



## **Take Over Operator Unit AS**

**Type**            **105-312 NG002**

**Description**  
**Operation**  
**Installation**  
**Maintenance and Repair**

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Drawings:

Dimensional Drawing	105-312.HP007
Connection Diagram	105-312.HP009

## Safety instructions



**Please note:**

The Take Over Operator Unit AS is an important part in the steering control system. In view of the ship's safety, particular attention must therefore be given to its care and maintenance and make sure that only original RAYTHEON Anschütz equipment/parts are used.

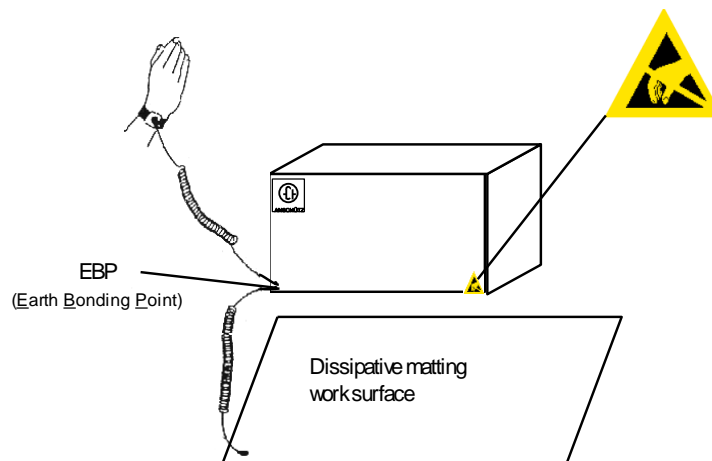


**Please note:**

The Take Over Operator Unit AS, type 105-312 must be configured with a Configuration Tool, type NB42-232 by RAYTHEON Anschütz service personnel only.



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 to an 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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**Caution**

Alarm outputs must be connected to a central Alarm Panel/Signal Unit.  
Alarm Panel or Signal Unit must have an acoustic and optical indication



**Caution**

this equipment includes electromechanical devices such as relays, switches or potentiometers.  
Electromechanical devices are subject to wear and tear depending on operation cycles and environmental conditions.



**Caution**

Installation and commissioning must be performed by well-trained and qualified personnel.



**Caution**

While connecting cables to the equipment do not bend cables to an acute angle, pinch, twist, or impact excessive force. Cracks or damage to the cable coating can cause fire or electric shock.



**Caution**

When establishing cable connections ensure that the cables are disconnected from any power supply.  
It is essential to ensure that all cables are disconnected from the power supply. If necessary, measure the voltage beforehand and/or disconnect the relevant distributor.



**Caution**

It is essential to ensure that all connections have a common ground point on the ship. Any additional components (optional) must also be connected to the common ground point.



**Caution**

Maintenance and repair must be performed by trained and qualified personnel who are knowledgeable in equipment safety requirements.

Device may be damaged.

Exchange of spare parts, when power is on, can cause severe damage to the equipment.

Exchange of spare parts only with the supply voltage switched off or disconnected.

Observe precautions for handling electrostatic sensitive devices.

Use care during maintenance and repair to avoid contact with energized electrical conductors. Applicable safety regulations must be followed, such as VDE, VBG 4, OSHA 1919, and other consensus safety standards.

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**Caution**

NautoSteer AS consists of two independent steering control systems that are technically separated from each other. These steering control systems can be selected by use of the steering mode selector switch.

In “NFU direct” mode the valves/steering gear are operated without use of electronics.

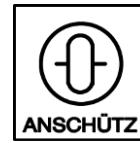
In “Main” mode a closed loop control system is used.

Recommendation: In case of any failure in either one of the two independent steering control systems, please switch to the other mode by use of the Steering Mode Selector Switch to retrieve the steering capabilities of the control system.

Please note: Depending on the steering philosophy, different manufacturers or different user requests, the Steering Mode Selector Switch may have different designations (as there are for example “Main Steering Switch”, “Steering Selector”, or “Mode Selector”). Its switch positions (minimum of two) may have different designations as well (as there are for example “HAND” and “AUTO”, “NFU direct” and “MAIN”, “NFU” and “FU”, or “MAIN” and “SECONDARY”).

Depending on the system design, the steering control system may not contain a Steering Mode Selector Switch. Therefore, it is strongly recommended to become familiar with the steering control system in order to select the correct steering control in emergencies.





## Abbreviations/Acronyms

ACK	Acknowledge
AS	Advanced Steering
appr.	approximately
BITE	Built In Test Equipment
CAN	Controller Area Network
CPU	Central Processing Unit
DIP	Dual Inline Package
FU	Follow-Up
GND	Ground
HP	Auxiliary Paper ( <b>Hilf</b> spapier)
LED	Light Emitting Diode
NG	Standard Device ( <b>Norm</b> gerät)
NFU	Non Follow-Up
PCB	Printed Circuit Board
SA	Special Application
stbd	Starboard

## Change History

Date	Change
May 02, 2013	First edition
November 2015	Additional Note in Chapter 3, additional information in chapter 1

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1

**General**

This Take Over Operator Unit AS - set into control desks or steering stands - serves as a control element for ships steering systems.

