

THERMOWELL (Drilled Bar Stock Type Protection Tube) is usually being used to ensure longer service life under critical conditions such as very corrosive gases or liquids, high temperature, high pressure, vibration, shock or high flow velocity. AT KONICS various THERMOWELLS durable under these conditions are manufactured.

Features

• Bores & depths

Bore (mm)	Max. Depth (mm)
4.0	500
5.5	700
7.0	800
8.5	1,000
10.0	1,200
11.0	1,200
12.0	1,200
16.0	1,200

• Test and inspection

- Integrity test

Each well is tested under air pressure of 5kgf/cm² for 5 minutes.

- Hydrostatic pressure test

Internal pressure test up to 300kgf/cm² is conducted upon request.

- X-ray inspection

X-ray inspection to insure uniform wall thickness or complete finish is also performed upon request.



Specifications

TYPE	CONN, TYPE	MODEL	LENGTH(mm)	MAT'L	REMARK
DRILLED BAR	SCREWED	TWD-RS1	50 ~ 1200	SU304 & ETC	HIGH TEMP
	WELDING	TWD-RW1	50 ~ 1200	SU305 & ETC	HIGH PRESS
	FLANGE	TWD-RF1	50 ~ 1200	SU306 & ETC	HIGH PRESS
END CLOSED	SCREWED	TWP-HC1	50 ~ 6000	SU307 & ETC	LOW TEMP
	FLANGE	TWP-RD1	50 ~ 6000	SU309 & ETC	LOW PRESS

A	Recorders
B	Indicators
C	Converters
D	Controllers
E	Thyristor Units
F	Pressure Transmitters
G	Temperature Transmitters
H	Temp. Sensors
I	Thermo Meters
J	Pressure Gauges
K	Accessories

Material

• Raw material size(mm)

- Round bar(O.D.) : 25, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 55
- Hexagonal Bar : 26, 29, 32, 35, 38, 41

• Standard material

304 SS, 316 SS, 316L SS, 310S SS, Hastelloy A, Hastelloy B, Hastelloy C, Monel, Nickel and its alloys, 50Co-30Cr, Titanium and its alloys, Inconel. Other special materials are also available upon request.

• Features of protection tubes metallic protection tubes

Material	Operating Temp(°C)	Maximum Temp(°C)	Features
Plain Steel	800	900	Good resistance to reducing atmosphere but less resistant to oxidation and acids attacks.
304 S.S.	900	1,000	Widely used as common protection tube against heat and corrosion but not recommendable for use in the presence of sulphur or reducing flame.
304L.S.S.	900	1,000	Less carbon content (Cn0.03%) than 304S.S. and excellent resistance to grainboundary corrosion.
321S.S.	900	1,000	Higher corrosion resistance than 304 S.S. because of its Ti content. Excellent resistance to grain boundary corrosion fter welding.
316S.S.	900	1,000	Contains Mo and excellent resistance to heat, acids and alkalis.
316L.S.S.	900	1,000	Less carbon content than 316S.S. and has better resistance to grain boundary corrosion.
310SS.S.	950	1,050	High Ni-Cr content and good high temperature strength with resistance tooxidation at high temperatures.
347S.S	900	1,000	Because of its Nb-Ta content, higher corrosion resistance than 304 S.S. and excellent resistance to grain boundary corrosion.
446 S.S.	1,050	1,125	Excellent resistance to oxidizing and reducing flames containing sulphur. Best suitable for the use in salt baths, molten metals and other high temperature applications.
50Co-30Cr	1,100	1200	Excellent resistance to heat, corrosion and abrasion. Also good resistance to sulphurizing atmospheres.
Inconel 600	1,180	1,250	Excellent resistance to oxidizing and reducing atmospheres at high But sulphurous atmospheres should be avoided.
Inconel 800	870	1,000	Excellent to high temperature oxidizing atmospheres and thermal shock. About 10 times longer service life than 304S.S. against high temperature corrosion.
Kanthal A	Oxi.1000 Red.1000		Good resistance to high temperature oxidation but becomes brittle due to recrystallization.
80Ni. 20Cr	1,100	1,250	Good mechanical strength and corrosion resistance at high temperature oxidizing atmospheres but not recommendable for use in sulphurizing atmospheres.
Kurimax*	1,200	1,400	Excellent resistance to molten chemicals and combustion gases. Also good resistance to corrosion by liquid copper.
Hastelloy B	800	1,100	Excellent resistance to heat and corrosion, especially to HCl and H ₂ SO ₄
Hastelloy C	1,000	1,100	Excellent resistance to high temperature oxidizing and reducing atmospheres and also to Cl ₂ gases.
Hastelloy X	1,175	1,260	Excellent resistance to oxidizing and carburizing atmospheres at high temperatures. Better machinability and weldability than other Hastelloy alloys.
Haynes Alloy 25	980	1,100	High resistance to oxidizing and carburizing atmospheres at high temperatures.
Titanium	Oxi.250 Red.1000		Superior corrosion resistance in cryogenic temperatures but at high temperatures. Easily oxidized and becomes brittle.
Monel	500	600	Excellent resistance to water vapor, high pressure and corrosion.
Tantalum	Oxi300 Red2200		Excellent heat-resistant material with high resistance to all acids but apt to severe oxidation and embrittlement in air at high temperatures.

