

# General Specifications

## Yokogawa Temperature Sensor Solutions

*Temperature sensing in the process automation Industry is one of the most important measurement technologies, requiring accuracy, repeatability and safety.*

*A comprehensive range of temperature sensors complement our YTA series head and field mounted Temperature Transmitters providing a full integrated temperature supply*

*Our temperature sensor solutions include Resistance Temperature detectors (RTD's), Thermocouples (TC's), a wide selection of Thermowells and the capability to supply special engineered temperature assemblies.*

### Temperature Sensors

An assortment of temperature sensors are readily available. These include Resistance Temperature Detectors (RTD's) and Thermocouples (TC's) to suit all process automation applications. Wire wound RTD's represent the most common temperature sensors because of their inherent accuracy and stability, used extensively in process measurement and control.

Thermocouples deliver high temperature capability and are more vibration tolerant than RTD's. Furthermore, they can be manufactured in small diameters for asset monitoring purposes. The quality of the sensor remains essential to the overall health of your process and plant

### Thermowells

Thermowells are an important part of the temperature measurement and the plant's containment solution, providing protection against potentially dangerous process mediums. Quality of design and manufacturing is essential to meet the requirements of a variety of process environments.

#### A correctly designed thermowell can withstand;

- Erosion
- Abrasion
- Corrosion
- High pressures and velocities
- Various mechanical stressors

Thermowells can be manufactured from barstock, forgings or tubular construction and in a variety of materials ranging from stainless steel to exotic alloys. These ensure mechanical integrity, safety and longevity.

A welded flanged thermowell can be an acceptable solution for many applications, however, a full penetration welded flanged thermowell (double "J") delivers the maximum mechanical strength for high pressure service.

Once welded and heat treated the thermowell becomes effectively a one piece construction of similar alloys. Quality assurance testing, such as; dye-penetration, X-Ray, ultrasonic and pressure testing confirm the welding process. The ultimate thermowell is formed from a single piece of material, forging and therefore, has no welds. This is an excellent choice for high pressure, arduous process.



## General information

YTE1, 2 and 3 are Temperature assemblies encompass our inclusive range of Temperature measuring solutions, providing 4-20 mA, HART and Foundation Fieldbus transmitters or RTD/TC outputs.

Yokogawa's temperature sensor model structure includes YTE 1, a part structure specifically designed for a sensor to fit an existing thermowell or supplied with a specifically designed thermowell in accordance with customer Thermowell standards or Thermowells engineered to manage hostile as well as complex process conditions.

The YTE 2 temperature sensor and thermowell model structure includes a comprehensive number of standard Thermowell options, for uncomplicated selection and faster delivery. Yokogawa's YTE 3 temperature sensor and tubular thermowell model structure is suited to less arduous lower pressure process conditions and hygienic applications.

## Hazardous approvals for sensors

### Option KF1 EEx d for YTA110/310/320



II 2G Ex d IIC T1-T6



II 1/2G Ex d IIC T1-T6



II 2G Ex d IIC

For All other Yokogawa Head mounted Transmitter RTD/TC outputs

### Option KF1 EEx d



II 1/2G EEx d IIC T6, T5, T4, T3, T2, T1 resp.

II 2G EEx d IIC T6, T5, T4, T3, T2, T1

### Option KN1 EEx n



II 3GD EEx nAL IIC TX°C IP65 resp. II 3 G EEx nAL IIC TX

### Option KI1 EEx i



II 1/2G EEx ia IIC T6, T5, T4, T3, T2, T1 resp.

II 2G EEx ib IIC T6, T5, T4, T3, T2, T1

## Technical information

### Resistance Temperature Detectors (RTD)

#### Nominal Resistance

Platinum element Pt 100 element 100Ω at 0°C  
Alpha value of 0.00385 EN60751

#### Tolerance and accuracy

In accordance with IEC 751 = EN60751 (see table 1)

#### Number of elements

Single or Duplex

#### Wiring configuration

3 or 4 wire single  
3 wire Duplex

**Table 1. Tolerance on Temperature**

Operating temperature range	Measured temperature °C	Tolerance	
		Class index A	Class index B
		Temperature °C	Temperature °C
H M L	-200	±0.55	±1.3
	-100	±0.35	±0.8
	0	±0.15	±0.3
	100	±0.35	±0.8
	200	±0.55	±1.3
	300	±0.75	±1.8
	350	±0.85	±2.05
	400	±0.95	±2.3
	500	±1.15	±2.8
	650	±1.45	±3.6

#### Thermocouples

Type K, J, T, E See table 2  
(Others available on request)

#### Class

Per IEC 584 /EN60751 also refer to table 3

#### Limits of normal operating temperature

Refer to table 4

#### Limits of elevated operating temperature

Refer to table 4

#### Tolerance on temperature

Refer to table 4

#### Number of elements

Single or Duplex

**Table 2. Thermocouple Material Composition**

Thermocouple type	Material Composition	
	+leg	-leg
K	Nickel-Chromium	Nickel
E	Nickel-Chromium	Copper-Nickel
J	Iron	Copper-Nickel
T	Copper	Copper-Nickel

