NC & NR Filled System Thermometers

The Rototherm range of filled system thermometers offer tough yet accurate instruments with rigid stems for direct mounting or with flexible capillary for remote reading.

Most models in the range may be specified with electrical contact heads to provide alarm or control functions.

Rototherm non toxic filled system thermometers are designed to give guaranteed reliability over a wide range of ambient temperature conditions and are compensated for ambient temperature changes from -30 to +50ºC.

NC1 & NC2 Capillary Thermometers

Where display is required some distance from the sensing point, for example on an instrument panel, capillary thermometers should be used. The dial can be located up to 30 metres from the sensing point and isolated from dirt and vibration. The sensing bulb is connected by stainless steel microbore capillary, protected by stainless steel tubing. For severe conditions, flexible armour can extend the entire length of the capillary. Alternative protections can be specified if required.

Specifications - NC1 & NC2 Capillary Thermometers

Case & Bezel
NC1 Diecast aluminium.
Weatherproof IP67

NR2 304 stainless steel.
316 stainless steel option. Weatherproof IP67

Dial
Clearly marked black characters on white background

Window
Glass as standard. Options - acrylic and toughened glass.

Bulb / Stem
316 stainless steel

Capillary
Microbore stainless steel tube with 3mm OD stainless steel protection.

Maximum capillary Length
30 metres (for Gas filled instruments)
12 metres (for Xylene filled instruments)

Temperature Range
See table for standard temperature ranges (page 12)

Accuracy
Class 1.0 (±1.0% FSD) (±2% when electrical contact heads are fitted)

Ambient Temperature
Head compensated for variation in ambient temperature from -30 to +50ºC.

Models

NC1 General Purpose capillary Thermometers
Tough accurate thermometers housed in a gasket sealed diecast aluminium case with adjustable zero.

NC2 Stainless Steel Cased Thermometers
Reliable, accurate industrial thermometers housed in a stainless steel case with the option of 100mm or 160mm diameter dial

NC1 42	100mm Dial, Surface Mounted Bottom Entry
NC1 46	100mm Dial, Panel Mounted Back Entry
NC2 42	100mm Dial, Surface Mounted Bottom Entry
NC2 46	100mm Dial, Panel Mounted Back Entry
NC2 48	100mm Dial, Bracket Mounted Bottom Entry
NC2 62	160mm Dial, Surface Mounted Bottom Entry
NC2 66	160mm Dial, Dial Panel Mounted Back Entry
NC2 68	160mm Dial, Bracket Mounted Bottom Entry

NR1 General Purpose Thermometers
Tough accurate thermometers housed in a gasket sealed glass filled polyester resin case with adjustable zero. Instruments can be configured as vertical or horizontal mounting.

NR2 Stainless Steel Cased Thermometers
Reliable, accurate industrial thermometers housed in a stainless steel case with the option of 100mm or 160mm diameter dial.

NR1 42	100mm Dial, Bottom Entry
NR1 46	100mm Dial, Lower Back Entry
NR2 42	100mm Dial, Bottom Entry
NR2 46	100mm Dial, Lower Back Entry
NR2 62	160mm Dial, Bottom Entry
NR2 66	160mm Dial, Lower Back Entry

Specifications - NR1 & NR2

Case & Bezel
NR1 Glass filled polyester resin, non toxic, fire retardant, black.
Weatherproof IP67
NR2 304 stainless steel. 316 stainless steel option.
Weatherproof IP67

Dial
Clearly marked black characters on white background

Window
Glass as standard. Options - acrylic and toughened glass.

Stem
316 stainless steel

Temperature Range
See table for standard temperature ranges

Stem Dimensions
12.7mm diameter (other non standard diameters are available on request) Standard stem lengths 200mm, 300mm, 400mm and 500mm. Sensitive length X depends on temperature range and filling medium and is indicated by shallow waisting.

Accuracy
±1.0% FSD (±2% when electrical contact heads are fitted)

Ambient Temperature
Head compensated for variation in ambient temperature from -30 to +50ºC.

