DS8041en	Data Sheet	GRUNER
TOW9-Series (T)	**Outdoor Temperature Sensor** **Modbus RTU (RS-485) Communication**	

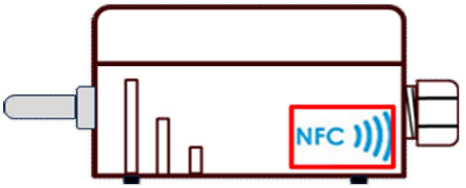
The TOW9-Series (T) is designed to measure temperature in outdoor areas, plant rooms, cold stores, greenhouses, production plants and warehouses

In accordance with RESET® and WELL Building Standard™ Reading

Cover/bottom housing connected with magnets and two screws

Reading/parameter settings via NFC technology

The sensor characteristic is active



Use

Compatible to all common HVAC DDC and Analog Controls systems, with/without Building Automation System

Used in all common HVAC applications

Used in Commercial and Industrial Buildings

Features

Sensor output is Modbus RTU (RS-485)

Reading/parameter settings via NFC technology

Professional and practical product design

Cover/bottom housing connected with magnets and screws

Firmware updates via service connector (C+)

Easy to use, install and maintain

Product Range

Order Code	Output	Measuring Element	Power Supply	Measuring Range	Accuracy	IP Rating	Product Dimension
TOW9G.DG	Modbus RTU (RS-485)	Outside the housing	AC/DC 24 V (±10 %)	−40 °C to +60 °C (default) Free selectable via NFC −40 °C to +135 °C	±0.2 °C between 0 °C to +50 °C	IP65 to IEC60529	78 mm × 58 mm × 47 mm

Sensor Specification	**Sensor Specification**	Measured	Temperature
		Sensor Characteristic	Active
		Sensing Element	PT1000 Class A
		Sensor Output	Modbus RTU (RS-485)
		Accuracy	±0.2 °C between 0 °C to +50 °C
		Default Measuring Range	−40 °C to +60 °C
		Maximum Measuring Range	Free selectable via NFC −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 @ 24 V AC/DC
	Mechanical Information	Sensor Pocket Diameter	6 mm
		Sensor Pocket Length	35 mm
		Cable Entry	M16, Ø6~Ø8 mm cables
		Bootloader for software updates	C+ Connector
		Sensing Element Position	External, top of the immersion rod
	Materials and Colours	Housing Cover	ABS, white
		Housing Bottom	ABS, white
		Lock Screws	US:AISI 304; EU: EN X 6 CrNi 18 10; GER: W.N. 1.301
		Lock Nuts	Brass
		Cable Gland	ABS. white
		Gland Rubber Seal	TPS, natural
		Protection Caps	ABS, white
		Immersion Rod	US:AISI 304; EU: EN X 6 CrNi 18 10; GER: W.N. 1.301
	Environmental Conditions	Operation Temperature	−25 °C to +70 °C
		Operation Humidity	100 % RH, with condensation
		Transport Temperature	−35 °C to +70 °C
		Transport Humidity	<90 % RH
		Storage Temperature	−10 °C +70 °C
		Storage Humidity	<85 % RH, no condensation
	Norms and Directives	IP-Rating	IP65 to IEC60529
		Product Safety	Safety class III, in accordance with EN IEC 60730-1
		Product Standard	Automatic electrical controls for household and similar use 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**	N/A	
	Shipping & Handling	Minimum Order	1 box with 2 pieces, multiple of 2 pieces
		Package Material	Rigid cardboard packaging
	Order Note	Order Code	See product range, page 1, e.g. TOW9G.DG

