

|                                                                               |                                                                          |                   |                                                                                   |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------|
|  | DS8011en                                                                 | <b>Data Sheet</b> |  |
| TRW9-Series (T)                                                               | <b>Room Temperature Sensor with<br/>Modbus RTU (RS485) communication</b> |                   |                                                                                   |

The TRW9-Series (T) is designed to measure temperature in rooms or areas

The sensor operates with low voltage power supply

In accordance with RESET® and WELL Building Standard™

Parameter settings via NFC technology

The sensor output is RS485 Modbus RTU communication



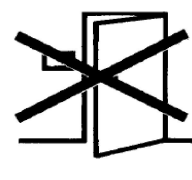
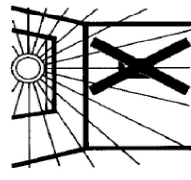
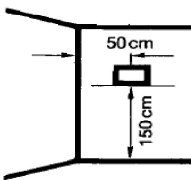
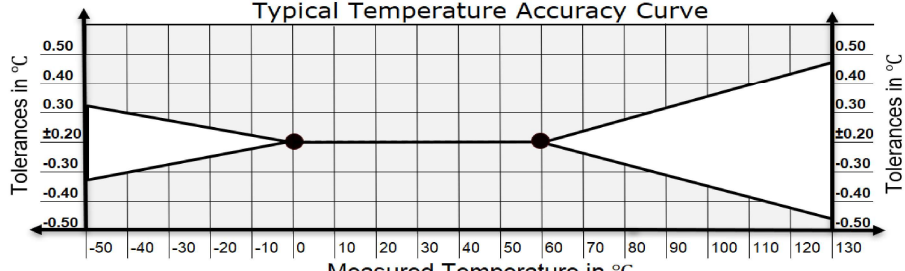
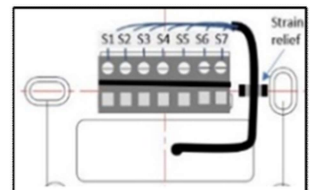
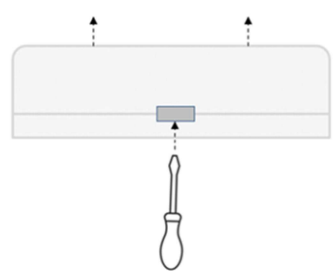
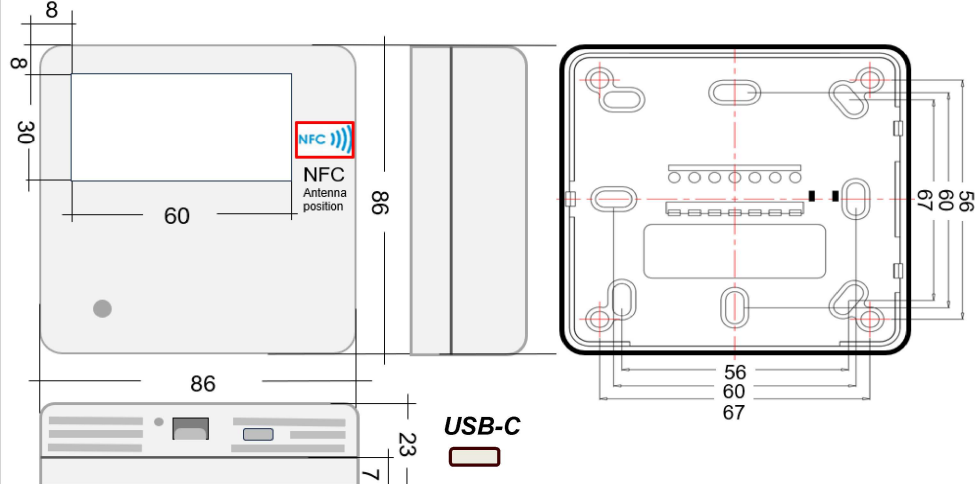
|            |                                                                                                |
|------------|------------------------------------------------------------------------------------------------|
| <b>Use</b> | Compatible to all common HVAC DDC and Analog Controls systems, with Building Automation System |
|            | In Building Automation System where Modbus RTU communication protocols are used                |
|            | Used in all common HVAC applications in Commercial and Industrial Buildings                    |

