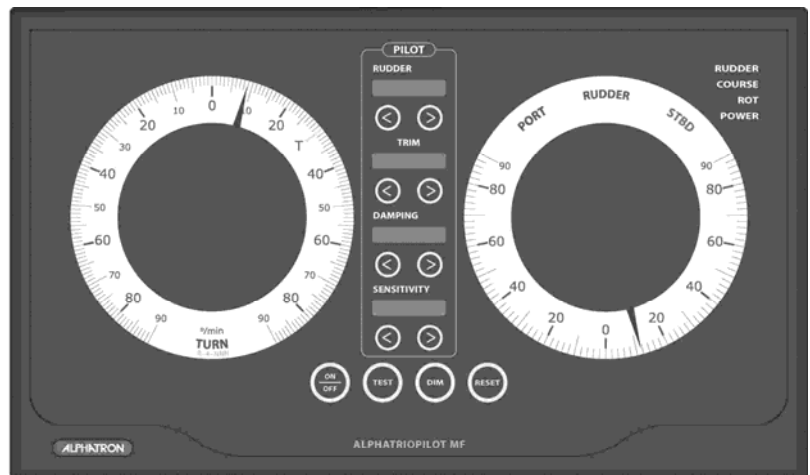
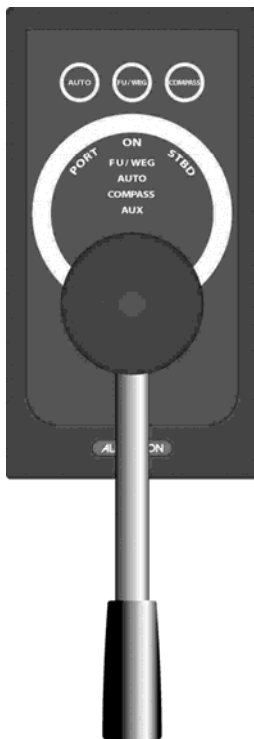


## ALPHATRIOPILOT MF

### Installation & User manual



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**Important!**

**Under no circumstances changes may be made to the instrument without written permission from Alpatron. Otherwise the warranty will be void.**

**Read the entire manual before installing the instrument and/or using it.**

**Delivery Terms: All our deliveries are under the general terms and conditions applicable to the metal and electrical industry, which have been filed with the Clerk of the District Court in The Hague on 21 August 1991. Chamber of Commerce Chamber of Commerce Rotterdam nr 182635.**

**Warranty: 1 year on Alpatron equipment on material and / or workmanship, excluding travel and accommodation and additional sea trials. Unless otherwise agreed.**

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Although this guide is composed with the utmost care, Alpatron accepts no liability for the consequences of any inaccuracies occurring



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## 1 REVISIONS

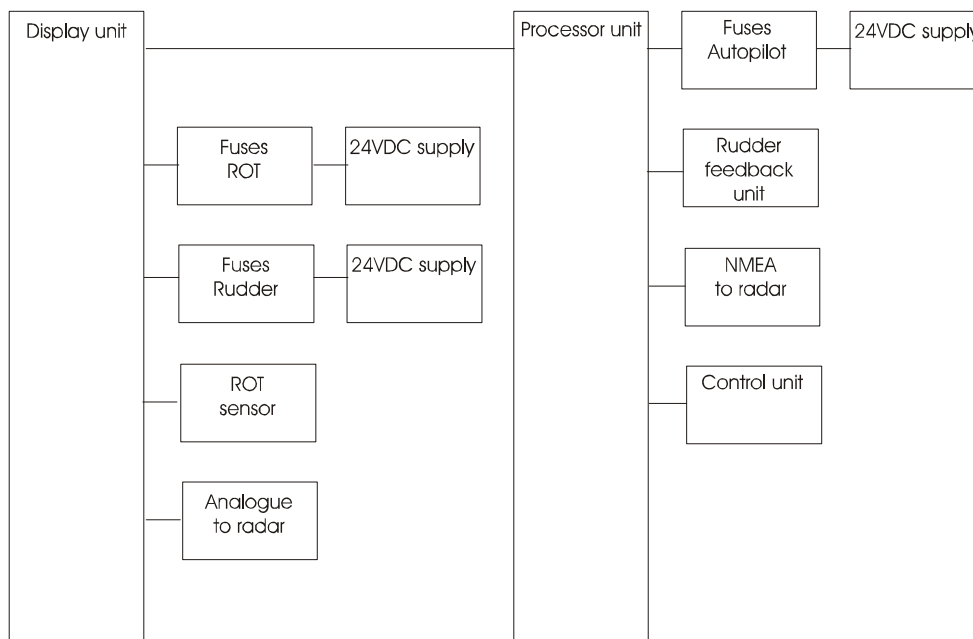
Revision number	Description	Date
V1.0	first draft	12-07-2012
V1.1	index revised	13-07-2012
V1.2 UK	small changes after getting Rhine Certificate	11-09-2012



