

### Sailing along Pre-planned Tracks

#### CCRP

**REF CON:** The Consistent Common Reference Point is the conning position of the bridge. All measurements (VRM, EBL, TCPA, CPA, target symbols, target data, bearings, distances and ranges refer to this point. **REF RADAR:** The CCRP is the position of the radar antenna. All measurements refer to this point. See operating instructions for details.

**TRACK DATA (see page 4) refer to System Position, NOT to CCRP!**

#### Preparations, Parameterisation, Activation

Perform preparation, parameterisation and activation according to Section Using TRACKPILOT as Autopilot. In addition:

**Selecting suitable position sensor:** If possible, DGPS or GPS. On ships with BSH or DNV NAUT-AW approval, special features must be observed when selecting the sensor - see Operating Instructions.

**Checking accuracy of position data and (if necessary) performing position-error correction:** See Brief Operating Instructions Radar, ARPA, EPA Functions.

#### Pre-planned Tracks

Pre-planned tracks are defined by geographical waypoint coordinates and should preferably be edited on a CHARTPILOT. Tracks taken over from position sensors cannot be used by TRACKPILOT.

**Selecting pre-planned track to be displayed:** Click on TRACK, the LOAD button, relevant catalog, tracks to be displayed, then LOAD.

**Generally switching display of track elements on/off:** Click on TRACK, switch the desired components (COURSE, WPT NUMBER, LEG, WPT SYMBOL) on/off by clicking.

**Cancelling display of pre-planned tracks:** Click on TRACK, and under TRACKS the CLEAR button, the track(s) to be switched off, then CLEAR.

#### System Track

Every displayed pre-planned track can be sailed with the TRACKPILOT, but must previously have been defined as the System Track on a radar indicator (on the TRACKPILOT Master if TRACKPILOT has been activated). System Track is displayed in red.

**Defining the System Track:** Click on TRACK, and under SYSTEM TRACK the SET button, the track, then SET.

System Track can be sailed by TRACKPILOT in predefined direction only. In case of doubt, check TRK display in TRACK DATA display.

If, in addition, a line now appears running from ship to a waypoint of System Track (or to edge of PPI if waypoint lies outside PPI), this is the approach track to the System Track (temporary track, see Section Automated Sailing of System Track, Track mode).

**Cancelling the definition of System Track:** Click on TRACK, and under TRACKS the CANCEL button.

**Using the System Track data:** For manual sailing of System Track, the set courses and set radii contained in System Track are used. In addition, TRACKPILOT is automatically parameterised by means of parameters (called Pilot Data) entered in System Track. Pre-planned tracks contain parameters "track control mode" (see Section Automated Sailing of System Track, Track Mode) and "sailing mode" (see below), and they should contain: Radius, rudder economy, course limit and track limit. All parameters can be entered at any waypoint, and are applicable from there onwards until value is changed.

**Switch-on of take-over of System Track data:** Click on PD button (PD = Pilot Data); PD button must be green.

As a result, course to be sailed after the TO-waypoint is displayed as next course, and the set radius to be used at the TO-waypoint is displayed as next radius, together with corresponding Curved Headline.

Pilot Data entered in System Track for present track-segment now overwrite the existing set values.

#### Checking and (if necessary) correcting the parameters taken over:

- Rudder economy, course limit and track limit - see page 1.
- Sailing mode: Only if a temporary track is displayed: Specifying whether a waypoint more than 25 NM away is to be approached on great circle or on rhumb line: By clicking on the sailing mode button, choose between RHUMB LINE and GREAT CIRCLE.

#### Setting the course correction for precise track-control in Track mode:

In TRACKPILOT SETTINGS dialog, set the field behind CSE CORR to AUTO. (For manual setting, see Operating Instructions.)

