



A respected national supplier of radiator valves and regulating

*sensors for the heating and cooling industry since 1975, **Macon Controls** - a division of the Tunstall Corporation - maintains a solid reputation for energy-efficient products, trouble-free service, and virtually non-existent failure rates. Distinguished by superior quality and performance, all Macon valves and controls conform to ASHRAE Standard 102P-1983 and European Standard EN 215/1215 and carry a 12-month warranty.*

Macon Controls are ideal for hydronic and low-pressure steam heating applications – and they deliver up to 30 percent energy savings. A complete line of valve sizes and non-electric control models is available, allowing for temperature regulation of radiators, convectors, fin-tube baseboard, fan coils or wherever individual control is required.

As a pioneer and developer of “smart solutions”, Macon also offers high quality, innovative accessories, including Umbrella adaptors TM to upgrade existing thermostatic controls to Macon operators and E-Z Fit TM Conversion kits which transform manual radiator valves to temperature sensitive self-acting valves.

NT SERIES VALVES

NON-ELECTRIC OPERATORS

ELECTRIC OPERATORS

ONE-PIPE STEAM

NT SERIES VALVE ACCESSORIES

E-Z FITTM CONVERSION INSERTS

UMBRELLA ADAPTORS

Tunstall Corporation

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www.maconcontrols.com

Vertical Angle Valve	Straight Valve	Horizontal Valve	Sweat Valve
			
Thermostatic Diverter or Mixing Valve	MTW	MTWZ	ENTL B46000
			
ENTLZ B56000	VM Series	ZMC - ES & DDC Series	MVA 2-10V
			
OPSK	NT Series Valve Inserts	E-Z Fit™ Conversion Kits	Umbrella Adaptors
			



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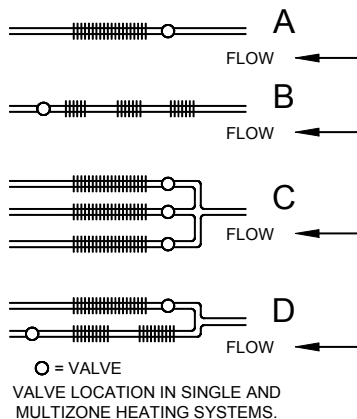
Instruction Sheet - Non-Electric Operators

Operation

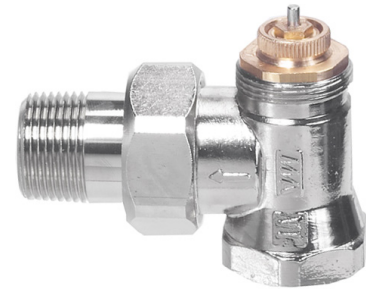
The *Macon* valve is designed to save energy by controlling hot water or low pressure steam heat in freestanding radiators, convectors, baseboards, fan coil units and the like in a loop, a zone or a unit. The valve, coupled with a *Macon* operator, provides a reliable automatic modulating unit. As room temperature drops, the *Macon* valve opens to allow more hot water or steam to flow through the radiator, thus allowing more heat into the room. When the room approaches the selected temperature, the operator causes the valve to begin closing off the flow of hot water or steam. This continued monitoring of the temperature is fully automatic, using no electricity whatsoever. The *Macon* valve can be equipped with any wide variety of *Macon* operators.

Features

- Compact dimensions
- Replaceable insert
- Stainless steel spindle
- Individual room control
- Easy one-trade installation
- Fuel savings up to 30%
- Prevents over- and under-heating
- Helps balance the heating system
- Same valve used for hot water or low pressure steam
- All NPT are forged brass nickel-plated
- Minimizes or eliminates expansion noises
- Suitable for nearly any hydronic heating application
- Operators can be changed without draining the system
- Shipped with a protective cap that can be used to control heating during the installing period



Vertical angle valve with straight nipple. NPT - female inlet, male union outlet.



- N10637 - 1/2"
- N10657 - 3/4"
- N10677 - 1"
- N10697 - 1-1/4"

Straight valve with straight nipple. NPT - female inlet, male union outlet.



