APPLICATION NOTES



# RUDDER ANGLE TRANSMITTER
# Replacing RT-1 or RT-2 by RTA 602

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# General information

## Warnings, legal information and safety

### Warnings and notes

Throughout this document, a number of notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

### Notes

**The notes provide general information which will be helpful for the reader to bear in mind.**

### Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the product. If there is any doubt about how to install or operate the product, the company responsible for the installation or the operation must be contacted.

**The units are not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.**

### Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

### Safety issues

Installing and operating the product may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.

### Electrostatic discharge awareness

Sufficient care must be taken to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.

### Factory settings

The product is delivered from factory with certain factory settings. These are based on average values and are not necessarily the correct settings for matching the product in question. Precautions must be taken to check the settings before running the product.

# About the application notes

**General purpose**

This document contains general information on how to replace an old DEIF RT-1 or RT-2 with the RTA 602 in already installed systems.

You will find a number of examples how to upgrade an existing system with RTA 602.
This can be a necessary replacement of the sensor in a service situation or to obtain better system performance.

**Intended users**

The document is mainly intended for the service engineer in situations where an old rudder angle transmitter of the types RT-1 or RT-2 must be replaced by the new RTA 602 rudder angle transmitter.
It is recommended to read the user and installation documentation for RTA 602 in addition to the information you get in this application note.

**Contents/overall structure**

The document is divided into chapters, and in order to make the structure of the document simple and easy to use, each chapter will begin from the top of a new page.

# Data sheets and other documents

From the DEIF website www.deif.com, additional documentation such as data sheets, installation manuals, type approval certificates and additional application notes are available for download, this document included.

In the below listed documents, further information about the components in the DEIF rudder angle indicator system is available:

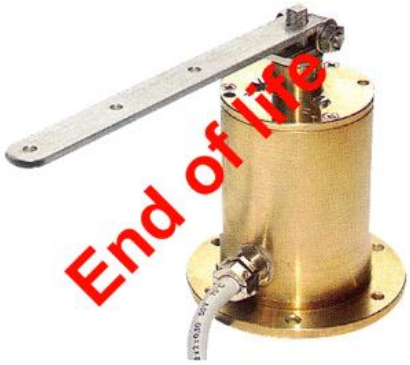
- RTA 602 data sheet 4921250068 UK
- RTA 602 installation instruction 4189350070 UK
- RTA 602 quick guide 4189350051 UK

(Documents in other languages may also be available on www.deif.com)

# Product overview

### RT-1 Rudder transmitter

The RT-1 and RT-2 have been phased out and are replaced by the RTA 602 rudder angle transmitter.




The RT-1 is a very old DEIF product, and please note that RTA 602 is not mechanically compatible.
The output from RT-1 is +/-1 mA or 0.1 to 0.6 to 1.1 mA depending on configuration. This should be observed when ordering parts to replace an existing RT-1.

(Data sheet for RT-1 can still be downloaded from www.deif.com)

### RT-2 Rudder transmitter


The RT-2 can be configured as a 2-, 3- or 4-wire analogue rudder transmitter.

Configured as 2-wire, the output is always 4-20 mA, and the sensor electronics are powered by the measuring signal.
Configured as 3-or 4-wire, the analogue output is 0-20 mA.
The sensor electronic circuit is separately powered via the extra wire(s).

(Data sheet for RT-2 can still be downloaded from www.deif.com)

### RTA 602 Rudder transmitter

The RTA-602 is a 2-wire sensor with 4-20 mA analogue output.
The electronic circuit in the sensor is powered by the 4-20 mA signal.

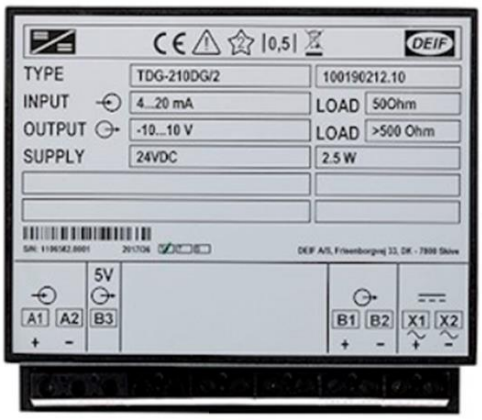
To replace an RT-1 or an RT-2 (0-20 mA) by an RTA 602, the DEIF TDG-210DG is used to convert the 4-20 mA signal.

