Models

PR-9□□□□-□□-(□□□□)-□□□□

Automatic steering control model
1:PID Single line
2:PID Dual line
3:ADPT Single line and PID Single line
5:ADPT Dual line and PID Dual line

Gyrocompass Connection
1:Gyrocompass Single(Built in)
2:Gyrocompass Single(Stand Alone)
3:Gyrocompass Dual(Built in)
4:Gyrocompass Dual(Stand Alone)
5:Gyrocompass Dual(1x Built in, 1x Stand Alone)
6:Gyrocompass Dual(Built in)*
7:Gyrocompass Dual(Stand Alone)*
8:Gyrocompass Dual(1x Built in, 1x Stand Alone)*
9:Other heading sensor
*Class Notation

Type of Gyrocompass
A:TG-8000
B:TG-8500
C:Other Heading sensor
D:TG-8100
E:TG-8600
F:FOG COMPASS TF-1000
K:FOG COMPASS TF-900

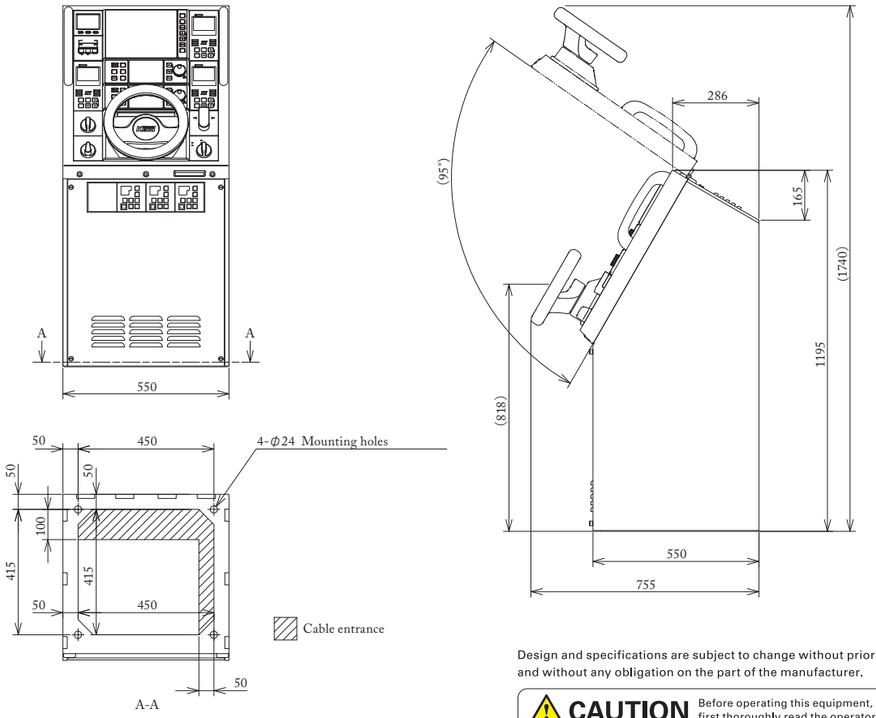
Type of Steering stand
0:Unit type
1:Stand type(width 550mm)
2:Stand type(width 750mm)
3:Stand type(width 1000mm)
4:Unit type + Stand type(width 550mm)
5:Unit type + Stand type(width 750mm)
6:Unit type + Stand type(width 1000mm)

Advanced Control for Ecology(ACE)
(* Optional function)
ACE1:No.1HCS to be equipped ACE
ACE2:No.2HCS to be equipped ACE
ACE3:No.1/No.2HCS to be equipped ACE

Type of Steering gear control system
DM/DW :Torque motor control type
DT :Proportional solenoid valve control type
E□ :Solenoid valve control type
L□ :Electric hydraulic type
FP/FR :Frequency control motor type
ZZ :System only for heading control system

Equipment dimensions

(Unit:mm)



Design and specifications are subject to change without prior notice, and without any obligation on the part of the manufacturer.

⚠ CAUTION Before operating this equipment, you should first thoroughly read the operator's manual.

TOKYO KEIKI INC.

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TOKYO KEIKI

AUTO PILOT

PR-9000

TOKYO KEIKI INC.

Providing efficient solutions for maritime vessels throughout the world.

