

120 Series Explosion-Proof Temperature and Indicating Temperature Switches and Controls

Local Mount Types B121, B122, C120
Remote Mount Types E121, E122, F120; 820E,
822E



UNITED ELECTRIC
CONTROLS

Installation and Maintenance Instructions

Please read all instructional literature carefully and thoroughly before starting. Refer to the final page for the listing of Recommended Practices, Liabilities and Warranties. For functional safety applications, please refer to the safety manual which can be downloaded from www.ueonline.com.

GENERAL

MISUSE OF THIS DEVICE MAY CAUSE EXPLOSION AND PERSONAL INJURY. THESE INSTRUCTIONS MUST BE THOROUGHLY READ AND UNDERSTOOD BEFORE DEVICE IS INSTALLED.

THIS DEVICE IS SUITABLE FOR USE IN CLASS I, DIVISION 1, GROUPS B, C AND D; CLASS II, DIVISION 1, GROUPS E, F AND G; CLASS III; OR NON-HAZARDOUS LOCATIONS ONLY. ENCLOSURE TYPE 4X, 7 & 9.

The device has been certified in accordance with the applicable requirements of the following standards:

- IEC 60079-0, 6th Edition, Revision Date 2013/12
- IEC 60079-1, 7th Edition, Revision Date 2014/06
- IEC 60079-31, 2nd Edition, Issue Date 2013/11
- EN 60079-0:2012+A11:2013
- EN 60079-1:2014
- EN 60079-31:2014

THIS DEVICE IS ATEX CERTIFIED FOR EQUIPMENT CATEGORY 2. SUITABLE FOR APPROPRIATE USE IN GAS ZONE 1 & DUST ZONE 21 APPLICATIONS.

DEMKO 09 ATEX 0815573X
0539 IECEx UL 03.0001X

II 2 G Ex db IIC T6 Gb
 II 2 D Ex tb IIIC T85°C Db IP66
-40°C ≤ TAMB. ≤ + 75°C

TO PREVENT IGNITION OF HAZARDOUS ATMOSPHERES, DISCONNECT SUPPLY CIRCUITS BEFORE OPENING. KEEP COVER TIGHT WHILE CIRCUITS ARE ENERGIZED.

MAXIMUM TEMPERATURE* STATED IN LITERATURE AND ON NAME-PLATE MUST NEVER BE EXCEEDED, EVEN BY SURGES IN THE SYSTEM. OCCASIONAL OPERATION OF UNIT UP TO MAX. TEMPERATURE IS ACCEPTABLE (E.G., START-UP, TESTING). CONTINUOUS OPERATION SHOULD BE RESTRICTED TO THE DESIGNATED ADJUSTABLE RANGE.

*Maximum Temperature - the highest temperature to which a sensing element may be occasionally operated without adversely affecting set point calibration and repeatability.

THIS DEVICE DOES NOT HAVE ANY FIELD REPLACEABLE PARTS. ANY SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 1.

The 120 Series temperature switch utilizes either a liquid filled sensing stem (immersion stem, direct mounting) or liquid filled sensing bulb (bulb & capillary, remote mounting) to detect a temperature change. The response at a pre-determined set point(s), actuates a SPDT, dual SPDT, or DPDT snap-acting micro switch(es), converting the temperature signal into an electrical signal. Control set point(s) may be varied by turning the adjustment hex (C120, F120) or the external knob(s) and pointer(s) (B121, B122, E121, E122, 820E, 822E) according to the procedures outlined (See Part II - Adjustments)

Please refer to the product technical brochures for product specifications. Product technical brochures may be found at www.ueonline.com.

UE declarations and third party issued certifications are available for download at www.ueonline.com/prod_approval.

Date code format on nameplate is "YYWW" for year and week.

Part I - Installation

TOOLS NEEDED – Screwdriver/Adjustable Wrench to 1 1/2"

MOUNTING

TO PREVENT ELECTROSTATIC DISCHARGE, WIPE DOWN COVER AND ENCLOSURE OF ANY DUST BUILD UP BEFORE REMOVING COVER.

INSTALL DEVICE WHERE SHOCK, VIBRATION AND TEMPERATURE FLUCTUATIONS ARE MINIMAL. DO NOT MOUNT DEVICE IN AMBIENT TEMPERATURES THAT EXCEED THE LIMITS ON THE NAMEPLATE FOR THE APPROPRIATE AREA


MOUNT DEVICE TO PREVENT MOISTURE FROM ENTERING THE ENCLOSURE. IT IS IMPERATIVE TO USE PROPERLY RATED EXPLOSION-PROOF SEALING FITTINGS FOR ELECTRICAL WIRE ENTRY.


TO PREVENT IGNITION OF HAZARDOUS ATMOSPHERES, SEAL CONDUIT RUNS WITHIN 18 INCHES OF ENCLOSURE


TYPES C120, F120, 820E AND 822E ARE PROVIDED WITH TWO 3/4" NPT ELECTRICAL CONDUIT OPENINGS, EITHER OF WHICH OR BOTH CAN BE USED DURING INSTALLATION. A 3/4" EXPLOSION PROOF PLUG* IS PROVIDED FOR PROPERLY PLUGGING THE UNUSED CONDUIT OPENING. THE EXPLOSION PROOF PLUG MUST BE PROPERLY INSTALLED.


*Plug is approved explosion-proof with the product as a full assembly and does not carry individual markings.

DO NOT KNOCKOUT ANY PLUGS ON EXPLOSION-PROOF TYPES 820E OR 822E

 THE CONNECTION OF THE DEVICE SHALL BE MADE BY CABLE ENTRIES OR A STOPPING BOX SUITABLE FOR THE CONDITIONS OF USE AND CORRECTLY INSTALLED, AND CERTIFIED BY TYPE OF EXPLOSION PROTECTION - FLAMEPROOF ENCLOSURE 'd'.


 ALWAYS HOLD A WRENCH ON THE TEMPERATURE HOUSING HEX WHEN MOUNTING THE DEVICE. DO NOT TIGHTEN BY TURNING THE ENCLOSURE AS THIS WILL DAMAGE SENSOR AND WEAKEN SOLDER AND WELDED JOINTS.

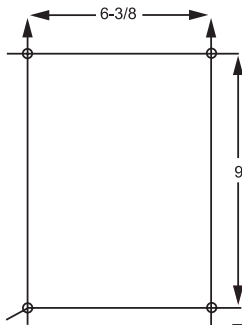
 VERTICAL MOUNTING (TEMPERATURE PROBE FACING DOWN) IS RECOMMENDED; HOWEVER DEVICE CAN BE MOUNTED IN ANY ORIENTATION WITH ADHERENCE TO PREVIOUS WARNINGS AND EXCEPTIONS BELOW.

 Remote mount types E121, E122 & F120 temperature devices may be mounted vertically (temperature assembly facing down) or horizontally. The conduit connection must be properly sealed (potted) for horizontal installation. Device may be surface mounted via the four 1/4" screw holes on the enclosure or mounting bracket. It can also be mounted directly to a rigid pipe using a thermowell.

Types 820E and 822E

Units must be surface mounted. Drill mounting holes per Figure 1.

 IF A SEAL FITTING IS REQUIRED, INSTALL THE NIPPLE AND THE SEAL FITTING PRIOR TO SURFACE MOUNTING THE CONTROLLER.




Clearance for 1/4 screw (4) places

Figure 1: 820E, 822E Mounting


Mounting Bulb and Capillary


Fully immerse the bulb and 6" of capillary in the control zone. For best control it is generally desirable to place the bulb close to the heating or cooling source in order to sense temperature fluctuations quickly. Be sure to locate the bulb so it will not be exposed to temperature beyond the device range limits.

 AVOID BENDING OR COILING THE CAPILLARY TUBE TIGHTER THAN 1/2" RADIUS. EXERCISE CAUTION WHEN MAKING BENDS NEAR THE CAPILLARY ENDS.


If a separable well or union connector is used follow separate instructions included with them.


WIRING

 DISCONNECT ALL SUPPLY CIRCUITS BEFORE WIRING DEVICE. WIRE DEVICE IN ACCORDANCE WITH LOCAL AND NATIONAL ELECTRICAL CODES. MAXIMUM RECOMMENDED WIRE SIZE IS 14 AWG AND RECOMMENDED TIGHTENING TORQUE FOR FIELD WIRING TERMINALS IS 7 TO 17 IN-LBS

 ELECTRICAL RATINGS STATED IN LITERATURE AND ON NAMEPLATE MUST NOT BE EXCEEDED—OVERLOAD ON A SWITCH CAN CAUSE FAILURE ON THE FIRST CYCLE.

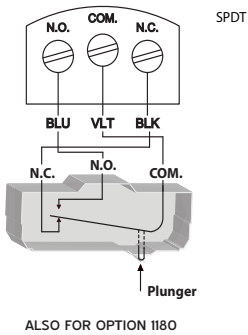
 FIELD WIRING MUST BE RATED 90°C MINIMUM. FOR AMBIENT TEMPERATURES BELOW -10°C, USE SUITABLE FIELD WIRING.

 THE EXTERNAL GROUNDING TERMINAL IS NOT TO BE USED AS THE PRIMARY EQUIPMENT GROUNDING TERMINAL. THE INTERNAL GROUNDING TERMINAL SHALL BE USED AS THE PRIMARY EQUIPMENT GROUNDING MEANS AND THE EXTERNAL GROUNDING TERMINAL IS ONLY FOR A SUPPLEMENTAL (SECONDARY) GROUNDING CONNECTION WHERE LOCAL AUTHORITIES PERMIT OR REQUIRE SUCH A CONNECTION.

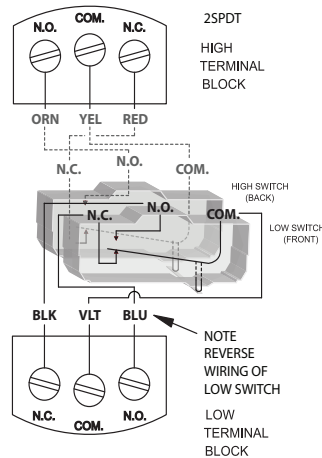
 TO PREVENT SEIZURE OF ENCLOSURE COVER, DO NOT REMOVE LUBRICANT. THREADS SHOULD ALSO BE FREE OF DIRT, ETC.

Remove cover and wire device (See Figure 2). Wire directly to the terminal block. An internal grounding terminal is located near the right-hand conduit opening. Replace cover and hand tighten to fully engage cover O-ring.

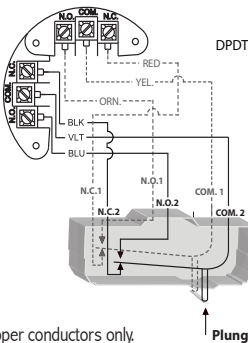
TYPES B121, C120, E121, F120, 820E



TYPES B122, E122,



OPTION 1010, 1190, 1195
(FOR TYPE B121, C120, E121, F120 ONLY)



TYPE 822E

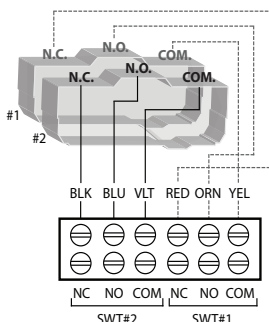


Figure 2
Use 90°C copper conductors only.
Recommended tightening torque for
field wiring terminals is 7-17 in-lbs.

Types B121 and E121

Remove adjustment cover. Adjust set point by turning external knob and pointer to desired setting on scale (see figure 4).

Types B122 and E122

Individual switches may be set together or separately by up to 100% of range. The front (low) switch should never be set higher than the rear (high) microswitch. Turning external knobs will increase or decrease each switch setting independently (see figure 4).

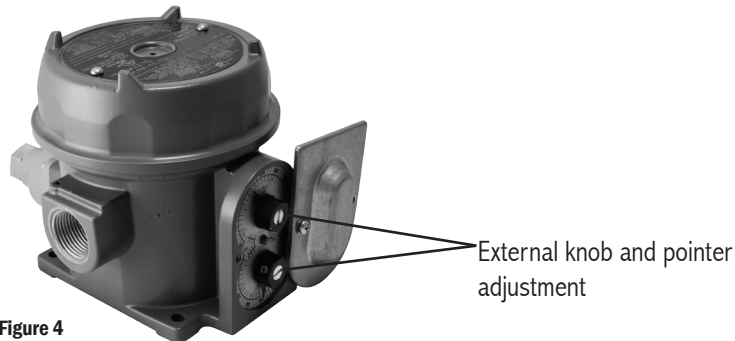


Figure 4

Indicating Temperature Switch Types 820E & 822E

NOTE: Prior to making any device adjustment, the cover and adjustment knob should be removed. When adjustment is completed, all applicable parts should be replaced.

Type 820E

Move the set point Adjustment Pointer up scale beyond the brown Indicating Pointer. This permits checking the set point by moving the lever arm upward with a finger or tool simulating thermal assembly movement. Connect test lights to indicate switch operation or listen for the switch to click. Loosen adjustment "A" and move the Adjustment Pointer until it agrees with the Indicating Pointer (see Figure 5). When the switch clicks re-tighten the screw.

Type 822E

NOTE: Type 822E has a single knob and pointer for both switches. Both switches are standardly, factory set together within 5% of the dial range. Turning the knob positions both switches simultaneously, maintaining a constant separation between them.

Remove the explosion-proof die-cast cover to permit access to the switches. Move the Adjustment Pointer up scale beyond the Indicating Pointer by an amount greater than the difference between the switch settings by moving the actuating lever upward with a finger or a tool simulating thermal assembly movement (see Figure 5). Connect test lights to indicate switch operation or listen for the individual switch clicks.

The set point of switch #1 is determined by the red Adjustment Pointer. The set point of switch #2 may be adjusted by up to 25% of the range span below the switch #1 set point by turning adjustment "D" in (clockwise). See back page for 822E dual switch adjustment. The set point of switch #2 should not be above that of switch #1.

To align switch #1 to the Adjustment Pointer, loosen adjustment "A" and set the Adjustment Pointer to the scale, then re-tighten adjustment "A" (see Figure 5).

NOTE: Indicating Pointer Deflection (820E, 822E): The indicating pointers will read slightly low when the bulb temperature is 15° above the controller setting. This deflection is normal and repeatable (approximately 0.5% of scale range on single switch models) and is due to the transference of the switching mechanism load to the thermal system. It can be measured by moving the setting pointer from the high to the low end of the scale and observing the resultant indicating pointer deflection.

Part II - Adjustments

TOOLS NEEDED

- 3/16" Open End Wrench (2)
- 1/4" Open End Wrench
- 5/64" Allen Wrench
- 5/16" Open End Wrench (2 required for 822E only)

AFTER COMPLETING ADJUSTMENTS ON ALL 120 SERIES, BE SURE TO RE-INSTALL ADJUSTMENT COVER. DO NOT OVER TIGHTEN COVER SCREWS.

For set point adjustment and recalibration, connect device to a calibrated temperature source and stabilize.

Types C120, F120

Remove Cover. Adjust set point by holding plunger with 3/16" open end wrench and turning the calibrating screw with another 3/16" open end wrench (see figure 3). Turn clockwise to increase setting or counter-clockwise to decrease setting.

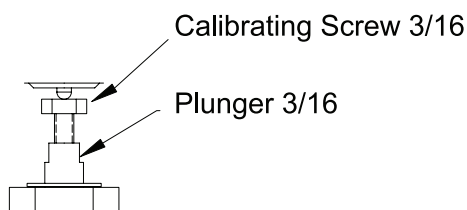


Figure 3

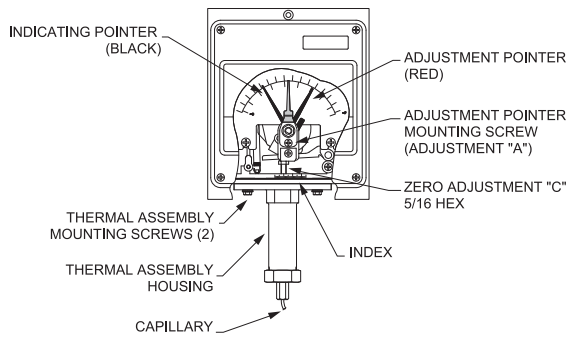


Figure 5: Indicating Enclosure Internals

NOTE: Indicating Pointer Adjustment (820E, 822E): Use an accurate test thermometer such as a thermocouple with its probe mounted directly to the center of the sensing bulb. Before making any adjustments, allow process temperature to stabilize; i.e., successive on-off cycles repeated.

Correct any difference between the Indicating Pointer and the test thermometer by holding the compensator with a 5/16" wrench while turning the zero adjustment "C" on the thermal assembly with a second 5/16" wrench (see Figure 5) until the brown Indicating Pointer reads the same as the test thermometer. Turning clockwise lowers indicated reading. Compare the process temperature with the set point Adjustment Pointer. Loosen adjustment screw "A" to align set point Adjustment Pointer with the Indicating Pointer. Re-tighten screw "A".

Correction of Capillary (820E, 822E)

If the length of capillary immersed in the process differs from the amount immersed (6", see Mounting Bulb & Capillary in Part I - Installation) at the factory calibration bath, a calibration shift will occur. The error may be corrected as follows:

Move set pointer to the highest temperature setting. Note indicating scale reading with the head and sensor at room temperature. Loosen the two thermal assembly mounting screws. Re-position the housing index against the calibration on the instrument case (or skeleton casting) at a rate of 1 division line per capillary length listed in Figure 6. Move to the left if capillary is to be added to the process, or to the right if capillary is to be removed from process.

Model Number	Range	Cap Length/ Division*
1	-180 to 120°F	2 ft
2	-125 to 350°F	1 1/2 ft
3	-125 to 500°F	1 ft
4	-40 to 120°F	4 ft
5	-40 to 180°F	3 ft
6	0 to 250°F	2 1/2 ft
7	0 to 400°F	2 ft
8	50 to 650°F	2 ft

*Added to or taken away from the process

Figure 6

ZONE HAZARDOUS LOCATIONS FLAMEPROOF GAP AND JOINT DETAILS

120'S

Activation Plunger to adjustment screw hole gap joints: 1.140in/28.96mm min length by 0.0039in/0.099mm max annular gap

Plunger Guide to enclosure through threaded joints: minimum 8 1/2 fully engaged threads

Cover to enclosure through threaded joints: minimum 7 1/2 fully engaged threads

121'S & 122'S

Activation Plunger to enclosure through hole gap joints: 1.000in/25.40mm min length by 0.0030in/0.076mm max annular gap

Adjustment shaft to shaft through hole gap joints: 1.050in/26.67mm min. length by 0.0035in/0.089mm max. annular gap

Cover to enclosure through threaded joints: minimum 7 1/2 fully engaged threads

MANUAL RESET OPTION 1530 (120'S,121'S)

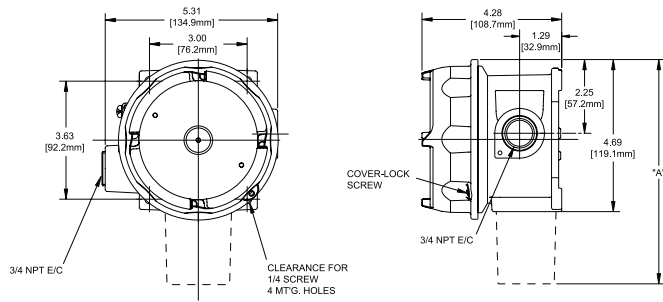
Reset pivot to pivot guide through hole gap joints: 1.118in/28.40mm min. length by 0.0036in/0.091mm max annular gap

Reset guide to enclosure through threaded joints: 8 fully engaged threads

Dimensions

(Dimensional drawings for all models may be found at www.ueonline.com.)

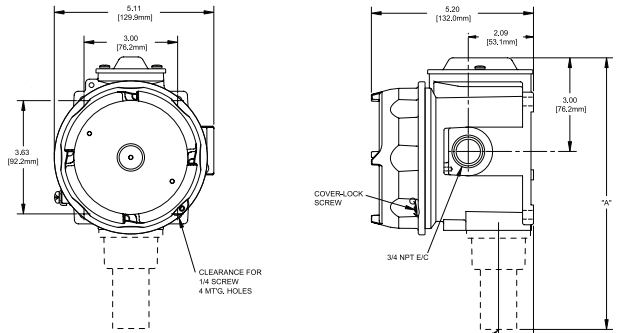
Internal Set Point Adjustment, Types C120, F120



Dimension A

Model	Inches	mm	NPT
120	9.12	231,4	Immersion stem
121	8.97	227,4	Immersion stem
1BS-8BS	8.47	214,8	Bulb & capillary

