

Manual BlueTrace Modbus Sensors

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BlueTrace Modbus Sensors

1 Introduction

This manual describes the BlueTrace Modbus Sensors of GO Systemelektronik.

At the completion of this manual, the following types of design were available:

Modbus Sensor	Article number
BlueTrace Oil in Water	461 6200
BlueTrace Crude Oil	461 6300
BlueTrace Turbidity	461 6780

The type of version is indicated on the laser engraved type label on the sensor body.



High-grade steel




Titanium

The products of GO Systemelektronik are constantly being developed, therefore deviations between this manual and the delivered product can result. Please understand that no legal claims can be derived from the contents of this manual.

The documentations of GO Systemelektronik products can be found at www.go-sys.de/downloads.

The symbol  indicates a useful additional information.

The symbol  indicates a note to avoid incorrect operation.

The symbol  indicates an instruction, the non-fulfilment of which may affect the measuring operation.

2 Safety Instructions BlueTrace Oil in Water Sensor and BlueTrace Crude Oil in Water Sensor



Danger: The device emits dangerous UV radiation. Use eye protection.

3 Description of the Sensors


The BlueTrace Modbus Sensors are compact measuring probes. All sensor electronics are located in the sensor electronics unit in the sensor body. All settings are stored in the memory of the sensor electronics unit. The resistant design of the BlueTrace Sensors allows the usage under harsh conditions, such as in corrosive media and under high pressure.


The configuration of the sensors is done with the configuration program Modbus Tool.exe.

⇒ see **Manual Modbus Tool.exe for GO Modbus Sensors**

Modbus Tool.exe is included with the BlueTrace sensors. With Modbus Tool.exe you can, for example, read out sensor information, assign a Modbus address, determine the internal amplification of the input signal, calibrate the sensor and display measurement values.

3.1 Technical Data

Parameter	Oil in Water BTEX PAH
Measuring principle	Fluorescence measurement Evaluation at 300 - 400 nm Light source < 300 nm 
Measuring ranges	0 - 30 ppm 0 - 100 ppm 0 - 300 ppm
Measuring accuracy	typical 3 % FS
Measuring interval	≥ 1 s

Parameter	Crude Oil in Water
Measuring principle	Fluorescence measurement Evaluation at 410 nm - 600 nm Light source < 365 nm 
Measuring ranges	0 - 30 ppm 0 - 100 ppm 0 - 300 ppm
Measuring accuracy	typical 3 % FS
Measuring interval	

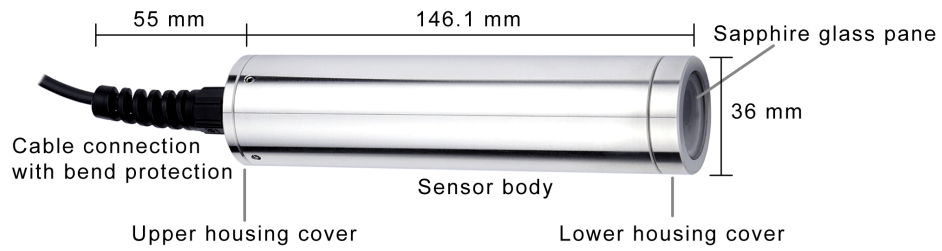
Parameter	Turbidity	Temperature	TSS
Measuring principle	Scattered light measurement; Light source 860 nm	Semiconductor; Bandgap Voltage Reference	Model
Measuring ranges [FNU]	0 - 50 0 - 100 0 - 1000 0 - 4000	0 - 60 °C	0 - 5 g/l*
Measuring accuracy	typical 3 % FS	3 % FS	3 % FS*
Measuring interval	≥ 1 s	≥ 1 s	

Voltage supply	10 - 32 VDC
Power consumption	typical 0.5 W
Weight	0.6 kg
Dimensions	see 3.2 <i>Device Setup</i>
Cable lengths	5 m 10 m 20 m
Ambient temperature range	-5 to +55 °C
Ambient pressure	max. 6 bar
Body material	High-grade steel 1.4404; optional Titanium
Interface	Modbus [RTU]

* Accuracy and calibration depend on the composition of the substance.

