June 1, 2004

OPERATING MANUAL

Density Transmitter

Gamma Instrument Services

GHK-7ED

HK INSTRUMENT SYSTEMS
Gamma Instrument Services div
90 Clairton Blvd.
Suite 13
Pittsburgh, PA 15236
Tel: (412) 653-7717
Fax: (412) 291-1245
E-mail: HKInstrumentsBG@aol.com

INDEX

APPENDIX

I. System Description

A. The Density Transmitter is designed to make a non-contacting measurement of the density of liquids, suspensions, and slurries. The measurement can be carried out on a pipeline or in a vessel.

II. User Interface

The parameters that set up the Density Transmitter and allow the user to perform the required operations are accessed through the keypad located on the front panel of the Transmitter (Figure 1). There are six (6) buttons, which allow the user to interface with the menu driven software that runs the Density Transmitter.

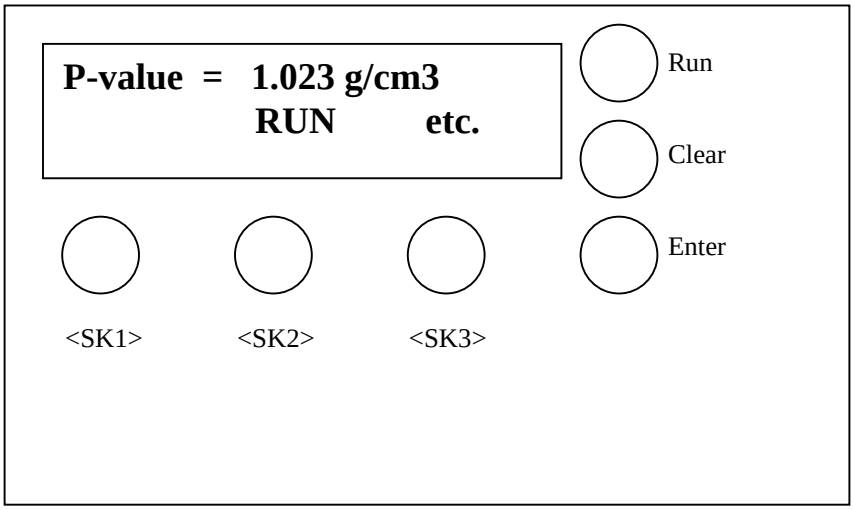


Figure 1

1. Keypad

a) Description of keypad buttons

<SK1>
- Selection of menus and sub-menus
- Entering of numbers, when necessary
- Viewing of options within a sub-menu

<SK2>
- Selection of menus and sub-menus
  Moving of cursor when entering numbers

<SK3.>
- Use this button to move from one menu position to the next

<Enter>
- This button is pressed to confirm an input or change

<Clear>
- Press to clear display and return to last known value

<Run>
- Starts and stops the measurement

2. Menus

The Density Transmitter uses the following menus to configure the system:

- General
- Meas. par
- Operate
- Calibr.
- Service
- T-comp

Menu Name **Menu Description**

General General system parameters are located in this menu:

1) Locking and unlocking the keypad
2) Selection of language
3) Program version
4) Date
5) Units of measure

Meas. Par. Specific system parameters are located in this menu:

1) Time constant for signal averaging
2) Rapid Switchover
3) Current output values
4) Min and Max Threshold Values with Hysteresis setting
5) Density of Solid Component
6) Density for Liquid Component

Operate Measured values are displayed in this menu. No inputs allowed:

1) Live display of measurement, g/cc, %, g/l, Be
2) Live display of Countrates
3) Product temperature (optional)

Calibr. Calibration is performed in this menu:

1) Calibration curve found in this sub-menu.
2) Calibration data points are located here (Optional)

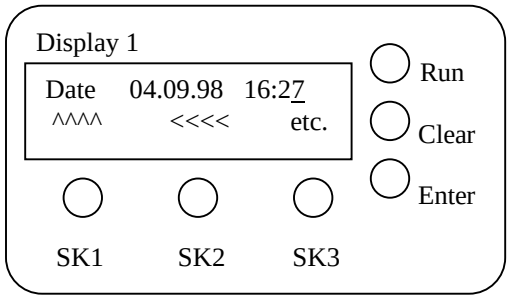
Service

1) Select Isotope for Decay Compensation
2) Test rate can be selected here to test unit.
3) Starting point of measurement entered here
4) Current output selection of 0-20 mA or 4-20 mA
5) Current input selection of 0-20 mA or 4-20 mA
6) Test current output selected here
7) The output of the current during the hold condition is set here

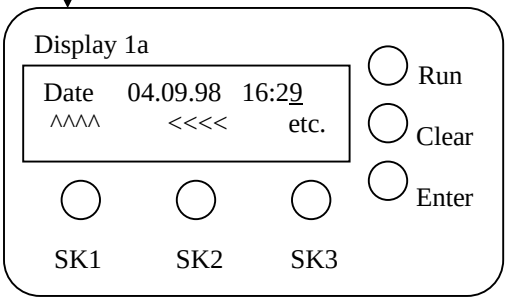
T-comp In this menu, it is possible to switch on or off the temperature compensation and to adjust the necessary parameters.

3. Entering Numbers

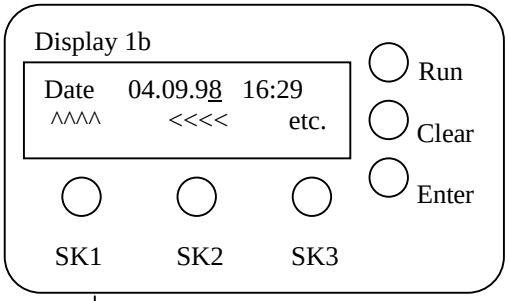
Entering numbers is quite easy. Three buttons are used to enter numbers - <SK1>, <SK2>, and Enter.
<SK1> is used to increase the number directly over the Cursor.
<SK2> moves the Cursor to the left.
Enter button confirms entry.
Let's enter a new number in the display for date and time.
Current value = 04.09.98 16:27
New value = 04.09.99 16:29:



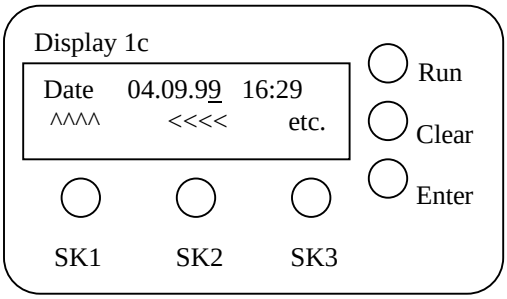
Step 1. Looking at display 1, increase the number over the Cursor to the number 9. It is now 7.
Press the <SK1> button until the number 9 is seen Over the Cursor (display 1a). Press Enter.



Step 2. Change the year to 99. Press <SK2>
Until the Cursor is positioned under the 1 (display 1b).



Step 3. Press the <SK1> button until the number 9 is seen
Over the Cursor (display 1c).



Step 4. Press Enter button and change the date from
04.09.98 16:27 to 04.09.99 16:29.

4) Entering numbers in Screens that contain two (2) Variables.