Movement
Direct acting bourdon tube with bimetallic compensator.
Option silicone damped

Standard Temperature Ranges - NC1, NC2, NR1 & NR2

Temperature Range		Approximate Sensitive Length - Dimension "X"	
		12.7 mm bulb / stem diameter	
Degree C	Degree F	Xylene Non Toxic Filling	Nitrogen Non Toxic Filling
-30 to +70 ºC	-20 to 160 ºF	30 mm	Not available
0 to 60 ºC	30 to 140 ºF	40 mm	Not available
0 to 100 ºC	30 to 220 ºF	30 mm	Not available
0 to 120 ºC	30 to 250 ºF	30 mm	Not available
0 to 160 ºC	30 to 300 ºF	25 mm	Not available
0 to 200 ºC	50 to 400 ºF	25 mm	125 mm
0 to 300 ºC	0 to 550 ºF	Not available	125 mm
0 to 400 ºC	0 to 700 ºF	Not available	125 mm

Other non standard ranges may be available - please check with Rototherm sales

Bulb Types - NC1 & NC2

Type 301
This bulb type is used when no compression fitting is required. This bulb may be held in place by a bracket or clip (not supplied by Rototherm) or may inserted directly into the process.

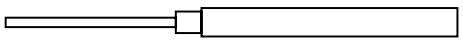
Type 302
This bulb has a compression gland fitting that slides along the capillary and is tightened into the required position. This bulb type is only available with plain stainless steel capillary (type C1) - armoured capillaries are not available as it is not possible to move the fitting along the armoured capillary. Bulb length cannot be specified.

Type 303
Compression gland fittings tighten on the bulb to provide liquid and gas tight seal. Once fitted the position of the gland fitting can only be altered by cutting off the olive and replacing it with a new one.

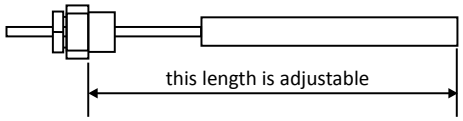
If required this bulb type may be specified with a compression gland fitting - in this instance please confirm the required overall length of the bulb.

Add 50mm for BSP threads (75mm for NPT threads) to desired immersion length to obtain minimum "L" dimension).

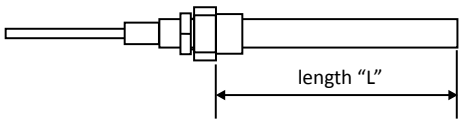
Type 301



Type 302

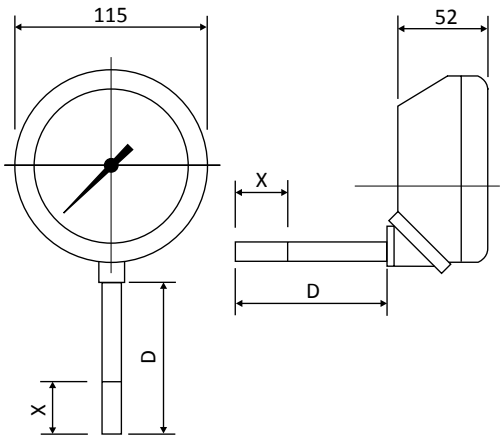


Type 303

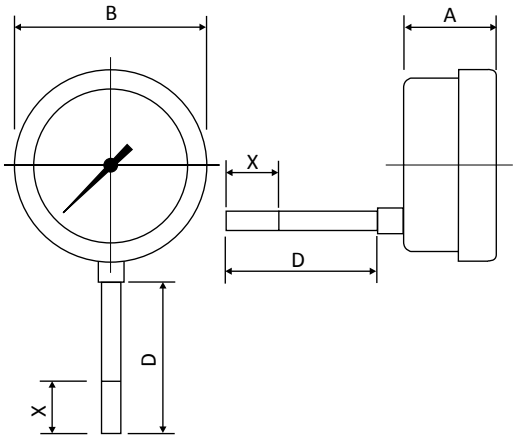


Drawings are for illustration purposes only and are not to scale

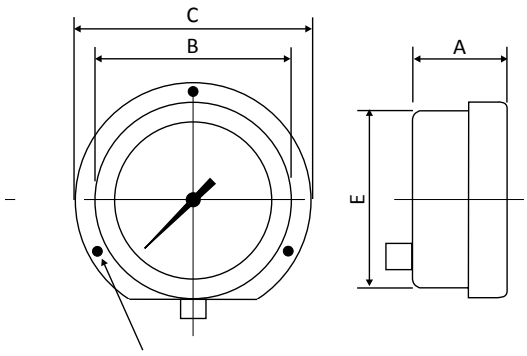
Dimensions - NR1



Dimensions - NR2



Dimensions - NC2



3 holes “K” diameter on p.c.d “L”

All dimensions are in mm. Drawings are for illustration purposes only and are not to scale

