track distance	Perpendicular distance of the vessel from the track including direction (negative if the vessel is left of the intended track)
Cross track error	See 'Cross track distance'
Cross-track limit	Maximum cross track distance before an alert is activated.
Curved track	Non-straight track between two straight legs.
ECDIS (Electronic Chart Display and Information System)	A geographic information system used for nautical navigation that complies with IMO regulations as an alternative to paper nautical charts. An ECDIS displays the information from ENC or DNC and integrates position information from position, heading and speed through water reference systems and optionally other navigational sensors. Other sensors which could interface with an ECDIS are radar, Navtex, Automatic Identification Systems (AIS), and depth sounders.
Electronic Navigational Charts	An official database created by a national hydrographic office for use with an ECDIS.
Heading	The horizontal direction in which a vessel points or heads at any instant, expressed in angular units from a reference direction, usually from 000° at the reference direction clockwise through 360°.
Heading control	Control of the vessel's heading.
HCS (Heading Control System)	A system which enables a vessel to keep a pre-set heading with minimum operation of the vessel's steering gear, within limits related to the vessel's manoeuvrability in conjunction with their sources of heading information. The HCS may work together with a TCS. A turn rate control or a turning-radius control for performing turns may be provided. The term HCS differentiates the automatic pilot (autopilot) from a system designed to keep a vessel on a pre-determined track throughout its passage, which is called TCS.
Heading Monitor System	This system monitors the actual heading sensor by an independent second source.
Helm	A wheel or tiller by which a vessel is steered.
IEC	A non-profit, non-governmental international standards organization that prepares and publishes International Standards for all electrical, electronic and related technologies.
Indication	Visual display of any message to the user which may be accompanied by a low intensity acoustic signal to gain attention.
Latitude and Longitude	The units that represent the coordinates at geographic coordinate system.
LOG	Speed data from Water Speed Log
Leg	Line between two waypoints defining the track.

Main conning position	Place on the bridge with a commanding view providing the necessary information and equipment for the conning officer to carry out his functions.
Main steering gear	The machinery, rudder actuators, steering gear power units, if any, and ancillary equipment and the means of applying torque to the rudder stock (e.g. tiller or quadrant) necessary for effecting movement of the rudder for steering the vessel under normal service conditions.
Magnetic compass	The Earth has a magnetic field which is approximately aligned with its axis of rotation. A magnetic compass is a device that uses this field to determine the cardinal directions.
Manual (steering) mode	Method of controlling steering gear manually is contrast with automatic steering control mode (course control mode). Both Follow-Up and Non-Follow-Up modes may be considered as manual steering mode.
Override function	An intentional fast change-over from automatic to temporary manual control.
Radius of turn	Radius of a curved track
Rate-Of-Turn	The speed (or rate) at which a vessel is turning at, or can turn at, measured in degrees per minute.
Relative bearing	The direction of a target from own vessel expressed as an angular displacement from own vessel's heading.
Relative course	The direction of motion of a target relative to own vessel's position expressed as an angular displacement from north. It is deduced from several measurements of target range and bearing on own vessel's radar.
Relative speed	The speed of a target relative to own vessel's position. It is deduced from several measurements of target range and bearing on own vessel's radar.
Rudder Feedback Unit	The Rudder Feedback Unit can be used in a rudder angle indicator system and as a part of the control loop in a steering control system.
SOLAS (Safety of Life at Sea)	An international maritime treaty which requires signatory flag states to ensure that vessels flagged by them comply with minimum safety standards in construction, equipment, and operation.
Speed	The absolute value of velocity. May either be the vessel's speed through the water, or the speed made good over the ground.
SOG (Speed over ground)	The speed of the vessel relative to the surface of the earth.
Steering gear	The equipment provided on vessels to turn the vessel.
Steering mode selector	A switch provided for the selection of manual steering modes and automatic steering devices.
Tiller	A device that is used to turn the rudder, which then steers the boat.
Track	Path to be followed over ground.
Track control	Control of the vessel's movement along a track, where corrections made by the controller to compensate for wind, drift and other influences, are based on the cross-track error and not only on the bearing to the destination waypoint.

TCS (Track Control System)	System designed to keep a vessel on a pre-determined track throughout its passage. Track Control systems must be interfaced with an electronic position fixing system. SOLAS Regulation 19, 2.8.2 requires Heading Control or Track Control Systems to be fitted to all vessels of 10000 GT and upward. There is no requirement to fit a Track Control system to any class of vessel. Track Control Systems include the functional capabilities of Heading Control systems.
Waypoint	An intermediate point or place on a route or line of travel, a stopping point or point at which course is changed.

II. Safety Information

The signal words DANGER, WARNING and CAUTION used in this manual indicate the degree of hazard that may be encountered by the user. These words are defined as follows:

**DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations.

**WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

The signal word NOTICE used in this manual indicates information considered important but not related to injury. It is typically used to prevent damage to equipment or property.

To safely operate this system, the following DANGERS, WARNINGS, and CAUTIONS must be adhered to. Failure to comply with the precautions or with specific dangers, warnings, and cautions elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment. ALPHATRON MARINE assumes no liability for the customer's failure to comply with these requirements.

AlphaPilot is a very useful navigational aid but DOES NOT UNDER ANY CIRCUMSTANCES REPLACE A HUMAN NAVIGATOR.

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 the law prohibits use of autopilot.

**WARNING**

When using AlphaPilot:

- Do not leave the helm unattended;
- Do not place any magnetic material or equipment near the heading sensor used in the AlphaPilot MFM system;
- Verify at regular intervals the course and position of the vessel;
- Always switch to Standby mode in due time to avoid hazardous situations

**WARNING**

Do not disassemble or modify the equipment. Otherwise, it may cause a fire, or you may suffer an electrical shock.

**WARNING**

Immediately turn off the power and disconnect the power supply cable if the equipment is generating any smoke or odour or is overheated. Immediately inform your local service agent of the symptom to have it repaired. Prolonged equipment operation under such a condition can cause a fire or electric shock.

**WARNING**

Do not place a container containing liquid on the equipment. Otherwise, it may cause a fire, or you may suffer an electrical shock if knocked over.

**WARNING**

When unplugging the instrument, be sure to remove the cord terminal correctly. If the cord is pulled, the cord may get damaged resulting in a fire or an electrical shock.

III. Warranty

To not to adversely affect the warranty, the following notices must be adhered to.

NOTICE Operating personnel must not remove equipment covers. Only personnel trained and certified by ALPHATRON MARINE must make component replacement and internal adjustment.

NOTICE Do not disassemble or modify the equipment. Failure to observe this instruction may cause equipment failure, and it will void the warranty.

NOTICE Any modification to this equipment without prior written permission from ALPHATRON MARINE will void the warranty.

NOTICE Installation of this product shall only be done by a certified installation company approved by either ALPHATRON MARINE or by an official ALPHATRON MARINE distributor. Acting otherwise will void the warranty.

NOTICE This product contains no operator serviceable parts. Service and repair shall only be carried out by personnel trained and certified by ALPHATRON MARINE.

NOTICE Do not place a container containing liquid on the equipment. The equipment can be damaged if knocked over.

NOTICE When cleaning the surface, do not use any organic solvent such as thinner or benzene. Otherwise, the paint and markings on the surface may get damaged. For cleaning the surface, remove the dust and debris and wipe with a clean dry cloth.

IV. About the manual

Intended readers

This manual is an operation manual for the AlphaPilot MFM system and control unit. The manual is intended for end users.

Manual overview

This manual has the following chapters:

- **Introduction** contains a description of the AlphaPilot MFM system.
- **AlphaPilot MFM control unit** contains a description of the control unit and its interface.
- **Operating modes** contains a description of the autopilot operating modes.
- **Controls and functions** contains a description of the basic functions such as dimming, control handover, alert handling, and alarm test.
- **Menus** contains a description of the accessible menus and menu items.
- **Alarms, warnings, and cautions** contains a description of alerts displayed on the AlphaPilot MFM control unit.

Related documents

The Alpatron AlphaPilot MFM system is available in many configurations, therefore 1 or more documents listed below may not be applicable.

- Alpatron Marine FU Tiller Operation Manual
- Alpatron Marine FU Tiller ROT Operation Manual
- Alpatron Marine FU Tiller S/I Operation Manual
- Alpatron Marine NFU Tiller Operation Manual
- Alpatron Marine Handwheel SR Operation Manual
- Alpatron Marine Handwheel TR Operation Manual
- Alpatron Marine Mode Switch 2 Pos Operation Manual
- Alpatron Marine Mode Switch 3 Pos Operation Manual
- Alpatron Marine RFU Rudder Feedback Unit MD/HD Installation and Operation Manual

Contact the Alpatron dealer for copies of the documents listed above.

1 Introduction

The Alpatron AlphaPilot MFM system is a type approved heading control system with self-adjusting 'Auto Tune' algorithm, designed to fit vessels of any size, including high speed crafts. It is a modern and technologically advanced digital vessel control unit that is intended to reduce the operator's workload, increase the vessel motion efficiency and improve operational safety.

The AlphaPilot MFM control unit is the main operator control unit of the AlphaPilot MFM system. It is used for control and monitoring of autopilot operation, setting vessel heading or rudder angle, selection of autopilot operating modes.

The AlphaPilot MFM control unit works in conjunction with an MCU (Main Control Unit) Box, which connects to the steering system or to the steering gear.

Refer to the AlphaPilot MFM Installation Manual for more details about the MCU Box and other technical information (including, but not limited to details about connectivity, data input, and data output).



WARNING! Always switch to Standby mode in due time to avoid hazardous situations.



WARNING! AlphaPilot is a very useful navigational aid but DOES NOT UNDER ANY CIRCUMSTANCES REPLACE A HUMAN NAVIGATOR.

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 the law prohibits use of autopilot.

When using AlphaPilot:

- Do not leave the helm unattended;
- Do not place any magnetic material or equipment near the heading sensor used in the AlphaPilot MFM system;
- Verify at regular intervals the course and position of the vessel;
- Always switch to Standby mode (i.e. Mode Switch to 'MAN' or 'NFU' position) in due time to avoid hazardous situations (ref. SOLAS-74 (Safety of Life at Sea), chapter 5, rule 19, International Regulations for Preventing Collisions at Sea; Navigation Rules-72, Rule 5 & etc.)

Compliance

The Alpatron AlphaPilot MFS system meets the following carriage and performance requirements:

MED/4.16 Heading Control Systems (HCS):

- SOLAS 74 Reg. V/18 & V/19
- IMO Res.A.342(IX)
- IMO Res.A.694(17)
- IMO Res.MSC.191(79)
- IMO Res.MSC.64(67) Annex 3
- IMO Res.MSC.302(87)

MED/4.40 Heading Control System (HCS) for High Speed Craft (HSC):

- SOLAS 74 Reg. X/3
- IMO Res.MSC.36(63)-(1994 HSC Code) 13
- IMO Res.MSC.97(73)-(2000 HSC Code) 13
- IMO Res.A.694(17)
- IMO Res.A.822(19)
- IMO Res.MSC.191(79)
- IMO Res.MSC.302(87)
- IMO MSC.1/Circ.1349

'Fail-to-safety' principle

'Fail-to-safety' principle is implemented in the AlphaPilot MFM system design, i.e. any failure results in the least critical of any possible new conditions.

2 AlphaPilot MFM control unit

The AlphaPilot MFM control unit has a touch screen display, a rotary knob, and a power button:

- The touch screen display shows information such as heading, current mode and settings, and alerts. The touch screen display is also used to set parameters (see Figure 2 on page 19).
- The rotary knob is used for various purposes such as, changing heading, and setting parameters.
- The power button is used to reset the AlphaPilot MFM.



Figure 1: AlphaPilot MFM control unit

The information shown on the display depends partly on the operating mode. Figure 2 (and Table 1) is provided as an example to highlight generic information. For information displayed in a specific operation mode related information is described in the respective section (see section 'Operating modes' on page 22).

All information, menus and functions are by default in English.