**Table 3. Tolerance on Temperature (IEC 584)**

Type	Tolerance class 1	Tolerance class 2
Type T		
Temperature range	-40 °C to +125 °C	-40 °C to +133 °C
Tolerance value	±0.5 °C	±1 °C
Temperature range	125 °C to 350 °C	133 °C to 350 °C
Tolerance value	±0.004 •   t	±0.0075 •   t
Type E		
Temperature range	-40 °C to +375 °C	-40 °C to +333 °C
Tolerance value	±1.5 °C	±2.5 °C
Temperature range	375 °C to 800 °C	333 °C to 900 °C
Tolerance value	±0.004 •   t	±0.0075 •   t
Type J		
Temperature range	-40 °C to 375 °C	-40 °C to +333 °C
Tolerance value	±1.5 °C	±2.5 °C
Temperature range	375 °C to 750 °C	333 °C to 750 °C
Tolerance value	±0.004 •   t	±0.0075 •   t
Type K, type N		
Temperature range	-40 °C to +375 °C	-40 °C to +333 °C
Tolerance value	±1.5 °C	±2.5 °C
Temperature range	375 °C to 1000 °C	333 °C to 1200 °C
Tolerance value	±0.004 •   t	±0.0075 •   t

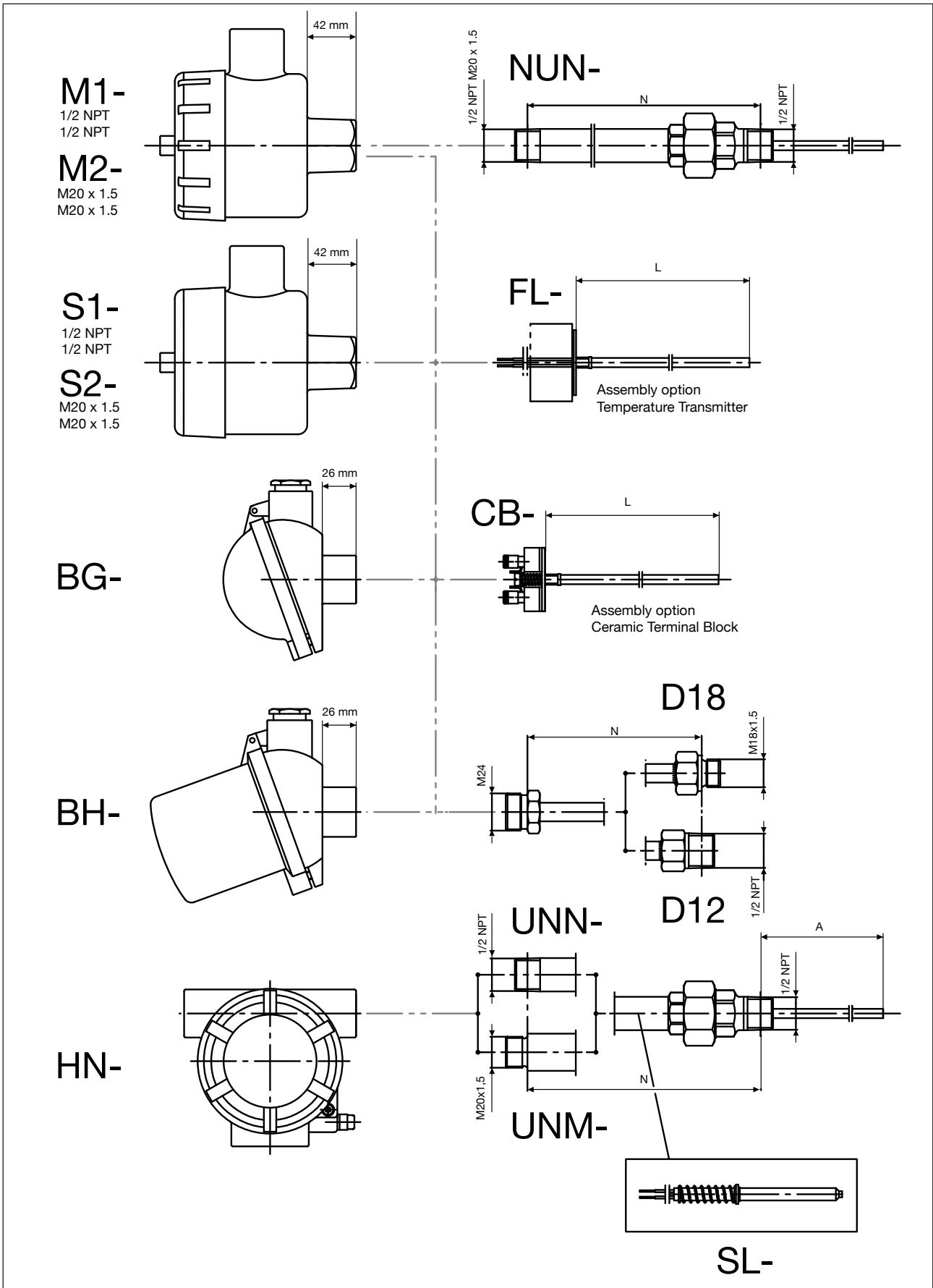
**Table 4. Limits of Normal Operating Temperature and Elevated Operating Temperature.**

