



FEATURES

- ISOLATED LOOP POWER 4-20 mA OUTPUT WITH REVERSE POLARITY AND SURGE PROTECTION
- RESOLUTION: 1 uA
- THE TRANSMITTER IS BUILT-IN THE HEAD - IT IS JUST THE PROBE AND A THIN CABLE COMING OUT OF IT
- TRIPPLE ISOLATION
- POTENTIAL FREE ELECTRODES - THE MEASUREMENT DOES NOT CHANGE OR POLARIZE THE LIQUID
- BOTH THE CONDUCTIVITY FOR 4 mA AND 20 mA ARE FIELD PROGRAMMABLE FROM 0 TO 100 000 uS/cm - THE OUTPUT CAN BE MOVED UP/DOWN, SCALED OR INVERSED
- FIELD PROGRAMMABLE TEMPERATURE COEFFICIENT FROM 0.00 TO 10.00 % / °C
- SINGLE TempCo OR A 10 POINTS CURVE
- LIQUID TEMPERATURE: -20 TO +120 °C
- AMBIENT TEMPERATURE: -30 TO +80 °C
- KYNAR PVDF BODY AND GRAPHITE ELECTRODES ENSURE VERY HIGH CHEMICAL AND WEAR RESISTANCE
- PLATINUM RTD ENSURES VERY ACCURATE TEMPERATURE MEASUREMENT AND COMPENSATION
- ONE POINT FIELD CALIBRATION
- IP67 (NEMA-6) PROTECTION ON THE ELECTRONICS
- WEIGHT: 180 g (6.3 oz)
- DIMENSIONS: (dia)33.3 mm x (L)110 mm ((dia)1.32" x (L)4.33")

APPLICATIONS

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



1. DESCRIPTION

GCT100K is a low power conductivity transmitter with an isolated loop power 4-20 mA output. Both the conductivity for 4 mA and the conductivity for 20 mA can be programmed on the field in the range of 0 – 100 000 uS/cm. This way the output can be scaled, moved up and down and / or even made inverse anywhere in the range of 0 to 100 000 uS/cm.

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

GCT100K also offers a 10 points curve for temperature compensation. Switching between the single temperature coefficient and the curve can be done at any time on the field in 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 programming port of GCT100K 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
Voltage for the analog output	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
Analog Output					
Power Supply	-30 °C to +80 °C, Note 1	7.5		36	V DC
Resolution	25 °C, 7.5 – 36 V DC		1		µA
Temperature Error	Liquid temperature from -20 °C to +120 °C		0.3	0.5	°C
Conductivity Error	25 °C, 0–100 000 µS/cm, read through the port, Note 2		0.5 % + 1µS/cm		% of rate
Materials					
Head body	Kynar PVDF				
Electrodes	Graphite				
Transmitter body	CPVC				
Mechanical					
Thread	1" NPT				
Wrench	1-1/16" thin head wrench				
Programming port	5 V TTL RS232, MODBUS RTU				
Cable	4 wires, 180 cm (6') long, Note 3				

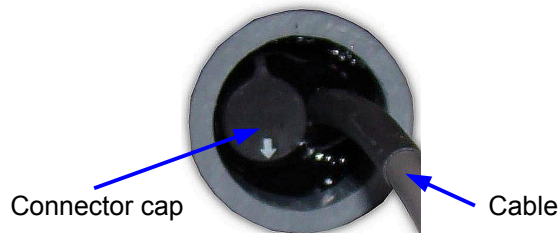
Note 1: The minimum voltage for the 4-20 mA output to operate is $V = 7.5 + R_{load} [\text{ohm}] * 0.020$ [V DC]
For a GCT100K with a load of 250 ohm connected the minimum voltage would be 12.5 V DC.

Note 2: 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](#).

Note 3: GCT100K PN 30230 has 7 wires cable, 180 cm (6') long, no connector
GCT100K PN 30339 has 7 wires cable, 5 m (16'.4) long, no connector

4. PROGRAMMING

GCT100K has a programming port located on the back, next to the cable. The connector has a water-tight cap. Remove the cap and connect the programmer GFP23 (PN 30560).