The Take Over Operator Unit AS is designed for applications with a CAN Bus technology (see also section 1.3), but the steering elements (tiller) are not based on this technology.

NFU Tiller, FU Tiller, or Autopilot can be connected to the Take Over Operator Unit AS or the Take Over Operator Unit can activate CAN-Bus components such as NFU Tiller/FU Tiller.



**Figure 1-1 Take Over Operator Unit AS**

The function, which is realized with the Take Over Operator Unit AS, is designated as “One Hand Action”.

By pressing the pushbutton “Active Standby”, an absolute take over by an external connected steering element takes place. The LED at the pushbutton “Active/Standby” lights green.

The LEDs are either off (dark) green, red, or amber depending on their activated function.

“Main” steering mode:

The rudder angle is transmitted via the CAN Bus to respective CAN controlled devices (Follow-Up Amplifier).

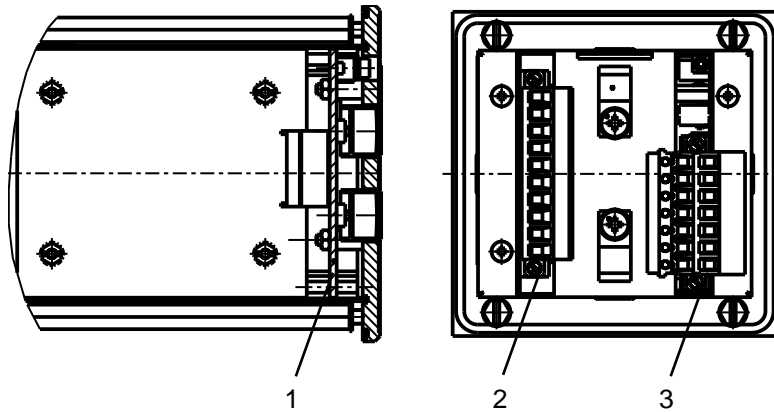
“NFU Direct” steering mode:

The Take Over Operator Unit AS is passive.

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**1.1 Mechanical construction**



**Figure 1-2** Cross-sectional view of the Take Over Operator Unit AS

The Take Over Operator Unit AS consists of three PC Boards built in a metallic casing with a front plate.

Behind the front plate a PC Board, type 105-313.01 ([Figure 1-2/1](#)) is arranged. The front plate has a service hole for controlling the LED illumination via an ambient light sensor.

On the left side of the front plate the interface PC Board, type NB05-387 ([Figure 1-2/2](#)) is placed and on the right side the CPU PC Board, type 105-312.100 ([Figure 1-2/3](#))

The metallic casing has an earthing flat plug at the backside for a common earth connection.



## 1.2 Technical data

For dimensions, weight and type of enclosure, see appended Dimensional Drawing 105-312.HP007

Supply Voltage	24V DC (via the CPU PCB) (18 to 32 V DC)
Current consumption	appr. 125mA 24V/DC

### 1.3 CAN Bus technologie (general)

The CAN Bus is a Multi-Master-Bus allowing the connection of all devices and systems regardless of their task and function. This means that any number of devices can be connected. These devices must be designed for CAN Bus technology. For the CAN Bus it is essential that every CAN Bus participant is addressable via a unique address. This address is set within each bus participant or via a component (participant) which is able to look into the CAN Bus architecture.



**Please note:**

This CAN Bus address can be set with a Configuration Tool, type NB42-232 by RAYTHEON Anschütz service personnel only.

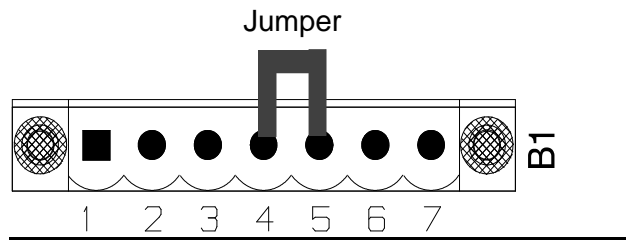
It cannot be changed without this tool.

Each CAN Bus participant can send and receive data via the CAN Bus. For data transmission, this data is combined with a header (address from the data source), and the data itself. The data is transmitted to the CAN Bus cyclically. Each CAN Bus participant monitors the CAN Bus to take off the relevant data.

The CAN Bus must be terminated at both ends (within an application) via an ohm resistor (125Ω).

This terminating resistor is set by jumpers at the respective connection (see [Figure 1-3](#)).

The termination has always to be set between the termination terminals (T) and the CAN LOW terminal (L).



**Figure 1-3** Jumper for terminating the CAN Bus

**Table 1-1** Jumper for terminating the CAN Bus

Figure/terminal	Remarks
<a href="#">Figure 1-3/4</a>	CAN bus termination (T)
<a href="#">Figure 1-3/5</a>	CAN bus low (L)

For each CAN Bus, a screened 3-core twisted cable with a conductor cross-section of 0.5mm<sup>2</sup> must be use (24V DC supply not considered).