Thermocouple type	Normal operating temperature limit *1 °C	Elevated operating temperature limit *2 °C	Thermocouple type	Normal operating temperature limit *1 °C	Elevated operating temperature limit *2 °C
K	650	850	J	400	500
	750	950		450	550
	850	1050		500	650
	900	1100		550	750
	1000	1200		600	750
E	450	500	T	200	250
	500	550		200	250
	550	650		250	300
	600	750		300	350
	700	800			

\*1: Normal operating temperature limit means the limit of temperature within which thermocouples can be continuously used in the air.

\*2: Elevated operating temperature limit means the limit of temperature at which thermocouples can be used for a short time in the case of unavoidable needs.

YTE1



## Model and Suffix Codes YTE1

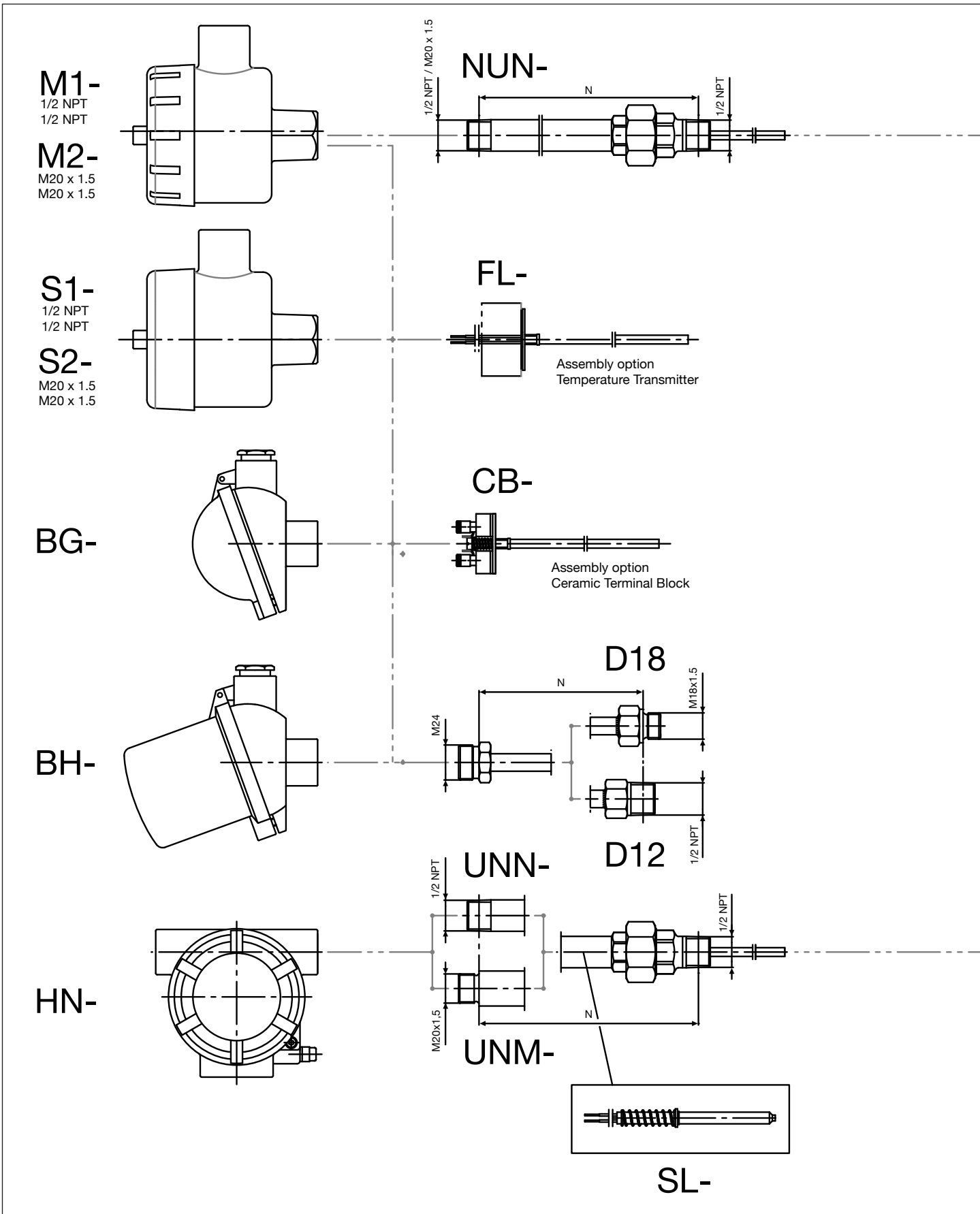
Code	Yokogawa European Temperature Assembly	Notes
YTE1	Temperature Assembly without Thermowell	
Code	Connection Head Type & Material	Conduit Entry / Process Entry
M1-	Aluminum IP66	1/2" NPT X 1/2" NPT
M2-	Aluminum IP66	M20 x 1.5 X M20 x 1.5
S1-	Stainless Steel IP66	1/2" NPT X 1/2" NPT
S2-	Stainless Steel IP66	M20 x 1.5 X M20 x 1.5
BG-	GR-A/BL (BSZ), Aluminum IP65	M20 x 1.5 X M24 x 1.5
BH-	TZ-A/BL (BSZH), Aluminum IP65	M20 x 1.5 X M24 x 1.5
HN-	No Connection Head	For mounting YTA110,YTA310 & YTA320 Transmitters
Code	Sensor Termination	Transmitter Type
SL-	Spring Loaded Adapter - 1/2 inch NPT	For mounting YTA110,YTA310 & YTA320 Transmitters
FL-	Flying Leads - On DIN Plate	For mounting YTA50,YTA70 & YTA80 Transmitters
CB-	Ceramic Terminal Block	No Transmitter Pt100/TC output
Code	Sensor Type	
3B-	RTD Pt100 3 wire, Class B	Sheath Material 316ss,Diameter 6mm
3A-	RTD Pt100 3 wire, Class A	Sheath Material 316ss,Diameter 6mm
4B-	RTD Pt100 4 wire, Class B	Sheath Material 316ss,Diameter 6mm
4A-	RTD Pt100 4 wire, Class A	Sheath Material 316ss,Diameter 6mm
TK-	Type K Thermocouple, Class 2	Sheath Material 316ss,Diameter 6mm
TJ-	Type J Thermocouple, Class 2	Sheath Material 316ss,Diameter 6mm
TT-	Type T Thermocouple, Class 2	Sheath Material 316ss,Diameter 6mm
TE-	Type E Thermocouple, Class 2	Sheath Material 316ss,Diameter 6mm
Code	Sensor Style	
1-	RTD Pt100 Single	
2-	RTD Pt100 Duplex	
3-	Thermocouple Hot junction Ungrounded Single	
4-	Thermocouple Hot junction Ungrounded Duplex	
5-	Thermocouple Hot junction Grounded Single	
6-	Thermocouple Hot junction Grounded Duplex	
Extension Type		
D12-	DIN Standard process connection 1/2"NPT	316SS Ass. length 'N' =100mm Not Available for Exd
D18-	DIN Standard Process connection M18 x 1.5	316SS Ass. length 'N' =100mm Not Available for Exd
UNM-	Union Nipple Process connection 1/2" NPT	316SS Ass. length 'N' =150mm with option SLElectrical Connection M20 x 1.5 For mounting YTA110,YTA310 & YTA320 Transmitters
UNN-	Union Nipple Process connection 1/2"NPT	316SS Ass. length 'N'=150mm with option SL Electrical Connection 1/2"NPT For mounting YTA110,YTA310 & YTA320 Transmitters
NUN-	Nipple Union Nipple Process conn. 1/2"NPT	316SS Assembled length 'N' =150mm For M1, M2, S1, S2 Connection Heads

