

TS1 SERIES TEMPERATURE CONTROLS

The TS1 Series is ALCO's range of adjustable thermostats for application in refrigeration and heat pump systems. In these systems, thermostats serve control and monitoring functions, such as space temperature control, high/low temperature alarming or defrost termination. By operating a set of electrical contacts, a temperature value is kept inside a certain limit.

Several housing variants and sensors are provided in order to suit a control to a specific application.

FEATURES

- ☆ Adjustable temperatures and differentials
- ☆ Range and differential pointer in units °C and °F
- ☆ Range and differential individually lockable by wire seal
- ☆ Captive terminal and cover screws
- ☆ Manual toggle for system checkout and override
- ☆ Bellows heater for thermostats with vapour charge
- ☆ Room thermostats with insulation console
- ☆ Standard accessories include mounting brackets and knob with lockplate on all individually packed controls
- ☆ Non-ambient sensitive
- ☆ Heavy-duty SPDT switch allows handling of most loads directly without the use of relays

SPECIFICATIONS

- ☆ Ambient temperature ranges -50°C to +70°C (-58°F to 158°F)
- ☆ SPDT switch rated for 120VAC/240VAC at 24FLA and 144LRA
- ☆ Agency approvals include: UL/CUL file #E85974, VDE 0631/0660, TÜV, CE 73/23/EWG, CE 93/68/EWG



OPTIONS

- ☆ Housing variants for top and front operation
- ☆ Flush mounted version
- ☆ Vapor, liquid and cross-ambient charges
- ☆ Sensor shapes for various applications
- ☆ Versions with and without manual override
- ☆ Factory set to customer specification
- ☆ Different types of mounting brackets
- ☆ Sensor bulb wells and capillary tube holders
- ☆ Special approvals

TF115 REPLACEMENT

See page 351 for Old to New Cross Reference (TF115 to TS1)

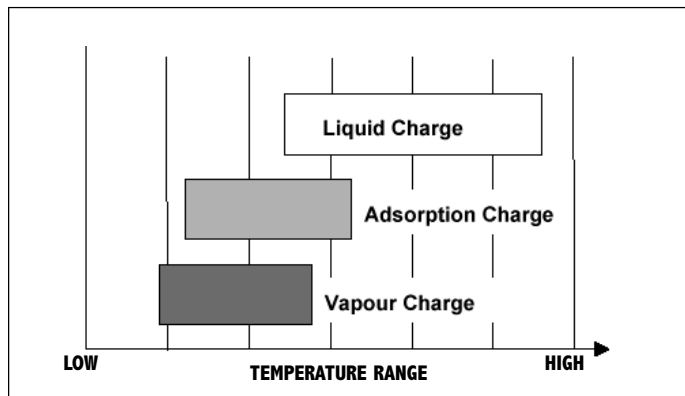
NOMENCLATURE — EXAMPLE TS1 B1E

TS1	B	1	E
Product Name	Housing Variant/function	Temperature Range	Sensor Type
TS1 = Adjustable thermostat	A = Wall mount design, top adjustment	0 = +40 to +68°F (+4.5 to +20°C)	A = Vapor Charge, 2 m. capillary
TSA = Customer specials	B = Wall mount design, top adjustment, off-switch	1 = -50 to +14°F (-45 to -10°C)	C = Liquid Charge, 2 m. bulb
	C = Frost monitor, auto reset	2* = -22 to +50°F (-30 to +10°C)	E = Vapor Charge, 0 m. coil
	D = Frost monitor, manual reset	-22 to +59°F (-30 to +15°C)	F = Adsorption Charge, 2 m. bulb
	E = Wall mount design, front adjustment	3* = +14 to +77°F (-10 to +25°C)	P = Vapor Charge, 2 m. capillary for housing variant A/B/E/F/G/H/R.
	F = Wall mount design, front adjustment, off-switch	+14 to +95°F (-10 to +35°C)	6 m. capillary for housing variant C/D/X/Y.
	G = Flush mount design, front adjustment	4* = -13 to +86°F (-25 to +30°C)	
	H = Flush mount design, front adjustment, off-switch	-22 to +95°F (-30 to +35°C)	
	R = Wall mounting, top adjustment, manual reset	5* = +68 to +140°F (+20 to +60°C)	
	X = Wall mount design, top adjustment,	+77 to +167°F (+25 to +75°C)	
	Y = Frost monitor, manual reset	6 = +122 to +212°F (+50 to +100°C)	
		7 = +32 to +50°F (0 to +10°C)	
		8 = +194 to +284°F (+90 to +140°C)	
		9 = +266 to +356°F (+130 to +180°C)	
		NOTES	
		Temp ranges 0-4:	
		manual reset for falling temperature	
		Temp ranges 5-9:	
		manual reset for rising temperature	
		* First line is range for controls with housing variant/function A, B, C, D, R, X or Y. Second temperature range applies to controls with housing variant/function E, F, G or H.	

