

General sales specification

Triton-CPP

CPP Propulsion Control System

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Improvements

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A	Minor layout and terminology changes.	HOK	29.05.2013
B			
C			

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Abbreviations

CPP / CP-propeller - Controllable Pitch Propeller
 ECR - Engine Control Room
 IAS - Integrated Alarm System
 MSB - Main Switch Board
 PMS - Power Management System
 PWM - Pulse-Width Modulation
 VDR - Voyage Data Recorder

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1 General

PLC based remote control system for propulsion for vessels with CP-propellers. It is designed as a standard system according to the fail-safe principle. The system is very user friendly, highly accurate, and advanced and flexible with many possibilities. Standard and custom designed solutions available.

The specification is general and divided into two main parts:

1. Basic/standard configuration.
2. Options.

Functions and possibilities listed in the basic/standard configuration section are always included. Note that alternatives exist, i.e. it is necessary to check which is included.

Functions and possibilities listed in the option section are included if clearly stated. Other functions and possibilities are not available for this system. If other functions or possibilities are required, the Neptune-II remote control system must be used, please check with Scana Mar-EI in each individual case.

Note that all signals into the propulsion control system (input signals) must be galvanically isolated from all other system(s). All signals out from the system (output signals) are galvanically isolated if not otherwise described.

1.1 Main features

This section describes the basic/standard configuration that is always included. Available options and alternatives are described in the options section.

Control of (pr. side):

- Propeller pitch.
- Main engine RPM.
- Up to three standard clutches (main or PTO).

Indication:

- Propeller pitch.
- Propeller shaft RPM.
- Main engine RPM (requires external signal).
- Clutch status, operating mode, command position etc.
- Alarms and monitoring.

Manoeuvre stations (up to five in total, more than main panel bridge is optional):

- Standard panel(s) bridge, with lever, buttons and touch screen for operation and indication.
- Local control panel with touch screen mounted in the cabinet door or ECR control desk.
- Very easy adoption of additional manoeuvre stands.

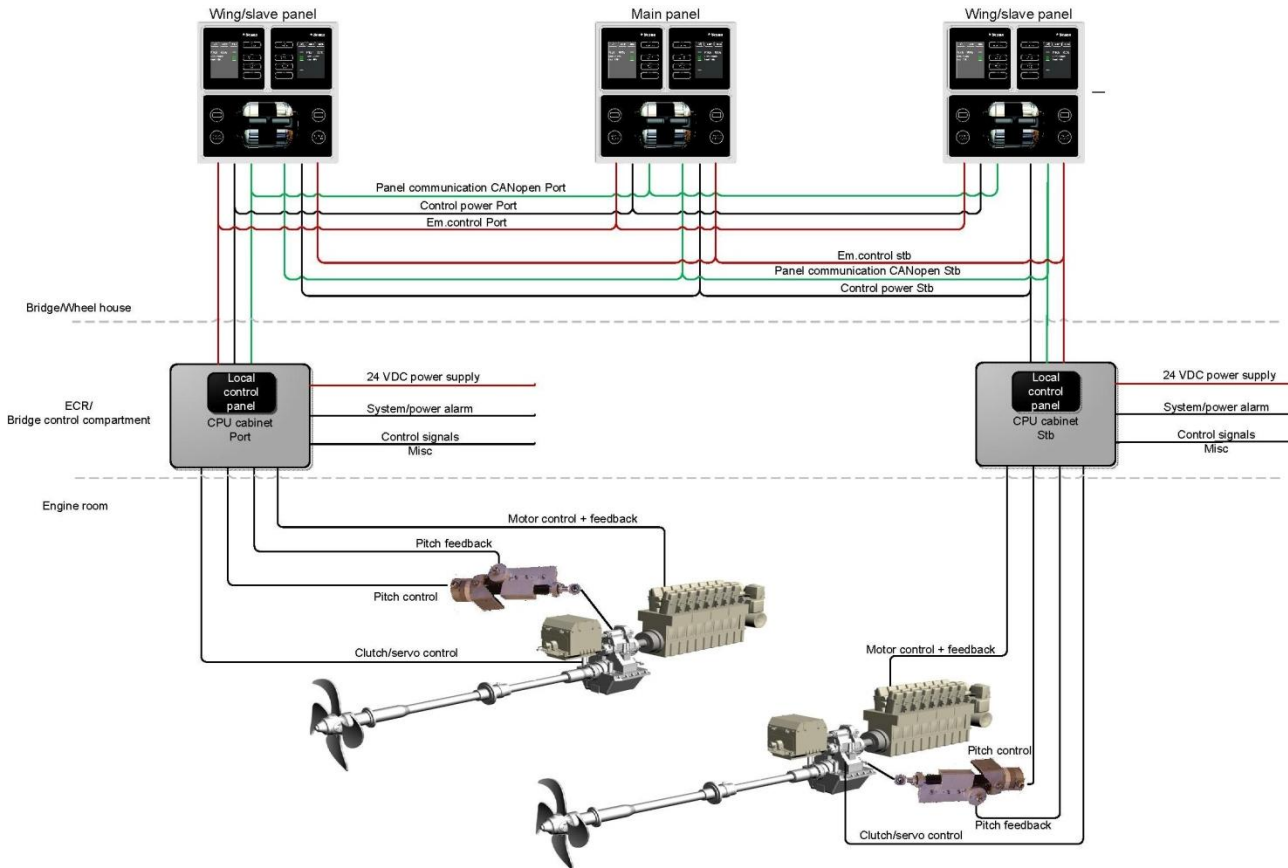
Other features:

- Back-up system for propeller pitch from joystick switches in the bridge panels.
- Responsibility shift system that prevents jumps in pitch/combinator order at command transfer.
- Automatic load control system for protection of the main engine(s) (option).
- Two fixed pitch/load reductions.
- Mode for shaft generator.
- Outputs from potential free contact for 'Voltage failure' and 'System failure' to alarm system.
- Quick and easy commissioning, diagnostics and service via user-friendly Windows software or the Local control panel.
- Bus communication between units reduces installation time and costs.
- Type approved by major classification societies.

Standard control mode is combinator, i.e. the main engine RPM and the propeller pitch are controlled by one order lever according to the combinator curve. All system set-up and adjustments can be done from the optional local control panel.

1.2 Block diagram

Example block diagram control system for twin screw CP-propeller including miscellaneous options:



2 Basic configuration

Functions and possibilities listed in this section are always included. Functions and possibilities listed in the 'Options' section are available on request. Other functions and possibilities (i.e. tailor made solutions) can also be delivered.

Note that all input signals into the control system shall be galvanically isolated from all other systems. Output signals from the system are galvanically isolated, if not otherwise described.

2.1 Propeller pitch

Interface to stepping motor operated actuator, e.g. MAC-10x-Dxxxxx (versions with and without built-on crank handle for emergency control available). Feedback from potential free potentiometer/sensor with two separate tracks required (built-on for the MAC-10x-Dxxxxx actuators).

The propeller pitch is controlled by lever on the bridge panel(s) or from touch display in the local control panel. Analogue external input from a joystick system may also be used.

In backup mode, control of pitch is by joystick switches on the bridge panel in command.

2.2 Main engine RPM

Standard interface to the main engine is 4-20mADC RPM setting to electronic governor, with analogue (4-20mADC) RPM and load feedback. Additional interlocks are also possible.

Mechanical and pneumatic governors may also be interfaced. Separate units/signal converters must be added (options).

The engine RPM is controlled from combinator lever or separate RPM lever (option), MSB (constant RPM mode) or joystick system (option).

2.3 Clutches (standard clutch)

Control of up to three standard clutches may be included, either main clutches (up to two) or PTO clutches. The clutches are controlled from the touch screen in the manoeuvre station(s).

Output to 24VDC solenoid valves, max. 2A (one solenoid for engage and one for disengage). Feedback from pressure switch with potential free contact sensing the clutch pressure required.

The engagement of the main clutch is interlocked with zero pitch and high RPM. The clutches have inputs for external interlock of engagement/disengagement from potential free contacts and input for external disengagement.

2.4 Fixed pitch/load reductions

Two fixed pitch/load reductions controlled by potential free contacts are included. The reduction level is preset, but adjustable. May e.g. be used as 'Slow Down'.

2.5 Mode for shaft generator

Mode for shaft generator and standard interface signals are included.

Description of the interface:

1. In the touch screen 'Const. RPM' activates the constant RPM mode.
2. When the constant RPM mode is activated, a potential free closed contact is asserted. Used to interlock the shaft generator to only be engaged when the constant RPM mode is activated.
3. When the shaft generator is engaged, a potential free closed contact shall be received. Used to interlock the constant RPM function so it is impossible to deactivate the mode when the shaft generator is engaged.

The engine RPM can be adjusted with an external unit outputting a galvanically isolated 0-10VDC or 4-20mADC signal, normally mounted in the main switchboard or an output from the power management system (PMS).