|                 |                                                            |
|-----------------|------------------------------------------------------------|
| <b>Features</b> | Sensor with Modbus RTU output (field selectable)           |
|                 | With Operation LED, optional with ePaper display available |
|                 | Parameter settings via NFC technology                      |
|                 | Modern and practical product design                        |
|                 | Firmware updates via external USB C                        |
|                 | Easy to use, install and maintain                          |

|                      |             |                    |                                 |            |                                                                  |                   |           |                       |
|----------------------|-------------|--------------------|---------------------------------|------------|------------------------------------------------------------------|-------------------|-----------|-----------------------|
| <b>Product Range</b> | Order Codes | Power Supply       | Display                         | Output     | Measuring Ranges                                                 | Accuracy          | IP Rating | Product dimension     |
|                      | TRW9G.FG    | AC/DC 24 V (±10 %) | Operation LED                   | Modbus RTU | 0 °C to +50 °C (default)<br>-40 °C to +135 °C via NFC adjustable | typically ±0.2 °C | IP20      | 86 mm × 86 mm × 23 mm |
|                      | TRW9G.GG    |                    | ePaper display<br>31 mm × 60 mm |            |                                                                  |                   |           |                       |

|                       |                          |                                         |                                                                                                       |
|-----------------------|--------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------|
| Sensor Specification  | Sensor Specification     | Measured                                | Temperature                                                                                           |
|                       |                          | Sensor Characteristics                  | Active                                                                                                |
|                       |                          | Outputs                                 | Modbus RTU communication, RS485                                                                       |
|                       |                          | Accuracy                                | ±0.2 °C between 0 °C to +50 °C                                                                        |
|                       |                          | Response time                           | t <sub>63</sub> = 2 s                                                                                 |
|                       |                          | Long Term Drift                         | <0.03 °C per year                                                                                     |
|                       |                          | Measuring Range (T)                     | −40 °C to +135 °C                                                                                     |
| Technical Information | Electrical Information   | Power Supply                            | AC/DC 24 V (±10 %)                                                                                    |
|                       |                          | Frequency                               | 50/60 Hz at AC 24 V                                                                                   |
|                       |                          | Terminal Clamp                          | Screw terminal, max. 1.5 mm²                                                                          |
|                       |                          | Power Consumption                       | ≤1 W @ AC 24 V / DC 24 V                                                                              |
|                       | Mechanical Information   | Cable Entry                             | 30 mm × 15 mm, on the backside of the housing                                                         |
|                       |                          | Sensing Element Position                | Inside the housing, bottom of the housing                                                             |
|                       | Materials and Colours    | USB Type C                              | Bootloader for software updates                                                                       |
|                       |                          | Housing Cover                           | ABS, white                                                                                            |
|                       |                          | Housing Bottom                          | ABS, white                                                                                            |
|                       | Environmental Conditions | Operation Temperature                   | −25 °C to +70 °C                                                                                      |
|                       |                          | Operation Humidity                      | 5 % to 95 % RH, no condensation                                                                       |
|                       |                          | Transport Temperature                   | −35 °C to +70 °C                                                                                      |
|                       |                          | Transport Humidity                      | <90 % RH                                                                                              |
|                       |                          | Storage Temperature                     | −10 °C to +70 °C                                                                                      |
|                       |                          | Storage Humidity                        | <85 % RH, no condensation                                                                             |
|                       | Norms and Directives     | IP-Rating                               | IP20 to IEC60529                                                                                      |
|                       |                          | Product Safety                          | Safety class III, in accord. with EN IEC 60730-1                                                      |
|                       |                          | Product Standard                        | Automatic electrical controls for household and similar use<br>in accordance with EN IEC 60730-1:2022 |
|                       |                          | CE marking in accordance with Directive | 2014/30/EU Electromagnetic Compatibility (EMC)                                                        |
|                       |                          | EMC Emissions, in accordance with       | EN IEC 60730-1:2022                                                                                   |
|                       |                          | EMC Immunity, in accordance with        | EN IEC 60730-1:2022                                                                                   |
|                       |                          | RoHS Compliance, in accordance with     | Directive 2011/65/EU, as amended by (EU) 2015/863                                                     |
|                       |                          | Operation Climatic Condition            | IEC 60 721-3-3                                                                                        |
|                       |                          | Operation Mechanical Condition          | IEC 60 721-3-2 to class2M2                                                                            |
|                       |                          | Transport to Climatic Condition         | IEC 60 721-3-2                                                                                        |
|                       |                          | Transport Mechanical Condition          | IEC 60 721-3-2 to class2M2                                                                            |
|                       |                          | Storage Climatic Condition              | IEC 60 721-3-1                                                                                        |
|                       |                          | Storage Mechanical Condition            | IEC 60 721-3-1 to class2M2                                                                            |
| Miscellaneous         | Accessories              | Accessory not included in delivery      | TRA0.A (106 mm × 106 mm backplate)                                                                    |
|                       | Shipping & Handling      | Minimum Order                           | 1 box with 1 piece                                                                                    |
|                       |                          | Package Material                        | Rigid cardboard packaging                                                                             |
|                       | Order Notes              | Order Code                              | See product range, page 1, e.g. TRW9G.FG                                                              |