Note: 1).Operating and maximum temperatures vary depending on the atmospheres.
 2).Other special protection tubes are also available upon request.

SH1, SL1
SH2, SL2
SH3, SL3
SH4, SL4
SP3-B, SP3-D
SP3-U, SP3-S
SP4-M
TWD,TWP
BX,RX,SX KX,EX,JX TX
Reference

● **Features of protection tubes non-metallic protection tubes**

Material	Code-No.	Operating Temp(°C)	Maximum Temp(°C)	Features
Translucent Quartz	QT	1,000	1,100	Excellent resistance to thermal shock but fragile. Poor resistance to alkalis but good to acids. Less gas-tightness in hydrogen reducing gases. High thermal conductivity.
Mullite	PT2	1,400	1,500	High alumina ceramic. Good resistance to thermal shock. Recommendable for use in coal or oil burning and electric furnaces.
	PT1	1,500	1,600	Sintered alumina. Better than PT2 slightly less thermal shock resistance. Recommendable for use in heating furnace and regenerator, impervious.
Recrystal-lized Alumina	PTO	1,600	1,800	Superior chemical stability and better than PT-1, Recommendable for use in molten steel, slag and molten glass, impervious.
Cermet (Cermo-therm)	LT1	1,600	2,000	High heat conductivity, good thermal shock resistance and corrosion resistance in molten metals. Recommendable for continuous use in molten steel but not suitable for use in oxidizing atmosphere at high temperatures.
Recrystallized Silicon Carbide	Y1 SiC	1,400	1,650	Good resistance to acids and alkalis. Recommendable for the use in neutral atmospheres up to 1,500°C and also in molten zinc, aluminum, lead, copper, etc., porous.
Self-bonded Silicon Carbide	Y2 SiC	1,650	1,800	Very low porosity. Excellent resistance to thermal shock, corrosion and abrasion at high temperatures. Recommendable for use in oxidizing and reducing atmospheres up to 1,500°C
Clay-bonded Silicon Carbide	Y3 SiC	1,500	1,700	Good heat conductivity. More accurate measurement than oxide-type tube can be expected. Excellent resistance to thermal shock, porous.
Nitride Bonded Silicon Carbide	Y4 SiC	1,550	1,750	Excellent performance similar to Y3 Sic but contains Si ₃ N ₄ . Most suitable for use in molten aluminum, porous.
Zirconia	ZR 1706	1,800	2,000	Gas-tight and chemically stable against molten metals other than alkalis. Recommendable for use in molten special metals,
Ko-phire	KP	1,900	2,000	Chemical reactors in the presence of corrosive compounds such as hot mineral acids or melts, ammonia synthesis, sulphur, in petrochemistry, hydrogen production, etc

Note: 1).Operating and maximum temperatures vary depending on the atmospheres.
 2).Other non-metallic tubes are also available upon request.