- N10737 - 1/2"
- N10757 - 3/4"
- N10777 - 1"
- N10797 - 1-1/4"

Horizontal angle valve with straight nipple. NPT - female inlet, male union outlet.



- N10837 - 1/2"
- N10857 - 3/4"
- N10877 - 1"
- N10897 - 1-1/4"

Sweat valve with female inlet and outlet.



- N10930 - 1/2"
- N10950 - 3/4"
- N10970 - 1"

Fail closed valves also available, consult factory. All *Macon* valves and thermostats conform to ASHRAE Standard 102P-1983 and European Standard EN 215/1215. We are also ISO 9001 certified (1994) and ISO 14001 certified (1998).



DATA - Macon Valves for NT Series

Vertical Angle NPT

1/2", 3/4", 1", 1-1/4"

Straight NPT

1/2", 3/4", 1", 1-1/4"

Horizontal Angle NPT

1/2", 3/4", 1", 1-1/4"

Straight Female Sweat

1/2", 3/4", 1"

Disc Material: EPDM

Body Styles: Straightway or angle

Maximum steam pressure: 15 psig

Maximum static pressure: 145 PSI

Maximum water temperature: 250°F

Body tappings: Female inlet, male union outlet, Female sweat

Body Material: Forged brass, NPT valves are nickel-plated

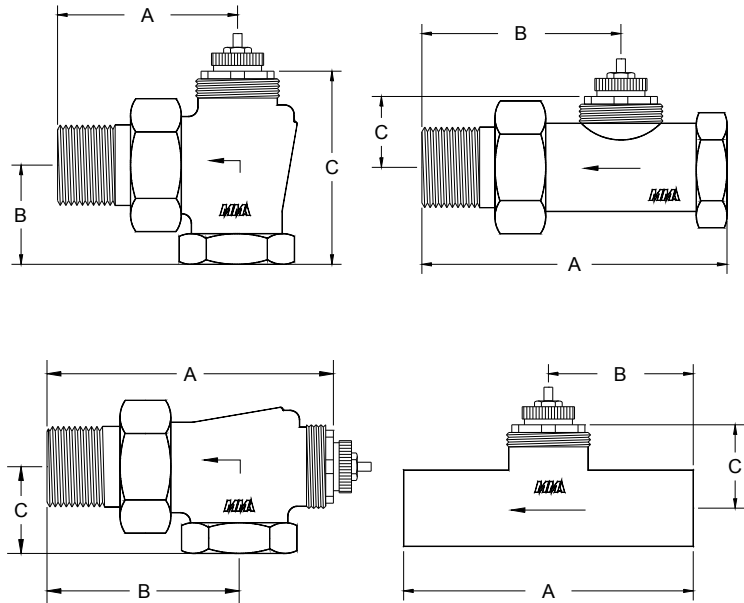
Max. Differential pressure: 20 psi H₂O, refer to thermostat specs

Suggested Differential Pressure = 0.5 to 2.9 psi

Overall Height: Add thermostat dimensions less 1/4"

Macon NT Series Valves are in an open position when no operator is attached.

CV:	1/2"	= 1.8
	3/4"	= 2.5
	1"	= 2.74
	1-1/4"	= 3.5



DIMENSIONS

VERTICAL ANGLE

BODY #	SIZE	A	B	C
N10637	1/2"	2-1/4"	1"	1-3/4"
N10657	3/4"	2-1/2"	1-1/8"	2-1/8"
N10677	1"	3"	1-3/8"	2-1/4"
N10697	1-1/4"	3-1/4"	1-3/4"	2-3/4"

STRAIGHTWAY

BODY #	SIZE	A	B	C
N10737	1/2"	3-1/2"	2-1/16"	1"
N10757	3/4"	4"	2-1/2"	1"
N10777	1"	4-5/8"	2-15/16"	1"
N10797	1-1/4"	5-1/4"	3-3/8"	1-1/8"