Dimensions	Back Flange		Panel Mounting		Bracket Mounting		Direct Mounting	
	100mm	160mm	100mm	160mm	100mm	160mm	100mm	160mm
A	52	52	47	47	47	47	47	47
B	112	171	112	171	112	171	112	171
C	135	196	-	-	-	-	-	-
E	-	-	97	158	-	-	97	158
Panel Cut Out	-	-	100	161	-	-	-	-
Weight	1.2 kg	1.8 kg	1.2 kg	1.8 kg	1.2 kg	1.8 kg	1.2 kg	1.8 kg
K	6	6	-	-	-	-	-	-
L	116	178	-	-	-	-	-	-

All dimensions are in mm

Electrical Contact Heads (Model NC2 & NR2 only)

To provide alarm or control functions, filled system thermometers can be specified with electrical contact heads mounted in a clear plastic hood which replaces the standard window. The set point can be adjusted to any position on the scale with a removable key. Single and dual contacts systems are available.
Electrical contact heads provide a repeatable switching point, but the absolute accuracy tolerance of the instrument is approximately doubled by the contacts.

Contact Rating
Standard contact head assemblies: 250V, switching capacity 10W, 18VA, maximum current 0.7A.

Service
Indoor use, ambient temperature -10/70ºC, free from vibration.

System Operation	Typical Application
A Break on rise	Temperature control
B Make on rise	Over temperature alarm
C 2 Contacts to break on rise in temperature	Temperature control plus alarm or 2 step pressure control
D 2 Contacts to make on rise in temperature	Alarm and trip
E Break on rise and make on rise in temperature	Temperature control plus alarm

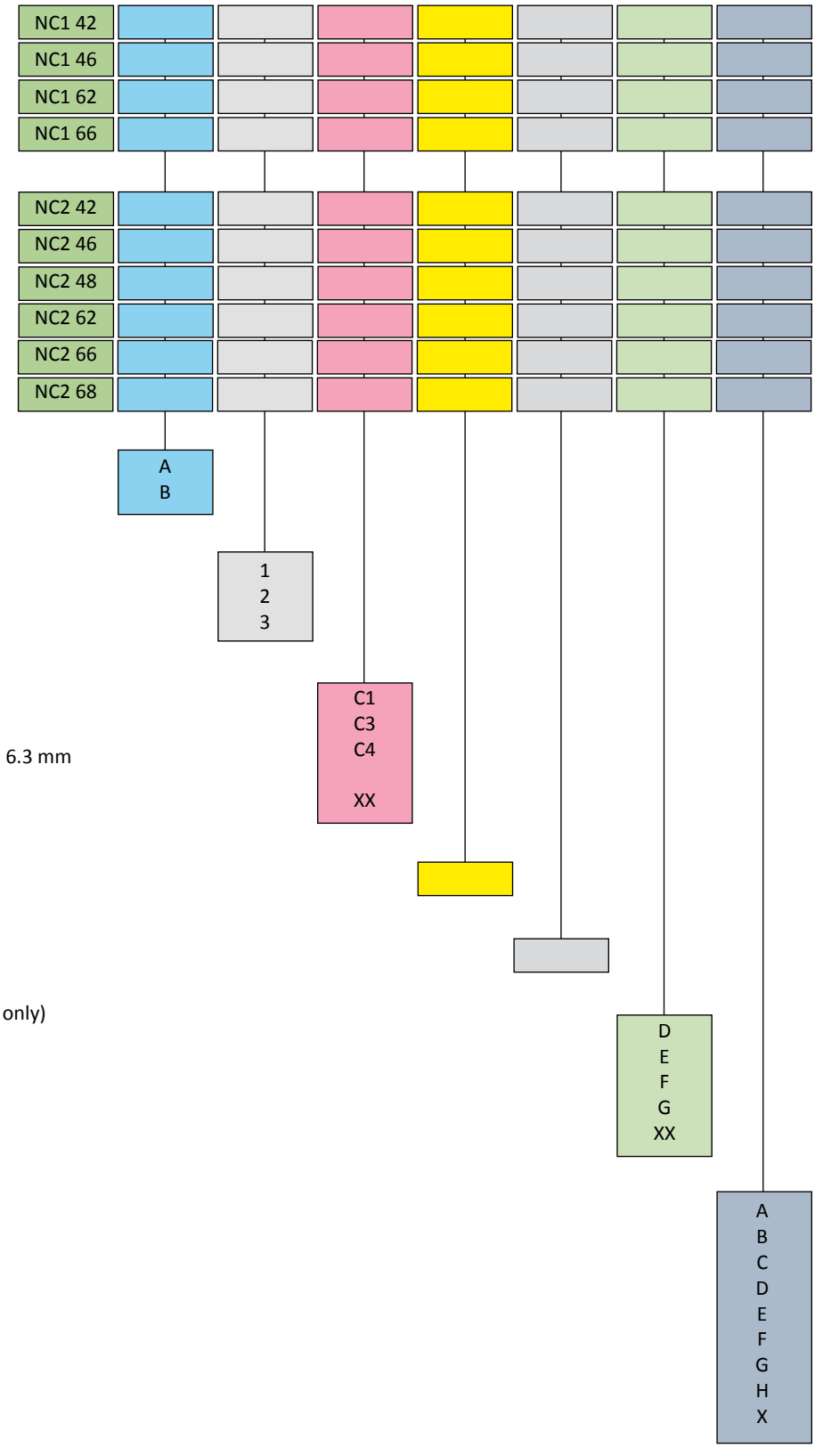
Order Codes Capillary Filled System Thermometers