BlueTrace Modbus Sensors

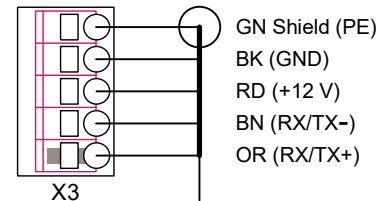
3.2 Device Setup



3.3 Connection Assignment

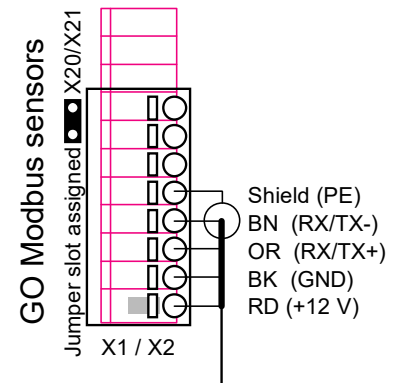
Assignment at the board of the BlueConnect Module

Slot X3

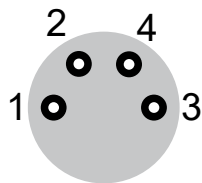


Assignment at the BlueSense Transducer

Slot X1/X2



Pin assignment serial interface on the BlueBox T4



RS485

panel plug (M8, male)

1	GND
2	12 VDC
3	RX/TX-
4	RX/TX+



Cable socket, shielded body



Cable colours see below

! Here there is the BlueBox version with a 4-pin M8 panel plug and a 12 VDC power supply.
For versions with 3-pin M8 panel plug without 12 VDC power supply, an adapter or similar must be used.

Assignment at the motherboard of the BlueBox R1 > see Manual BlueBox R1 and Panel

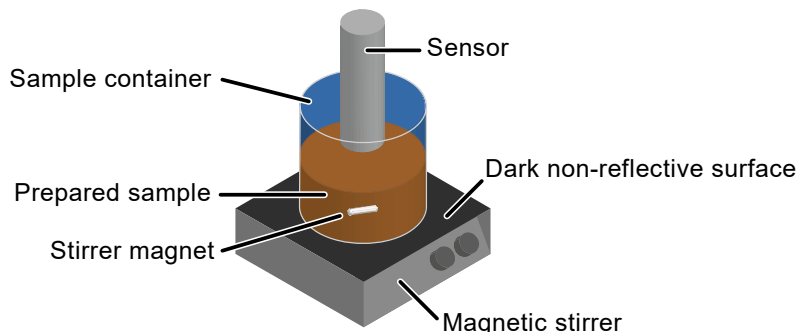
4 Notes on Calibration

4.1 Calibration Oil in Water

! If necessary, the sensor should be cleaned before calibration. see 5.3 *Cleaning the Sensor*

The calibration is done with the configuration programme **Modbus Tool.exe** from GO Systemelektronik.
see *Manual Modbus Tool.exe for GO Modbus Sensors*

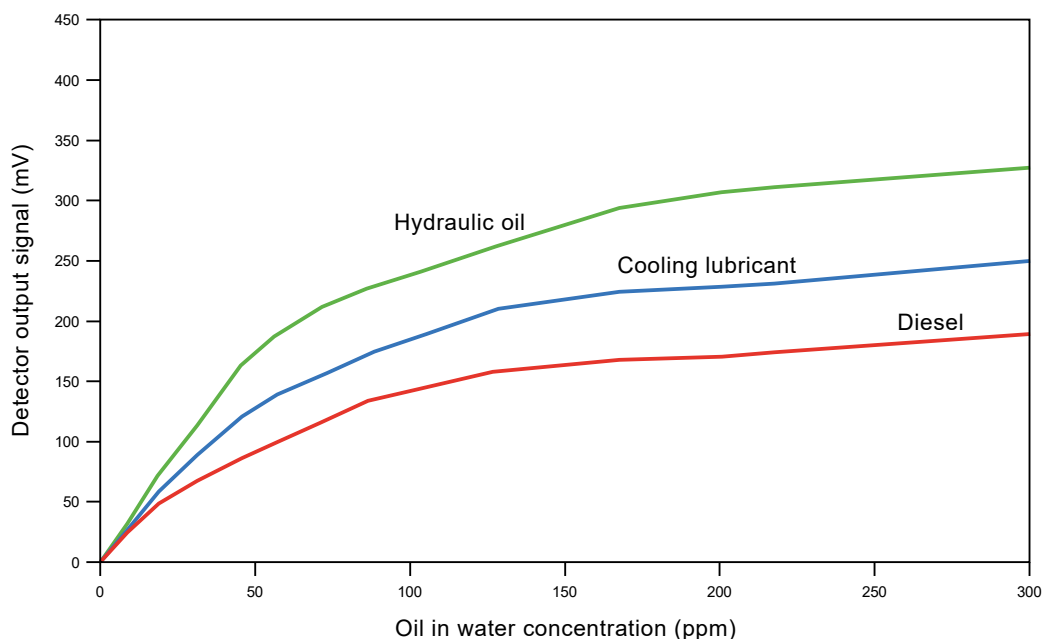
Exemplary setup:



! Distance of the sensor from the bottom of the sample container: ≥ 8 cm
Distance of the sensor from the sides of the sample container: ≥ 4 cm
Avoid ambient light, especially sunlight.

4.1.1 Specifics Calibration Oil in Water

Since the fluorescence spectrum is extremely dependent on the properties of the refined oil to be measured, the sensor functions optimally with a specific calibration to this oil. The absorption of the water also has an influence on the measurement, so that the oil should be mixed with the expected water for calibration. In low concentrations a linear behaviour can be expected, here a two-point calibration can be sufficient – however, at least a three-point calibration is recommended.



The sensor successively measures the prepared samples; then a multi-point calibration is performed with the measurement and reference values. The measurement and reference values are entered into the BlueTrace Configuration Program. With this specific calibration, the reliable measurement of the desired oil in the expected concentrations can be guaranteed.

4.1.2 Specifics Calibration Crude Oil in Water

Wenden Sie sich bitte an GO Systemelektronik.

4.2 Calibration Turbidity and TSS

- The BlueTrace Turbidity Sensor is already calibrated for turbidity measurement in FNU on delivery. If you want to perform your own calibration, contact GO Systemelektronik.
- The calibration of the **TSS measurement** is customer-specific with two calculation coefficients. see *Manual Modbus Tool.exe for GO Modbus Sensors* there 3.3 *The Parameter Window there BlueTrace Turbidity > Parameter*

- ! Distance of the sensor from the bottom of the sample container: ≥ 20 cm
Distance of the sensor from the sides of the sample container: ≥ 4 cm
Avoid ambient light, especially sunlight.

5 Notes on Operation

5.1 Operation Oil in Water

- ! Distance of the sensor from the bottom of the sample container: ≥ 8 cm
Distance of the sensor from the sides of the sample container: ≥ 4 cm
Avoid ambient light, especially sunlight.

5.2 Operation Crude Oil in Water

- ! Distance of the sensor from the bottom of the sample container: ≥ 8 cm
Distance of the sensor from the sides of the sample container: ≥ 4 cm
Avoid direct sunlight.

5.3 Operation Turbidity

- ! Distance of the sensor from the bottom of the sample container: ≥ 20 cm
Distance of the sensor from the sides of the sample container: ≥ 4 cm
Avoid ambient light, especially sunlight.

6 Maintenance



5.1 Maintenance Notes

Prerequisite for a trouble-free operation is a proper installation of the sensor in the measuring location, as well as regular checking of the installation conditions. The sensor must be cleaned as part of the inspection. This cleaning must be carried out at sufficiently short intervals, depending on the external influences.

6.2 Maintenance Recommendations

Although the BlueTrace Oil in Water Sensor is very easy to maintain, the following points must be noted, so that the sensor is always ready to use and gives reliable results:


- ▶ Regular manual cleaning of the sapphire glass pane of the sensor
- ▶ see 5.3 *Cleaning the Sensor*
- ▶ Yearly or half-yearly inspection of the system by GO Systemelektronik authorized service personnel
- ▶ Ensure that the sapphire glass pane of the sensor is always in fluid. A drying out of the sapphire glass pane will lead to a build up of film (depending on the type of fluid) and then a cleaning is necessary.