| Register                                 | Register_Name                                   | Register_Description_1                   | Register_Description_2                                          | Attributes | Range             | Default |
|------------------------------------------|-------------------------------------------------|------------------------------------------|-----------------------------------------------------------------|------------|-------------------|---------|
| 0                                        | MODBUS_SERIALNUMBER_0                           | Serial number 0                          | Actual version                                                  | R          | N/A               | N/A     |
| 1                                        | MODBUS_SERIALNUMBER_1                           | Serial number 1                          | Actual version                                                  | R          | N/A               | N/A     |
| 2                                        | MODBUS_SERIALNUMBER_2                           | Serial number 2                          | Actual version                                                  | R          | N/A               | N/A     |
| 3                                        | MODBUS_SERIALNUMBER_3                           | Serial number 3                          | Actual version                                                  | R          | N/A               | N/A     |
| 4                                        | MODBUS_VERSION_SOFTWARE                         | Software version                         | Actual version                                                  | R          | N/A               | N/A     |
| 5                                        | MODBUS_VERSION_HARDWARE                         | Hardware version                         | Actual version                                                  | R          | N/A               | N/A     |
| 6                                        | MODBUS_ADDRESS                                  | MODBUS address                           | Default 120, selectable 1–254                                   | R/W        | 1 to 254          | 120     |
| 7                                        | MODBUS_PORTOCOL_SELECTION                       | Protocol                                 | 0 = MODBUS RTU                                                  | R/W        | 0                 | 0       |
| 9                                        | MODBUS_BAUD_MANUAL                              | Baud rate                                | 0 = 9600; 1 = 19.200; 2 = 38.400;<br>3 = 57.600; 4 = 115.200    | R/W        | 0 to 4            | 1       |
| 10                                       | MODBUS_STOP_BITS                                | MODBUS stop bits                         | 0 = 1bit; 1 = 2bits                                             | R/W        | 0 or 1            | 0       |
| 11                                       | MODBUS_PARITY_BITS                              | Parity bits                              | 0 = none; 1= even; 2 = odd                                      | R/W        | 0 to 2            | 1       |
| 12                                       | MODBUS_DEFAULT_RESET                            | Factory reset                            | 0 = updated values,<br>1 = update to default values             | R/W        | 0 or 1            | 0       |
| Temperature<br>(50–99)                   | Register_Name                                   | Register_Description_1                   | Register_Description_2                                          | Attributes | Range             | Default |
| 50                                       | MODBUS_TEMPERATURE_CALIBRATION                  | Temperature sensor calibration<br>±10 K) | Calibration factor (10 = 1 K)                                   | R/W        | –100 to +100      | 0       |
| 51                                       | MODBUS_TEMPERATURE_UNIT                         | °C (Celsius) = 0<br>°F (Fahrenheit) = 1  | Temperature unit                                                | R/W        | 0 or 1            | 0       |
| 52                                       | MODBUS_TEMPERATURE_MIN_RANGE                    | Temperature minimum range                | Microchip temperature range                                     | R/W        | –40 °C to +135 °C | N/A     |
| 53                                       | MODBUS_TEMPERATURE_MAX_RANGE                    | Temperature maximum range                | Microchip temperature range                                     | R/W        | –40 °C to +135 °C | N/A     |
| 55                                       | MODBUS_TEMPERATURE_VALUE                        | Temperature actual value                 | Temperature value including calibration<br>value                | R          | N/A               | N/A     |
| Humidity<br>(100–149)                    | Register_Name                                   | Register_Description_1                   | Register_Description_2                                          | Attributes | Range             | Default |
| 100                                      | MODBUS_REL_HUMIDITY                             | Rel. humidity actual value               | Rel. Humidity actual value including<br>calibration value       | R          | 0 to 100 %        | N/A     |