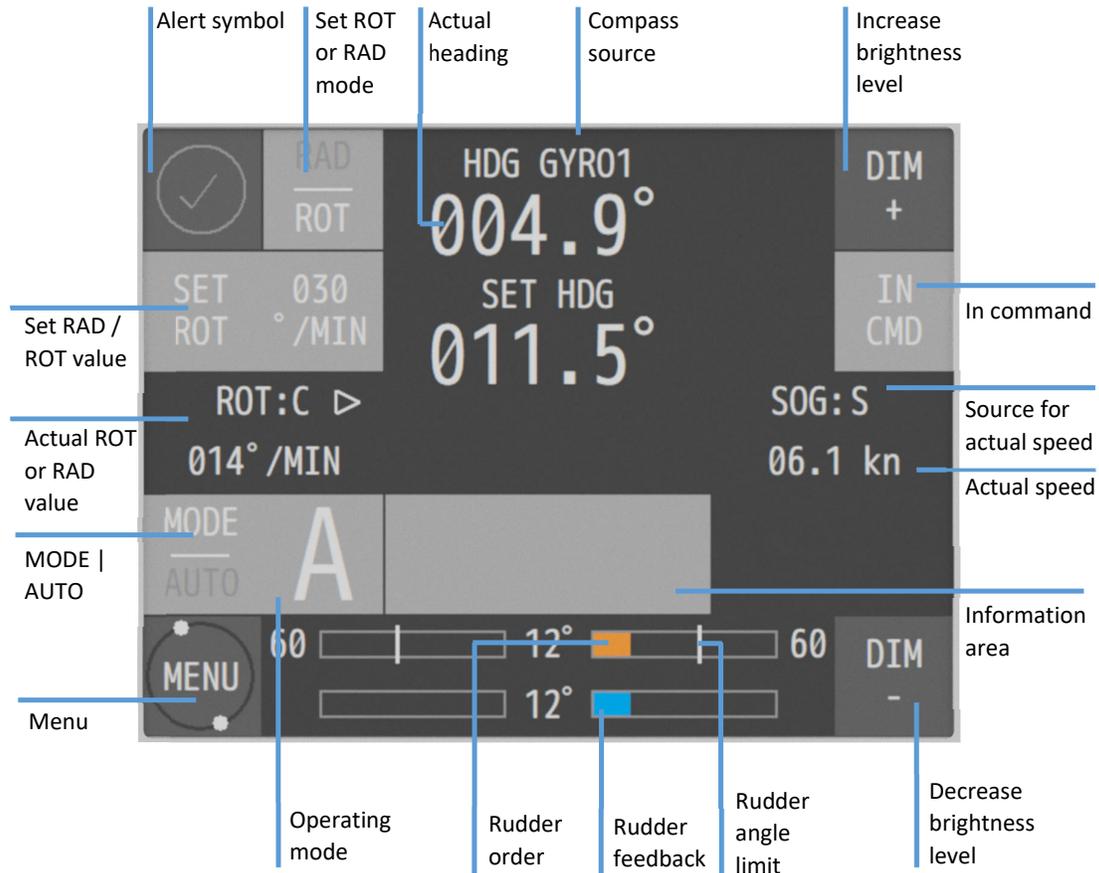


Figure 2: AlphaPilot MFM control unit - Displayed information

Item	Description
Alert symbol	Symbol for active alarm or notification. For detailed descriptions of alerts, see section 'Alarms, warnings, and cautions' on page 16.
Actual heading	Actual heading taken from compass source.
Compass source	Source from which the actual heading is taken. The following sources may be displayed: GYRO1 = Gyrocompass 1 (NMEA) GYRO2 = Gyrocompass 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)

Item	Description
Increase brightness level	Increase brightness level of all modules simultaneously.
In command	Shows if the AlphaPilot MFM control unit is in command. Also used for control handover. See section 'Control handover' on page 49.
Source for actual speed	Source from which the speed is taken. SOG value can be received from sensor (i.e. SOG:S) or it can be calculated (i.e. SOG:C). Speed can also be inputted manually (i.e. SPD MAN) (not recommended).
Actual speed	Speed value in knots.
Information area	Information depends on the heading control mode. Selection of displayed data can be done via the rotary knob. Information that can be displayed is explained in Table 2 on page 21.
Decrease brightness level	For simultaneous brightness level control of all interconnected modules.
Rudder angle limit	Shows the pre-set limit for the angle of the rudder. Rudder limit can be set in menu 'Parameters'. See section Menu 'Parameters' on page 51.
Rudder order	Presented as ordered rudder angle (in degrees).
Rudder feedback	Feedback of the RFU (Rudder Feedback Unit). Presented as rudder angle (in degrees). NOTE: This value should follow the rudder order.
Operating mode	Shows the active operating mode. For more information, see section 'Operating modes' on page 22.
Menu	The MENU button is used to enter or exit the parameters menu or advanced menu, which enables changing of the AlphaPilot operating parameters. For more information, see section 'Menus' on page xx.
MODE AUTO	The 'MODE AUTO' button is used to select the desired control mode. Press the 'MODE AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When new mode is confirmed by pushing the rotary knob, the AlphaPilot goes into selected mode and the respective symbol appears in 'Operating mode' field on the display. If a mode is not confirmed within 20 seconds, AlphaPilot remains in previous control mode.
Actual ROT or RAD value	Actual operating ROT or RAD value. Operating ROT value is shown in degrees per minute. Operating RAD value is shown in nautical miles. ROT value can be received from sensor (i.e. ROT:S) or it can be calculated (i.e. ROT:C).
Set ROT or RAD mode	Set steering method to ROT or RAD mode. NOTE: Some control modes (e.g. CTS pilot (C) and Wind vane (V) control mode) use their own steering method (which are strongly defined in the Autopilot software regardless of this setting).

Table 1: Description of AlphaPilot MFM displayed items

Info Field Name	Example	Description
Vessel 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 except 'Wind Vane' if Wind Sensor is connected
True Wind data and its type	TRUE WIND 020° SPD 01.2 kn CALC	Available in all control modes except 'Wind Vane' if Wind Sensor is connected
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 or Heading Source is the external Heading Monitor System (HMS)
Route Leg	ROUTE LEG 268.1°	Available in 'Track' (Ti) control mode only
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

Table 2: Displayed information in Information area

3 Operating modes

3.1 Introduction

The operating modes are displayed on the AlphaPilot MFM control unit (see Figure 2 on page 19) and explained in this section. Symbols are used to clearly indicate the active autopilot operating mode.

To enable a heading control mode, press the 'MODE|AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When the desired control mode is shown, push the rotary knob, and the Autopilot goes into selected mode (the respective symbol appears in 'Operating mode' field on the display).

Symbol	Mode	Description
S	Standby	Autopilot is in Standby mode (not in control).
		Autopilot is in Follow-Up mode (not in control).
F	FU	In FU mode, the vessel can be hand steered by using the FU Tiller or Steering wheel. Hand steering is typically used when the vessel is manoeuvring, and navigating in restricted waters, channels, and areas with traffic density.
		Autopilot is (in control) in Automatic heading control mode. The autopilot steers the vessel to the reference course as shown on the display. When wind and/or current will push the vessel off course, the Autopilot will measure and counteract to keep the vessel to the set heading. The reference course will be the course the vessel has when Auto mode is selected.
A	Auto	AlphaPilot MFM can also operate with one or two tunnel thrusters and support the 'Low Speed Heading Control' mode (sub mode of Auto mode); Alert 'LOW SPEED FOR AUTO' is disabled, and one or two tunnel thrusters assist in vessel control.
D	Dodge*	Short-term manual FU steering via rotary knob on the Autopilot MFM control unit. Autopilot is in control.
O	Override	Short-term manual FU steering via Steering wheel or FU Tiller. Intentional fast handover to avoid an object. Autopilot is not in control.
T	Track*	Autopilot is in Track control mode (TCS Category A, B)**

Symbol	Mode	Description
	Track*	Autopilot is in Track control mode (TCS Category C)** Turn Rate controlled.
	Track*	Autopilot is in Track control mode (TCS Category C)** Radius controlled.
	Rate of Turn*	In Rate of Turn mode, the Autopilot is switched over to manual ROT steering via knob on the control panel or activated on an external FU Tiller ROT module.
	CTS*	CTS mode is an estimated course that a vessel should steer to arrive at a waypoint or bearing and stay on ground track. The vessel will stay on a pre-set COG. The drift, wind force, and direction are ignored.
	Wind vane*	For sailing yachts only! Wind vane mode is automatic steering by pre-set Relative Wind angle. A wind sensor is required. Wind vane mode is not compliant to the SOLAS convention.
	NFU	Autopilot is in Non-Follow-Up mode (not in control). In NFU mode, the vessel can be hand steered by using the NFU Tiller.

* The control mode may not be available. It can be enabled or disabled by a service engineer (see AlphaPilot MFM Installation Manual).

** Track control mode combines an ECDIS with the Autopilot. The navigator can program a voyage plan into the ECDIS that contains one or more tracks. The Track Control System (TCS) is used together with the input from the sensors for position, course and speed and is designed to keep the vessel on the plotted route. Track control systems according to requirements of the IMO Performance Standards (MSC.74(69) Annex 2 Recommendation on Performance Standards for Track Control Systems) applies to three categories of track control systems: Category A: Single leg track control or multiple leg track control without assisted turns between legs. Category B: Multiple leg track control with assisted turns between legs. Category C: Full track control on legs and turns.

3.2 Standby (S) mode

Autopilot is not operating for vessel heading control.

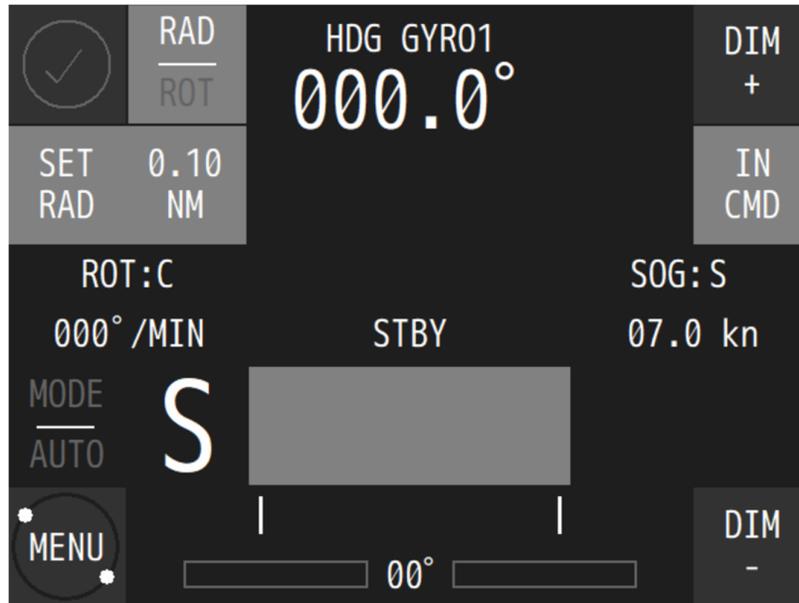


Figure 3: AlphaPilot MFM control unit - S mode

Autopilot will go into Standby (S) mode automatically when the Mode Switch is switched to the 'NFU' position.

3.3 Follow-Up (F) mode

Autopilot is not operating for vessel heading control. In Follow-Up mode, the vessel can be hand steered by using the FU Tiller or Steering wheel. Hand steering is typically used when the vessel is manoeuvring, and navigating in restricted waters, channels, and areas with traffic density traffic density.

Autopilot will go into Follow-Up (F) mode automatically when the Mode Switch 3 Pos is switched to the 'MAN' position.

NOTE: Follow-Up (F) mode is not available for an autopilot with Mode Switch 2 Pos. For manual (Follow-Up) steering, use the FU Tiller or Steering wheel to enable the Override (O) mode, or use the AlphaPilot MFM control unit to enable the Dodge (D) mode.

NOTE: Autopilot will go into Override (O) mode automatically when the Mode Switch 2 Pos is switched to the 'MAN|AUTO' position.

For more information, refer to FU Tiller and/or Handwheel Operation Manual.

3.4 Auto (A) control mode

3.4.1 Introduction

Automatic steering by means of heading (course) control. Auto (A) control mode is the main autopilot control mode which automatically steers the vessel to a pre-set heading.

When wind and/or current will push the vessel off course, Auto (A) control mode will measure and counteract to keep the vessel to the pre-set heading.

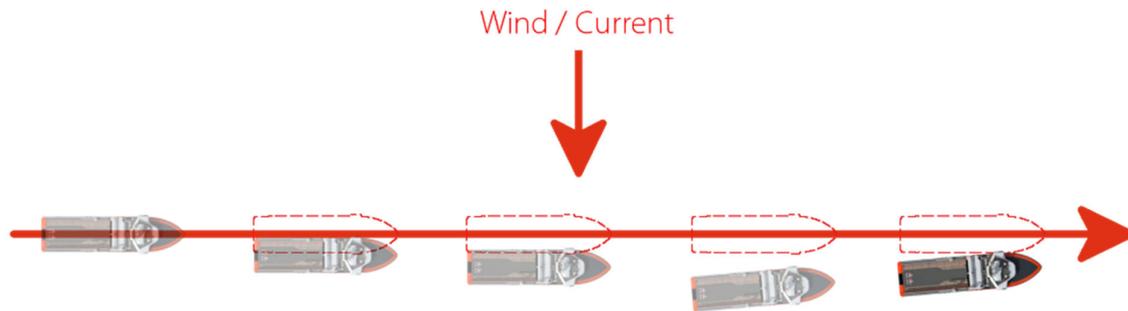


Figure 4: A mode - Wind and current factor

The following information is displayed in Auto (A) control mode: actual heading, pre-set heading, actual speed, actual ROT in degrees per minute or actual RAD in nautical miles, rudder(s) order, rudder(s) feedback, and steering method.

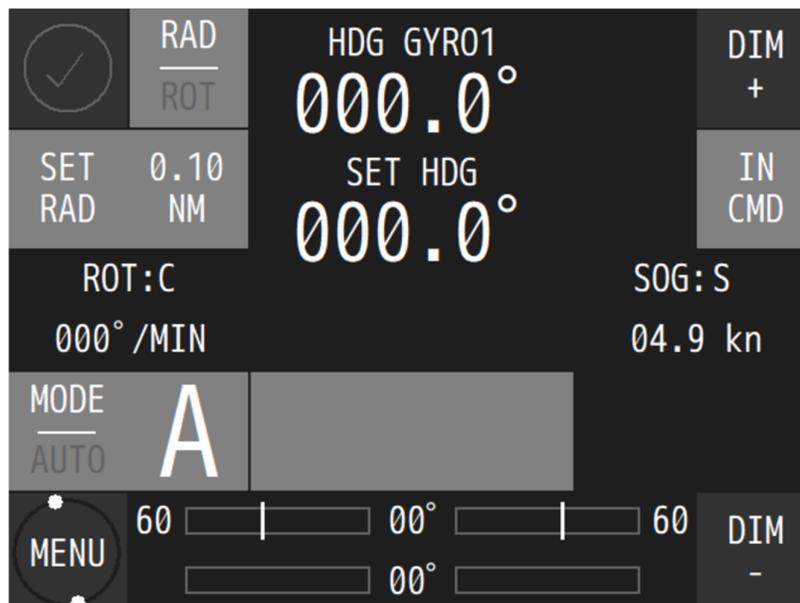


Figure 5: Auto (A) mode on AlphaPilot MFM control unit

NOTE: While in Auto (A) control mode, the system continuously checks for the availability and quality of heading and speed information. In case of no heading data, the audible and visual alert is generated and 'SWITCH TO MANUAL' prompt message appears on the display.