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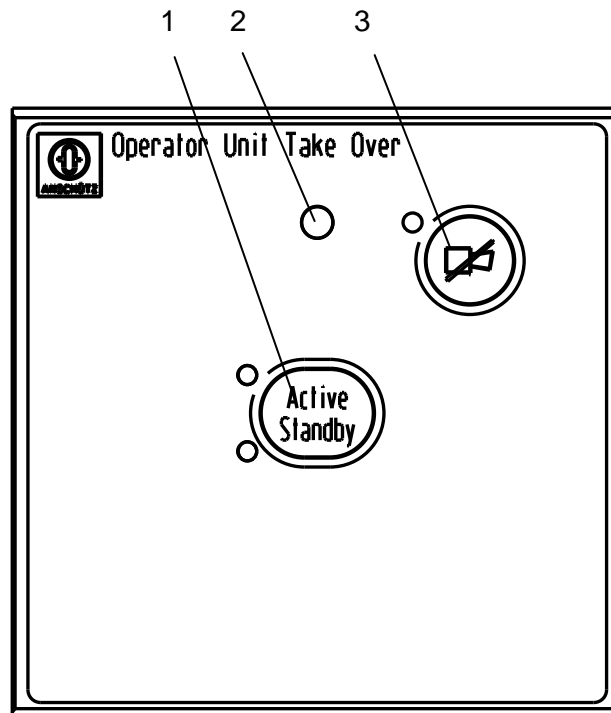
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2

Operation



**Figure 2-1** Operating elements

**Table 2-1** Operating elements

Figure/position	Function
Figure 4/1	<p><u>“Active/Standby” push button with LEDs.</u></p> <p>LED (green) lights up if “Take Over” mode is “Active” (steering element is based on non-CAN Bus technology).</p> <p>LED (yellow) lights up if the external device is ready (standby).</p>
Figure 4/2	Hole for ambient light sensor.
Figure 4/3	<p>“ACK” push button with LED.</p> <p>To mute the internal signal horn and acknowledge active alarms (see also section 5).</p> <p>LED flashes (red) means the Take Over Operator Unit AS is defective, it lights up constant (red) if the alarm is acknowledged but still present.</p> <p>The LED lights up (blue) in mode “Configuration”.</p>

After switching on the 24V DC for the CAN Bus, the unit is ready for operation, there is no separate ON/OFF switch.

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### 3 Installation and Configuration

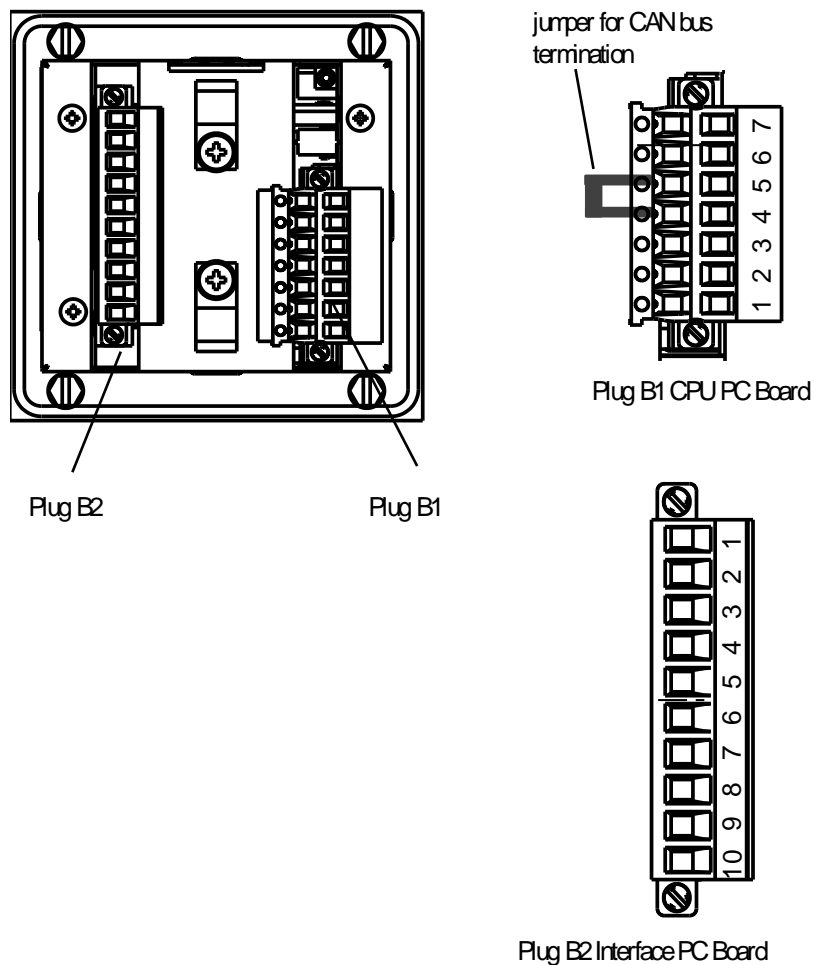
The installation of a Take Over Operator Unit AS is performed according to appended Dimensional drawing 105-312.HP007.