Note: There are certain screens, which contain two (2) variables, which must be entered. These screens are:

1. The Data Pairs in the Calibration Menus. Each screen contains both the Density of the sample and the Scintillation Detector Countrate.

2. The Factor and Offset are also found in the Calibration Menu.

3. The Linear Temperature Compensation Coefficient, Tk, and the Reference Temperature are found on the same screen in the Temp Menu.

4. The values for the 4 and 20 mA temperature inputs are found in a screen in the T-Comp Menu.

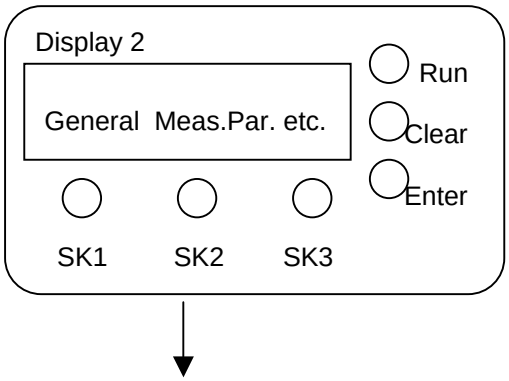
III. How to make it work, Using System software

A) General Menu

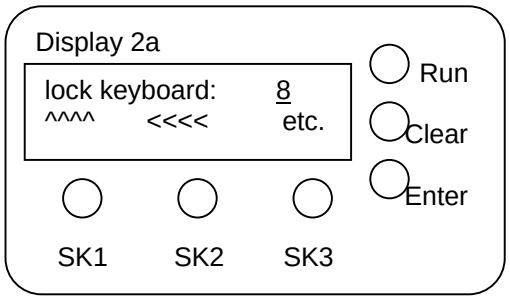
1. Locking the keypad – when it is necessary to protect the data in your evaluation unit from unauthorized access, it is possible to enter a passnumber to lock out keypad access.

Note: Make sure the system is in the RUN mode before locking the keypad.

Step 1. Press the <SK3> button until you see the word
General displayed.



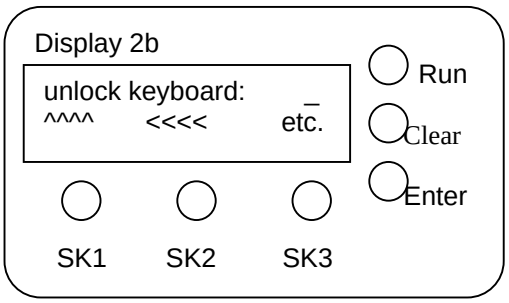
Step 2. Press the <SK> button, which selects the General Menu.
The first Display in the General menu is display 2a.
Step 3. Press <SK1> to place a number over the
Cursor. 8 will be entered here.
Step 4. Press <SK2> to move the Cursor. Repeat Step 3.



Step 5. After you have placed your passnumber in
The display presses the Enter button. This number
Has become your password. The keypad is now
Locked and you must re-enter this passnumber to unlock it.

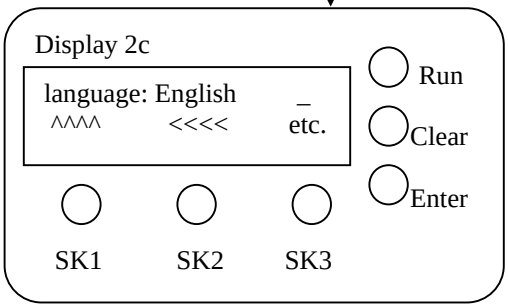
2) Unlocking the keypad – if you have entered a number
To lock the keypad, you must re-enter that number
According to the following steps to unlock the keypad
And gain access:

Step 1. Select the General Menu.
Step 2. Press <SK3> button until display 2b is shown.
Step 3. Press <SK1> button to place a number over
The Cursor.
Step 4. Press <SK2> to re-position the Cursor.
Step 5. Repeat until you see your passnumber in the
Display.
Step 6. Press the Enter button to unlock keypad.



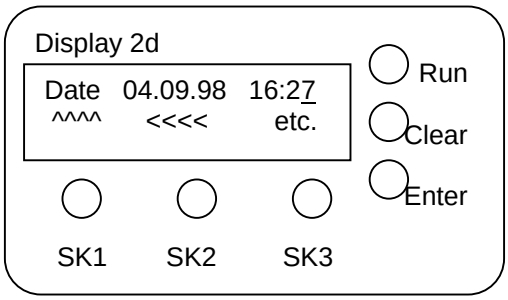
3) Changing the language of your Evaluation Unit

Step 1. Select the General Menu.
Step 2. Display 2a should be in the display.
Step 3. Press <SK3> button until display 2c is shown.
Step 4. Press <SK1> button until language of choice is
Shown.
Step 5. Press the Enter button to select language in display.



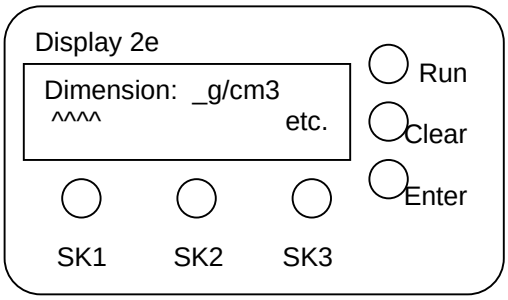
4) Changing the time and date in the Evaluation Unit.
Format is European - day: month: year hour: minute

Step 1. Select the General Menu.
Step 2. Display 2a should be in display.
Step 3. Press <SK3> button until display 2d is shown.
Step 4. Press <SK1> button to change the value of the number
Directly over the Cursor.
Step 5. Press <SK2> to re-position the Cursor.
Step 6. When the time and date in the display is correct, press
The Enter button for the Evaluation Unit to accept value.



5) Selecting the units of measure

Step 1. Select the General Menu.
Step 2. Display 2a should be shown.
Step 3. Press <SK3> button until display 2e is shown.
Step 4. Press <SK1> button until the desired units are in
Display.
Step 5. Press Enter button to select units.



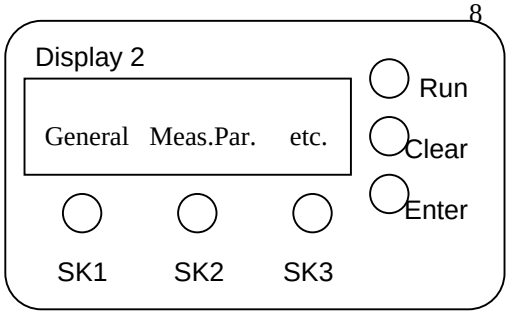
B. Meas. Par. Menu

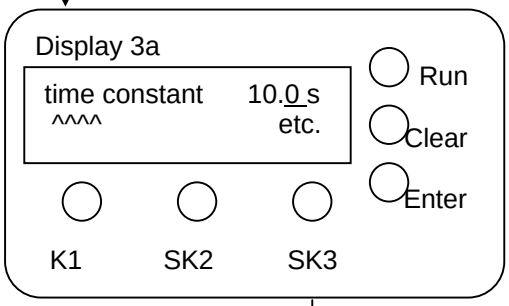
1) Setting the system time constant.

The value of the time constant will depend on the following Factors:
1) The consistency of the material being measured.
2) The rate at which the material may change.
3) The requirements of the control loop.