● **Chemical resistance of protection tubes**

Corrosives	Content.	Temp. (°C)	304SS	321SS	316SS	316LSS	316JLSS	310S SS	347SS	Carpenter 20	Inconel 600	Nimonic	Hastelloy B	Hastelloy C	Hastelloy X	Titanium	Monel	Tantalum	Teflon	Copper	Zirconium	Nickel	PVC	Cupro-nickel	Aluminium	Brass	Lead	Common //Iel	50Co-30Cr	Haynes alloy 25
H ₂ SO ₄	5% "	30	B	B	B	B	B	B	B	A	B	B	A	A	B	B	A	A	B	A	B	A	B	C	C	A	A	C	A	A
	10% "	30	B	B	B	B	B	B	B	A	B	B	A	A	B	B	A	A	B	A	B	A	B	C	C	A	A	C	A	A
	50% "	30	C	C	C	C	C	C	C	A	B	B	A	A	B	B	A	A	B	A	B	A	B	C	C	A	A	C	A	A
	90% "	30	B	B	B	B	B	B	B	A	B	B	A	A	B	B	A	A	B	A	B	A	B	C	C	A	A	C	A	A
2HCL	5% "	30	C	C	C	C	C	C	C	B	B	B	A	A	B	B	A	A	B	B	A	B	A	C	C	C	B	B	C	B
	10% "	30	C	C	C	C	C	C	C	C	B	B	A	A	B	B	A	A	B	B	A	B	A	C	C	C	B	B	C	B
	20% "	30	C	C	C	C	C	C	C	C	B	B	A	A	B	B	A	A	B	B	A	B	A	C	C	C	B	B	C	B
HNO ₃	20% "	30	A	A	A	A	A	A	A	A	A	A	A	C	A	A	A	A	C	C	C	C	B	C	B	C	C	C	C	C
	40% "	30	A	A	A	A	A	A	A	A	A	A	A	C	A	A	A	A	C	C	C	C	B	C	B	C	C	C	C	C
	75% "	30	A	A	A	A	A	A	A	A	A	A	A	C	A	A	A	A	C	C	C	C	B	C	B	C	C	C	C	C
CH ₃ CO ₂ H	10% "	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	B	A	B	B	B	B	C	C	A
	50% "	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	B	A	B	B	B	B	C	C	A
	85% "	30	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	B	A	B	B	B	B	C	C	A
H ₃ PO ₄	5% "	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	B	A	B	C	C	B	A	A	A
	50% "	30	B	B	B	B	B	B	B	A	B	A	A	A	A	A	A	A	A	B	A	B	A	B	C	C	B	A	A	A
	85% "	30	B	B	B	B	B	B	B	A	B	A	A	A	A	A	A	A	A	B	A	B	A	B	C	C	B	A	A	A
H ₂ F ₂	30% "	30	C	C	C	C	C	C	C	C	A		A	A	C	C	A		A	C	C	A	C	C	C	B	B	C	C	C
	70% "	30	C	C	C	C	C	C	C	C	B		C	C	C	C	B		A	C	C	A	C	C	C	B	B	C	C	C
HCl	30	30	B	B	B	B	B	B	B	B	B	B	A	A	A				A									A	A	A
	200 400	30	B	B	B	B	B	B	B	B	B	B	A	A	A				A									A	A	A
NaOH	10% "	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	B	B	B	B	B	B	B
	50% "	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	B	B	B	B	B	B	B
	70% "	30	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	A	A	A	B	B	B	B	B	B	B
KOH	25%	B.P	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	C	A	B		B	C	C	B	B	B	B	B
	50%	B.P	B	B	B	B	B	B	B	A	A	A	A	A	A	A	A	A	C	A	B		B	C	C	B	B	B	B	B
HCl(dry) HCl(wet)	30	30	C	C	C	C	C	C	C	C	A		A	A	A	A	A	A	A				A	A	C	B	C	A	A	A
	30	30	C	C	C	C	C	C	C	C	C		C	C	C	A	A	A	A				A	A	C	B	C	A	A	A
HCl vapor			C	C	C	C	C	C	C	B									A									A	A	A
HF			C	C	C	C	C	C	C	A	C																	A	A	A
H ₂ (SiF ₆)	5%	20	C	C	C	C	C	C	C	C	A	A	A	A	A	A	A	A				C	A	C	C	C	B	C	C	C
F	10%	30	C	C	C	C	C	C	C	A	A											C	A	C	C	C	B	C	C	C
NaOH	10%	B.P	B	A	A	A	A	A	A	A	A												A	C	C	B	C	C	C	C
	75%	100	B	A	A	A	A	A	A	A	A												A	C	C	B	C	C	C	C
CO ₂	10%	200	A	A	A	A	A	A	A	A																				
SO ₂			A	A	A	A	A	A	A	A															C					
Na ₅ P ₃ O ₁₀	10%	30	B	B	B	B	B	B	B	B	C	C	C	A																
CHCl ₃		30	C	C	C	C	C	C	C														B	C	C			B		
AlF ₃	50%	30	B		B																		A	C						
Fatty Acids		100	A	A	A	A	A	A	A	A	A																			
NH ₃			A	A	A	A	A	A	A	A																				
NaCl			A	A	A	A	A	A	A	A																				
CrO ₄										A																				
H ₂ O ₂			A	A	A	A	A	A	A	A																				
S(liquid)			A	A	A	A	A	A	A	A															A					
CaCl ₂			A	A	A	A	A	A	A	A																				

Note: A=Alot no corrosion in critical conditions.
 B=Small corrosion but permissible in general use other then specific parts.
 C=Heavy corrosion and unsuitable.