NOTE: Warning message 'ROT/RAD UNREACHABLE' appears on the display if operating parameters 'SET ROT' or 'SET RAD' are not corresponding with the actual 'Rudder Limit' value. Decrease the value for 'SET ROT' or increase the value for 'SET RAD'.

NOTE: Alert 'OFF HEADING' is generated when the difference between the vessel's actual heading and pre-set heading exceeds the 'Heading Alarm'. See Menu 'Alarm Settings' on page 53.

3.4.2 Enable Auto (A) control mode

Press the 'MODE|AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When the Auto (A) control mode is shown, push the rotary knob, and the Autopilot goes into selected mode (the 'A' symbol appears in 'Operating mode' field on the display).

3.4.3 Steering in Auto (A) control mode

3.4.3.1 Change the heading

To change the heading, rotate the knob to select a new heading value, and push to confirm. The autopilot starts changing the actual heading to the new heading. The autopilot maintains the actual heading if no confirmation is received within 20 seconds.

3.4.3.2 Change the resolution

To change the resolution (1° or $1/10^\circ$), push and hold the rotary knob for two seconds, then rotate the knob and push to confirm.

3.4.3.3 Change the steering method

Two steering methods are available for Auto (A) control mode, namely steering by ROT or steering by RAD. The selected steering mode is shown on the top left part of the display (SET ROT or SET RAD).

To change the steering method, press the 'ROT|RAD' button.

3.4.3.4 Change parameters

See section Menu 'Parameters' on page 51 and Menu 'Advanced' on page 54.

3.5 Low Speed Heading Control mode

3.5.1 Introduction

AlphaPilot MFM can operate with one or two tunnel thrusters and support the ‘Low Speed Heading Control’ mode (sub mode of Auto mode); Alert ‘LOW SPEED FOR AUTO’ is disabled, and one or two tunnel thrusters assist in vessel control.

NOTE: Low Speed Heading Control may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).

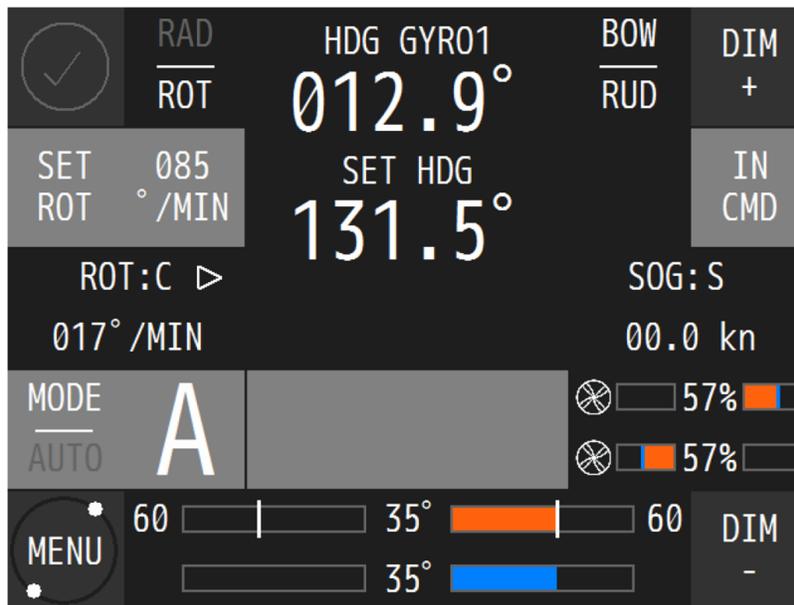


Figure 6: Low Speed Heading Control mode with a single thruster on AlphaPilot MFM control unit

NOTE: Selection of another control mode is not allowed while in ‘Low Speed Heading Control’ mode.

3.5.2 Enable Low Speed Heading Control mode

While in Standby (S) mode, change the 'AP Type' parameter in the menu 'Parameters':

PARAMETERS		PARAMETERS	
Heading Sens	11	Heading Low Sns	05
Rudder Limit	35	Rudder Limit	35
Course Precision	10	Course Precision	10
AP Type	AP	AP Type	TT
Wind Precision	05	Wind Precision	05
Wind Shift	15°	Wind Shift	15°

Figure 7: Menu 'Parameters' AP Type 'AP' (left), AP Type 'TT' (right)

- 'AP' : Low Speed Heading Control is disabled. Bow and/or stern thruster(s) are not used.
- 'TT' : Low Speed Heading Control is enabled. Only bow and/or stern thruster(s) will be used for Low Speed Heading Control mode.
- 'TTR' : Low Speed Heading Control is enabled. Rudder(s), bow, and/or stern thruster(s) will be used for Low Speed Heading Control mode.

Enable Auto (A) control mode, and Low Speed Heading Control is activated as well.

NOTE: Selection of the 'Low Speed Heading Control' (i.e. 'TT' or 'TTR') cannot be done in a control mode other than the Standby (S) mode, see figure below.

PARAMETERS	
Heading Sens	11
Rudder Limit	35
Course Precision	10
AP Type *	AP
Wind Precision	05
Wind Shift	15°
* - Change in STBY only!	

Figure 8: Menu 'Parameters'; Change of AP type is not allowed

NOTE: Selection of other control modes is not permitted during operation in Low Speed Heading Control.

3.5.3 Steering in Low Speed Heading Control mode

NOTE: In case of a single failure during operation in 'Low Speed Heading Control' mode, the AlphaPilot MFM will use the following procedure to keep a 'SET HDG' as accurate as possible:

- Single thruster failure
Autopilot uses the second thruster (if available) and single, linked, or independent rudders – if 'AP Type' is set to 'TT'.
- Single rudder failure
Autopilot uses thruster(s) in 'TT' mode or thruster(s) and second independent rudder (if available in 'TTR' mode).

In case of an emergency, always switch the Mode Switch to the 'NFU' position!

3.5.3.1 *Change the heading*

To change the heading, rotate the knob to select a new heading value, and push to confirm. The autopilot starts changing the actual heading to the new heading. The autopilot maintains the actual heading if no confirmation is received within 20 seconds.

3.5.3.2 *Change the sensitivity of the thruster/heading keeping*

Parameter 'Heading Low Sns' specifies the sensitivity of the thruster/heading keeping in the Low Speed Heading Control mode.

Accepted range is 1 to 30. Recommended range is 5 to 12. Increase the parameter value if the vessel responds too slowly to sea conditions, i.e. at significant off-headings the rudder angle changes and forces to tunnel thruster(s) are not enough.

3.6 Dodge (D) mode

3.6.1 Introduction

Short-term manual FU (Follow-Up) steering (set angle of rudder(s)) via rotary knob on the Autopilot MFM control unit. Autopilot is in control.

NOTE: Dodge (D) control mode may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).

The following information is displayed in Dodge (D) control mode: actual heading, actual speed, actual ROT in degrees per minute, rudder(s) order, rudder(s) feedback.

NOTE: 'Rudder Limit', 'SET ROT' and 'SET RAD' parameters are not used during operation in Dodge (D) control mode.

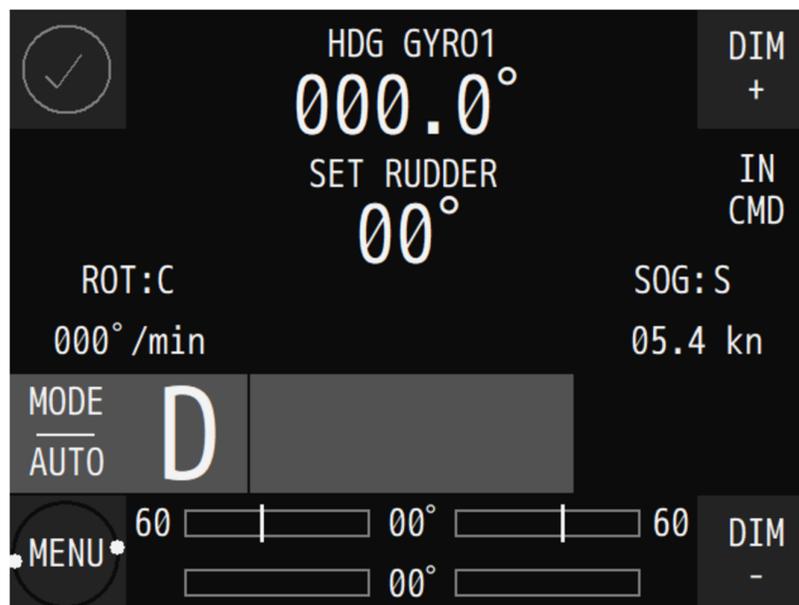


Figure 9: Dodge (D) mode on AlphaPilot MFM control unit

3.6.2 Enable Dodge (D) control mode

Press the 'MODE|AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When the Dodge (D) control mode is shown, push the rotary knob, and the Autopilot goes into selected mode (the 'D' symbol appears in 'Operating mode' field on the display).

NOTE: After using the Dodge (D) mode, the Autopilot must be manually returned to Auto (A) mode; the actual heading is taken as pre-set heading.

3.6.3 Steering in Dodge (D) control mode

Rotate the knob to change the rudder angle.

NOTE: For vessels with two independent rudders; In Dodge (D) control mode; control operations for both rudders are implemented synchronously.

3.7 Override (O) control mode

3.7.1 Introduction

Override (O) control mode is intended for short-term manual FU (Follow-Up) steering (set angle of rudder(s)) via Steering wheel or FU Tiller (e.g. to avoid an object). Autopilot is not in control.

NOTE: Follow-Up (F) mode is not available for an autopilot with Mode Switch 2 Pos, therefore Override (O) mode is used for manual (Follow-Up) steering. Autopilot will go into Override (O) mode automatically when the Mode Switch 2 Pos is switched to the 'MAN|AUTO' position.

Note that Override (O) control mode may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).

The following information is displayed in Override (O) control mode: actual heading, actual speed, actual ROT in degrees per minute, rudder(s) order, rudder(s) feedback.

NOTE: For vessels with two independent rudders; In Override (O) control mode, all control operations for both rudders are implemented synchronously.

NOTE: 'Rudder Limit', 'SET ROT' and 'SET RAD' are not used during operation in Override (O) control mode.

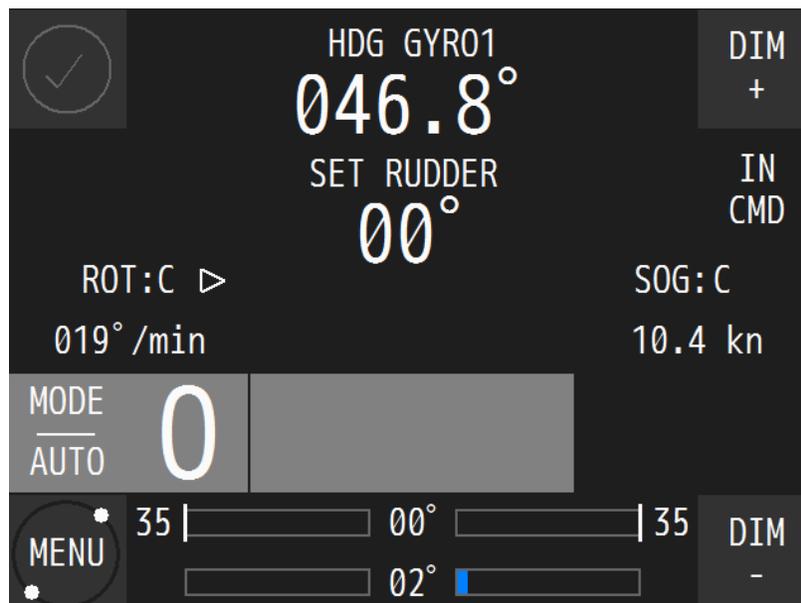


Figure 10: Override (O) mode on AlphaPilot MFM control unit

3.7.2 Enable Override (O) control mode

Override (O) control mode is only enabled via Steering wheel or FU Tiller.

Press the 'FU' button on the FU Tiller, and the control mode indicator 'FU' and handle indicator on the FU Tiller will illuminate, meaning that the respective mode (i.e. Override (O) control mode) and the handle is enabled. and the Autopilot goes into selected mode (the 'O' symbol appears in 'Operating mode' field on the display).

The AlphaPilot MFM control unit generates time limited audible signal and displays a warning message 'OVERRIDE'.

NOTE: After using the Override (O) control mode, the Autopilot must be manually returned to Auto (A) mode; the actual heading is taken as pre-set heading.

3.7.3 Steering in Override (O) control mode

Rotate the handle to change the rudder angle. For more details, refer to the FU Tiller Operation manual.

3.8 Track (T) control modes

3.8.1 Introduction

Track (T) control mode (also referred to as 'Track steering') combines an ECDIS with the Autopilot. The navigator can program a voyage plan into the ECDIS that contains one or more tracks.

The TCS (Track Control System) is used together with the input from the sensors for position, course and speed and is designed to keep the vessel on the plotted route.

Track Control Systems according to requirements of the IMO Performance Standards (MSC.74(69) Annex 2 Recommendation on Performance Standards for Track Control Systems) applies to three categories of Track Control Systems:

- Category A: Single leg track control or multiple leg track control without assisted turns between legs.
- Category B: Multiple leg track control with assisted turns between legs.
- Category C: Full track control on legs and turns.