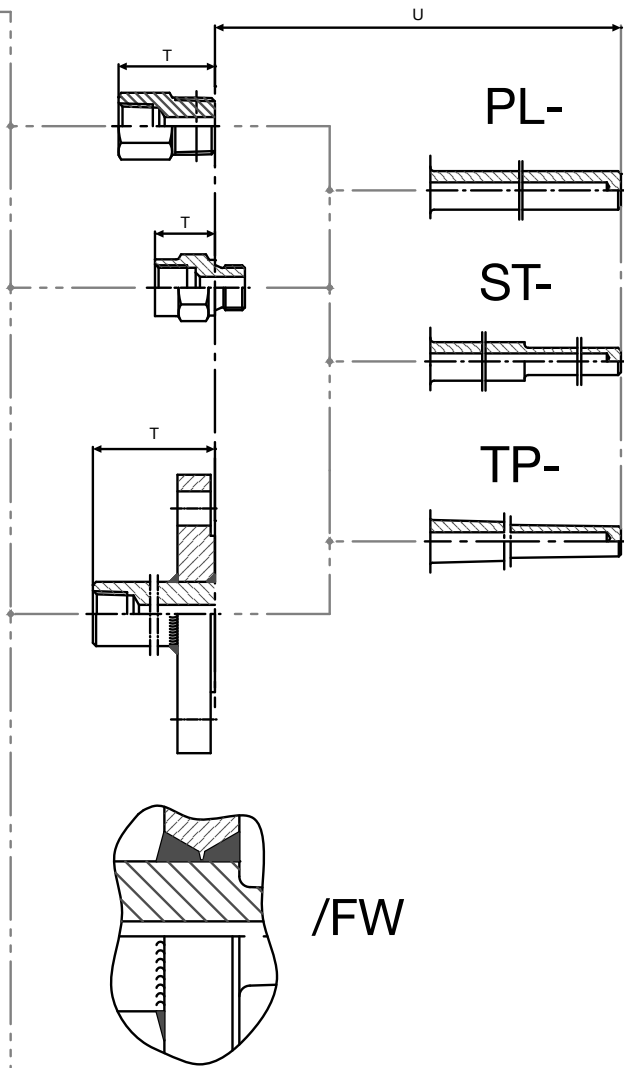
Code	Sensor Length (L) in Millimeters
0145	145
0205	205
0275	275
0315	315
0375	375
0405	405
0435	435
0555	555
0XXX	Non-Standard Sensor Lengths up to 1.000mm in 5mm steps