Modbus Parameters

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 = 19200; 2 = 38400; 3 = 57600; 4 = 115200	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, 1 = update to default values	R/W	0 or 1	0
Temperature (50–99)	**Register_Name**	**Register_Description_1**	**Register_Description_2**	**Attributes**	**Range**	**Default**
50	MODBUS_TEMPERATURE_CALIBRATION	Temperature sensor calibration ±10 K)	Calibration factor (10 = 1 K)	R/W	−100 to +100	0
51	MODBUS_TEMPERATURE_UNIT	°C (Celsius) = 0 °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 value	R	N/A	N/A
Humidity (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 calibration value	R	0 to 100 %	N/A
101	MODBUS_DEW_POINT_VALUE	Dew point actual value	Dew Point actual value including calibration value	R	–20 °C to +80 °C	N/A
102	MODBUS_ENTHALPY_VALUE	Enthalpy actual value	Enthalpy actual value including calibration value	R	0 to 85 kJ/kg	N/A
103	MODBUS_ABSOLUTE_HUMIDITY	Absolute Humidity actual value	Absolute Humidity value including calibration value	R	0 to 50 g/m³	N/A
104	MODBUS_HUMIDITY_CALIBRATION	Humidity sensor calibration (±10 %)	Calibration factor (10 = 1 %)	R/W	0 to 1000	0
Air Quality CO_2 (150–199)	**Register_Name**	**Register_Description_1**	**Register_Description_2**	**Attributes**	**Range**	**Default**
150	MODBUS_CO_2_VALUE	CO_2 value	CO_2 value including calibration value	R	0 to 5000	N/A
151	MODBUS_CO_2_CALIBRATION	CO_2 calibration (±500 ppm)	Calibration factor (1 = 10 ppm)	R/W	–500 to +500	0
152	MODBUS_CO_2_MIN_RANGE	CO_2 minimum range	Microchip CO_2 range	R/W	0 to 5000	N/A
153	MODBUS_CO_2_MAX_RANGE	CO_2 maximum range	Microchip CO_2 range	R/W	0 to 5000	N/A
170	MODBUS_CO_2_LED/DIS_RELEASE	0 = enables; 1 = disabled	LED control	R/W	0 or 1	0
171	MODBUS_CO_2_LED/DIS_STATUS	0 = good; 1 = fair; 2 = bad	LED status	R/W	0 to 2	N/A
172	MODBUS_CO_2_LED/DIS_GREEN_SETPOINT	Max value for good	CO_2 Level "Fair" On Yellow Colour On / EMOJI fair	R/W	0 to 40000	800
173	MODBUS_CO_2_LED/DIS_Yellow_SETPOINT	Max value for fair	CO_2 Level "Bad" On Red Colour On / EMOJI bad	R/W	0 to 40000	1400
Air Quality VOC (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 (IP)	R/W	100	0
202	MODBUS_VOC_MIN_OUTPUT	VOC range	Microchip VOC Range (VOC Index Points IP)	R/W	0 to 500	N/A
203	MODBUS_VOC_MAX_OUTPUT	VOC range	Microchip VOC Range (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	LED status	R/W	0 to 2	N/A
222	MODBUS_VOC_LED/DIS_GREEN_SETPOINT	Max value for good	VOC Level "Fair" On Yellow Colour On / EMOJI fair	R/W	0 to 500	200
223	MODBUS_VOC_LED/DIS_YELLOW_SETPOINT	Max value for fair	VOC Level "Bad" On Red Colour On / EMOJI bad	R/W	0 to 500	350

Advices

Installation Notes

Observe the following general regulation for engineering and installation:

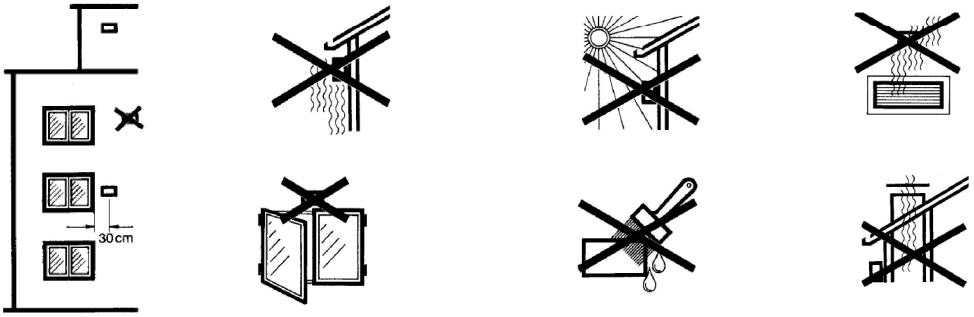
All relevant national and local electrical installation codes

