



## FEATURES

- RS485 MODBUS RTU, FULLY COMPLIANT, FULLY PROGRAMMABLE
- 1/8 LOAD, ALLOWING UP TO 247 DEVICES ON THE NETWORK
- RESOLUTION: 1 uS/cm
- THE TRANSMITTER IS BUILT-IN THE HEAD - IT IS JUST THE PROBE AND A THIN CABLE COMING OUT OF IT
- HIGH ISOLATION
- POTENTIAL FREE ELECTRODES - THE MEASUREMENT DOES NOT CHANGE OR POLARIZE THE LIQUID
- PROGRAMMABLE TEMPERATURE COEFFICIENT FROM 0.00 TO 10.00 % / °C
- PROGRAMMABLE 10 POINTS CURVE FOR THE TEMPERATURE COEFFICIENT
- SWITCHING BETWEEN SINGLE TempCo OR A 10 POINTS CURVE AT ANY TIME
- LIQUID TEMPERATURE: -20 TO +120 °C
- AMBIENT TEMPERATURE: -30 TO +80 °C
- KYNAR PVDF BODY AND GRAPHITE ELECTRODES ENSURE HIGH CHEMICAL AND WEAR RESISTANCE
- PLATINUM RTD ENSURES ACCURATE TEMPERATURE MEASUREMENT AND COMPENSATION
- ONE POINT FIELD CALIBRATION
- IP67 (NEMA-6) PROTECTION ON THE ELECTRONICS
- WEIGHT: 176 g (6.2 oz)
- DIMENSIONS: (dia)33.3 mm x (L)102 mm ((dia)1.32" x (L)4.0")

## APPLICATIONS

- WATER TREATMENT
- COOLING TOWERS
- WATER TOWERS
- LABORATORY MEASUREMENTS



## 1. DESCRIPTION

GCT100K-MB is a low power conductivity transmitter with a RS485 MODBUS RTU communication port. It represents 1/8 load allowing up to 247 devices connected to the same network. Conductivity, temperature coefficient, curve and other settings can be read many times a second or written at any time.

The temperature coefficient can be programmed at any time from 0.00 to 10.00 %/°C. The reference temperature is also programmable allowing greater flexibility and various options for temperature compensation.

GCT100K-MB also offers a 10 points curve for temperature compensation. Switching between the single temperature coefficient and the curve can be done at any time in parts of a second. This way the temperature compensation can be done accurately in a very large temperature range.

The calibration is one point only and can be done in the field through the communication port of GCT100K-MB in a couple of minutes.

Using high quality materials and our proprietary circuits and algorithms ensures high accuracy, reliability, flexibility and long time without service.



## 2. ABSOLUTE MAXIMUM RATINGS \*

Liquid temperature	-20 °C to +120 °C
Ambient temperature	-30 °C to +80 °C
Power supply voltage	40 VDC

\* **NOTE: Stresses above those ratings may cause permanent damage to the device.**

## 3. CHARACTERISTICS

Parameter	Conditions	Min	Typical	Max	Units
Power supply voltage	-30 °C to +80 °C	8.5		36	V DC
Consumption	-30 °C to +80 °C			18	mA
Resolution	25 °C, 8.5 – 36 V DC		1		uS/cm
Temperature Error	Liquid temperature from -20 °C to +120 °C		0.3	0.5	°C
Conductivity Error	25 °C, 0–100 000 uS/cm, <b>Note 1</b>		0.5 % + 1uS/cm		% of rate
<b>Materials</b>					
Head body			Kynar PVDF		
Electrodes			Graphite		
Transmitter body			CPVC		
<b>Mechanical</b>					
Thread			1" NPT		
Communication port			Two-wire RS485, MODBUS RTU, 1/8 load		
Cable			4 wire, 180 cm (6') long		

**Note 1:** Percent of rate, not full scale. This means the measured conductivity will be within 0.5 % of the real conductivity, no matter where in the whole range. For more about errors and accuracy, please read our document [AN103](#).

## 4. PROGRAMMING AND COMMUNICATION

GCT100K-MB has a two wire RS485 MODBUS RTU communication port. All programming is available through this port. It can be connected to a lap top or a PC through a USB to RS485 converter or to a PLC through RS232 to RS485 converter.

The settings are:

- The baud rate is 9600, 19 200, 38 400, 57 600 or 115 200, programmable. Default is 19 200.
- The character is 8 bit
- The parity is none, odd or even, programmable. Default is even.
- Stop bits are 1 or 2, not programmable. MODBUS standard requires 1 stop bit with odd or even parity and 2 stop bits with no parity.
- No handshaking.

MODBUS address is programmable from 1 to 247. Default is 1.

The protocol for communication is MODBUS RTU. Functions 0x03 (read holding registers), 0x04 (read input registers) and 0x06 (write single register) are implemented. GCT100K-MB handles exceptions 1, 2 and 3.



