

CLEAN ROOM

DISTRIBUTED DATA ACQUISITION SYSTEM

From:

POLMON INSTRUMENTS PVT.LTD

“POLMON HOUSE”

Nizampet Road, Kukatpally: Hyderabad – 500 072

Ph No: 23057642 ; 23057308

Fax: 040 – 23055425

e-mail: polmon@polmon.com

URL: www.polmon.com

INTRODUCTION:

What is a Clean Room ?

It is defined as a contained volume of space in which contamination down to microscopic size is controlled below a level, which can render a susceptible product unusable.

In other words it is a room in which undesirable contamination is not allowed to reach the product.

What parameters to be monitored for a Clean Room ?

Parameters of Clean Room to be monitored and controlled to create and maintain the cleanliness levels are

Differential Pressure, Humidity, Temperature, Filter Dp, Static Pressure, Air Pressure, Particle Count etc.,

What POLMON offers for Clean Room?

Clean Room Distributed Data Acquisition with Local indication & Remote Data Logging of parameters

Differential Pressure, Humidity, Temperature, Filter Dp etc.

Clean Room Distribution Data Acquisition System:

Salient Features:

- Differential Pressure, RH & Temperature Monitoring & Data Acquisition for HVAC applications.
- Widely accepted compact clean room design with Flush mounting & Concealed enclosure.
- Substantial reduction in cable cost.
- Digital Data transmission for Zero Loop errors.
- Replaces Conventional Dial type instruments (Like Magnehelic Gauge) with Display & Data Logging.
- Multi parameters measurement, individual display for each parameter & Digital Data Transmission.
- Software Calibration through soft touch tactile keypad.
- Data logging through PC.
- Data Analysis & Presentation software with 21 CFR Part 11 Compliance.

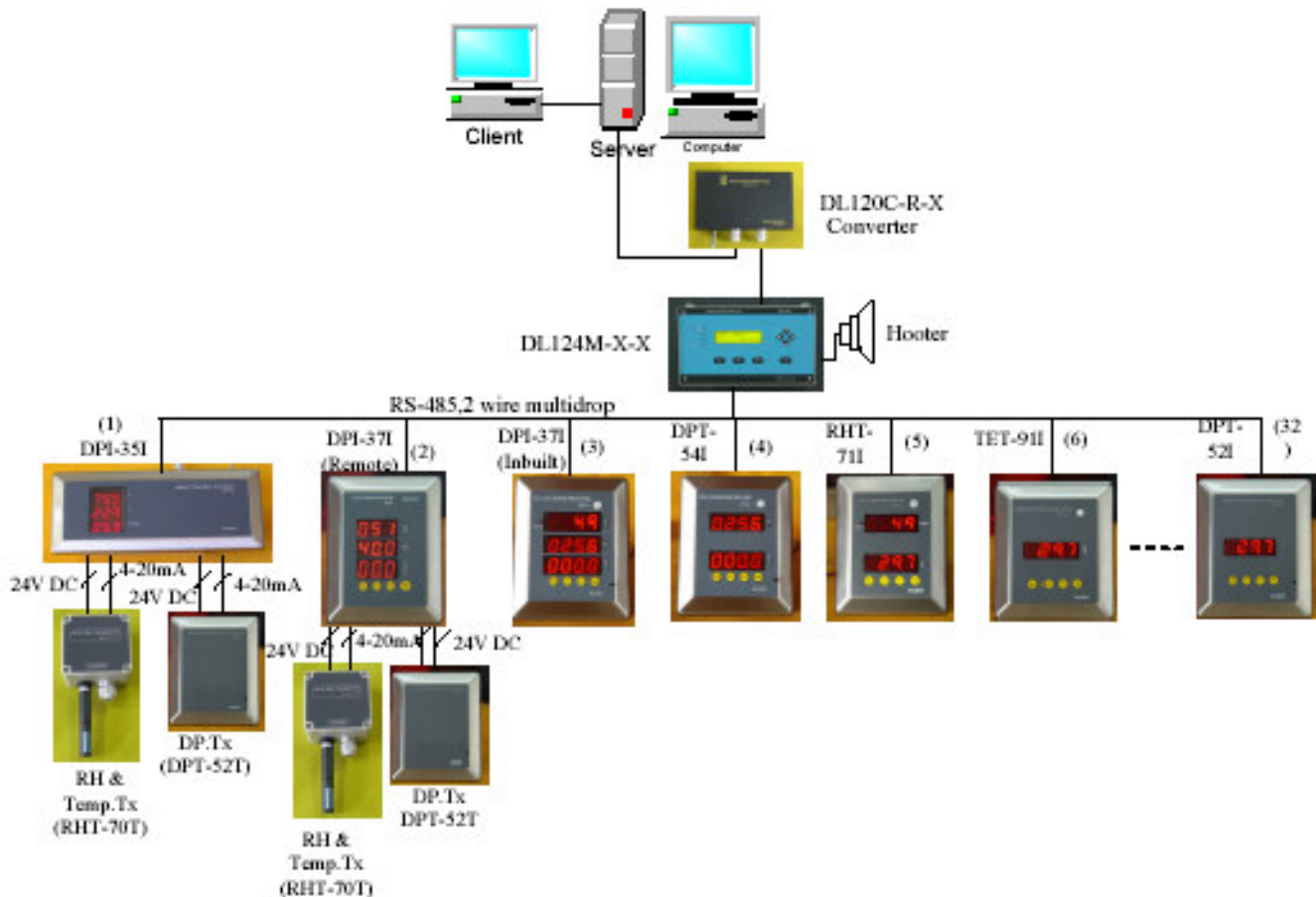
Applications:

- Pharmaceutical.
- Formulations.
- Clinical Trials.
- Bulk Storage.
- Green Houses.
- Semiconductors Manufacturing.

Instrumentation:

- **Clean Room Data Acquisition Unit (DL124M)**
- **Relative Humidity & Temperature Transmitter (RH T-70 T)**
- **Temperature Transmitter (TET-90 T)**
- **Smart Process Scanner (DPI-35 I)**
- **Clean Room Monitor (DPI-37 I)**
- **Differential Pressure Transmitter/Indicator (DPT-52)**
- **RH & Temperature Indicator (RH T-71 I)**
- **DP & Temperature Indicator (DPT-54 I)**
- **Temperature Indicator (TET-91 I)**
- **Clean Room Distributed Data Acquisition Software (POLSOFT900C)**

Scheme 1: Clean Room Distribution Data Acquisition System:



Description:

1. DP transmitter measures the differential pressure between Clean Rooms and Internal Corridor to Room/ Room to Room and transmits Current (4-20mA).
2. RH & Temperature Transmitters are used to measure Relative Humidity and Temperature transmits Current (4-20/0-20mA)/Voltage (0-1/1-5/0-10).
3. All transmitters are connected to a SMART PROCESS SCANNER/CLEAN ROOM MONITOR, which display parameters locally and transfers the Digital Data using a 3 wire Serial Communication Interface to Clean Room Data Acquisition Unit which eliminates deviation between them.
4. Clean room monitors has an advanced feature that it displays the data from remote transmitters or it can display the DP, RH, Temp. Values locally through the inbuilt sensor.
5. Clean Room Data Acquisition Unit collects the data from 32 Smart Process Scanner/CLEAN ROOM MONITORS and stores the data and transfers to a PC using a 3 wire Serial Communication Interface which eliminates deviation between them.
6. Clean room data acquisition unit has one more unique feature that, it not only transfers the data to PC, it even communicates with PLC/SCADA through MODBUS Protocol.
7. RS232-RS485 converter enables the 3 wire Serial (RS485) data to conventional Serial (RS232) to interface to PC
8. Data Acquisition Software enables the user to collect the Data, Store, View, Analyze the data with an option to secure the Data.

