



FEATURES

- **OUTPUT OPTIONS, ALL ISOLATED AND PROTECTED:**
 - PASSIVE 4-20 mA
 - ACTIVE 0-20 mA
 - ACTIVE 4-20 mA
 - 0-5 V
 - 0-10 V
- **RESOLUTION: BETTER THAN 2 μ A (4-20 mA)**
- **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 0 % AND 100% OUTPUT ARE FIELD PROGRAMMABLE FROM 0 TO 2000 μ S/cm - THE OUTPUT CAN BE MOVED UP/DOWN, SCALED OR INVERSED**
- **FIELD PROGRAMMABLE TEMPERATURE COEFFICIENT FROM 0.00 TO 10.00 % / $^{\circ}$ C**
- **SINGLE TempCo OR A 10 POINTS CURVE**
- **LIQUID TEMPERATURE: -20 TO +120 $^{\circ}$ C**
- **AMBIENT TEMPERATURE: -30 TO +80 $^{\circ}$ C**
- **21.6 – 26.4 VDC POWER**
- **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)**
- **DIMMENSIONS: (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

GCT2000 is a low power conductivity transmitter with an isolated analog output:

- GCT2000 has a passive 4-20 mA
- GCT2001 – active 0-20 mA
- GCT2002 – active 4-20 mA
- GCT2003 – 0 to 5 V
- GCT2004 – 0 to 10 V

Both the conductivity for 0 % and the conductivity for 100 % output can be programmed on the field in the range of 0 – 2000 μ S/cm. This way the output can be scaled, moved up and down and / or even made inverse in the range of 0 to 2000 μ S/cm.

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

GCT2000 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 GCT2000 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	26.4 VDC
Voltage for the analog output, GCT2000	40 VDC

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

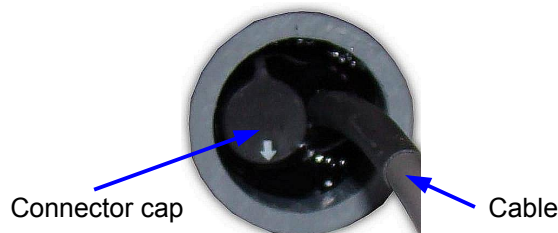
3. CHARACTERISTICS

Parameter	Conditions	Min	Typical	Max	Units
Power supply voltage	-30 °C to +80 °C	21.6		26.4	V DC
Consumption, GCT2000	-30 °C to +80 °C			14	mA
GCT2001				30	mA
GCT2002				30	mA
GCT2003				30	mA
GCT2004				30	mA
Analog Output					
Power Supply, GCT2000 only	-30 °C to +80 °C, Note 1	7.5		36	V DC
Resolution, GCT2000-202	GCT2001 and GCT2002 do not need external power supply		1.7		µA
Resolution, GCT2003	GCT2003 does not need external power supply		0.63		mV
Resolution, GCT2004	GCT2004 does not need external power supply		1.3		mV
Temperature Error	Liquid temperature from -20 °C to +120 °C		0.3	0.5	°C
Conductivity Error	25 °C		TBD		
Materials					
Head body	Kynar PVDF				
Electrodes	Graphite				
Transmitter body	CPVC				
Mechanical					
Thread	1" NPT, undersized				
Wrench	1-1/16" thin head wrench				
Programming port	5 V TTL RS232, MODBUS RTU				
Cable	4 wire, 180 cm (6') long				

Note 1: The minimum voltage for the 4-20 mA output to operate is $V = 7.5 + R_{load} [ohm] * 0.020$ [V DC]
 For a GCT2000 with a load of 250 ohm connected the minimum voltage would be 12.5 V DC.

4. PROGRAMMING

GCT2000 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.

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 GCT2000 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. GCT2000 handles exceptions 1, 2 and 3. The default MODBUS address is 1 and it can be changed.

Here are the registers used:

<i>Register address</i>	<i>Register Type</i>	<i>Read/Write</i>	<i>Description</i>	<i>Format</i>
20	Input	R	Conductivity in 0.1 uS/cm steps 0 – 20 000 = 0 – 2000.0 uS/cm	53 = 5.3 uS/cm
1008	Holding	R/W	Conductivity for 0% output in uS/cm 0 to 2000	default is 0 uS/cm
1009	Holding	R/W	Conductivity for 100% output in uS/cm 0 to 2000	default is 2000 uS/cm
1010	Holding	R/W	Temperature coefficient 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1012	Holding	R/W	Reference Temperature , NOTE 1 -200 to +1200 = -20.0 °C to +120 °C	default is 250 = 25.0 °C
1013	Holding	R/W	Curve 0 = single TempCo, 1 = Curve	default is 0 = single TempCo
1014	Holding	R/W	Temperature for Point 0, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is -200 = -20.0 °C
1015	Holding	R/W	Temperature coefficient for Point 0 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1016	Holding	R/W	Temperature for Point 1, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1017	Holding	R/W	Temperature coefficient for Point 1 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1018	Holding	R/W	Temperature for Point 2, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1019	Holding	R/W	Temperature coefficient for Point 2 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1020	Holding	R/W	Temperature for Point 3, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1021	Holding	R/W	Temperature coefficient for Point 3 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1022	Holding	R/W	Temperature for Point 4, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1023	Holding	R/W	Temperature coefficient for Point 4 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1024	Holding	R/W	Temperature for Point 5, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1025	Holding	R/W	Temperature coefficient for Point 5	default is 200 = 2.00 %/°C



			0 to 1000 = 0.00 to 10.0 %/°C	
1026	Holding	R/W	Temperature for Point 6, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1027	Holding	R/W	Temperature coefficient for Point 6 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1028	Holding	R/W	Temperature for Point 7, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1029	Holding	R/W	Temperature coefficient for Point 7 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1030	Holding	R/W	Temperature for Point 8, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1031	Holding	R/W	Temperature coefficient for Point 8 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1032	Holding	R/W	Temperature for Point 9, NOTE 1, NOTE 2 -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1033	Holding	R/W	Temperature coefficient for Point 9 0 to 1000 = 0.00 to 10.0 %/°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.

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 GCT200x has four wires – two for power and two for the analog output.

Red – power “+” 24 VDC

Black – power “-” 24 VDC

USE 24 VDC REGULATED, THE VOLTAGE MUST BE 21.6 – 26.4 VDC. CHECK IF IT REALLY IS BEFORE CONNECTING TO GCT200x DEVICE.

White – analog output “+”

Green – analog output “-”



- **GCT2000** 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. The white wire sinks and the green wire sources the current.
- **GCT2001-2004** analog outputs are active. They do not need external power and the device that receives the signal must be passive. The white wire is sourcing and the green wire is sinking the signal.

5.2. MECHANICAL

GCT2000 has 1" NPT. We strongly recommend mounting GCT2000 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 GCT2000 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>
GCT2000 conductivity transmitter with 6 feet 4 wire cable	30348
GCT2001 conductivity transmitter with 6 feet 4 wire cable	30349
GCT2002 conductivity transmitter with 6 feet 4 wire cable	30350
GCT2003 conductivity transmitter with 6 feet 4 wire cable	30351
GCT2004 conductivity transmitter with 6 feet 4 wire cable	30352
GFP23 programmer	30560



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