A good starting value is 60.0 sec. This can be reduced or Increased depending on the performance of the instrument. Too low is not good (1 sec) and too high is not good (100 sec).

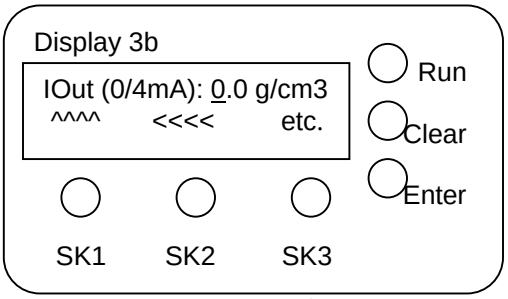
Step 1. Select the Meas.Par. Menu, Press <SK2> display 1.
Step 2. Display 3a should be shown.
Step 3. Press <SK1> button to change the number above the Cursor.
Step 4. Press <SK2> button to re-position the Cursor.
Step 5. Press Enter button when the display shows the time Constant you wish to use.





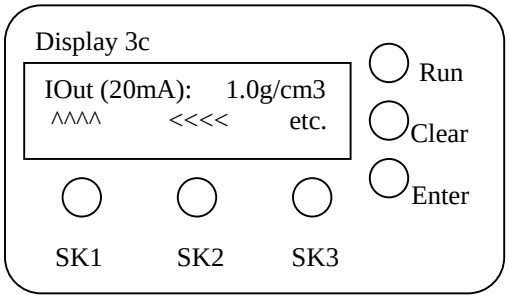
2) Setting the 4 mA of the system current output.

Step 1. Select the Meas. Par. Menu.
Step 2. Display 3a should be shown.
Step 3. Press <SK3> button until display 3b is shown.
Step 4. Press <SK1> button to change the number over the Cursor.
Step 5. Press <SK2> button to move the Cursor.
Step 6. Press Enter button when the desired 4-mA value is in the Display. In this case, the value representing 4 mA will Be 0.0 g/cm3.



3) Setting the 20 mA of the system current output.

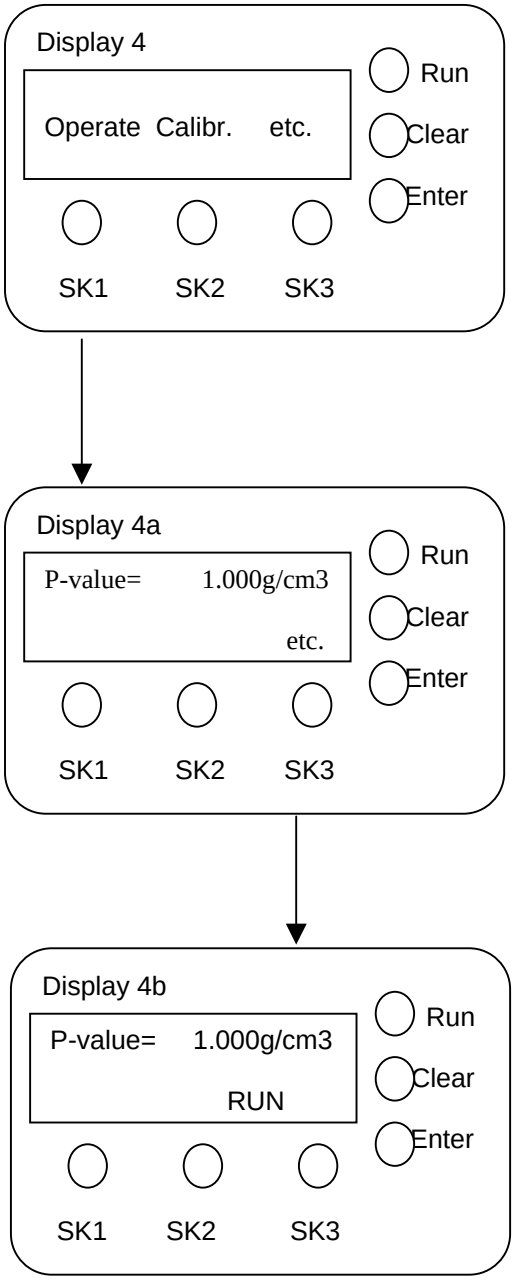
Step 1. Select Meas.Par. Menu.
Step 2. Display 3a should be shown.
Step 3. Press <SK3> button until display 3c is shown.
Step 4. Press <SK1> button to increase the number over the Cursor.
Step 5. Press <SK2> button to move the Cursor.
Step 6. Press Enter button when the desired 20 mA value is in the Display. In this case the value representing 20 mA is 1.0 g/cm3.



C. Operate Menu

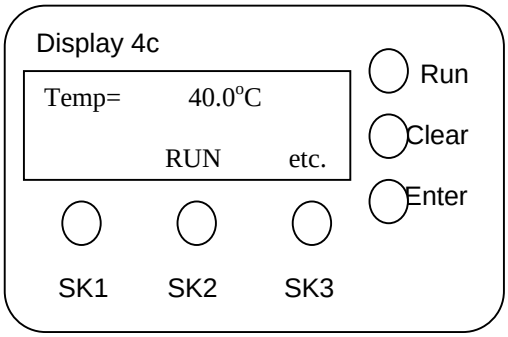
1) Getting the live reading of the units of measure in the display.

Step 1. Select the Operate Menu.
Step 2. Display 4a should be shown, live readings should be in display. Display 4a is not in the Run mode.
Step 3. Press Run Button to place system in measurement mode. 4b.



2) Getting the live reading of the Temperature in the display.

Step 1. Select the Operate Menu.
Step 2. Live readings should be in display, Display 4a.
Step 3. Press <SK3> button, display 4c should be shown.
Step 4. Press <SK3> button until you see the word Operate. Press <SK> button under Operate.



IV. Calibration

A. It is required that count rates measured by the Scintillation Detector for different densities or concentrations be read into Density Transmitter. This is done in the Calibr Menu. The densities should be distributed evenly over the measuring range.

B. There are 10 pairs of data in the Calibr. Menu. Each calibration pair represents the Density and Countrate of the product at different densities or concentrations.