Clean Room Data Acquisition Unit

Model : DL-124M

***** Experience the unrivaled capacity of the Clean Room Measurement Solution**



FEATURES:

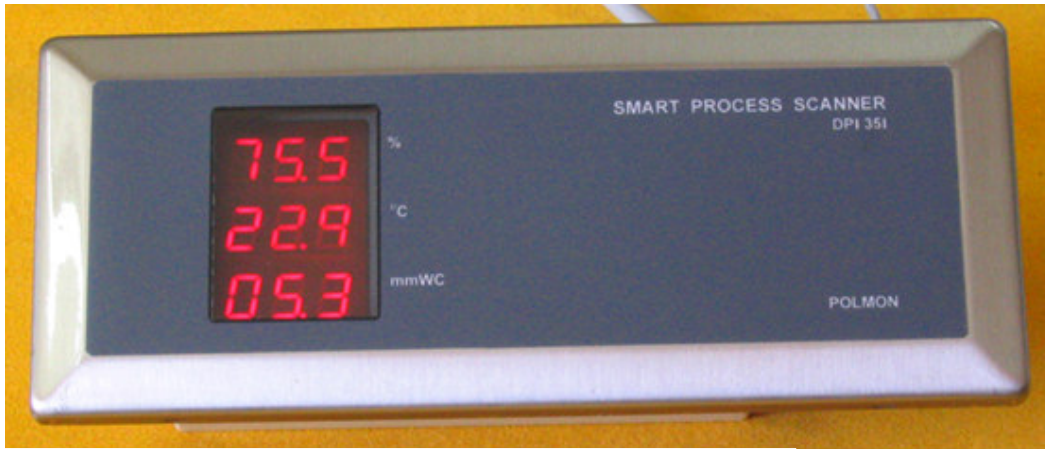
- Accepts Digital data from “Serial Devices” in RS 485 loop for Error free Data Logging.
- Dual 3 Wire Serial Communication with Serial Devices & PC reduces the Cable Cost to more than 50%.
- Stamps each data packet with Real time & date.
- Stores data in built in 384 KB of flash memory and transmit it to PC.
- Displays Process Values (PVs) in Alphanumeric Backlit LCD display.
- Supports a maximum of 144 process channels/32 devices.
- Supports High communication baud rate viz. 38.4Kbps.
- Supports Common Hooter & Acknowledgement.

DL124M is designed as the most convenient and effective way of acquiring Digital data from Field devices (Max 32) which communicate on 3 Wire Serial port which reduces the **Cable Cost** and **Zero deviation** between Local Indication to Data Logged which eliminates maintenance problems in calibrating the errors encounter in conventional 4-20mA loops.

SMART PROCESS SCANNER Model No: DPI-35I

*** INNOVATIVE MEASUREMENT SOLUTION

The POLMON “Smart Process Scanner” has been specially Designed for measurement & Remote Data Logging of Parameters like RH, Temperature, Dew point & Differential Pressure of CLEAN Rooms in Pharmaceutical industries. Communication port for Remote Data Logging & inbuilt 3-channel scanning provided in the instrument reduces the Cables which makes it unique & one of its own kind for clean room process measurement.



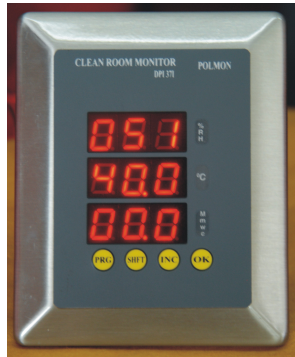
Features:

- Measures DP, RH & Temperature.
- SS Faceplate, flush mount for Clean Room Application (Standard Accessory)
- Cable reduction for Remote Data Logging applications.
- Real Time data Transmission of 3 input parameters.
- Digital data transmission eliminates Loop calibrations.
- Software Calibration & Ranging through soft touch tactile keypad.
- Individual display for each parameter.
- Violation Set points for each parameter (HI/LO) for Visual Annunciation.
- Programmable digital filter.
- Diagnostic messages to indicate functional performance of sensors.
- Fully Differential inputs.
- Optional MODBUS interface Max 32 Devices without Repeater.
- Programmable Baud Rate selection 1200 / 9600 / 19200/38400.
- 24V inbuilt power Supply to power Transmitters.
- Clean Room compatible Conceded Enclosure (Depth 45 mm)
- Optical isolation > 10K v for communication port.
- Programmable Baud Rate selection 1200 / 9600 / 19200/38400.