## 2 INTRODUCTION

The ALPHA TRIO PILOT MF is one of the products from the Alpha Line MF. The ALPHA TRIO PILOT MF is an autopilot/ROT-Rudder display combination, which has been specially developed for inland shipping. By default, the ALPHA TRIO PILOT MF is suitable to be steered manual with the steering lever and also function as an autopilot. This ALPHA TRIO PILOT MF combination is fitted with a rudder and turn indicator available in the same instrument. Optionally, one can also connect an electronic compass (or GPS/satellite compass) and use that as a reference. In result both gyro and compass will serve then as sensor input and combine functions between turn indicator and compass. The pilot is able to feed signals to black / white or proportional valves. Also special servo output is available to control Rudder propeller systems e.g.

Diagram:



**NOTE:**  
**Always make sure, before operating the auto pilot, that no one is near the rudder (rudder installation) and assure free motion of all mechanical parts !**



## 2.1 Options

As an option, the following items are available:

- Additional remote control (e.g. for outdoor operation)
- Manual / auto switch 2 positions (HAND / AUTO)
- Manual / auto switch 3 positions (Manual / AUTO / or EMERGENCY HAND / AUTO / OFF)
- Rudder feedback assembly, comprising:
  - belt/pulley set, or
  - Chain or
  - Locking bars

## 2.2 VERSIONS

The ALPHA TRIO PILOT MF is available in two different versions. For larger vessels the 90 ° / min model is most suitable, for smaller vessels a 300 ° / min is available. In addition, the instrument are both available in standard Alphatron grey, as well as a in black.

## 2.3 CLASSIFICATION

All parts of the Alpha Trio Pilot MF are suitable for use in dry rooms



### 3 INSTALLATION

#### 3.1 Standard delivery materials

The hardware of a ALPHATRIOPILOT-MF comprises of:

- ❑ Mounting frame display unit
- ❑ Mounting frame control unit
- ❑ ALPHATRIOPILOT MF display unit
- ❑ ALPHATRIOPILOT control unit
- ❑ Processor unit
- ❑ Feedback unit (with double potentiometer)
- ❑ Single Gyro (sensor)

#### 3.2 General terms for installation

Don't install pilot hardware parts along strong vibration locations, nor in direct sunlight or places where oil vapour, moisture, high temperature or high concentration of dust is present. For the dimensions of the various parts, check the available drawings. Be sure, when installing the hardware, to keep a safe distance from any compass.

#### 3.3 Placing the ALPHATRIOPILOT MF

The system consists of a number of hardware units for which it is important to select a suitable location. For the dimensions of the various parts, see the available drawings.

Display: De ALPHATRIOPILOT MF can be installed in various different ways. The display unit is flush mounted by default but a bracket mount housing is available. According to (rhine) regulation requirements the display must be placed in plain view of the helmsman and must be easy accessible. There are no restrictions regarding the length of cable between the display unit and the processor unit.

Operating unit/steering lever: This unit needs to be installed so that the zero positioning of the steering lever exactly aligns with the bow/aft axis of the ship's hull. For this unit also certain general installation regulation apply and need to be followed.

Processor unit: To adjust the pilot settings easy access the processor unit is required, therefore it should be installed at an easily accessible location in the wheelhouse console.

