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ANSCHÜTZ

Adaptive Autopilot NP2030 (W1)

Type AP01-S01

OPERATOR MANUAL

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Notes:

1) In the operator manual the term ECDIS is always used for ECDIS or ECS, even if it concerns an ECS.

2) At present a rearrangement of the terms “Course Control” and “Set Course” is taking place internationally.
   - “Course Control” changes to “Heading Control” and
   - “Set Course” changes to “Preset Heading”.

   During the transitional period it can occur that the hardware is delivered with the old labeling. In the operator manual in hand both terms will be used for a time.

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Operator Manual

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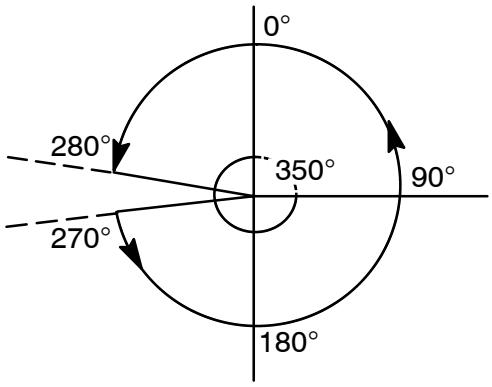
Attention

There are two different possibilities to adjust the heading preadjustment.

1.Preselected Heading

Heading adjustment und acknowledgement of the adjusted value by the Set-key. In this mode the ship follows the respective heading adjustment within a range of 0 to 359,9°. It means, there will be an all-around circle.

For example: Actual heading is 270°.
New heading will be 280°.
Direction of roation should be Port.
The new heading will be 280° after a around circle of 350° with a direction of rotation to port.



Direction of rotation of the preselected heading

2. Direct heading

The rotary knob has to be pushed-in while the heading value is adjusted. In this mode the ship follows at once the new value and a change of heading can be more than an all-around circle.

Caution: In case of a malfunction, it means a heading-jump with an adaption to the new heading value, the initialized heading-change-maneuovre will be aborted.

1 General

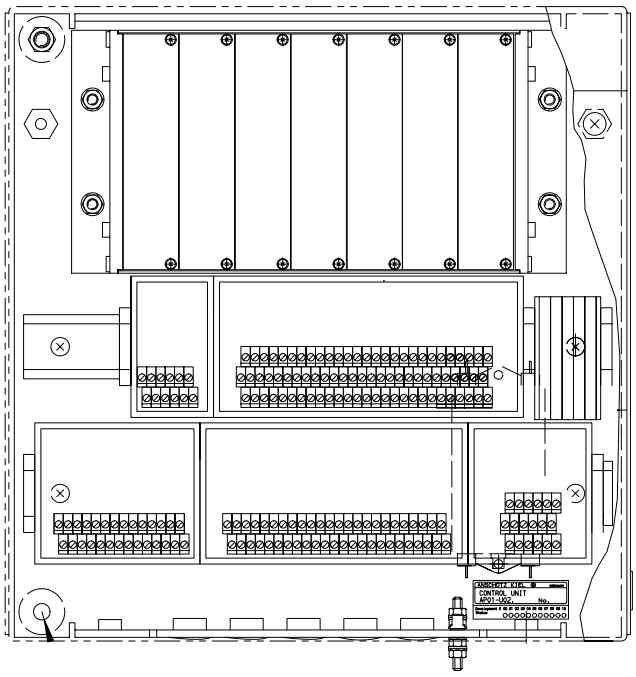
Equipment Overview

The NP2030 is a modern adaptive autopilot system designed for all sizes of sea-going ships.

The autopilot equipment is composed of:

- Operator Unit, Type AP01-U01
- Control Unit, Type AP01-U04
- Connection Cable

Operator Unit, Type AP01-U01



Control Unit, Type AP01-U04

Operator Manual

This operator manual contains the operating instructions as well as a survey of possible warnings and alarms indicated on the operator unit.

Service Manual (In preparation)

In addition to the operator manual a service manual is available. It contains:

- information about installation and first putting into operation
- information about care, maintenance and repair
- a description of the autopilot equipment

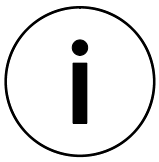
2 Operating Instructions

2.1 General

NOTE

The membrane keyboard must never be operated by a pointed object (ball point pen, pencil etc.)!

For cleaning the membrane keyboard and the display fields, a commercial, acid-free agent is to be used!



In case of lengthy input pauses (approx. 15s), a time-out occurs. The current text indication disappears, the previous indication appears again.

The NP2030 has the following operating modes:

- Heading control in consideration of a radius or R.o.T. limit value adjustment
- Track control in conjunction with an ECDIS system
- Rate-of-turn control via an R.o.T. tiller

The intended operating mode can be called up via command keys.

On selecting an operating mode, all necessary sensor data is checked for plausibility.

Luminous diodes indicate the active operating mode.
In case of disturbance, an error message in plain text appears in the alphanumeric line.
Operator inputs are possible only when the alarm has been acknowledged.

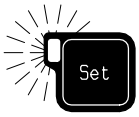
Function keys permit calling up and varying parameters, sensors and permanent information indication within the text line.

Depending on requirements, the operator can adapt the steering quality to the present sailing area by selecting between Economy, Precision and Basic.

Annex 1 provides a short description of the keys and displays on the NP2030 operator unit!

2.2 Explanation of Used Symbols

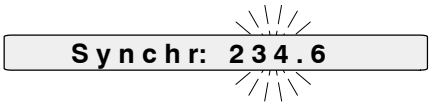
Key actuation



LED *flashing*

LED *out*

LED *alight*



Parameter indication flashing

Audible signal *on*

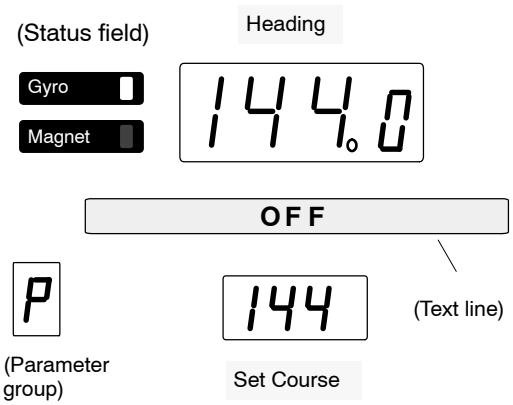
Audible signal *off*

Rotary knob pressed

2.3 NP2030 – PASSIVE – (Steering Mode Selector in Position HAND)

The NP2030 has been separated from the steering control system by means of the steering mode selector.

The operator unit now
- acts as a display unit for the actual heading
- indicates the connected sensors and their status
- permits various configuration adjustments via the function keys.

	Indications	Comment/Notes
1 Setting the steering mode selector to position HAND		
HAND 		The current NP2030 operating mode is no longer valid. The functions of the command keys are cancelled. The set course (preset heading) is made to follow up the heading. The status of the heading sensor remains displayed. Within the text line, the status of the NP2030 equipment is permanently displayed. The last parameter group number remains indicated. Settings such as – parameter management – display management, or the – dimmability of the key and display illumination remain possible. Possible sensor failures (compass, log etc.) are signalized by flashing of the symbol key LED. Alarms are not indicated via the text line (no audible signalling).

2.4 NP2030 – ACTIVE – (Steering Mode Selector in Position AUTO)

The Autopilot NP2030 is connected to the steering control system via the steering mode selector switch.

	Indications	Comment/Notes
1	Setting the steering mode selector to position **AUTO**PILOT NP2030	
AUTO	(Command keys) Course Control; Radius R.o.T. (Status field) Heading Gyro Magnet 144,0 Setrudder: 0° P 144 (Text line) (Parameter group) Set Course	The NP2030 is automatically switched to operating mode COURSE CONTROL (Heading Control). The LED lights up. The last limit value adjustment for R.o.T. or radius is active. The current heading is adopted as set course presetting (preset heading). The heading sensor status is indicated. The last selected infotext appears in the text line with its current value.

2.5 Secondary Operator Units

Within an NP2030 system, several operator units may be managed. If there is no active disturbance (alarm that is not acknowledged), change-over between the operator units can be performed.

Change-over is made directly via the command keys of the operator unit concerned:

- In case of same operating mode, the set course preselection (preset heading) is maintained
- If the operating mode is changed, the set course (preset heading) is equated with the heading.

Passive operator units are in STANDBY.
STANDBY means;

- Indication of set course (preset heading) and heading
- Status indication of the heading sensor
- Indication of parameter group
- No possibility of adjustment via function keys
- Operator unit can be activated via a command key:

⇨ switches the operator unit to the operating mode of course control (heading control).

⇨ switches the operator unit to the operating mode of track control

⇨ switches the operator unit to the operating mode of R.o.T. control

Any active operator unit permits unrestricted system operation and parameter management.

NOTE

If the autopilot is activated via the steering mode selector switch, the main operator unit is always switched to the operating mode of **Course Control (Heading Control)**.

2.6 Operating Mode of Course Control (Heading Control)

After being activated via the steering mode selector switch the Autopilot NP2030 is automatically switched to the operating mode of course control (heading control).

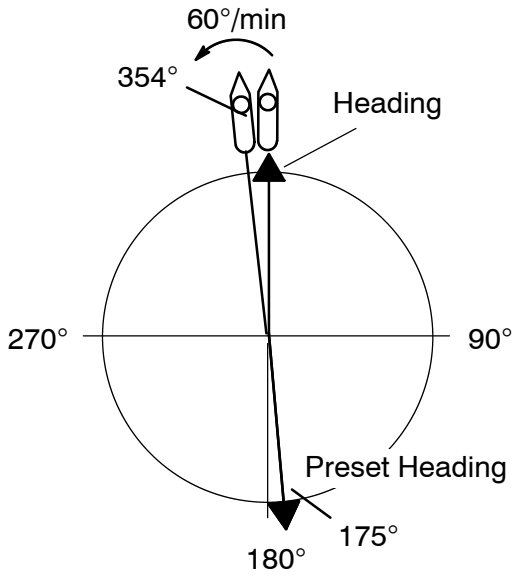
The set course (preset heading) equals the heading.

- Prepared set course (preset heading) change
  Pre-condition:
  - Steering mode selector in position **AUTO**

CAUTION!

Set course (preset heading) inputs differing by more than ±180° (calculated in direction of preset heading adjustment) from the instantaneous heading of the ship are executed by NP2030 through the shorter way as a matter of principle.
In case of a set course (preset heading) change of 180° exactly, therefore, the direction of change is uncertain!

Behavior at preset heading adjustment while ship is turning:
In case of a heading change maneuver initiation of more than 180° (calculated in direction of preset heading adjustment) it could happen that the ship at least turns via the longer way.



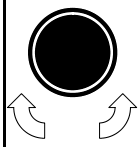
Example:
New preset heading 175°
Actual rate of turn: 60°/min. to BB

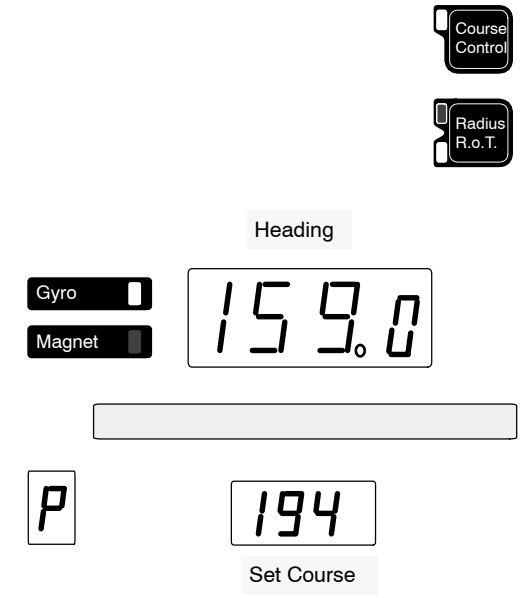
At heading 0° the new preset heading is activated.

Result:
Since preset heading/heading difference < 180°, the ship is forced to turn to STB.
The rate of turn (to BB) will be reduced.

At 354° for instance, the R.O.T reaches 20°/min.
Now the preset heading/heading difference is < 180° to BB.

The ship continues turning to BB!