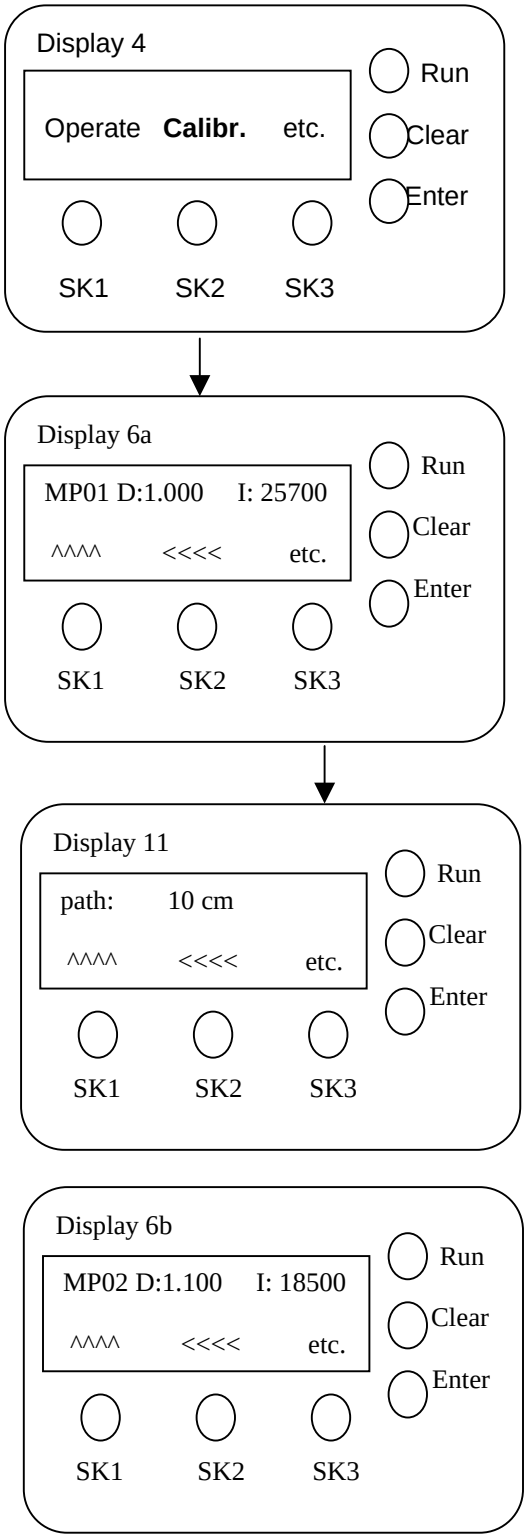
D. Calibr. Menu

1. Entering Calibration Points (Multi-Point)

Select Calibr. Menu, Press <SK2> Display 4
see screen 6a. There are two (2) values in this screen. MP01 D:1.000 and I: 25700. The MP01 represents the density or concentration of the product for sample #1. There are 10 data points from MP01 to MP09.
The I: 27500 represents the countrate, which is measured by the Scintillation Detector when the product had a density of g/cm3.

Display 6b shows the second data pair. The density for point one was 1.000 g/cc and the density for point 2 is 1.100 g/cc. The countrate for point 1 was 27000 and for point 2 is 18500**.**

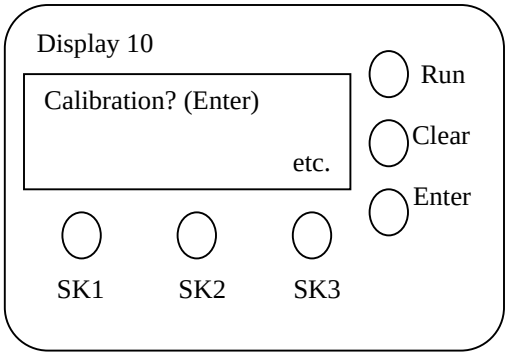
You must also enter the Pipe Diameter in cm in display 11



2. Calculating Calibration Line

A. Once you have entered the Data Pairs you are going to use for the calibration line you must tell the system you want it to calculate the line.

B. Scroll down to the last screen in the Calib. Menu (Display10) Press the Enter button and the system will use the Data Pairs to calculate a Calibration line.

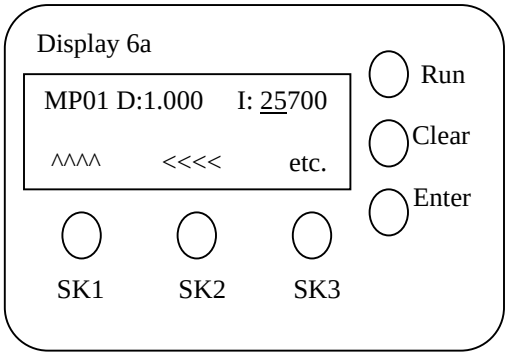


3. Single Point Calibration

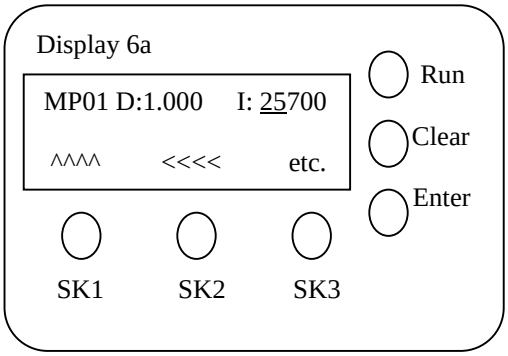
A. There are three (3) steps to be performed when performing a single point calibration

Enter a countrate and density value for one density value.
Enter the absorption coefficient
Tell the density transmitter to draw a line

B. Enter a Countrate and Sample Density value.

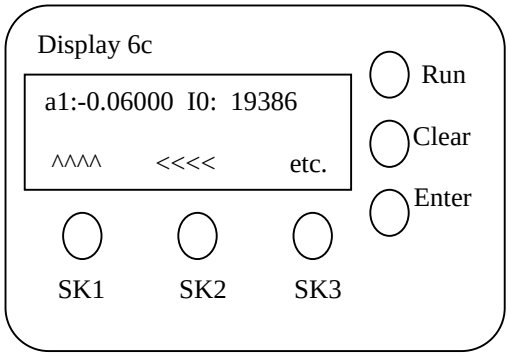


Step 1: Select the Calibr. Menu and Display 6a will be shown
Step 2: Press the Enter button to move the cursor so that it is located under the I: 25700
Step 3: Press the Run Button to read in a countrate. After the measurement settles down, press the Run Button again to stop the measurement and read in the counts.
Step 4: Take a sample of the product and have the Lab Analyze it.
Step 5: Enter the Density in the MP01 space. To do this, you will need to Press the SK3 button until you can once again select the Calibr Menu.
Step 6:



2. Entering the absorption Coefficient (a1) for a single point calibration

Step 1. Select Calibr. Menu, Press <SK2> display 4
Step 2. Display 6a should be shown.
Step 3. Press the SK3 button under you see Display 6c
Step 4: Enter -0.0600 for a1



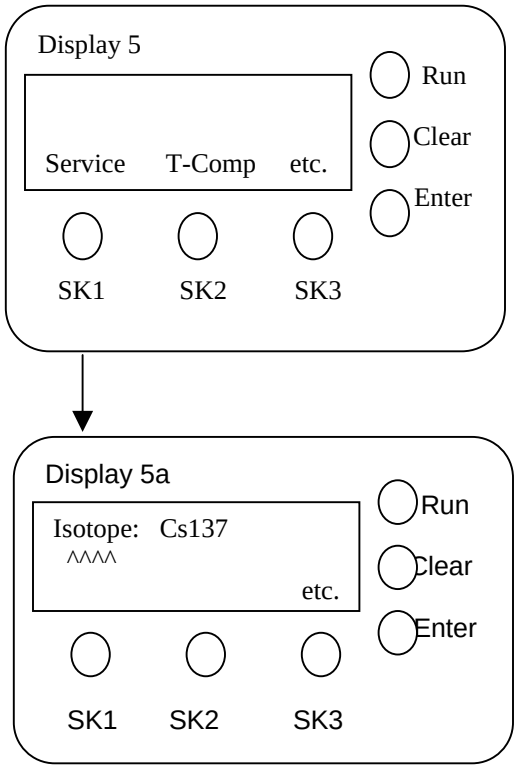
NOTE: For certain displays there are 2 distinct values to enter, display 18d is 1 of those displays. After you press the Enter button the first time, the Cursor will move to the second entry.