The Autopilot covers two types of Track control modes:

- Track (T) control mode: Track control mode as per Category A, B
- Track (Tn or Ti) control mode: Track control mode as per Category C

3.8.2 Track (T) control mode, TCS category A, B

3.8.2.1 Introduction

Note that Track (T) control mode, TCS category A, B, may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).

Automatic steering by means of track control on straight legs (TCS category A, B); Autopilot receives information (XTD and BTW) from an external TCS (Track Control System) and operates as a track controller.

In this mode, the user is requested to acknowledge waypoints.

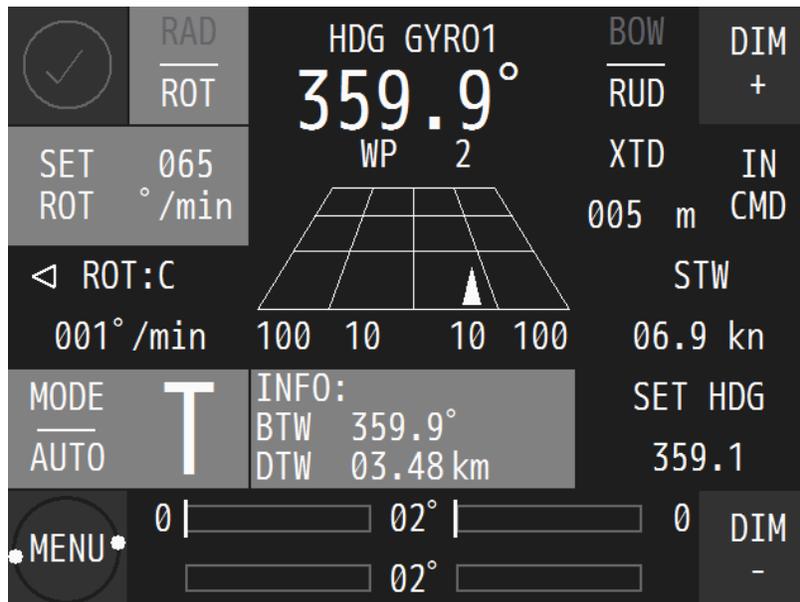


Figure 11: Track (T) mode on AlphaPilot MFM control unit



WARNING This functionality is not compliant to the SOLAS convention unless approved as part of a TCS category A, B. Otherwise, Track (T) control mode can be only used on non-SOLAS ships and leisure crafts

NOTE: Valid D-GPS position and speed are required for Track (T) control mode.

NOTE: In Track (T) control mode, an 'OFF TRACK' alarm is generated when the XTD value exceeds the 'XTD Alarm' setting (see Menu 'Alarm Settings' on page 53).

NOTE: In Track (T) control mode, an 'OFF COURSE' alarm is generated when the difference between the vessel's heading and current track leg exceeds the 'Course Alarm' setting (see Menu 'Alarm Settings' on page 53).

NOTE: In Track (T) control mode, a 'CHANGE SPEED SOURCE' alert is generated when a manual speed was set before the activation of the Track (T) control mode. Switch back into Standby (S) mode and change a speed source to LOG or SOG in the submenu 'Set devices' of the menu 'Advanced'.

NOTE: While in Track (T) control mode, the system continuously checks for the availability and quality of APB, BWC, BWR and VTG, GGA, GLL messages. In case if these messages are missing, the 'TRACK FAIL' alarm is generated and 'SWITCHED TO AUTO' prompt message appears on the control panel display. In this case actual heading is taken over as a pre-set heading in Auto (A) control mode automatically.

The following information is displayed in Track (T) control mode: actual heading, pre-set heading, actual speed, actual ROT in degrees per minute or actual RAD in nautical miles, rudder(s) order, rudder(s) feedback, steering method.

NOTE: Steering by RAD is recommended in combination with an external ECS system/ECDIS.

NOTE: While in Auto (A) control mode, the system continuously checks for the availability and quality of heading and speed information. In case of no heading data, the audible and visual alert is generated and 'SWITCH TO MANUAL' prompt message appears on the display.

3.8.2.2 Enable Track (T) control mode

Press the 'MODE|AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When the Track (T) control mode is shown, push the rotary knob, and the AlphaPilot MFM system goes into selected mode (the 'T' symbol appears in 'Operating mode' field on the display).

3.8.2.3 Steering in Track (T) control mode

3.8.2.3.1 Confirm a new waypoint

External TCS (ECDIS/ECS) switches over track waypoints. At changing the waypoint, AlphaPilot MFM control unit requests heading change confirmation for turning to a new leg. Push the rotary knob to confirm a new waypoint.

Display shows the new waypoint name (WP), cross-track distance (XTD), bearing to (the new) waypoint (BTW), direction and estimated value of heading change and its direction (CHG). An audible signal is generated and 'NEW WP' warning message is displayed in the 'ALARM' field. Press 'ALARM' button to acknowledge the 'NEW WP' warning. Then press knob to confirm starting of the turn (heading change to the new WP). Path to the new leg depends on the turn permission event.

Below are various vessel motion options at taking the new leg.

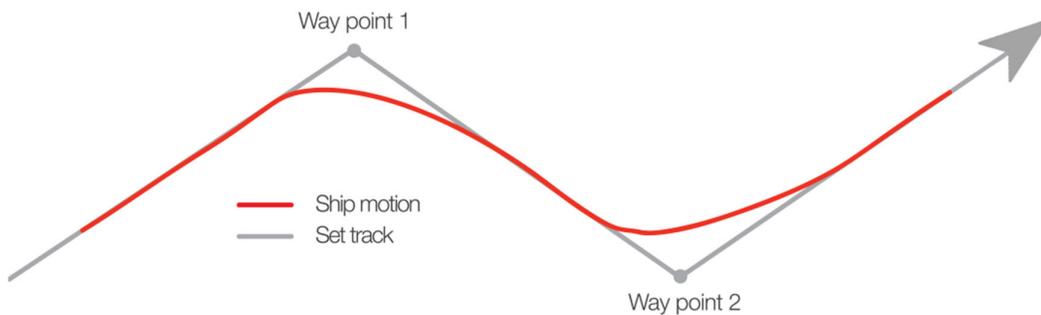


Figure 12: Early permission

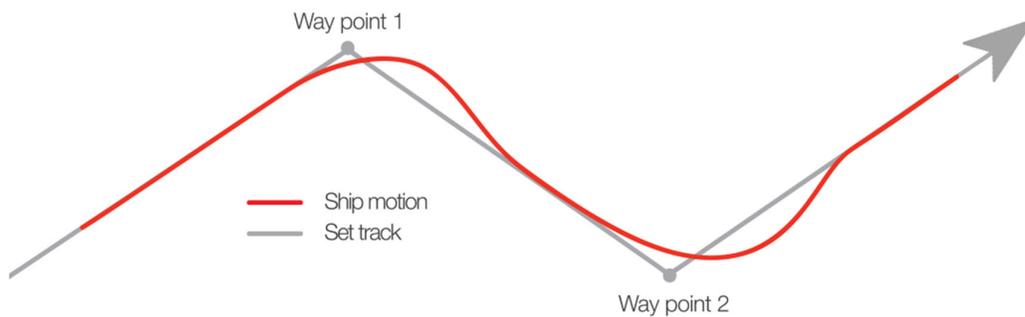


Figure 13: Late permission

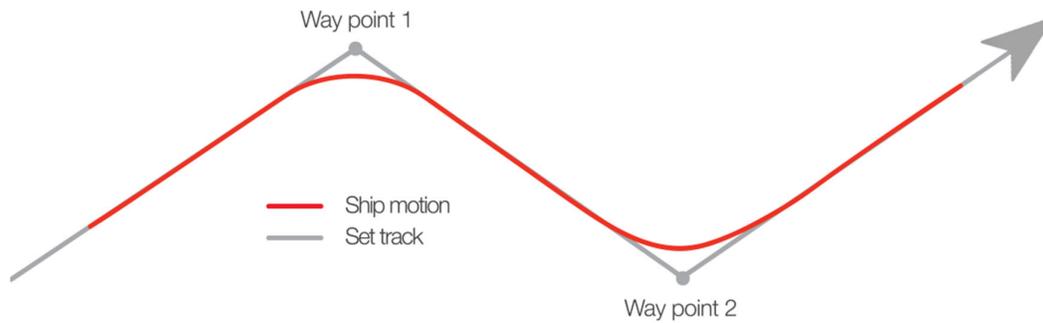


Figure 14: Timely permission

NOTE: It is recommended to use in the external ECDIS/ECS system the WP changing method “by entering into Arrival Circle” during operation in Track (T) control mode. In that case timely permission to turn to the new leg can be achieved within steering by RAD method in Track (T) control mode. Turn radiuses can be set for any WP in the ECDIS, and the corresponding ‘SET RAD’ parameter – in the operating menu ‘Parameters’ or using ‘ROT/RAD’ button and rotary knob on the AlphaPilot MFM control unit.

3.8.2.3.2 [Change the steering method](#)

Two steering methods are available for ‘Track (T)’ mode, namely steering by ROT or steering by RAD. The selected steering mode is shown on the top left part of the display (SET ROT or SET RAD).

To change the steering method, press the ‘ROT|RAD’ button.

3.8.2.4 [Change track control precision](#)

To change the Course Precision parameter, refer to Menu ‘Parameters’ on page 51.

3.8.2.5 [Change parameters](#)

See section Menu ‘Parameters’ on page 51 and Menu ‘Advanced’ on page 54.

3.8.3 Track (T_N or T_I) control mode, TCS category C

3.8.3.1 Introduction

Automatic steering by means of track control on straight legs and turns (TCS category C); Autopilot receives information from an external TCS and operates as a track controller.

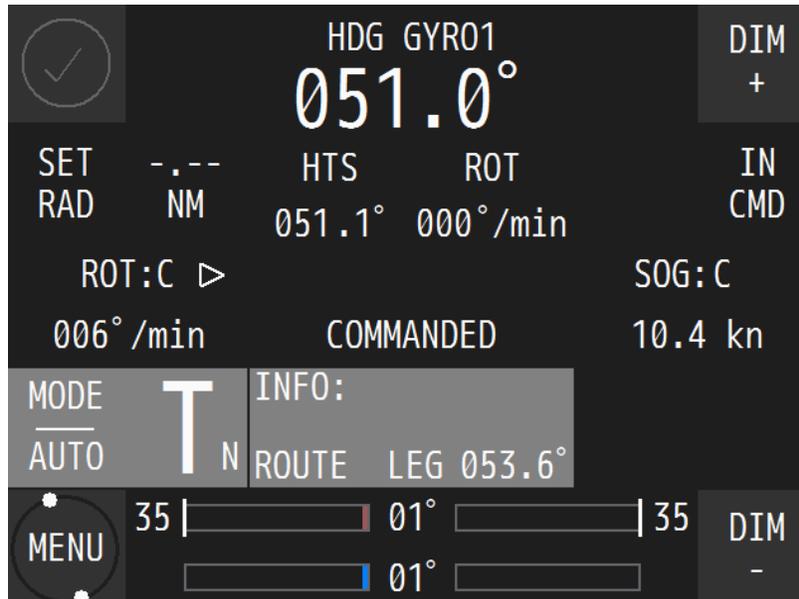


Figure 15: T_N mode on AlphaPilot MFM control unit

NOTE: Track (T_N or T_I) control mode, TCS category C, may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).



WARNING This functionality is not compliant to the SOLAS convention unless approved as part of a TCS category A, B. Otherwise, Track (T) control mode can be only used on non-SOLAS ships and leisure crafts

NOTE: Autopilot receives commanded Heading-To-Steer (HTS), commanded radius or commanded ROT from TCS.

NOTE: While in Track (T_N or T_I) control mode, the system continuously checks for the validity (age), format and check sum of 'HTC' / 'HSC' messages. If one of these messages are missing, the 'TRACK FAIL' alarm is generated and 'SWITCH TO AUTO' prompt message appears on the display. In this case; (a) If sailing was on a curved path, the turn is completed with the latest commanded ROT and the track course of the next straight leg is taken over as present heading for heading control; (b) If sailing on a straight leg, the actual heading is taken over as the pre-set heading for the heading control.

NOTE: In Track (T_N or T_I) control mode, a 'CHANGE SPEED SOURCE' alert is generated when a manual speed was set before the activation of the Track (T) control mode. Switch back into Standby (S) mode and change a speed source to LOG or SOG in the submenu 'Set devices' of the menu 'Advanced'.

NOTE: 'Rudder Limit', 'SET ROT' and 'SET RAD' parameters are not used during operation in Track (T_N or T_I) control mode. AlphaPilot uses incoming HTC sentences (commanded HTS, ROT or RAD) from an external TCS.

3.8.3.2 Enable Track (T_N or T_I) control mode

Press the 'MODE|AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When Track (T_N or T_I) control mode is shown, push the rotary knob, and the Autopilot goes into selected mode (the 'Tn' symbol appears in 'Operating mode' field on the display).

3.8.3.3 Steering in Track (T_N or T_I) control mode

Commanded heading to steer and rate of turn (HTC, HSC or proprietary messages) is set by an external TCS Category C.

3.8.3.4 Change parameters

See section Menu 'Parameters' on page 51 and Menu 'Advanced' on page 54.

3.9 Rate of Turn (R) control mode

3.9.1 Introduction

Rate of Turn (R) mode is a ROT steering control mode. ROT is the speed (or rate) at which a vessel is turning at, or can turn at, measured in degrees per minute. Steering is done via knob on the AlphaPilot MFM control unit or on a FU Tiller ROT.

NOTE: Rate of Turn (R) control mode may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).

NOTE: RAD is not used during operation in Rate of Turn (R) mode.