	Indications	Comment/Notes
1 Switching on the operating mode of course control (heading control)		
Course Control	Radius R.o.T. Heading Gyro Magnet 144.0 P 144 Set Course	The set course (preset heading) equals the heading. The last limit value adjustment for e.g. R.o.T. remains valid. The parameter adjustments remain valid. The ship is held on the set course (preset heading).
2 Set course (preset heading) preselection		
	Course Control Radius R.o.T. Heading Gyro Magnet 144.0 PRESELECTED HDG P 194 Set Course Set	Turning the rotary knob results in that the desired set course (preset heading) appears within the **Set Course** display. A comment appears within the text line (for approx. 15s). The previous text is overwritten for this period. The LED of the Set key is flashing. The new set course (preset heading) must be acknowledged within approx.15s. If not acknowledged, the previous set course (preset heading) value, which remains valid, re-appears on the Set Course display after 15 s.

	Indications	Comment/Notes
3	Acknowledging the set course (preset heading) preselection	
Set		The ship starts the heading change maneuver. The heading change maneuver is executed with regard to the limit value adjustment for R.o.T. (see Section 2.9.14). The heading change maneuver is completed as soon as the heading corresponds to the set course (preset heading) preselection.

2.7 Operating Mode of Track Control

2.7.1 Definitions

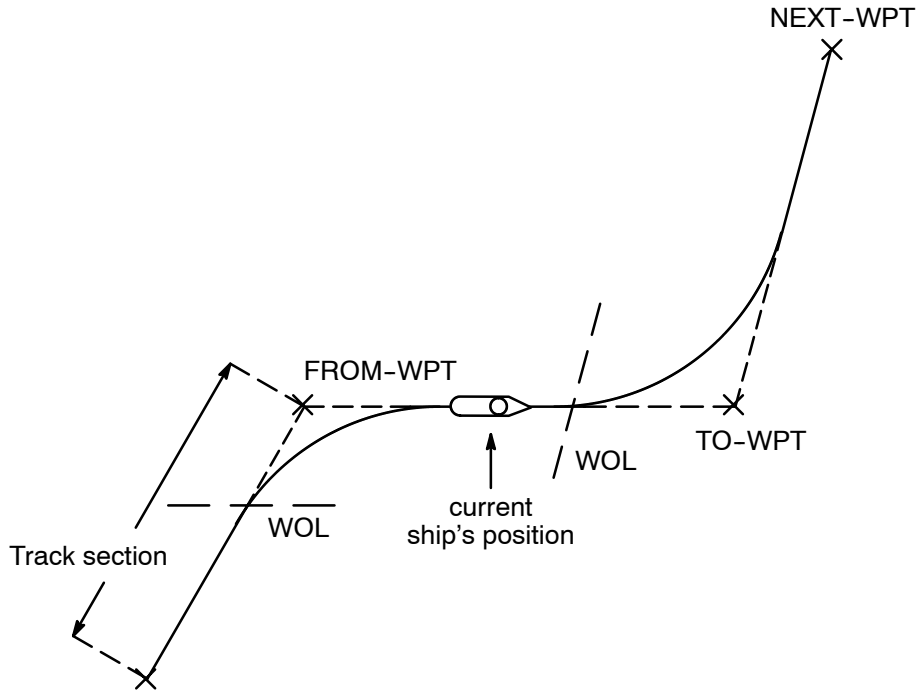


Fig. 1: Definitions

WPT	Waypoint
Track Section	A track section is the route between two WPT.
TO-WPT	Waypoint to be steered for, the WPT being considered as a "TO-WPT" as long as the associated track change maneuver is not terminated and the new track section has not been reached.
FROM-WPT	The "FROM-WPT" is the previous waypoint.
NEXT-WPT	The "NEXT-WPT" is the waypoint following the "TO-WPT".
WOL	Means wheel-over-line and is that line of the track where the planned track change maneuver is intended to start.
Approach-Time	The approach time is that time before the WOL when the approach message is indicated on the operator unit.
ECDIS	**E**lectronic **C**hart **D**isplay and **I**nformation **S**ystem: Track planning system; system where the the planning of the track and the input of the WPTs is performed.
ECS	Electronic Chart System
Control Parameters	Rudder Limit Rate of Turn (R.o.T.) Radius

2.7.2 Principle of Operation

The NP2030 is capable of storing up to 4 WPTs in its WPT memory. Before track control is started, WPTs are transmitted to the NP2030. This process is called initialization. Further WPTs are transmitted during track control from the ECDIS to the NP2030 after request of the NP2030. After initialization, the NP2030 is switched into the operating mode of track control and the ship turns in to the first track section.

Within a time of between 3 to 6 min before a track change maneuver starts, the operator's attention is drawn to the forthcoming track change maneuver by means of a message on the operator unit. The time can be selected on the ECDIS. This message is to be acknowledged by the operator. 30 s before the track change maneuver starts, the operator is requested by the operator unit to acknowledge the forthcoming track change.

At the end of the route, the operator's attention is drawn by an alarm to the track end, and he is requested to change over into the operating mode of course control (heading control).

After each switch-over from track control to course control (heading control) or R.o.T. control the NP2030 waypoint memory is erased. Before switching over to track control again, the NP2030 has to be initialized by the ECDIS again.

2.7.3 Pre-conditions for the Activation of Track Control

The activation of track control is only possible under the following conditions:

1. The NP2030 is in the operating mode of course control (heading control).
2. At least two WPTs are in the memory of the NP2030.
3. A valid position is supplied to the NP2030.
4. The NP2030 receives a valid status from the ECDIS.

Note:
In the normal case (except for defects), automatic read-in from the log is to be switched on for track control because of drift estimation (see Section 2.9.11).

2.7.4 Starting Track Control

Changing over to Track Control - General -

During the operating mode of track control, the adjusted control parameters can be viewed on the operator unit. As a matter of principle, in the operating mode of track control ”Radius” is active. On pressing the key ”Limits Values”, the presently valid radius can be indicated on the display (see Section 2.9.15). For track changes, the NP2030 takes the radius value transmitted from the ECDIS. This radius cannot be varied on the operator unit. This means that the value adjusted during course control (heading control) is overwritten! When changing manually back to course control (heading control), the old value is re-activated.

For the approaching maneuver (the way from the actual ships position to the pre-planned track) a radius can be planned at ECDIS. This radius will be transmitted to the NP2030. If there is no transmission of an approach radius from ECDIS to NP2030 an NP2030 default radius value will be taken. This radius is ships specific and is to be adjusted by the service engineer.

During track control, the rudder limit is automatically set to ”Max.” The value cannot be varied during track control. In case of manual change-over to course control (heading control), the old value is taken again.

Example:
The NP2030 is in the operating mode of course control (heading control), a radius of 0.800 NM is adjusted and ”Radius” is selected. The rudder limit is set to 10°. A route has been planned on the ECDIS, and the radius on the TO-WPT of the route has been planned to be 1.200 NM. The NP2030 has been initialized, the WPTs and the approach radius have been transmitted to the NP2030. The approach radius is set to 0.300NM. After change-over from course control (heading control) to track control and on actuating the key ”Limits Values”, the radius (0.300 NM) can be indicated. On calling-up ”Rudder Limit”, the information ”Max.” appears instead of the value 10°. After reaching the first track (message ”NEW TRACK ...°”), on indicating the radius, the NP2030 displays 1.200NM, i.e. the radius used for the next track change.

If the operating mode is changed back to course control (heading control) by actuation of the key ”Course Control”, the old value of 0.800 NM re-appears on pressing the key ”Limits Values”. On calling up ”Rudder Limit” ”10°” appears again. Now the values can be varied on the operator unit again.

A similar situation occurs, if ”R.o.T.” is selected during course control (heading control). On changing the operating mode from course control (heading control) to track control, change-over from ”R.o.T.” to ”Radius” is performed. The LED for ”R.o.T.” goes out, the LED for ”Radius” is alight. During track control, adjustment of ”R.o.T.” is not possible. ”R.o.T.” cannot be activated.

Example:
The NP2030 is in the operating mode of course control (heading control), a rate of turn of 15°/min. has been adjusted and ”R.o.T.” is active. The rudder limit is set to 10°. A route has been planned on the ECDIS. The NP2030 has been initialized, the WPTs and the approach radius have been transmitted to the NP2030. The approach radius is set to 0.300NM. On changing the operating mode from course control (heading control) to track control, the LED for ”R.o.T.” goes out, and the LED for ”Radius” lights up. On actuating the key ”Limits Values”, the radius (0.300 NM) can be indicated on the display. This value can not be varied, ”R.o.T.” cannot be selected. On calling-up ”Rudder Limit”, the information ”Max.” appears instead of the value 10°.

As soon as the operating mode is manually changed over from track control to course control (heading control) again, the LED for ”Radius” goes out and the LED for ”R.o.T.” lights up again. On calling-up the ”R.o.T.”, 15°/min appear again. The rudder limit is set to 10° again. The values can now be varied again.

The following Sections 2.7.4.1 and 2.7.4.2 describe two types of maneuvers for going to the planned track after starting track control.

The following Section 2.7.4.1 describes the GO-TO-WAYPOINT maneuvers which bring the vessel directly to the TO-WPT, i.e. to the beginning of the track section between TO-WPT and NEXT-WPT. The FROM-WPT is not required for this kind of maneuvers and remains undefined.

The Section 2.7.4.2 describes the GO-TO-TRACK maneuvers which bring the vessel to the track section between FROM-WPT and TO-WPT.

It depends on the ECDIS which of these two types is used.

2.7.4.1 Changing over to Track Control, GO-TO-WAYPOINT Maneuver (with FROM-WPT undefined)

(See Fig. 2 and Fig. 3).

	Indications	Comment/Notes
1 Switch on track control		
Track Control	**Go To Waypoint** three pulses Set	The pulses are repeated every 90s.
2 Acknowledge the track course preselection on the NP2030		
Set	**Chk Track Data** Track Control	Acknowledge track course by pressing the “Set” key, the switching-over procedure to track control is started. The NP2030 track controller will check the geometrical constellation of ships position and the track. If the geometrical constellation of the ship’s position, heading and planned track makes it impossible to reach the track, a warning (see Section 2.10.3, page 61) appears for 15s on the operator unit and the NP2030 doesn’t switch over to track control. If the check is passed and the geometrical constellation admits to switch over to track control, track control is activated.

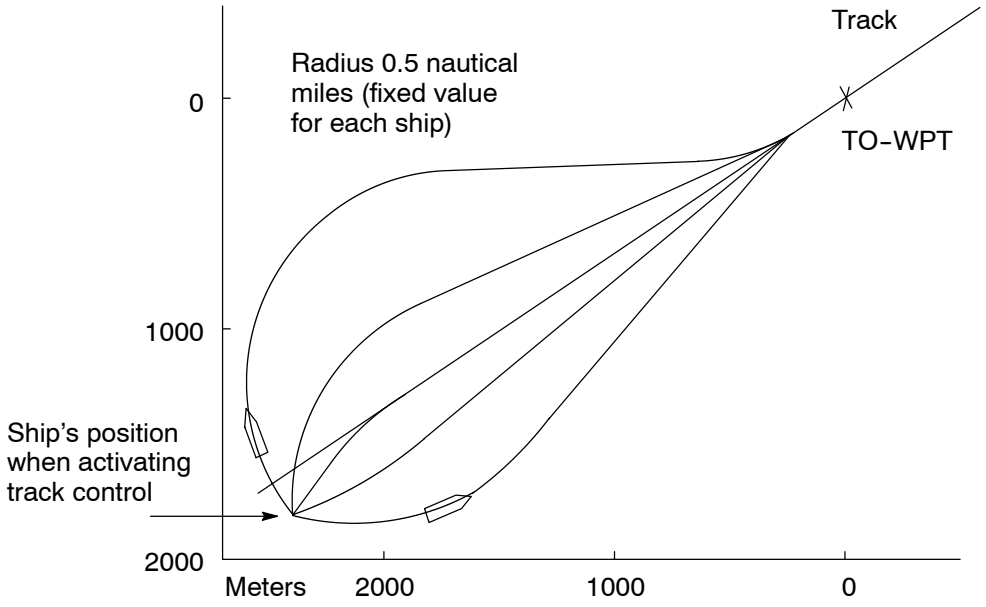
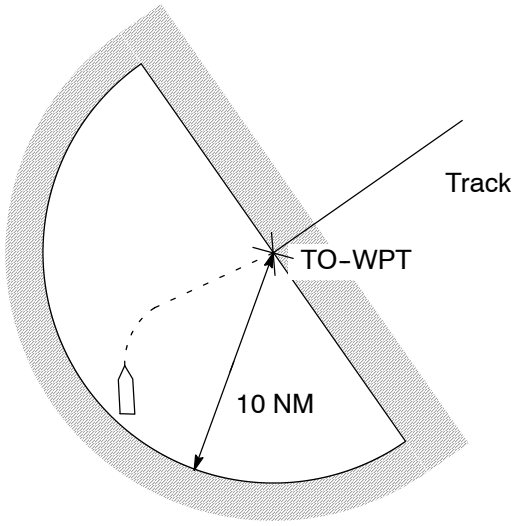