E. Service Menu

1. Select Isotope. You have the choice of either Cs-137 or Co-60 for an Isotope. The default is Cs-137.

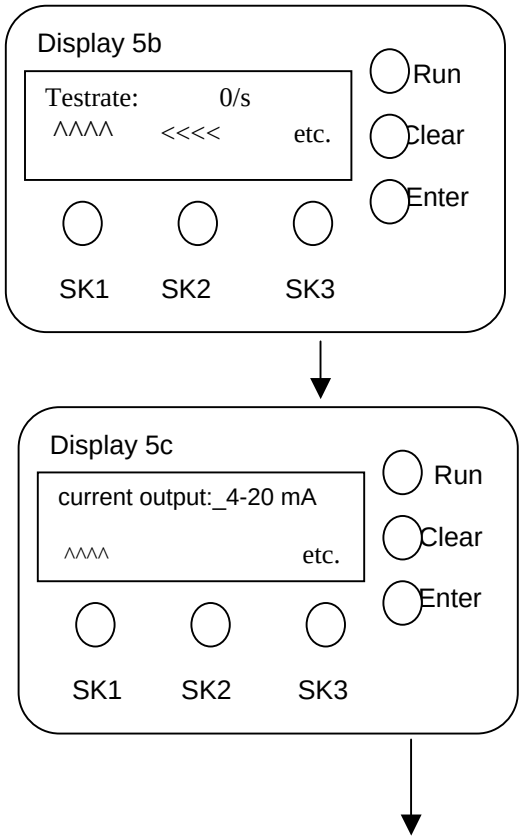
   a. to change the Isotope, Select The Service Menu, Display 5, and you will see 5a.

   b. When in screen 5a, you can change the Isotope by pressing the SK1 button. By pressing the SK1 button, the Isotope in the screen will switch between Cs-137 and Co-60. When you have the Isotope you want in the Screen, Press the enter button.



2. Testrate

   You can test the output of the unit by entering a test rate in Display 5b.

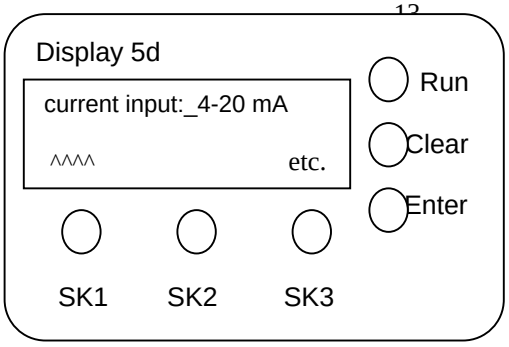


3. Selecting a 0-20 mA scale or a 4-20 mA scale for output

Step 1. Select the Service Menu.
Step 2. Display 5a should be shown.
Step 3. Press <SK3> button until display 5c is shown.
Step 4. Press <SK1> button to select 0-20 or 4-20 mA.
Step 5. Press Enter button when desired value is in display.

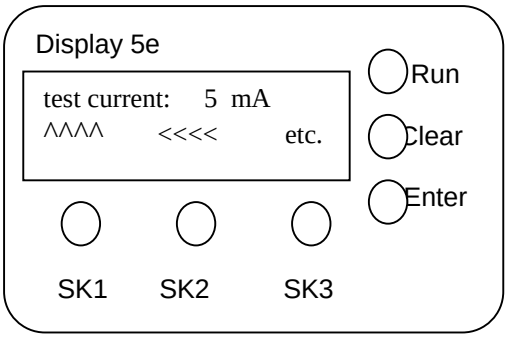
4. Selecting a 0-20 mA scale or a 4-20 mA scale for input

Step 1. Select the Service Menu.
Step 2. Display 5a should be shown.
Step 3. Press <SK3> button until display 5d is shown.
Step 4. Press <SK1> button to select 0-20 or 4-20 mA.
Step 5. Press Enter button when desired value is in display.



5. Entering a test current (must not be in Run mode)

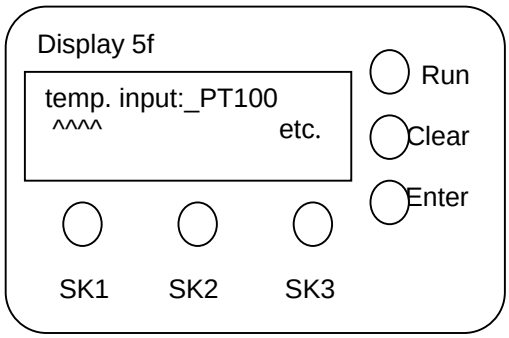
Step 1. Select Service Menu.
Step 2. Press scroll key until display 5e is shown.
Step 5. Press scroll button to select the value of the test current. The system will output 4 mA when it looks like Display 5e, with 5 mA entered.
Input: 0 = test current off
1 = current output of 0 mA
2 = current output of 1 mA
21 = current output of 20 mA
Step 6. Press Enter button when desired value is in display.



NOTE: YOU MUST ENTER A VALUE THAT IS 1 NUMBER HIGER THAN THE CURRENT OUTPUT YOU WANT TO MEASURE.

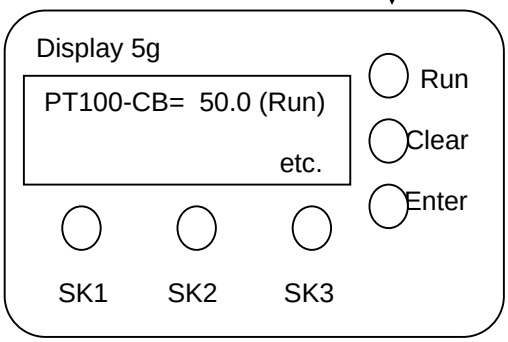
6. Selecting the type of temperature input.

Step 1. Select the Service Menu.
Step 2. Display 5a should be shown.
Step 3. Press <SK3> button until display 5f is shown.
Step 5. Press <SK1> button to select the PT100 or current loop input
Step 6. Press Enter button when desired value is in display



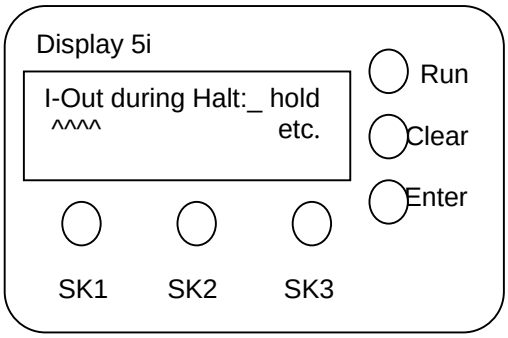
7. Calibrating the temperature input

Step 1. Connect a precision 100-Ohm resistor across terminals 20 and 21 (see Connection diagram in Appendix).
Step 1. Select the Service Menu.
Step 2. Display 5a should be shown.
Step 3. Press <SK3> button until display 5g is shown.
Step 4. Press Run button to measure the resistor and calibrate the circuit.
Step 5. Press Enter button when desired value is in display



8. Selecting the value of the current output during a hold condition

Step 1. Select the Service Menu.
Step 2. Display 5a should be shown.
Step 4. Press <SK3> button until display 5i is shown.
Step 5. Press <SK1> button to select the value of the current loop during a hold condition. The value can be, hold last reading, hold 0 mA, hold 4 mA, or hold 20 mA.
Step 6. Press Enter button when desired value is in display.