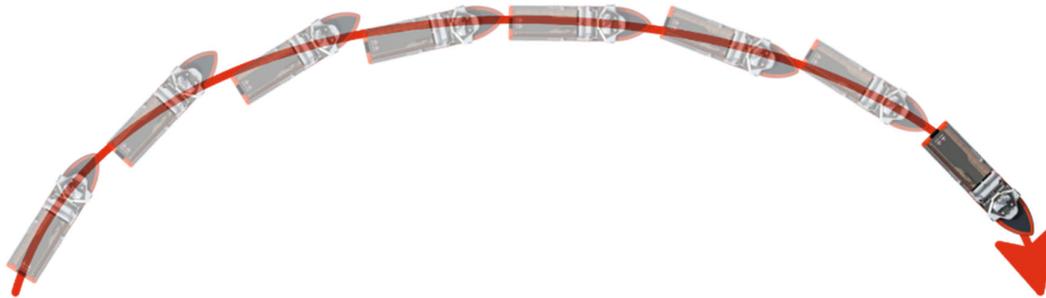


Figure 17: ROT

The following information is displayed in Rate of Turn (R) control mode: actual heading, actual speed, ROT order, actual ROT (in degrees per minute), rudder(s) order, rudder(s) feedback.

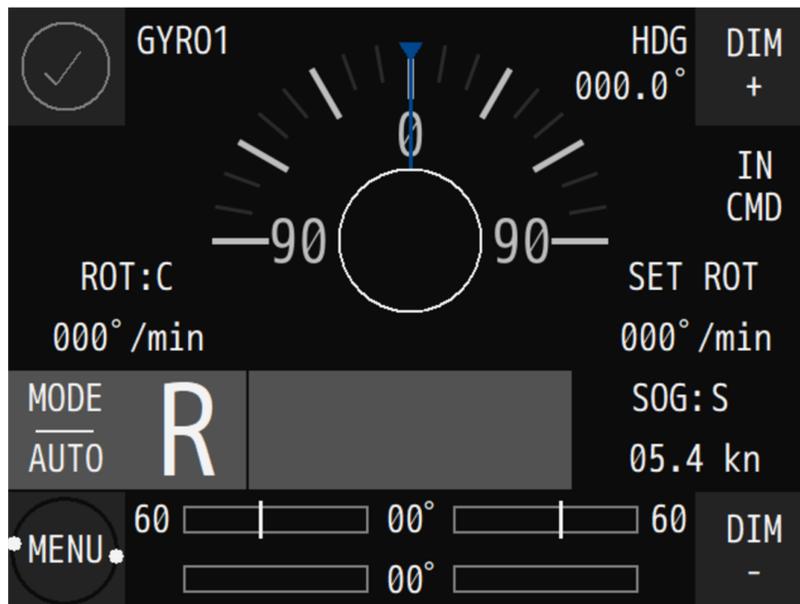


Figure 18: Rate of Turn (R) mode on AlphaPilot MFM control unit

3.9.2 Enable Rate of Turn (R) mode

3.9.2.1 *Enable Rate of Turn (R) mode from FU Tiller ROT*

Press the 'ROT' button on the FU Tiller ROT, and the control mode indicator 'ROT' and handle indicator on the FU Tiller ROT will illuminate, meaning that the respective mode (i.e. Rate of Turn (R) control mode) and the handle is enabled. and the Autopilot goes into selected mode (the 'R' symbol appears in 'Operating mode' field on the display).

For more details, refer to the FU Tiller ROT Operation Manual.

NOTE: The 'FU' button on other Tiller types (FU Tiller or FU Tiller S/is) used to enable the Dodge (D) control mode.

3.9.2.2 *Enable Rate of Turn (R) mode from AlphaPilot MFM control unit*

Press the 'MODE|AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When the Rate of Turn (R) control mode is shown, push the rotary knob, and the Autopilot goes into selected mode (the 'R' symbol appears in 'Operating mode' field on the display).

NOTE: After using the Rate of Turn (R) control mode, the Autopilot must be manually returned to Auto (A) mode; the actual heading is taken as pre-set heading.

3.9.3 Steering in Rate of Turn (R) mode

Rotate the handle to change the ROT order.

3.9.4 Change parameters

See section Menu 'Parameters' on page 51 and Menu 'Advanced' on page 54.

3.10 CTS pilot (C) control mode

3.10.1 Introduction

CTS (Course-To-Steer) pilot control mode is an estimated course that a vessel should steer to arrive at a waypoint or bearing and stay on ground track.

Note that the vessel's heading may differ from the COG value because of wind, tide, and currents. The vessel simply keeps the pre-set COG value.

The figure below shows a CTS of -55° and actual heading of -45° .

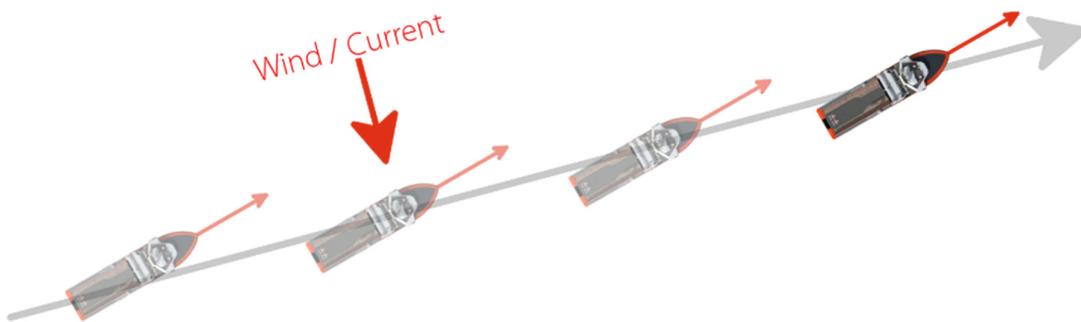


Figure 19: Wind and current factor

NOTE: CTS pilot (C) control mode may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).

NOTE: AlphaPilot MFM uses RAD in CTS pilot (C) control mode. ROT is not used during operation in CTS pilot (C) control mode.

NOTE: A valid D-GPS position and speed is required for operation in CTS pilot (C) control mode to use COG data in that control mode. GPS receivers calculate COG based on the direction of travel relative to the ground, whereas a compass will indicate which direction the boat is facing. Note that there are several reasons why these will differ, the primary ones being tide and wind. If the vessel is travelling across a strong tide then the vessel will move in a different direction to the direction in which the vessel is heading. For example, travelling at 5 knots across 1 knot of tide will cause an 11° difference between heading and COG as the tide pushes the vessel sideways.

NOTE: In CTS pilot (C) control mode, an 'OFF COURSE' alarm is generated when the difference between the actual (or calculated) COG value and 'SET COG' value exceeds the 'Course Alarm' setting (see Menu 'Alarm Settings' on page 53).

NOTE: In CTS pilot (C) control mode, a 'GPS POS FAIL' alert and 'SWITCHED TO AUTO' prompt message is generated when the position from GPS sensor is not received anymore.

NOTE: In CTS pilot (C) control mode, a 'CHANGE SPEED SOURCE' alert is generated when a manual speed was set before the activation of the CTS pilot (C) control mode. Switch back into Standby (S) mode and change a speed source to SOG in the submenu 'Set devices' of the menu 'Advanced'.

The following information is displayed in CTS pilot (C) control mode: actual COG, pre-set COG, actual speed, actual ROT in degrees per minute or actual RAD in nautical miles, rudder(s) order, rudder(s) feedback.

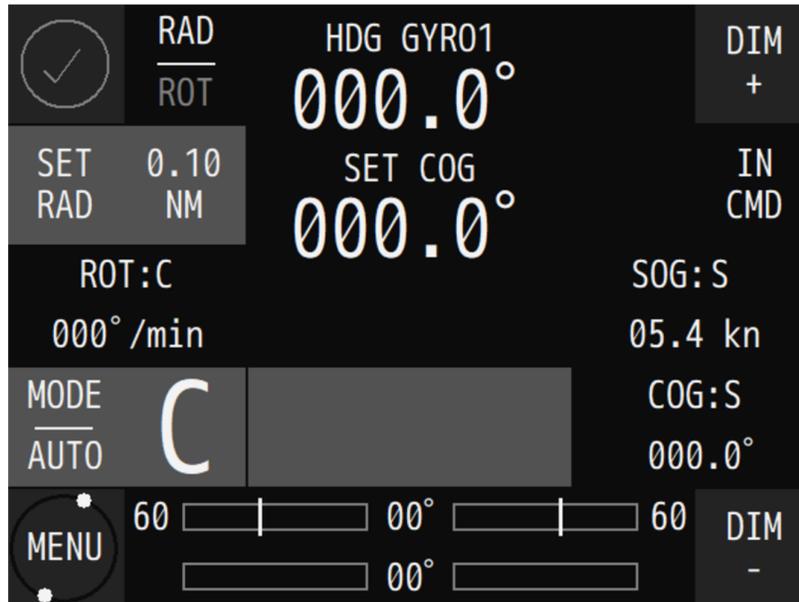


Figure 20: CTS pilot (C) mode on AlphaPilot MFM control unit

NOTE: COG value can be received from sensor (i.e. COG:S) or it can be calculated (i.e. COG:C).

3.10.2 Enable CTS pilot (C) control mode

Press the 'MODE|AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When the CTS pilot (C) control mode is shown, push the rotary knob, and the Autopilot goes into selected mode (the 'C' symbol appears in 'Operating mode' field on the display).

3.10.3 Steering in CTS pilot (C) control mode

To change the COG value, rotate the knob to select a new COG value, and push to confirm. The autopilot starts changing the actual COG value to the new COG value. The autopilot maintains the actual pre-set COG value if no confirmation is received within 20 seconds.

3.10.4 Change the resolution

To change the resolution (1° or 1/10°), push and hold the rotary knob for two seconds, then rotate the knob and push to confirm.

3.10.5 Change parameters

See section Menu 'Parameters' on page 51 and Menu 'Advanced' on page 54.

3.11 Wind vane (V) control mode

3.11.1 Introduction

For sailing yachts only. This control mode is intended for long sailing cruises at open sea when it is comfortable to steer after the wind. When the wind changes the autopilot adapts to a new course where the relative angle to the wind is maintained. When the boat tacks, the new heading will be the same relative wind angle on the opposite side of the boat.

This control mode is not compliant to the SOLAS convention. Automatic steering by the pre-set relative wind angle. A wind sensor is required.

NOTE: AlphaPilot MFM uses ROT in Wind vane (V) control mode. RAD is not used during operation in Wind vane (V) control mode.

NOTE: Wind vane (V) control mode may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).

NOTE: In Wind vane (V) control mode, Valid Wind data from the Wind sensor (Anemometer) is required, otherwise 'INVALID WIND DATA' alarm message appears on the screen.

The following information is displayed in Wind vane (V) control mode: actual heading, actual speed, pre-set Relative Wind angle (i.e. 'SET ANGLE'), actual Relative / True Wind data ('REL WIND' or 'TRUE WIND'), operating ROT value (i.e. 'SET ROT'), rudder(s) order, rudder(s) feedback.

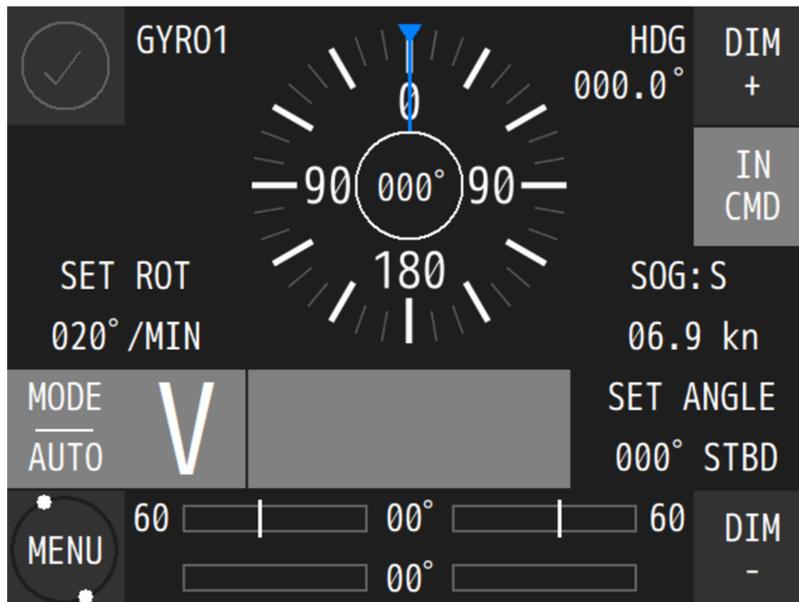


Figure 21: Wind vane (V) mode on AlphaPilot MFM control unit

3.11.2 Enable Wind vane (V) control mode

Press the 'MODE|AUTO' button to change the control mode (the identifier of the next available control mode appears on the display). When the Wind vane (V) control mode is shown, push the rotary knob, and the Autopilot goes into selected mode (the 'V' symbol appears in 'Operating mode' field on the display).

When switching over to Wind vane (V) control mode, the actual Relative Wind Angle is taken as pre-set Relative Wind Angle.

NOTE: Wind vane (V) control mode can be only activated when actual Wind Speed is a higher than a 'Minimal Wind Speed' pre-set parameter for this control mode (see AlphaPilot MFM Installation Manual).

3.11.3 Steering in Wind vane (V) control mode

To change the heading, rotate the knob to select a new Relative Wind Angle, and push to confirm. The autopilot will adjust accordingly. The autopilot maintains the actual pre-set Relative Wind Angle if no confirmation is received within 20 seconds.