International maritime vessels traversing the world's vast oceans must follow a safe pre-determined course in order to minimize the chance of error and maximize the safety of the ship.
Tokyo Keiki's Autopilot PR-9000 has incorporated a new LCD display allowing the crew to have available all navigational data at a glance. In addition, the new ACE (Advanced Control for Ecology) function provides significant energy efficiency by minimizing unnecessary rudder movement.
Tokyo Keiki has been involved in research and development of advanced navigational systems for many years.
The know-how gained from years of R&D experience has been incorporated into the new autopilot system.
The new Tokyo Keiki Autopilot PR-9000.
Leading the way in maritime technology.

PR-9000

The model PR-9000 is the latest autopilot system from TOKYO KEIKI. The PR-9000 is designed using the latest technology from a wealth of engineering and manufacturing experience of navigational instruments. Safety, accuracy, and reliability of information have been enhanced in our model lineup thereby significantly improving situational awareness and navigational safety.
An indispensable autopilot system providing effective and safe bridge resource management and energy efficient navigation.

Features

■ Enhanced Information Awareness
Color LCDs are incorporated into each system which enhances reliablity of information and improves situational awareness.
Features include color-coded steering information and popup-windows for easy understanding and use by the helmsman.
(Enhanced alarm presentation, avoidance operation information function, system condition display etc.)

■ Enhanced Safety/Reliability
Two independent systems are arranged and an independent monitoring system is installed that allows it to monitor each system.
Equipped with features that help to improve the independence of each system, enhances operation and monitoring from all of the ship's systems and sensors, and improves overall safety and reliability.

■ Energy efficient navigation
The newly-installed Adaptive Control (NCT*1) system automatically implements the most suitable steering. Unnecessary rudder movement due to external influences such as waves is significantly reduced which contributes to energy-efficient navigation. Also, when the Route Control function (ACE) *2 is installed, the course can be controlled using only the Autopilot.
Track Control System (TCS) steering is also possible when connected with ECDIS.
Maintaining a pre-determined route allows for safer navigation and ultimately contributes to energy efficiency.

■ Flexible system configuration
Console mounting type has been added to the line up to respond to any type of bridge layout and design.
Remote Control and Override operation connectability has been increased so that up to 8 units can be connected.

*1 :Notable Control Technology (Option) *2 :Advanced Control for Ecology (Option)

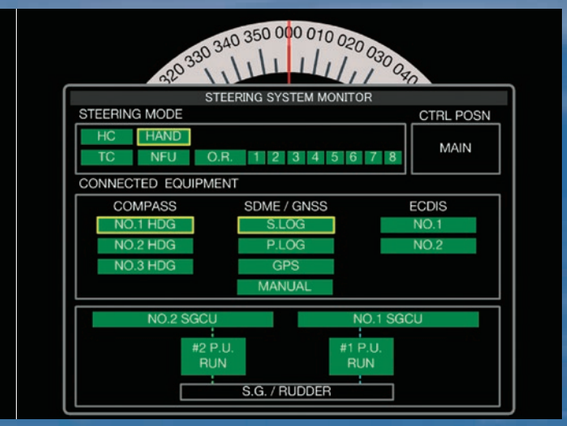
Repeater Unit with color LCD

In the past, our Autopilot systems were equipped with a card type repeater but the new PR-9000 series utilizes a color LCD display which greatly enhances the viewability of all navigational data.
Heading information from the Heading Sensor used for steering is displayed graphically, in addition it is possible to graphically show Rudder Angle and Rate Of Turn Indicator.
Also, steering-related monitoring information can be displayed on the monitor screen.
If a warning alert is generated, the navigator can simply view the proper guidance procedures on the screen in order to carry out evasive measures.

Enhanced Information awareness and Navigator Support

(Rudder Angle Indicator/Rate Of Turn Indicator Display)

Rudder Angle Indicator (Rudder Order and Actual Rudder angle) can be shown at the bottom of the Repeater Display.In the case of twin rudders, two (2) Rudder Angle Indicators can be displayed. This display can also be used as an supplemental information screen to support navigation.
(Display is different depending on the type of Autopilot model)



(Monitor Screen)

Integrated Steering system monitoring information can be displayed. Steering Mode, Rudder condition, and the condition of interfaced sensors can be understood at a glance.

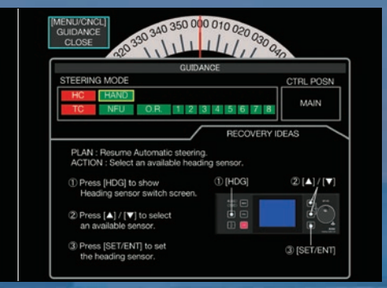
Maintaining Safe Navigation via Guidance Screen

(Alert Message Screen)

If a new alert occurs, an alert message is shown in the middle of the Display for 3 seconds.