  BlueTrace Oil in Water BlueTrace Crude Oil in Water	<p>Danger: The device emits dangerous UV radiation during operation. Before maintenance, the unit must be disconnected from the power supply!</p>
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6.3 Cleaning the Sensor

The necessary cleaning interval may vary significantly depending upon location and given dirt level (1 week to 3 months). **Note:** If you want to prolong the manual cleaning interval, ask GO Systemelektronik for accessories for automated cleaning

A slow, continuous change of the measurement value is an indicator of increasing impurity of the sapphire glass pane.

	<p>Caution: Never use strong organic solvents (e.g. acetone), strong acids and bases or abrasive cloths, brushes and steel wool!</p>
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	<p>Please note: Each unauthorized disassembling of the sensor head will void your warranty.</p>
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When cleaning, pay attention to any particles that may be adhering. Remove them with compressed air before using a brush or cloth so that the sapphire glass panes are not scratched during cleaning.

6.3.1 Work Flow of the Cleaning

1. Immerse the sensor in household cleaner in tap water for about 5 minutes. Then remove heavy dirt with a soft brush or a household cloth.
2. Rinse the sensor with warm tap water.
3. Prepare a warm (approx. 50 °C) citric acid solution (concentration 2 – 3 %) with tap water. Immerse the sensor in this solution for 10 – 15 minutes. Then clean the sensor in this solution. Then clean the sapphire glass pane in this solution with a soft brush or household cloth.
4. Use a grease-free alkaline laboratory glass cleaner to prepare a warm (approx. 50 °C) solution (concentration 2 – 3 %) with tap water. Immerse the sensor head and spacers in this solution for 10 – 15 minutes.
5. Rinse the sensor with tap water.

Appendix A – Calibration of a BlueTrace Oil in Water Sensor

Principal method

Multi-point calibration with a blank sample and up to 9 different standard concentrations – The number of standards depends on your measurement range. It is recommended to use at least three standards.

Chemicals:

1. Isopropanol
2. Oil that should be detected

Calibration instruments:

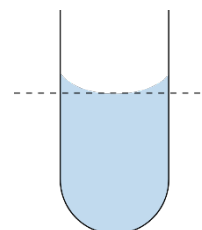
1. Dosing pipettes 1000 µl with pipette tips
2. 2-litre glass beakers; at least two
3. Volumetric flasks 10 ml
4. Measuring cylinders 1000 ml; at least two
5. Magnetic stirrer
6. Lint-free cloth
7. Measuring cylinder stopper
8. Laboratory stand

Preparation of the Samples

Base sample (1 % concentration):

100 µl of the oil is dissolved in 10 ml Isopropanol (use the volumetric flask).

At first pipette 100 µl of the oil into the volumetric flask. Then fill the flask up to mark. The surface of the liquid has a concave meniscus, the lower part of the meniscus has to be on the mark.



The resulting base sample has a concentration of 10,000 ppm (1 %).

Blank-Sample

The blank sample is the water in which the oil is to be detected. If there is no oil-free water available, tap water can be used instead. Note! You can also use DI-Water **but the used water should have a composition / matrix similar as possible to the water at the measuring point.**

Standard-Sample

For a concentration of 10 ppm, mix 800 µl of the base sample with 800 ml Blank Sample. Other concentrations can be generated by mixing the appropriate ratios (see table below).

Concentration	Base sample	Blank sample
1 ppm	80 µl	800 ml
5 ppm	400 µl	800 ml
10 ppm	800 µl	800 ml
:	:	:
:	:	:

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Variant 1 (for a concentration of 10 ppm):

Fill up the measuring cylinder to 800 ml with the same water you used for your Blank Sample and transfer it into the 2-litre glass beaker. Withdraw 800 µl with the 1000 µl pipette of the 2-litre glass beaker. Pipette 800 µl of the Base Sample into the 2-litre glass beaker.

Variant 2 (for a concentration of 10 ppm):

Pipette 800 µl of the Base Sample into the measuring cylinder. Fill up the measuring cylinder to 800 ml. Put a stopper on top of the measuring cylinder and shake the solution, so no oil will be attached to the wall of the measuring cylinder. Immediately transfer the solution into the 2-litre glass beaker.