A	Recorders
B	Indicators
C	Converters
D	Controllers
E	Thyristor Units
F	Pressure Transmitters
G	Temperature Transmitters
H	Temp. Sensors
I	Thermo Meters
J	Pressure Gauges
K	Accessories
	SH1, SL1
	SH2, SL2
	SH3, SL3
	SH4, SL4
	SP3-B, SP3-D
	SP3-U, SP3-S
	SP4-M
	TWD,TWP
	BX,RX,SX KX,EX,JX TX
	Reference

TWD

■ Please select basic model at first.

TWD - H W0 S

① ② ③ ④

④ **Downside shape**

S : Straight Type

T : Taper Type

③ **Thermo well shape** (Please refer to the drawings).

* This is the classification for installation and type of thermo well.

* Upside type of W0~W4 & F0~F5 is round type but upside type of S1~S4 is hexagon.

W0 : Welding0

W1 : Welding1

W3 : Welding3

W4 : Welding4

S1 : Screwed1

S2 : Screwed2

S3 : Screwed+Lagging1

S4 : Screwed+Lagging2

F0 : Franged0

F1 : Franged1

F2 : Franged2

F3 : Franged3

F4 : Franged4

F5 : Franged5

② **Upside shape**

H : Hexagon

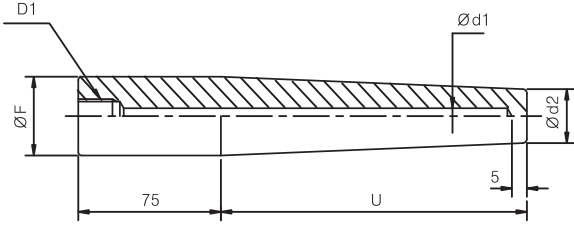
R : Round

① **Thermo well type**

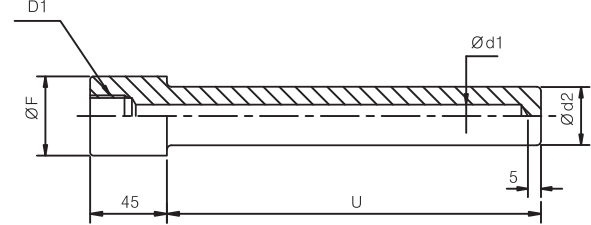
TWD : Drilled type thermo well

■ Selection of thermo well type

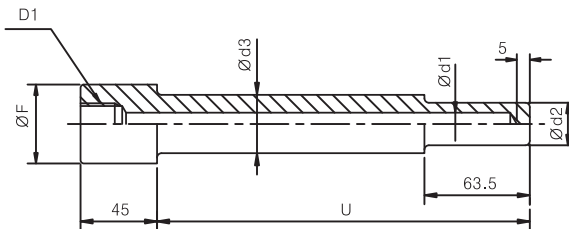
**Welding0 : TWD - R W0 T
TWD - R W0 S**



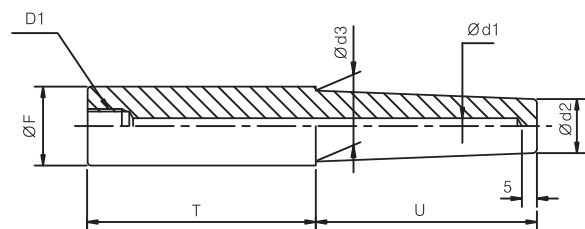
**Welding1 : TWD - R W1 T
TWD - R W1 S**



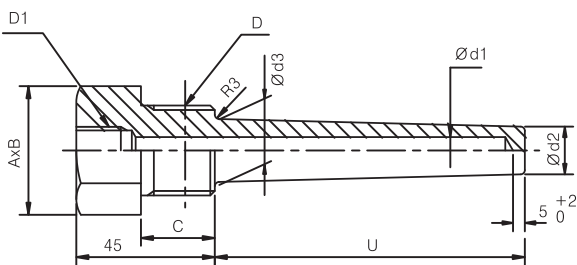
**Welding3 : TWD - R W3 T
TWD - R W3 S**