TEMPERATURE SENSING

TS1 thermostats sense temperature by means of a thermal system, consisting of temperature charge, bulb, capillary and bellows. The temperature charge changes its pressure based on the refrigerant temperature to be sensed. The sensor is the portion of the system which is in thermal contact with the refrigerant, the capillary connects the sensor with the bellows and the bellows contracts or expands depending on the pressure, causing the thermostat to operate the electrical contacts. An exception are capillary type of sensors, which do not have a bulb, instead, their capillary serves as the bulb directly. Charges and sensor types are matched to temperature ranges and other application specific characteristics.

TS1 thermostats come with one of three charge types: vapor charges, adsorption charges or liquid charges. The application temperature range covered by each charge type is shown in the chart below.



Vapor Charge—Sensor Type A, E, P

These sensing elements always sense from the coldest point on the capillary, coil, bulb or power element head. For proper operation it must be ensured that this coldest point is at the sensor portion which is exposed to the temperature to be sensed. The sensing location should be at least 4°F (2 K) colder than the other parts of the thermal system.

In order to avoid unwanted effects of heat transfer, e.g. from a cold wall, ALCO vapour charged thermostats come with an integrated bellows heater, which is rated for 230 V applications. For other applications the heater must be disabled, alternatively, a bellows heater with a different rating may be available.

In addition to the bellows heater, room thermostats are supplied with an insulation console for the same reason.

Sensor type 'A' is a coiled bulb sensor with two meter capillary, which may be used with or without a bulb well. Style 'E' is a coil sensor for space temperature sensing, and type 'P' is a capillary type of sensor which can be wrapped around a heat exchanger's surface in order to sense the coldest point on the heat exchanger for frost protection applications.

Vapor charges respond faster to temperature changes than adsorption and liquid charges.

Adsorption Charge—Sensor Type F

Adsorption charged sensor types operate on the basis of a temperature dependent adsorption material, which is located inside the bulb only. Therefore these sensor types always respond to temperature changes at the bulb only. This makes them suitable to applications where it is not always defined which part of the thermal system the coldest point is (cross ambient applications). An example for such applications is defrost control.

Adsorption charges are slower in response to temperature changes than vapour charges.

Liquid Charge—Sensor Type C

Liquid charge sensors of type 'C' always sense from the warmest point of the thermal system. This condition must always be ensured. The sensing location should always be warmer than 4°F (2 K) than other parts of the thermal system.

HOUSING VARIANTS

TS1 controls can be delivered in three main housing variants, top operated, front operated and flush mounted. All three variants are available either with or without off-switch, which cuts off power supply to the thermostat in off position

Top operated controls—Function/Housing Variant A,B,C,D,R,X,Y
Have adjustment spindles at the top and a display scale, indicating temperature setpoint and differential, at the front. A knob which may be permanently plugged onto one of the adjustment spindles comes with every control. Frost monitors and room thermostats are derivatives of top operated thermostats. They differ by their sensors and other features to suit their particular target applications.

Front operated controls—Function/Housing Variant E,F
Have an adjustment knob at the front for the temperature setpoint with an approximate scale imprinted on the knob. In order to adjust the temperature differential, the cover of the control must be removed.

Flush Mounted controls—Function/Housing Variant G,H
Designed in a way that they can be integrated into a panel or housing, for example into display cases.