ATTENTION! If you use the same measuring cylinder for all your standard samples, be sure you make your standards from the lowest to the highest oil concentration, to avoid contamination of old residuals. Additionally clean the measuring cylinder before you prepare the next standard sample.

Calibration procedure

On the BlueSense / BlueBox Transducer, the calibration option is selected.

Firstly, the blank sample (concentration 0 ppm) is set. To do this, you put 800 ml of the blank sample in a 2-litre glass beaker and place it on the magnetic stirrer.

Before you dip the sensor into the beaker, clean the sensor gently from the outside, including the glass, with a lint-free cloth and a drop of Isopropanol on it. For dropping the sensor into the beaker, either hold the sensor in the beaker so that it is vertical, in the middle of the beaker and dipped about 2 – 3 cm into the solution. Alternatively, you install the sensor on a laboratory stand.

You must ensure that the distance between the sensor and the inside beaker wall in all directions is at least 5 cm. The beaker should also be resting on a dark surface. If there are air bubbles on the sensor, they need to be removed by dipping the sensor carefully in and out of the solution. Sometimes it can help to start the magnetic stirrer, dip in the sensor near the beaker wall, and position the sensor afterwards in the middle of the beaker.

Turn the stirrer on to 500 rpm. The sensor uses an internal averaging, on that account it takes a few seconds until a mV-value can be assigned to the concentration. Additionally the oil needs to be homogeneously distributed, therefore wait for at least 90 seconds until you start the calibration

After the blank sample, the standard sample (e.g. concentration 10ppm) should be set. For this, the sensor should be placed like described before in a 2-litre glass beaker with the standard sample. Repeat the prior instructions including the cleaning process of the sensor.

After the calibration, the sensor should once again be placed in the blank sample and the standard samples to check if the correct values are displayed on the BlueSense / BlueBox.

If you have questions:

service@go-sys.de

+49(0)431-58080-17

GO Systemelektronik GmbH

Appendix B – EU Declaration of Conformity BlueTrace Oil in Water



EU-Konformitätserklärung

EU Declaration of Conformity

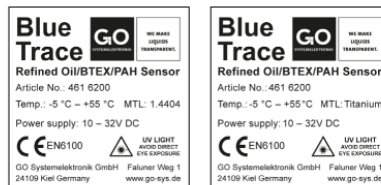
Hersteller: GO Systemelektronik GmbH
Manufacturer: Faluner Weg 1
 24109 Kiel Germany

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.
The sole responsibility for issuing this EU declaration of conformity is carried by the manufacturer.

Gegenstand dieser Erklärung: BlueTrace Öl in Wasser Sensor (tauchfähig bis 6 bar)
Subject to this declaration: BlueTrace Oil in Water Sensor (submersible up to 6 bar)

Artikelnummer: 461 6200
Article No.:

Beschriftung des Produktes:
Product labeling:



Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsvorschriften der Union.
The subject matter described above fulfills the relevant harmonization rules of the Union.

Zugrunde liegende Normen:
Underlying standards:

- | | | |
|-------------------------|----------------------------|---------------------------|
| 1. DIN EN 60079-0:2009 | Allgemeine Anforderungen | General requirements |
| 2. DIN EN 60079-28:2007 | Optische Strahlung 'op is' | Optical Radiation 'op is' |

Nach Prüfung durch den Hersteller entspricht das Gerät auch den folgenden Normen:
After verification by the manufacturer, the device also complies with the following standards:

- | | | |
|----------------------------|----------------------------|---------------------------|
| 1. DIN EN 60079-0:2014-06 | Allgemeine Anforderungen | General requirements |
| 2. DIN EN 60079-28:2016-04 | Optische Strahlung 'op is' | Optical Radiation 'op is' |

(Falls zutreffend) **Gemäß den Bestimmungen der Richtlinie/den Dokumenten:**
(If applicable) Following the provision of directive/the documents:

- | | |
|---|---|
| 1. Fertigungs- und Prüfanweisung BlueTrace 461 6200 | Manufacturing and test instruction BlueTrace 461 6200 |
| 2. Bedienungsanleitung BlueTrace Modbus Sensoren | Manual BlueTrace Modbus Sensors |

Kiel, 21.9.2021
 Ort, Datum der Ausstellung
 Place, date of issue



 Dr. Thorsten Knutz
 Geschäftsführer Managing director

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Appendix C – EU Declaration of Conformity BlueTrace Crude Oil in Water