## Options

Approvals	
/KF1	EEx d - CENELEC/ATEX Flameproof Approval
/KN1	EEx n BASEEFA Non-Incendive-Approval
/FF1	FM Approval (Flameproof Approval)
/K11	Exia Approval
/CF1	CSA Approval (Flameproof Approval)
Transmitter Assembly options	
/A1	Assemble Transmitter YTA50, YTA70, YTA80,
/A2	Assemble Transmitter YTA110, YTA310, YTA320,
Thermowell assembly	
/A3	Assemble Special Thermowell as detailed on an associated Tag Reference
Calibration	
/2F	2 point works standard (specify temperature points)
/3D	3 point DKD standard (specify temperature points)
/5D	5 point DKD standard (specify temperature points)
/CV	3 point Callendar Van Dusen Calibration (0, 100, & 420 DEG C) for YTA320 only

YTE2





## Model and Suffix Codes YTE2

<b>Code Yokogawa European Temperature Assembly</b>		<b>Notes</b>
YTE2 Temperature Assembly with Barstock Thermowell		
<b>Code Connection Head Type &amp; Material</b>		<b>Conduit Entry / Process Entry</b>
M1	Aluminum IP66	1/2" NPT X 1/2" NPT
M2	Aluminum IP66	M20 x 1.5 X M20 x 1.5
S1	Stainless Steel IP66	1/2" NPT X 1/2" NPT
S2	Stainless Steel IP66	M20 x 1.5 X M20 x 1.5
BG	GR-A/BL (BSZ), Aluminum IP65	M20 x 1.5 X M24 x 1.5
BH	TZ-A/BL (BSZH), Aluminum IP65	M20 x 1.5 X M24 x 1.5
HN	No Connection Head	For mounting YTA110,YTA310 & YTA320 Transmitters
<b>Code Sensor Termination</b>		<b>Transmitter Type</b>
SL-	Spring Loaded Adapter - 1/2 inch NPT	For mounting YTA110,YTA310 & YTA320 Transmitters
FL-	Flying Leads - On DIN Plate	For mounting YTA50,YTA70 & YTA80 Transmitters
CB-	Ceramic Terminal Block	No Transmitter Pt100/TC output
<b>Code Sensor Type</b>		
3B-	RTD Pt100 3 wire, Class B Sheath material 316SS, Diameter 6mm	
3A-	RTD Pt100 3 wire, Class A Sheath material 316SS, Diameter 6mm	
4B-	RTD Pt100 4 wire, Class B Available in single sensor style only,Sheath material 316SS, Diameter 6mm	
4A-	RTD Pt100 4 wire, Class A Available in single sensor style only,Sheath material 316SS, Diameter 6mm	
TK-	Type K Thermocouple Sheath material 316SS, Diameter 6mm, Glass 2	
TJ-	Type J Thermocouple Sheath material 316SS, Diameter 6mm, Glass 2	
TT-	Type T Thermocouple Sheath material 316SS, Diameter 6mm, Glass 2	
TE-	Type E Thermocouple Sheath material 316SS, Diameter 6mm, Glass 2	
<b>Code Sensor Style</b>		
1-	RTD Pt100 Single	
2-	RTD Pt100 Duplex	
3-	Thermocouple Hot junction Ungrounded Single	
4-	Thermocouple Hot junction Ungrounded Duplex	
5-	Thermocouple Hot junction Grounded Single	
6-	Thermocouple Hot junction Grounded Duplex	
<b>Code Extension Type</b>		
D12-	DIN Standard process conn. 1/2"NPT 316SS Ass. length 'N' =100mm	Not Available for Exd
D18-	DIN Standard Process conn. M18 x 1.5 316SS Ass. length 'N' =100mm	Not Available for Exd
UNM-	Union Nipple Process conn. 1/2" NPT 316SS Ass. length 'N' =150mm with option SLElectrical Connection M20 x 1.5	For mounting YTA110,YTA310 & YTA320 Transmitters
UNN-	Union Nipple Process conn. 1/2"NPT 316SS Ass. length 'N'=150mm with option SL Electrical Connection 1/2"NPT	For mounting YTA110,YTA310 & YTA320 Transmitters
NUN-	Nipple Union Nipple Process conn. 1/2"NPT 316SS Ass. length 'N' =150mm	For M1, M2, S1, S2 Connection Heads
<b>Code Thermowell Style</b>		
TP-	Tapered - Standard 18-26.5mm (DN25 and 1"Flanges Taper 12.5 -19mm)	
PL-	Parallel (Straight)	
ST-	Reduced Tip (stepped)	
<b>Code Thermowell Material</b>		
316-	316/316L Stainless Steel (Dual Grade)	
F51-	Duplex AISI-A182F51 (1.4462)	
F55-	Super Duplex AISI-A182F55 (1.4501)	
400-	Alloy 400 (2.4360)	
600-	Alloy 600 (2.4816)	
276-	Alloy C276 (All wetted parts C276 fitted with 316SS backing flange)	