Voltage supply and CAN Bus connection as well as the CAN Bus termination must be performed according to [Figure 3-1](#).



**Please note:**

- Do not forget to connect the earthing flat plug at the backside of the housing.
- Fix all cables with an applicable strain relief.



**Figure 3-1** Location of plugs B1 and B2 to perform the connections (cross sectional view)

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**Table 3-1**      Terminals at Plug B1

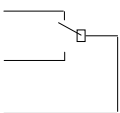

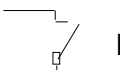
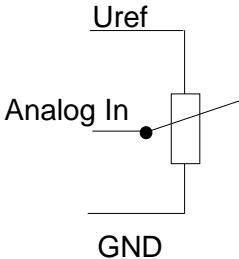

Figure/terminal	Remarks
Figure 1-3/1	Supply voltage +18 .....32VDC
Figure 1-3/2	Supply voltage 0 V DC
Figure 1-3/3	PE
Figure 1-3/4	CAN bus termination ( <b>T</b> ermination)
Figure 1-3/5	CAN bus low ( <b>L</b> ow)
Figure 1-3/6	CAN-bus ( <b>H</b> igh)
Figure 1-3/7	CAN-bus GND



**Please note:**

Connections described in Table 3-2 are not relevant, if the tiller are connected via CAN-Bus.

**Table 3-2** Terminals at Plug B2

Figure/terminal	Remarks
Figure 1-3/1 Figure 1-3/3 Figure 1-3/2	 <p>Is used to connect the status information from an external device.</p>
Figure 1-3/4 Figure 1-3/5	 <p>Digital In1</p> <ul style="list-style-type: none"> <li>- Starboard input for NFU Tiller</li> <li>- External take over input for FU Tiller</li> <li>- Standby input for Autopilot</li> </ul>
Figure 1-3/6 Figure 1-3/7	 <p>Digital In2 (for NFU tiller only)</p> <ul style="list-style-type: none"> <li>- Port input for NFU Tiller</li> <li>- Active input (acknowledge) for Autopilot</li> </ul>
Figure 1-3/8 Figure 1-3/9 Figure 1-3/10	 <p>Uref is connected if a potentiometer is used.</p> <p>No connection if an external voltage input (0-10V/±10V) is used.</p> <p>See appended Connection Diagrams 105-312.HP009.</p>
	<p><b>Please note:</b></p> <p>An NFU Tiller, a FU Tiller, or an Autopilot can be connected.</p>

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### 3.1 Configuration hints

See also Manual 3963 "Service Tool, type NB42-232".

After the Take Over Operator Unit AS is connected to the supply voltage and switched to active it must be configured. This configuration can be performed with a Service Tool only.

Configurable parameters/data are (among others):

- CAN Address, CAN Group
- Type of external device
- Give Over function enabled



**Please note:**

The Take Over Operator Unit AS, type 105-312 NG002 must be configured with a Configuration Tool, type NB42-232 by RAYTHEON Anschutz service personnel only.



**Please note:**

The LED at the "ACK" button lights up blue during a calibration procedure.

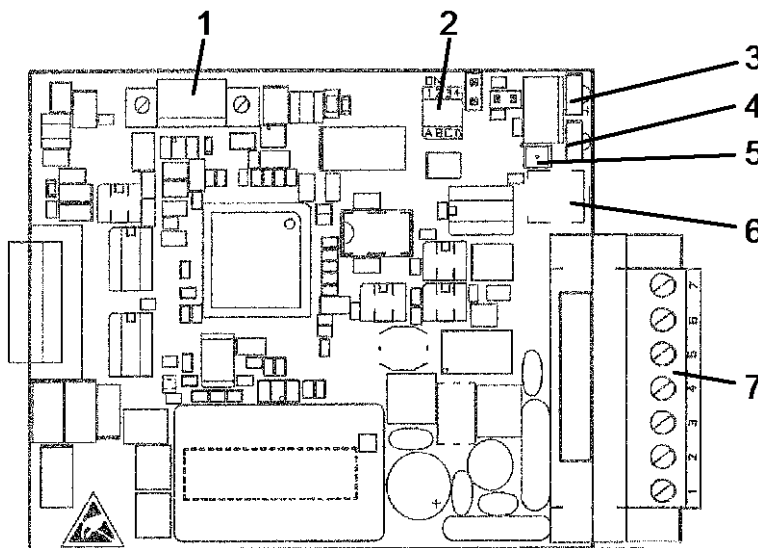
## 4 Maintenance, Fault finding and Repair

### 4.1 Maintenance

The Take Over Operator Unit AS is maintenance free.

### 4.2 Operation and monitoring elements of the CPU PCB for fault finding

Indications of the LEDs at the CPU PCB may be helpful for fault diagnostics.