CLEANROOM MONITOR

MODEL NO: DPI-37I

“DPI-37I” is specially designed for Clean rooms to meet the requirements of Differential pressure, Relative humidity and temperature measurement & display in process Industries. It is designed as the most convenient user Instrument with respect to Process values display and programming modes. The DPI-37I measures Differential pressure, Relative Humidity Dew point as well as Temperature and transfers data to Data logger for data storage.



DPI37I for Remote Transmitters



DPI37I with Inbuilt Sensors

FEATURES:

- Inbuilt RHT & DP sensor, which avoids cable between Transmitter and Indicator (Optional).
- Portable in size.
- Optional isolated RS-485 Communication to transfer the data for storage
- 3 displays for displaying DP, RH and Temperature Individually.
- Optional features to interface remote transmitters using 0-20/4-20mA or 0-10V.
- Designed to mount on either Modular wall or RCC wall
- Dew point display on demand with inbuilt RH & temperature Sensor.
- Process value violations display indication
- User selectable set limits for process value violations
- Inbuilt Buzzer to provide audible Process value violation
- Option to enable or disable buzzer.
- Password protected calibration & other programming modes.
- Software calibration.
- Option to interface data logger proprietary protocol or PLC Communication MODBUS protocol Interfacing.

RH & TEMPERATURE TRANSMITTER

MODEL No: RHT-70 T

FEATURES:

- Relative humidity & Temperature sensors on one module.
- Inbuilt sensor.
- Absolute accuracy RH $\pm 2\%$ of FSR @ 23°C & Temp: $\pm 0.3\%$ of FSR
- Temperature compensation for RH sensor.
- Ensures long term stability.
- Fast RH response time.
- 4-20mA/0-1V output for both %RH & Temperature.
- Wall mounting/Duct mounting/Green House type versions.



SPECIFICATIONS:

Type	Specification
Measurement Range	RH : 0 -100 %RH Temp. : -40 to 60°C
Accuracy	RH : $\pm 2\%$ of FSR Temp.: $\pm 0.3\%$ of FSR
Response time	RH: 0.7Sec
Calibration	0-1 Vo/p: Factory 4-20mA o/p: Field (Zero, Span)
Power supply	24VDC, 60 mA
Outputs:	RH: 4 – 20mA/0-1V Temp. : 4 – 20mA/0-1V Max Load resistance 500 Ω for 4-20mA o/p Min Load resistance >10K Ω for 0-1V o/p
Environmental ranges	Temperature: -40 to 85° C Humidity: 0 –100 %RH Storage Temperature: -40 to 85°C
Enclosure	Dimensions: See mechanical drawings Weight: 0.3Kg. (Approximately) Enclosure type: High impact ABS plastic (IP-65)
Mounting	Wall mounting/Duct mounting/Flush mounting

Standard Supply:

- Instrument.
- Test & calibration certificates.
- Instruction manual.
- Accessories (Fixing Screws)

TEMPERATURE TRANSMITTER

MODEL NO: TET-90T

FEATURES:

- Inbuilt sensor (PT100 ($\alpha = 0.00385$))
- Absolute accuracy $\pm 0.2\%$ of FSR
Including Sensor accuracy $\pm 0.7\%$ of FSR
- 4-20mA linear output
- Fine Zero and Span adjustment.
- Wall mounting/Duct mounting type versions.