OLD TO NEW CROSS REFERENCE (TF115 TO TS1)				REPLACES THE COMPETITION					
OLD MODEL	OLD PCN	NEW MODEL	NEW PCN	RANCO	PENN	WHITE-RODGERS	HONEYWELL	DANFOSS	SAGINOMIYA
TF115-S2-AA10	097457	TS1-X2A 21/30	097926	010-1408, 010-1409 010-1410, 010-104		1609-90	T4031A1008		
TF115-S4-AF10	097458	TS1-X4F 32/41	097929	060-100 F25-107	A19ABC-24 A19ZBC-2	1609-101, 1609-102 1609-103	T6031A1029		
TF115-S2-AE00	097467	TS1-X2E 36/40	097932	010-1418, 016-594 010-1072	A19BBC-2	201-20	T6054A		
TF115-S3-AE00	097468	TS1-X3E 64/68	097935	010-301, 016-165	A19BAB-3, A19BAC-1	201-8	T6054B		
TF115-S1-AA10	097466	TS1-X1A -4/0	097940	010-1433		1609-100			
TF115-H2-AA06	097680	TS1-B2A 21/30	097879	016-109				KP61 60L1103	
TF115-S0-AP20	097140	TS1-X0P 36/40	097882						
TF115-S0-DP20	097141	TS1-Y0P 36	097885						
TF115-S2-AA06	097423	TS1-X2P	097887	016-109				KP61 60L1100	BNS-C1030X
TF115-S4-AF06	097329	TS1-A4F 32/41	097888	016-109				KP71 60L1113, KP71 60L1115 KP73 60L1117, KP73 60L1118 KP73 60L1140, KP73 60L1143 KP75 60L1120, KP75 60L1137	TNS-C1010XC TNS-C1034XC