HORIZONTAL ANGLE

BODY #	SIZE	A	B	C
N10837	1/2"	3-3/8"	2-3/16"	1-1/2"
N10857	3/4"	3-3/4"	2-1/2"	1-1/4"
N10877	1"	4-3/16"	3"	1-3/8"
N10897	1-1/4"	4-3/4"	3-1/4"	1-7/8"

SWEAT VALVES

BODY #	SIZE	A	B	C
N10930	1/2"	2-3/16"	1-3/32"	1"
N10950	3/4"	2-11/16"	1-11/32"	7/8"
N10970	1"	3-5/32"	1-9/16"	1"



**STEAM
BTU/hour**

P.D.* with 10 PSI Inlet	3.5 C _v 1-1/4" Valves	2.74 C _v 1" Valves	2.5 C _v 3/4" Valves	1.8 C _v 1/2" Valves
1 psi	48,000	39,000	36,000	28,000
3 psi	87,000	70,000	65,000	46,000
5 psi	113,000	91,000	84,000	63,000
7 psi	130,000	104,000	96,000	72,000
10 psi	162,000	130,000	120,000	90,000

*P.D. = Pressure Drop

Capacity measured with 10 psi inlet pressure.

EDR = Equivalent Direct Radiation (in ft.²)

$$\text{EDR} = \frac{\text{BTU/hr}}{240} \quad \text{BTU/hr} = 240 \times \text{EDR}$$

$$\text{BTU/hour} = \text{lbs. steam/hour} \times 1000$$

**HOT WATER
BTU/hour****

** Pressure Drop Ft.	P.D. PSI	3.5 C _v 1-1/4" Valves	2.74 C _v 1" Valves	2.5 C _v 3/4" Valves	1.8 C _v 1/2" Valves
1	.43	21,000	17,000	16,500	12,000
2	.87	28,000	23,000	22,000	15,500
4	1.7	44,000	35,000	32,500	23,500
6	2.6	53,000	43,000	40,000	29,000
8	3.5	64,000	51,000	47,000	33,500
10	4.3	70,000	56,000	52,000	37,500
12	5.2	77,000	62,000	57,000	41,000
14	6.1	83,000	67,000	62,000	44,500
16	7.0	88,000	71,000	66,000	47,500

** Assumes 20°F drop in water temperature through radiation.

$$\text{GPM} = C_v \sqrt{P.D.} \quad 1 \text{ psi} = 2.31 \text{ Ft. H}_2\text{O}$$

$$\text{BTU/hour} = \text{GPM} \times 10,000 \text{ 1Ft. H}_2\text{O} = .433 \text{ psi}$$

EDR (Equivalent Direct Radiation in ft.²) for Hot Water

Water Temperature	Cast Iron Radiator	Convactor
200°F	209	205
190°F	187	183










$$\text{BTU/hour} = \text{EDR in ft.}^2 \times (\text{Appropriate number from above EDR Table})$$