Fig. 2: Example of Five Different GO-TO-WAYPOINT Maneuvers depending on the Initial Heading

A) The **initial position** must be ”before” the track and less than 10 nautical miles away



B) The **initial heading** must be between track course minus 45° and track course plus 135° if starting from the PORT side of the track and between track course minus 135° and track course plus 45° if starting from the STB side of the track

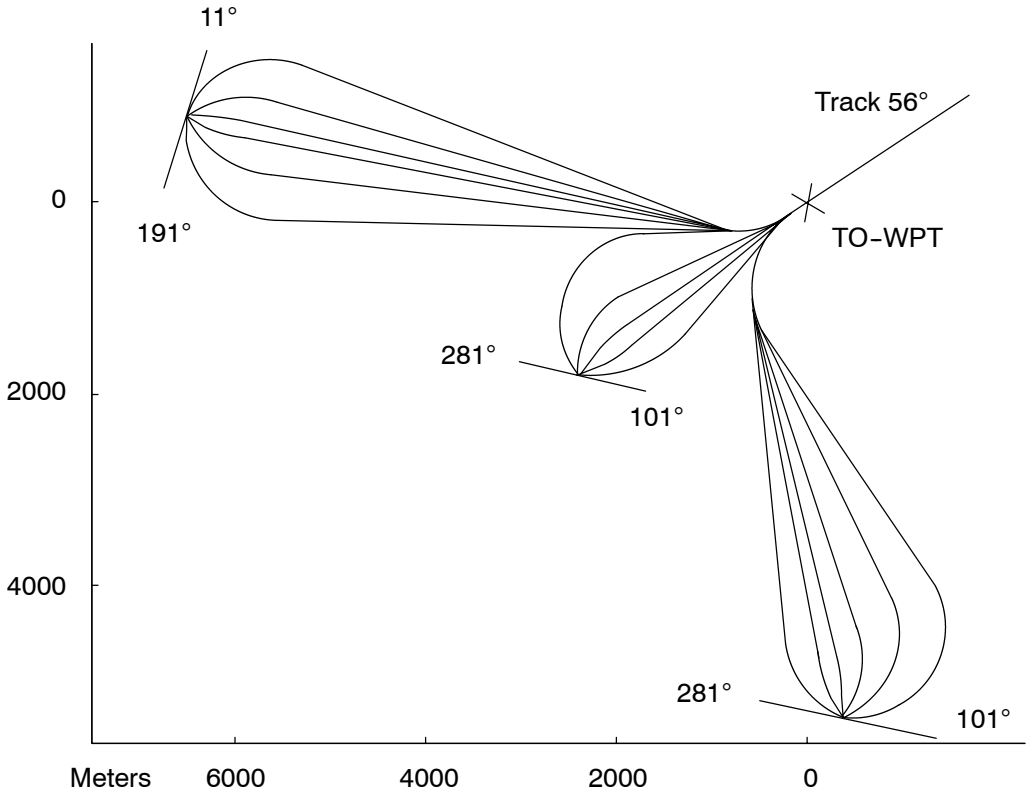


Fig. 3: Geometrical Requirements of GO-TO-WAYPOINT Maneuvers

2.7.4.2 Changing over to Track Control – with FROM–WPT defined by the ECDIS (GO–TO–TRACK Maneuver)

Dependent on the use of the ECDIS, it is also possible to define a FROM–WPT on the ECDIS and to transmit it to the NP2030. Approaching a track is then performed like resuming track control after an interruption.

	Indications	Comment/Notes
1 Switch on track control		
	**New Track 070°**  three pulses 	The pulses are repeated every 90s.
2 Acknowledge the track course preselection on the NP2030		
	**Chk Track Data** 	Acknowledge track course by pressing the “Set” key, the switching–over procedure to track control is started. The NP2030 track controller will check the geometrical constellation of ships position and the track. If the geometrical constellation of the ship’s position, heading and planned track makes it impossible to reach the track, a warning (see Section 2.10.3, page 61) appears for 15s on the operator unit and the NP2030 doesn’t switch over to track control. If the check is passed and the geometrical constellation admits to switch over to track control, track control is activated.

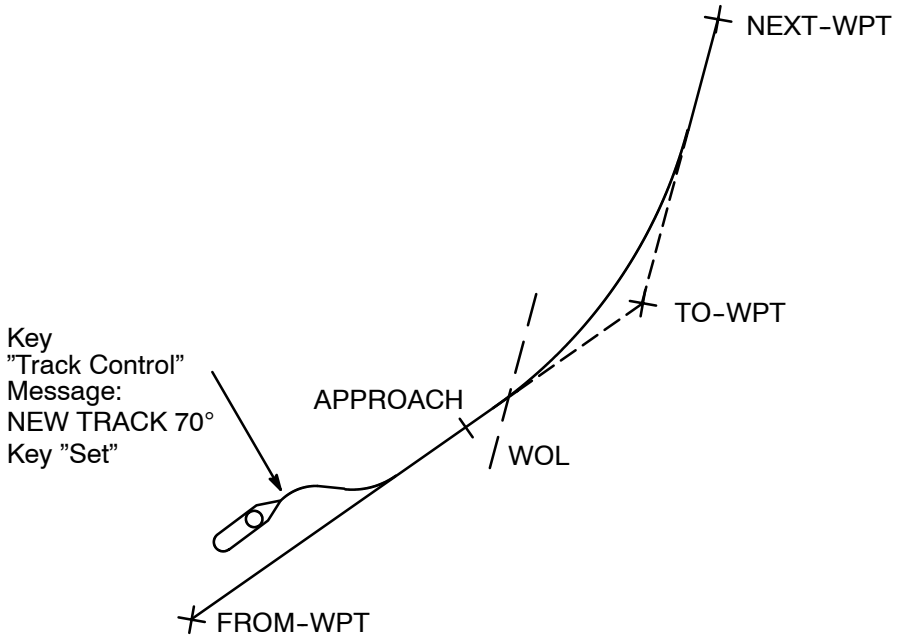


Fig. 4: Changing over to Track Control - on transmitting a FROM-WPT by the ECDIS

NOTE !

In case of failure of the ECDIS during track control, automatic change-over from track control to course control (heading control) takes place. In that situation the response of the NP2030 is different. It is described under "No or Invalid Status from ECDIS" (see Section 2.7.9.3).

2.7.5 Track Change Maneuver

(See Fig. 5).

> **Attention!**
> The track change maneuvers are planned and checked on the ECDIS. No check within the NP2030 takes place. A limitation, however, is incorporated.
> **If a non-realizable small radius is transmitted to the NP2030, this may lead to hard-over rudder positions!**

On planning the routes, attention is to be paid to the fact that from the end of the radius of a track change maneuver to the beginning of the radius of the next track change maneuver at least 350 m are to be planned. This distance is required to bring the ship to the necessary rate of turn. The minimum distance between both radii depends on the vessels maneuverability.

If this is not the case, the result may be that the planned radii cannot be realized. This will be signalized on the operator unit by the error message ”Track CTL Impos.” (track control impossible) and a continuous audible alarm (see Section 2.7.9.4).

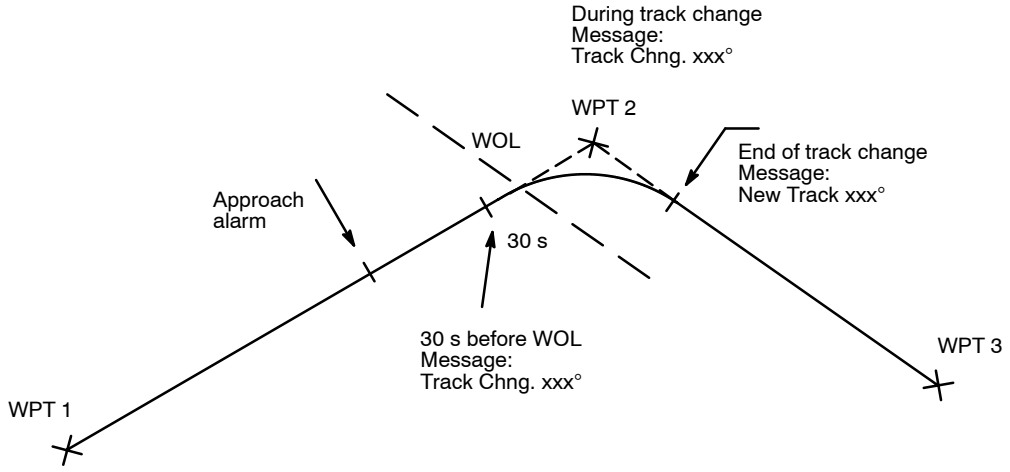
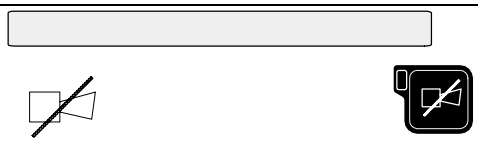
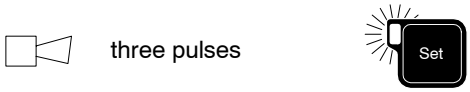
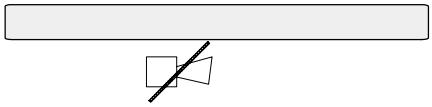


Fig. 5: Procedure of the Track Change Maneuver (Example)

Procedure of the Track Change Maneuver

	Indications	Comment/Notes
1	Alarm	
	App. To-Waypoint 	Between 3 and 6 min. before the WOL. The approach time is transmitted from the ECDIS to the NP2030. The value defined by the NP2030 when the NP2030 is initialized, set to 6 min. and must be varied from the ECDIS, if a variation is wanted by the operator.
2	Acknowledge the alarm	
		
3	Message	
	Track Chng. xxx°  three pulses Set	30s before the track change maneuver is started.
4	Acknowledge the warning	
 Set		
5	Track change maneuver starting	
	Track Chng. xxx°  one pulse	Indication when track change maneuver is starting.
6	Approach maneuver to new track ended	
	End of Appr.Man. New Track xxx°  one pulse	As soon as the ship has reached the new track section.

Note:
If the WPTs are very close together and if a long APPROACH time has been adjusted, it may happen that the APPROACH alarm of the following WPT appears already during the current track change maneuver:

	Indications	Comment/Notes
1 Alarm		
	App. Next-WPT	
2 Acknowledge the alarm		

Note:
If more than two WPTs are planned close together, it may be that the approach time for the NEXT-WPT remains below the value of the adjusted approach time. ”Close together” means here that the distance of two successive radii is smaller than the adjusted approach time ∗ ship’s speed.

Extreme case:

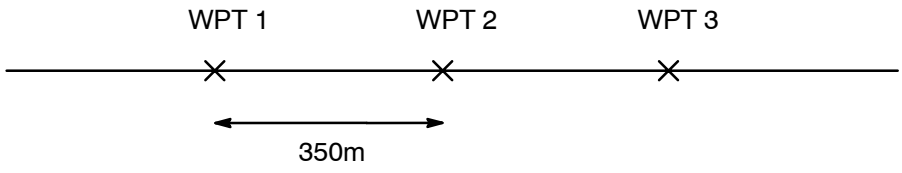


Fig. 6: Extreme Case Example of a Track Change Maneuver

Attention is here to be paid to that the minimum distance of between two successive radii has been defined to be 350 m and that, therefore, with a speed of approx. 20 kn the shortest approach time time that may occur in this most unfavorable case is still approx. 70s.