#### Designation of waypoints when sailing the System Track:

- FROM-waypoint: The last passed waypoint
- TO-waypoint: The waypoint which the ship is approaching
- NEXT-waypoint: The waypoint following the TO-waypoint

System Track can now be sailed manually or in automated manner:

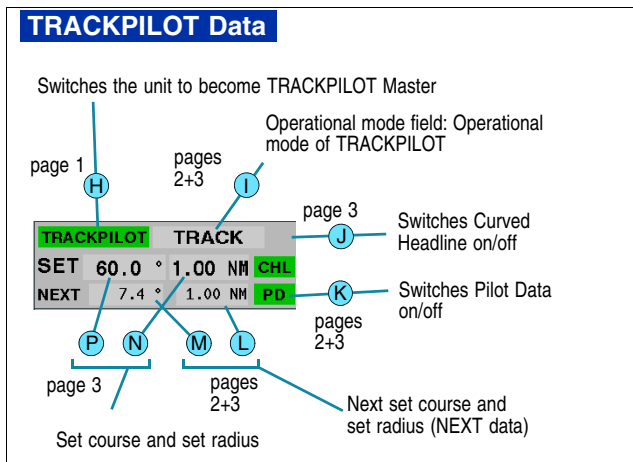
#### Manual Sailing of System Track

**Starting the manoeuvre:** When position of Curved Headline corresponds to planned manoeuvre, press EXECUTE key. Change-over to next course is then performed with radius displayed up until then in NEXT radius field (like steering with NEXT data). The NEXT-waypoint becomes the TO-waypoint. After end of manoeuvre, values defined in System Track for this waypoint are automatically entered as NEXT data.

**Changing the NEXT data:** Click on NEXT course field or NEXT radius field and change the NEXT data (NEXT data flash).

**Cancelling the change:** Click on NEXT course field or NEXT radius field with MORE, then cancel NEXT data by clicking on CANCEL NEXT DATA. As a result, System Track data are entered again.

With joystick, a course change can be performed at any time. Curved Headline and NEXT data appear again when new course is reached.

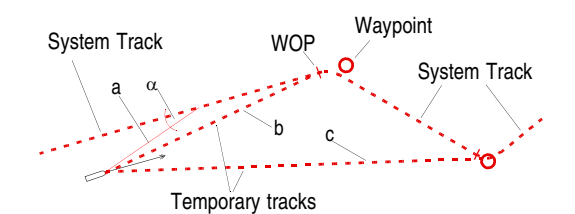


#### Automated Sailing of System Track, Track Mode

Automated sailing takes place in Track mode. Before switch-over to Track mode, additional preparations must be made:

**Parameterisation of TP WPT APPROACHING alarm:** In TRACKPILOT SETTINGS dialog, click on WPT APPROACH field and enter the time at which TP WPT APPROACHING alarm is to appear in addition to the TP WPT EXECUTION alarm before a planned wheel over point (WOP).

**Action required if ship is not already on System Track:** Depending on how ship is to steer onto System Track after switch-on of Track mode:



- a) Ship is to steer onto System Track: Track limit must not be exceeded (no OFF TRACK message in TRACK DATA display). In TRACKPILOT SETTINGS dialog, select TO TRACK by clicking on the track control mode button. Correction angle alpha is max. half the course limit.
- b) Directly to the TO-waypoint: Select track control mode To Waypoint. A temporary track to the point is computed and displayed.
- c) Directly to a different waypoint: Click on TRACK, SELECT TO-WPT, mark the waypoint in the list, then click on SELECT. The temporary track to the point is displayed.
- d) Ship is situated before 1st waypoint: Temporary track to the point is displayed.

**Checking the activation conditions:** Course limit must not have been reached (no OFF COURSE message in TRACK DATA display); in case a), this also applies to track limit (no OFF TRACK message).

**Turning the ship:** In case a): onto correction course. In cases b) to d): onto temporary track.

**Switching over to Track mode:** Click on operational mode field, then click on TRACK MODE or press TRACK MODE key. Ship is now guided along correction course or temporary track, and then along System Track.

**Confirming the manoeuvre:** Acknowledge the TP WPT APPROACHING alarm which appears in good time before the WOP is reached. 30 seconds before a WOP is reached, the TP WPT EXECUTION alarm appears. Acknowledge the alarm within 30 seconds using the EXECUTE key. If the manoeuvre is not to be executed as planned, switch off the Track mode before reaching the WOP.