V. Temperature Compensation

A. Background:

The temperature of the AMBIENT Environment can change.
The temperature of the PRODUCT can change.

1. Ambient Temperatures

    a. The standard System compensates for the effects of changes in Ambient Temperature on the electronics in the Density Transmitter. This is accomplished with a feedback loop in the solid-state electronics.

2. Product Temperatures

    a. Every System has the capability to compensate for the effects of changes in the temperature of the product. Several steps must be taken to configure each system.

        a) All Systems can be ordered to come with the ability to input a 2-wire RTD (Resistance Temperature Device), but it is not built in.
        b) The RTD must be installed and connected to the system to have a measurement of product temperature available to use for compensation.
        c) It can either be supplied by the user or the equipment supplier, but it must be installed and wired to the System to be available.

3. When is Temperature Compensation Required. Typically it is needed for a Percent Total Solids measurement. In addition:

    a) There are three (3) parameters which determine if Temperature Compensation is required:

        1) ACCURACY – What are the actual requirements?
        2) TEMPERATURE CHANGES – What are the Ambient and Product temperature changes, which are likely?
        3) RESOLUTION OF MEASUREMENT – What is the resolution of the measurement?

    b) Accuracy requirements. Each application will have different requirements for accuracy. Here are two (2) examples:

        1) Sand and Water – the required accuracy for this measurement can be +/- 1.5 %Total Solids.
        2) Wood Fiber and Water – the required accuracy for this measurement cab be +/- 0.15 %Total Solids.

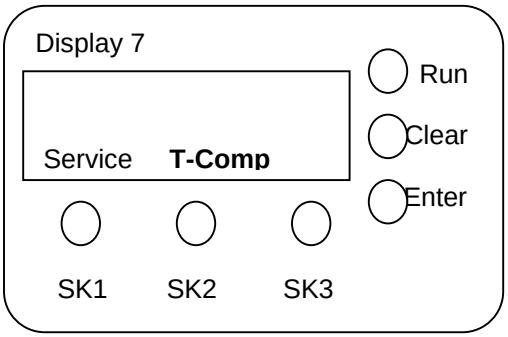
        The first application is unlikely to require Temperature Compensation. The second application will probably require temperature compensation.

    c) Changes in Temperature. Variations in process temperature during a production process is usually quite small. Some applications will have changes in process temperature, which require temperature compensation.

        NOTE: If the change in temperature is due to System Upset Conditions, or Start Up Conditions, it will be very difficult to compensate for the changes in temperature. Temperature compensation and

comparative sampling are only good under normal conditions. Under normal conditions, changes are slow to happen, and are usually small.

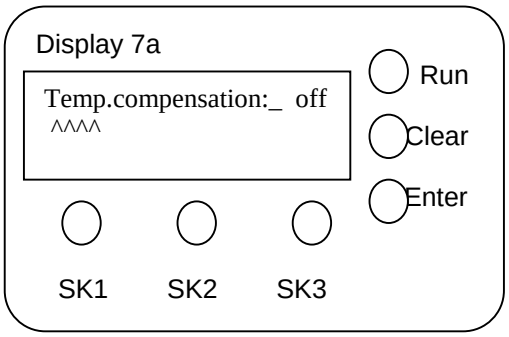
d) Resolution of the measurement. The resolution of each application is different. The higher the resolution of the measurement, the less likely it will be to need compensation.



F. T-comp Menu

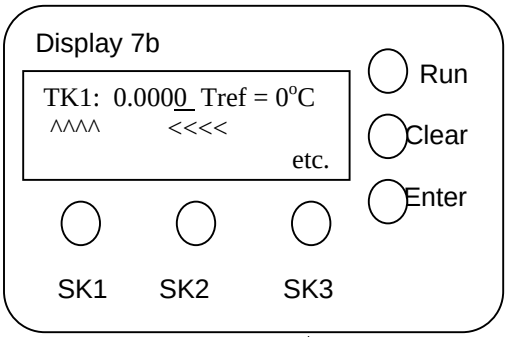
1. Activate temperature compensation

Step 1. Select the T-Comp Menu, press <SK2> display 7
Step 2. Press <SK2> button, display 7a should be in display.
Step 3. Press <SK1> button to activate temperature comp.
Step 4. Press Enter button when desired value is in display.



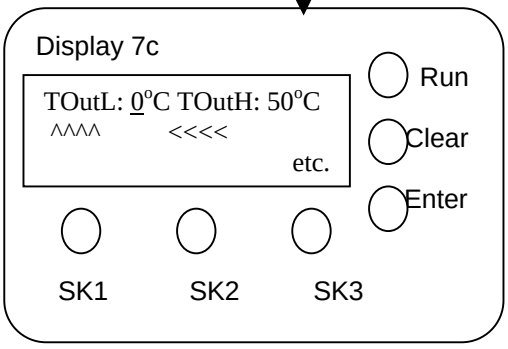
2. Entering a linear temperature coefficient and a reference temperature.

Step 1. Select the T-Comp Menu
Step 2. Display 7a should be in display.
Step 3. Press <SK3> button, display 7b should be in the display.
Step 4. Press <SK1> button to change the number over the Cursor.
Step 5. Press <SK2> to re-position the Cursor.
Step 6. Press Enter button when desired value is in display. The Cursor will now move to the Tref position.
Step 7. Press <SK1> to change the number over the Cursor for the T-ref (Reference temperature)
Step 8. Press Enter button when desired value is in display.



3. Entering the values of the 4-20 mA current output that represent the temperature.

Step 1. Select T-Comp Menu.
Step 2. Display 7a should be shown.
Step 3. Press <SK3> button until display 7c is shown.
Step 4. Press <SK1> button to change the number over the Cursor.
Step 5. Press <SK2> to re-position the Cursor.
Step 6. Press Enter button when desired value is in display.
Step 7. Press <SK1> button to change the number over the cursor.
Step 8. Press <SK2> button to move the cursor.
Step 9. Press Enter button when desired value is in display.