ORDERING INFORMATION FOR TS1 TEMPERATURE CONTROLS

TYPE	ALCO U.S. PCN*	ALCO EUROPE PCN*	ADJUSTMENT RANGE		FACTORY SETTING °F (°C)	TEMPERATURE SENSOR	
			UPPER SETPOINT °F (°C)	DIFFER. SETPOINT °F (°K)		CHARGE	TYPE
TOP OPERATED THERMOSTATS WITHOUT OFF-SWITCH (CAPILLARY TYPE SENSOR)							
TS1-A2P		4530400	-22 to 59 (-30...+15)	3 to 29 (2 to 16)	30/21 (-1/-6)	VAPOR	2 m. capillary
TS1-R2P ^①		4715170	-22 to 59 (-30...+15)	man. reset ca. 5 (2.5) fix	36 (+2)	VAPOR	2 m. capillary
TS1-A3P		4356700	14 to 95 (-10...+35)	3 to 29 (2 to 16)	37/28 (+3/-2)	VAPOR	6 FT. (2 m.) capillary
TS1-A1A		4351500	-49 to 14 (-45...-10)	3 to 29 (2 to 16)	0/-4 (-18/-20)	VAPOR	6 FT. (2 m.) cap. & bulb
TS1-X1A	097940		-49 to 14 (-45...-10)	3 to 29 (2 to 16)	0/-4 (-18/-20)	VAPOR	6 FT. (2 m.) capillary
TS1-A2A		4351600	-22 to 59 (-30...+15)	3 to 29 (2 to 16)	30/21 (-1/-6)	VAPOR	6 FT. (2 m.) cap. & bulb
TS1-X2A	097926		-22 to 59 (-30...+15)	3 to 29 (2 to 16)	30/21 (-1/-6)	VAPOR	6 FT. (2 m.) capillary
TS1-A3A		4352500	14 to 95 (-10...+35)	3 to 29 (2 to 16)	37/28 (+3/-2)	VAPOR	6 FT. (2 m.) cap. & bulb
TS1-A4F ^②	097888	4351800	-22 to 95 (-30...+35)	5 to 36 (3...20)	41/32 (+5/0)	ADSORPTION	6 FT. (2 m.) cap. & bulb
TS1-X4F	097929		-22 to 95 (-30...+35)	5 to 36 (3...20)	41/32 (+5/0)	ADSORPTION	6 FT. (2 m.) cap. & bulb
TS1-A5F		4458400	68 to 140 (+20...+60)	5 to 18 (3...10)	95/86 (+35/+30)	ADSORPTION	6 FT. (2 m.) cap. & bulb
TS1-A5C		4351900	77 to 167 (+25...+75)	4 to 27 (2...15)	149/140 (+65/+60)	LIQUID	6 FT. (2 m.) cap. & bulb
TS1-A6C		4352000	122 to 212 (+50...+100)	4 to 27 (2...15)	185/176 (+85/+80)	LIQUID	6 FT. (2 m.) cap. & bulb
TS1-A8C		4354900	194 to 284 (+90...+140)	5 to 36 (3...20)	212/203 (+100/+95)	LIQUID	6 FT. (2 m.) cap. & bulb
TS1-A9C		4355000	266 to 356 (+130...+180)	5 to 36 (3...20)	320/311 (+160/+155)	LIQUID	6 FT. (2 m.) cap. & bulb
TOP OPERATED THERMOSTATS WITH OFF-SWITCH (CAPILLARY TYPE SENSOR)							
TS1-B1A		4366700	-49 to 14 (-45...-10)	3 to 29 (2 to 16)	0/-4 (-18/-20)	VAPOR	6 FT. (2 m.) cap. & bulb
TS1-B2A	097880	4366800	-22 to 59 (-30...+15)	3 to 29 (2 to 16)	30/21 (-1/-6)	VAPOR	6 FT. (2 m.) cap. & bulb
TS1-B3A		4366900	14 to 95 (-10...+35)	3 to 29 (2 to 16)	37/28 (+3/-2)	VAPOR	6 FT. (2 m.) cap. & bulb
TS1-B4F		4367000	-22 to 95 (-30...+35)	2.8 ... 20	41/32 (+5/0)	ADSORPTION	6 FT. (2 m.) cap. & bulb
ROOM THERMOSTATS TOP OPERATED WITHOUT OFF-SWITCH (INCLUDES INSULATION CONSOLE AND COIL TYPE SENSOR)							
TS1-A1E		4362800	-49 to 14 (-45...-10)	3 to 29 (2 to 16)	0/-4 (-18/-20)	VAPOR	Coil
TS1-A2E		4355200	-22 to 59 (-30...+15)	3 to 29 (2 to 16)	39/35 (+4/+2)	VAPOR	Coil
TS1-X2E	097932		-22 to 59 (-30...+15)	3 to 29 (2 to 16)	39/35 (+4/+2)	VAPOR	Coil
TS1-A3E		4355300	14 to 95 (-10...+35)	3 to 29 (2 to 16)	68/64 (+20/+18)	VAPOR	Coil
TS1-X3E	097935		14 to 95 (-10...+35)	3 to 29 (2 to 16)	68/64 (+20/+18)	VAPOR	Coil
ROOM THERMOSTATS TOP OPERATED WITH OFF-SWITCH (INCLUDES INSULATION CONSOLE AND COIL TYPE SENSOR)							
TS1-B1E		4344300	-49 to 14 (-45...-10)	3 to 29 (2 to 16)	0/-4 (-18/-20)	VAPOR	Coil
TS1-B2E		4344400	-22 to 59 (-30...+15)	3 to 29 (2 to 16)	39/35 (+4/+2)	VAPOR	Coil
TS1-B3E		4344500	14 to 95 (-10...+35)	3 to 29 (2 to 16)	68/64 (+20/+18)	VAPOR	Coil
FREEZE-STAT, TOP OPERATED WITHOUT OFF-SWITCH (CAPILLARY TYPE SENSOR)							
TS1-C0P		4352100	40 to 68 (+4.5...+20)	5 (3) fix	40/36 (4.5/+2)	VAPOR	20 FT. (6 m.) capillary
TS1-D0P ^①		4352200	40 to 68 (+4.5...+20)	man. reset ca. 5 (3) fix	36 (+2)	VAPOR	20 FT. (6 m.) capillary
TS1-X0P	097882	4529100	40 to 68 (+4.5...+20)	5 (3) fix	40/36 (4.5/+2)	VAPOR	20 FT. (6 m.) capillary
TS1-Y0P	097885	4528800	40 to 68 (+4.5...+20)	man. reset ca. 5 (3) fix	36 (+2)	VAPOR	20 FT. (6 m.) capillary