SPECIFICATIONS:

Type	Specification
Input Type	Pt100 ($\alpha = 0.00385$), 3-wire connection
Measurement Range	-50°C to 50°C
Accuracy	$\pm 0.2\%$ of FSR Including Sensor $\pm 0.7\%$ of FSR
Calibration	Zero Adjustment: $\pm 10^\circ\text{C}$ Span Adjustment: $\pm 10^\circ\text{C}$
Power supply	>+12VDC to <+30VDC, 30mA
Output	4-20mA Linear Max Load resistance = (Supply voltage - 7.5 V/20mA) - Loop wire resistance.
Sensor open fault signal	$\cong 27$ mA output
Sensor short fault signal	$\cong 2.2$ mA output
Environmental ranges	Temperature: -40 to 85°C Humidity: 10-95%RH Non condensed
Enclosure	Storage Temperature: -40 to 85°C Dimensions: See mechanical drawings Weight: 0.3Kg. (Approximately)
Sensor	Enclosure type: High impact ABS plastic Type: Pt100 ($\alpha = 0.00385$), 3-wire, Length: 105 mm
Mounting	Wall mounting/Duct mounting

Standard Supply:

- TET-90T Instrument.
- Test & calibration certificate.
- Instruction manual.
- Accessories (3 X 9 mm SS wooden Fixing Screws-4No's).

RH & TEMPERATURE INDICATOR

MODEL NO: RHT-71I

“RHT-71I” is specially designed to meet requirements of Relative humidity and temperature measurement in Clean rooms and Process Industries.

It is designed as the most convenient user Instrument with respect to Process values display and programming modes.

The RHT-71I measures Relative Humidity, Temperature and Dew point and display on provided inbuilt display as well transfers data to Data logger for data storage



FEATURES:

- Inbuilt RHT sensor which avoids cable between Transmitter and Indicator
- Optional RS-485 Communication to transfer the data for storage
- Dual display for displaying RH and Temperature Individually.
- Designed to mount on either Modular wall or RCC wall
- Dew point display on demand
- Process value violations display indication
- Users selectable set limits for process value violations
- Inbuilt Buzzer to provide audible Process value violation
- Optional PLC Communication MODBUS protocol interfacing
- Software Calibration.

SPECIFICATIONS:

Type	Specification
Measurement Range	RH: 0 -100%RH Temp.: 0 to 60°C
Accuracy	RH: ±2.0% For the range 10-90% and ±4% for remaining Temp: ±1 °C For the range 0-40 °C and ±2 °C for remaining Dew Point: ±1 °C For the range 40-100% and : ±2 °C for remaining
Resolution	RH: 1 % Temp: 0.1/1 °C
Response time	Typically 12sec
Power supply	24VDC, 200mA
Outputs:	RS-485 Proprietary / Modbus
Display	7 segment 0.3" size displays
Operating ranges	Instrument Temperature: 0-60°C Humidity: 0-100%RH Storage Temperature: -40 to 85°C
Enclosure	For details see the Mechanical details
	Weight: 0.5Kg. (Approximately)
	Enclosure type: MS
Mounting	Brick/Modular Wall mounting

TEMPERATURE INDICATOR

Model.No: TET-911

FEATURES:

- Inbuilt sensor
- Absolute accuracy $\pm 0.2\%$ of FSR
- RS-485/4-20mA/Relay output
- Wall mounting.
- Sensor break detection.
- Alarms indication for set values.



SPECIFICATIONS:

Type	Specification
Input Type	Inbuilt sensor
Measurement Range	0°C to 60°C
Accuracy	± 1 deg c
Resolution	0.1°C/1 °C
Calibration	Software
Power supply	21.6-26.4V DC
Output	RS-485 modbus (or) Proprietary Relay (or) 4-20mA Linear Max Load resistance = (Supply voltage – 7.5 V/20mA)– Loop wire resistance.
Display Type	4-digit Seven segment display Dimensions: 40X10 mm Height of the digits: 10mm
Environmental ranges	Operating Temperature: 0 to 50°C Humidity: 10–95 %RH Non condensed Storage Temperature: -40 to 85°C
Enclosure	MS Enclosure with North West single window SS faceplate Weight: 0.25 kg (Approx.) Size: 73X71X40 mm (Approx.)
Sensor	Digital Output
Mounting	Wall mounting