Technical Data

Density Meter HK7-E

Utilities:	**AC 220/110 V** **47-65 Hz** **approx 15VA**
Repeatability:	**+/- 0.001 g^3**
Time constant:	**0.1 – 999.9 s**
Data storage:	**non-volatile flash e-prom**
Decay compensation:	**automatic control via quartz clock**
Display:	**alphanumeric 2 X 24 characters LCD, dialogue with push buttons**
Housing:	**NEMA 4X, IP 65**
Operating temperature:	**-20 to 50 deg. C**
Temperature compensation:	**via 100 RTD or 0/4 to 20ma**
Analog output:	**isolated, 0/4 to 20 ma, maximum load 500 ohm**

Phoenix Connectors

The following Information can be used to identify the wires needed to wire up to the Gamma Instrument Systems Density Transmitter

Connector Type	Number of Conductors	AWG	Diameter of Outer Sheath of Conductor	Diameter of Wire including Insulation
AC Power	**3**	**16-18**	**0.22 inch - 0.35 inch**	**< or = 2.5mm < or = 0.1 inch**
Current outputs	**4**	**18-22**	**0.16 inch - 0.3 inch**	**< or = 2.5mm < or = 0.1 inch**
Temperature Inputs	**2**	**16-18**	**0.16 inch - 0.3 inch**	**< or = 3.0 mm < or = 0.12 inch**

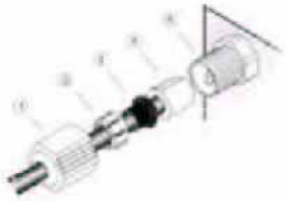
QUICKON Features

zurück zur Navigation

QUICKON includes a union nut set consisting of several parts.

Seitenanfang

QUICKON components



1. Union nut
2. Collar
3. Rubber seal
4. Splice ring
5. Contact carriers

Seitenanfang

Assembly of the conductor with QUICKON

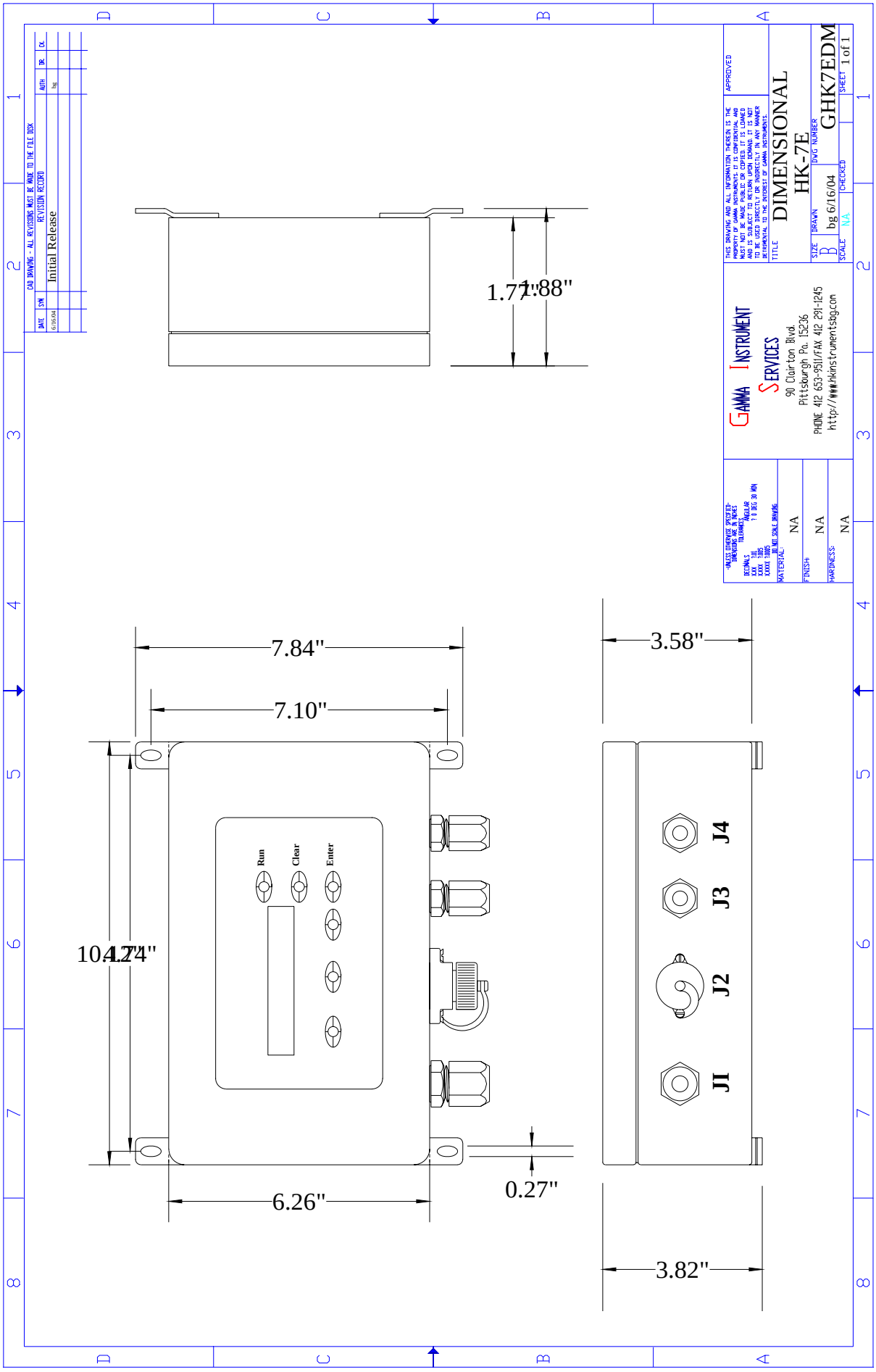
QUICKON - the new type of connection system makes the installation of e.g. sensors, actuators and other system components in automation technology not only faster but also simpler and less expensive. The assembly principle of QUICKON is extremely simple.

Seitenanfang

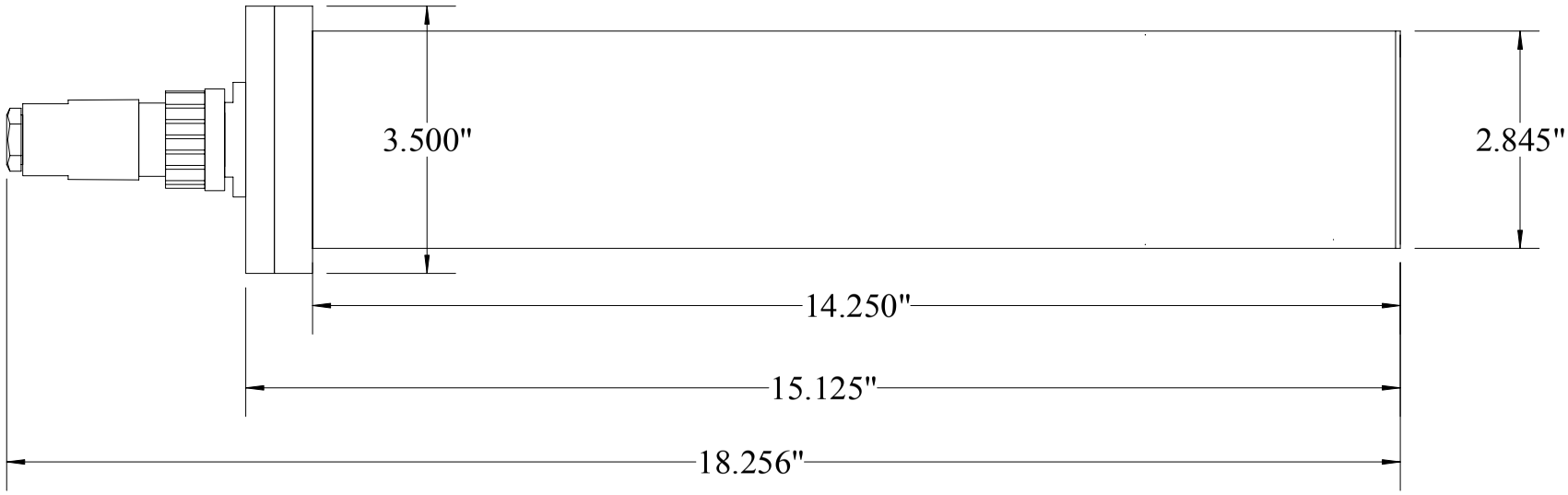
1. Preparation

- Remove approx. 15 mm of the cable sheath,
- Slide on the union nut, the cap and the rubber seal.