| 101                                      | MODBUS_DEW_POINT_VALUE                          | Dew point actual value                   | Dew Point actual value including<br>calibration value           | R          | –20 °C to +80 °C  | N/A     |
| 102                                      | MODBUS_ENTHALPY_VALUE                           | Enthalpy actual value                    | Enthalpy actual value including calibration<br>value            | R          | 0 to 85 kJ/kg     | N/A     |
| 103                                      | MODBUS_ABSOLUTE_HUMIDITY                        | Absolute Humidity actual value           | Absolute Humidit value including<br>calibration value           | R          | 0 to 50 g/m³      | N/A     |
| 104                                      | MODBUS_HUMIDITY_CALIBRATION                     | Humidity sensor calibration<br>(±10 %)   | Calibration factor (10 = 1 %)                                   | R/W        | 0 to 1000         | 0       |
| Air Quality CO <sub>2</sub><br>(150–199) | Register_Name                                   | Register_Description_1                   | Register_Description_2                                          | Attributes | Range             | Default |
| 150                                      | MODBUS_CO <sub>2</sub> _VALUE                   | CO <sub>2</sub> value                    | CO <sub>2</sub> value including calibration value               | R          | 0 to 5000         | N/A     |
| 151                                      | MODBUS_CO <sub>2</sub> _CALIBRATION             | CO <sub>2</sub> calibration (±500 ppm)   | Calibration factor (1 = 10 ppm)                                 | R/W        | –500 to +500      | 0       |
| 152                                      | MODBUS_CO <sub>2</sub> _MIN_RANGE               | CO <sub>2</sub> minimum range            | Microchip CO <sub>2</sub> range                                 | R/W        | 0 to 5000         | N/A     |
| 153                                      | MODBUS_CO <sub>2</sub> _MAX_RANGE               | CO <sub>2</sub> maximum range            | Microchip CO <sub>2</sub> range                                 | R/W        | 0 to 5000         | N/A     |
| 170                                      | MODBUS_CO <sub>2</sub> _LED/DIS_RELEASE         | 0 = enables; 1 = disabled                | LED control                                                     | R/W        | 0 or 1            | 0       |
| 171                                      | MODBUS_CO <sub>2</sub> _LED/DIS_STATUS          | 0 = good; 1 = fair; 2 = bad              | LED status                                                      | R/W        | 0 to 2            | N/A     |
| 172                                      | MODBUS_CO <sub>2</sub> _LED/DIS_GREEN_SETPOINT  | Max value for good                       | CO <sub>2</sub> Level "Fair" On<br>Yellow Color On / EMOJI fair | R/W        | 0 to 40000        | 800     |
| 173                                      | MODBUS_CO <sub>2</sub> _LED/DIS_Yellow_SETPOINT | Max value for fair                       | CO <sub>2</sub> Level "Bad" On<br>Red Color On / EMOJI bad      | R/W        | 0 to 40000        | 1400    |
| Air Quality VOC<br>(200–249)             | Register_Name                                   | Register_Description_1                   | Register_Description_2                                          | Attributes | Range             | Default |
| 200                                      | MODBUS_VOC_VALUE                                | VOC value                                | VOC value including calibration value                           | R          | N/A               | N/A     |
| 201                                      | MODBUS_VOC_CALIBRATION                          | VOC sensor calibration                   | Calibration factor (1 = 1 VOC Index Point<br>(IP)               | R/W        | 100               | 0       |
| 202                                      | MODBUS_VOC_MIN_OUTPUT                           | VOC range                                | Microchip VOC Range<br>(VOC Index Points IP)                    | R/W        | 0 to 500          | N/A     |
| 203                                      | MODBUS_VOC_MAX_OUTPUT                           | VOC range                                | Microchip VOC Range<br>(VOC Index Points IP)                    | R/W        | 0 to 500          | N/A     |
| 220                                      | MODBUS_VOC_LED/DIS_RELEASE                      | 0 = enables; 1 = disabled                | LED control                                                     | R/W        | 0 or 1            | 0       |
| 221                                      | MODBUS_VOC_LED/DIS_STATUS                       | 0 = good; 1 = fair; 2 = bad (red)        | LED status                                                      | R/W        | 0 to 2            | N/A     |
| 222                                      | MODBUS_VOC_LED/DIS_GREEN_SETPOINT               | Max value for good                       | VOC Level "Fair" On<br>Yellow Color On / EMOJI fair             | R/W        | 0 to 500          | 200     |
| 223                                      | MODBUS_VOC_LED/DIS_YELLOW_SETPOINT              | Max value for fair                       | VOC Level "Bad" On<br>Red Color On / EMOJI bad                  | R/W        | 0 to 500          | 350     |