3 Options

The system can be configured to suit a number of applications. Below are examples of options that can be included.

3.1 Local control panel

Local control panel mounted in the CPU-cabinet door or separately (e.g. in the engine control room desk, optional). Control and monitoring/indication of the included functions from 4,3" touch screen, e.g. propeller pitch, engine RPM and clutch(es). One for each propeller system needed.

The panel also gives access to parameters for system set-up and adjustment and possibility for data logging. Benefits include easier service and monitoring of the system and historic data via data logging for easier fault finding and tracing of "what happened".

3.2 Automatic load control system

Advanced automatic load control for protection of the prime mover and/or MSB by automatically controlling the load by means of controlling the propeller pitch or the RPM.

The function needs a signal giving the load of the prime mover and/or an "available power" signal from the MSB. Standard signal is 4-20mADC, which must be galvanically separated. Note that the automatic load control system cannot work if this signal is missing.

3.3 Separate control of engine RPM and propeller pitch

The bridge panels are equipped with two order levers, one for each of engine RPM and propeller pitch. If this option is included, it must be included for all bridge panels.

Separate control of engine RPM and propeller pitch is in addition to combinator, i.e. combinator is always included (the pitch lever is the combinator lever when this mode is active).

3.4 Interface to Voyage Data Recorder (VDR)

Interface to VDR can be delivered. The standard interface is according to the NMEA 0183 (IEC 61162-1) protocol standard and Scana Mar-EI defined telegrams.

3.5 Interface to joystick-system

Interface to joystick-system can be delivered. Galvanic isolated $\pm 10\text{VDC}$ or 4-20mADC order signal and hand-shaking via potential free contacts (i.e. 'Call' and 'Ready' signals).

3.6 External instruments

External instruments, e.g. 96x96mm analog gauges, can be supplied for:

- Propeller pitch.
- Main engine RPM.
- Propeller shaft RPM.
- Other options on request.

3.7 Other options

The following options can also be delivered against additional price:

- 4-engine control system for high-speed vessels, including all 2- and 3-engine modes.
- Indication of panel in command (Bridge/ECR, Main, Slave 1-2).
- Indication of local/remote RPM control.
- SoftClutch interface. Can only be delivered in Scana Propulsion systems.
- Manoeuvre panel(s) with IP56 protection in front.
- Custom manoeuvre panel design. Price must be determined for each case.
- Pitch valve interface to Danfoss valves or for 4-20mADC, $\pm 10\text{VDC}$ or PWM control signals.
- Extended servo interface, i.e. analog indication from clutch and servo pressure sensors.
- Floating frequency (Limit RPM). NB! Requires separate control of engine RPM and propeller pitch.
- Windmill landing mode (special mode for offshore windmill service vessels).
- Control of feathering (sailing) position for the propeller pitch.
- Sailing boost mode (for sailing boats, both sail and engine/propeller).
- Control of shaft lock device.
- Serial interface to IAS, conning display or alarm system according to the NMEA 0183 (IEC 61162-1) protocol standard and Scana Mar-EI defined telegrams.

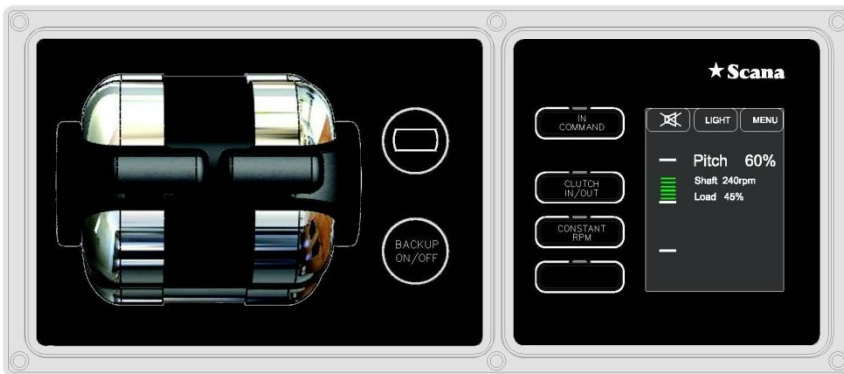
4 Manoeuvre stations

4.1 Standard bridge panels

Standard bridge panel (with combinator levers) for twin screw CP-propeller system:



Standard bridge panel (with separate levers for pitch and RPM) for single screw CP-propeller system:



4.2 Local control panel

4,3" touch screen, mounted in CPU-cabinet door or ECR console, one for each propeller system:

