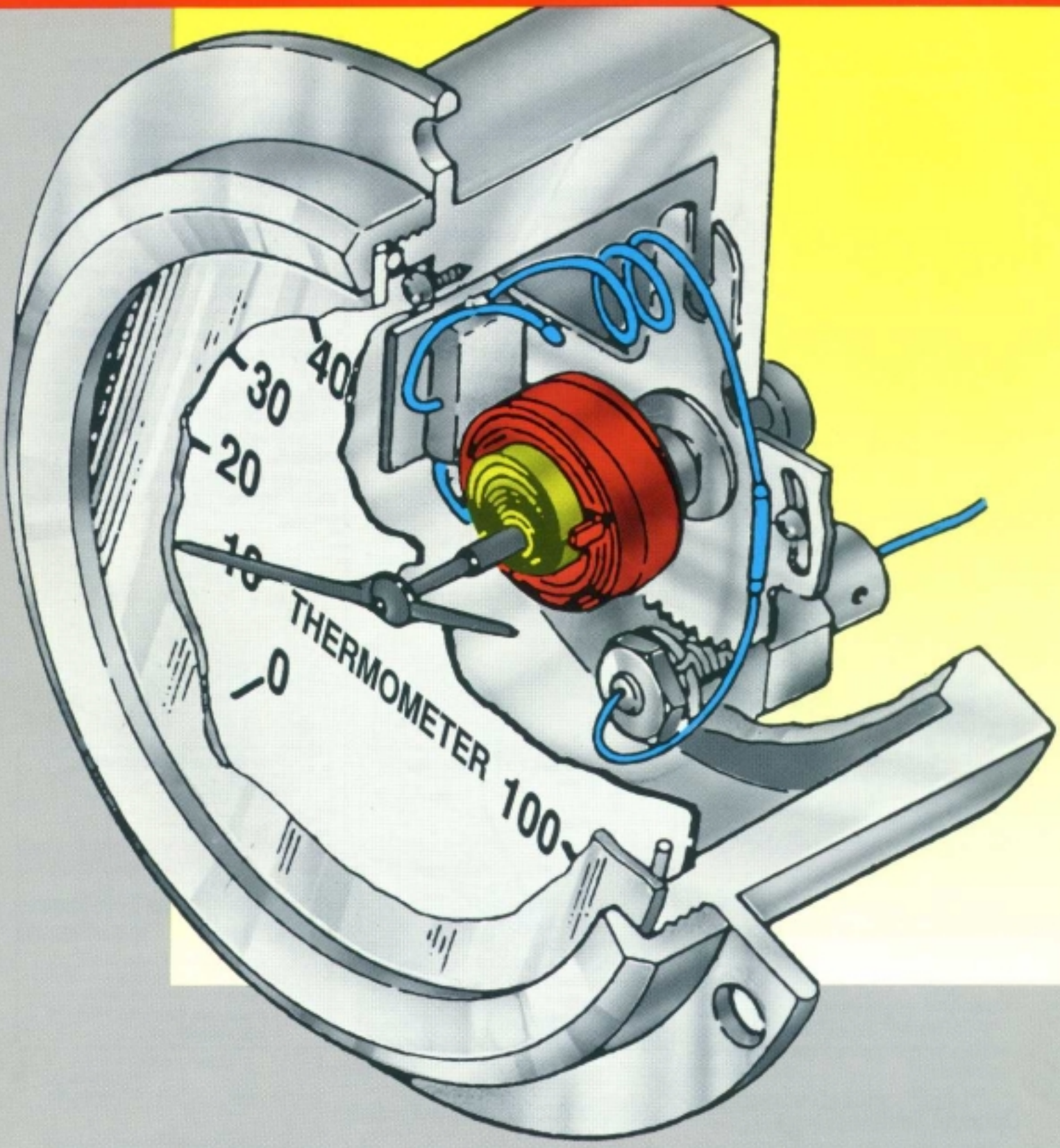
3D DIRECT DRIVE NON-MERCURY FILLED TEMPERATURE GAUGES



3D Instruments, Inc.

Direct Drive Difference

THE DIRECT DRIVE DIFFERENCE IN THERMOMETERS

The 3D thermometer is superior to other systems because it provides an evenly graduated scale without the use of a multiplying mechanism or delicate geared segments, pinions or hair springs. This results in a most rugged instrument suitable for installations which, by necessity, have severe vibration and shock.