**Figure 4-1** Operation and monitoring elements at the CPU PCB

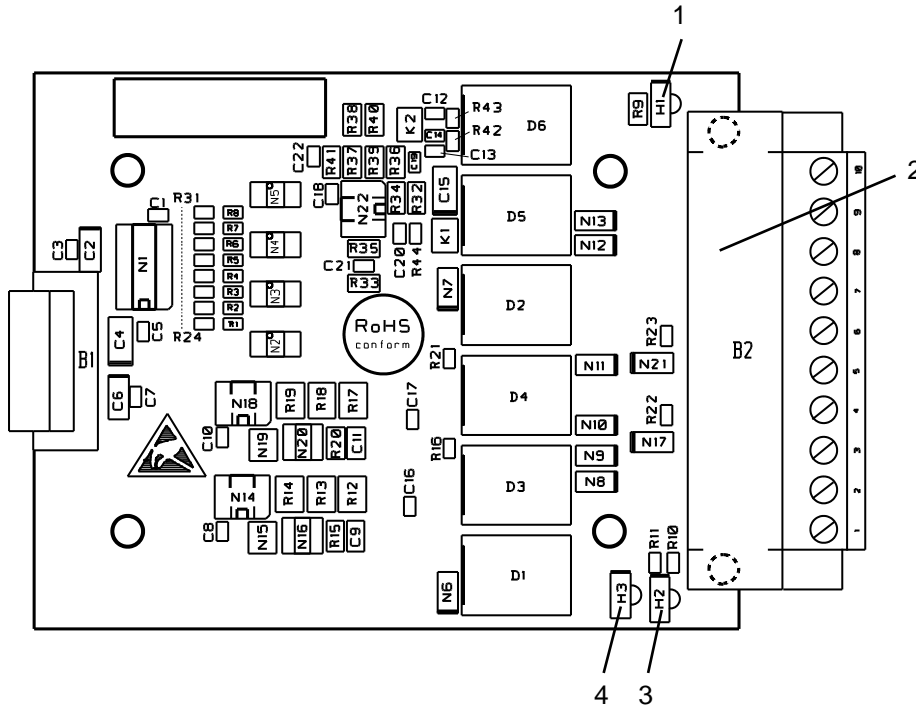
**Table 4-1** Operation and monitoring elements at the CPU PCB

Figure/position	Designation/Function
Figure 4-1/1	Plug B6 Development only. <b>Do not use it.</b>
Figure 4-1/2	DIP switches Development only. <b>Do not change switch positions.</b>
Figure 4-1/3	LED H2 (currently not used)
Figure 4-1/4	LED H1 yellow, lights up in operation
Figure 4-1/5	LED H3,           green = BITE o.k. red    = BITE n.o.k, PCB defect This LED lights up red constant during a reset procedure or in a boot loader mode.
Figure 4-1/6	Plug B2 (currently not used)
Figure 4-1/7	Plug B1 to connect CAN Bus and supply voltage

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**4.3 Operation and monitoring elements of the Interface PCB for fault finding**

Indications of the LEDs at the Interface PCB may be helpful for fault diagnostics.



**Figure 4-2** Operation and monitoring elements of the Interface PC Board

**Table 4-2** Operation and monitoring elements of the Interface PC Board

Figure/position	Designation/Function
Figure 4-2/1	LED H1 (yellow) lights up if the takeover function is active.
Figure 4-2/2	Plug B2 Is used to connect external devices (status signals, analogue voltages, digital information)
Figure 4-2/3	LED H2 (yellow) (actually not used)
Figure 4-2/4	LED H3 (yellow) (actually not used)





#### 4.4 Repair

A repair of the Take Over Operator Unit AS is possible in manufacturers' facility only.  
It has to be replaced complete.

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## 5 Alarm handling

An alarm is indicated by an acoustical sound and a blinking LED (red) "ACK".  
By pressing the pushbutton "ACK" the acoustical signal is muted and the LED is constant alight (red).

An alarm is generated if the Take Over Operator Unit AS itself fails.

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## 6 Disposal

The Take Over Operator Unit AS or components of it can be disposed according to the respective national regulations for electronic waste without harmful material (according to 2002/96EC WEEE - disposal for Waste Electrical and Electronic Equipment).

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## **7 Tiller application within a steering system**

### **7.1 “Take over” function**

Function principles:

This function is designated as “One Hand Action”.

Instead of a “Main Steering Switch” or a “Steering Selector Switch” where the steering control unit has been selected, is it possible to activate a steering control unit at the installed position.

This function is possible only, if the “Main Steering Switch” is switched into position “Main”.

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**7.1.1            “Take over” function for steering control units without CAN Bus technology**

If there is a steering control unit without CAN Bus technology, the “Take Over Operator Unit AS” must be installed.

This Take Over Operator Unit AS communicates with the steering control unit via status messages/data and a separate connection.

This status messages/communication must be accounted during the installation before.

The Take Over Operator Unit AS has one pushbutton

- Active/Standby

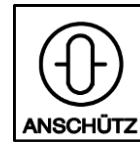
The Main Steering Switch is already switched into position “Main”.

By pressing the button “Active/Standby” at the Take Over Operator Unit AS, the steering control element, which communicates directly with the Take Over Operator Unit AS is active and the LED at the button “Active/Standby” is alight (green).