Feedback unit: Depending of the type of propulsion a feedback unit may or may not be needed. The default position of the feedback unit is near to the rudder(s). Check the drawing for more details. During and after installation especially check the absolute free motion of the mechanical link between the rudder stock and the feedback unit. Also be sure this link (in most cases a ribbed belt and pulley set) is mounted fully horizontal. Don't place the pulleys (big one on the rudder stock, small pulley on the feedback axis) further apart than approx. 50 cm. Be sure that the tension spring (of the belt) cannot come into contact with either pulleys, choose the installation distance and the length of the belt accordingly.

To avoid the belt of coming loose from the pulleys enough tension needs to be applied to the belt. The coil spring provides for this if the length of the belt is cut to the appropriate length.



Rate of turn sensor/ single axis gyro: Choosing the correct location for installing the ROT sensor (gyro) is of great importance to obtain the right steering characteristics of the auto pilot. Check the following instructions for correct installation:

- Position of the gyro as near to the waterline as possible
- Position the gyro as near to the centre line of the hull as possible
- Place the gyro, horizontally, at a stable platform, try to avoid installation in the column of,- or in the lifting wheelhouse.
- The arrow on the gyro sensor housing needs to be placed parallel to the length direction of the ship.
- Install the gyro housing on the supplied shock absorbers. Avoid contact with oil and grease
- Note that the top of the gyro housing needs at least 10 cm of free space above to be able to be dismantled.

### 3.4 Other needed materials

Besides the materials in the scope of supply a functional auto pilot system comprises of:

- various cables (check the diagram of the ALPHATRIOPILOT MF )
- external switch: manual steering / auto pilot steering
- fuse box and fuses
- Heading setter (optional in case of compass input in auto pilot)

Manual/auto steering switch: If the ship had an auto pilot prior installed and this switch exist (must be able to switch at least 5AhDC) than this one can be used. Otherwise a switch need to be installed (can be ordered separately form Alphatron Marine).

Installation of this switch is normally near to the pilot or near the existing controls of the steering engine. This switch is needed to turn off the auto pilot's output (to either steering servo,- or valves) The emergency steering installation always needs to be operational standby and must be functional independent of the position of the manual/auto steering switch. Check the available schematic diagram how to set up the manual/auto switch properly.

#### **IMPORTANT:**

The output of the auto pilot processor box is connected directly to the steering system's solenoids or their relays.

Without the possibility to isolate and stop the signal from the auto pilot to the steering system a malfunction (for instance: a "hanging" relay) will cause big problems (rudder will keep turning).

Therefor installing a "manual/auto – switch" is very important as a precaution to regain control over the steering system again if and when the autopilot brakes down.

Heading setter: When a Alphacourse (electronic compass, recently more and more GPS compasses will be used instead....) is connected to the auto pilot a "heading setter" need to be installed near the helmsmen's steering position. This device (can be a single turning knob) then function to set a course.





### 3.5 Cable installation:

Check the cable diagram for proper cable installation. When no other specifics are known use cables with a minimum thickness of 0,5mm<sup>2</sup>. Cables need to be shielded and will have a flexible core.

Always try to avoid laying cables over long stretches nearby other high power (high current)cables.

### 3.6 Connecting:

The auto pilot system need to be installed according to the connecting diagram.

### 3.7 Grounding:

All hardware parts of this system need to be grounded. Make sure to ground the shield webbing of the used cables on both ends too, also connect the non-used cable wires (on just one end) to ground.

The processor unit, gyro and ROT/RUDDER Display need to be grounded to the ship's hull using at least a 2,5mm<sup>2</sup> diam. cable. This need to be done using the shortest possible length of cable from the unit to the hull.

### 3.8 Connecting power:

De ALPHATRI OPILOT MF needs to be connected to a power supply, of 18VDC to 31VDC, capable of delivering at least 10 Ah.

The power supply to the pilot, Rudder display and ROT display are separately to be installed. Each to its own circuit breaker.

### 3.9 Servo unit:

If the pilot is connected to a servo unit (electrical steering system), then the connections to valves and feedback module will be unnecessary.