The mechanical difference between the 3D thermometer and a conventional type thermometer is shown in Figure 1.

Because of its "gearless" mechanism, the 3D thermometer has the following advantages as compared with conventional type thermometers.

1. Excellent stability.
2. Less trouble because of its simple mechanism.
3. More durability against vibration and shock.
4. Smoother movement of pointer action.
5. Better accuracy.
6. Greater sensitivity and faster response to changes in temperatures.

Features

Not offered by conventional thermometers

- 130% over temperature protection, standard.
- Case compensation, standard.
- Capillaries are stainless steel armored, standard.
- Accuracy is ±1-2% full scale, standard.
- Helical coil sensing element has no mechanical movement to fail, standard.
- Compatibility to any existing thermowell, standard.
- 1 Year Warranty

Optional Features

- Up to two 5 amp micro switches per unit.
- Reset able maximum temperature indicator
- Sliding union connections available on sensing bulb.
- Remote or direct mount styles available.
- Weather proof enclosures (NEMA4)
- e Explosion Proof Case & Switches (NEMA7, Class 1, Group C & D; Class 11, Group E, F & G)
- Consult Factory

Standard Specifications

Case

Cases are black enameled cast aluminum with glass crystal and "O" ring seal.

Standard model is case compensated. Dual capillary (case and line compensated) are also available.

Some models such as "AGNESS" have stainless steel case as standard.

Dial Face

- Black numbers and divisions on White background, Black pointer standard.
- White on black is available as an option.
- Three dial sizes 3" (75mm), 4" (100mm), 6" (150mm), on most models.

Capillary

10 feet (3m) is standard length capillary for all Remote Reading Thermometers. Maximum length capillary is 33 feet for case compensated types, and 164 feet (50m) for Dual Capillary and Line Compensated types,
The standard material of construction is stainless steel.

Bulbs

Liquid Filled Gauges have 10mm (.393") diameter bulbs x 4" in length as standard, with a 112" NPT sliding union connection (bulb model -A). Gas Filled Gauges have 12mm (,472") diameter bulbs x 4" in length, with 112" NPT sliding union connection (bulb model -A). 3/4" unions, fixed unions, and plain bulbs available as options. Please refer to page 7 for details on bulbs,

Compensations

Bimetal compensator corrects for ambient temperature change. (case compensation is standard)

Double lead compensator (consists of two bourdon tubes and capillary tubes) available if specified.

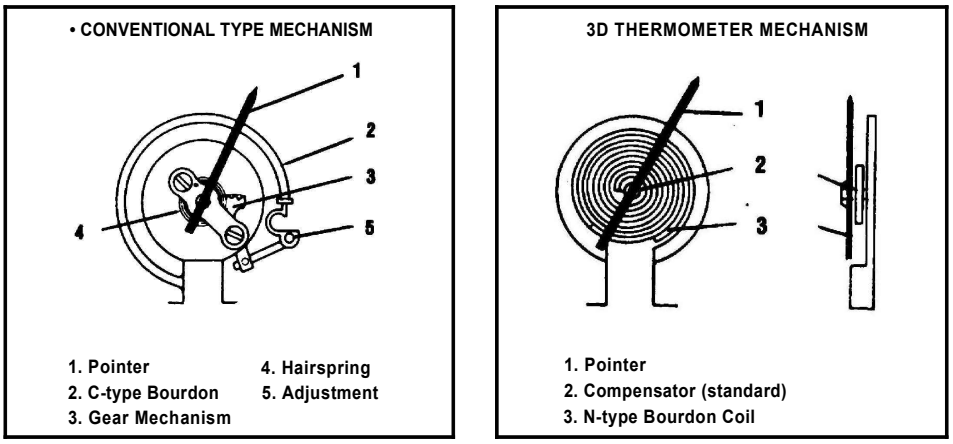


FIGURE 1

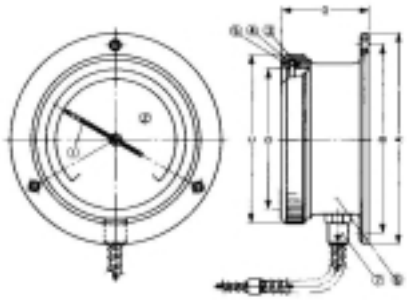
3D Instruments, Inc.
Direct Drive Difference

MODEL 1100 MODEL 1110

Dia	A	B	C	D	Q
3”	110	100	92	70	60
4”	140	125	112	93	60
6”	206	190	168	140	60

No.	Part Name	Material
1	Pointer	P-Bronze or 304 SS
2	Scale Plate	Aluminum
3	Gasket	Neoprene
4	Glass Disk	Glass
5	Covering Ring	Aluminum Alloy
6	Housing	Aluminum Alloy
7	Capillary Outlet	304 SS

Dimensions in mm

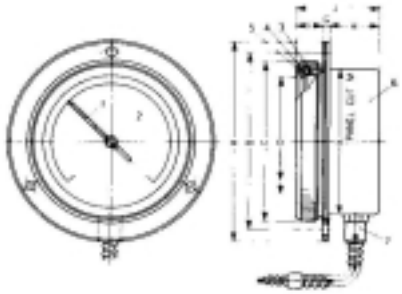


MODEL 1160

Dia	A	B	C	D	F	G	H	J	K	M
3”	110	100	92	70	18	4	38	60	80	60
4”	140	125	112	93	18	4	38	60	102	60
6”	206	190	168	140	18	5	38	60	154	60

No.	Part Name	Material
1	Pointer	P-Bronze or 304 SS
2	Scale Plate	Aluminum
3	Gasket	Neoprene
4	Glass Disk	Glass
5	Covering Ring	Aluminum Alloy
6	Housing	Aluminum Alloy
7	Capillary Outlet	304 SS

Dimensions in mm

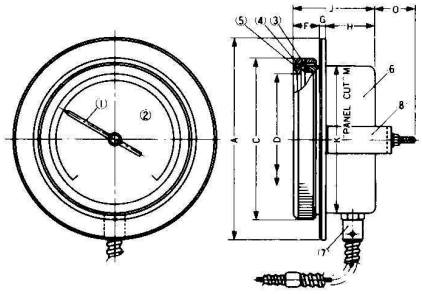


MODEL 1170

Dia	A	C	D	F	G	H	J	K	M	O
3”	110	92	70	18	4	38	60	80	87	20
4”	140	112	93	18	4	38	60	102	106	20
6”	206	168	140	18	5	37	60	154	158	20

No.	Part Name	Material
1	Pointer	P-Bronze or 304 SS
2	Scale Plate	Aluminum
3	Gasket	Neoprene
4	Glass Disk	Glass
5	Covering Ring	Aluminum Alloy
6	Housing	Aluminum Alloy
7	Capillary Outlet	304 SS

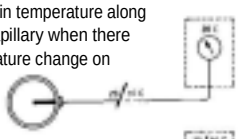
Dimensions in mm



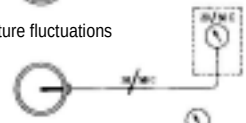
COMPENSATION

Examples of when "Full Compensator" is necessary

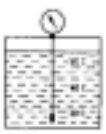
EX. 1 Great fluctuation in temperature along the periphery of the capillary when there is scarcely any temperature change on the indicator.



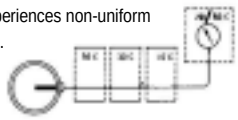
EX. 2 Great temperature fluctuations in both the capillary and indicator.



EX. 3 Liquid temperature measurement in a tank with varied temperature distribution.



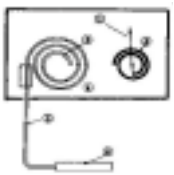
EX. 4 The capillary experiences non-uniform temperature conditions.



The temperature conditions illustrated above are for reference purposes only; the possible conditions are not limited to these.

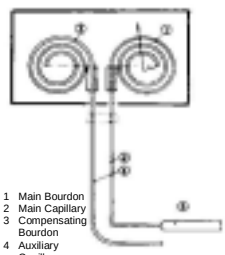
The indicator, capillary, and thermobulb are a single unit filled with liquid or gas. These liquids or gases will respond properly in spite of any peripheral temperature changes. The compensator exists in order to automatically control any changes owing to temperature fluctuations in these liquids and gases, which are highly susceptible to temperature changes under normal circumstances.

Single Capillary



1 Indicator
2 Compensating Auxiliary
3 Bourdon Tube
4 Case Interior
5 Capillary
6 Thermobulb

Double Capillary



1 Main Bourdon
2 Main Capillary
3 Compensating Bourdon
4 Auxiliary Capillary
5 Thermobulb

For Single Capillary Types

Because the compensator is housed within the case, it is necessary to keep the capillary at the same temperature as the case. This type of compensator is called a "Case Compensator" or a "Bi-metallic Compensator" Our gauges having this type compensator have a model number that start with 1."

For Double Capillary Types

In each gauge the bourdon tubes and the capillaries are grouped into two sets. One set is for temperature measurement, while the other set is for temperature compensation. This gauge will compensate reliably even under local temperature fluctuation.

This feature is called "Full Compensation" and places this gauge a grade above gauges with so-called "Case Compensation." Our products having full compensation have a model number that start with "2."

RIGID STEM

MODEL 1200 MODEL 1220

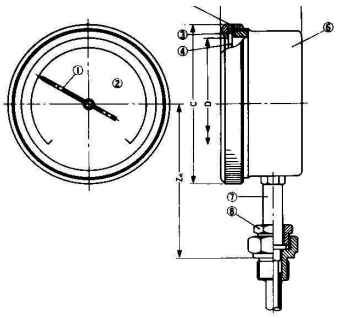
RIGID STEM TYPE

Dia	C	D	T	**Z0
3”	92	70	60	94 ± 5
4”	112	93	60	105 ± 5
6”	168	140	60	131 ± 5

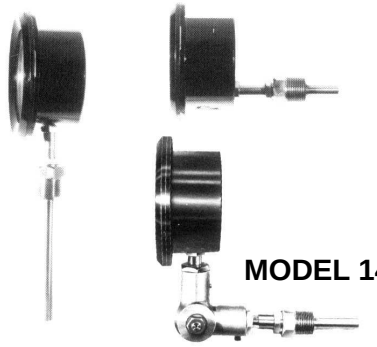
** Add 4 inches for temperature ranges over 300°C

No.	Part Name	Material
1	Pointer	P-Bronze or 304 SS
2	Scale Plate	Aluminum
3	Gasket	Neoprene
4	Glass Disk	Glass
5	Covering Ring	Aluminum Alloy
6	Housing	Aluminum Alloy
7	Rigid Stem	304 SS
7	Fixed Screw	304 SS

Dimensions in mm



MODEL 1400 MODEL 1420



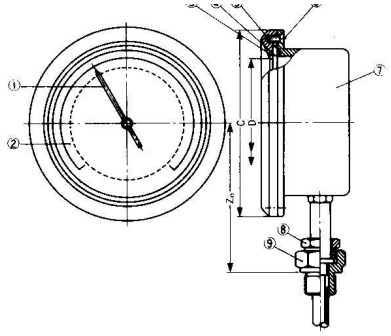
RIGID STEM FOR OUTDOOR USE

Dia	C	D	**Z0
4”	133	93	105 ± 5

** Add 4 inches for temperature ranges over 300°C

No.	Part Name	Material
1	Pointer	P-Bronze or 304 SS
2	Scale Plate	Aluminum
3	Gasket	Neoprene
4	Glass disk	Glass
5	Covering Ring	Aluminum Alloy
6	Screw	304 SS
7	Housing	Aluminum alloy
8	Union Nut	304 SS
9	Mounting Screw	304 SS

Dimensions in mm

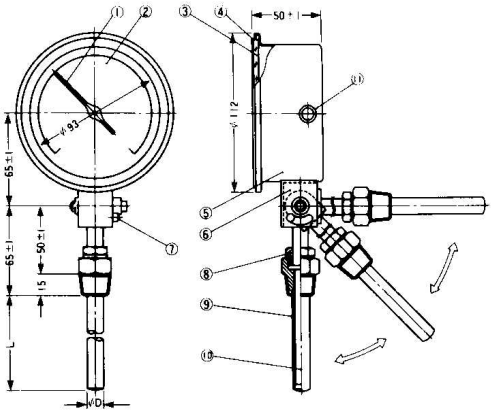


MODEL 1620 AGNESS

(Any Angle Thermobulb)

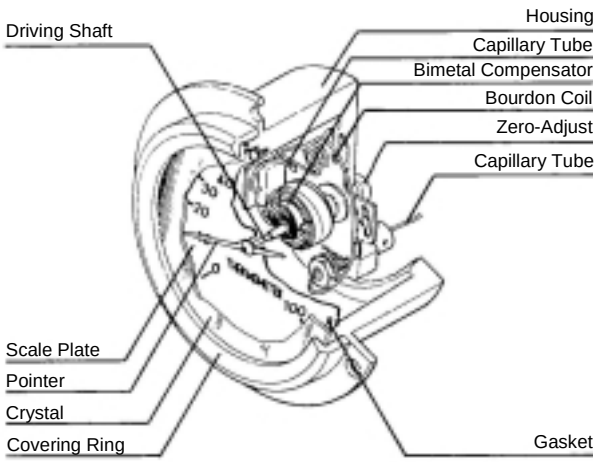
No.	Part Name	Material
1	Pointer	P-Bronze or 304 SS
2	Scale Plate	Aluminum
3	Glass disk	Glass
4	Covering Ring	304 SS
5	Housing	304 SS
6	Adjustable Elbow Joint	304 SS
7	Locking Pin	304 SS

Dimensions in mm

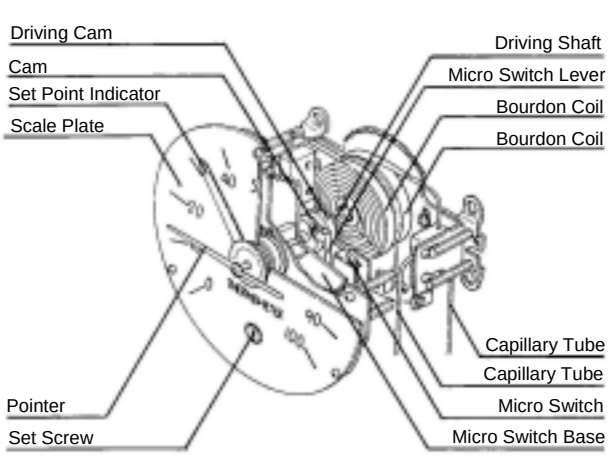


CONSTRUCTION

Thermometer



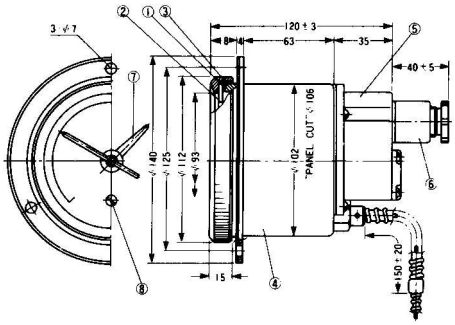
Temperature Switch



MODEL 136X

No.	Part Name	Material
1	Gasket	Neoprene
2	Glass Disk	Glass
3	Covering Ring	Aluminum Alloy
4	Housing	Aluminum Alloy
5	Terminal Box	Aluminum Alloy
6	Cable Wire outlet	Brass Coated
7	Set Point Indicator	Brass Coated
8	Set Screw	Brass Coated

4" only
Dimensions in mm

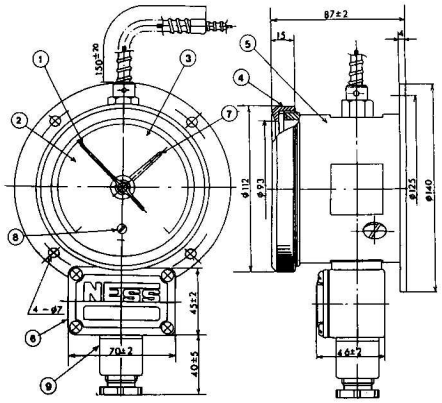


MODEL 138X*

*LOWER CAPILLARY: MODEL 137X

No.	Part Name	Material
1	Pointer	P-Bronze or 304 SS
2	Scale Plate	Aluminum
3	Glass Disk	Glass
4	Cover	Aluminum Alloy
5	Case	Aluminum Alloy
6	Terminal Box	Aluminum Alloy
7	Set Point Indicator	Brass Coated
8	Set Screw	Brass Coated
9	Cable Wire outlet	Brass Coated

4" only
Dimensions in mm

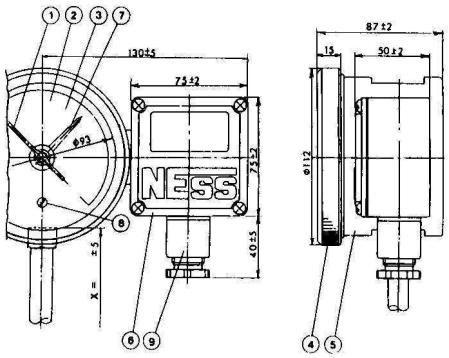


MODEL 148X*

* LOWER BACKMOUNT: MODEL 147X

No.	Part Name	Material
1	Pointer	P-Bronze or 304 SS
2	Scale Plate	Aluminum
3	Glass Disk	Glass
4	Cover	Aluminum Alloy
5	Case	Aluminum Alloy
6	Terminal Box	Aluminum Alloy
7	Set Point Indicator	Brass Coated
8	Set Screw	Brass Coated
9	Cable Wire outlet	Brass Coated

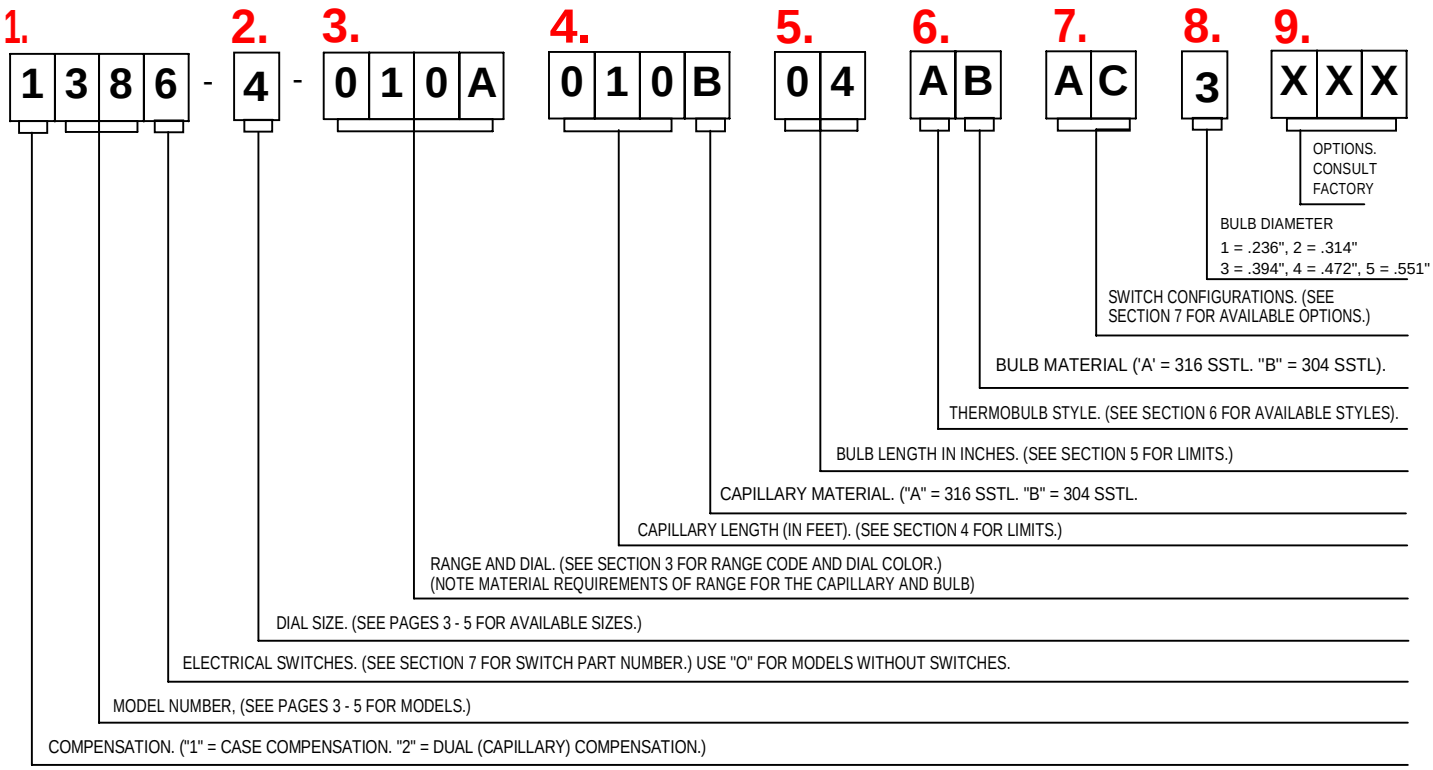
4" only
Dimensions in mm



ELECTRICAL SWITCH SPECIFICATION

Micro Switch Contact Capacity	
125 VAC (non-inductive)	5A
24 VDC	4A
100 VDC	0.4A
200 VDC	0.2A

ORDERING INFORMATION



1. Model numbers (refer to pages 3-5)

2. Dial sizes (refer to pages 3-5)

3. Ranges, Graduations and Dial Colors Available

Range In Degrees C	Material Code	Range Code	Min. Temp. Graduation And Colors Available					
			3"		4"		6"	
- 200 TO + 50	◆	000	5		5	A B	5	A B
-100 TO +50	◆	001	2	A B	2	A B	2	
-50 TO +50	●	002	2	A	1	A B	1	A B
-50 TO +100	●	003	2	A	2	A B	2	B
-30 TO +40	●	004	2	A B	1	A B	1	A
-30 TO + 70	●	005	1	A	1	A B	1	A B
- 20 TO + 120	●	006	2	A B	2	A B	2	A B
- 10 TO +60	●	007	1	A	1	A B	1	A B
0 TO + 50	●	008	1	A B	1	A B	1	A B
0 TO + 70	●	009	2		1	A B	1	A
0 TO + 100	●	010	2	A B	2	A B	1	A B
0 TO + 120	●	011	2	A B	2	A B	2	A B
0 TO + 150	●	012	2	A B	2	A B	2	A B
0 TO + 200	●	013	2	A B	2	A B	2	A B
0 TO + 250	●	014	5		5	A B	5	A B
0 TO + 300	◆	015	5	A B	5	A B	5	A B
0 TO + 350	◆	016	5		5	A B	5	A B
0 TO + 400	◆	030	10	A B	10	A B	10	A B
0 TO + 500	◆	031	10	A B	10	A B	10	A B
0 TO + 600	◆	033	10	A B	10	A B	10	A B

Range In Degrees F	Material Code	Range Code	Min. Temp. Graduation And Colors Available					
			3"		4"		6"	
- 340 TO + 150	◆	100			10	A		
-100 TO +200	◆	101	5	A	5	B		
- 60 TO + 212	●	102			5	B	5	A
- 40 TO + 240	●	103	5	A	5	A B	5	A
0 TO + 120	●	104	2	A	2	A B	2	A
0 TO + 150	●	105	2	A	2	A B	2	A
32 TO + 210	●	106	5	A B	5	A B	5	A B
32 TO + 300	●	107	5	A	5	A B	5	A
32 TO + 400	●	108	10	A	10	A B	10	B
32 TO + 500	●	109			10	A B	5	A
32 TO + 600	◆	110	10	A	10	A B	10	A
32 TO + 800	◆	130	10	A	10	A B	5	A
32 TO +1112	◆	131	20	A	20	A B		

Bulb material must match capillary material A with A and B with B.

AVAILABLE DIAL COLORS

A = BLK ON WHT
B = WHT ON BLK

MATERIAL REQUIREMENTS

◆ = GAS FILLED UNIT REQUIRES 316 SSTL MATERIAL.

● = LIQUID FILLED. REQUIRES 304 SSTL OR 316 SSTL.

4. Capillary

Minimum capillary length is 2 feet. Maximum length for case compensated units is 33 (033) feet.

Maximum length for dual (capillary) compensated units is 164 feet.

Enter '0000' in this position if unit is stem mounted.

5. Bulb Length

Maximum bulb length is 40 inches. See tables below for minimums.

Minimum size of thermobulb.
The volume (length and diameter) of the thermobulb depends on the capillary, switches and temperature range. First, determine from the desired capillary and switch options whether to use Table A or B below.

	Without Electrical Contact	With Micro Switch
Case Compensated	Table *B*	Table A
Dual Compensated	Table A	Table A

Then determine, from Table A or B, the minimum bulb length in inches based on the temperature range and the outside diameter of the thermobulb.

MINIMUM BULB LENGTH TABLES

TABLE A

RANGE CODE		DIAMETER IN INCHES				
DEG.C	DEG. F	0.236	0.314	0.394	0.472	0.551
000	100	N/A	N/A	N/A	N/A	N/A
001	101	7.5	4.0	2.5	2.0	1.5
002		7.5	4.0	2.5	2.0	1.5
003	102	7.5	4.0	2.5	2.0	1.5
004	103	7.5	4.0	2.5	2.0	1.5
005	104	16.5	9.5	5.0	3.5	2.5
006	105	14.5	8.0	4.5	3.0	2.5
007		14.5	8.0	4.5	3.0	2.5
008		14.5	8.0	4.5	3.0	2.5
009		12.0	6.5	4.0	2.5	2.0
010	106	12.0	6.5	4.0	2.5	2.0
011		7.5	4.0	2.5	2.5	2.0
012	107	7.5	4.0	2.5	2.0	2.0
013	108	6.0	3.5	2.0	1.5	1.0
014	109	5.0	3.0	2.0	1.5	1.0
015	110	3.0	2.5	1.5	1.0	1.0
016		3.0	2.5	1.5	1.0	1.0
030		N/A	N/A	N/A	N/A	N/A
031	130	N/A	N/A	N/A	N/A	N/A
032		N/A	N/A	N/A	N/A	N/A
033	131	N/A	N/A	N/A	N/A	N/A

TABLE B

RANGE CODE		DIAMETER IN INCHES				
DEG. C.	DEG.F	0.236	0.314	0.394	0.472	0.551
000	100	26.5	15.0	11.5	9.5	8.0
001	101	3.5	2.0	1.5	1.0	1.0
002		3.5	2.0	1.5	1.0	1.0
003	102	3.5	2.0	1.5	1.0	1.0
004	103	3.5	2.0	1.5	1.0	1.0
005	104	7.0	4.0	2.5	1.5	1.5
006	105	6.0	3.5	2.0	1.5	1.0
007		6.0	3.5	2.0	1.5	1.0
008		6.0	3.5	2.0	1.5	1.0
009		5.0	3.0	2.0	1.5	1.5
010	106	5.0	3.0	2.0	1.5	1.5
011		3.5	2.0	1.5	1.0	1.0
012	107	3.5	2.0	1.5	1.0	1.0
013	108	3.0	2.0	1.0	1.0	1.0
014	109	2.5	1.5	1.0	'1.0	1.0
015	110	2.0	1.0	1.0	1.0	1.0
016		2.0	1.0	1.0	1.0	1.0
030		20.0	12.0	9.5	8.0	7.0
031	130	20.0	12.0	9.5	8.0	7.0
032		20.0	12.0	9.5	8.0	7.0
033	131	20.0	12.0	9.5	8.0	7.0

6. Thermobulb Models

Model-A

Sliding Union Type

(Requires use of a thermowell)

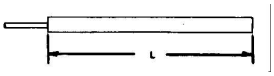
Model-C

Fixed Union Type

(Pressures above 150 psi requires use of a thermowell)

Model-

Plain Bulb Type remote reading only



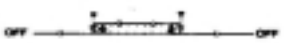
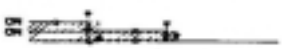
7. Electrical Switches

Switch Part Number	
No Switches	X = 0
One Micro Switch	X = 5
Two Micro Switch	X = 6

▼ *Set point*

● *Normal Use Temp*

NOTE: "ON" indicates closed contact; "OFF" indicates open contact.

PN	Set Point Nos			
-AX	1		Increase ON	
-BX	1		Increase OFF	
-CX	1		Decrease ON	
-DX	1		Decrease OFF	
-AC	2		Red Pointer Increase ON	Yellow Pointer Decrease ON
-BD	2		Increase OFF	Decrease OFF
-AA	2		Increase ON	Increase ON
-BB	2		Increase OFF	Increase OFF
-CC	2		Decrease ON	Decrease ON
-DD	2		Decrease OFF	Decrease OFF