Code	Process connection
T2N-	Threaded 1/2" NPT
T3N-	Threaded 3/4" NPT
T4N-	Threaded 1" NPT
T2R-	Threaded 1/2" BSPT (R 1/2")
T3R-	Threaded 3/4" BSPT (R 3/4")
T4R-	Threaded 1" BSPT (R 1")
T2G-	Threaded 1/2" BSP (G 1/2")
T3G-	Threaded 3/4" BSP (G3/4")
T4G-	Threaded 1" BSP (G 1")
T2M-	Threaded M20 X 1.5
T3M-	Threaded M27 X 2
T4M-	Threaded M33 X 2
F4A-	Flanged 1" 150 RF ASME/ANSI B16.5
F4B-	Flanged 1" 300 RF ASME/ANSI B16.5
F6A-	Flanged 1 1/2" 150 RF ASME/ANSI B16.5
F6B-	Flanged 1 1/2" 300 RF ASME/ANSI B16.5
F6C-	Flanged 1 1/2" 600 RF ASME/ANSI B16.5
F6D-	Flanged 1 1/2" 900 RF ASME/ANSI B16.5
F6E-	Flanged 1 1/2" 1500 RF ASME/ANSI B16.5
F6F-	Flanged 1 1/2" 2500 RF ASME/ANSI B16.5
F6K-	Flanged 1 1/2" 900 RTJ ASME/ANSI B16.5
F6L-	Flanged 1 1/2" 1500 RTJ ASME/ANSI B16.5
F6M-	Flanged 1 1/2" 2500 RTJ ASME/ANSI B16.5
F8A-	Flanged 2" 150 RF ASME/ANSI B16.5
F8B-	Flanged 2" 300 RF ASME/ANSI B16.5
F8C-	Flanged 2" 600 RF ASME/ANSI B16.5
F8D-	Flanged 2" 900 RF ASME/ANSI B16.5
F8E-	Flanged 2" 1500 RF ASME/ANSI B16.5
F8F-	Flanged 2" 2500 RF ASME/ANSI B16.5
F8K-	Flanged 2" 900 RTJ ASME/ANSI B16.5
F8L-	Flanged 2" 1500 RTJ ASME/ANSI B16.5
F8M-	Flanged 2" 2500 RTJ ASME/ANSI B16.5
D4A-	Flanged Form B1 EN DN25, PN16
D4B-	Flanged Form B1 EN DN25, PN25/40
D6A-	Flanged Form B1 EN DN40, PN16
D8A-	Flanged Form B1 EN DN50, PN16
D8B-	Flanged Form B1 EN DN50, PN25/40

Code	Thermowell immersion Length 'U'
0050-	50mm
0075-	75mm
0100-	100mm
0125-	125mm
0150-	150mm
0175-	175mm
0200-	200mm
0225-	225mm
0250-	250mm
0275-	275mm
0300-	300mm
0325-	325mm
0350-	350mm
0375-	375mm
0400-	400mm
0425-	425mm
0450-	450mm
0475-	475mm
0500-	500mm
0525-	525mm
0550-	550mm
0575-	575mm
0600-	600mm
0625-	625mm
0650-	650mm
0675-	675mm
0700-	700mm
0725-	725mm
0750-	750mm
0775-	775mm
0800-	800mm
0825-	825mm
0850-	850mm
0875-	875mm
0900-	900mm
0925-	925mm
0950-	950mm
0975-	975mm
01000-	1000mm