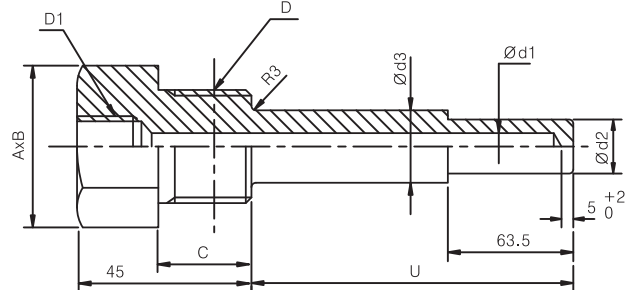
**Welding4 : TWD - R W4 T
TWD - R W4 S**



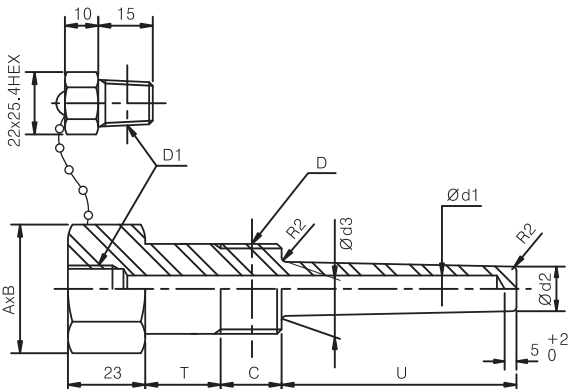
**Screwed1 : TWD - H S1 T
TWD - H S1 S**



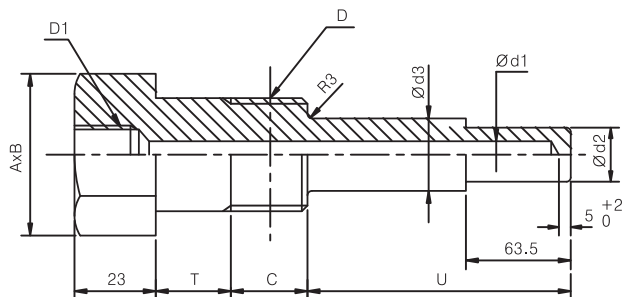
**Screwed2 : TWD - H S2 T
TWD - H S2 S**



**Screwed + Lagging1 : TWD - H S3 T
TWD - H S3 S**



**Screwed4 + Lagging1 : TWD - H S4 T
TWD - H S4 S**



(Unit : mm)

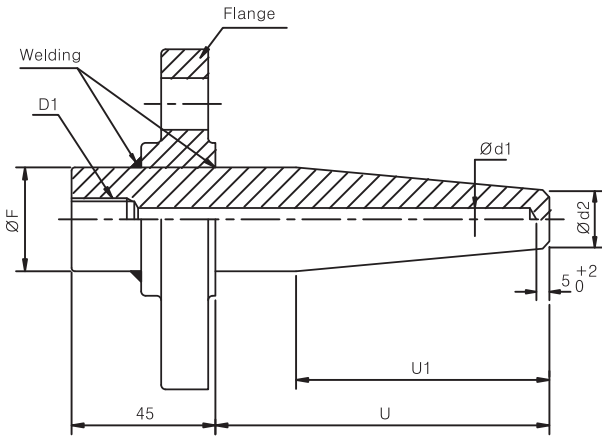
A	Recorders
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SH1, SL1
SH2, SL2
SH3, SL3
SH4, SL4
SP3-B, SP3-D
SP3-U, SP3-S
SP4-M
TWD, TWP
BX, RX, SX KX, EX, JX TX
Reference