The planned manoeuvre is executed even without acknowledgement. On DNV NAUT-AW ships, the rudder limit is possibly exceeded if necessary.

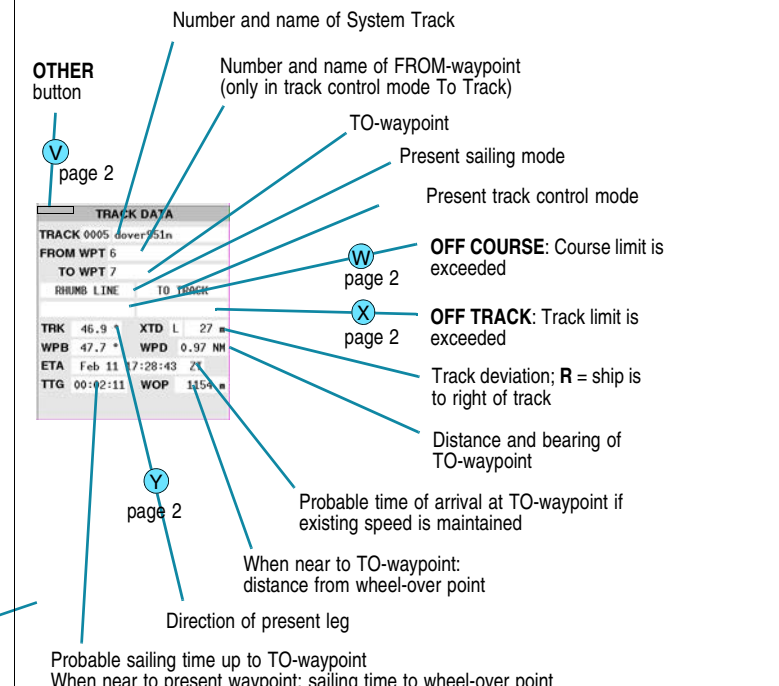
**Performing an avoidance manoeuvre:** With the joystick, a manual course-change can be performed at any time. The system automatically switches over to the Heading mode, and the existing heading is taken over as the set course.

**Changing of parameters in Track mode:** Is possible, except for set course and next course. Limitations: Track control mode and sailing mode not in a curve, sailing mode only in the track control mode TO TRACK. Set radius not during the manoeuvre and only if no radius is entered for the TO-waypoint in the System Track. To change the next radius, switch off the Pilot Data by clicking on the PD button. Change the next radius using the joystick. After the manoeuvre, switch on the Pilot Data again.

**Switch-off of Track mode:** Switch over to the Course or Heading mode using the mode display or keys. New set course: Switching over before the WOP: existing course/heading; switching over during the manoeuvre: set course is kept. Acknowledgement of TP END OF TRACK alarm causes switch-over to Course mode and take-over of actual course as the set course.

#### TRACK DATA Display

**Switching-on TRACK DATA display:** System Track must have been defined. If necessary, close any menus overlaid on TRACK DATA display. If TRACK DATA display is covered by TARGET DATA or WAYPOINT DATA display: Click on OTHER button, TRACK DATA.



All measurements (TRK, XTD, WPB, WPD, WOP and data calculated using the mentioned measurements like ETA and TTG) refer to the system position!

#### WAYPOINT DATA Display

**Switching-on WAYPOINT DATA display:** Like TRACK DATA display, but click on WAYPOINT DATA button instead of TRACK DATA. For explanations of data, see Operating Instructions.

**WARNING: Observe safety precautions - see Operating Instructions.**

**Scope:**  
 This document describes the functions of **TRACKPILOT 1100** with optional **CONNINGPILOT 1100**. It is applicable for the operating procedure on **RADARPILOT 1100**, **CHARTRADAR 1100** and **MULTIPILOT 1100**.

### TRACKPILOT 1100

The TRACKPILOT 1100 is a track controller for **automated and highly precise track-control** of the ship, and can optionally also perform the function of a **conventional adaptive autopilot** and an **adaptive autopilot**.