2.7.6 Interruption of Track Control

Interruption of track control is possible as follows:

- Change-over of the operating mode of track control to course control (heading control) on the operator unit of the NP2030.
- Change-over of the operating mode of track control to manual control by changing over the operating mode on the steering mode selector.
- Activating the override tiller

- If the ECDIS fails, track control is automatically changed to course control (heading control). For more details on this case, refer to "No or Invalid Status from ECDIS" (see Section 2.7.9.3).

Re-approaching the Track is the same procedure as starting a new track !

2.7.7 Changing TO-WPT and NEXT-WPT without Interrupting Track Control

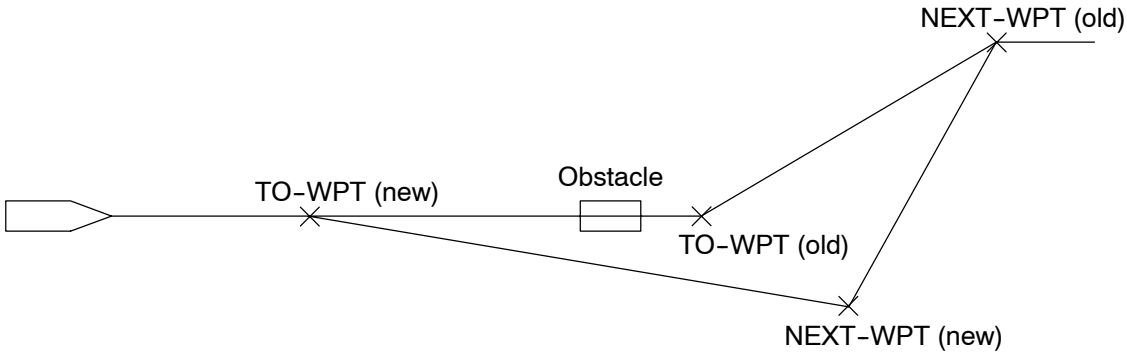


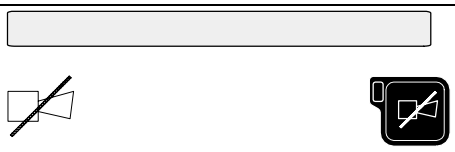
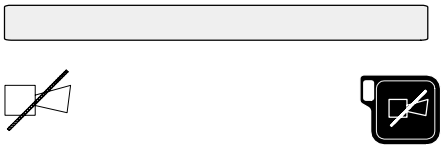
Fig. 7: Changing TO-WPT and NEXT-WPT without Interrupting Track Control

NP2030 permits changing TO-WPT and NEXT-WPT without interrupting track control, if the track planning system (ECDIS) already supports this feature.

Consult your ECDIS manuals for further operating instructions on how to change the waypoints of the active route.

2.7.8 End of Track Control

Via marking the last track point at the ECDIS, the track controller recognizes the end of a track.

	Indications	Comment/Notes
1 Alarm		
	Track End xx Min 	xx minutes left to the last track point.
2 Acknowledge the alarm		
		
3 Alarm		
	Track End Passed **Selec.Headg.Ctrl** 	Last track point reached.
4 Acknowledge the alarm		
		The alarm comes up every 30 s until having changed-over to another operating mode, e.g. heading control or manual control.

Attention:
Before change-over is performed, the ship continues moving along the extended track with the operating mode “Track Control”!

2.7.9 Error Considerations

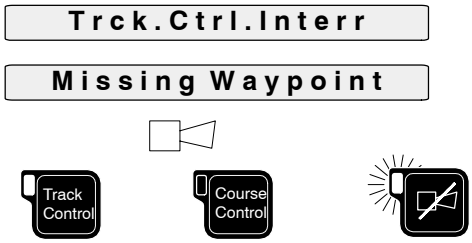
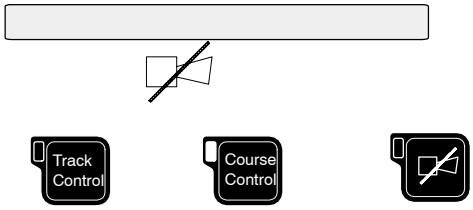
- Missing Waypoint
- No Position
- No or invalid Status
- Track Control Impossible

ATTENTION:
If an error occurs during track control, the operating mode changes from track control to course control (heading control).
As opposed to manual change-over from track control to course control (heading control), the setting of the maneuver parameters is here maintained as under track control. I. e.:

- In any case, the radius setting is maintained. The radius planned for the next track change maneuver is maintained as value.
- **The rudder limit remains at Max.**

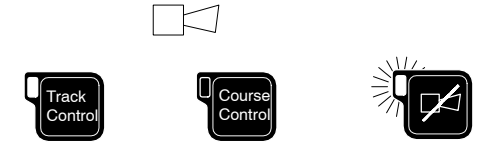
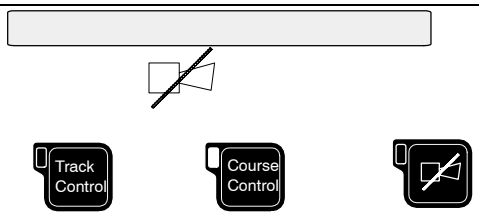
2.7.9.1 Missing Waypoint

Should disturbances occur on the interface between ECDIS and NP2030, and the NP2030 does not receive WPTs, this will be indicated on the operator unit at the end of the track change maneuver. The following alarm appears on the display:

	Indications	Comment/Notes
1 Alarm		
		
2 Acknowledge the alarm		
		The operating mode changes from track control to course control (heading control). The track course of this track section is taken as the new set course (preset heading). As opposed to manual change-over from track control to course control (heading control), the setting of the maneuver parameters is here maintained as under track control. I. e.: - In any case, the radius setting is maintained. The radius planned for the next track change maneuver is maintained as value. - **The rudder limit remains at Max.**

2.7.9.2 No Position

The NP2030 monitors the position interface. In the normal case, the position is transmitted to the NP2030 once per second. Should the position fail to come in for longer than 5s, the following alarm appears on the display:

	Indications	Comment/Notes
1 Alarm		
	Trck.Ctrl.Interr **No Position** 	
2 Acknowledge the alarm		
		The operating mode changes from track control to course control (heading control). If the ship is at this moment on a track section and not in a track change maneuver, the track course of this track section is taken as the new set course (preset heading). As opposed to manual change-over from track control to course control (heading control), the setting of the maneuver parameters is here maintained as under track control. I. e.: - In any case, the radius setting is maintained. The radius planned for the next track change maneuver is maintained as value. - **The rudder limit remains at Max.** If during automatic change-over from track control to course control (heading control) - the ship is in a track change maneuver, the track course of the next track section is taken as the new set course (preset heading). The radius planned for the current track change maneuver is taken as maneuver parameter.

2.7.9.3 No or Invalid Status from ECDIS

The NP2030 monitors the incoming status of the ECDIS. Should the status fail or be provided with the information that the ECDIS is not ready for operation, one of the following alarms appears on the display:

	Indications	Comment/Notes
1 Alarm		
	Trck.Ctrl.Interr No ECS Status or ECS Not Ready    	
2 Acknowledge the alarm		
	    	The operating mode changes from track control to course control (heading control). If the ship is at this moment on a track section and not in a track change maneuver, the track course of this track section is taken as the new set course (preset heading). As opposed to manual change-over from track control to course control (heading control), the setting of the maneuver parameters is here maintained as under track control. I. e.: - In any case, the radius setting is maintained. The radius planned for the next track change maneuver is maintained as value. - **The rudder limit remains at Max.** If during automatic change-over from track control to course control (heading control) - the ship is in a track change maneuver, the track course of the next track section is taken as the new set course (preset heading). The radius planned for the current track change maneuver is taken as maneuver parameter.

2.7.9.4 Track Control Impossible

1. On activating track control (See Fig. 8 and Fig. 9)

– If the ship – when the track control is activated – is already too close to the TO–WPT and, for geometrical reasons, the intended maneuver can not be realized any more.

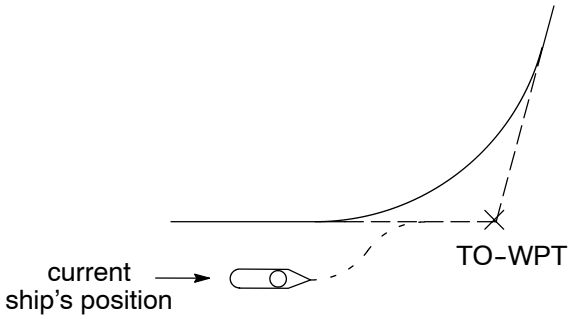


Fig. 8: Intended GO–TO–TRACK Maneuver Impossible with the Ship too Close to the TO–WPT

– If – when the track control is activated – the distance of the current ship's position to the track is greater than the distance between FROM–WPT and TO–WPT or greater than 10 nautical miles.

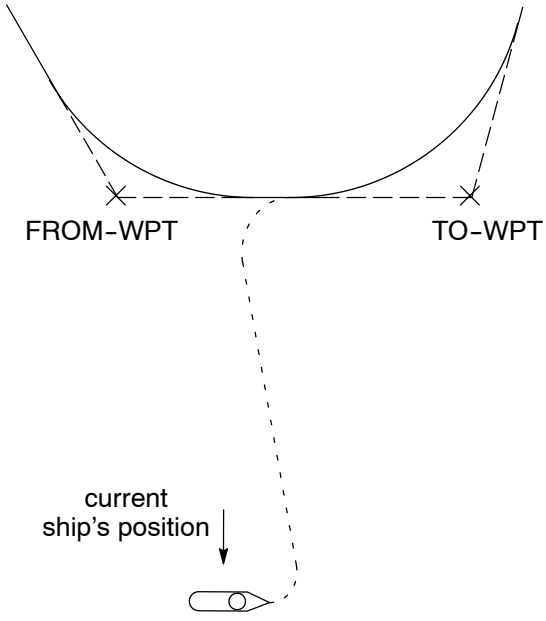
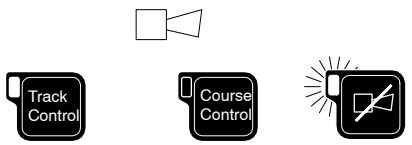
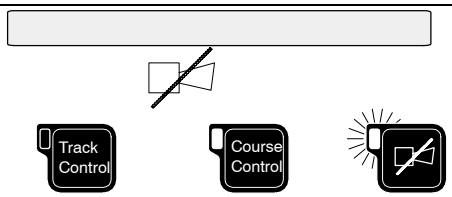


Fig. 9: Track Control Impossible with the Distance to the Track too Large

The following warning appears on the operator unit:

	Indications	Comment/Notes
	Trck.Too Far Awy	

2. During a long active voyage in the operating mode of track control
   The NP2030 received WPTs whose radii are closer together than 350m or the difference of the track courses is >135°.

	Indications	Comment/Notes
1 Alarm		
	Trck.Ctrl. Interr Dist.TO/NEXT-Wpt or Trck.Ctrl. Interr Chng.Ang.Too Big 	
2 Acknowledge the alarm		
		The operating mode changes from track control to course control (heading control). The track course becomes set course (preset heading). As opposed to manual change-over from track control to course control, the setting of the maneuver parameters is here maintained as under track control. I. e.: - In any case, the radius setting is maintained. The radius planned for the next track change maneuver is maintained as value. - **The rudder limit remains at Max.** If during automatic change-over from track control to course control (heading control) - the ship is in a track change maneuver, the track course of the next track section is taken as the new set course (preset heading). The radius planned for the current track change maneuver is taken as maneuver parameter.

2.8 Operating Mode of Rate-of-Turn Control

The operating mode requires an external R.o.T. tiller. The desired rate of turn is preset by the tiller, and the ship's rate of turn is controlled via the NP2030.

The desired rate of turn depends

- on the initial turning behaviour of the ship
- and on the adjusted parameters.

When the ship starts turning, the rate of turn may be increased up to approx. 50%!