### 3.10 Commisioning.

Connecting the power and valves to the auto pilot is a job reserved only to an installer/service engineer of the Alphatron Marine team or someone with the proper training and certification by Alphatron. This person also need to for fill all requirements implemented by CCR regulations. Improper installation will void any warranty and cause damage to the auto pilot.

After proper installation the auto pilot system need to be commissioned/ fine-tuned. Get in contact with Alphatron to schedule this work.

Prober adjusting procedure starts with tuning the system while docked. The second part of proper adjusting procedure involves a trail sail in open water. It does not matter whether the ship is loaded with cargo or not.

For Pusher boats with barges the trail sail WILL involve both sailing with and without the barge.

Rudder motion speed: When black/white valves are involved we recommend to set the full motion time of the rudder blade moving from max. port to max starboard on to approx. 16 seconds.

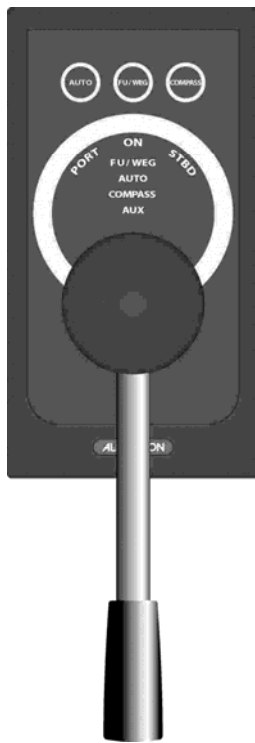
This will enable a correct setup for the auto pilot. Proportional valves don't pose any problems for correct rudder motion speed setup.

Proper setup procedure: check the technical manual.

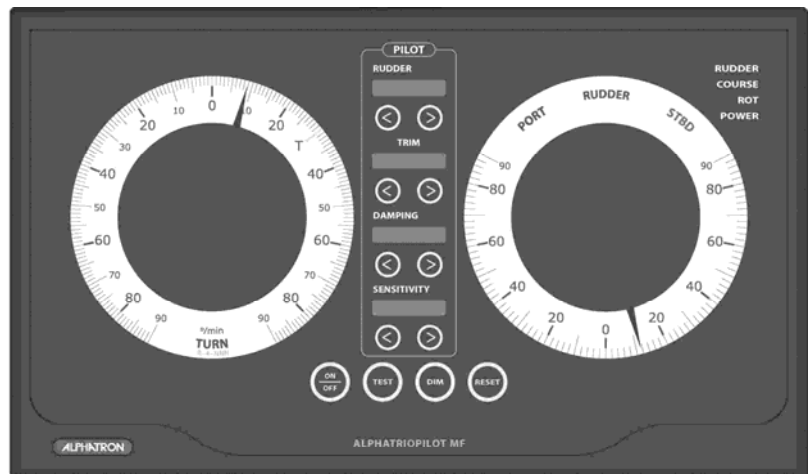


## 4 Controlling the ALPHATRI OPILOT MF

This chapter deals with explaining the controls of the ALPHATRI OPILOT MF.



control unit (steering lever)



Display unit

### 4.1 Push buttons

Operating the auto pilot system is done by means of using the push buttons on the displays and moving the steering lever on the control unit.

#### 4.1.1 ALPHAPILOT MF, turning on/off.

Turning on: push "on/off" button briefly.  
Turning off: push "on/off" button for longer period.

#### 4.1.2 ALPHATRI OPILOT MF, dimming lights

Push the "dim" button repeatedly to scroll thru the dimming cycle from minimal to maximal.

#### 4.1.3 ALPHATRI OPILOT MF, test functions

Located on the display unit is a "test" button for activating testing the alarms and correct working of the gyro.

During testing the indicator will swing as far as the (yellow) "t" marking on the ROT. The true rotation speed during the test needs to be 0 degrees/minute.

During operational modes: "Auto" and "Compass" the test function is blocked to prevent unwanted rudder movements.