The track on which the ship is guided by the TRACKPILOT can be a **straight line** (in Heading mode and Course mode, differences see page 3) pointing in the direction of the set course, or a **pre-planned track** (in Track mode) in which the voyage route is defined by geographic coordinates of waypoints.

**Course changes** are basically sailed with defined **radii** and are an integral part of a track.

### CONNINGPILOT 1100

The CONNINGPILOT 1100 is a monitor connected to the TRACKPILOT electronics unit for showing conning displays, also those useful when steering with the TRACKPILOT. Presentation is almost identical to that of the Conning mode of the MULTIPILOT or CHARTRADAR. Operating: Only the display settings; no data entry possible. For details, see the Brief Operating Instructions *Chart, ECDIS, Conning Functions and Radar, ARPA, AIS Functions*.

### General Info about Operating

The operating procedure for the TRACKPILOT is completely integrated within all indicators of the Radar/MULTIPILOT 1100 series (RADARPILOT, CHARTPILOT and MULTIPILOT). For these systems and the CONNINGPILOT, the same operating principles apply - see Brief Operating Instructions *Radar, ARPA, AIS Functions*.

**Switching TRACKPILOT on:** TRACKPILOT Electronics Unit is switched on by switching on the first radar or CONNINGPILOT (and switched off by switching off the last radar or CONNINGPILOT).

**Selecting the operating unit:** TRACKPILOT can be operated on any radar indicator equipped with a TRACKPILOT keyboard (situated to right of trackball), but only on one radar indicator at a time. So that TRACKPILOT can be operated on a particular radar indicator, that indicator must be switched to become TRACKPILOT Master:

**Switching radar indicator to become TRACKPILOT Master:** In TRACKPILOT data, click on **TRACKPILOT** button (H) (see page 2) and then on **MASTER**. Or: Press **TRACKPILOT MASTER** key (G) for at least 3 seconds.

➤ TRACKPILOT Master can be recognised from fact that **TRACKPILOT** button appears green and small lamp above **TRACKPILOT MASTER** key is alight.

### Using TRACKPILOT as Autopilot

#### Preparation

**Selecting a suitable speed sensor:** If possible, two-axis log in Bottom Track mode, also position sensor with stable and correct speed values, or other log.  
 On ships with BSH or DNV NAUT-AW approval, special features must be observed when selecting the sensor - see Operating Instructions.

**Sailing at minimum speed:** Depends on ship; standard value is 3 kt.

#### Parameterising the TRACKPILOT

**Display of present parameters:** In **TRACKPILOT SETTINGS** dialog (see page 3), the set parameters are displayed. There, they can also be changed manually.

**Loading state:** Click on **LOADING** button (b), then click on button that corresponds to loading state.

**Rudder economy:** Click on **RUDDER ECONOMY** field (a), then set economical control behaviour by clicking on a value according to table:

Rudder Economy	Steering	Weather
1	Precise	Calm
2...3	Precise to tolerant	Normal
4...6	Tolerant	Bad
Higher	Very tolerant	Very bad

**Rudder limit:** Click on **RUDDER LIMIT** field (d) and enter maximum rudder angle that TRACKPILOT is to be able to set.

**Course limit:** Click on **COURSE LIMIT** field (e) and enter the course limit.

Course limit is smallest "actual course / set course" difference at which **TP COURSE LIMIT** alarm appears. Course limit influences corrective steering behaviour in case of deviation from track: large course limit causes fast return to track, small course limit causes slow return.

**Track limit:** Click on **TRACK LIMIT** field (f) and enter the track limit.

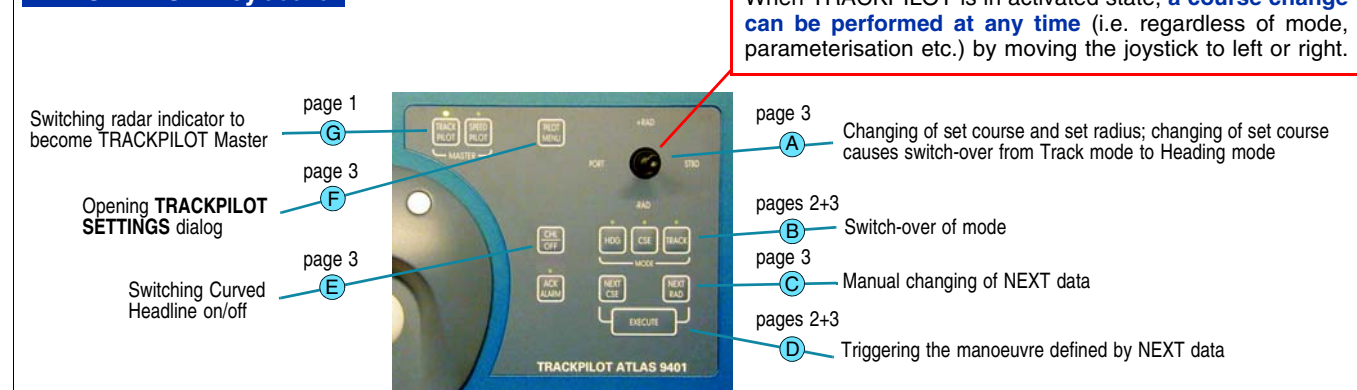
Track limit is smallest "deviation of ship's position from track" value at which **TP TRACK LIMIT** alarm appears. Furthermore, a small track limit produces more precise track-control, and a larger track limit produces steadier track-control.

➤ These course and track limit values are also used for the track monitoring.

**Drift limit:** Click on **DRIFT LIMIT** field (g) and enter drift that should cause alarm and is maximum drift that can be compensated by TRACKPILOT.

Continued on page 3

### TRACKPILOT Keyboard

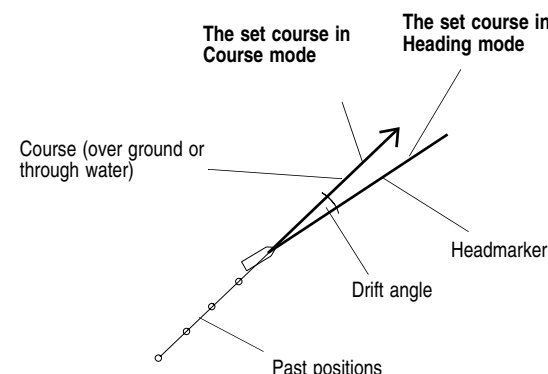


### Activation/Deactivation, Heading Mode, Course Mode

**Activation:** Activation is performed with the steering mode selector switch. As soon as a mode is displayed in operational mode field (I) in the TRACKPILOT data, TRACKPILOT is switched to connect it to steering gear, i.e. course control is performed with aid of TRACKPILOT. On activation, existing compass course (Q) is taken over as set course (P). The mode to which switching occurs is always Heading mode.

➤ **Heading mode:** Steering **without** taking account of drift angle (like conventional autopilot). Influence of wind or current must be corrected manually by means of appropriate course-settings.

**Course mode:** Steering **taking account** of drift angle (if the necessary sensor information is available - see Operating Instructions).



**Switch-over between Heading/Course mode:** Click on operational mode field (I), then click on desired mode or press **HDG MODE** or **CSE MODE** key (B).

**Switching off:** With steering mode selector switch or an override facility, switching back to manual steering can be performed at any time.

### Curved Headline

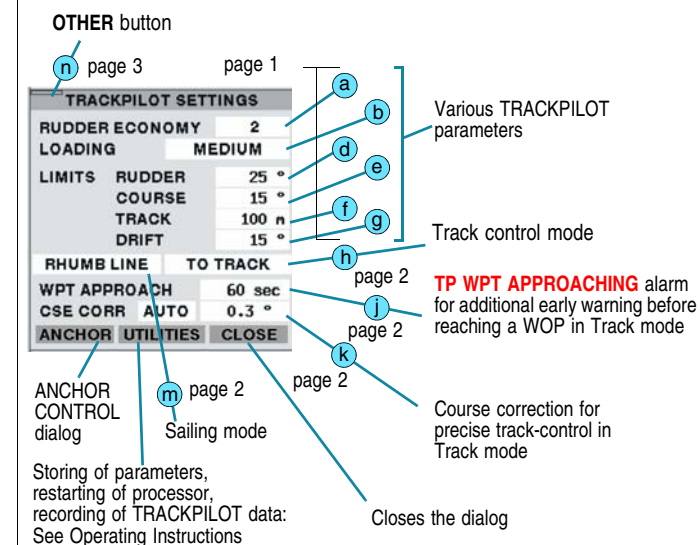
**Switching the Curved Headline display on/off:** Click on **CHL** button (J) or press **CHL/OFF** key (E). Switch-on is recommended.