(Avoidance operating procedures Guidance Screen)

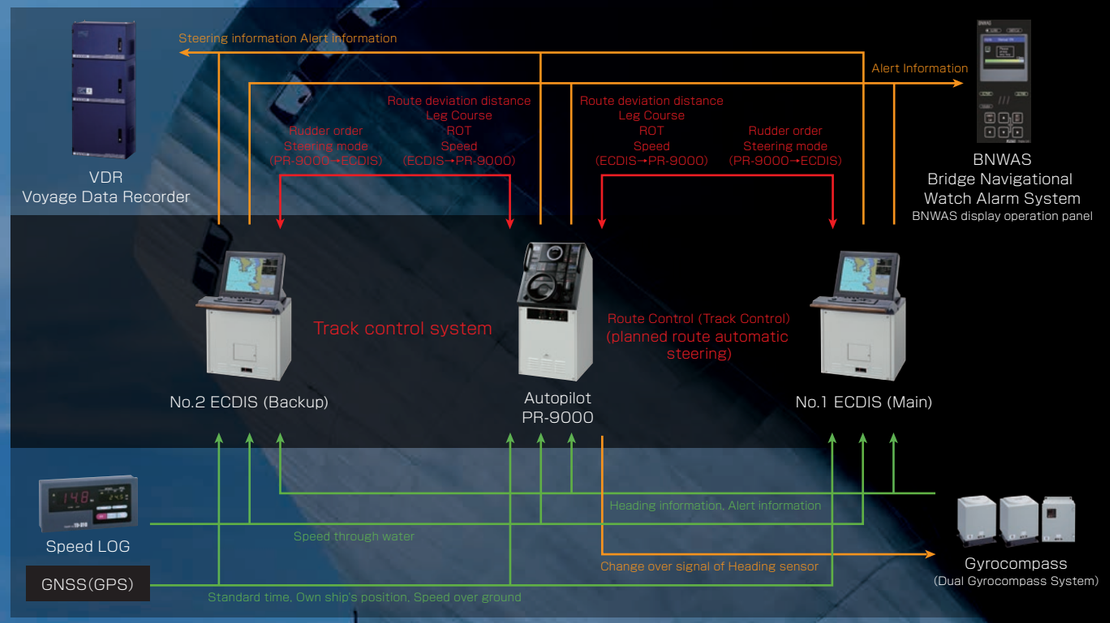
When a serious failure or malfunction occurs, operation procedures to avoid dangerous situations with the vessel are displayed on the guidance screen.



(Recovery operation procedures Guidance Screen)

The method for recovering the original function is clearly displayed. Even if the steering mode is currently not available and if there is a procedure for recovering the original function, proper guidance procedures will be displayed.

System configuration example



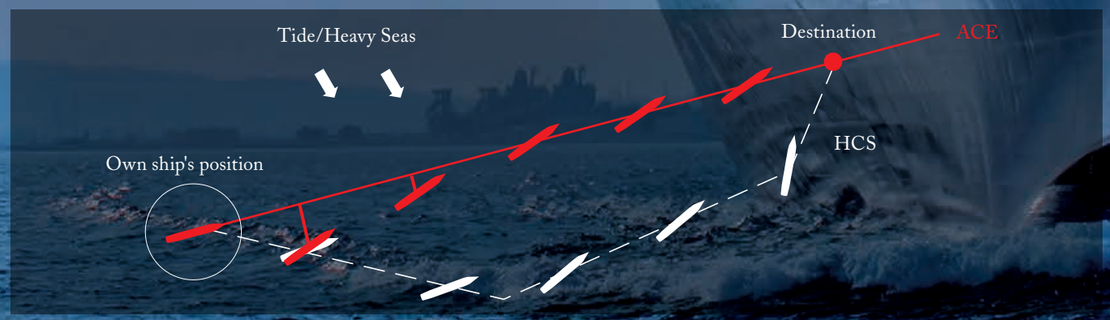
Route Control function (ACE) Route Control is performed only with Autopilot (Optional function)

It is possible to control a straight route with the PR-9000 without having to connect it to the Electronic Chart Display and Information System (ECDIS).

With Autopilot (HCS), the ship follows the direction of the set course and influence from tides or heavy seas can move the ship off course prior to arrival at the destination which in turn increases the navigation distance.
Due to this external influence, small steering changes must be performed in order for the ship to return to the original planned destination.