NOTE: In Wind vane (V) control mode, a 'WIND SHIFT' alarm message is generated when the actual Relative Wind angle deviates momentary from the pre-set Relative Wind Angle beyond a pre-set limit. After that the AlphaPilot MFM is switched automatically to the Auto (A) control mode and alarm 'WINDVANE FAIL' and a prompt message 'SWITCHED TO AUTO' is shown.

3.11.4 Change parameters

AlphaPilot MFM keeps the pre-set Relative Wind Angle as accurate as possible this mode. The 'Wind Precision' parameter specifies the Wind Angle keeping algorithm sensitivity in this control mode. Change the parameter, if necessary.

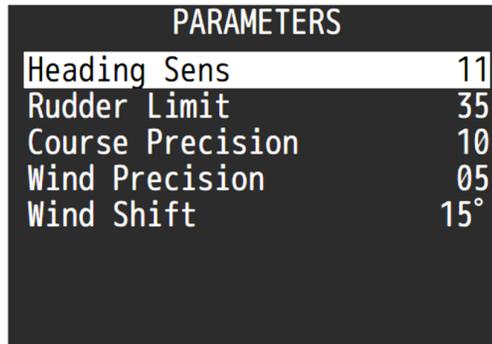


Figure 22: Menu 'Parameters'

Menu item	Description
Heading Sens	See section Menu 'Parameters' on page 51.
Rudder Limit	See section Menu 'Parameters' on page 51.
Course Precision	See section Menu 'Parameters' on page 51.
Wind Precision	This parameter determines with which ROT (how fast) AP will compensate difference between set and actual wind.

Menu item	Description
	<p>Set the sensitivity of the Wind Angle keeping algorithm (for Wind vane (V) control mode):</p> <ul style="list-style-type: none"> - '1' (2.0°/min) - '2' (4.0°/min) - '3' (6.0°/min) - '4' (10.0°/min) - '5' (20.0°/min) - '6' (40.0°/min) - '7' (70.0°/min) - '8' (100.0°/min) - '9' (130.0°/min) <p>NOTE: A lower value results in a smooth and slow command response (less rudder movements and less turn rate). A higher value results in maximum efficiency, quick rudder command response (frequent rudder movements and a bigger turn rate value).</p> <p>NOTE: The range can be less than 9, as the maximum value can be adjusted by the commissioning engineer (see AlphaPilot MFM Installation Manual).</p>
Wind Shift	<p>Max. allowed difference between set and actual relative wind.</p> <p>In Wind vane (V) control mode, a 'WIND SHIFT' alarm message is generated when the actual Relative Wind angle deviates momentary from the pre-set Relative Wind Angle beyond a pre-set limit. After that, the AlphaPilot MFM is switched automatically to the Auto (A) control mode and alarm 'WINDVANE FAIL' and a prompt message 'SWITCHED TO AUTO' is shown.</p> <p>Set the Wind Shift parameter:</p> <ul style="list-style-type: none"> - 'Off' : Relative Wind Angle is changeable in range of -/+180 degrees from actual Heading. The 'WIND SHIFT' alarm is disabled. - '2°, 5°, 10°, 15°, 30°, 50° and 90°' : Relative Wind Angle is changeable in the mentioned value per one operator command, using the knob on the AlphaPilot MFM control unit. The 'WIND SHIFT' alarm is enabled, and the pre-set limit is active.

4 Controls and functions

This section describes other controls and functions (not related to operating modes as described in the previous section).

4.1 Reset and turn off

Switch the AlphaPilot MFM system to Standby (S) mode. Switch the Alphasatron Mode Switch 2 Pos (or 3 Pos) to the NFU position (or external mode selector on the Navigational Bridge in the appropriate Standby mode).

To reset the device, simultaneously push and hold the power button and the rotary knob for three seconds.

The AlphaPilot MFM system will start-up (and performs system testing).

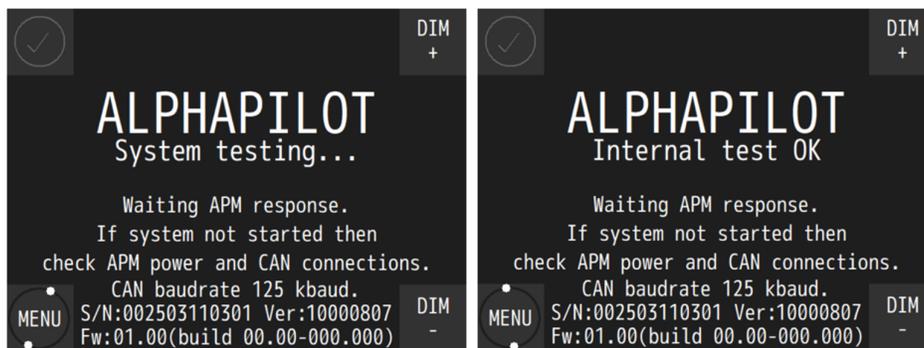


Figure 23: Start-up of system, 'System testing...' and 'Internal test OK'

After start-up, the AlphaPilot MFM system will go into Standby (S) mode (the AlphaPilot is not operating for vessel heading control).

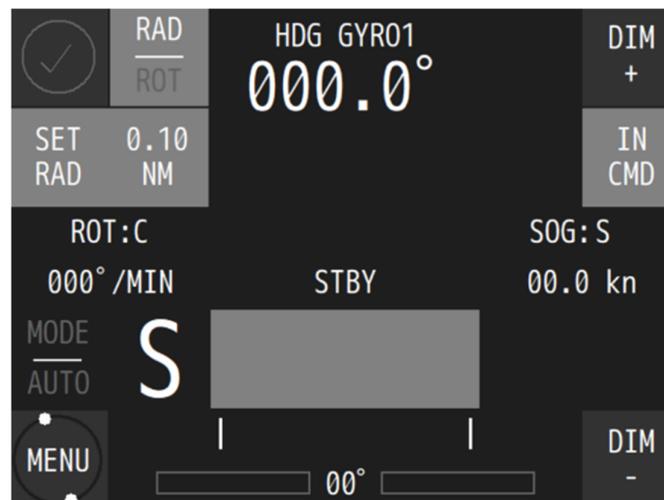
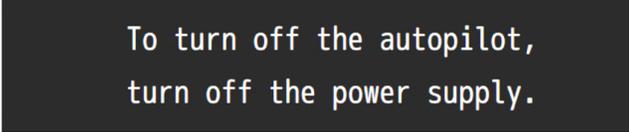


Figure 24: AlphaPilot MFM control unit - S mode

The AlphaPilot MFM system is ready for operation. Switch the Alphasatron Mode Switch to 'AUTO' (or external mode selector on the Navigational Bridge in the appropriate Auto mode) to activate the Auto (A) control mode.

NOTE: The AlphaPilot MFM can only be switched off by switching off the power (to prevent accidental shutdown during operation).

NOTE: When the power button is pushed, the following message will appear.



To turn off the autopilot,
turn off the power supply.

Figure 25: Turn off message

4.2 Enabling control

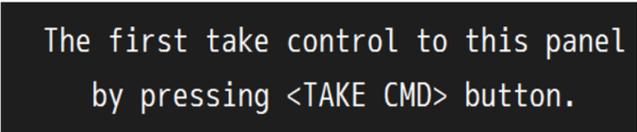
When not in control, the AlphaPilot MFM control unit is in Standby mode, and the ring around the rotary knob is not illuminated.

Enabling control from manual steering (MAN or NFU):

- AlphaPilot MFM system with Mode Switch 3 Pos
The primary AlphaPilot MFM control unit control is enabled automatically when the Mode Switch is switched to the AUTO position.
The 'IN CMD' letters will show, and the ring around the rotary knob will illuminate.
- AlphaPilot MFM system with Mode Switch 2 Pos
AlphaPilot MFM control unit control must be enabled manually after the Mode Switch is switched to the MAN|AUTO position (which automatically enables manual steering).
Press the 'TAKE CMD' area to take control*.
The 'IN CMD' letters will show, and the ring around the rotary knob will illuminate.

*Note that control must be allowed, see subsection 'Control allowed/not allowed'. Note that another active controller may need to allow control handover first, see subsection 'Control handover' on page 49.

NOTE: If the AlphaPilot MFM control unit has no control, and the user presses the key buttons, a message appears.



The first take control to this panel
by pressing <TAKE CMD> button.

Figure 26: No control message

4.2.1 Control allowed/not allowed

Control is allowed when the AlphaPilot MFM control unit shows 'TAKE CMD'. Press the 'TAKE CMD' area to take control*.

* Note that another active controller may need to allow control handover first, see subsection 'Control handover' on page 49.

4.2.2 Control handover

If applicable, handover of control must be allowed first by the active controller to allow the AlphaPilot MFM control unit to take control.

The method for control handover is pre-set during commissioning. Two system settings are possible, namely 'Take control' or 'Release/take control'.

4.2.2.1 Take control

Any controller can take control. Control handover allowance is not applicable.

Procedure for AlphaPilot MFM control unit:

- Push the 'TAKE CMD' button to enable control. The 'TAKE CMD' letters will change to 'IN CMD', and the ring around the rotary knob will illuminate, meaning that the AlphaPilot MFM control unit is in command and can take control, and that the rotary knob is enabled.

4.2.2.2 Release/take control

Any controller can take control, only when the active controller allows control handover.

Procedure for AlphaPilot MFM control unit:

- Take control
Allow control handover (i.e. release control) from the active controller. AlphaPilot MFM control unit shows 'TAKE CMD' to indicate that take control is allowed.
Push the 'TAKE CMD' button to enable control. The 'TAKE CMD' letters will change to 'IN CMD', and the ring around the rotary knob will illuminate, meaning that the AlphaPilot MFM control unit is in command and can take control, and that the rotary knob is enabled.
- Release control
To allow control handover to another controller, push the 'IN CMD' area, until the 'IN CMD' text flashes (indication that control handover is allowed).
NOTE: The AlphaPilot MFM control unit stays in control until control is transferred to another controller.
NOTE: The 'IN CMD' text keeps flashing until control is transferred to another controller. The speaker produces one second beeps with one second interval to indicate that the operation is not finished. There is no timeout.
NOTE: The AlphaPilot MFM control unit goes into Standby (S) mode when control is transferred to another controller.

4.3 Alert handling

When an alarm occurs, all alarm speaker buttons (of all interconnected modules) will flash in an uninterrupted sequence, and the speakers will beep in an uninterrupted sequence.

The speakers can be muted via any alarm speaker button.

When the alarm (is read and) acknowledged on the AlphaPilot MFM control unit, then the illumination will be constant, and the speaker will be muted (if not muted already via another interconnected module). When the alarm is accepted (e.g. problem solved), then the illumination on the alarm speaker button will turn off.

See section 'Alarms, warnings, and cautions' on page 60 for more information.

4.4 Dimming

The 'DIM -' and 'DIM +' buttons are dimmed to a pre-set brightness level. Control is always allowed. Push the 'DIM -' or 'DIM +' button to simultaneously adjust the brightness level of all indicators on the interconnected modules.

Note that the ring around the rotary knob is always illuminated (dimmed to a pre-set brightness level).

4.5 Alarm test

Generate an alarm for testing purpose. See 'Alarm Test' at section 'Submenu 'Panel Settings'' on page 57.

4.6 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.

Validity check	Plausibility check	Integrity monitoring	INS data marking			Remark
			Validity flag or Status flag or Mode indicator (e.g. GLL)	Plausibility status (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 control mode

5 Menus

Use the rotary knob to navigate through the menu items. Push the rotary knob to select an item, rotate the rotary knob to change the parameter.

Menu items marked with '<' and '>' indicate nested menu items. Push the rotary knob to enter a nested menu item.

5.1 Menu 'Parameters'

This menu is used to quickly change settings during operation.

To enter the Parameters menu, single press the MENU button.

NOTE: Visibility of parameters is not based on the selected (i.e. activated) operating mode but based on enabled/disabled operating modes. This way, parameters can be changed before entering an operating mode for which that parameter applies.

NOTE: When Wind vane (V) mode is enabled (i.e. allowed to select), parameter 'Wind Precision' and 'Wind Shift' will be shown as well. Wind vane (V) mode can be enabled or disabled (see AlphaPilot MFM Installation Manual). Refer to subsection Wind vane (V) mode on page 44 for more information about these parameters.

NOTE: When Low Speed Heading Control mode is allowed, then this menu is different (e.g. other parameters are shown). See subsection 'Low Speed Heading control' on page 27.

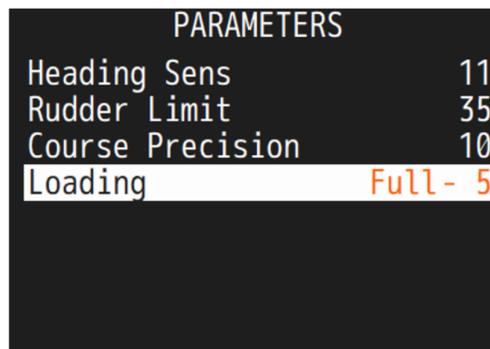


Figure 27: Menu 'Parameters'

Menu item	Description
Heading Sens	Heading sense, rudders activity. A lower setting results in 'looser/inert' steering. A higher setting results in 'tighter'/'energetic' steering. Parameter settings: 1 (low) – 30 (high).
Rudder Limit	Rudder angle limit. Note that the max. rudder angle is determined by a commissioning engineer during Rudder Order/Feedback calibration. Parameter settings: 5 (low) – max.
Course Precision	Strictness of heading maintenance to compensate XTD or keep set COG.