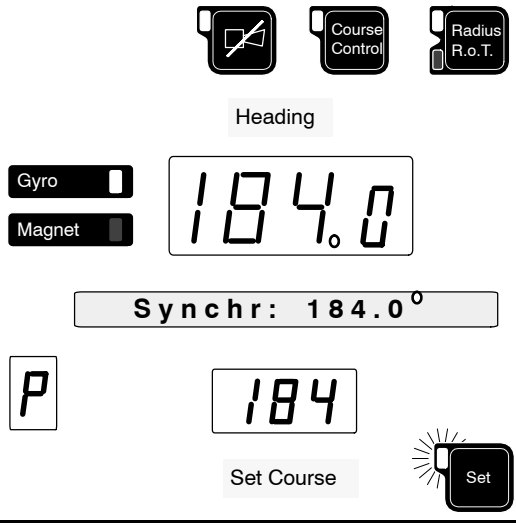
Caution!
Turning behaviour with preset rudder limitation:
If the adjusted rate of turn is not reached due to rudder limitation, the rudder limitation is to be extended only step by step (steps of < 5°). Otherwise, the rate of turn might considerably be exceeded because of the integral component of the controller.

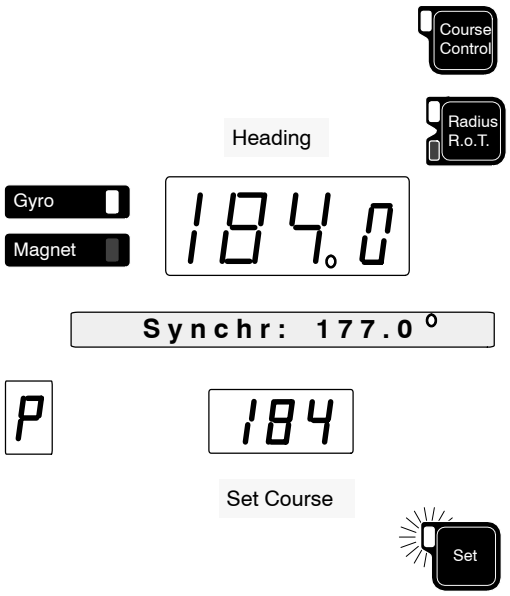
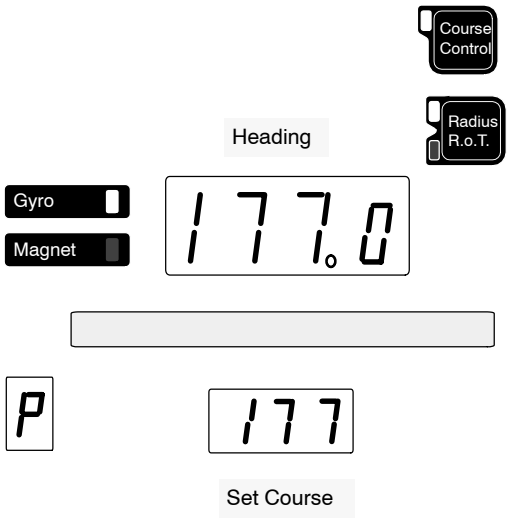
	Indications	Comment/Notes
1 Selecting the R.o.T. tiller		
R.o.T. Tiller	R.o.T. Tiller	The limit-value adjustment (radius or R.o.T.) is now no longer active. The other parameter settings remain valid.
2 Adjusting the R.o.T. tiller		
	R.o.T. Tiller	The tiller adjustment (e.g. Port 10°/min) becomes immediately effective. The ship turns with a rate of 10°/min . The operating mode can be varied at any time by actuating a command key.

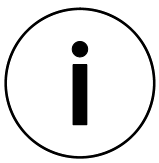
2.9 Operation and Operation Monitoring

2.9.1 Automatic Synchronization of the Gyro Compass Heading

In case of a system start or disturbance (e.g. compass defective or voltage failure), the NP2030 checks the type of compass transmission.
If exclusively fine shaft transmission is recognized (only in conjunction with a heading PCB), the dialogue is as follows.

	Indication	Comment/Notes
1	Automatic request for synchronization (manual request see Section 2.9.2)	
		The last heading is indicated and executed (heading equal to set course (preset heading)). Audible signal is heard continuously. The flashing LED signalizes an alarm message (Synchronization Alarm) and requests acknowledgement.
2	Synchronizing NP2030	
		The last heading is offered as new synchronization value. The flashing LED indicates the data take-over to be acknowledged.

	Indications	Comment/Notes
3	Adjusting a new compass value	
		By actuation of the keys, the current compass heading can be adjusted (e.g. 177°). The set course (preset heading) and heading are adjusted equally to ensure that the heading difference remains constant during the synchronization procedure. The flashing LED indicates the data take-over to be acknowledged.
4	Acknowledging the new compass value	
		



Prior to any departure, check coincidence of heading and compass reading!

2.9.2 Manual Synchronization of Gyro Compass Heading

The synchronization is only required with missing coarse shaft transmission (via the course PCB in systems without STANDARD 20).

Due to, e.g. a power breakdown, synchronization trouble can occur during transmission of the gyro compass heading to the autopilot. The NP2030 senses this condition during a system start (the **Synchronization** alarm is triggered).

	Indications	Comment/Notes
1	Calling up parameter (possible with exclusive fine shaft transmission only)	
Sensor	Synchr: 234.6 Set	By actuating the key, the current heading value appears. The flashing LED of the key requests acknowledgement.
2	Varying the synchronization value	
☼ ☼	Synchr: 238.4 Set	The synchronization value is read off from the gyro compass, e.g. 238.4. By actuating the key, the value has to be adjusted. The flashing LED requests acknowledgement.
3	Acknowledging the synchronization value	
Set	Heading 238.4	The text indication disappears. The actual heading corresponds to that of the gyro compass display.

2.9.3 Set Course (Preset Heading) Input

The knob is used exclusively for adjusting the set course (preset heading).

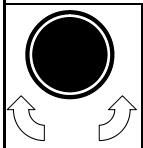
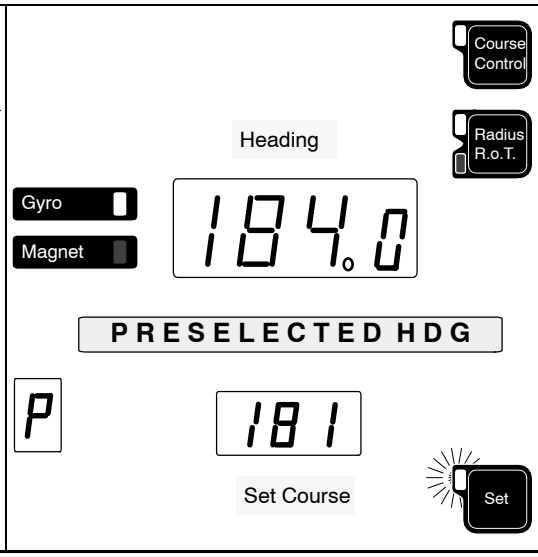
The rotary knob has a loose adjusting range for fine adjustment and a springy stop for port and starboard. If the rotary knob is turned to a springy stop, the result will be a fast change of values of the set course (preset heading) presetting.

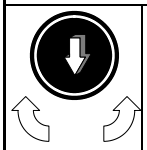
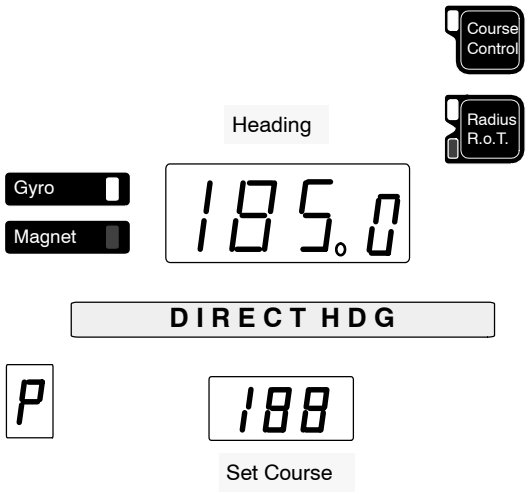
The rotary knob can be used during the operating mode course control (heading control) and track control.
The knob can be used in two different ways:

- turning the knob (set course input) or
- turning the knob and simultaneously pressing the knob (direct set course (preset heading) input).

NOTE

Direct set course (preset heading) input interrupts track control !

	Indications	Comment/Notes
Set course (preset heading) input		
		Enter the new set course (preset heading). The previous preset heading remains valid until the Set key is pressed. If the Set key is not pressed, the new preset heading is deleted after 15 s and the previous preset heading value appears on the display. The new preset heading preselection is only accepted and carried out when the key is pressed.

	Indications	Comment/Notes
Direct set course (preset heading) input		
		Operation mode course control (heading control). Press and turn the knob. The new set course (preset heading) is already accepted while the knob is being turned and the heading change maneuver is initiated. Acknowledgement with the set key is not required. Attention: depending on the configuration of the NP2030, R.o.T or Radius is active: Configuration setting **Maneuver No** has been selected. Selected navigation parameter Radius or R.o.T. is active. Configuration setting **Maneuver Yes** has been selected. The selected navigation parameter is not active, the ships turn with an R.o.T. of up to 120°/min. In case of an preselected R.o.T. value >120°/min, the presetting remains valid (unchanged). Attention: the rudder limitation remains active! The configuration setting can be checked, refer to Service Manual, Section 1.

2.9.4 Change-over between the Parameters Radius and R.o.T. for the Heading Change Maneuver

The change-over takes place via a double-function key:

- **R**ate **o**f **T**urn determines the maximum rate of turn (°/min), by which a heading change maneuver is performed. Entry of parameter value see Section 2.9.14.
- **Radius** determines the turning circle radius by which a heading change maneuver is performed. Entry of parameter value see Section 2.9.15.

Note

During a heading change maneuver, do not change the R.o.T/Radius adjustment! Very different R.o.T. and Radius values can result in severe changes in the turning behavior of the ship !

	Indications	Comment/Notes
1 Change-over, e.g. from R.o.T. to Radius		
	 	The next heading change is executed via a preset turning circle radius.

2.9.5 Selecting the Steering Quality (Economy/Precision or Basic)

Selection between operation mode Economy/Precision and Basic can be made before or during the journey:

Precision

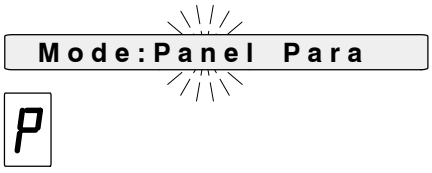
The NP2030 attempts to hold to the preset heading (set course) as exactly as possible.

Economy

The NP2030 adapts automatically to the current weather conditions.

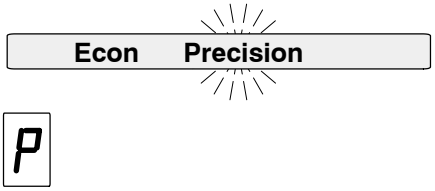
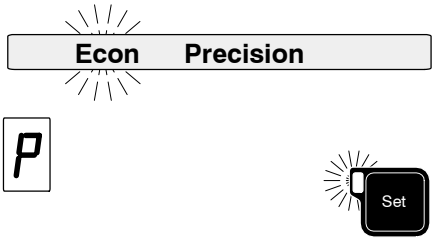
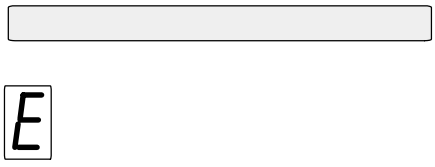
Basic

The adaptivity of the autopilot is switched off.

	Indications	Comment/Notes
1 Calling up the Configuration Selection Menu		
		Press both keys for approx. 4s simultaneously. The following request is displayed on the text line: Y ⇒ ***ECONOMY / PRECISION*** N ⇒ ***BASIC*** Note: The configuration selection menu is immediately quit by pressing a function or command key. Changes in the configuration are not accepted.
2 Selecting the Desired Quality		
		The setting changes from N to Y. The current setting flashes on the cursor.
3 Acknowledging the Desired Quality		
		The display shows the current steering quality after acknowledgment: P ⇒ ***PRECISION*** In the text line the following request appears: Panel ⇒ Change configuration of the operator unit Para ⇒ Change configuration of the system
4 Quit Configuration Selection		
		Quit configuration selection by pressing a function or command key, e.g. COURSE CONTROL (Heading Control). A RESTART of the operator unit is performed automatically.