For example: 205 for 200°F water in convactor



COMPARISON CHART

Description	MACON	Ammark		Bell & Gossett (ITT)	Honeywell Braukmann	Honeywell Sparco/ Braukammn	Danfoss RA 2000	Taco
		Old (SYR)	New					
½" Vertical Angle	N10637	70	60	TM12-50	V110E1004	V100E1055/5030	013G8014	5323
½" Horizontal Angle	N10837	77	67	TM42-50	V110F1002	V100F1054	013G8013	5322
½" Straight	N10737	71	61	TM21-50	V110D1000	V100D1056/5057	013G8015	5321
½" Sweat	N10930	-	-	-	-	V100G5054	013G8042	-
¾" Vertical Angle	N10657	70	60	TM12-75	V110E1012	V100E1063	013G8019	5333
¾" Horizontal Angle	N10837	77	67	TM42-75	V110F1010	V100F1062	013G8018	5332
¾" Straight	N10737	71	61	TM21-75	V110D1008	V100D1008	013G8020	5331
¾" Sweat	N10930	-	-	-	-	V100G5062	013G8044	-
1" Vertical Angle	N10637	70	60	TM12-100	V110E1020	V100E1071	013G8024	-
1" Horizontal Angle	N10837	77	67	TM42-100	V110F1018	V100F1070	013G8023	-
1" Straight	N10737	71	61	TM21-100	V110D1016	V100D1072	013G8025	-
1" Sweat	N10930	-	-	-	-	-	-	-
1¼" Vertical Angle	N10637	70	60	-	V110E1028	-	013G8031	-
1¼" Horizontal Angle	N10837	77	67	-	V110F1026	-	013G8030	-
1¼" Straight	N10737	71	61	-	V110D1024	-	013G8032	-
Direct Mount T-Stat	ENT B26000	72	62	TM5	T104A1018/1040	T100A1028/1018	013G8200	5201
Direct Mount T-Stat	MTW-28	72	62	TM5	T104A1018/1040	T100A1028/1018	013G8250	5201-3
Remote Sensor T-Stat	MTWZ	73	63	TM6	T104F1021/1512	T100F1395/1021	013G8252	5203
Remote Dial T-Stat	ENTL B46000	76	66	TM9	T104B1019/1038	T100B1035/1387	013G8562	5206
Remote Sensor & Dial	ENTLZ B56000	74	-	-	T104C1015/1036	T100C1026/1015	013G8564	5211
One Pipe Steam Valve	OPSK	-	-	TM1PS	Y108P	Y100P	013G0140	5213

	 MTW	 MTWZ	 ENTL B46000	 ENTLZ B56000	 VM-24 Volt
 Vertical Angle	Not recommended (may shut off prematurely due to poor air circulation)	Yes	Yes	Yes	Yes
 Straight	Yes, if thermostat is mounted inverted or horizontal	Yes	Yes	Yes	Yes
 Horizontal Angle	Yes	Yes	Yes	Yes	Yes
 Sweat	Yes, if thermostat is mounted inverted or horizontal	Yes	Yes	Yes	Yes



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We reserve the right to alter designs, specifications and information without notice.

Bulletin-NTCT-0714
Valves

Operation

The EDV is a twin seat valve with an intermediate cone of EPDM rubber that closes flow to both gates at the end position and directs flow as required. This valve can be used with any of the Macon electric or nonelectric thermostats.

Areas of Use

Three way valves are designed for mixing or diverting flows in various water based heat or cooling transmission systems, such as radiator loops, floor heating, heat exchangers, solar heat collectors, water heaters, etc.

Features

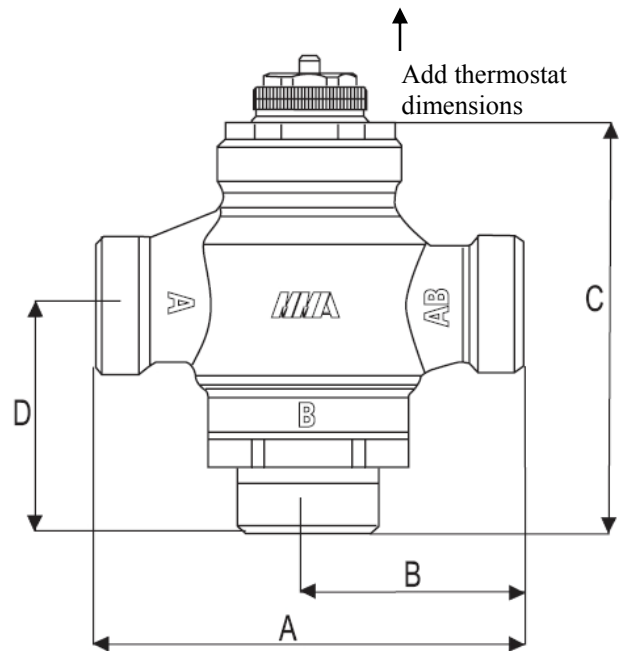
- Forged brass construction
- Compact dimensions
- Replaceable insert
- Stainless steel spindle
- Easy one-trade installation
- Electric or non-electric - fully automatic
- Provides constant temperature
- Actuators can be changed without draining of the system
- Shipped with a protective cap that can be used to control the unit during installation period
- Four temperature ranges available (ask for details):

