Warranty Certificate

This instrument is warranted against any manufacturing defects for a period of twelve months from the date of installation, or eighteen months from the date of purchase, which ever is early.

Kindly note the following:

1. *The warranty is limited to repairing the instrument and no responsibility is taken for any other damage resulted.*
2. *The warranty will be void if the instrument is opened or tampered in any way.*
3. *The faulty instrument has to be returned to our factory, carriage prepaid.*

Product Category : Simulator series

Model No. : _____

Serial number : _____

Date of despatch : _____

Authorised signatory :

Company seal

The Inside Stuff

Kindly forward this product manual to the end user. The user is requested to read the manual thoroughly before operating the instrument.

As You Unpack

Congratulations on buying
ESD - Simulator series
ESD - 310

As you unpack kindly ensure that
1. The material received is in good condition
2. You have received following material
   i) ESD - Simulator series **ESD - 310** as per your purchase order.
   ii) This manual along with Warranty Certificate and Test Certificate

In case of any discrepancies contact our customer support department immediately.

We are sure you will get long and troublefree service from our instrument.

We need your feedback :

Every attempt is made to make this manual clear and easy to understand, so that you feel confident to install, use and maintain our product. ESD welcomes your suggestions, which will help to improve this product as well as the document and make it more user freindly

Instrumentation Health Tips

Taking care of your equipment is just as important as buying the best equipment. So simply take the following precautions and ensure a long, trouble- free service from your temperature measurement and control system.

Use

- Three wire system for connecting Pt-100 sensor to the instrument.
- Same area of cross section for all the three wires.
- Appropriate compensating cables for connecting T/C to an instrument
- Appropriate Thermally conductive media between Thermowell & sensor sheath.
- Proper sheathing material as per application and environment.
- Proper size crimped wire termination lugs with insulated sleeves & ferrule no's.
- Proper size screw driver for making connections to the terminations and also while adjusting calibration and set points.
- Fuses of correct ratings for mains and relay outputs.

Do's

- Sensor cables must be isolated from power cables.
- Insert minimum required sensitive length in the measurement object.
- Operating temperature should be 80 % of the maximum specified temperature.
- Check that all the wiring is firm and as per wiring diagram.
- Recalibrate instruments only when errors are confirmed with the help of certified calibrators.
- Output loads connected should be within specified limits.
- Provide proper Earthing to Instrument / Instrumentation Panel.
- Select a Sensor / Instruments / Instrumentation Panel manufacturer who has the required technical knowledge and infrastructure inhouse.

Avoid

- Terminal joints or junction boxes for sensor cables.
- Exposure of thermocouple head to temperatures greater than 90°C.
- Too large sheath diameter as this may introduce time lag.
- Mechanical stresses and vibrations.
- Sharp objects for operating front panel membrane keys.
- Excessive relative humidity at installation place.
- Magnetic field / inductive pick up / noise.
- Excessive Ambient temperature at installation place.
- Direct radiant heat on instrument.
- Corrosive gasses in the surroundings.
- Chemicals or pressure wash for cleaning instruments.
- Excessive tightening of mounting accessories.
- Excessive light from being incident on displays.

Look-up Table

Temperature V/s Sensor output

Temp in °C	**Pt-100** Res. in Ω	**T/C Output** in mV (Reference junction at 0°C)			
		Fe-Ko (J)	Cr-Al (K)	Pt-Pt-13% Rh (R)	Pt-Pt-10% Rh (S)
-150	39.71	-6.499	-4.912	-	-
-100	60.25	-4.632	-3.553	-	-
-50	80.31	-2.431	-1.889	-	-
-25	90.13	-1.239	-0.368	-	-
0	100.00	0.000	0.000	0.000	0.000
10	103.90	0.507	0.397	0.111	0.055
15	105.85	0.762	0.597	0.082	0.084
20	107.79	1.019	0.798	0.171	0.113
22	108.57	1.122	0.879	0.123	0.125
24	109.35	1.225	0.960	0.135	0.137
26	110.12	1.392	1.041	0.147	0.148
28	110.90	1.432	1.122	0.158	0.161
30	111.67	1.536	1.203	0.232	0.173
32	112.45	1.640	1.285	0.183	0.185
34	113.22	1.745	1.366	0.195	0.197
36	113.99	1.849	1.468	0.207	0.210
38	114.77	1.994	1.529	0.220	0.222
40	115.54	2.058	1.611	0.296	0.235
50	119.40	2.585	2.022	0.363	0.299
60	123.24	3.115	2.436	0.431	0.365
70	127.07	3.649	2.850	0.501	0.432
80	130.89	4.186	3.266	0.573	0.502
90	134.70	4.725	3.681	0.643	0.573
100	138.50	5.268	4.095	0.723	0.645
120	146.06	6.359	4.919	0.879	0.795
140	153.58	7.457	5.733	1.041	0.950
160	161.04	8.560	6.539	1.208	1.109
180	168.46	9.667	7.338	1.380	1.273
200	175.84	10.777	8.137	1.557	1.440
250	194.07	13.553	10.151	2.017	1.873
300	212.02	16.325	12.207	2.498	2.323
350	229.67	19.089	14.292	2.997	2.786
400	247.04	21.846	16.395	3.511	3.260
500	280.90	27.388	20.640	4.580	4.234
600	313.59	33.096	24.902	5.696	5.237
700	345.13	39.130	29.128	6.860	6.274
800	-	-	33.277	8.072	7.345
900	-	-	37.325	9.203	8.448
1000	-	-	41.269	10.503	9.585
1100	-	-	45.108	11.846	10.754
1200	-	-	48.828	13.224	11.947
1300	-	-	-	14.624	13.155
1400	-	-	-	16.035	14.368
1500	-	-	-	17.445	15.576
1600	-	-	-	18.842	16.771