NOTE: Make sure to replace the cap after programming.

NOTE: GCT100K, PN 30230 and 30339 have no connector but 7 wires cable instead.



GFP23 is a USB to 5V TTL RS232 converter with the proper connector at the end of its cable. The programming can be done using our software or a third party software using a PC or a lap top on the field.

The communication port of GCT100K is 3 wire 5V TTL RS232. Its settings are: 19 200, 8 bit character, even parity, 1 stop bit, no handshaking. The protocol used for communication is MODBUS RTU. Functions 0x03 (read holding registers), 0x04 (read input registers) and 0x06 (write single register) are implemented. GCT100K handles exceptions 1, 2 and 3. The default MODBUS address is 1 and it can not be changed.

Here are the registers used:

Register address	Register Type	Read/Write	Description	Format
19	Input	R	Conductivity in uS/cm, high word, NOTE 3	
20	Input	R	Conductivity in uS/cm, low word	
1008	Holding	R/W	Conductivity for 4 mA in uS/cm high word, NOTE 3	default is 0
1009	Holding	R/W	Conductivity for 4 mA in uS/cm low word	default is 0
1010	Holding	R/W	Conductivity for 20 mA in uS/cm high word, NOTE 3	default is 0 NOTE 4
1011	Holding	R/W	Conductivity for 20 mA in uS/cm low word	default is 10 000 uS/cm NOTE 4
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 in °C default is 250 = 25.0 °C	276 = 27.6 °C
1016	Holding	R/W	Single TempCo = 0, Curve = 1 default is 0 = Single TempCo	
1017	Holding	R/W	Temperature for Point 0, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is -200 = -20.0 °C
1018	Holding	R/W	Temperature coefficient for Point 0 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1019	Holding	R/W	Temperature for Point 1, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1020	Holding	R/W	Temperature coefficient for Point 1 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1021	Holding	R/W	Temperature for Point 2, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1022	Holding	R/W	Temperature coefficient for Point 2 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1023	Holding	R/W	Temperature for Point 3, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1024	Holding	R/W	Temperature coefficient for Point 3 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1025	Holding	R/W	Temperature for Point 4, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1026	Holding	R/W	Temperature coefficient for Point 4 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C



1027	Holding	R/W	Temperature for Point 5, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1028	Holding	R/W	Temperature coefficient for Point 5 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1029	Holding	R/W	Temperature for Point 6, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1030	Holding	R/W	Temperature coefficient for Point 6 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1031	Holding	R/W	Temperature for Point 7, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1032	Holding	R/W	Temperature coefficient for Point 7 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1033	Holding	R/W	Temperature for Point 8, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1034	Holding	R/W	Temperature coefficient for Point 8 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C
1035	Holding	R/W	Temperature for Point 9, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120.0 °C	default is 1200 = +120.0 °C
1036	Holding	R/W	Temperature coefficient for Point 9 0 to 1000 = 0.00 to 10.00 %/°C	default is 200 = 2.00 %/°C

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

NOTE 4: For GCT100K, PN 30339, factory default is 100 000 uS/cm

4.1. USING THE CURVE

Typically the temperature coefficient is not a constant and 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 has four wires – two for power and two for the analog output.

Red – power “+”
Black – power “-”

White – analog output “+”
Green – analog output “-”

The analog output is passive. It controls the current through it but it does not provide the power to the loop. The power has to be provided by the device receiving the signal or by an external power supply.

GCT100K, PN 30230 and 30339 have 3 additional wires instead of the programming connector:

Blue - common for the communication
Orange - TxD → data from GCT100K to the programmer
Brown - RxD ← data from the programmer to GCT100K

5.2. MECHANICAL

GCT100K 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 by rotating its gray part. This may damage the electronics inside the gray CPVC piece of pipe.

6. ORDERING

For ordering please use the following G Instruments part numbers:

<i>Description</i>	<i>G Instruments PN</i>
GCT100K with 4 wires, 6' long cable	30222
GCT100K with 7 wires, 6' long cable	30230
GCT100K with 7 wires, 16.4' long cable	30339
GFP23 programmer	30560



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