Menu item	Description
	<p>This setting is intended for XTD reducing in Track (T) control mode. Vessel heading is corrected more quickly and accurately when this parameter value is increased. This value should be defined depending on the weather conditions and voyage area during voyage in the Track (T) control mode.</p> <p>For example, the 'Course Precision' value for the ocean voyages may be set to 10 or smaller.</p> <p>Parameter settings: 1 (low) – 30 (high).</p> <p>NOTE: This parameter will be shown when a Track (T) control mode or CTS pilot (C) control mode is enabled (i.e. allowed to select). The modes can be enabled or disabled (see AlphaPilot MFM Installation Manual).</p>
Loading	<p>Parameter to compensate for the change in manoeuvrability of the ship depending on the draft of the vessel.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Menu shows 'Ballast 0 .. +5': Autotuning of the vessel was carried out in ballast. Difference in draft can be set from 0 to +5 meters. - Menu shows 'Half -5 .. +5': Autotuning of the vessel was carried out half loaded. Difference in draft can be set from -5 to +5 meters. - Menu shows 'Full -5 .. 0': Autotuning of the vessel was carried out fully loaded. Difference in draft can be set from 0 to -5 meters. <p>NOTE: The exact value of the parameter is determined by the crew for the best stability of heading and may not coincide with the real one.</p> <p>NOTE: This parameter will be shown when configured as a vessel with highly variable draft depending on loading.</p>

Press the MENU button to exit the menu.

5.2 Menu 'Alarm Settings'

This menu is used to quickly enable/disable alert conditions and change their operating parameters.

To enter the Alarm Settings menu, press and hold the Alert symbol.

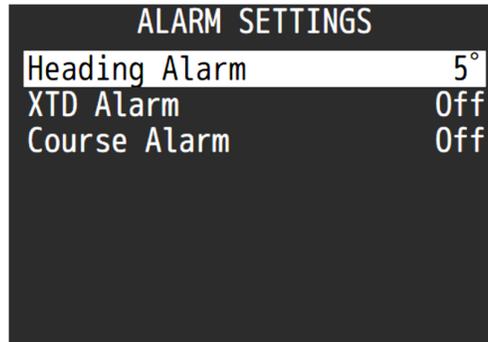


Figure 28: Menu 'Alarm Settings'

Menu item	Description
Heading Alarm	<p>Set the maximum deviation between the actual heading and the set heading:</p> <ul style="list-style-type: none"> '2°, 3°, 5°, 8°, 10°, 15°, 20°' : When this value is exceeded, an 'OFF-HEADING' alarm is generated. <p>NOTE: This alarm is only applicable for Auto (A) control mode. NOTE: This alarm is not generated during the turn, e.g. when new heading is confirmed by operator via knob.</p>
XTD Alarm	<p>Set the maximum deviation between the current vessel's position and the leg of route (in meters):</p> <ul style="list-style-type: none"> 'OFF', '5', '10', '20', '50', '100', '185', '500' meters : When this value is exceeded, an 'OFF TRACK' alarm is generated. <p>NOTE: This Alarm is only applicable for Track control mode! NOTE: This alarm is not operating during the turn to the new leg of the route (i.e. to new WP). NOTE: To reduce alerts, we recommend setting this value higher than the value that was set in the ECDIS (as a part of TCS Category C).</p>
Course Alarm	<p>Set the maximum deviation between the actual heading and the track course (in degrees):</p> <ul style="list-style-type: none"> 'OFF', '2', '3', '5', '8', '10', '15', '20', '30', '40', '60' degrees : When this value is exceeded, an 'OFF COURSE' alarm is generated. This alarm is also generated when the 'SET COG' value deviates from the actual or calculated COG value. <p>NOTE: This Alarm is applicable for Track and CTS pilot control modes only! NOTE: This alarm is not operating during the turn to the new leg of the route (i.e. to new WP) or during the turn to the new 'SET COG' direction.</p>

Press the MENU button to exit the menu.

5.3 Menu 'Advanced'

This menu is used to change numerous settings (e.g. select external devices that sends NMEA data such as actual heading, rate-of-turn, position, and speed).

To enter the Advanced menu, press and hold the MENU button.

NOTE: Menu 'Advanced' may not be available, as it can be enabled or disabled (see AlphaPilot MFM Installation Manual).

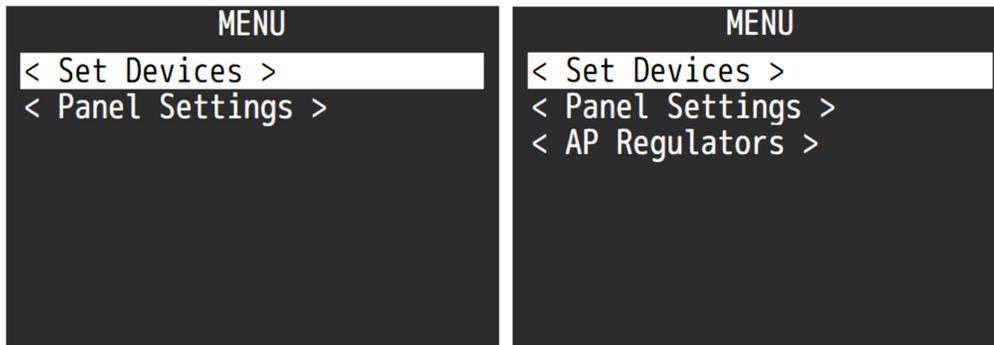


Figure 29: Submenu 'Advanced' – AP Regulators submenu not available (left), and AP Regulators submenu available (right)

NOTE: Submenu 'AP Regulators' may not be available, as it can be enabled or disabled. This submenu is used to change parameters during manual (autopilot) tuning, typically done for unstable vessels. Refer to the AlphaPilot MFM Installation Manual for more information.

5.3.1 Submenu 'Set Devices'

The submenu can be used to select the external devices that sends NMEA data to the AlphaPilot MFM.

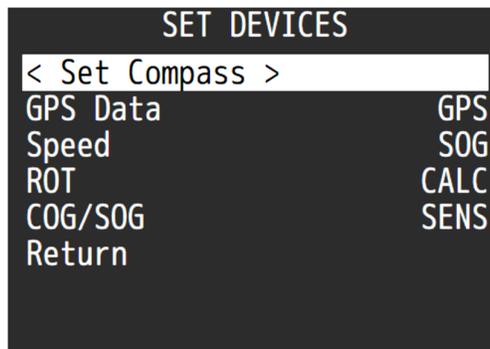


Figure 30: Submenu 'Set devices'

Menu item	Description
< Set Compass > or Compass	Set the device(s) that send the actual heading data to the AlphaPilot MFM: <ul style="list-style-type: none"> - 'GYRO1', 'GYRO2' : Gyro compass - 'THD' : True Heading Device, GNSS principles (Satellite Compass)

Menu item	Description
	<ul style="list-style-type: none"> - 'MAGN' : Magnetic compass with NMEA output. - 'HMS ID1' : ID of the Master Compass from an external HMS system (ID1 from incoming NMEA HMR sentences). <p>If more than one compass is installed, then a submenu < Set Compass > appears here, instead of 'Compass'. See next subsection.</p>
GPS Data	<p>Set the device that sends vessel position data to the AlphaPilot MFM:</p> <ul style="list-style-type: none"> - 'GPS' : Position data from D-GPS (GGA, GLL NMEA messages). - 'ECDIS' : Position data from navigation system (ECDIS/ECS). <p>NOTE: Position data is used for indication purposes (if GPS/ECDIS is connected to AlphaPilot MFM), and calculation of COG/SOG by incoming GGA, GLL sentences (if VTG sentences are unavailable from GPS/ECDIS).</p> <p>NOTE: Parameter can be changed only in Standby (S) mode.</p>
Speed	<p>Set the device that sends vessel speed data to the AlphaPilot MFM:</p> <ul style="list-style-type: none"> - 'SOG' : Speed data from GPS or ECDIS, depending on the selected item for parameter 'GPS Data'. - 'LOG' : Speed data from Water Speed Log. - 'ECDIS LOG' : Speed Through Water data from navigation system (ECDIS, ECS, INS) by their VHW / VBW NMEA output. - '0 to 40' : Manual speed setting, in knots (not preferred). <p>NOTE: Speed source can be changed only in Standby (S) mode, except for manual speed setting ('0 to 40') (can be used for some heading control modes (e.g. for Auto (A), Dodge (D), FU Override (O), Rate of Turn (R)).</p> <p>NOTE: Track (T) and CTS pilot (C) control modes require a real speed source.</p>
ROT	<p>Set the source that sends vessel speed data to the AlphaPilot MFM:</p> <ul style="list-style-type: none"> - 'SENS' : ROT data from an external ROT NMEA sensor. - 'CALC' : Calculated ROT data. Calculation based on the information from primary heading source (e.g. master gyro compass). <p>NOTE: Only calculated ROT data is used for internal heading adaptive algorithm. This setting is only for the ROT presentation and operation in the Rate of Turn (R) control mode.</p>
COG/SOG	<p>Select the source that sends COG and SOG data to the AlphaPilot MFM:</p> <ul style="list-style-type: none"> - '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 (Latitude and Longitude) <p>NOTE: Only calculated COG-SOG data is used for internal course adaptive algorithm. This setting is only intended for the COG-SOG presentation on the AlphaPilot MFM control unit and operation in corresponding control modes (e.g. CTS pilot (C) control mode).</p>

5.3.1.1 Submenu 'Set Compass'

The submenu can be used to select the external compasses which send heading data to the AlphaPilot MFM. The submenu is also used to set heading monitoring parameters.

NOTE: This menu is only available if more than 1 heading source is connected to the AlphaPilot MFM.

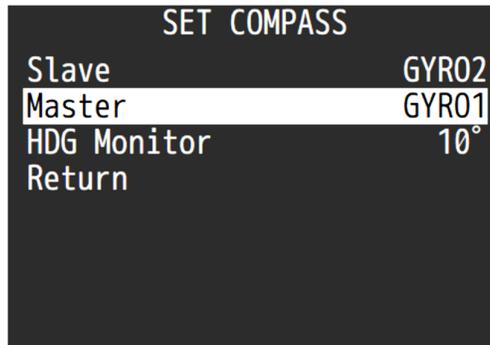


Figure 31: Submenu 'Set compass'

Menu item	Description
Slave	Shows the selected slave compass for information only. If heading monitoring is activated (see 'HDG Monitor'), then the name of the slave compass is shown here.
Master	Set the device that sends heading data to the AlphaPilot MFM: <ul style="list-style-type: none"> - '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. The alert 'MAGN COMPASS IN USE' is shown while the magnetic compass is selected as master. This alert remains active until an appropriate heading source (GYRO1, GYRO2 or THD) is selected.
HDG Monitor	Monitoring of the actual heading sensor (Master) by an independent 2 nd source (Slave): <ul style="list-style-type: none"> - 'OFF' : Heading monitoring is disabled - '2', '3', '5', '8', '10', '15', '20' : Heading monitoring is enabled. When this value is exceeded, an alert 'HDG MONITOR' is generated. Heading monitoring is a mandatory function for all vessels where two or more heading sources are required. If more than one compass is installed, then heading monitoring is enabled automatically. The heading monitoring is disabled automatically if only one compass is installed. NOTE: When the parameter is set to 'OFF', the alert 'HEADING MONIT. OFF' is shown, even during operation with two different heading sources.
Return	Return to the previous menu.

5.3.2 Submenu 'Panel Settings'

The submenu is used to set panel setting, e.g. skins, brightness, and perform an alarm test.

NOTE: This submenu is the only menu item which can be accessed at any 'slave' AlphaPilot MFM control unit. Access to other menu items is prohibited on 'Slave' AlphaPilot MFM control unit.

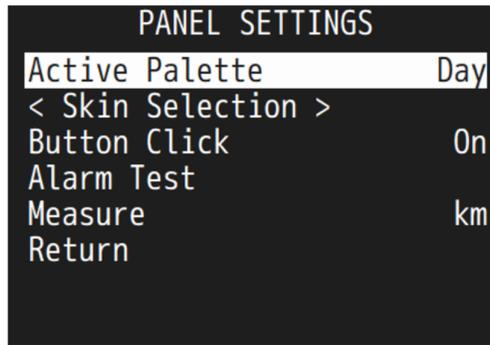


Figure 32: Submenu 'Panel Settings'

Menu item	Description
Active Palette	Select the 'Day', 'Dusk', or 'Night' palette.
< Skin Selection >	Select a skin for 'Day', 'Dusk' and/or 'Night' mode.
Button Click	On or Off. Enable or disable a button click sound (via internal speaker) during use.
Alarm Test	Select this item to generate an alarm (for testing purpose). All indicators will be illuminated, the 'ALARM TEST' message is shown, and the internal speaker is activated.
Measure	Select 'km' or 'NM'.
Return	Return to the previous menu.

5.4 Menu 'Installation'

This menu is used during installation, commissioning, and testing (e.g. change advanced settings or view the alarm log). For more information, refer to the AlphaPilot MFM Installation Manual.

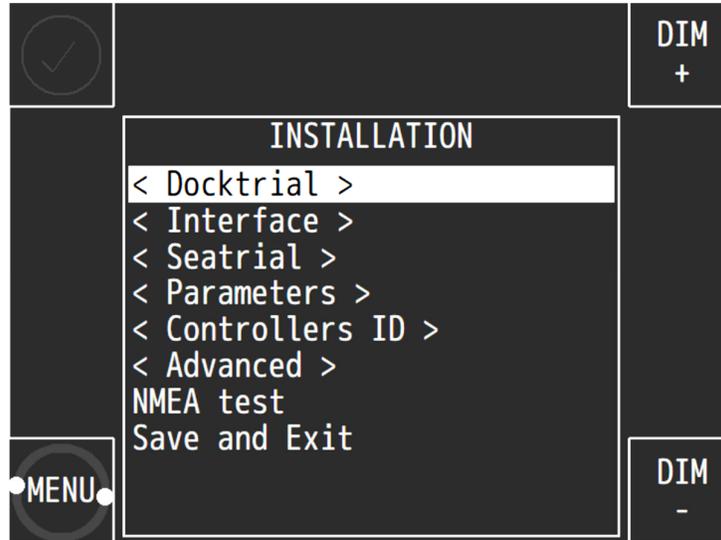


Figure 33: Menu 'Installation'

5.5 Alert logs

To enter the Alert logs menu, push and hold the rotary knob and Alert symbol simultaneously.