#### Meaning of Curved Headline:

- a) If no NEXT data have been entered: Manoeuvre defined by **SET course** (P) and **SET radius** (N).
- b) If NEXT data (M) and (L) have been entered: Pre-planned manoeuvre defined by NEXT data.

### TRACKPILOT SETTINGS Dialog (R)

**Opening the TRACKPILOT SETTINGS dialog:** Click on button **MENU** (U), **PILOT** or press **PILOT MENU** key (F), and click on **TRACKPILOT SETTINGS**. If **TRACKPILOT SETTINGS** dialog is covered: Click on **OTHER** button (n), **TRACK SYSTEM**.



### Steering with the Joystick

**Changing the set course:** Move joystick (A) to **PORT** or **STBD**. Course change is performed immediately.

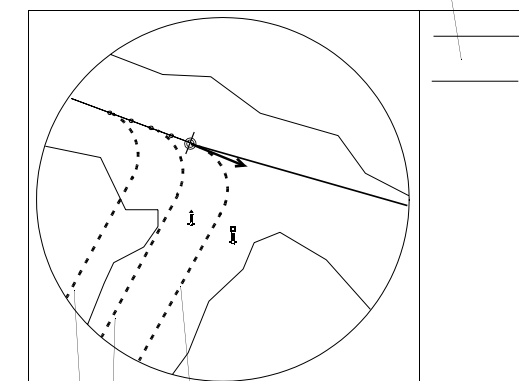
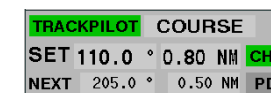
- **Changing the set radius:** Move joystick to **+RAD** or **-RAD**.
- Brief "tapping" of joystick produces smallest possible changes.
- Curved Headline is the track on which ship is guided.

### Steering with NEXT Data

Pilot Data must be switched off, **PD** button (K) must not be green; if necessary, click on **PD** button.

**Entering the NEXT data:** Before intended manoeuvre, a) click on **NEXT course** field (M) (or press **NEXT CSE** key (C)) and enter new set course or b) put **EBL** onto new set course, click on **NEXT course** field with **MORE**, and select **TAKE EBL**.

If necessary, also click on **NEXT radius** field (L) (or press **NEXT CSE** key) and enter a different set radius. Curved Headline indicates planned manoeuvre and moves along together with ship.



Curved Headline (shown here immediately before start of manoeuvre) which results from NEXT course and NEXT radius and which becomes active track after pressing of **EXECUTE**

Examples of where Curved Headline was displayed in the past

**Triggering a manoeuvre:** When position of Curved Headline corresponds to planned manoeuvre, press **EXECUTE** key (D). Course change is then performed with radius displayed up until then in **NEXT radius** field.

➤ Curved Headline is now the track on which ship is guided. In Course mode, Curved Headline is bottom-stabilised; in Heading mode, it moves along together with drift (in standard setting).

**Correcting a triggered manoeuvre:** Even after **EXECUTE**, set course and set radius can be changed by means of joystick.

➤ **Not executing planned manoeuvre:** Click on **NEXT course** field or **NEXT radius** field with **MORE**, then cancel **NEXT data** by clicking on **CANCEL NEXT DATA**.

#### WARNING:

Steering with NEXT data is to be used for execution of pre-planned manoeuvres. Do not use the NEXT data input to modify a manoeuvre during an existing turn. Use the joystick for fast changes of course or radius.