DIFFERENTIAL PRESSURE TRANSMITTER/INDICATOR

MODEL NO: DPT-52

The “DIGITIZED DIFFERENTIAL PRESSURE (DPT52)” is specially designed to measure difference between two Pressures and to transmit current signal to the process indicators Or data loggers, which can help the user to monitor the DP and to take necessary actions to maintain the room conditions as per the requirement or a application.



Differential Pressure Indicator

Differential Pressure Transmitter

FEATURES:

- 1) MODBUS/Proprietary protocol communication.
- 2) Test & Calibration certificate traceable to National Standards.
- 3) 4-20mA o/p or 24V relay o/p.
- 4) Inbuilt Pressure Sensor

SPECIFICATIONS:

Model NO	DPT52-R-1-X-X	DPT52-R-2-X-X	DPT52-R-3-X-X
NO .of Inputs	1		
Input Supply	24VDC,200mA		
Measuring Range	-100 mmWC to +100 mmWC		
Resolution	Depends upon the selected measured units		
Accuracy	+/- 1.5 % of FSR		
Display	4-digit 7-segment display		
Outputs .	Modbus/RS 485 Prop.	4-20 mA Output	Relay Output
No .of Units	10		
Response time	1 sec		
Operating Temperature Range	0-50°C		
Face Plate	MP 733 North West Single Window SS		
Size	a)DPT52 MS BOX 73X72X40 b)Brick Wall Concealed Box 95 X79 X50		
Mounting	Modular wall & Brick wall Mounting		
Environmental Ranges	Air & Neutral gases		
Weight	0.25 Kg (Approx)		

DP & TEMPERATURE INDICATOR

MODEL No: DPT-54I

“DPT54I” is specially designed to meet requirements of Differential Pressure (DP) and Temperature measurement in Clean rooms and Process Industries.

It is designed as the most convenient user Instrument with respect to Process values display and programming modes.

The DPT-54I measures DP, Temperature and display on provided inbuilt display as well transfers data to Data logger for data storage



FEATURES:

- Inbuilt DP and Temp sensors which avoids cable between Transmitter and Indicator
- Optional RS-485 Communication to transfer the data for storage
- Dual display for displaying DP and Temperature Individually.
- Designed to mount on either Modular wall or RCC wall
- Process value violations display indication
- User selectable set limits for process value violations
- Inbuilt Buzzer to provide audible Process value violation
- PLC Communication MODBUS protocol interfacing.
- Software calibration

SPECIFICATIONS:

Type	Specification
Measurement Range	DP : +/- 100 mmW C Temp. : 0 to 60°C
Accuracy	DP: ±1.5 % FSR Temp: ±1 °C For the range 0-40 °C and ±2 °C for remaining
Resolution	DP: 0.1 mmW c Temp: 0.1/1 °C
Response time	Typically 12sec
Power supply	24VDC, 200mA
Outputs:	RS-485 Proprietary / Modbus Factory Configurable
Display	7 segment 0.3" size displays
Operating ranges	Instrument Temperature: 0-60°C Humidity: 0-100%RH Storage Temperature: -40 to 85°C
Enclosure	For details see the Mechanical details Weight: 0.5Kg. (Approximately) Enclosure type: MS Enclosure Face plate : SS
Mounting	Brick/Modular Wall mounting

POLSOFT
Distributed Data Acquisition Software
(Server / Client)

POLSOFT (Data acquisition Software) in association with Data Logger provides a comprehensive and complete solution to *Data Analysis* and *Presentation*

Polsoft for Clean Rooms

- ❑ Data Acquisition for Clean Room parameters – DP, RH, Temperature.
- ❑ Screens with room layouts & dynamic process values.
- ❑ Customized reports for analysis of AHU filters functioning etc.