## Options

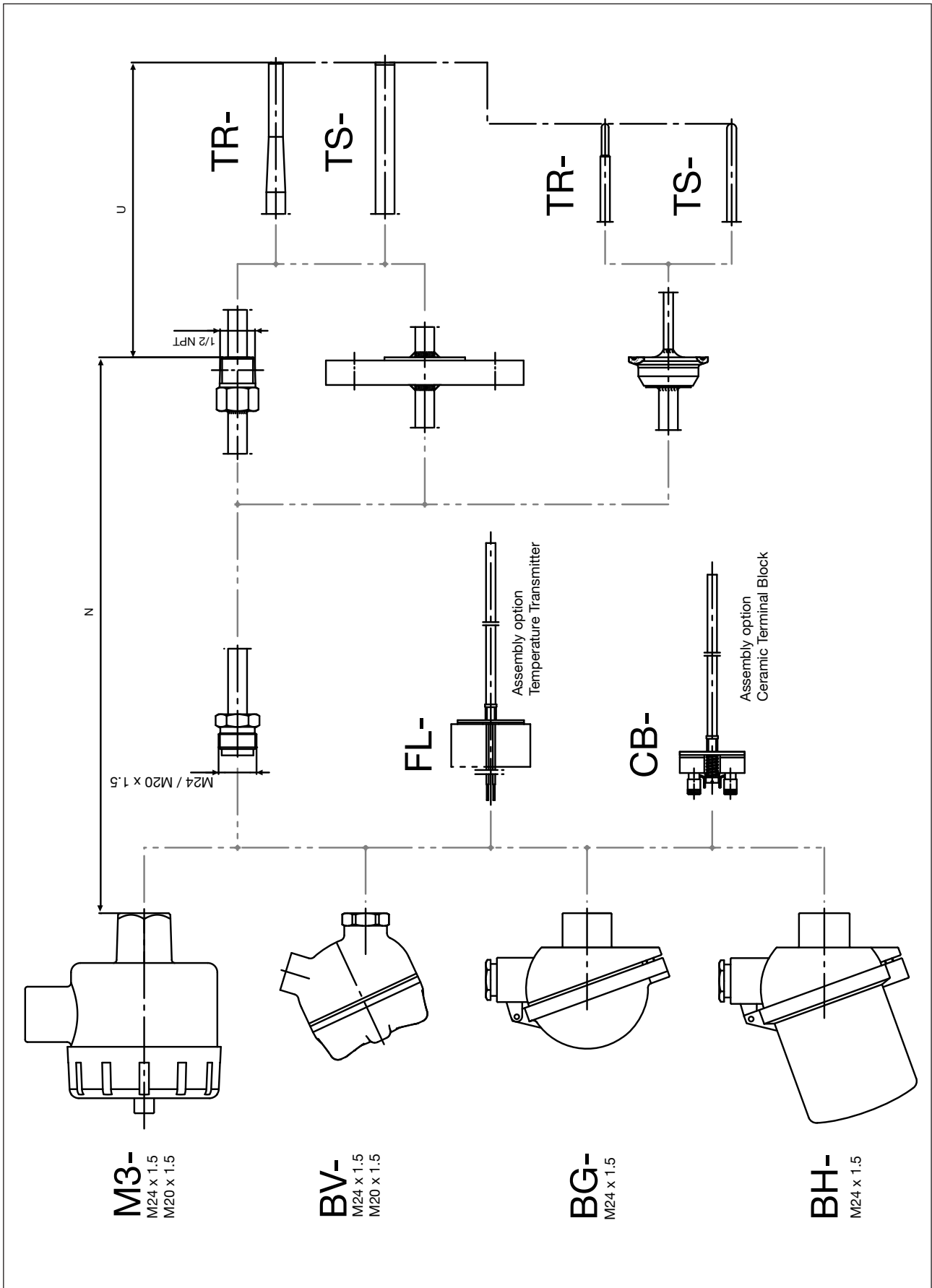
Approvals	
/KF1	EEx d - CENELEC/ATEX Flameproof Approval
/KN1	EEx n BASEEFA Non-Incendive-Approval
/FF1	FM Approval (Flameproof Approval)
/K11	Exia Approval
/CF1	CSA Approval (Flameproof Approval)
Mounting	
/A1	Assemble Transmitter YTA50, YTA70, YTA80,
/A2	Assemble Transmitter YTA110, YTA310, YTA320,
Calibration	
/2F	2 point works standard (specify temperature points)
/3D	3 point DKD standard (specify temperature points)
/5D	5 point DKD standard (specify temperature points)
/CV	3 point Callendar Van Dusen Callibration (0, 100, & 420 DEG C) for YTA320 only

Thermowell	
/MC	Material Certificate DIN EN 10204 3.1b
/NC	NACE Conformity Certificate
/PM	PMI Testing
/EP	External Hydrotest
/DP	Liquid Dye Penetrant Testing
/CN	Bore Concentricity Certificate
/XR	X-Ray
/WQ	Welders Qualification
/WF	Wake Frequency Calculation (PTC 19.3)
/SP	Stainless Steel Plug and Chain
/FW	Full Penetration Weld
/O2	Cleaning for Oxygen Service