With the new Route Control function (ACE), a route is automatically created on the heading between the current position and the destination, outside disturbances (tides) etc., are calculated, and the best rudder control is implemented making it possible for the vessel to sail on the newly designated route.
When compared to Autopilot, due to reduced route deviation/ shorter sailing distance/ reduction of wasted rudder, it ultimately contributes to safety and energy efficient navigation.

(ACE Screen)



Nomenclature

Universal Display (Option)
- Gyrocompass Heading Display

Magnetic Compass Display etc.

Override Cancel Unit
(Override function/ Option)
- Steering change over to Main Steering location
- Steering position information display

BNWAS Display Operation Unit (Option)
- BNWAS related display operation

Helm Unit
- Rudder Order Display
- P/S Display Light
- Wheel

Max Rudder Angle Change Over Unit (Option)
- Normal:Rudder angle
- Wide:Rudder angle system change over unit

System Selection Unit
- HCS and SGCS start, stop

OFF: Stop (HCS/SGCS)
No.1: No.1 HCS start and power supply condition for starting of SGCS.
No.2: No.2 HCS start and power supply condition for starting of SGCS.

Gyrocompass Display and Operation Unit (DUAL Gyrcompass for INS specification/OPTION)
- Gyrocompass Heading Display

Gyrocompass, Heading Sensor Change Over

Repeater Unit
- Ship's Heading Display
- Information Display

Annunciator Unit
- SGCS and Steering Gear information display

No.1 Heading Control Unit
- HCS display, operation, processing

No.2 Heading Control Unit (option)
- HCS display, operation, processing

NFU Unit
- NFU Steering Lever

Mode Change Over Unit
- Mode change over switch

HC: Heading Control
TC: Track Control (Option)
HAND: Manual (Follow Up)
RC: Remote (Option)
NFU: Non Follow Up

Basic Specification

1 HCS related (Heading Control System)

(1) PID Control
- Basic System

Course keeping, Course Change Automatic servo control with course deviation signal and rudder angle signal inputs.

- Adjust

Weather, Rudder Rate, Counter Rudder, Rudder Angle limit manual adjustment

(2) ADAPTIVE control (Option)
- Basic System

Automatically estimates the ship's dynamics and adjusts the operating parameters by calculating heading/speed/rudder angle.
- Identification

Estimation of ship's dynamics during waypoint changes in Manual Steering (HAND) and Automatic Steering (HC/TC) modes
- Maintaining the Course

CONFINED Mode (specific course keeping) , OPEN Mode (specific energy saving) change over
- Course change

Automatically navigates course changes in consideration of the characteristics of the ship's maneuverability and steering gear.

(3)Route Control function (ACE): Option
- Maintaining the Course

Automatic generation of a straight line route via waypoint settings. Calculation of route deviation and outside influence (wave). Optimum rudder control.
Control parameter (course keeping, reduction of rudder angle) change over (ECO, LOW, NORMAL, HIGH)

HCS general specification
- Input Power

AC100 to 220V (Power possible to be provided from SGCS), DC24V (DC24V is backup power for the HCS)
- Main connection equipment

Gyrocompass (other heading sensors): Serial signal, max 3 inputs (IEC61162-1/2THS, HDT)
Speedlog: Serial signal, 1 input (IEC61162-1VBW,VHW)/pulse signal 1 input
GNSS: Serial signal 1 input (IEC61162-1GGA,GLL,VTG,ZDA)
ECDIS: Serial signal, max 2 input/ouputs (based on the ECDIS maker)
INS related: Serial signal, max 2 input/outputs (IEC61924ALF,ALC,ARC(output)/NSR,ACN(input)
External equipment: Serial signal, 2 outputs (IEC61162-1 HTD,RSA,ROR): output from same terminal as SGCS
Input/ouput dry contact for each type

2 SGCS related(Steering Control System)

- Steering Mode

HC : Heading Control
TC : Track Control
HAND : Hand steering
RC : Remote Control steering
NFU : Non Follow Up lever steering

- Applicable Steering Gear Systems

Torque Motor Control, Proportional Solenoid Valve Control, Solenoid Valve Control, Hydraulic, Frequency Control, etc.

- Optional

Route Control function (ACE), maximum rudder angle change over, Steering limit with relation to ship speed, Avoidance steering (Override) etc
- Input power

AC440V, 380V,220V,110V,DC24V (DC 24V power for independent monitoring)
- Main interface equipment

External equipment: Serial signal, 2 outputs (IEC61162-1 HTD,RSA,ROR): output from same terminal as HCS
Input/ouput dry contact for each type