NC1 Diecast Aluminium Case

100 mm dial, bottom entry
100 mm dial, back entry
160 mm dial, bottom entry
160 mm dial, back entry

NC2 Stainless steel Case

100 mm dial, back flange, bottom entry
100 mm dial, panel clamp, rear entry
100 mm dial, bracket mounting, bottom entry
160 mm dial, back flange, bottom entry
160 mm dial, panel clamp, rear entry
160 mm dial, bracket mounting, bottom entry



Window
Glass (Standard)
Acrylic

Bulb Type
Type 301
Type 302
Type 303

Capillary Protection
Stainless steel tube, 3.0 mm diameter
Stainless steel flexible armour, 6.3 mm diameter
Stainless steel flexible armour over stainless steel, 6.3 mm diameter
Other (state requirement)

Capillary Length
Insert length in metres (3 metres is standard)

Temperature Range
Insert temperature range and units from table

Compression Gland Fitting (type 302 & 303 bulbs only)
Not required
1/2" BSP male, stainless steel
3/4" BSP male, stainless steel
1/2" NPT male, stainless steel
Other (State Requirement)

Pointer Options & Electrical Contact Heads

Electric contact type A	(NC2 models only)
Electric contact type B	(NC2 models only)
Electric contact type C	(NC2 models only)
Electric contact type D	(NC2 models only)
Electric contact type E	(NC2 models only)

Maximum pointer
Minimum pointer
Index pointer
No electric contact or additional pointer

Example Order Code - Capillary Thermometer

NC2 46	A	3	C1	03	0 to 60ºC	B	X

Model NC2 46, 100mm capillary thermometer, panel clamp mounting, glass window. Type 303 bulb with 3 metres of type C1 stainless steel capillary. Temperature range 0 to 60ºC, 1/2" BSP male stainless steel gland. No additional pointer or options.

Order Codes Rigid Stem Filled System Thermometers

NR1 Glass Filled Polyester Resin Case

100 mm dial, bottom entry
100 mm dial, back entry
160 mm dial, bottom entry
160 mm dial, back entry

NR2 Stainless steel Case

100 mm dial, bottom entry
100 mm dial, back entry
160 mm dial, bottom entry
160 mm dial, back entry