### Thermowell Notes:

- 1) Instrument connection 1/2" NPT
- 2) Thermowell bore 6.5mm
- 3) Tip Thickness 6.5mm
- 4) Flange Raised Face surface finish 125-250 AARH
- 5) Flanged Thermowell Dimension T = 57mm
- 6) 1500 LB Flange T= 83mm
- 7) 2500 LB Flange T= 102mm
- 8) Taper thread process connections T= 45mm
- 9) Parallel thread connections T= 28mm

YTE3



### Model and Suffix Codes YTE3

Code	Yokogawa European Temperature Assembly	Notes
YTE3	Temperature Assembly with Fabricated Tubular Thermowell	
Code	Connection Head Type & Material	Conduit Entry / Process Entry
M3-	Aluminum IP66	M20 x 1.5 X M24 x 1.5
BV-	Stainless Steel Type BVA	M20 x 1.5 X M24 x 1.5
BG-	GR-A/BL (BSZ), Aluminum IP65	M20 x 1.5 X M24 x 1.5
BH-	TZ-A/BL (BSZH), Aluminum IP65	M20 x 1.5 X M24 x 1.5
Code	Sensor Termination	Transmitter Type
FL-	Flying Leads - On DIN Plate	For mounting YTA50, YTA70 & YTA80 Transmitters
CB-	Ceramic Terminal Block	No Transmitter required Pt100/TC output
Code	Sensor Type	
3B-	RTD Pt100 3 wire, Class B Sheath material 316SS, Diameter 6mm	
3A-	RTD Pt100 3 wire, Class A Sheath material 316SS, Diameter 6mm	
4B-	RTD Pt100 4 wire, Class B Available in single sensor style only, Sheath material 316SS, Diameter 6mm	
4A-	RTD Pt100 4 wire, Class A Available in single sensor style only, Sheath material 316SS, Diameter 6mm	
TK-	Type K Thermocouple Sheath material 316SS, Diameter 6mm	
TJ-	Type J Thermocouple Sheath material 316SS, Diameter 6mm	
TT-	Type T Thermocouple Sheath material 316SS, Diameter 6mm	
TE-	Type E Thermocouple Sheath material 316SS, Diameter 6mm	
Code	Sensor Style	
1-	RTD Pt100 Single	
2-	RTD Pt100 Duplex	
3-	Thermocouple Hot junction Ungrounded Single	
4-	Thermocouple Hot junction Ungrounded Duplex	
5-	Thermocouple Hot junction Grounded Single	
6-	Thermocouple Hot junction Grounded Duplex	
Code	Thermowell Style	
TS-	Tubular Straight DIN 43772-2G	
TR-	Tubular Tapered DIN 43772 -3G	
Code	Thermowell Lagging Length 'N'	
050-	50mm	
085-	85mm	
100-	100mm	
Code	Thermowell Material	
316S-	316 Stainless Steel (1.4401)	
316L-	316L Stainless Steel (1.4404)	
A600-	Alloy 600 (2.4816)	
C276-	Alloy C276 (2.4819)	

Code	Process connection
T2N-	Threaded 1/2" NPT
T3N-	Threaded 3/4" NPT
T2R-	Threaded 1/2" BSPT (R 1/2")
T3R-	Threaded 3/4" BSPT (R 3/4")
T2G-	Threaded 1/2" BSP (G 1/2")
T3G-	Threaded 3/4" BSP (G3/4")
T2M-	Threaded M20 X 1.5
T3M-	Threaded M27 X 2
T4M-	Threaded M33 X 2
F4A-	Flanged 1" 150 RF ASME/ANSI B16.5
F6A-	Flanged 1 1/2" 150 RF ASME/ANSI B16.5
D4A-	Flanged Form B1 EN DN25, PN16
D4B-	Flanged Form B1 EN DN25, PN25/40
D6A-	Flanged Form B1 EN DN40, PN16
T2C-	1/2" Tri clamp
T3C-	3/4" Tri Clamp
T4C-	1" Tri Clamp
T5C-	1 1/2" Tri Clamp
T6C-	2" Tri Clamp
Code	Thermowell immersion Length 'U'
025-	25mm
0075-	75mm
0100-	100mm
0125-	125mm
0175-	175mm
0200-	200mm
0225-	225mm
0250-	250mm
0300-	300mm
0XXX-	XXX mm non standard length (Upto 999mm)

### Options

Approvals	
/KI1	Exia Approval
Mounting	
/A1	Assemble Transmitter YTA50, YTA70, YTA80,
Calibration	
/2F	2 point works standard (specify temperature points)
/3D	3 point DKD standard (specify temperature points)
/5D	5 point DKD standard (specify temperature points)
Thermowell	
/MC	Material Certificate DIN EN 10204 3.1b
/PT	External Hydrotest
/EP	Electro Polishing Ra < 0.4 Micron
/O2	Cleaning for Oxygen Service

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