DATA COLLECTION & STORAGE

- ❑ Supports Remote data collection and retrieval.
- ❑ Quick and convenient downloading of logger data.
- ❑ Detects and avoids storage of Wrong / Corrupted data.
- ❑ Supports export of data to other environments (Word, Excel etc.,).
- ❑ Backup and restore facilities available.

DATA VIEWING & ANALYSIS

- ❑ Easy data access through grouping facility.
- ❑ Online view of Data in Tabular / Panel format.
- ❑ Historical data view with Set Limit violation indicated with different colours.
- ❑ Sorting of data based on the violation.

SECURITIES

- ❑ All Configurations are Password protected.
- ❑ Software closing is also Password protected.
- ❑ 21 CFR Part 11 compliance (Optional).

Overall Plant view:

POLMON DATA ACQUISITION SOFTWARE - POLSOFT [Ver 9.15] - [Data View for Clean Rooms Process]

Settings Security Display Arrange Help

PLANT VIEW

- A BLOCK
 - TEST GROUP1
 - BUFFER ROOM 1
 - DP1
 - %RH1
 - TEMP1
 - CHANGE ROOM 1
 - DP2
 - %RH2
 - TEMP2
 - BUFFER ROOM 2
 - DP3
 - %RH 3
 - TEMP 3
 - CHANGE ROOM 3
 - DP4
 - %RH4
 - TEMP 4
 - PROCESS CORRIDO
 - DP5
 - %RH5
 - TEMP 5
 - RH & TEMP
 - %RH1
 - TEMP1
 - %RH2
 - TEMP2
 - %RH 3
 - TEMP 3

BUFFER ROOM 1 - Panel View

DP1	%RH1	Temp1
3.0	51.2	35.0
mmWC	%RH	Deg C

Select View

- On Line Data (List)
- On line Data (Panel)
- Reactor History - Graph - Report
- Parameter History - Graph - Report

Process : 12 [DL 122-0002] : 100000917310

DATA History

POLMON DATA ACQUISITION SOFTWARE - POLSOFT [Ver 9.15] - [Data View (Room / Sub Group Wis...]

Settings Security Display Arrange Help

History

BLOCK: 0001A.BLOCK
 GROUP: 0001 - TEST GROUP1
 Room / Sub Group: 0001 - BUFFER ROOM 1
 PARAMETER: [Dropdown]

From Date: 14/12/04 12:01
 To Date: 14/12/04 12:30
 No. of Records: 1440

Buttons: Refresh, NEXT, BACK

Recorded At	DP1	%RH1	Temp1
14/12/04 12:16	+003.0	+051.2	+035.0
14/12/04 12:15	+003.0	+051.2	+035.0
14/12/04 12:14	+003.0	+051.2	+035.0
14/12/04 12:13	+003.0	+051.2	+035.0
14/12/04 12:12	+003.0	+051.2	+035.0
14/12/04 12:11	+003.0	+051.2	+035.0
14/12/04 12:10	+003.0	+051.2	+035.0
14/12/04 12:09	+003.0	+051.2	+035.0
14/12/04 12:08	+003.0	+051.2	+035.0
14/12/04 12:07	+003.0	+051.2	+035.0
14/12/04 12:06	+003.0	+051.2	+035.0
14/12/04 12:05	+003.0	+051.2	+035.0
14/12/04 12:04	+003.0	+051.2	+035.0
14/12/04 12:03	+003.0	+051.2	+035.0
14/12/04 12:02	+003.0	+051.2	+035.0
14/12/04 12:01	+003.0	+051.2	+035.0

Violations

- DH
- Normal
- DL

Process : 6 [DL 122-0002]