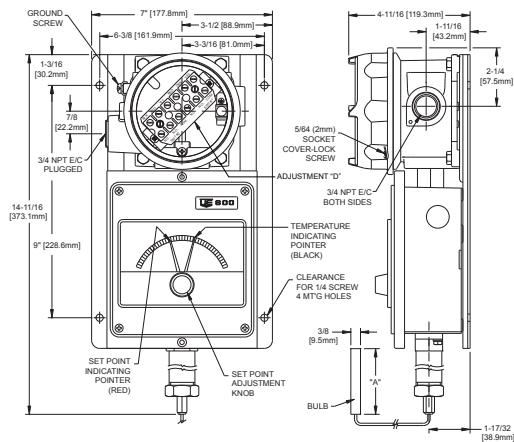
External Set Point Adjustment, Types B121, B122, E121, E122



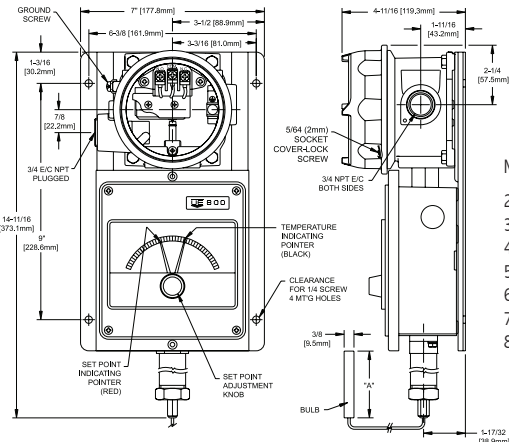
Dimension A

Model	Inches	mm	NPT
120,121 (B121)	10.0	254,0	Immersion stem
120(B122)	10.0	254,0	Immersion Stem
121(B122)	9.84	250,0	Immersion Stem
2BS-8BS	9.31	236,6	Bulb & capillary
13272, 13322	10.0	254,0	Immersion stem (Freeze Protection)
13273, 13321	9.31	236,6	Bulb & capillary (Heat Tracing)

Type 822E dual switch



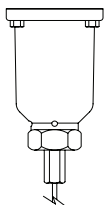
Type 820E single switch



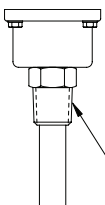
Dimension A

Model	Inches	mm
2BS	2.44	62,0
3BS	2.13	54,0
4BS	6.75	171,5
5BS	5	127,0
6BS	4.5	114,3
7BS	3	76,2
8BS	3.25	82,6

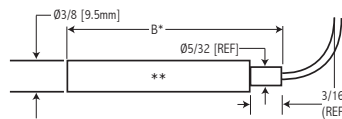
Temperature Sensors



Type E121, E122, F120
Models 2BS-8BS
REMOTE MOUNT TEMPERATURE ASSEMBLY



Type B121, B122, C120
Models 120-121
DIRECT MOUNT TEMPERATURE ASSEMBLY



*USE DIMENSION "B" FOR SEPARABLE WELL INSTALLATIONS.

Remote Bulb

**Except model 13273, 13321 bulb OD is \varnothing 1/4 (6.35mm)

Dimension B		
Model	Inches	mm
2BS/BSA	2.63	66,7
3BS	2.13	54,1
4BS	6.75	171,5
5BS	5.00	127,0
6BS	4.50	114,3
7BS	3.00	76,2
8BS	3.25	82,6
13273	9.51	241,5
13321	9.51	241,5

RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (e.g., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. Orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point or faulty display. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- For all applications, a factory set unit should be tested before use.
- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.
- Do not mount unit in ambient temp. exceeding published limits.

LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachusetts. INCOTERMS); provided, however, that this warranty applies only to equipment found to be so defective within a period of 24 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF SELLER'S LIABILITY

Seller's liability to Buyer for any loss or claim, including liability incurred in connection with (i) breach of any warranty whatsoever, expressed or implied, (ii) a breach of contract, (iii) a negligent act or acts (or negligent failure to act) committed by Seller, or (iv) an act for which strict liability will be inputted to seller, is limited to the "limited warranty" of repair and/or replacement as so stated in our warranty of product. In no event shall the Seller be liable for any special, indirect, consequential or other damages of a like general nature, including, without limitation, loss of profits or production, or loss or expenses of any nature incurred by the buyer or any third party.

UE specifications subject to change without notice.



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