Window
Glass (Standard)
Acrylic

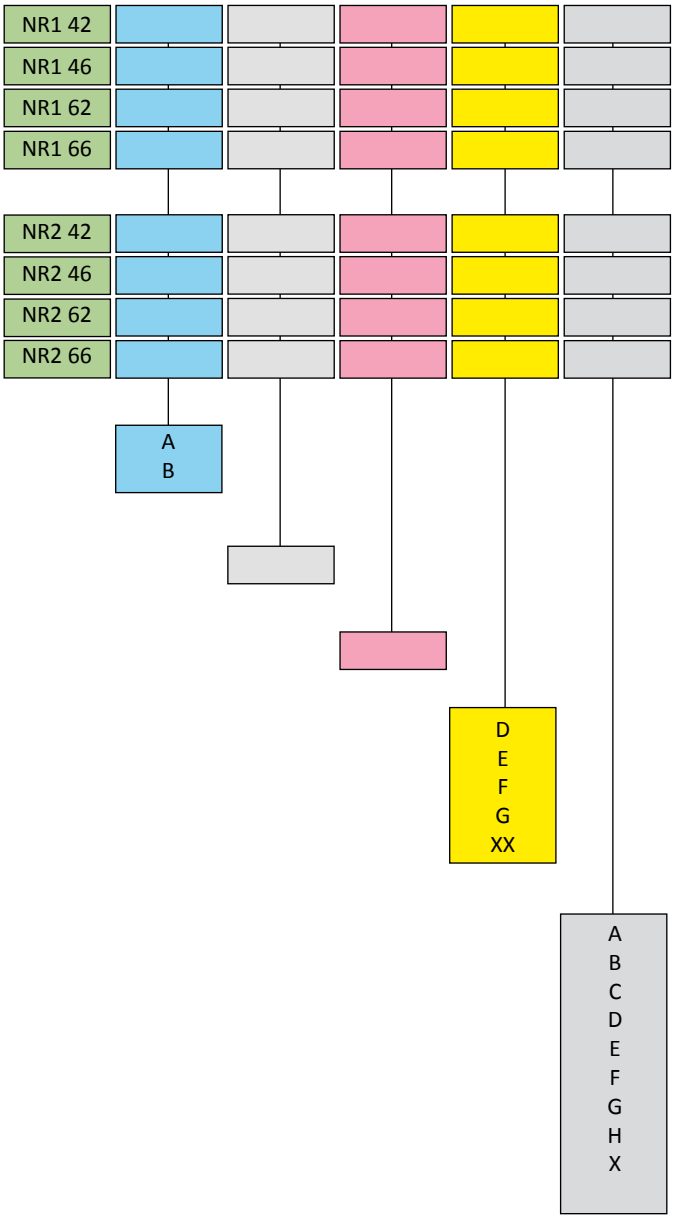
Stem length
Insert stem length “D” in mm

Temperature Range
Insert temperature range and units from table

Compression Gland Fitting (type 302 & 303 bulbs only)
Not required
1/2” BSP male, stainless steel
3/4” BSP male, stainless steel
1/2” NPT male, stainless steel
Other (State Requirement)

Pointer Options & Electrical Contact Heads

Electric contact type A	(NR2 models only)
Electric contact type B	(NR2 models only)
Electric contact type C	(NR2 models only)
Electric contact type D	(NR2 models only)
Electric contact type E	(NR2 models only)
Maximum pointer	
Minimum pointer	
Index pointer	
No electric contact or additional pointer	



Example Order Code - Rigid Stem Thermometer

NR2 42	B	150mm	0-60ºC	B	A

Model NR2 42, rigid stem thermometer 100mm dial bottom entry, glass window. Stem length 150 mm. Temperature range 0 to 60ºC, 1/2” BSP male stainless steel gland. Single electric contact - type A, make on rise in temperature.

Thermowells

Used predominantly in the power, process, pharmaceutical and petrochemical industries, thermowells are used to protect temperature indicators and sensors from process media and to enable servicing or replacement of indicators without the need to shut down plant.

Rototherm thermowells are designed to meed standards established by BSI, DIN, ASME and other authorities as well as established company standards such as BP, Shell,CEGB, ICI etc.

Thermowells are available fabricated from tube, drilled from barstock or from forgings. Full material certification including original mill and suppliers material certificates can be provided. If required NACE standard MR-01-75 requirements can be met.

Process Connections

Rototherm thermowells are available with both flanged and screwed process connections including:
FLANGES - ANSI, BS, and DIN (others also available)
SCREWED - NPT, API, BSP and ISO

Dye penetrant or radiographic inspection of welds is available if required. Flanged thermowells can also be manufactured from "one piece" forgings removing the need for welding.

Materials

Rototherm Thermowells are available in a wide variety of materials, including:

- Stainless steels (304, 316, 321 etc.)
- Carbon steel
- Brass
- Aluminium Bronze and other non ferrous alloys
- Nickel alloys - Monel, Inconel, Hastelloy etc.

Rototherm can also supply thermowells in a variety of corrosion resistant protective coatings, e.g. PTFE, PFA, Gore Fluroshield. Tantalum etc.

Rototherm's experienced engineering sales department can give advice and guidance on thermowell selection.
Please also refer to the Thermowell data sheet

Compression Glands / Fittings

Compression glands tighten on the stem to provide liquid and gas tight seal. Once fitted the position of the thermometer can only be altered by cutting off the olive and replacing it with a new one.

Add 50mm for BSP threads (75mm for NPT threads) to desired immersion length to obtain minimum "D" dimension).

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