#### 4.1.4 ALPHATRI OPILOT MF, switching between different operating modes

On the control unit (steering lever) are 3 push buttons for choosing different operational modes. A light indicator shows the selected mode. The following operational modes are available:

- FU/Weg
- Auto
- Compass
- Aux

Fu/weg: In mode "Fu/Weg" (follow up) the rudder blades follow the chosen rudder angle with the steering lever, regardless of the movements of the ship. This mode will be chosen for manual maneuvering the ship.

When the ALPHAPILOT MF is turned on this mode is default and can be altered at will into a other mode.

Auto: Using "auto" mode the ship will follow automatically the selected rate of turn in degrees per minute.

This means: steering lever in zero position than ship will sail straight ahead. Steering lever tilted to either side of zero than the ship will turn with a rotation velocity according to the set lever position to port or starboard site.

Compass: In compass mode the ship will automatically sail the chosen course set by the heading setter. Another option is connecting the auto pilot to a certified GPS compass. NOTE: in fact the GPS compass has more or less displaced the Alphacourse (see chapter 3.4)

When a GPS compass is used a heading setter is not necessary, the steering lever will than function as such.

Aux: In Aux mode the auto pilot is in standby. Controlling the rudders is taken over by other means than the auto pilot. Switching to Aux mode is done by handling an external switch, an indicator light ('aux') warns you when the pilot is in standby.

#### 4.1.5 ALPHATRI OPILOT MF, control unit – steering lever

When sailing the auto pilot in "follow-up" mode the steering lever is connected directly to the steering engine/rudder blades. In "Auto"-mode the steering lever is connected to the Rate of Turn indicator. In "compass"-mode, when in use with Alphacourse, the steering lever has no function, course is than set with a heading setter. In "compass"-mode, when in use with a certified GPS compass, the steering lever is needed to set the selected course.

The range of the steering lever around zero position is not completely linear with the motion of the rudder blades when sailing in "auto"-mode (see below table for details). This enables steering with more care and precision where this is most appropriate.

Led 0 (oranje)	0°
Led 1 (groen/rood)	0-3°
Led 2	3-8°
Led 3	8-13°
Led 4	13-27°
Led 5	27-44°
Led 6	44-64°
Led 7	64-87°
Led 8	87-100°



#### 4.1.6 ALPHATRI OPILOT MF, use on pusher boats.

Especially for use on pusher boats the ALPHATRI OPILOT has the ability to access and use a second set of parameters to program the processor with. This feature enables the same pilot to be used for sailing the pusher on its own as well as sail in convoy with barges fixed to the push boat. In both cases the pilot functions excellent even though the sailing characteristics are quite different.

Switching from 'single push boat' mode into 'push boat with barges' mode can be done (depending of the set up on board) by use of the "compass" or "aux" button.

#### 4.1.7 Settings for the ALPHATRI OPILOT MF

On the display a number of settings to the auto pilot can be changed at will. Depending on circumstances and sailing conditions adjusting setting is even necessary. The following settings can be adjusted:

- Rudder
- Trim
- Damping
- Sensitivity

Rudder: With this setting the reaction time of the rudder movements controlled by the auto pilot can be adjusted to match the sailing characteristics influenced by the cargo load (depth of the hull in water). The more cargo is loaded the higher the "rudder" needs to be adjusted. In case of fast reaction time of the ship to its rudder the "rudder" settings need to be lowered.

When the ship is yawing the value of "rudder" is set to high. When the ships reaction time to a steering command is to slow the value of "rudder" is set to low and it is possible to hear a course alarm.

The more light bars occur to the right on the display the higher "rudder" sensitivity is set.

Trim: This setting is used to fine tune zero (sailing straight ahead). Check during a longer stretch of time if the ship is sailing exactly 0 degrees/min, if not than adjust accordingly. The range of "trim" adjusting is 4 degrees to either side of zero. To light up a next led bar on the display one need to push 'trim' 4 times (note: the trim is than adjusted 4 times! With the amount of led lights fixed in the hardware and range of adjustment needed this ratio was the only way to cope).