EU-Konformitätserklärung

EU Declaration of Conformity

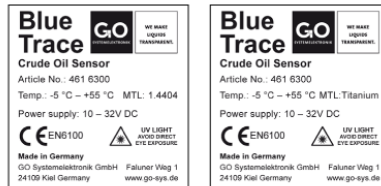
Hersteller: GO Systemelektronik GmbH
Manufacturer: Faluner Weg 1
 24109 Kiel Germany

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.
The sole responsibility for issuing this EU declaration of conformity is carried by the manufacturer.

Gegenstand dieser Erklärung: BlueTrace Rohöl in Wasser Sensor (tauchfähig bis 6 bar)
Subject to this declaration: BlueTrace Crude Oil in Water Sensor (submersible up to 6 bar)

Artikelnummer: 461 6300
Article No.:

Beschriftung des Produktes:
Product labeling:



Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsvorschriften der Union.
The subject matter described above fulfills the relevant harmonization rules of the Union.

Zugrunde liegende Normen:
Underlying standards:

- | | | |
|-------------------------|----------------------------|---------------------------|
| 1. DIN EN 60079-0:2009 | Allgemeine Anforderungen | General requirements |
| 2. DIN EN 60079-28:2007 | Optische Strahlung 'op is' | Optical Radiation 'op is' |

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After verification by the manufacturer, the device also complies with the following standards:

- | | | |
|----------------------------|----------------------------|---------------------------|
| 1. DIN EN 60079-0:2014-06 | Allgemeine Anforderungen | General requirements |
| 2. DIN EN 60079-28:2016-04 | Optische Strahlung 'op is' | Optical Radiation 'op is' |

(Falls zutreffend) **Gemäß den Bestimmungen der Richtlinie/den Dokumenten:**
(If applicable) Following the provision of directive/the documents:

- | | |
|---|---|
| 1. Fertigungs- und Prüfanweisung BlueTrace 461 6300 | Manufacturing and test instruction BlueTrace 461 6300 |
| 2. Bedienungsanleitung BlueTrace Modbusensoren | Manual BlueTrace Modbus Sensors |

Kiel, 25.5.2022
 Ort, Datum der Ausstellung
 Place, date of issue



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Appendix C – EU Declaration of Conformity BlueTrace Turbidity



EU-Konformitätserklärung

EU Declaration of Conformity

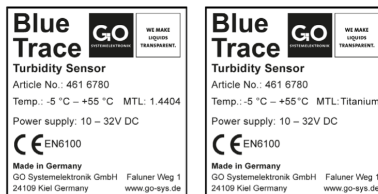
Hersteller: GO Systemelektronik GmbH
Manufacturer: Faluner Weg 1
 24109 Kiel Germany

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.
The sole responsibility for issuing this EU declaration of conformity is carried by the manufacturer.

Gegenstand dieser Erklärung: BlueTrace Trübungssensor (tauchfähig bis 6 bar)
Subject to this declaration: BlueTrace Turbidity Sensor (submersible up to 6 bar)

Artikelnummer: 461 6780
Article No.:

Beschriftung des Produktes:
Product labeling:



Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsvorschriften der Union.
The subject matter described above fulfills the relevant harmonization rules of the Union.

Zugrunde liegende Normen:
Underlying standards:

- | | | |
|-------------------------|----------------------------|---------------------------|
| 1. DIN EN 60079-0:2009 | Allgemeine Anforderungen | General requirements |
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| 2. DIN EN 60079-28:2016-04 | Optische Strahlung 'op is' | Optical Radiation 'op is' |

(Falls zutreffend) **Gemäß den Bestimmungen der Richtlinie/den Dokumenten:**
(If applicable) Following the provision of directive/the documents:

- | | |
|---|---|
| 1. Fertigungs- und Prüfanweisung BlueTrace 461 6780 | Manufacturing and test instruction BlueTrace 461 6780 |
| 2. Bedienungsanleitung BlueTrace Modbusensoren | Manual BlueTrace Modbus Sensors |

Kiel, 21.9.2021
 Ort, Datum der Ausstellung
 Place, date of issue



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