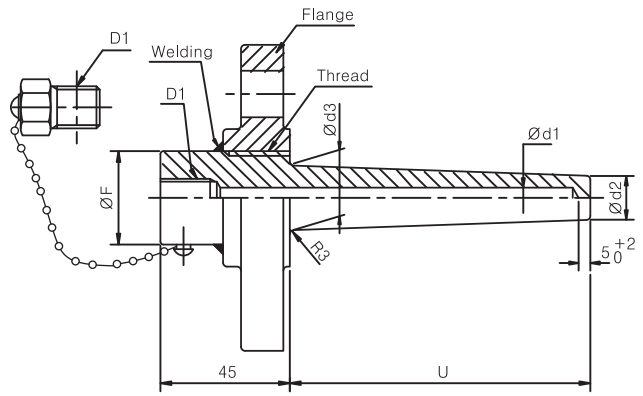
TWD

Drilled Type Thermo Well

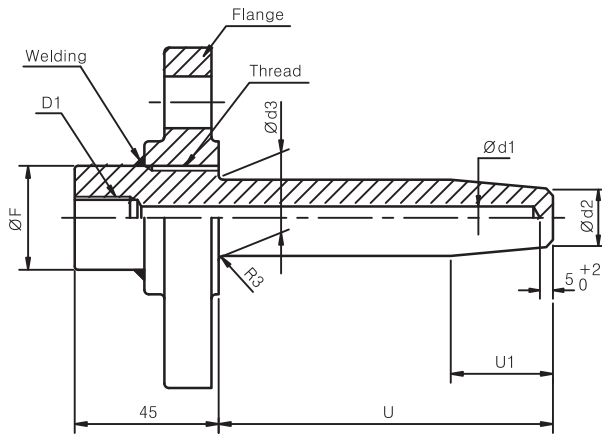
**Franged0 : TWD - R F0 T
TWD - R F0 S**



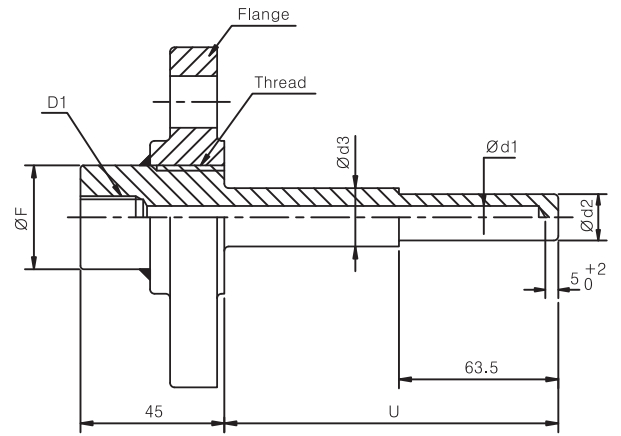
**Franged1 : TWD - R F1 T
TWD - R F1 S**



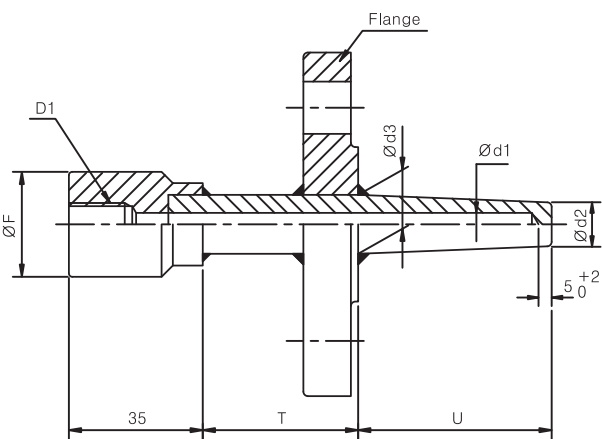
**Franged2 : TWD - R F2 T
TWD - R F2 S**



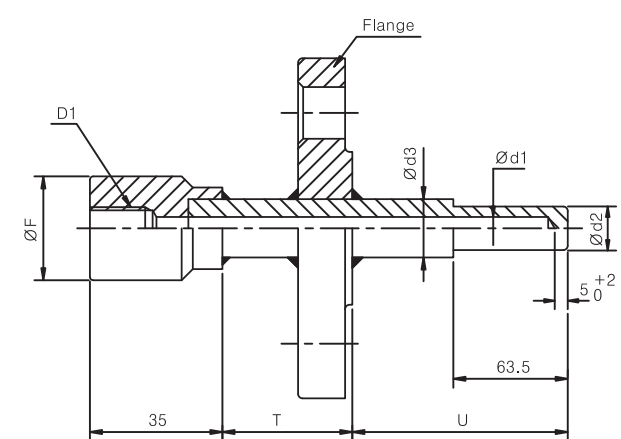
**Franged3 : TWD - R F3 T
TWD - R F3 S**