Here are the registers used:

<b>Register address</b>	<b>Register Type</b>	<b>Read/Write</b>	<b>Description</b>	<b>Format</b>
19	Input	R	Conductivity in uS/cm, high word, <b>NOTE 4</b>	
20	Input	R	Conductivity in uS/cm, low word	
21	Input	R	Temperature , <b>NOTE 1</b> -200 to +1200 = -20.0 °C to +120 °C	538 = 53.8 °C
1012	Holding	R/W	Temperature coefficient 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1015	Holding	R/W	Reference Temperature , <b>NOTE 1</b> -200 to +1200 = -20.0 °C to +120 °C	default is 250 = 25.0 °C
1016	Holding	R/W	Curve 0 = single TempCo, 1 = Curve	default is 0 = single TempCo
1017	Holding	R/W	Temperature for <b>Point 0</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is -200 = -20.0 °C
1018	Holding	R/W	Temperature coefficient for <b>Point 0</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1019	Holding	R/W	Temperature for <b>Point 1</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1020	Holding	R/W	Temperature coefficient for <b>Point 1</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1021	Holding	R/W	Temperature for <b>Point 2</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1022	Holding	R/W	Temperature coefficient for <b>Point 2</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1023	Holding	R/W	Temperature for <b>Point 3</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1024	Holding	R/W	Temperature coefficient for <b>Point 3</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1025	Holding	R/W	Temperature for <b>Point 4</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1026	Holding	R/W	Temperature coefficient for <b>Point 4</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1027	Holding	R/W	Temperature for <b>Point 5</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1028	Holding	R/W	Temperature coefficient for <b>Point 5</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1029	Holding	R/W	Temperature for <b>Point 6</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1030	Holding	R/W	Temperature coefficient for <b>Point 6</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1031	Holding	R/W	Temperature for <b>Point 7</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1032	Holding	R/W	Temperature coefficient for <b>Point 7</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1033	Holding	R/W	Temperature for <b>Point 8</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1034	Holding	R/W	Temperature coefficient for <b>Point 8</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1035	Holding	R/W	Temperature for <b>Point 9</b> , <b>NOTE 1</b> , <b>NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C



1036	Holding	R/W	Temperature coefficient for <b>Point 9</b> 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1053	Holding	W	Baud Rate, <b>NOTE 3</b>	default is 1 = 19 200
1054	Holding	W	Parity: 0 = even, 1 = odd, 2 = none, <b>NOTE 3</b>	default is 0 = even
1200	Holding	W	MODBUS address , 1 to 247	default is 1

**NOTE 1:** This is a signed 16 bit integer

**NOTE 2:** Point 0 must have the lowest temperature and every next point must have higher temperature than the previous point. Do not skip points. Program the temperature of the unused points with 1200.

**NOTE 3:** When changing the baud rate, the MODBUS address or the parity, GCT100K-MB will first do the change and then reply to the master with the new setting already in effect.

0 = 9 600  
1 = 19 200  
2 = 38 400  
3 = 57 600  
4 = 115 200

**NOTE 4:** High and low words must be combined into a 32 bit unsigned integer

**TIP:** After changing the MODBUS address, or the baud rate or the parity, write down the new setting on the white label on GCT100K-MB

#### 4.1. USING THE CURVE

Typically the temperature coefficient is not a constant but it changes with the temperature. Using a single temperature coefficient for compensating in a large temperature range may not be accurate enough. If you know how the TempCo changes in the temperature you can use the curve to improve the accuracy of the measurement. Program the points of the curve and then switch to using the curve instead of a single TempCo.

**NOTE:** Point 0 must have the lowest temperature and every next point must have higher temperature than the previous point. Do not skip points. Program the temperature of the unused points with 1200.

## 5. APPLICATION

### 5.1. ELECTRICAL

The cable of GCT100K-MB has four wires – two for power and two for the RS485 port.

Red – power “+”  
Black – power “-”

White – RS485 signal A (D+)  
Green – RS485 signal B (D-)

The RS485 port is not isolated from the power. If you need to use RS485 ground, use the power ground (black wire).

**NOTE:** If the application allows we strongly recommend earth grounding the negative (black wire) of the power supply.



Both the power and the RS485 are isolated from the electrodes and the liquid.

## 5.2. MECHANICAL

GCT100K-MB has a standard 1" NPT. We strongly recommend mounting GCT100K in a CPVC sch 80, PVC or other plastic Tee.

To mount the transmitter use 1-1/16" wrench with a thin head.

**NOTE: Do not try mounting GCT100K-MB by rotating its gray part. This may damage the electronics inside the gray CPVC piece of pipe.**

## 6. ORDERING

For ordering please use G Instruments part number 30545



## IMPORTANT NOTICE

G Instruments reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products at any time without notice.

Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

G Instruments does not assume any liability arising from the use of any device or circuit described herein, nor does it convey any license under its patent rights or the rights of others.

Customers are responsible for their products and applications using G Instruments devices. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

G Instruments products are not authorized for use as critical components in life support devices or systems without express written approval of G Instruments.

Trademarks and registered trademarks are the property of their respective owners.