2.9.6 Change-over between Steering Quality Economy and Precision

Requirement: The Adaptive Mode has been selected as in Section 2.9.5.

	Indications	Comment/Notes
1 Display		
		The display shows the active steering quality.
2 Change-over the Steering Quality		
		You can change-over the steering quality by pressing the key. The flashing LED on the key requests you to acknowledge the setting.
3 Confirming the new steering quality		
		The steering quality Economy is activated.

2.9.7 Entering/Checking the Parameters Yawing, Rudder, Counter Rudder

The parameter management is depending on the steering quality (Economy, Precision or Basic).

Precision

The NP2030 attempts to hold to the preset heading (set course) as exactly as possible.

The key Parameter allows to modify the values of the parameters Yawing, Rudder and Counter Rudder.

The key Control Preset allows to change-over to operation mode Economy.

Economy

The NP2030 adapts automatically to the current weather conditions. This is a gradual process, and not abrupt.

The values of the parameters Yawing, Rudder and Counter Rudder can not be modified.

The key Control Preset allows to change-over to operation mode Precision.

Basic

The adaptivity of the autopilot is switched off.

Up to 6 parameter groups can be created and stored. Depending on the present sailing area or the actual weather conditions the corresponding parameter group can be called up and loaded. The parameter values of the loaded group can be individually altered depending on the situation. This altered set of parameters is, however, not permanently loaded into the parameter memory.

The key Parameter is used to open and modify a temporary or a stored parameter group.

The key Control Preset allows selection of a stored parameter group (1 ... 6).

2.9.7.1 Steering Quality Precision – Changing Parameters

Parameter values Yawing, Rudder, Cnt.Rudder can be pre-set.

	Indications	Comment/Notes
1 Calling up parameter		
Para-meter Para-meter Para-meter	Yawing: 2 Rudder: 5 Cnt.Rudder: 5 P Set	The example shows the default values preset at the works.
2 Varying one or more parameter value		
	Yawing: 3 P Set	On actuating one of the keys, a new value appears. The flashing LED of the key requests acknowledgement. If desired, the next parameter, as shown in Point 1, can be called up and varied.
3 Accepting the parameter value		
Set	Yawing: 3	The new value is accepted.

2.9.7.2 Steering Quality Basic – Defining and Storing a Parameter Group

Actually not implemented!

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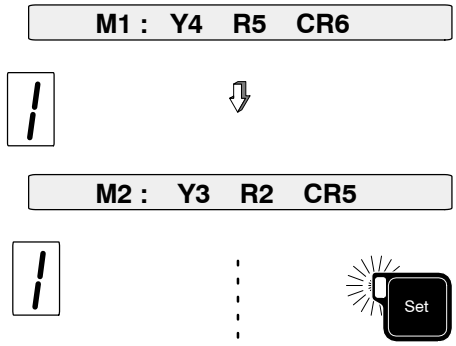
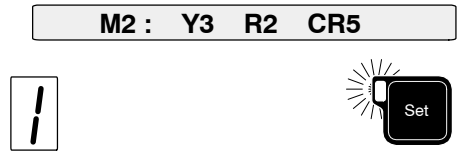
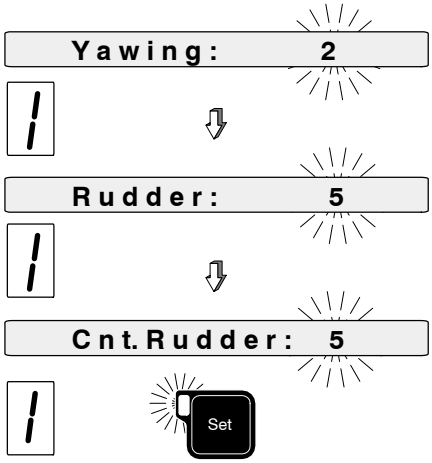
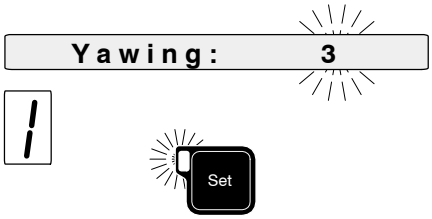
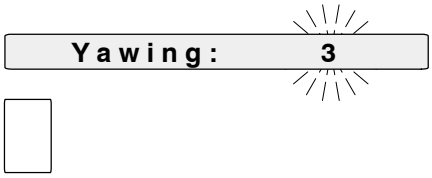
2.9.7.3 Steering Quality Basic - Calling-up and Loading Stored Parameter Groups

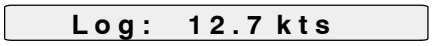
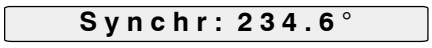
	Indications	Comment/Notes
1 Screening the parameter group		
		By actuating the key, e.g. this set of parameters is adjusted. The corresponding parameter group number is indicated.
2 Calling up parameter group 2		
		Actuate the key until the group appears in the text line.
3 Loading parameter group 2 for operation		
		NP2030 executes course control (heading control) with parameter group 2.

2.9.7.4 Steering Quality Basic – Temporary Change of Loaded Parameters

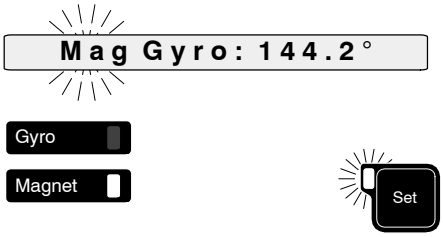
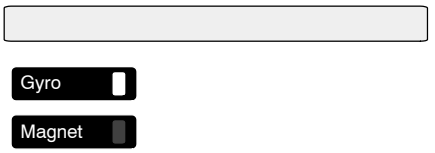
Loaded parameter groups can be temporarily changed. Temporary changes are not stored. On calling up another parameter group, the temporary changes are deleted.

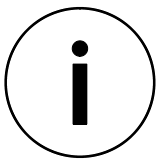
	Indications	Comment/Notes
1 Calling up parameter		
		Parameter group 1 is loaded. On actuating the key, the parameters appear (example).
2 Changing one or more parameter values		
		On actuating one of the keys, a new value appears. The flashing LED of the key requests acknowledgement. If desired, the next parameter, as shown in Point 1, can be called up and varied.
3 Taking over parameter value		
		The new value is taken over. The parameter group number is extinguished. NP2030 executes course control (heading control) with the new parameters. On calling up another parameter group, the temporary changes are deleted.

2.9.8 Screening Sensors

	Indications	Comment/Notes
1 Screening sensors		
		By repeated key depression, the next text line appears.
		
		This text line is shown only when a log sensor is available.
		This text line will be indicated with fine shaft transmission only (see Section 2.9.1).
		The flashing LED requests acknowledgement.

2.9.9 Selecting the Heading Sensor (Magnet/Gyro)

	Indications	Comment/Notes
1 Calling up heading sensor		
		The lettering of the active heading sensor (**Mag**) is flashing. The flashing LED requests acknowledgement.
2 Changing the heading sensor		
		The lettering for gyro compass (**Gyro**) is flashing. The flashing LED of the key requests acknowledgement.
3 Selecting the heading sensor		
		On actuating the key, the heading sensor is selected. The text indication disappears.



Operating mode of COURSE CONTROL (Heading Control)
If the magnetic compass values and gyro compass values are different, switching-over to the compass difference results in a set course (preset heading) adaptation.
Possible heading differences between set course (preset heading) and heading remain in existence.

2.9.10 Change-over to Manual Speed Input and Manual Entering of Ship's Speed

The manually entered ship's speed must correspond to the current speed, otherwise the control quality can be seriously impaired!

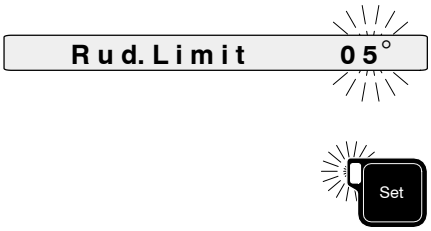
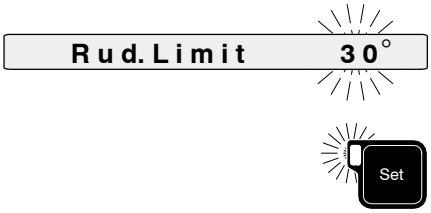
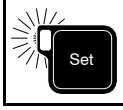
	Indications	Comment/Notes
1 Calling up parameter		
Sensor	Man: 17.2 kts Set	By actuating the key, the last actual value appears. The flashing LED of the key requests acknowledgement.
2 Adjusting or updating the ship's speed		
	Man: 13.2 kts Set	By actuating the key, the desired value can be adjusted. The flashing LED of the key requests acknowledgement.
3 Acknowledging the value		
Set		By actuating the key, the value is accepted. The text indication disappears.

2.9.11 Change-over to Speed from Log

	Indications	Comment/Notes
1 Calling up parameter		
	Log: 12.7 kts 	By actuation of the key, the current value appears. The flashing LED of the key requests acknowledgement.
2 Acknowledge log selection		
		The text indication disappears.

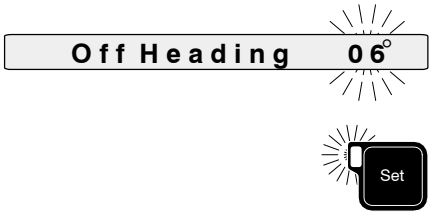
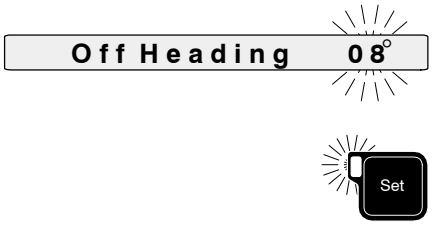
2.9.12 Entering/Checking the Parameter "Rudder Limit"

Determines the maximum rudder position in ° which the autopilot will not exceed.

	Indications	Comment/Notes
1 Parameter Rud.Limit request		
		
2 Adjusting the new parameter value for example 30°		
		By activating the key, the current value is changed.
3 Acknowledging and saving the new parameter value		
		

2.9.13 Entering/Checking the Parameter ”Off Heading”

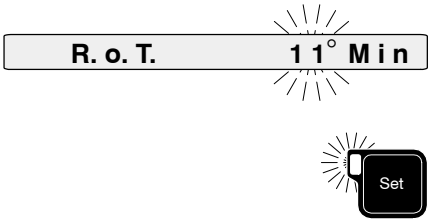
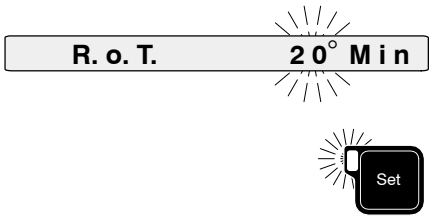
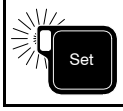
Determines the alarm threshold for heading deviations to port or starboard during course control (heading control).

	Indications	Comment/Notes
1 Parameter Off Heading request		
		
2 Adjusting the new parameter value for example 8°		
		By activating the key, the current value is changed.
3 Acknowledging and saving the new parameter value		
		

2.9.14 Entering/Checking the Parameter "Rate of Turn"

Navigation parameter Rate of Turn.

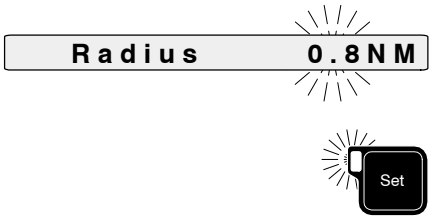
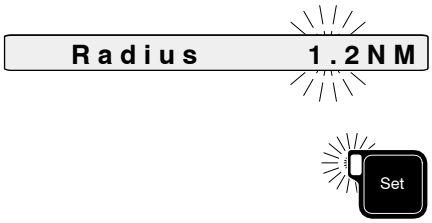
Determines the set rate of turn for the heading change maneuver, see Section 2.9.4.