Other country-specific regulations

Comply with all local safety regulations, schematics, cable listings, dispositions, specifications, and arrangements from the engineering office in charge

Third-party specifications, e.g., general contractors' or constructors' notes

Mounting Advices



Disposal Notes

The device is considered an electronic device for disposal in terms of the European Directive 2012/19/EU

The device may not be disposed as domestic garbage

The device must be disposed through channels provided for this purpose

It is mandatory to comply with local currently applying laws and regulations

NFC Setting

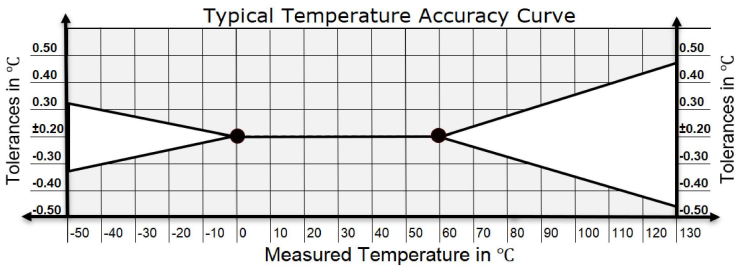
All devices marked with the NFC Logo can be parameterized via the Gruner AP NFC APP

The NFC APP is available on the Gruner AP Website, https://www.grunerasiapacific.com/

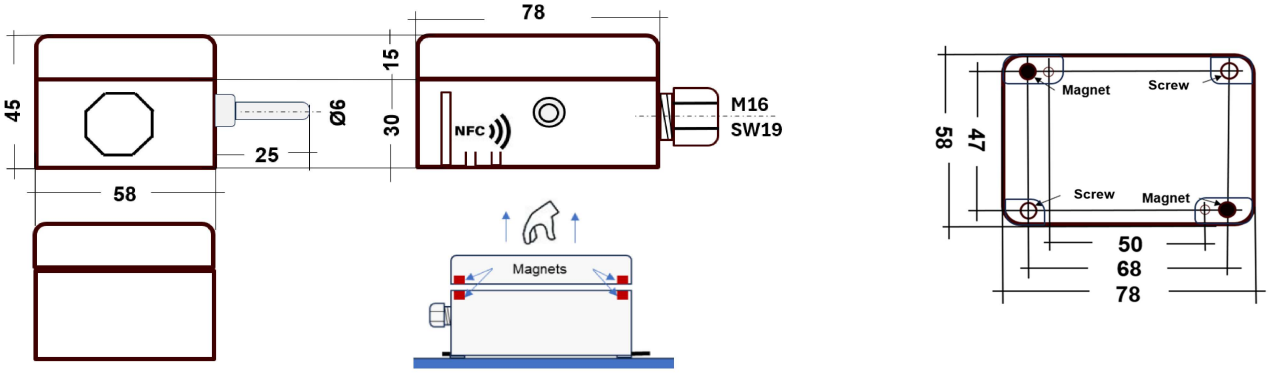
Hold your NFC-capable Android phone to the NFC Logo, the installed APP will start automatically

Commissioning Note: The sensor will reach its specified accuracy after 1 hour of being powered up

Accuracy Curves



Dimensional Drawing



Connections & Settings

Terminal Connections						
S1	S2	S3	S4	S5	S6	S7
N/A	N/A	24 V AC/DC	GND	N/A	RS485 B (+)	RS485 A (-)