RUDDER ANGLE

INDICATION SYSTEMS
STAYING THE COURSE AT SEA

Rudder angle solutions for all ship types

A frontrunner in marine bridge instrumentation for decades, DEIF offers a full range of rudder angle indication systems covering both 4-20mA current loop system, +/-10V systems, and CAN systems. For instance, you can combine DEIF’s analogue or CAN-based rudder angle transmitters (RTA/RTC) with display-based illuminated indicators (XDi) and create your very own, customised solution. Digitally accurate, you can even calibrate one unit and broadcast automatically to all other units on board!

General features available:
► Complete and type approved system
► Superior accuracy and flexibility
► Robust design and performance
► NMEA output to your Voyage Data Recorder (VDR)
► Analogue or CAN rudder angle transmitter and signal lines
► Calibration on one indicator and broadcast to all others
► Indication of both measured and commanded rudder angle possible

Uncompromising quality – fully tested & approved
All DEIF marine products are type-tested and tried in the harshest possible conditions before market release to ensure outstanding levels of accuracy, robustness, reliability and water-proof housing.

The tests are carried out in our own in-house test centre by our meticulous staff of specialised engineers. The test centre is part of our ISO 9001 certified quality management system and houses some of the most advanced testing facilities in the world. They allow us to carry out all the relevant tests for marine classification approvals, CE marking, MED approvals, UL, etc. – under our own roof.

Stay the right course – choose DEIF.
1. Rudder system

4-20mA

The basic 4-20mA current loop is most likely the most used configuration for rudder systems today.

The DEIF RTA 602 rudder angle transmitter is able to drive at least 7 XL indicators and one TRI-2 indicator in a 24V system.

Please see the RTA 602 data sheet for details.
2. Rudder system

+/-10V

The 4-20mA rudder angle signal is converted to +/-10V in the TDG-210DG located on the bridge.

All indicators on the bridge have a +/-10V input and are star-coupled to the TDG. TDG-210DG can drive up to 19 indicators (BW, BRW-2, TRI-2 or XDi).

The TDG-210DG can of course also be located in the steering gear room, giving a complete +/-10V indicator system.

Rudder angle transmitter 4-20mA

RTA 602
3. Rudder angle indication system

4-20mA/CANopen

- Rudder angle transmitter 4-20mA
  - RTA 602
    - Rudder angle transmitter 4-20mA

- CAN bus
  - RTA is calibrated in the installation.
  - Fine adjustments of the sensor input can be handled via the installation menu in the XDi located in the steering gear room. This unit transmits the rudder angle to all other indicators via CAN.

- All XDi indicators can be replaced with XL CAN or BW CAN indicators, except the one in the steering gear room.

- Connect VDR direct from 4-20mA or via NMEA0183 via NX1 module on any XDi indicator.
4. Rudder system
CANopen

Bridge overhead

XDi192D

TRI-2 CAN

Bridge Centre console

XDi144D

BW144

Bridge wing Portside

Bridge wing Starboard

BW144

XDi144D

Centro console

Can bus

XDi96D

Engine room

XDi144D

RTC 600

Rudder angle transmitter CANopen

CAN bus

Calibration of the rudder sensor input is handled via the installation menu in the XDi located in the steering gear room. This unit transmits the rudder angle to all other indicators directly via CAN.

All XDi indicators can be replaced with XL CAN indicators.
## Illuminated bridge indicators

**Platform overview**

### Digital accuracy, analogue or display-based readability
DEIF’s range of sturdy illuminated bridge indicators features high accuracy, meeting or exceeding international standards for optimal readability and precision.

### Analogue indication: The XL series
Offering digital accuracy and analogue readability, the well-proven XL series is based on DEIF’s patented microprocessor-controlled X-coil technology. The range is available for panel, ceiling and bridge wing mounting with a variety of stocked standard designs. Custom designs are available on request.

### Display-based indication: The XDi series
A game changer in bridge instrumentation, DEIF’s new, patented illuminated indicator display series, XDi, offers highly accurate display-based indication. The compact, easy-to-install, versatile and user-friendly revolution in bridge instrumentation, gives you more flexibility and the ability to configure and make repairs on-site. The XDi series replaces mechanical scales and pointers with high quality displays without compromising DEIF customisation standards and maintaining approvals for rudder applications.

### XL series
- XL
- BW
- BRW-2
- TRI-2

### XDi series
- XDi 96 Dual
- XDi 144 Dual
- XDi 192 Dual

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### Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>XL series</th>
<th>XDi Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogue or Dual (COS/SIN) input</td>
<td>V/mA</td>
<td>V/mA* Selectable</td>
</tr>
<tr>
<td>Backlight dimmer</td>
<td>Analogue/CAN</td>
<td>CAN/Analogue*/Digital*</td>
</tr>
<tr>
<td>CANopen interface</td>
<td>1 or 2</td>
<td>2</td>
</tr>
<tr>
<td>Day/night scale</td>
<td>Fixed</td>
<td>Day/night (dusk)</td>
</tr>
<tr>
<td>DIN Cut out</td>
<td>Q72, Q96, Q144, Q192</td>
<td>Q96, 144 × 96, 192 × 144</td>
</tr>
<tr>
<td>Display sizes</td>
<td>3.5, 5, 7”</td>
<td></td>
</tr>
<tr>
<td>Extention modules</td>
<td>AX1, DX1, NX1</td>
<td></td>
</tr>
<tr>
<td>Indication/readout</td>
<td>Fixed (needle/disc)</td>
<td>Selectable</td>
</tr>
<tr>
<td>Library with multiple virtual indicators</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>Outdoor bridge wing indicator</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>Relay output</td>
<td>×*</td>
<td></td>
</tr>
<tr>
<td>Scale type</td>
<td>Printed scale</td>
<td>TFT Display</td>
</tr>
<tr>
<td>Serial – NMEA0183 (IEC61162-1)</td>
<td>Output*</td>
<td></td>
</tr>
<tr>
<td>X-coil indicator</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>XDi Net</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>Commanded rudder indication</td>
<td>×</td>
<td></td>
</tr>
</tbody>
</table>

* Extension module required
Product type overview
Indicators & transmitters

Indicators

Flexible display indicator
Display-based illuminated bridge indicators with preinstalled designs.

Illuminated indicator
Digital accuracy, analogue readability. Panel mounting.

Bridge wing indicator
Digital accuracy, analogue readability. In-/outdoor mounting.

Bridge wing indicator
Digital accuracy, analogue readability. Outdoor mounting.

Panorama rudder angle indicator
250 ° reading of rudder position. Analogue or CAN input.

Transmitters

Rudder angle transmitter
No touch magnetic angle detection technology. Analogue or CANopen.

Insulation amplifiers

TDG-210DG
DC/DC amplifier with galvanic separation between input and output.
**Flexible display indicator**

The game changer in illuminated bridge instrumentation

DEIF’s XDi illuminated indicator display series is a compact, easy-to-install, versatile and user-friendly revolution in bridge instrumentation.

The ultimate all-in-one solution, the XDi saves you panel space and installation time, gives you greater choice, more flexibility and the ability to configure and make repairs on-site.

With the XDi series, we have replaced mechanical scales and pointers with high quality displays, taking indicator performance to a new level without compromising DEIF customisation standards and maintaining approvals for rudder applications.

XDi features high accuracy analogue readout (no mechanical or parallax’s reading error), high precision digital readings, wide viewing angle and optimised day and night colour pallets, even a custom dusk pallet.

The XDi Dual variants are a perfect fit for rudder applications and can be ordered with a DEIF standard indicator library – or you can have your own customised.

Already a market-leader with record delivery times, the XDi series also enables us to ship your orders even faster.

DEIF’s XDi rudder angle indicators are approved by MED and other major classification societies. They are also MED-certified as a part of a rudder system. DEIF has developed the XDi series cooperating closely with DNV GL.

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### XDi features

- TFT graphical LED 3.5, 5 or 7" display
- Multiple virtual indicator layouts selectable from library
- Standard and custom scale designs
- Commanded rudder (selectable)
- XDi-Net – a short-cut to CAN bus
- Reduced wiring and installation
- Instant repairs on board
- Analogue and digital readout combined
- Analogue or CAN input
- NMEA0183 output (IEC61162-1)
- Standard day and night designs
- Dusk designs on request
- MED and other relevant class approvals

### Variants

<table>
<thead>
<tr>
<th>Variant</th>
<th>No. of input values</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDi 96 Dual</td>
<td>1 or 2</td>
</tr>
<tr>
<td>XDi 144 Dual</td>
<td>1 or 2</td>
</tr>
<tr>
<td>XDi 192 Dual</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>

### Cutouts

<table>
<thead>
<tr>
<th>Variant</th>
<th>Cutouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>XDi 96 Dual</td>
<td>92 x 92mm</td>
</tr>
<tr>
<td>XDi 144 Dual</td>
<td>138 x 92mm</td>
</tr>
<tr>
<td>XDi 192 Dual</td>
<td>186 x 138mm</td>
</tr>
</tbody>
</table>

### Dimmer options

- Waterproof (IP66) dimmer box for indicators, 10kOhm potentiometer*
- Dimmer potentiometer 1kOhm*
- Front frame w. buttons for dimming

* AX1 extension module required
**XDi – indicator libraries**

Game-changing functionality made simple

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**Library**

The library contains a range of indicators and product profiles. During installation, the setup wizard guides you through the selection process.

**Product Profile – PP**

The library contains one or more PP’s to ease the installation setup. A PP contains default parameters for the CAN bus, dimmer groups and input type, warning and sound. Default parameters can be changed from the XDi menu.

**Virtual Indicator – VI**

A library may contain more than 100 predefined virtual indicators. The VI contains the graphical design which can be either DEIF standard designs or unique custom designs placed in a custom library made by DEIF. The graphical design is fixed to comply with the relevant marine standards and cannot be changed by the user.

**Virtual Indicator Setup – VS**

Each virtual indicator has one or more VS profiles to select for easy configuration. Each VS defines a unique setup for all inputs, outputs, controls and selectable headlines for the related virtual indicator. Default parameters can be changed from the XDi menu.

**DEIF standard rudder angle indicator library**

The standard rudder indicator library is available in FWD or AFT designs and with day and night scale. It contains the following scale ranges:

- ±40°
- ±45°
- ±50°
- ±70°

To order, please state the following when you contact us:

- Library owner 000001
- Library number 031

Please contact your DEIF representative for assistance if you need customised scale designs.

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**Setup**

**Setup Wizard**

An automatic guide makes setup very easy, even without prior training.

**Surveyor Information**

Select the info screen for a complete status of the selected and locked set-up.

**On-site choices**

**Indicator headline**

Integrated headline option reduces variants.

**Day & night scales**

**Day**

Standard library contains both day and night designs.

**Night**

Standard library contains both FWD and AFT designs.
Standard indicator library
DEIF standard libraries contain a selection of indicators presenting dual or multiple data in a common design line. The different indicator types are collected in application-specific libraries to make selection and ordering easier. The standard indicators for applications requiring wheel-marking are approved according to the Marine Equipment Directive (MED).

Updating is simple
With a built-in USB interface on the rear side of the XDi, upgrading units with new libraries or other updates is a simple and easy procedure. All standard and your customised libraries are available for free download and can easily be uploaded to your XDi.

Customised indicator libraries
Categorised according to application types, the indicators you need may be placed in different standard libraries. Since XDi units can hold just one library at a time, you will find it beneficial to order your XDi with the correct library.

Customisation level 1
If you often use the same combination of standard indicators, for instance from the azimuth, tunnel thruster and rudder libraries, it may well prove beneficial for you to have your own customised library created which contains your preferred indicators (copied from standard libraries). DEIF offers to compile and pre-install such a custom library in your indicators for a small one-off fee.

Customisation level 2
To match your system needs and reduce setup time during installation it may be cost-effective for you to have some of the standard indicators or default setup parameters slightly changed. The fee is slightly higher than for customisation level 1.

Customisation level 3
Full customisation is for those requiring unique designs in line with their company profile. DEIF’s knowledge and experience in this field secures optimised graphical designs and system integration for the entire custom library. Please contact DEIF for a quotation based on your requirements.

Logo on front frame
For those looking to brand XDi with their own company logo, DEIF recommends placing the logo on the removable front frame. Logos can be added to the virtual indicator designs, but will take up valuable display space, thus reducing flexibility and readability.
Patented range of illuminated panel indicators designed to indicate a wide range of rudder angle designs. These indicators are based on microprocessor-controlled X-coil technology.

**XL scale designs**
DEIF offers a wide range of recommended standard scale designs. The range has been designed to meet international standards for optimal readability and precision – see www.deif.com for the current list.

DEIF can also handle customised scale designs, adding logos/text or create a new visual layout to identify your brand.

### XL features

- High shock/vibration resistance (robust)
- Class 0.5 accuracy
- Analogue or CANopen interface (sCAN)
- Optional IP66 protection
- LED illumination
- Q72, Q96, Q144 and Q192 cutouts

<table>
<thead>
<tr>
<th>Variants</th>
<th>Minimum cutouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>XL72</td>
<td>68.5 x 68.5 mm</td>
</tr>
<tr>
<td>XL96</td>
<td>92.5 x 92.5 mm</td>
</tr>
<tr>
<td>XL144</td>
<td>138.5 x 138.5 mm</td>
</tr>
<tr>
<td>XL192</td>
<td>186.5 x 186.5 mm</td>
</tr>
</tbody>
</table>

### Dimmer options

Waterproof (IP66) dimmer box for indicators, 10kOhm potentiometer

Dimmer potentiometer 1kOhm

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**Variant overview**

<table>
<thead>
<tr>
<th>XL</th>
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</thead>
</table>
**Outdoor bridge wing indicator**

Digital accuracy, analogue readability, outdoor mounting

Patented range of illuminated bridge wing indicators for outdoor mounting based on microprocessor-controlled X-coil technology. DEIF stocks a wide range of recommended standard scale designs for rudder angle indication.

The range meets international standards for optimal readability and precision – see www.deif.com for the current list. DEIF also handles customised scale designs.

For outdoor mounting, we recommend all-white scales.

**BRW-2 features**

- Outdoor bridge wing mounting
- Front-mounted dimmer
- High shock/vibration resistance (robust)
- Class 0.5 accuracy
- Analogue or CANopen interface (sCAN)
- IP66 protection
- LED illumination

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**Indoor & outdoor bridge wing indicator**

Digital accuracy, analogue readability, indoor & outdoor mounting

Patented range of illuminated bridge wing indicators for indoor and outdoor mounting based on microprocessor-controlled X-coil technology. DEIF stocks a wide range of recommended standard scale designs for rudder angle indication.

The range meets international standards for optimal readability and precision – see www.deif.com for the current list. DEIF also handles customised scale designs.

For outdoor mounting, we recommend all-white scales.

**BW features**

- Indoor and outdoor bridge mounting hanging or standing on pivot foot
- Rear-mounted dimmer
- High shock/vibration resistance (robust)
- Class 0.5 accuracy
- Analogue or CANopen interface (sCAN)
- IP66 protection
- LED illumination

**Variants**

BW144
BW192
TRI-2 is applied for the indication of the rudder position on the bridge. The indicator consists of a robust moving coil system equipped with three pointers mounted on a common shaft. The TRI-2 is available with CAN or analogue input.

With its large scales, the TRI-2 ensures a quick and easy reading of the rudder position from any angle up to 250 ° and from a distance of up to 5 metres from the indicator. The TRI-2 is housed in a matt black case for ceiling suspension.

Panorama rudder angle indicator
Quick & easy reading from angles up to 250 °

TRI-2 features
► 3 extra large, easy-to-read scales
► Readable from up to 5 meters
► Black or white scales
► Long-life LED illumination
► Built-in dimmer
► Analogue interface or CAN

Variants | Features
---|---
TRI-2 | Analogue input
TRI-2 CAN | CAN-based input
DEIF’s rudder/azimuth angle transmitters convert the rudder or azimuth thruster’s position angles into either electrical current signals or digital data values with a 16 bit resolution (+/-180° = +/-32767).

Unlike potentiometers, DEIF’s angle transmitters use a “no touch” magnetic angle detection technology. The technology guarantees optimal accuracy and performance and longer life for the transmitters as they have no electromechanical parts.

DEIF’s rudder and azimuth systems are MED-approved for easy use and immediate class approval. The robust mechanical design and IP67 protection make the transmitters ideal for use aboard any ship.

**General features**
- “No touch” magnetic angle detection – no wear & tear
- Accuracy < 0.25°
- Analogue or CAN bus output for direct connection of one or more indicators
- Angle position range from +/-20° to +/-180°
- Continuous shaft rotation
- Clockwise/counterclockwise, zero set & max./min. adjustment

<table>
<thead>
<tr>
<th>Variants</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTA 602</td>
<td>Analogue. 2 wire 4 to 20 mA DC. Ø19mm stainless steel shaft for direct rudder connection. Available with 90° mounting bracket Directly compatible with DEIF’s RT-2 rudder angle transmitter*.</td>
</tr>
<tr>
<td>RTC 300</td>
<td>CAN bus. Ø6mm standard axel.</td>
</tr>
<tr>
<td>RTC 600</td>
<td>CAN bus. Ø19mm stainless steel shaft for direct rudder connection. Available with 90° mounting bracket Directly compatible with DEIF’s RT-2 rudder angle transmitter*.</td>
</tr>
</tbody>
</table>

* Not recommended for new designs

<table>
<thead>
<tr>
<th>Variants</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting bracket</td>
<td>Available for RTA 602 and RTC 600</td>
</tr>
<tr>
<td>Position linkage</td>
<td>Available for RTA 602 and RTC 600</td>
</tr>
<tr>
<td></td>
<td>Length: 317 mm</td>
</tr>
<tr>
<td>Adjustable lever</td>
<td>Available for RTA 602 and RTC 600</td>
</tr>
<tr>
<td></td>
<td>Max. length: 1127 mm</td>
</tr>
</tbody>
</table>

**Variant overview**
- RTA 602
- RTC 600
- RTC 300
- RTA 602 w/position linkage and lever
TDG-210DG is a CE-marked DC/DC amplifier with galvanic separation between input and output.

The TDG-210DG has been MED-approved as part of a rudder system and is typically used for converting e.g. 4-20mA to ±10V or 0-10V.
OUR 24/7 GLOBAL REACH

We want to maximise your uptime

Offering you unrivalled response times, the DEIF Group’s extended reach means we are on call for maintenance, repairs, replacements or upgrades 24/7/365 with regional and local anchors guaranteeing a “glocal” view.

► Sales offices, competence centres and training facilities in 17 key markets
► Global distributor, system integrator and trusted service partner network
► Day-to-day spare part delivery, 3 year supply of spare parts for standard controllers.