Damping: This setting dampens the rudder movements without influencing long term accuracy of the pilot system. The readout of the display is not influenced by adjusting the "damping". In case of heavy swells (waves) or shallow water this setting needs to be increased so that small swift changes of the rate of turn indicator (gyro sensor) will not affect the rudder as much.

Damping the ROT influence is at its highest when the far right led-light indicator on the display is lit. When the far left led indicator burns the auto pilot will stir the ship as exact and direct as possible.

Sensitivity: This setting regulates the sensitivity of the auto pilot. Depending on the required reaction speed of the pilot this setting influences that effect. In most cases the indicator belonging to this setting will show centre position. The sensitivity of the rudders in auto mode is than equal to that of follow-up mode.

When "sensitivity" is set lower (indicator to the left) the rudder blades will react only in case of larger deviations from the set course, when this setting is chosen higher (indicator to the right) than the rudder will react even in case of small course changes. This setting does not influence long term accuracy of the pilot.



#### 4.1.8 Alarms

The following alarm indicators may show on the display:

- Rudder
- Course
- ROT
- Power

Rudder alarm: when the rudder does not respond to a steering command or in case the rudder moves without command.

Course alarm: when the ship does align to a set course within the required time when sailing in auto,- or compass mode than this alarm will sound.

ROT: When the fly wheel in the gyro sensor does not spin at the correct rpm this alarm will sound.

Power: provided the pilot is turned on and the power fails this alarm will sound.

Accepting an alarm:

Press the "reset" button to accept an alarm. The buzzer will mute but the indicator light will keep on burning until the alarm is no longer active.

Testing alarm function:

Press the "reset" button for testing the alarm function.

When the pilot is set in "follow-up" mode also the ROT will be tested (check 4.1.3.)



## 5 Repair/maintenance

This chapter deals with maintenance that may be done by the owner/user. Repairs only may be executed by a certified and authorised service engineer approved by Alpatron Marine BV. Any deviation from this will void your warranty.

Only casual cleaning with a moist cloth is required by the owner. Make sure that water or other fluids cannot come in contact with the (inner) hardware. Strong detergents and/or dissolvent need to be avoided. When used with caution alcohol can be used to clean the surface of the instruments.

Regularly check the physical status of the feedback unit near the rudder installation (look for loose components, mounting failures and absolute free movement without obstacles). Also check the used linkage to the rudder (either: belt with pulleys or chain or locking bars ).

The belt and pulley set we normally install are of high quality and will ensure a long life time.

At delivery no spare parts are provided with the ALPHATRI OPILOT MF.

### 5.1 Failures:

#### **IMPORTANT:**

In case of failure during sailing on auto pilot immediate switch over to manual steering until the pilot is repaired. Shutting down the auto pilot in such case can be done by switching the external switch: manual steering / auto pilot steering (check chapter 3.4) into "manual" position.

#### 1. No working system after turn on, no lighted display:

Possible causes: power supply failure, check fuses, check voltage on connector strip of display and processor unit.

#### 2. Display illumination failure:

Possible causes: "dimming" is set very low. Push "dimming" button a few times to increase brightness of lightning

#### 3. No rudder movement after steering command:

Possible causes: No hydraulic pressure, or, connection between pilot box and valves is out. External switch "manual/auto" steering could be in position "manual".

#### 4. Power alarm led is on:

Possible causes: Power supply to one of 3 hardware units in de pilot set up fails. check fuses, check voltage on connector strip of display, steering lever and processor unit.

#### 5. Rudder alarm led is on:

Possible causes: Rudder/steering engine out of control > rudder moves uncontrollably, connection between feedback and rudder hardware is broken, rudders don't move after steering command with pilot steering lever



6. ROT alarm led is on:

Possible causes: The Fly wheel of the gyro sensor is not yet at proper working speed or doesn't spin at all. NOTE: AUTO PILOT WIL NOT WORK PROPERLY AND MAY FAIL COMPLETELY.

Follow up steering mode is not affected by a failing gyro.

When the system is powered up it is normal that this alarm sounds briefly.