	Indications	Comment/Note
1 Parameter R.o.T. request		
		
2 Adjusting the new parameter value for example e.g. 20°		
		By activating the key, the current value is changed.
3 Adjusting and saving the new Parameter value		
		

2.9.15 Entering/Checking the Parameter ”Radius”

Navigation parameter Radius.

Determines the set radius for the heading change maneuver, see Section 2.9.4.

	Indications	Comment/Notes
1 Parameter radius request		
		
2 Adjusting the new parameter value for example 1.2NM		
		By activating the key, the current value is changed.
3 Acknowledging and saving the new parameter value		
		

2.9.16 Entering/Checking the Parameter "Rudder Trim" (Rudder Bias)

Offset value for the rudder bias *

For normal journey/maneuver the value should be set to 0° (automatic rudder bias is active).
For special maneuvers (e.g. towing), manual rudder bias can be set (automatic rudder bias is switched off).

A bias rudder angle is a rudder bias which, via integral parts of the course control (heading control), automatically sets in as a result of disturbances on the ship.

There are 2 different types of rudder bias in the NP2030:
1 automatic rudder bias
2 manually set rudder bias

Automatic Rudder Bias

By constant disturbances as wind, rough sea or asymmetrical pressure, e.g. whilst towing, the autopilot calculates from the integral proportion in the rudder bias to keep the ship on heading. This is automatic and requires no action on the part of the operator.

The bias rudder values are normally only useful for a particular heading range; therefore, in case of a set course (preset heading) change of >20° , the integral proportion of the course controller is reset and the automatically calculated rudder bias is set to 0.

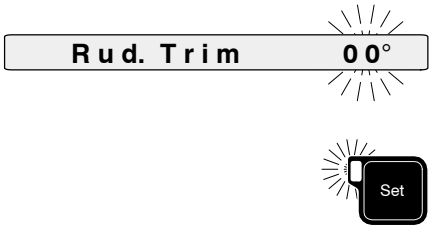
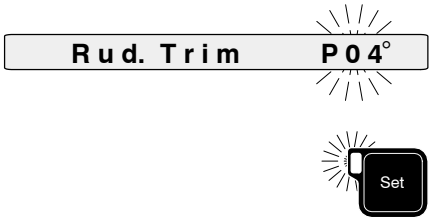
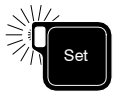
Manually Set Rudder Bias Value

In the event that the operator wishes to directly influence the rudder bias value, he can do this using the Rud. Trim. parameter.

Normally the value is 0° (automatic rudder bias).
The operator can enter a rudder bias angle in ° the port or starboard direction.
The entered value is added to the last valid automatic rudder bias value !

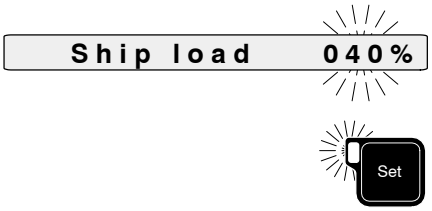
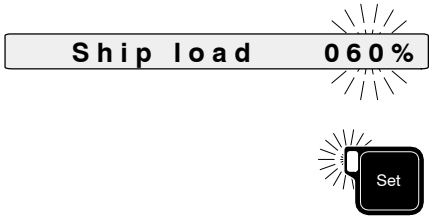
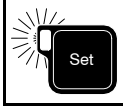
NOTE

Changes in the rudder bias influence the heading stability of the autopilot!
The operator is responsible for any values that he sets!

	Indications	Comment/Notes
1 Parameter Rud.Trim. request		
		
2 Adjusting the new parameter value for example 4°		
		By activating the key, the current value is changed.
3 Acknowledging and saving the new parameter value		
		

2.9.17 Entering/Checking the Parameter ”Ship Load”

Determines the load condition for the optimization of the heading regulation in dependence on the load of the ship. The load condition is entered in % .

	Indications	Comment/Note
1 Parameter Ship load request		
		
2 Adjusting a new ships loading e.g. 60%		
		By activating the key, the current value is changed.
3 Acknowledging and saving the new Parameter value		
		

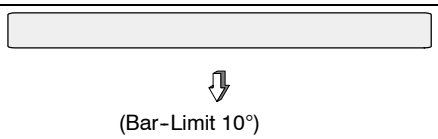
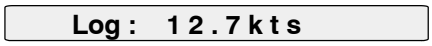
2.9.18 Display

Additional information can be displayed in the text line using the DISPLAY key.

The displayed information is overwritten when:

- an alarm or warning occurs
- values are entered

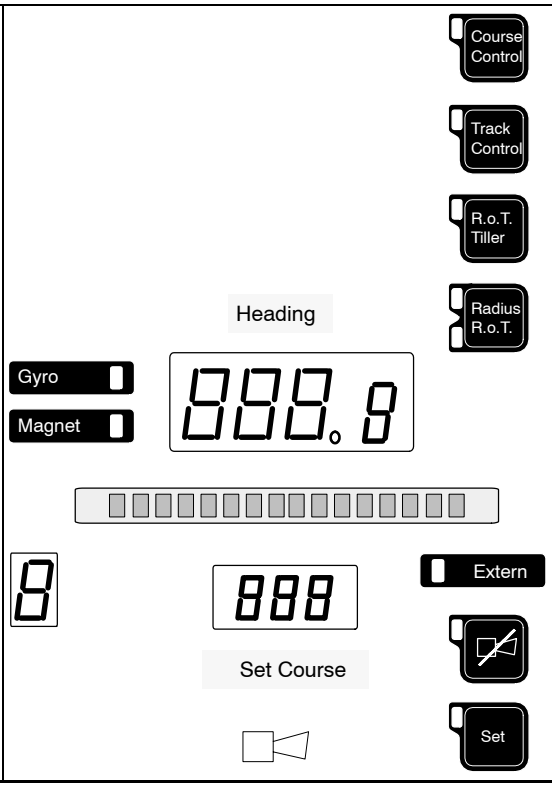
After acknowledgement of the alarm or completion of the entry, the additional information selected re-appears in the display.

	Indications	Comment/Notes
Possible information display		
	 (Bar-Limit 10°) (Pointer for limit exceeding)	No indication. Shows the heading deviation (only with the operating mode of COURSE CONTROL (Heading Control)) as a tendency indication. The tendency indication can be adjusted via the configuration of **Bar-Limit** (see Service Manual).
		Indicates the current speed, manual or transmitted via log sensor.
	or	
		
		Indicates the current set course (preset heading) with a 1/10 degree of resolution.
		Indicates the current set rudder position, **P** for Port, **S** for Starboard.

2.9.19 Dimming

	Indications	Comment/Notes
Dimming the indications or key illumination		
		Actuating a key results in that the luminosity is varied.

2.9.20 Lamp Test

	Indications	Comment/Notes
Starting the lamp test– only possible in the operating mode NP2030 PASSIVE		
Test		By actuating the keys simultaneously, the lamp test adjusts itself. Subject to test: – All displays (7–segment display) – Status indications – Status indications of keys – All indicating elements of the text line (16 pcs) – Audible signalling The test lasts for approx. 10s, subsequently, the last valid indicator surface appears. ⚠ In case a visual error is recognized, the Raytheon Marine Service **must** be informed for REASONS OF SAFETY!

2.10 System Messages

2.10.1 Alarms

	Indications	Comment/Notes
1 Alarm		
	Alarm message  continuous sound 	On the operator unit, no inputs can be made.
2 Acknowledge the alarm		
		The audible alarm ceases. The error message is written into a memory until elimination of the disturbance. The LED remains alight until elimination of the disturbance. The operator unit can now be used again.
3 Calling-up alarm messages		
	**Alarm message**	By actuating the key, all error messages stored in the memory can be indicated one after another.

No.	Indication	Signification	Possible Cause	Effects on Operation	Measures
1	CHECK VALUES	Initial start	During the system's starting phase, a memory test is executed. If an implausibility is recognized, all parameter values are automatically replaced by default values	All individually adjusted values get lost	With the system start completed, the individual parameter profile can now be adjusted (see Section 2.9.7 and 2.9.12 to 2.9.17)
2	Off Heading	Heading error. Adjustable threshold for the difference between heading and preset heading is exceeded	Compass disturbance. Sudden drift effects	Inaccurate heading keeping	Eliminate compass disturbance. Check course error alarm threshold, adapt, if required (see Section 2.9.13). Check rudder controls

No.	Indication	Signification	Possible Cause	Effects on Operation	Measures
3	Gyro-Ref:Failure	Gyro compass failure	External disturbance	No course control (heading control) or track control with gyro compass possible	Change over to MAG compass (see Section 2.9.9)
4	TMC-Ref:Failure	Magnetic compass failure	External disturbance	No course control (heading control) or track control with magnetic compass possible	Change over to GYRO compass (see Section 2.9.9)
5	Speed Alarm	Data from speed sensor is not plausible	External disturbance	The autopilot may show a different control behavior	Change over to manual speed adjustment (see Section 2.9.10)
6	Spd Ref missing	Speed sensor failure	External disturbance	The autopilot may show a different control behavior	Change over to manual speed adjustment (see Section 2.9.10)
7	Synchronization	Synchronization alarm	Coarse shaft of gyro compass failed or not existing	No course control (heading control) or track control is possible.	Perform synchronization (see Section 2.9.1 or 2.9.2)
8	Course-Bus Error	Course bus faulty	External disturbance	Course control (heading control) or track control not possible. No heading reading	Change over to HAND control (see Section 2.3). Repairs see Service Manual, Section 2
9	I/O-PCB	I/O PCB operating faultily	I/O PCB is defective	Autopilot NP2030 not ready for operation	Change over to HAND control (see Section 2.3). Repairs see Service Manual, Section 2
10	Course-PCB	Course PCB operating faultily	Course PCB is defective		
11	No Telegrams	Telegram transmission between operator unit and electronic connection box disturbed	Internal disturbance. Computer disturbance		
12	No Connection	Telegram transmission between operator unit and electronic connection box disturbed	Internal disturbance. Computer disturbance		

No.	Indication	Signification	Possible Cause	Effects on Operation	Measures
13	Trck. Ctrl. Interr Missing Waypoint	During track control a disturbance between ECDIS and NP2030 occurs	ECDIS does not transmit requested waypoint to autopilot	Automatic change-over from track control to course control (heading control)	Check ECDIS. Start track control again
14	Trck. Ctrl. Interr No Position	During track control a position transmission failure occurs	ECDIS gets no position information		Check position information at ECDIS
15	Trck. Ctrl. Interr No ECS Status	During track control an ECDIS status failure occurs	ECDIS breakdown. Disconnection of ECDIS and autopilot		Perform restart of ECDIS
16	Trck. Ctrl. Interr ECS not ready	During track control ECDIS not ready for operation	Restart of ECDIS		None
17	Trck. Ctrl. Interr Chng.Ang.Too Big	During track control the next track change angle is too big	–		Check route. For explanation of the error, see Section 2.7.9.4
18	Trck. Ctrl. Interr Dist.TO-Wpt Shrt	During track control the distance to the TO-WPT is too short	–		Check route
19	Trck. Ctrl. Interr Dist.TO/NEXT-Wpt	During track control the distance between the TO-WPT and the NEXT-WPT is too short	–		Check route. For explanation of the error, see Section 2.7.9.4
20	Trck. Ctrl. Interr WOLine-Overrun	During track control the wheel-over-line has been reached before the geometrical check has been performed	–		Check route
21	Trck. Ctrl. Interr Too Close To Wpt	During track control the ship is too close to the waypoint. The approach would end after track end or after start of next track change	–		Check route
22	Trck. Ctrl. Interr Wpt Not Ahead	During track control the bearing to the new waypoint (after having finished track change maneuver) does not fit with the heading of the ship after the turn	Modification of route during track control		Restart track control
23	Track End Passed Selec.Headg.Ctrl	During track control the track end passed	–	The alarm comes up every 30s until having changed over to course control (heading control) or HAND control	Change over to course control (heading control) or HAND control