**Ordering Information:
For Monitoring DP, RH & Temperature With Local Display in each Room.**

SLNo	Item Description	Mounting / Application	Model No	Qty	Remarks
1	Clean Room Data Acquisition Unit	Panel	DL-124M	1	Suitable to 32 Smart Process Scanner(DPI-351)
2 a.	RH & Temp Transmitter	Wall	RHT-70T-1	1	Each room(As Required)
b.		Duct	RHT-70T-2		
c.		Flush	RHT-70T-3		
3 a.	Temp. Transmitter	Wall	TET-90T-1-1	1	Each Room if Only temp.
b.		Duct	TET-90T-1-2		
c.		Flush	TET-90T-1-3		
4 a	Smart Process Scanner	Modular/ RCC wall, RS485 Proprietary	DPI351-1-X-X-X	1	Each room
		Modular/ RCC wall, RS485 MODBUS	DPI351-2-X-X-X		
b	RCC Wall Concealed Box	RCC Wall	DPI35B-1-1	1	Each room(As Required)
c	Modular Wall Concealed Box	Modular Wall (50 mm)	DPI35M-1-1	1	Each room(As Required)
5	Clean room Monitor	Modular/ RCC wall, (Remote Transmitter)	DPI371-1-1-1-X-X		
		Modular/ RCC wall, (Inbuilt Sensors)	DPI371-2-2-2-X-X		
6	Differential Pressure Transmitter/Indicator.	Modular/ RCC wall, RS485 Proprietary/Modbus	DPT52-R-1-1-X	1	Each room (As Required)
		Modular/ RCC wall, 420mA O/P, No Display	DPT52-R-2-0-X	1	Each room (As Required)
		Modular/ RCC wall, 420mA O/P, Display	DPT52-R-2-1-X	1	Each room (As Required)
		Modular/ RCC wall, Relay O/P, Display	DPT52-R-3-1-X	1	Each room (As Required)
7	RH & Temperature Indicator	Modular/ RCC wall, RS485 Proprietary/Modbus	RHT711-R-X	1	Each room (As Required)
8	DP & Temperature Indicator	Modular/ RCC wall, RS485 Proprietary/Modbus	DPT54I-R-X	1	Each room (As Required)
9	Temperature Indicator	Modular/ RCC wall, RS485 Proprietary/Modbus	TET911-R-1-1-X	1	Each room (As Required)
		Modular/ RCC wall, 420mA O/P, No Display	TET911-R-2-0-X	1	Each room (As Required)
		Modular/ RCC wall, 420mA O/P, Display	TET911-R-2-1-X	1	Each room (As Required)
		Modular/ RCC wall, Relay O/P, Display	TET911-R-3-1-X	1	Each room (As Required)
10	<u>Cables</u>				
a.	0.5sq.mm PVC flexible Cable	220V Power			As per Layout
b.	0.5sq.mm PVC flexible shielded Cable 4 Core	RH & Temp Transmitter			As per Layout
c.	7/32, 4Core 0.5sq.mm PVC flexible shielded Cable 4 Core	DP Transmitter			As per Layout
11	UPS			1	Customer Scope

*** Multiply the Qty by the No. Of Rooms Required**

**For Intrinsic safe/FLP applications additional components need to be considered
Like FLP enclosure, Isdata barriers, loop transmitters etc**

For Data Acquisition

S.No	Item Description	Mounting / Application	Model No	Qty	Remarks
1	RS232-RS485 Converter	Wall	DL-120C-1-X	1	
2	Computer Cable		RS232C	1	Serial Comm. Cable to PC
3	Clean Room Distributed Data Acquisition Software (Server)		POLSOFT 900C-01-1-X	1	
4	Clean Room Distributed Data Acquisition Software (Client)		POLSOFT 800C-01-1-X	1	If additional terminal for accessing data
5	<u>Cables</u>				
a.	0.5sq.mm PVC flexible Cable	220V Power			As per Layout
b.	0.5sq.mm PVC flexible shielded Cable 4 Core	Communication (RS485)			As per Layout
6	Panel			1	Depends on no. of DL-124M
7	PC			1	Customer Scope
8	Printer			1	Customer Scope
9	UPS			1	Customer Scope