**Franged4 : TWD - R F4 T
TWD - R F4 S**



**Franged5 : TWD - R F5 T
TWD - R F5 S**



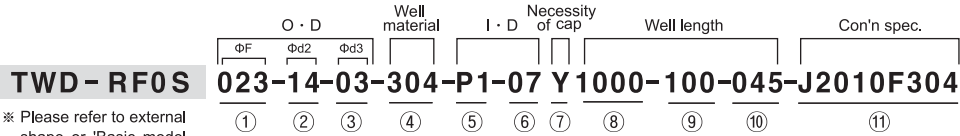
(Unit : mm)

A	Recorders
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SH1, SL1
SH2, SL2
SH3, SL3
SH4, SL4
SP3-B, SP3-D
SP3-U, SP3-S
SP4-M
TWD, TWP
BX, RX, SX KX, EX, JX TX
Reference

ORDERING = Basic model + Detailed specifications + Special specifications

Detailed specifications



※ Please refer to external shape or 'Basic model selection chart' in case of standard model.

- ① **Out-diameter of the top(ΦF or A×B)**
 - If upside shape is round
 W0~W4 : 265(26.5Φ), 333(33.3Φ), 480(48Φ), 600(60Φ)
 Etc. : 320(32Φ), 350(35Φ)
 - If upside shape is hexagon(A×B) : H27(27×31.2), H32(32×37), H36(36×41.6), H50(50×57.7), H70(70×80.8)
- ② **Out-diameter of the bottom(Φd2)**
 14(Φ14), 16(Φ16), 17(Φ17), 19(Φ19)
- ③ **Out-diameter of downside(Φd3)**
 Please fill in directly.
 ('Please fill in 'XX' in case of the type having not 'Φd3'.)
- ④ **Well material**
 Metal - 304(304SS), 316(316SS), 36L(316LSS), 310(310SS), 321(321SS),
 INC(Inconel 600), 50C(50Co-30Cr), 446(446SS),
- ⑤ **In-diameter of upside(ΦD1)**
 P1(PT1/2), N1(NPT1/2), F1(PF1/2), F2(PF3/4)
 P2(PT3/4), N2(NPT3/4)
- ⑥ **Necessity of cap**
 If cap is necessary, 'Y' / If cap is unnecessary, 'N'
- ⑦ **In-diameter of downside(Φd1)**
 07(Φ7), 09(Φ9), 10(Φ10), 12(Φ12)
- ⑧ **Downside length of well(Umm)**
 Please fill in directly.
- ⑨ **Downside detailed length of well(U1mm)**
 (Please fill in 'XXX' in case of the type having not 'U1'.)
- ⑩ **Well lagging length(Tmm)**
 Please fill in directly.(* Please fill in 'XXX' in case of the type having not 'T'.)
- ⑪ **Con'n spec.**
 Screw spec. : A113~A115 Page Ordering code reference
 Flange spec. : A116~A119 Page Ordering code reference + Flange material
 ※ Flange material
 304(304SS), 316(316SS), 36L(316SS), 310(310SS)
 446(446SS), 50C(50Co~30Cr), INC(INCONEL 600)

TWP Series(Piped type thermo well)

■ Please select basic model at first.

TWP - H C1 S

①

②

③

④

④ Downside shape

S : Straight Type

③ Thermo well shape (Please refer to the drawings).

C1 : Screwed1

C2 : Screwed+Lagging

D1 : Franged1

D2 : Franged2

※ Upside type of S1, S2 is hexagon type but upside type of F1, F4 is round.