No.	Indication	Signification	Possible Cause	Effects on Operation	Measures
24	Override defect.	Override tiller defective during override mode	Connection between ARCP override tiller and autopilot control unit interrupted	Override mode not possible	Change over to HAND control (see Section 2.3)
25	App. To-Waypoint	3 to 6 minutes left to turning maneuver	-	-	-
26	App. Next-Wpt	3 to 6 minutes left to the next turning maneuver when still being in a turning maneuver	-	-	-
27	Track End x Min	x minutes left to track end	-	-	-

2.10.2 Acknowledgeable Warnings

	Indications	Comment/Notes
1 Warning		
	Warning message  three pulses 	On the operator unit, no inputs can be made. The pulses are repeated every 90 s.
2 Acknowledge the warning		
		The audible signal ceases. The warning message disappears

No.	Indication	Signification	Possible Cause	Effects on Operation	Measures
1	Track Chng xxx°	30 seconds left to turning maneuver. Next track will be xxx°	–	–	–
2	New Track xxx°	Track control is started with ”Return To Track” maneuver. New track xxx°	–	–	–
3	Go To Waypoint	Track control is started with ”Go To Waypoint” maneuver	–	–	–
4	Man. Speed Selec	Manual speed input selected	When switching the steering mode selector switch from HAND to AUTO manual speed input is selected although the autopilot gets valid speed information from the log	–	Change–over to speed from log. See Section 2.9.11

2.10.3 Warnings

	Indications	Comment/Notes
1 Warning		
	Warning message  two pulses	The text appears for approx. 15 s

No.	Indication	Signification	Possible Cause	Effects on Operation	Measures
1	Rudder Limited	Rudder limit reached. **Exception:** **<u>three</u> pulses**	R.o.T. limit value selection too high, or rudder limitation too low	The required R.o.T. will not be reached	Adapt R.o.T., acc. to Section 2.9.14 or adapt rudder limit acc. to Section 2.9.12
2	Low-Speed	Ship's speed too low	-	Autopilot NP2030 shows instable behavior.	Change over to manual speed adjustment (see Section 2.9.10)
3	No Waypoints	When selecting track control no waypoints transmitted to the NP2030	ECDIS does not transmit requested waypoint to autopilot	Track control not possible	Check ECDIS. Initialize the NP2030 on the ECDIS
4	No Position	When selecting track control no valid position transmitted to the NP2030	ECDIS gets no position information	Track control not possible	Check position information at ECDIS
5	No ECS Status	When selecting track control no status transmitted from the ECDIS to the NP2030	ECDIS breakdown. Disconnection of ECDIS and autopilot	Track control not possible	Perform restart of ECDIS
6	ECS not ready	When selecting track control ECDIS not ready	Restart of ECDIS	Track control not possible	None
7	Changed Wpts	The stored waypoints in the autopilot are overwritten by the ECDIS because of route modifications	Modification of route during track control	New calculation of Approach and WOL warnings	-
8	Chng.Ang.Too Big	When selecting track control the next track change angle is too big	-	Track control not possible	Check route
9	Dist.TO-Wpt Shrt	When selecting track control the distance to the TO-WPT is too short	-	Track control not possible	Check route. For explanation of the error, see Section 2.7.9.4

No.	Indication	Signification	Possible Cause	Effects on Operation	Measures
10	Dist.TO/NEXT-Wpt	When selecting track control the distance between the TO-WPT and the NEXT-WPT is too short	-	Track control not possible	Check route
11	WOLine-Overrun	When selecting track control the wheel-over-line has been reached before the geometrical check has been performed	-	Track control not possible	Change start situation. E.g. select other start waypoint (TO-WPT)
12	Trck.Too Far Awy	When selecting track control with "Return To Track" maneuver the ship is too far away from the planned track	-	Track control not possible	For explanation of the error, see Section 2.7.9.4. Approach the track by manual control or course control (heading control) and then select track control again
13	Too Close To Wpt	When selecting track control the ship is too close to the waypoint. The approach would end after track end or after start of next track change	-	Track control not possible	Change start situation. E.g. select other start waypoint (TO-WPT)
14	Wpt Too Far Away	When selecting track control with "Go To Waypoint" maneuver the ship is too far away from the first waypoint	-	Track control not possible	For explanation of the error, see Section 2.7.4.1. Approach the waypoint by manual control or course control (heading control) and then select track control again
15	Go To Wpt Imp.PS	When selecting track control with "Go To Waypoint" maneuver the ship is in a sector where the maneuver is impossible	-	Track control not possible	For explanation of the error, see Section 2.7.4.1. Approach the waypoint by manual control or course control (heading control) and then select track control again
16	Go To Wpt Imp.HD	When selecting track control with "Go To Waypoint" maneuver the heading of the ship deviates too much for approaching the waypoint	-	Track control not possible	For explanation of the error, see Section 2.7.4.1. Approach the waypoint by manual control or course control (heading control) and then select track control again
17	Chk track data	Geographical check of the track is performed when track control is selected	-	The autopilot remains in course control (heading control) until the check is finished	-

2.10.4 Notes

	Indications	Comment/Notes
1 Note		
	Note message  one pulse	The text appears for approx. 15 s

No.	Indication	Signification	Possible Cause	Effects on Operation	Measures
1	Override	OVERRIDE tiller is active	–	Tiller control	–
2	STANDBY	Steering mode selector in position HAND. Change–over to a secondary operator unit has been made	–	–	Set steering mode selector to HAND control. Activate secondary operator unit (see Section 2.5)
3	Track Chng. xxx°	Track change manoeuvre starting	–	–	–
4	End of Appr.Man. New Track xxx°	Approach maneuver to the new track ended. New track xxx°	–	–	–
5	Track Chng. xxx° (no audible signal) (Text appears during whole turning maneuver)	Track change manoeuvre in progress	–	–	–

E/P
- **Modification** of the parameter
  Yawing
  Rudder
  Cnt. Rudder

BASIC
- **Opens** a temporary parameter group
- **Modification** of the temporary parameter group
- **Preadjustment** for preparing or varying a parameter group (M1..M6)

E/P
- **Display** indicates the current operating mode
  E for Economy
  P for Precision

BASIC
- **Display** for the numerical assignment of the parameter groups

E/P
- **Change over** to the operating mode **Economy** or **Precision**.

BASIC
- **Calling up** a parameter group (M1 ..M6)
  Quick-Tune

- **Indication** of the current heading sensor
- **Indication** of log sensor
- **Indication** of the manual speed adjustment
- **Presetting** for
  - Heading sensor selection
  - Manual speed adjustment
- **Synchronization** between heading sensor and NP2030 (only with fine shaft transmission)

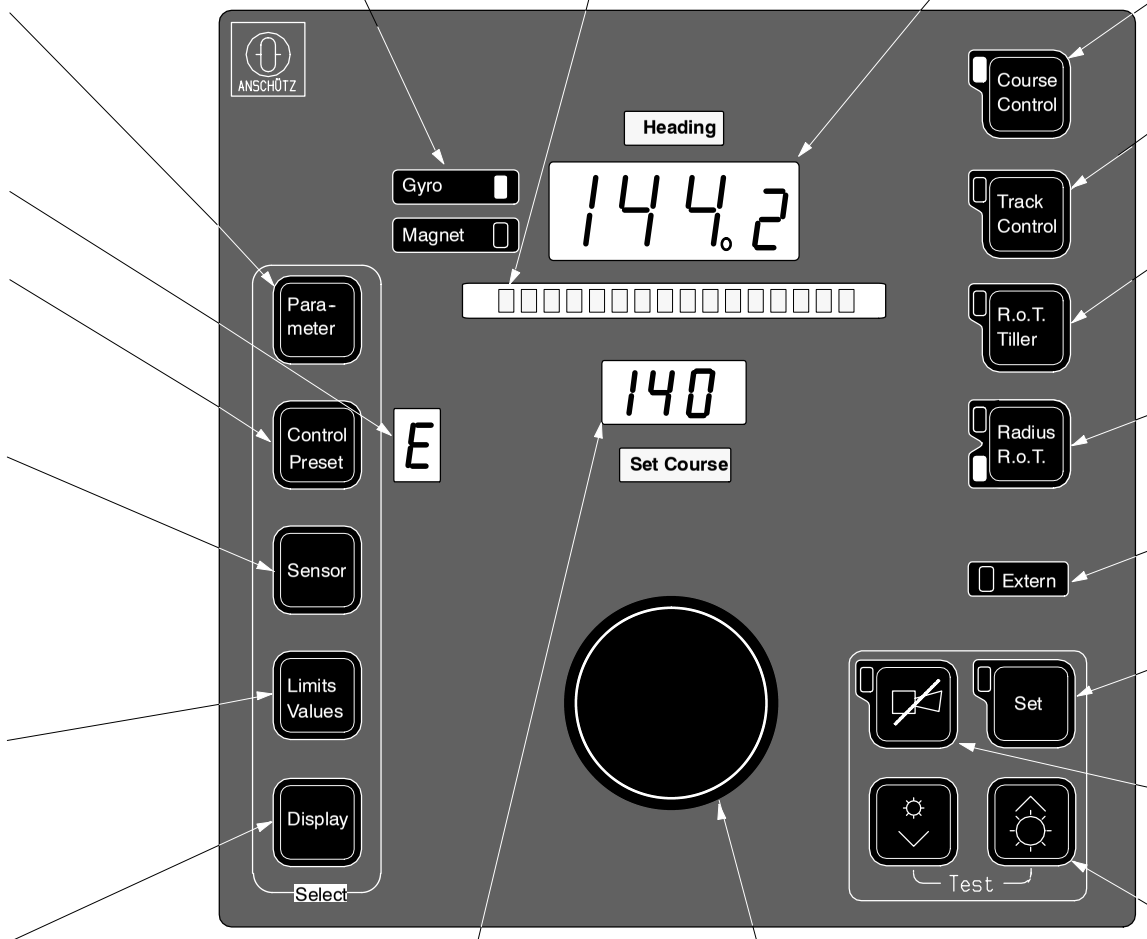
- **Indication** or **presetting** for
  - Rudder Lim ...°
  - Off Heading ...°
  - Rot ...°/min
  - Radius ...NM
  - Rud. Trim ...°
  - Ship Load ...%

- **Fading out** the text line (except for not acknowledged alarm messages)
- **Fading in** a continuous text or bar graph representation;
  - Heading difference indication as bar graph representation in the operating mode of *Course Control (Heading Control)*
  - Track error (XTE) in the operating mode of *Track Control*
  - Manually adjusted speed
  - Set course (preset heading) with 1/10° indication
  - Set rudder position in °

- **Status indication**, indicates the adjusted heading sensor

- **Alphanumeric line**, as text line or bar graph representation for the heading difference indication (heading/set course (preset heading)

- **Display** for heading indication



- Command key.
  Switches to operating mode *Course Control* (Heading Control) (LED lights up).

- Command key.
  Switches to operating mode *Track Control* (LED lights up).
  Only possible in conjunction with an external track planning system or navigation receiver.

- Command key.
  Switches to operating mode *R.o.T. Control* "Rate-of-Turn" (LED lights up).
  Only possible in conjunction with an external R.o.T. tiller

- **Determines** the type of heading change manoeuvre.
  - Heading change via a determined radius value (LED lights up), or
  - Heading change via a determined R.o.T. limit value (LED lights up)

- **Status indication**, indicates REMOTE operation.

- The flashing LED signalizes an action which will be stored or effective only when **acknowledged**.

- **Acknowledges** the audible alarm. LED shows red.
  The alarm message is stored.
- **Screening** the stored alarm messages. All alarm message are cyclically indicated via the text line.

- **Dimmer** for key and display illumination.
- **Modification** of parameter values.
- **Selection** of heading sensor
- **Lamp test** (both keys to be actuated simultaneously)

- **Display** for heading indication. Shows:
  - in the operating mode *Course Control* (Heading Control)
    – the set course (preset heading)
  - in the operating mode *Track Control*
    – the track course
  - in conjunction with an R.o.T. tiller
    – the heading
  - in the passive state of device (OFF)
    – the heading

- **Set course (preset heading) presetting in conjunction with the SET key**
  (only possible in the operating mode Course Control (Heading Control))
- **Direct set course (preset heading) presetting**
  For this method, the rotary knob is first to be pressed and then readjusted. The set course (preset heading) alteration is effective immediately!
  Direct set course (preset heading) presetting interrupts track control