This application note contains system examples, tables and necessary instructions on how to replace RT-1 or RT-2 with RTA 602 in both 2-, 3- or 4-wire current loop systems.

RTA 602 with mounting accessories for easy mechanical connection to the rudder.
The mounting bracket from the RT-2 can be used for the RTA 602. The new 90° bracket for the RTA 602 is also mechanically compatible with the RT-2 bracket.

**TDG-210DG DC/DC amplifier**

When the RT-2 is configured for 3- and 4-wire connection, the output signals can be set up to 0-20 mA. In that case, the TDG-210DG DC to DC amplifier is used to convert the 4-20 mA signal from the RTA 602. The TDG-210DG can be ordered with different output configurations. The output can be either voltage or current.



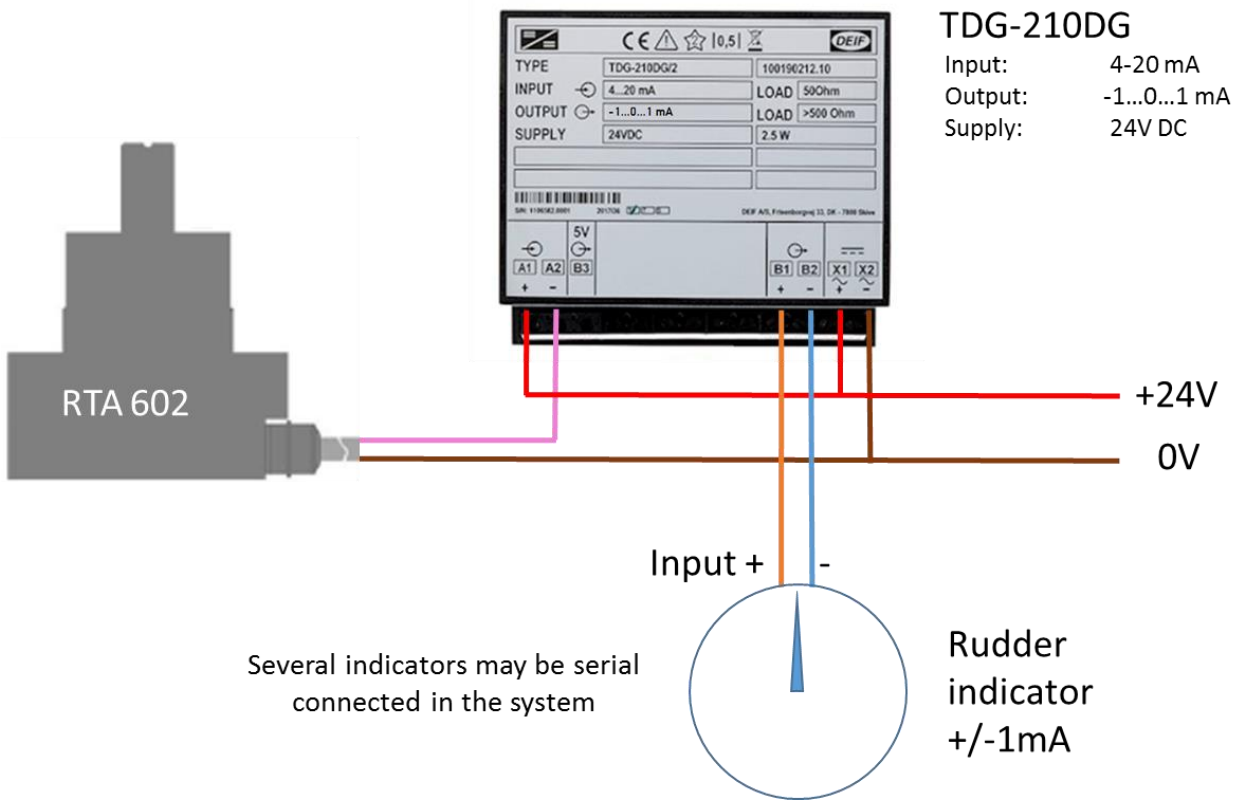

Typical TDG-210DG with 4-20 mA input and +/- 10V output.

If you have a rudder indicator system with a TDG-210DG used to convert the 4-20 mA RT-2 signal to for example +/-10 V output for the rudder indicators (this is quite often used). The RTA 602 can be directly used as replacement for the RT-2.
But if the RT-2 is 3- or 4- wire and uses 0-20 mA output, then the TDG-210DG input will be 0-20 mA, and it is necessary not only to exchange the RT-2 but also the TDG-210DG to be able to use RTA 602.

# How to replace an old rudder transmitter

**Replace an RT-1 in a 4-wire system**

This example shows an RT-1 configured for +/- 1 mA




**RTA 602 connections:**

| Wire | Type | Signal | Remark |
|---|---|---|---|
| Pink | I in (+ mA) | Current in/out | Min. 7.5 V to max. 35 $V_{dc}$ at 4 to 20 mA (Max. range 3.8 to 20.2 mA) |
| Brown | I out (- mA) | | |
| Green | S1 (Set 1) | Setup | Normal operation: **All** three setup wires must be connected together |
| Yellow | S2 (Set 2) | | |
| Grey | SC (Set Common) | | |
| White | Not used | Not used | This wire is cut off |

Calibration instructions please see:

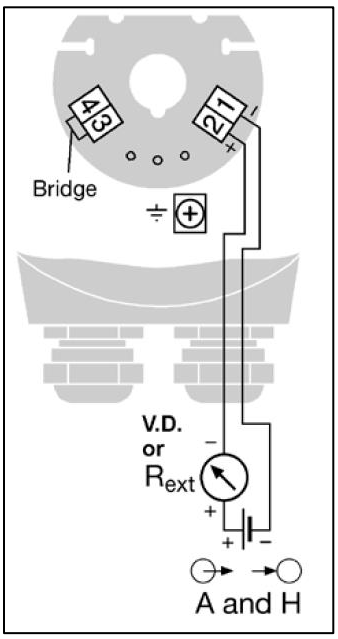
- RTA 602 quick guide
- RTA602 installation instruction

Download from www.deif.com

**After calibration, connect green, yellow and grey wires.**

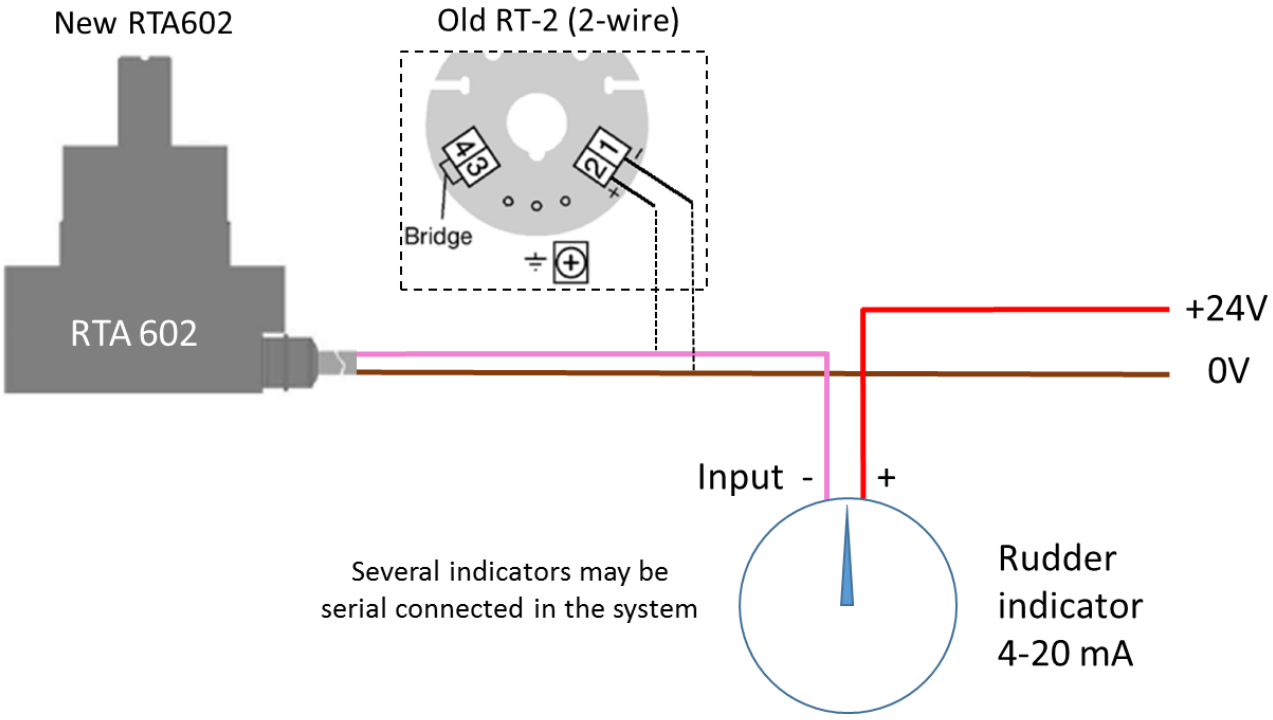
In case the RT-1 is set up to output 0.1 to 0.6 to 1.1 mA in the above system, then the TDG-210DG output must be specified accordingly when it is ordered from DEIF.

**Replace RT-2 2-wire in a 4-20 mA indicator system**




In this RT-2 system, the output is 4-20 mA and the RTA-602 can be used as a 1 to 1 replacement.

**Replacing RT-2 with RTA 602**



### RTA 602 connections

| Wire | Type | Signal | Remark |
|---|---|---|---|
| Pink | I in (+ mA) | Current in/out | Min. 7.5 V to max. 35 $V_{dc}$ at 4 to 20 mA (Max. range 3.8 to 20.2 mA) |
| Brown | I out (- mA) | | |
| Green | S1 (Set 1) | Setup | Normal operation: **All** three setup wires must be connected together |
| Yellow | S2 (Set 2) | | |
| Grey | SC (Set Common) | | |
| White | Not used | Not used | This wire is cut off |

Calibration instructions please see:

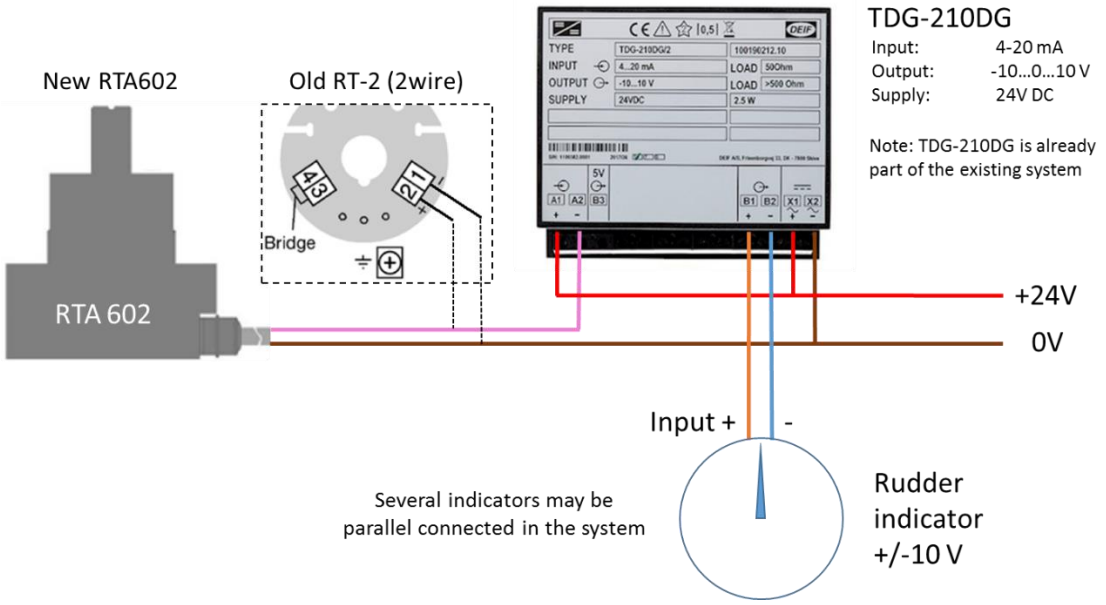
- RTA 602 quick guide
- RTA602 installation instruction

Download from [www.deif.com](http://www.deif.com)

**After calibration, connect green, yellow and grey wires.**

### Replacing RT-2 2-wire in a +/-10 V indicator system

In this system, the RT-2 will output 4-20 mA, and the TDG-210DG is installed in this system to convert the 4-20 mA signal to a +/- 10 V signal for the indicators. All indicators in the system are parallel-coupled (star-coupled) to the TDG.




RTA 602 can directly replace RT-2 as shown in this illustration.

### RTA 602 connections

| Wire | Type | Signal | Remark |
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| Pink | I in (+ mA) | Current in/out | Min. 7.5 V to max. 35 $V_{dc}$ at 4 to 20 mA (Max. range 3.8 to 20.2 mA) |
| Brown | I out (- mA) | | |
| Green | S1 (Set 1) | Setup | Normal operation: **All** three setup wires must be connected together |
| Yellow | S2 (Set 2) | | |
| Grey | SC (Set Common) | | |
| White | Not used | Not used | This wire is cut off |

Calibration instructions please see:

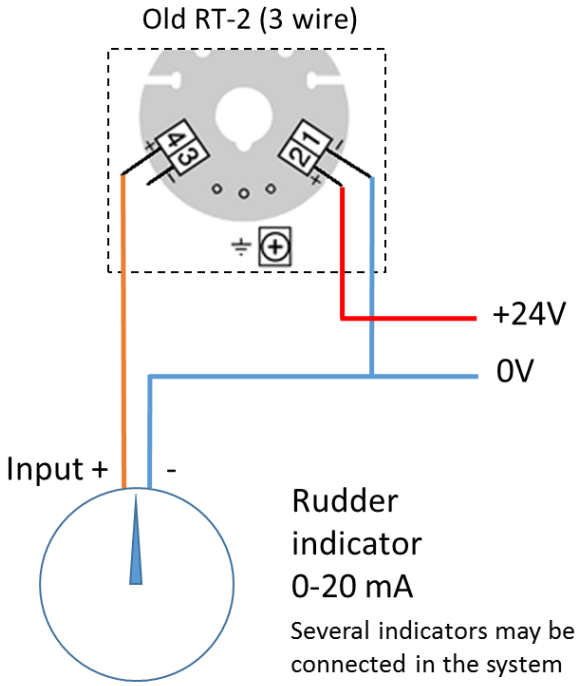
- RTA 602 quick guide
- RTA602 installation instruction

Download from [www.deif.com](http://www.deif.com)

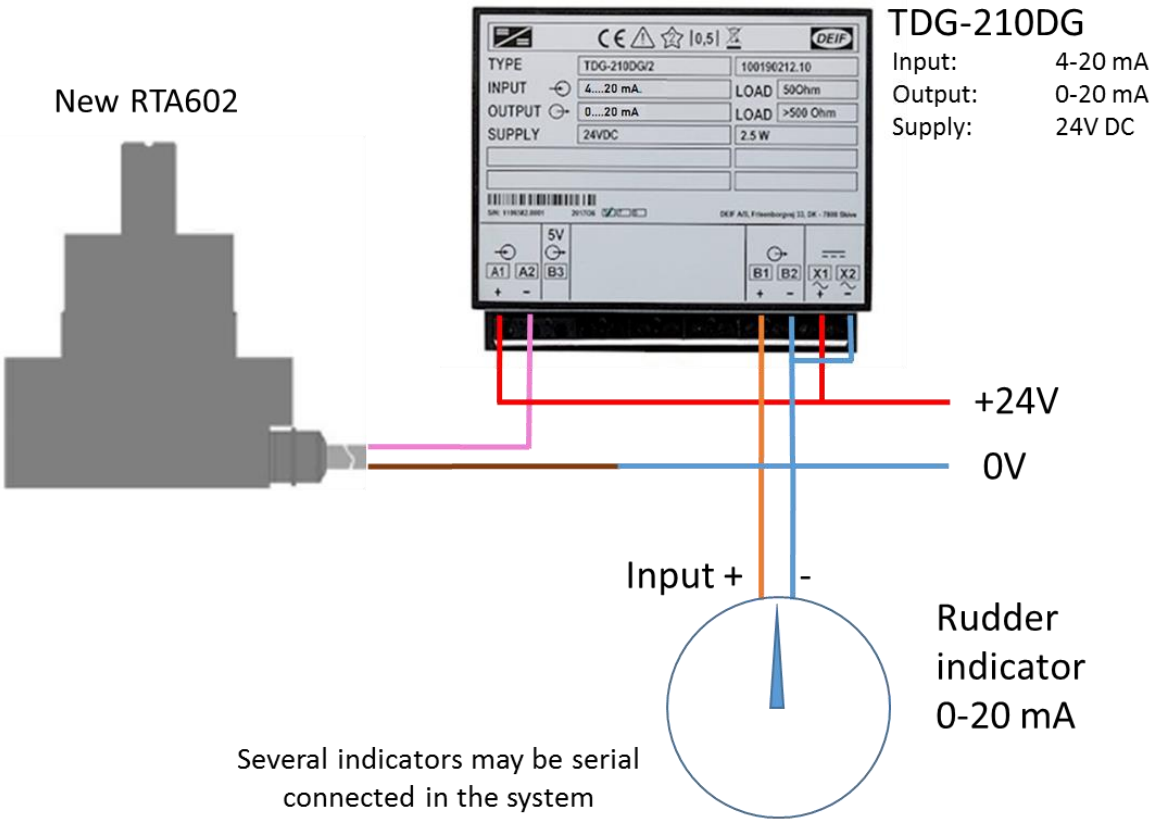
**After calibration, connect green, yellow and grey wires.**

**Replacing RT-2 3-wire in a 0-20 mA indicator system**

The output from the RT-2 is 0-20 mA which requires a TDG-210DG to convert the 4-20 mA output from the RTA-602 to 0-20 mA used as input for the indicators.




**The system when RT-2 is replaced by RTA 602/TDG-210DG**



### RTA 602 connections

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| Brown | I out (- mA) | | |
| Green | S1 (Set 1) | Setup | Normal operation: **All** three setup wires must be connected together |
| Yellow | S2 (Set 2) | | |
| Grey | SC (Set Common) | | |
| White | Not used | Not used | This wire is cut off |

Calibration instructions please see:

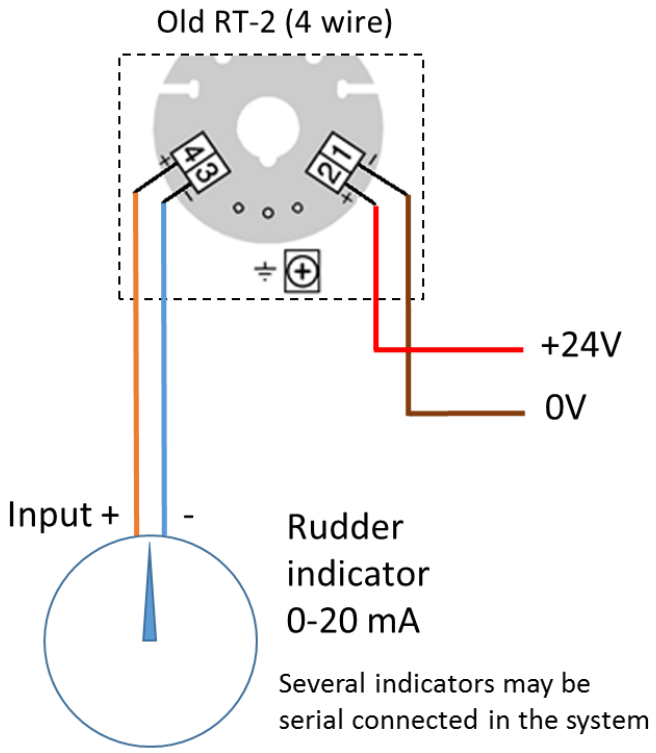
- RTA 602 quick guide
- RTA602 installation instruction

Download from [www.deif.com](http://www.deif.com)

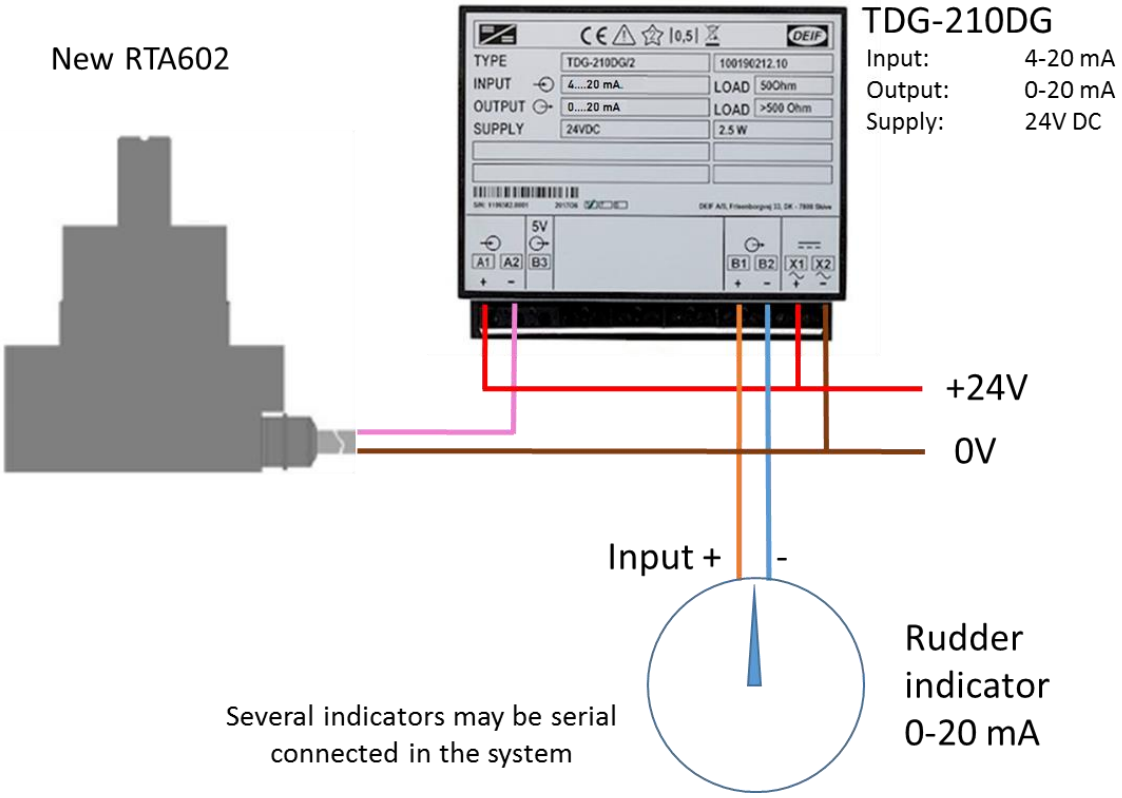
**After calibration, connect green, yellow and grey wires.**

**Replacing RT-2 4-wire in a 0-20 mA indicator system**

This 4-wire connection is configured as a 0-20 mA current loop.




**The system when RT-2 is replaced by RTA 602/TDG-210DG:**



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| Pink | I in (+ mA) | Current in/out | Min. 7.5 V to max. 35 $V_{dc}$ at 4 to 20 mA (Max. range 3.8 to 20.2 mA) |
| Brown | I out (- mA) | | |
| Green | S1 (Set 1) | Setup | Normal operation: **All** three setup wires must be connected together |
| Yellow | S2 (Set 2) | | |
| Grey | SC (Set Common) | | |
| White | Not used | Not used | This wire is cut off |

Calibration instructions please see:

- RTA 602 quick guide
- RTA602 installation instruction

Download from www.deif.com

**After calibration, connect green, yellow and grey wires.**