EDV Model	Temp Range	Operator*
T-1	56° - 83°F	MTWZ-T1
T-2	68° - 108°F	MTWZ-T2
T-3	95° - 131°F	MTWZ-T3
T-4	122° - 158°F	MTWZ-T4

DIMENSIONS		
	EDV-15	EDV-20
A	2-1/5"	2-1/5"
B	1"	1"
C	2-3/5"	2-3/5"
D	1-1/2"	1-1/2"



EDV-15 1/2"
EDV-20 3/4"



Sweat Couplings	
1/2"	1-1/4" O.A. Length
3/4"	1-1/2" O.A. Length

*MTWZ Thermostatic Operator sold separately



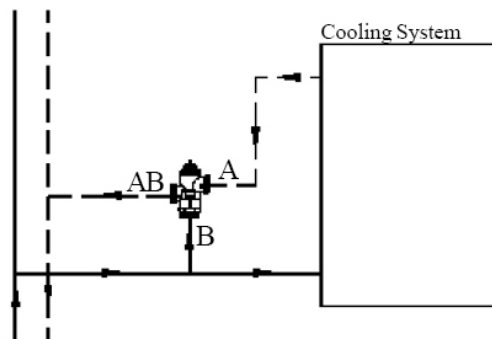
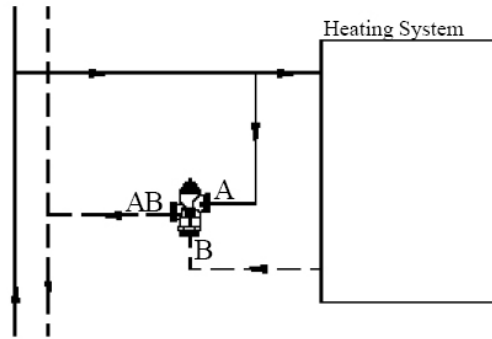
Data - Macon Thermostatic Diverter/Mixing Valve

Maximum static pressure: 145 psig
 Maximum water temperature: 250°F
 Cv-value
 1/2 = 2.0
 3/4 = 3.2

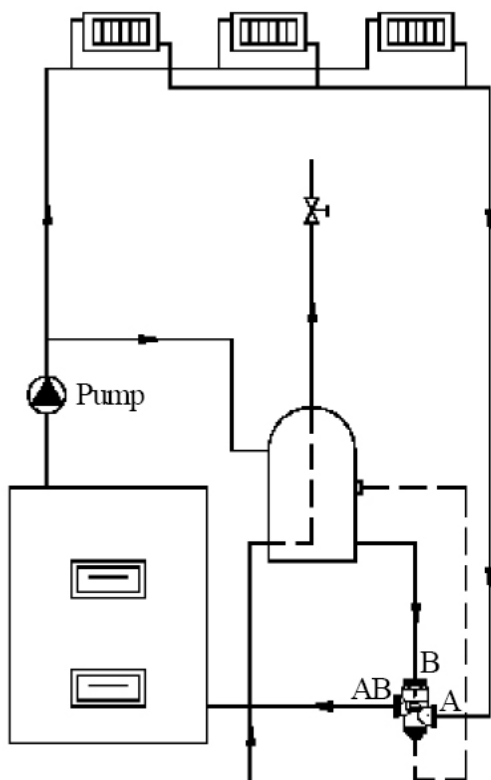
P-band at
 temperature range T-1: 56°-83°F
 temperature range T-2: 68°-108°F
 temperature range T-3: 95°-131°F
 temperature range T-4: 122°-158°F

Body sizes: 1/2" and 3/4"
 Body material: Forged brass
 Disc material: EPDM
 Body tappings: Female sweat inlets and outlet
NOTE: See chosen thermostat for control data