°F = (1.8 x °C) + 32 **°K = 273.15 + °C**

Introduction

ESD - 310

Highly precise, accurate and flexible control is the heart of any modern process control system. It is obvious that for a process to be accurately monitored and controlled, the instruments used must be highly accurate and precise. Here comes into picture the need of a calibrator (or simulator as one may prefer to call it). A simulator is nothing but an instrument which 'simulates' certain signals that may occur in a process control system. These signals represent the signals that will actually occur in a process. By referring to the standard charts corresponding signals are fed to the instrument and the instrument is adjusted to achieve the desired end results. This process is called **Calibration**.

It is evident then, that 'the performance of an instrument is greatly dependent upon it's calibration'.

Universal Calibrator MODEL ESD 310 is truly portable and highly reliable Calibrator which can be used for the calibration of many types of process control instruments which work on mV,mA,Resistance.The calibrator is designed to suit Instrument lab as well as field calibration.This can be used as a better tool for fault finding and confirmation of Instrument /Sensor reliability.

The instrument is immune to mechanical vibrations. Even it's table position will not affect the accuracy. Use of highly reliable electronic components with low tempco ensure faithful operation and long, trouble free service.The instrument is tested for its performance under various climatic conditions.

Principle Of Operation

This Calibrator works on two batteries of 9 volts which helps generating positive and negative supplies.Highly stable Zeners are used to enerate Reference Voltages.The same voltage is used to generate mV with the help of Coarse and fine potentiometers.These potentiometers are also used for generation of mA.The current generation is on the principle of feedback balancing voltage followed with input.

RTD resistance is generated with multiturn potentiometer.Measurement of mV, mA and Pt - 100 resistance is done with the help of same DPM. This DPM is 4 & 1/2 digit LCD display.Test Mode facility is provided to confirm the operation of calibrator and it should show 100.00 + - 0.10 reading.

Features :

- Certified accuracy which has traceability to international test standards
- Facility for mV / mA measurement & sourcing
- Proven field performance
- Highly compact
- Dust and vermin proof enclosure with epoxy powder coating.
- Fast response time
- Highly stable output
- Pt - 100 reading directly in terms of temperature
- Test Facility to confirm DPM and stabilized circuit.
- Low Battery indication
- Rechargeble batteries as option.
- Maximum MTBF and minimum MTTR

4.RTD Source

1.Connect the accurate DMM to RTD terminals. Put the RTD SOURCE /SINK toggle switch to SOURCE position and RTD READ/FEED toggle switch to FEED position.Adjust the resistance of 100.00 ohms corresponding to 0.0 o C by the RTD potentiometer on the front panel of calibrator.

3. Change the RTD READ / FEED toggle switch to READ position.

4. Now Calibrator should read 0.0 ^{o}C. If not , then adjust the same by RV4 potentiometer on calibrator PCB.

5. Put the RTD READ / FEED toggle switch to FEED position. Adjust the resistance of 247.06

6.Ohms corresponding to 400.00 ^{o}C by RTD potentiometer on the front panel of the calibrator.

7. Change the RTD READ / FEED toggle switch to READ position.

8. Now Calibrator should read 400.0 ^{o}C.If not then adjust the same by RV5 potentiometer on calibrator PCB.

9. Repeat the steps 2 to 7 till you get the correct readings within the accuracy limits.

5.RTD Sink

Calibration not required. You can measure the temperature of external RTD by connecting it to RTD terminals and putting the RTD SOURCE / SINK toggle switch to SINK position and RTD READ / FEED toggle switch to READ position.

Calibration Procedure

Warning: This procedure is to be carried out strictly by technical persons as per instructions given in this manual.