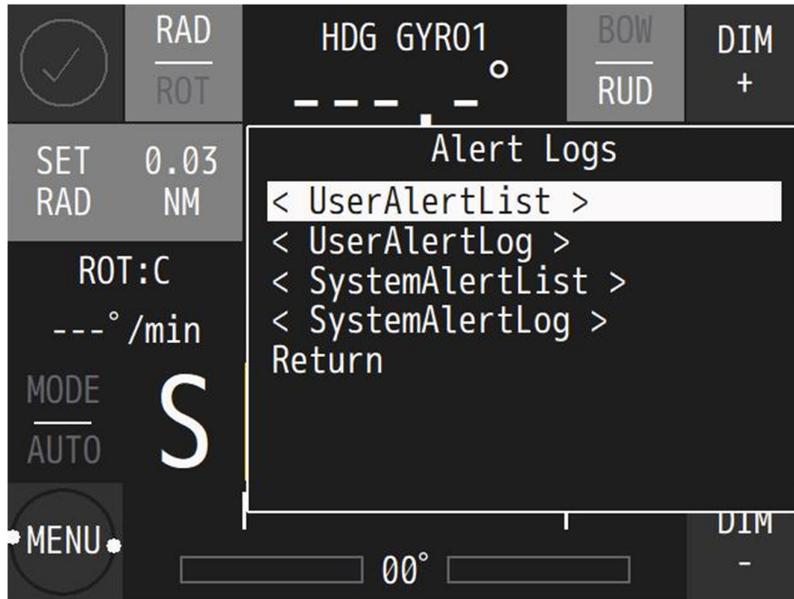


Figure 34: Menu 'Alert logs'

Press the MENU button to exit the menu.

6 Alarms, warnings, and cautions

The AlphaPilot MFM system recognizes 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 pre-set limit (heading monitor function)
- Failure of any Autopilot component
- Failure of steering gear

Alarms, warnings, and cautions are defined as follows:

- **Alarm**
The situation requires an immediate response, or the Autopilot system will go out-of-order.
- **Warning**
The system has degraded, but it still functions. It is possible to reduce the quality of control. A response to this message is required.
- **Caution**
The system does not require an immediate reaction and informs about the degradation of the system without deterioration of the quality of management.

Alarms, warnings, and cautions are displayed on the AlphaPilot MFM control unit. An Alert symbol will be shown, accompanied with or without an audible signal.

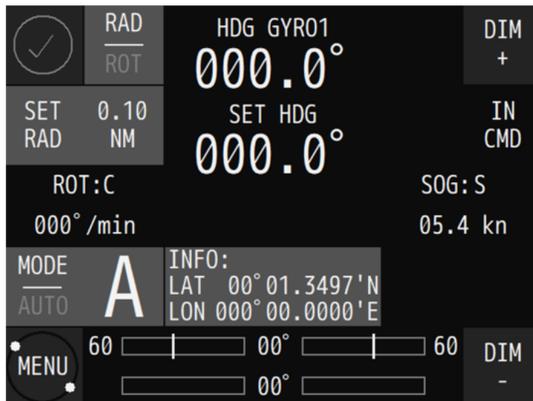


Figure 36: No alarm (notification)

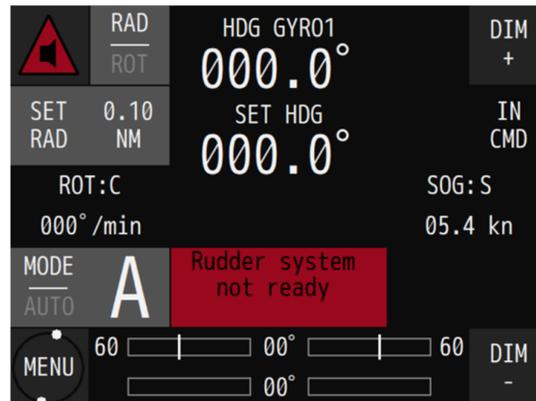


Figure 36: Alarm

The alert indicators are described in Table 3 on page 61. The sound schemes for alerts are described in Figure 37 on page 62.

Symbol	Symbol behaviour	Audible signal	Status	Priority
	Flashing (Red)	3 short signals, repeated every 7 s	Alarm active, not acknowledged	High
	Flashing (Red)	Silent	Alarm active, silenced	
	Flashing (Yellowish orange)	2 short signals, repeated at least 1x per 5 min or replaced by an alarm	Warning active, not acknowledged	
	Flashing (Yellowish)	Silent	Warning active, silenced	
	Flashing (Red)	Silent	Alarm, Rectified - unacknowledged	
	Steadily shown (Yellowish orange)	Silent	Warning, Rectified -unacknowledged	
	Steadily shown (Red)	Suppression of audible signal (Silent)	Alarm active, acknowledged	
	Steadily shown (Red)	Silent	Alarm active, responsibility transferred	
	Steadily shown (Yellowish orange)	Silent	Warning active, acknowledged	
	Steadily shown (Yellowish orange)	Silent	Warning active, responsibility transferred	
	Steadily shown (Yellow)	Silent	Caution active	Low
	Steadily shown	Silent	Normal state	Not applicable

Table 3: Alert indicators

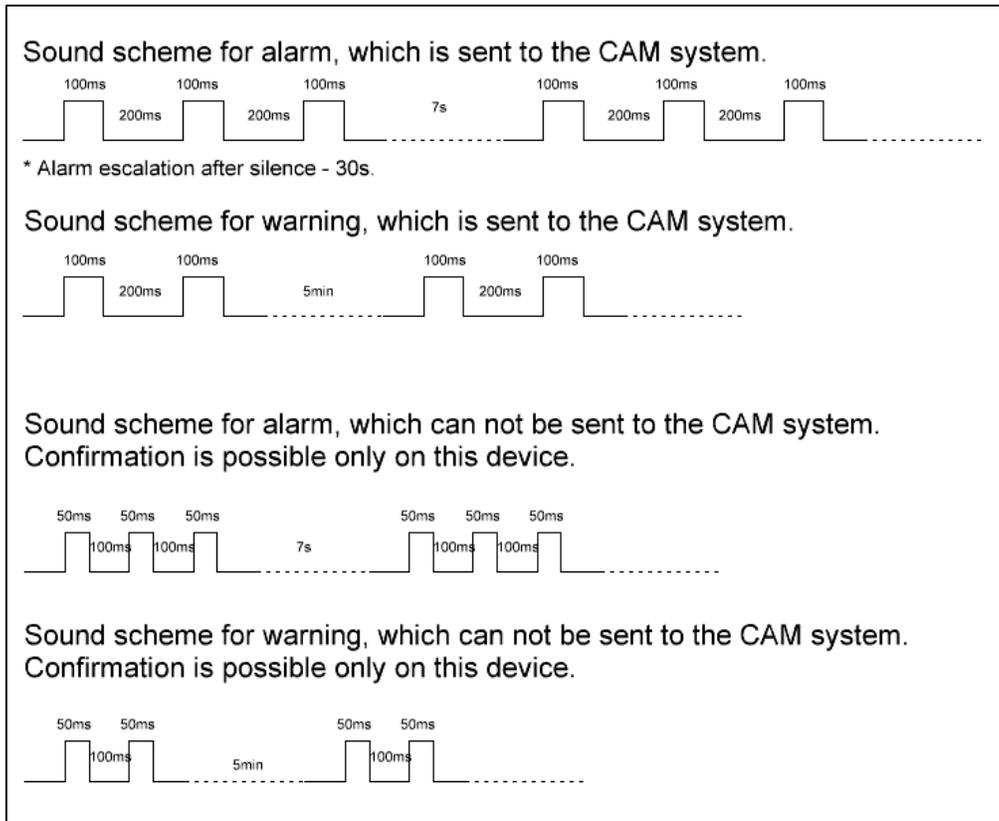


Figure 37: Sound schemes for alerts

When an alert is displayed, press the information area to access the Alerts List. The Alerts list shows more detailed information about the alert (see Figure 38).

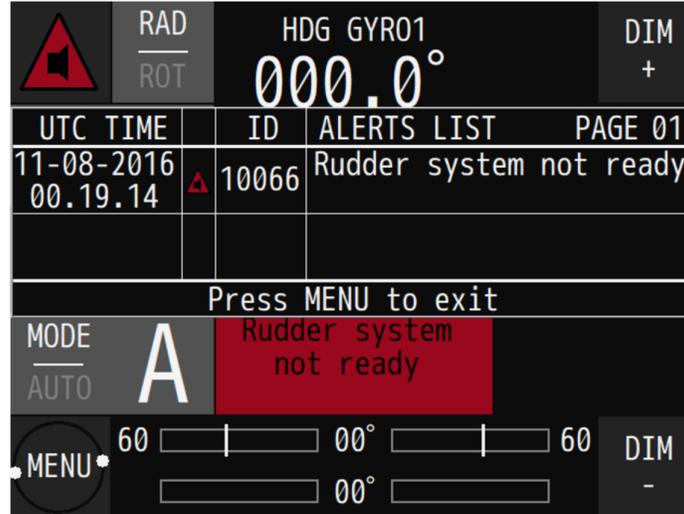


Figure 38: Alerts List

An alert is acknowledged by pressing the Alert symbol. The audible signal is silenced and flashing of the Alert symbol stops. The alert message is maintained until the issue is resolved.

Note that acknowledging alerts is only possible on the primary AlphaPilot MFM control unit (if it would be possible to confirm a critical alarm from a remote bridge, then the watch officer would miss this important information).

For more information such as recommended actions, refer to section Appendix B: .



7 Troubleshooting

When an abnormal condition has arisen, then the autopilot generates an audible alert, and an alert message is displayed on the AlphaPilot MFM control unit. Press the information area to access the Alerts list. The Alerts list shows more detailed information about the alert, such as the Alert ID.

All alerts are listed in Appendix B: Alpatron MFM Alerts.

To view all alerts in the log, see Submenu 'Alert logs' on page 59.

If the equipment for some reason does not work as described in this manual, contact the distributor or dealer, from where the equipment was originally bought. The distributor or dealer will have experience and know-how to assist with further technical support and troubleshooting.

All information that will get back to Alpatron Marin, either directly or indirectly, will be handled with confidentiality. End-user sensitive data will not be shared with any third party without prior written acceptance from the involved parties.

Appendices

Appendix A: Specification - AlphaPilot MFM control unit

Box Contents upon Delivery		Display Specifications	
AlphaPilot MFM 3104.0648 grey / 3104.0650 black		High quality TFT	Touch screen 5"
Mounting bracket		Pixels	480 x 640 (aspect ratio 3:4)
Template for cut-outs		Orientation	Horizontal
		Light intensity	Max. brightness 500 cd/m2
		Display colors	262k Colors (6-bit RGB)
		Nominal viewing distance	~1.0 meter
Physical Dimensions		Input/Output Signals	
Dimensions (WxHxD)	160x180x72 mm (6.30x7.09x2.84")	COM 1 (IEC 61162-1) isolated	NMEA Modbus Rx/Tx
Panel cut-out (WxH)	138x172 mm (4.84x6.77")	COM 2 (IEC 61162-1) isolated	NMEA Modbus Rx/Tx
Weight	1.2 kg (2.65 lbs)	COM 3 (IEC 61162-1) isolated	NMEA Modbus Rx/Tx
Power Specifications		CAN 1 (IEC 61162-3)	NMEA Canbus Rx/Tx
Power supply	24 VDC input +/- 20% (Single source)	CAN 2 (IEC 61162-3)	NMEA Canbus Rx/Tx
Rated current	0.5 A @ 24 VDC	USB port (Micro)	Not used
Protection	Reverse polarity protection	Alert output	NO contact (potential free)
Operating Conditions		Norms/Standards	
Operating temperature	-25°C to +55°C ¹	IEC 60945 (2002)	Incl. IEC 60945 Corrigendum 1 (2008)
Operating humidity	Up to 95% (at 40°C)	DNVGL-CG-0339	DNV GL
Storage temperature	25°C to +70°C	IEC 61162 series	NMEA Definitions
Storage humidity	Up to 95% (at 40°C)	IEC 62288 (2014)	
IP rating	IP56 front / IP22 back	Available Accessories	
Compass safe distance	Std: 30 cm / Steering: 15 cm	MFM IP56 Kit	3698.0018
Environmental according to DNVGL-CG-0339 Table 1			
Temperature	Class D		
Humidity	Class B		
Vibration	Class A		
EMC compatibility	Class B		
Enclosure	Class C		

¹ Although the test conditions for bridge units provide for a maximum operation temperature of 55°C, continuous operation of all electronic components should, if possible, take place at ambient temperature of 25°C. This is necessary for a long life and low service costs.



Appendix B: Alphontron MFM Alerts

Communication with CAM and local indication.

Work modes as abbreviated in this appendix are:

- Standby (STBY) mode
- Auto (AUTO) heading control mode
- Track (TC) control mode (Category A, B or C depending on configuration)
- Course control (CC) mode
- Temporary Override to FU Tiller or wheel (FFU)
- Temporary Override to FU Tiller (OVR)