|                        | <div><div>Installation Notes</div><div><p>Observe the following general regulation for engineering and installation:</p><p>All relevant national and local electrical installation codes</p><p>Other country-specific regulations</p><p>Comply with all local safety regulations, schematics, cable listings, dispositions, specifications, and arrangements from the engineering office in charge</p><p>Third-party specifications, e.g., general contractors' or constructors' notes</p></div></div>   |     |         |         |    |    |                  |     |     |         |         |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------|---------|----|----|------------------|-----|-----|---------|---------|
| Advices                | <div><div>Mounting Advices</div><div></div></div>                                                                                                                 |     |         |         |    |    |                  |     |     |         |         |
|                        | <div><div>Disposal Notes</div><div><p>The device is considered an electronic device for disposal in terms of the European Directive 2012/19/EU</p><p>The device may not be disposed as domestic garbage</p><p>The device must be disposed through channels provided for this purpose</p><p>It is mandatory to comply with local currently applying laws and regulations</p></div></div>                                                                                                                  |     |         |         |    |    |                  |     |     |         |         |
|                        | <div><div>NFC Setting</div><div><p>All devices marked with the NFC Logo can be parameterized via the Gruner AP NFC APP</p><p>The NFC APP is available on the Gruner AP Website, <a href="https://www.grunerasiapacific.com/">https://www.grunerasiapacific.com/</a></p><p>Hold your NFC-capable Android phone to the NFC Logo, the installed APP will start automatically</p><p><b>Commissioning Note:</b> The sensor will reach its specified accuracy after 1 hour of being powered up</p></div></div> |     |         |         |    |    |                  |     |     |         |         |
| Accuracy Curves        | <div><div>Typical Temperature Accuracy Curve</div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |         |         |    |    |                  |     |     |         |         |
| Dimensional Drawing    | <div></div>                                                                                                                                                                                                                                                                                                                 |     |         |         |    |    |                  |     |     |         |         |
| Connections & Settings | <div><div>Terminals</div><table><tr><th>S1</th><th>S2</th><th>S3</th><th>S4</th><th>S5</th></tr><tr><td>UB+<br/>24V AC/DC</td><td>GND</td><td>GND</td><td>RS485 B</td><td>RS485 A</td></tr></table></div>                                                                                                                                                                                                                                                                                                                                                                                | S1  | S2      | S3      | S4 | S5 | UB+<br>24V AC/DC | GND | GND | RS485 B | RS485 A |
| S1                     | S2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | S3  | S4      | S5      |    |    |                  |     |     |         |         |
| UB+<br>24V AC/DC       | GND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | GND | RS485 B | RS485 A |    |    |                  |     |     |         |         |