Seitenanfang


CAD DRAWING - ALL REVISIONS MUST BE MADE TO THE FILE DISK
REVISION RECORD
Initial Release
DIMENSIONAL
HK-7E
GHK7EDM
SHEET 1 of 1
GAMMA INSTRUMENT SERVICES
90 Clairton Blvd.
Pittsburgh Pa. 15236
PHONE 412 653-9511/FAX 412 291-1245
http://www.hkinstrumentsbg.com
bg 6/16/04
1.88"
1.77"
7.84"
7.10"
3.58"
10.74"
10.47"
Run
Clear
Enter
J4
J3
J2
J1
0.27"
6.26"
3.82"

CAD DRAWING - ALL REVISIONS MUST BE MADE TO THE FILE DISK					
DATE	SYM	REVISION RECORD	AUTH	DR.	CK.
6/30/04		Initial release	bg		



-UNLESS OTHERWISE SPECIFIED-
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS ANGULAR
X.XX ±.01 ± 0 DEG 30 MIN
X.XXX ±.005
X.XXXX ±.0005
DO NOT SCALE DRAWING

MATERIAL: NA

FINISH: NA

HARDNESS: NA

GAMMA INSTRUMENT SERVICES
90 Clairton Blvd.
Pittsburgh Pa. 15236
PHONE 412 653-9511/FAX 412 291-1245
http://www.hkinstrumentsbg.com

APPROVED

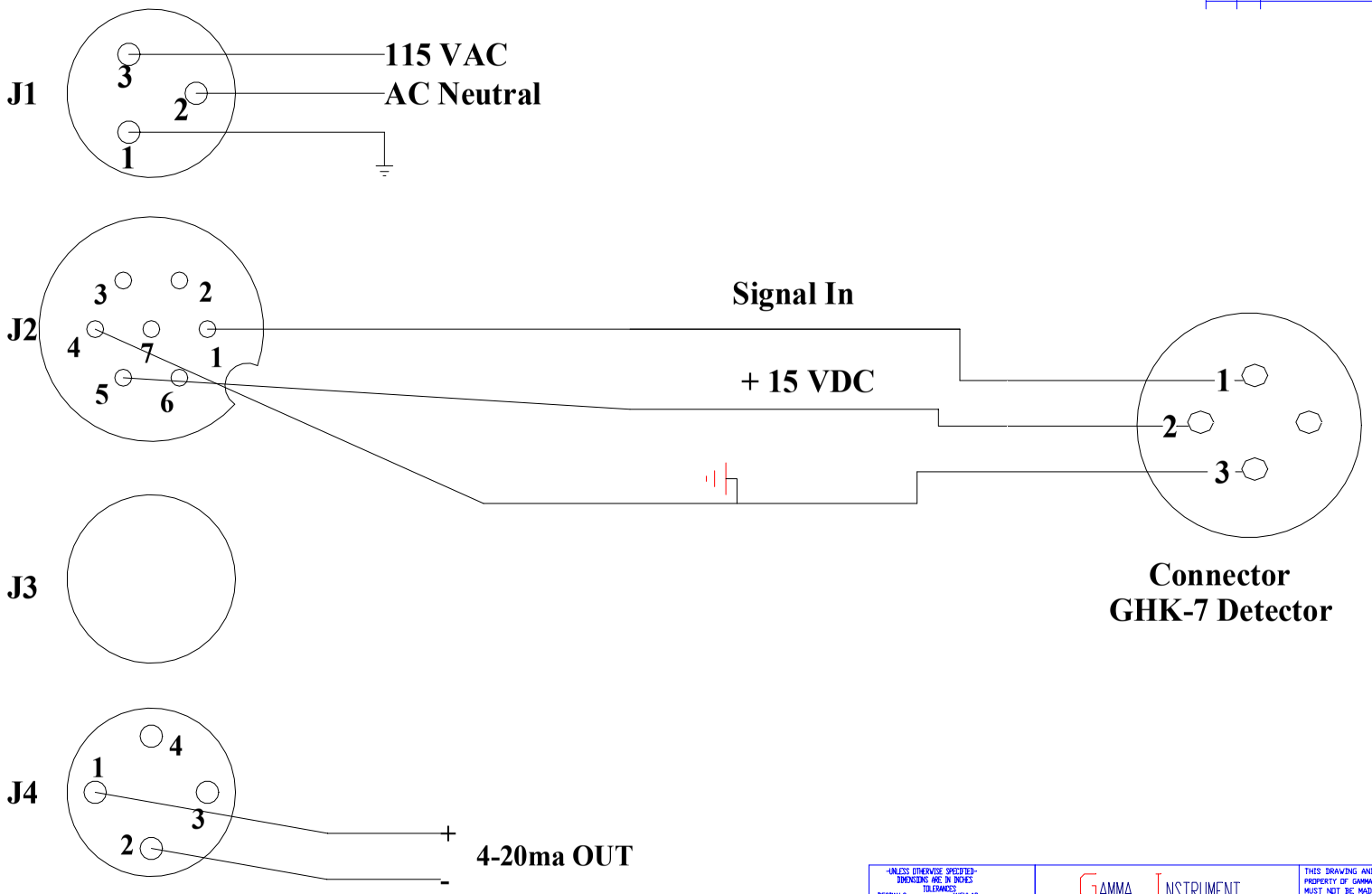
TITLE: **GHK-7 DIMENSIONAL**

SIZE	DRAWN	DWG NUMBER
B	bg 6/30/04	GHK7DIM

SCALE N.A. CHECKED SHEET 1of1

CAD DRAWING - ALL REVISIONS MUST BE MADE TO THE FILE DISK

DATE	SYM	REVISION RECORD	AUTH	DR.	CK.
6/16/04		INITIAL RELEASE	BG		



-UNLESS OTHERWISE SPECIFIED-
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS ANGULAR
X.XX ±.01 ± 0 DEG 30 MIN
X.XXX ±.005
X.XXXX ±.0005
DO NOT SCALE DRAWING

MATERIAL: NA

FINISH: NA

HARDNESS: NA

GAMMA INSTRUMENT SERVICES
90 Clairton Blvd.
Pittsburgh Pa. 15236
PHONE 412 653-9511/FAX 412 291-1245
http://www.hkinstrumentsbg.com

APPROVED

TITLE: Interconnect HK-7 RETRO-FIT

SIZE	DRAWN	DWG NUMBER
B	bg 6/16/04	HK7INT

SCALE N.A. CHECKED SHEET 1 of 1