② Upside shape

H : Hexagon

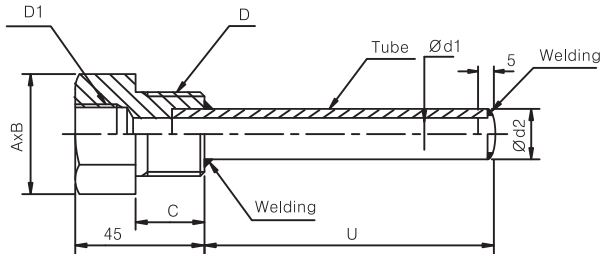
R : Round

① Thermo well type

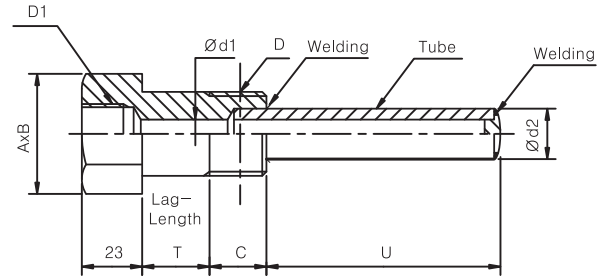
TWP : Piped type thermo well

■ Selection of tube - Selecting tube shape and material

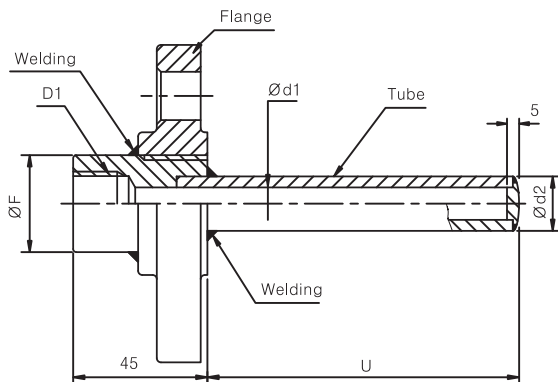
Screwed1 : TWP - H C1 S



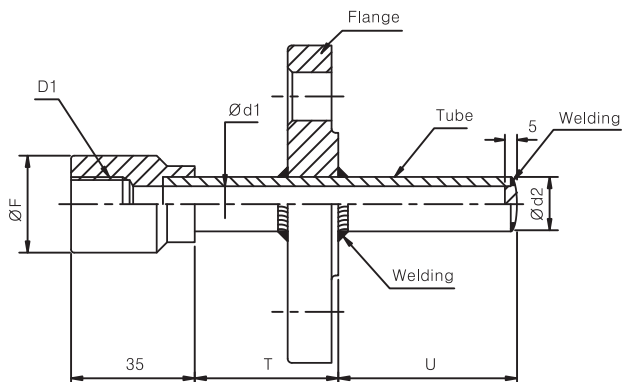
Screwed+Lagging : TWP - H C2 S



Franged1 : TWP - R D1 S



Franged2 : TWP - R D2 S

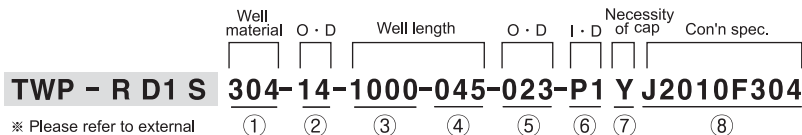


(Unit : mm)

A	Recorders
B	Indicators
C	Converters
D	Controllers
E	Thyristor Units
F	Pressure Transmitters
G	Temperature Transmitters
H	Temp. Sensors
I	Thermo Meters
J	Pressure Gauges
K	Accessories

ORDERING = Basic model + Detailed specifications + Special specifications

Detailed specifications



※ Please refer to external shape or 'Basic model selection chart' in case of standard model.

- ① **Well material**
 Metal - 304(304SS), 316(316SS), 36L(316LSS), 310(310SS), 321(321SS),
 INC(Inconel 600), 50C(50Co-30Cr), 446(446SS)
- ② **Out-diameter of the bottom(Φd2)**
 12(12Φ), 15(15Φ), 17(17Φ), 21(21.7Φ)
- ③ **Downside length of well(Umm)**
 Please fill in directly.
- ④ **Well lagging length(Tmm)**
 Please fill in directly.(* Please fill in 'XXX' in case of the type having not 'T'.)
- ⑤ **Out-diameter of the top(ΦF or A×B)**
 - If upside shape is round : 320(32Φ), 350(35Φ)
 - If upside shape is hexagon(A×B) : H27(27×31.2), H32(32×37), H36(36×41.6), H50(50×57.7), H70(70×80.8)
- ⑥ **In-diameter of upside(ΦD1)**
 P1(PT1/2), P2(PT3/4), N1(NPT1/2), N2(NPT3/4), F1(PF1/2), F2(PF3/4)
- ⑦ **Necessity of cap**
 If cap is necessary, 'Y' / If cap is unnecessary, 'N'
- ⑧ **Con'n spec.**
 Screw spec. : A113~A115 Page Ordering code reference
 Flange spec. : A116~A119 Page Ordering code reference + Flange material
 ※ Flange material
 304(304SS), 316(316SS), 36L(316LSS), 310(310SS), 446(449SS), 50C(50Co-30Cr), INC(INCONEL 600)

SH1, SL1
SH2, SL2
SH3, SL3
SH4, SL4
SP3-B, SP3-D
SP3-U, SP3-S
SP4-M
TWD,TWP
BX,RX,SX KX,EX,JX TX
Reference