7. Course alarm led is on:

Possible causes: De set/wanted heading position cannot be reached with in the given time. Ship sails to slow. Better to switch over to follow up mode

8. Rudder blades move to far corner:

Possible causes: Steering engine relays or valves failure. Feedback potential meter position is shifted somehow relative to the position of rudder blade, broken belt between feedback and rudder.

NOTE: switch over to manual steering (external switch "manual steering / auto pilot steering" to manual position)

9. No reaction of rudder blade to steering lever command:

Possible causes: Aux led burns on display (pilot is in standby mode).

External switch "manual/auto" steering could be in position "manual", switch over to "auto".



## 6 TECHNICAL SPECIFICATIONS

### Instruments and processor unit:

Voltage	: 24VDC +30% -25%
Current	: max. 6A (depending on valve current and start-up gyro)
Reverse polarity safety	: yes
Functions	: Fu/WEG follow up by use of steering lever AUTO pilot steering with ROT input COMP Pilot steering with compass sensor +ROT input AUX standby or external control. E.g.: master/slave
Alarm	: optical and acoustical with indicators for: - ROT failure - power failure - Course deviation, after 10 sec. - rudder position failure, after 2.5 sec.
Input	: - Rate of Turn indicator ( 20mV/degree/min) - electronic compass (20mV/degree) - feedback 2kΩ. - Rate of turn alarm - Remote control - NMEA (compass) - Master/slave, in case of double independent rudder system - slow/fast, in case of proportional steering engine - Standby/operate
Output	: - Black/white valves 24VDC max. 2A magnetic,- or proportional valves with adjustable current and zero - Danfoss - servo output, analog +10V tot -10V in case of Rudder propeller - potential free contact for compass steering on/of - main valve output - Pilot alarm, contact - Pilot ready, contact - Pilot voltage alarm, contact - NMEA (ROT, rudder, pilot) - Solenoid output, 0V~+10V - Rudder position output, +5V~0V~-5V - Solenoid output, 0V~+7V - Rate of turn (20mV/°/min), galvanic isolated
Steering lever, follow up	: non-linear/logarithmic, programmable
Steering lever, Auto	: Logarithmic
Range steering lever	: standard 90-0-90, adjustable
Max. cable length CPU/ctrl	: 15 meter
Hand/auto switching	: via separate external switch
Safe compass distance	: Magnetic compass: 0,55m. Magnet steering compass: 0,3m
EMC	: Meets rhine certificate requirements
Protection rating controls	: IP22, front side
Protection rating proc.unit	: IP55
Working temp	: 0°C tot 40°C
Storage temp	: -20°C tot 70°C



Feedback unit:

$\Omega$ -value : 2k $\Omega$   
Accuracy : > 0.8%  
Non linearity : <1.5%  
Protection rate : IP67  
Working temp : -30°C tot 80°C  
Storage temp : -30°C tot 80°C  
Dimensions : 122mm x 120mm x 80mm

Gyro sensor:

Voltage : 15VDC +/- 5%, powered from display unit  
RPM : 3750 at 90°/min, 1250 at 300°/min  
Protection rating : IP55  
EMC : meets Rhine approval requirements  
Working temp : 0°C tot 40°C  
Storage temp : -20°C tot 70°C  
Dimension : 206mm x 156mm x 126mm (check drawings)  
Weight : 3,2kg

Dimensions and weight:

Display unit : 304mm x 181mm x 77mm, 1,8kg  
Cut out : 288mm x 148mm  
  
Control unit : 97mm x 181mm (+ steering lever (max 77mm) x 77mm, 0,8kg  
Cut out : 72mm x 144mm  
  
Processor unit : 258mm x 158mm x 90mm, 2,9kg  
  
Gyro sensor : 206mm x 156mm x 126mm, 3,2kg  
  
Feedback : 122mm x 120mm x 80mm, 1,4kg



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## 7 TECHNICAL SUPPORT

Please contact us when you have questions or are in need of technical support:

Alphatron Marine BV  
Schaardijk 23  
3063NH, Rotterdam  
P.O. Box 21003  
The Netherlands  
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[service@alphatronmarine.com](mailto:service@alphatronmarine.com)