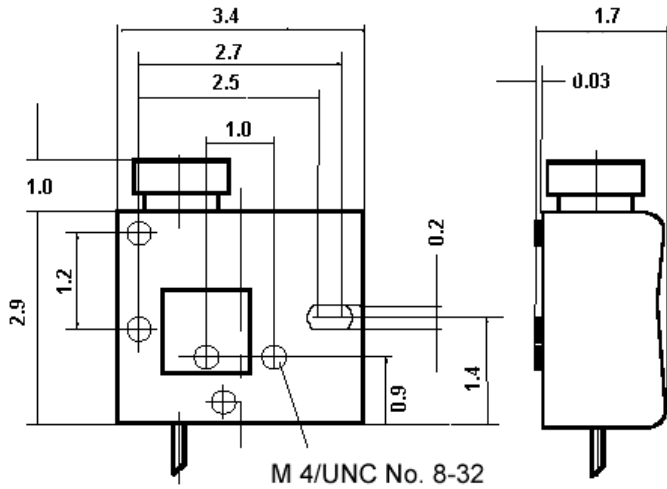
① LOW TEMPERATURE CUT OUT

② DEFROST & UNIVERSAL THERMOSTAT

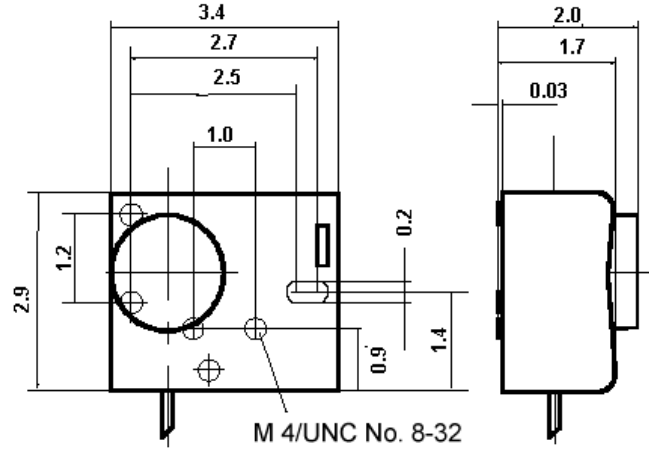
Standard Product Offering

* Product Code Number

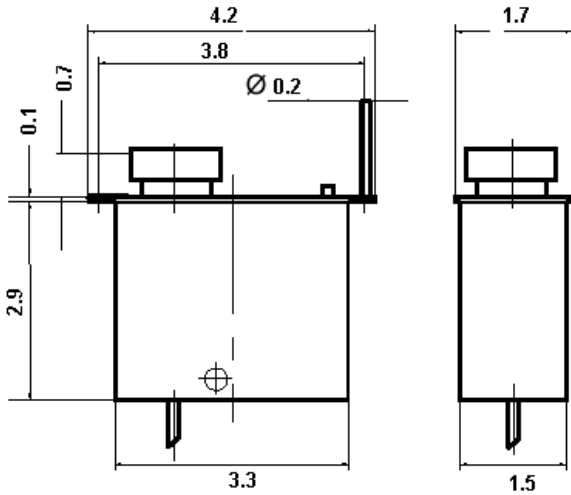
TS1 DIMENSIONAL DIAGRAMS



TS1-A/B/C/D/R/X/Y

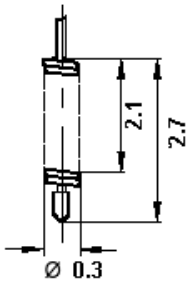


TS1-E/F

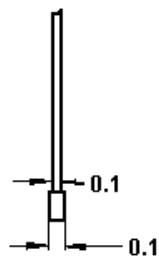


TS1-G/H

DIMENSIONS SHOWN ARE IN INCHES

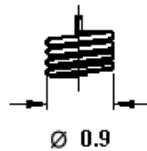


Sensor type A
Vapour charge
2m (6.56 ft)



Sensor type P*
Vapour charge

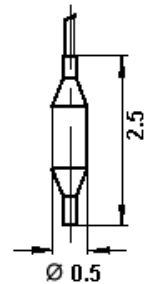
* 2 m. (6.56 ft) length
with housing variant
A/B/E/F/G/H/R
6 m. (19.68 ft) length
with housing variant
C/D/X/Y



Sensor type E
Vapour charge,



Sensor type F
Adsorption charge
2m (6.56 ft)



Sensor type C
Liquid charge
2m (6.56 ft)