



FU-Amplifier Proportional AS

Type 139-159 NG001, NG002, and NG003

Operation

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FU-Amplifier Proportional AS
Type 139-159
- Torque motor
- Three-phase motor
- Proportional solenoid valve



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Change History

Date	Change
February 04, 2013	First edition
May 03, 2013	Section 4 completely changed. Sections 3.2, 3.4, and 3.6 upgraded

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Abbreviations and Acronyms

CAN	Controller Area Network
CPU	Central Processing Unit
DC	Direct Current
DOC	Document
EBP	Earth Bonding Point
ESD	Electrostatic Sensitive Device
FU	Follow Up
NFU	Non Follow Up
NG	Normgerät (Standard device)
pt	port
stb	starboard

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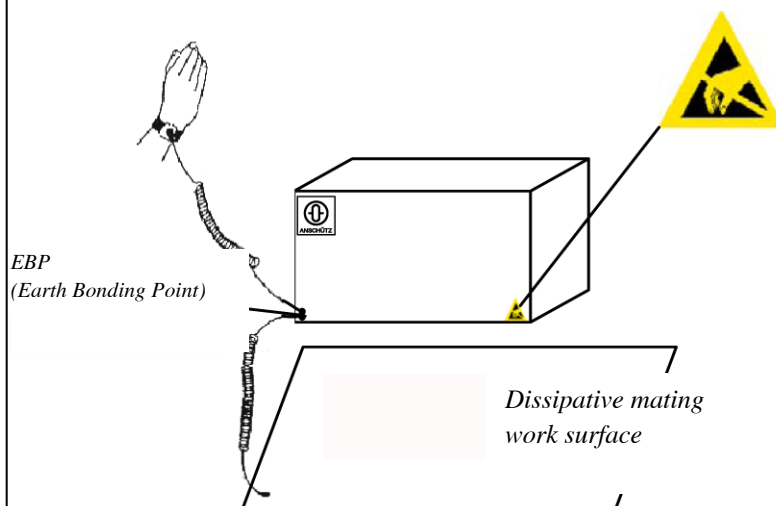
- Torque motor
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General notes and Safety notes



In case of error indications do not perform a repair immediately. First switch off and on the device and/or system. Second check the all cables to/from the device or system and at least perform a repair.

ESD = Electrostatic Sensitive Device



Devices/assemblies which are labelled as shown are electrostatic sensitive. This label indicates that handling or use of this item may result in damage from ESD if proper precautions are not taken.

To perform installation and/or calibration work appropriate protective measures must be deployed.

All necessary equipment for this protective measures can be supplied (on special order) with the RAYTHEON Anschütz Ident.-Number 1.990106

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1 General

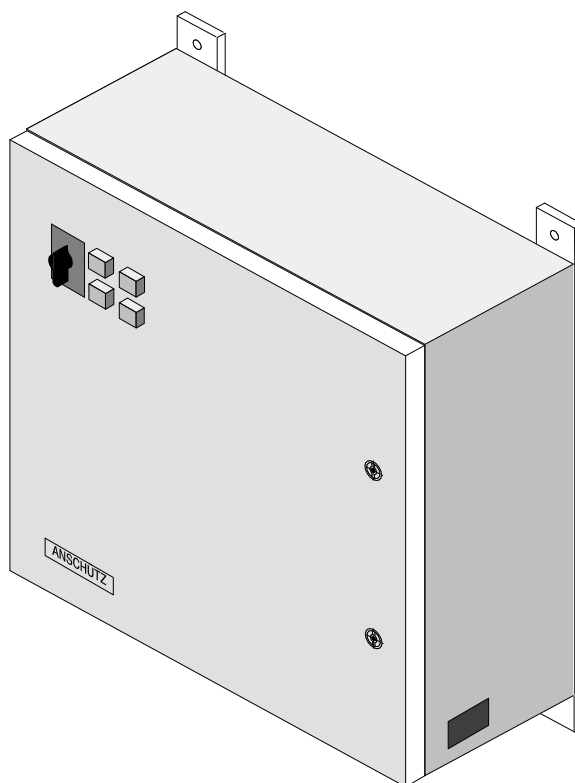
Unit overview

The FU Amplifier Proportional AS for proportional rudder control is the central component of the rudder control system. It controls the hydraulic valves of the steering gear until the rudder actual value has reached the set value of the rudder.

The FU Amplifier Proportional AS operates as a constant regulator, i.e., the hydraulic valves are opened less as the control deviation decreases and the rudder movement speed is reduced.

The FU Amplifier Proportional AS controls 3-phase DC motors, torque motors or proportional valves. As set rudder input FU-tillers, NFU tillers or autopilots can be used. In addition a NFU operation via push buttons on the FU-Amplifier Proportional AS itself is possible.

Figure 1-1 FU Amplifier Proportional AS



FU-Amplifier Proportional AS

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User manual

This current user manual includes all the operating procedures.