Now the steering control unit (without CAN Bus technology) acts to the rudder.

To close this “Take over” function, activate any steering control unit with CAN Bus technology - than usually the standby LED at the Take Over Operator Unit AS is alight (amber).





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## 7.2 “Give over” function

(See also manual no. 4080 “Steering Mode Operator Unit AS”)

Principle function:

Via a Steering Mode Operator Unit AS all steering control units of a steering system are selectable (and can be activated) - even those without CAN Bus technology. The steering control unit, which is selected and activated via the Steering Mode Operator Unit AS, should be used.

An expedient application is:

Switching off the Tiller, which are installed at the wings of a bridge during a sea trial, and activating them (both) via this “Give over” function for a docking manoeuvre. Steering control units can be preselected and activated to a definite moment.

This “Give over” function is applicable for steering control units with CAN Bus technology only.

For steering control units without CAN Bus technology the Take Over Operator Unit AS must be used.

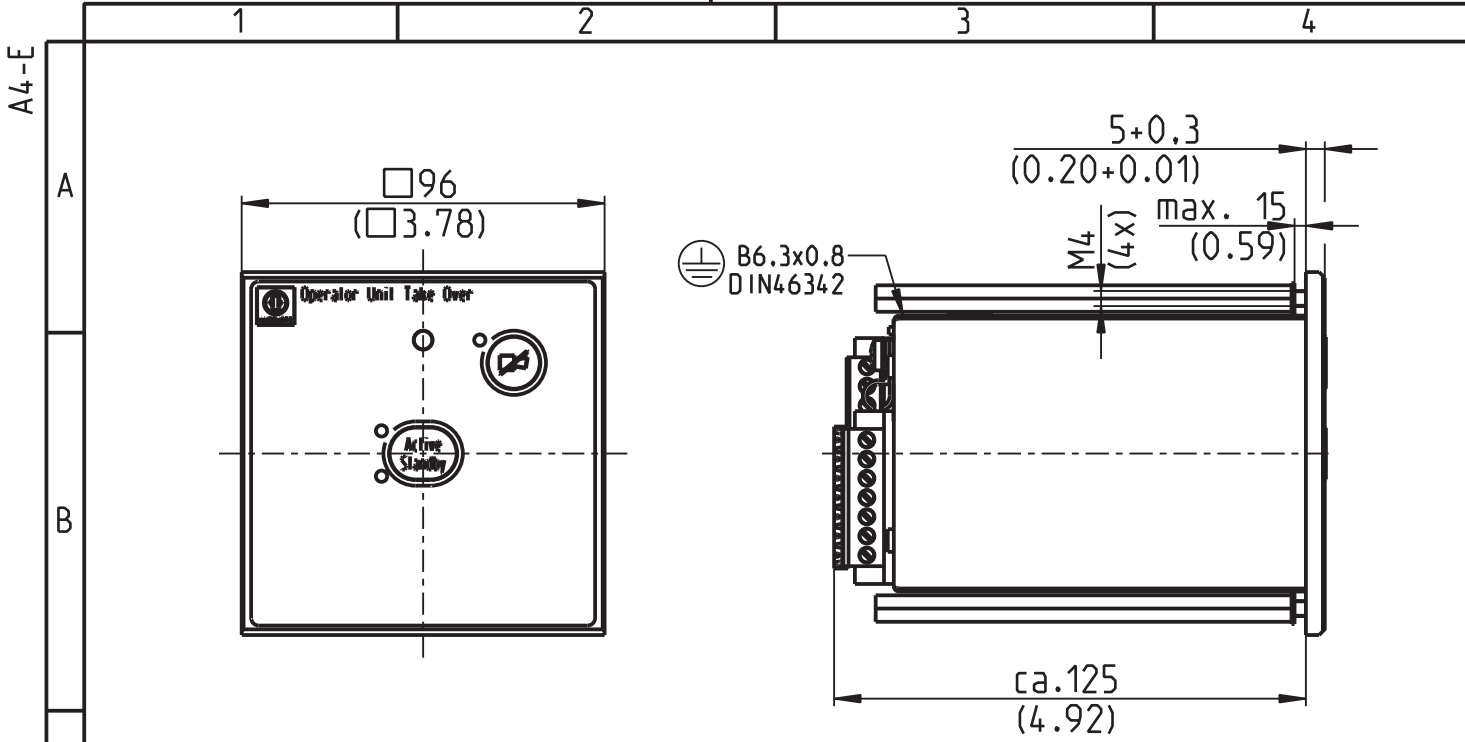
The “Give over” function can be closed either by deactivating the respective steering control unit with the Steering Mode Operator Unit AS  
or  
by activating another steering control unit in the steering system.

