



## FEATURES

- ISOLATED LOOP POWER 4-20 mA OUTPUT WITH REVERSE POLARITY AND SURGE PROTECTION
- RESOLUTION: BETTER THAN 2  $\mu$ A
- 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 20 000  $\mu$ 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
- 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

GCT20K 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 – 20 000  $\mu$ S/cm. This way the output can be scaled, moved up and down and / or even made inverse in the range of 0 to 20 000  $\mu$ 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.

GCT20K 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 GCT20K 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.**

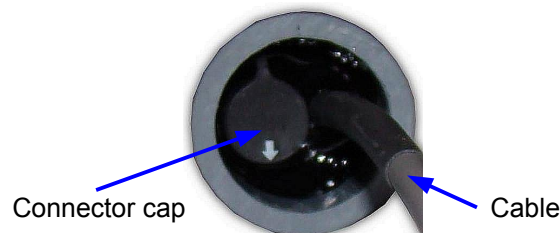
## 3. CHARACTERISTICS

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			16	mA
<b>Analog Output</b>					
Power Supply	-30 °C to +80 °C, Note 1	7.5		36	V DC
Resolution	25 °C, 7.5 – 36 V DC		1.7		uA
Temperature Error	Liquid temperature from -20 °C to +120 °C		0.3	0.5	°C
Conductivity Error	25 °C		TBD		
<b>Materials</b>					
Head body	Kynar PVDF				
Electrodes	Graphite				
Transmitter body	CPVC				
<b>Mechanical</b>					
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  $V = 7.5 + R \text{ load [ohm]} * 0.020$  [V DC]  
For a GCT20K with a load of 250 ohm connected the minimum voltage would be 12.5 V DC.

## 4. PROGRAMMING

GCT20K 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: GCT20K, PN 30686 and 30686 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 GCT20K 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. GCT20K handles exceptions 1, 2 and 3. The default MODBUS address is 1 and it can not be changed.

Here are the registers used:

<b>Register address</b>	<b>Register Type</b>	<b>Read/Write</b>	<b>Description</b>	<b>Format</b>
20	Input	R	Conductivity in uS/cm 0 to 20 000	12 550 = 12 550 uS/cm
1008	Holding	R/W	Conductivity for 4 mA in uS/cm 0 to 20 000	default is 0 uS/cm
1009	Holding	R/W	Conductivity for 20 mA in uS/cm 0 to 20 000	default is 10 000 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 , <b>NOTE 1</b> -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 <b>Point 0, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is -200 = -20.0 °C
1015	Holding	R/W	Temperature coefficient for <b>Point 0</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1016	Holding	R/W	Temperature for <b>Point 1, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1017	Holding	R/W	Temperature coefficient for <b>Point 1</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1018	Holding	R/W	Temperature for <b>Point 2, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1019	Holding	R/W	Temperature coefficient for <b>Point 2</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1020	Holding	R/W	Temperature for <b>Point 3, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1021	Holding	R/W	Temperature coefficient for <b>Point 3</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1022	Holding	R/W	Temperature for <b>Point 4, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1023	Holding	R/W	Temperature coefficient for <b>Point 4</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1024	Holding	R/W	Temperature for <b>Point 5, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1025	Holding	R/W	Temperature coefficient for <b>Point 5</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1026	Holding	R/W	Temperature for <b>Point 6, NOTE 1, NOTE 2</b>	default is 1200 = +120.0 °C



			-200 to +1200 = -20.0 °C to +120 °C	
1027	Holding	R/W	Temperature coefficient for <b>Point 6</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1028	Holding	R/W	Temperature for <b>Point 7, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1029	Holding	R/W	Temperature coefficient for <b>Point 7</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1030	Holding	R/W	Temperature for <b>Point 8, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1031	Holding	R/W	Temperature coefficient for <b>Point 8</b> 0 to 1000 = 0.00 to 10.0 %/°C	default is 200 = 2.00 %/°C
1032	Holding	R/W	Temperature for <b>Point 9, NOTE 1, NOTE 2</b> -200 to +1200 = -20.0 °C to +120 °C	default is 1200 = +120.0 °C
1033	Holding	R/W	Temperature coefficient for <b>Point 9</b> 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 GCT20K 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.

**GCT20K, PN 30685 and 30686 have 3 additional wires instead of the programming connector:**

Blue – common for the communication  
Orange - TxD → data from GCT20K to the programmer  
Brown - RxD ← data from the programmer to GCT20K



## 5.2. MECHANICAL

GCT20K has 1" NPT. We strongly recommend mounting GCT20K 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 GCT20K 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>
GCT20K with 4 wire, 6' long cable	30520
GCT20K with 7 wire, 6' long cable	30685
GCT20K with 7 wire, 5m (16.4') long cable	30686
GFP23 programmer	30560



## IMPORTANT NOTICE

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