Service manual

There is also a service manual available in addition to this user manual. It includes:

- Information on installation and initial startup
- Information on care, maintenance and repair
- A description of the FU Amplifier Proportional AS

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Notes on the operating instructions

Explanation of the symbols used



Lamp *off*



Lamp *on*



Switch operation

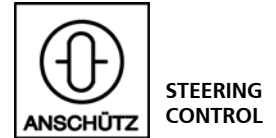
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3 Operation

3.1 General

The FU Amplifier Proportional AS is operated from the bridge in normal operation (operation mode BRIDGE). Operation mode LOCAL is only used for servicing work or emergencies.

The current operating mode is indicated at the bridge.

3.2 Switching on

The FU Amplifier Proportional AS does not have its own ON/OFF switch. There are two options available to switch the unit on, and these must be determined during the planning stage:

1. Switching on the status contact “Pump ON”:



The FU Amplifier Proportional AS is supplied by the same power supply as the steering gear. The FU Amplifier Proportional AS is then activated by the status signal “Pump ON”.

2. Switching on via the mains power supply:

Contact “Pump ON” is jumpered in the unit, and thus the FU Amplifier Proportional AS is switched on when the power supply is switched on (via the pump selector switch).

3.3 Operation mode BRIDGE

Table 3-1 Operation mode BRIDGE (indication)

Operation	Displays	Notes / Comments
<p style="text-align: center;">BRIDGE</p> 		<p>Modes of operation:</p> <p>1) Steering mode selector switch ‘NFU Direct’ means: Steering control by the main NFU-Tiller</p> <p>2) Steering mode selector switch ‘Main’ means: Steering control by the activated CAN Bus unit (Handwheel, Autopilot, or Tiller).</p>




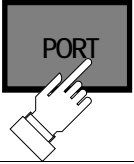


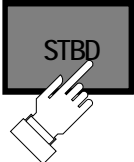


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3.4 Operation mode LOCAL

Table 3-2 Operation mode LOCAL (indication)

Operation	Displays		Notes / Comments
			Operation mode selector switch in the LOCAL position. Control is done by the buttons on the FU amplifier
			The rudder moves to port as long as the button is held down until the rudder limit position is reached.
			The rudder moves to starboard as long as the button is held down until the rudder limit position is reached.

LOCAL: The steering gear is controlled from the steering gear compartment.

BRIDGE: The steering gear is controlled from the bridge.

Note:

The operation mode of the FU Amplifier Proportional AS is indicated at the alarm panel (e.g. NAUTOALARM unit) via potential-free contacts. This status is also distributed via the CAN-Bus and can be displayed by means of an Alarm Signal unit AS, type 135-111 alternatively

3.5 Operation mode EMERGENCY

If the steering gear is provided with an emergency switch, it is possible to deactivate the FU Amplifier Proportional AS by use of the switch.

3.6 Switching off

The FU Amplifier Proportional AS does not have its own ON/OFF switch. It is automatically switched off when the associated pump of the steering gear is switched off.

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Disturbed operation

Disturbed operation of the FU Amplifier Proportional AS is indicated at the alarm panel (e.g., NAUTOALARM unit) via potential-free contacts. These error messages are also distributed via the CAN-Bus and can be displayed by means of a Signal Unit AS alternatively.

Table 4-1 Alarm overview

Display	Meaning	Action	Comment
<div style="background-color: black; color: white; padding: 5px; text-align: center; width: fit-content; margin-bottom: 10px;">FU FAIL</div> <p>System failure</p>	<p>Operation in 'Main' steering mode is not possible.</p> <ul style="list-style-type: none"> • Failure of the power supply. • CPU failure. • Internal voltage failure (5V DC /±15V DC/ +24V DC/+36V DC) • Overcurrent/ short circuit • CAN Bus failure 	<ul style="list-style-type: none"> • Switch to 'NFU Direct' steering mode. 	<ul style="list-style-type: none"> • Troubleshooting (see Service Manual) • The overcurrent monitoring unit works independatly and is detected by software. Once the overcurrent has been detected, the FU Amplier Proportional AS is automatically reactivated. This procedure is r epeated ever 2 seconds; after 5 attempts "FU FAIL" is triggered.
<div style="background-color: black; color: white; padding: 5px; text-align: center; width: fit-content; margin-bottom: 10px;">HYDRAUL. LOCK</div>	<p>The steering gear drive does not follow the rudder command.</p>	<p>Switch OFF the effected pump system and switch ON the redundant pump system.</p>	<ul style="list-style-type: none"> • Check the hydarulic system. • Check parameters for Hydr. Lock alarm (PA14, PA15 see Service Manual)

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Display	Meaning	Action	Comment
STEERING FAILURE	The actual rudder does not follow the rudder command.	<ul style="list-style-type: none">• Switch to 'NFU Direct' steering mode. <p>-or-</p> <ul style="list-style-type: none">• Switch OFF the effected pump system and switch ON the redundant pump system.	<ul style="list-style-type: none">• Check the hydraulic system.• Check parameters for Steering Fail alarm (PA16, PA17 and PA20, see Service Manual).
WIRE BREAK	Wire break in the steering gear control loop. The rudder stopps.	Switch to 'NFU Direct' steering mode.	<ul style="list-style-type: none">• Check the wiring.• Troubleshooting (see Service Manual).