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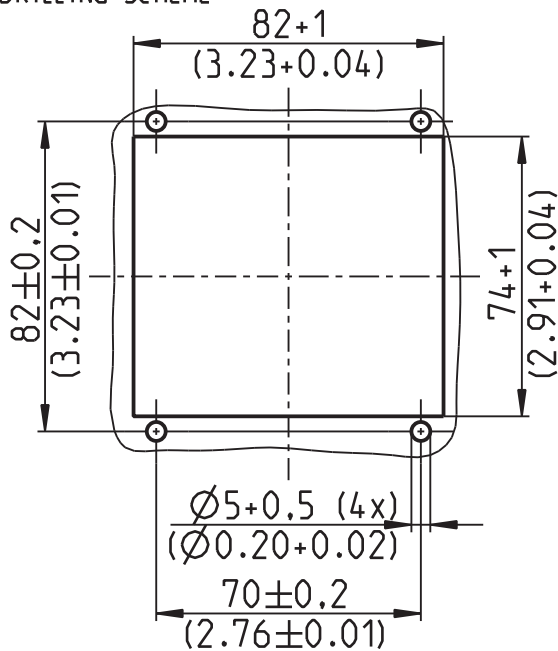
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DRILLING SCHEME



DIMENSIONS WITHOUT TOLERANCES ARE MAXIMUM DIMENSIONS

TYPE OF ENCLOSURE: EN 60529 IP23/IP56 FRONT-SIDED

EVENNESS OF MOUNTING SURFACE < 0.1mm

		CAD: Pro/E		ID.NO.: 5025127	
		SCALE: -		WEIGHT: ca. 1 Kg	
		mm (INCH)		DRAWING TITLE:	
		DATE		NAME	
		DR. 25.10.12		Zm	
		APPR. 26.10.12		L ü	
		CHK. 17.12.12		Lut	
		RELEASE: 15.02.13			
				DRAWING NO.:	
				105-312.HP007	
REV.	REVISIONS	DATE	NAME	OF 1	