1.mV Source / Sink

1. Put the mv/mA Source / Sink toggle switch to" SOURCE" position.
2. Connect the accurate DMM at mV output terminals .Adjust reading of 100.00 mV on the DMM display by using mV/mA Coarse / Fine potentiometer.
3. Check the reading on Calibrator display, it should be 100.00mV. If not adjust the potentiometer on the DPM PCB so that it should indicate 100.00mV
4.Check the in between readings as per your reqiurements.

2.mA Source

1.Connect the accurate DMM to mA source terminals.
2. Adjust the current 4.00mA on the DMM display by using mV/mA Coarse / Fine potentiometer. Calibrator should indicate 4.00 mA. If not adjust the potentiometer RV6 on the PCB to get the exact 4.00mA
3.Adjust the current 20.00 mA on the DMM display by using mV/mA Coarse / Fine potentiometer. Calibrator should indicate 20.00 mA.If no t adjust the potentiometer RV3 on the PCB to get the exact 20.00mA
4. Repeat the steps 2 and 3 till you get the correct readings.

3.mA Sink

1.Connect the Current Source to mA Sink terminals with proper polarity.
2. Feed the current of 20.00 mA.Calibrator should read 20.0mA.If not adjust the same by the potentiometer RV9 on PCB.
3.Check the readings for 0,4,8,12,16 mA

Specifications

Model : ESD 310

1. DC mV : (Source / Sink)

Range :199.99

Resolution : 10 Microvolt
Accuracy at 25 ^{0}C : +/- 0.1 % of FS
Load : 5mA max

2. DC mA : (Source / Sink)

Range :25.00 mA

Resolution : 10 Microampere
Accuracy at 25 ^{0}C : +/- 0.1 % of FS
Load : 500 ohms at 20mA

3. RTD : (Source / Sink)

Range : 0 to 400 or 247.06 Ohms

Resolution : 100 MicroOhms
Accuracy at 25 ^{0}C : +/- 0.15 % of FS
Load : 0.25 W

Display	: 4& 1/2 digit LCD display with Battery Low, Over- range and polarity Indication.
Supply voltage	: Two batteries of 9 V
Temperature range	: 0 to 55 ^{o}C
Humidity	: 90 % Non Condensing
Mounting	: Table top
Dimensions	:170(H) X 90(W) X 45(D)
Weight	: Upto 500 grams
Storage Temp	: 0 to 70 ^{0}C
Battery Life	: 6 Hrs in case of continous operation for full current output

Illustrations

Front View

Operational Instructions

1. mV Source

1.Put the mV.mA Source/ Sink toggle switch to "SOURCE"position
2.Connect the equipment at mV terminals with proper polarity.Then set the mV to be fed on calibrator display. Vary the mV as per requirement.
3.In case of Thermocouple mV feeding,feed the mV after subtracting the mV corresponding to the ambient temperature to get proper reading on indicating instruments.(eg For feeding the mV's for 200^{o}C [K type T/C] at 25 ^{o}C ambient, feed 8.14-1.00 = 7.14 mV's

2. mV Sink

1.Put the mV/mA Source/ Sink toggle switch to " SINK " position.
2.Connect the mV's to be measured to the mV terminals with proper polarity. Read the calibrator display. The Display will indicate the measured mVs.

3. mA Source

1.Put the mV/mA Source/ Sink toggle switch to " SOURCE " position.
2.Connect the equipment to which mAs to be fed to the mA Source terminals of the calibrator with proper polarity.
3.Set the mAs to be fed on Calibrator display .The display indicates the mAs generated and fed to the equipment connected.Now you can vary the mAs as per requirement.

4. mA Sink

1.Put the mV/mA Source/ Sink toggle switch to " SINK " position.
2.Connect the Current Source or mAs to be measured to mA sink terminals with proper polarity.
3.Calibrator display indicates the value of measured mAs

5.RTD Source

1. Connect the Equipment to which RTD resistance is to be fed to Calibrator.
2. Put RTD ' SOURCE/SINK' toggle switch to SOURCE position and RTD READ / FEED toggle switch to READ position. Set the temperature reading required on the Calibrator Display. Then put the RTD READ/FEED switch to FEED position. Now the resistance corresponding to set temperature will be fed to the equipment connected.At this time there will be over range i.e 1 indication will be on Calibrator Display. Repeat above procedure for other temp settings.

6. RTD Sink

1. Put RTD 'SOURCE/SINK' toggle switch to SINK position and RTD READ / FEED toggle switch to READ position.
2.Connect the RTD to be measured to RTD terminals of the Calibrator and read the calibrator display. Display indicates the temperature corresponding to the resistance connected to the RTD terminals of the Calibrator.