8 7 6 5 4 3 2 1

F

E

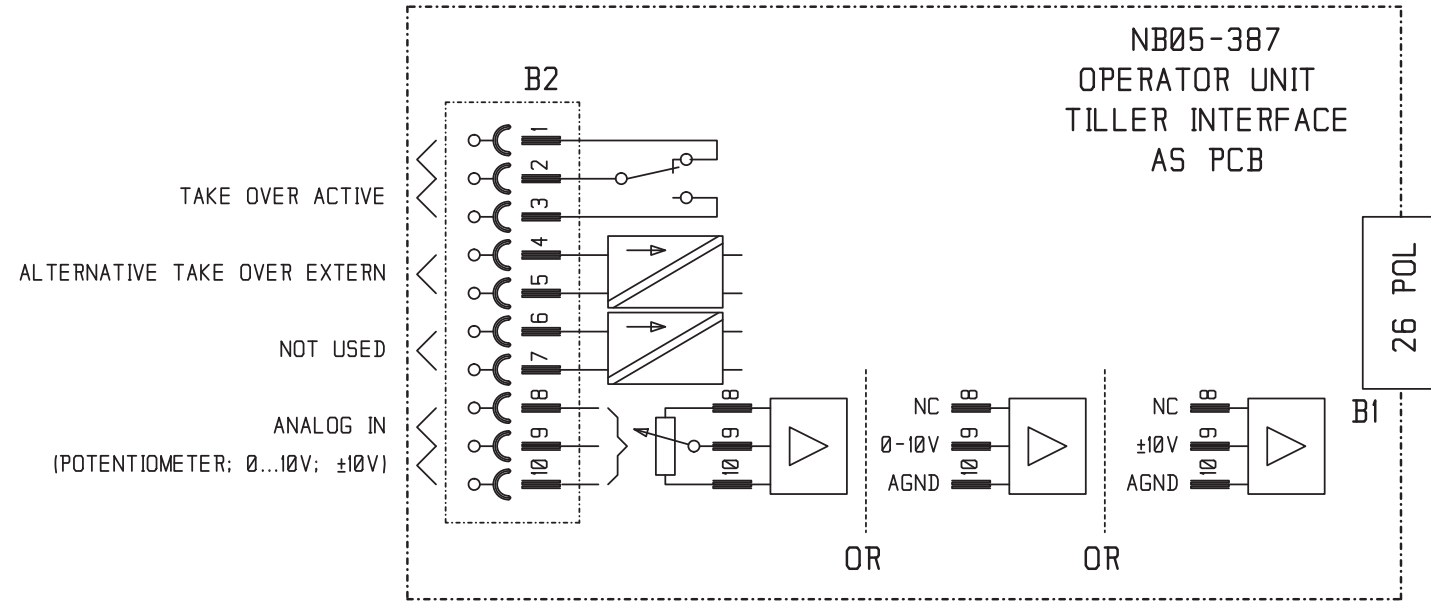
D

C

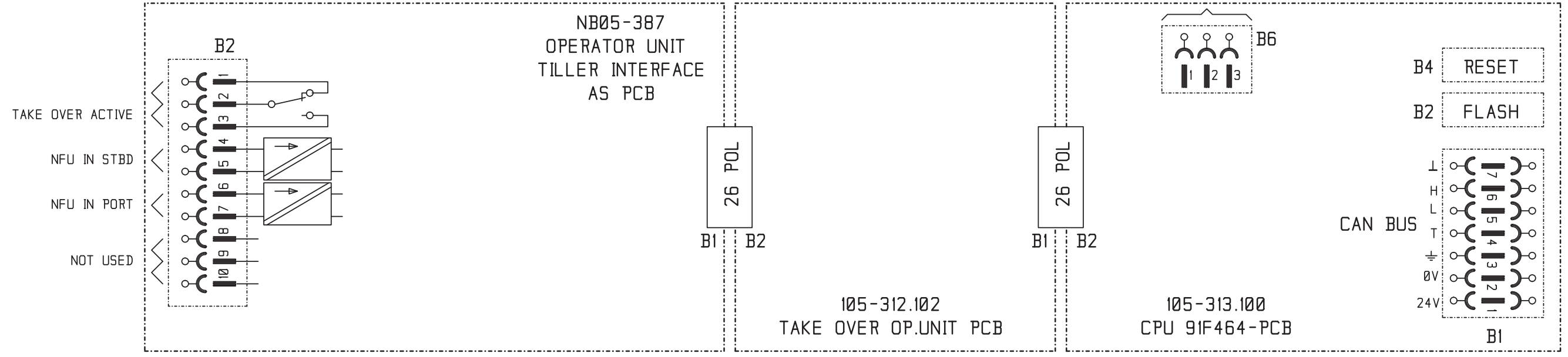
B

A

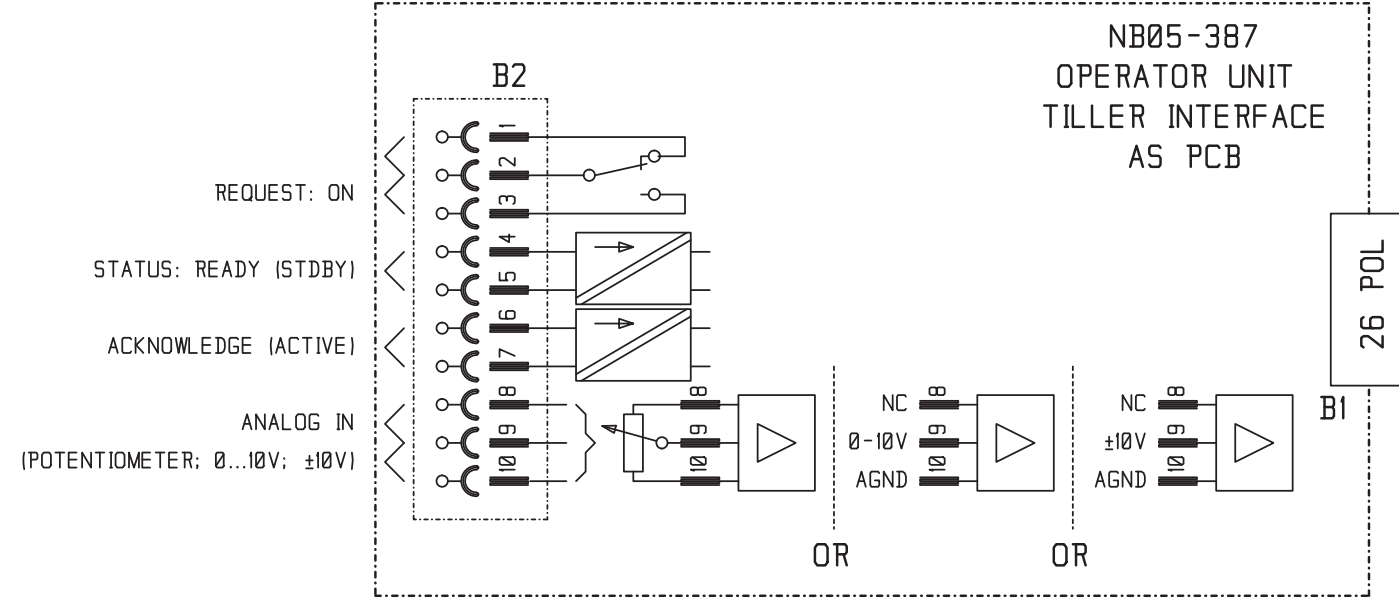
\* TAKE OVER FUNCTION : FU- TILLER



\* TAKE OVER FUNCTION : NFU- TILLER



\* TAKE OVER FUNCTION : AUTOPILOT



\* TAKE OVER FUNCTION DEPENDS ON CONFIGURATION

ID.-NR.: 5025132

CAD		B 4940 A		BENENNUNG		TAKE OVER OPERATOR UNIT AS	
ALLGEMEINTOLERANZ		ISO 2768 - mK		ANSCHLUSSPLAN / CONNECTION DIAGRAM		ZEICHNUNGSNUMMER	
BEARB		DATUM		NAME		105-312.HP009	
GEPR		15.02.13		RIENITZ		BL. 1	
NORM		15.02.03		Fa		VON 1	
FREIG		15.02.03				ERS.FÜR	
ZUST		ANDERUNG		DATUM		ERS.DURCH	
NAME							