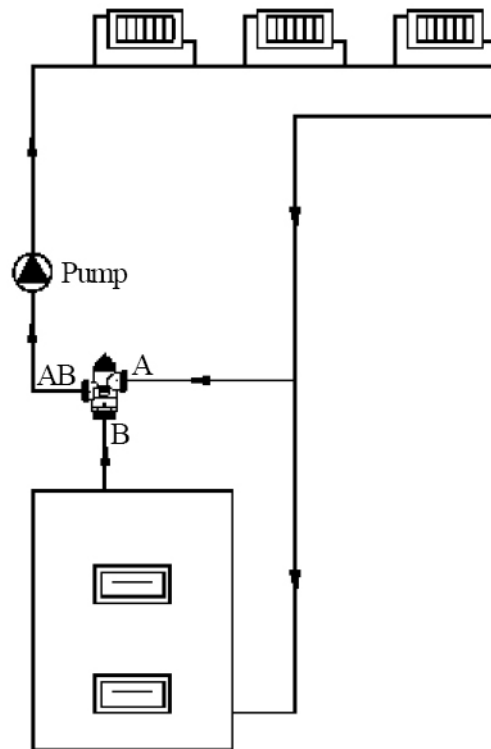
INSTALLATION EXAMPLES

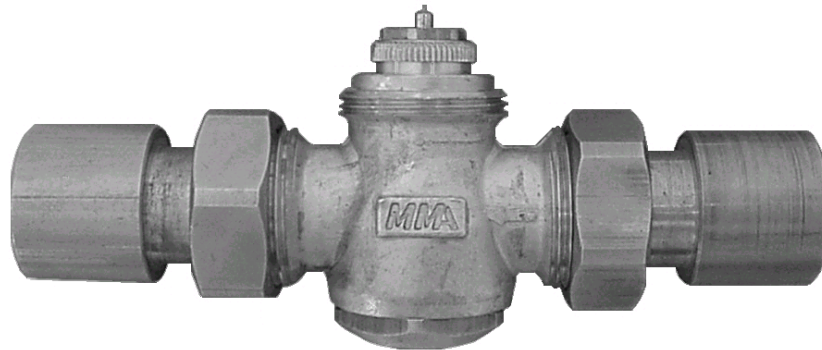


Example of DHW-cyl. control



Example of radiator circuit control





Areas of use

The EKV valves are designed for use in refrigeration plants, induction or fan coil units where the flow of cold water through the heat exchangers can be regulated to obtain constant differentiated temperatures in different parts of the building.

Function

The sensor medium of a thermostat component expands with rising temperature. The expansion is transmitted to the valve spindle and conus, opening the valve to permit flow of coolant. A return spring in the valve body closes the valve when the pressure on the spindle is relieved. The valve will be balanced so that the plug comes to rest in a given position, passing a given flow of coolant. Any change in the temperature at the sensor bulb causes a change in the position of the plug and thus increases or reduces the flow. The desired temperature is set by adjusting the regulation knob on the thermostat.

Features

- Compact dimensions
- Forged brass valve
- Actuators can be changed without draining the system
- Stainless steel spindle
- Shipped with protective cap that may be used for controlling cooling during construction period
- Easy, one-trade installation
- Replaceable insert
- Prevents over- and under-cooling
- Accessories available for proper mounting of sensor in circulating air for good sensing function
- 24 Volt electric or non-electric t'stats available
- Provides constant temperature

Technical Data		
	EKV15 - 1/2"	EKV20 - 3/4"
Max. Static Pressure	145 PSI	145 PSI
Cv - Value	1.8	2.75
Fittings	1/2 Union Sweat	3/4 Union Sweat
O.A. Length w/Fittings	4-1/2"	5"
Weight	6 oz	8 oz
Height Less Operator	2-1/8"	2-1/8"





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The DR 15 pressure differential pressure valve has a proportional control characteristic, opening with rising differential pressure. It is suitable for installation in circulated pumped radiator circuits equipped with radiator thermostatic valves. Used with hot water systems.

OPERATION

Design: flow regulation with cap for concealed setting. At a given setting (number of turns “n”) of the valve spindle and a given differential pressure, a given amount of water flows through the valve. If the differential pressure rises, e.g. when one or more radiators are shut off, the through-flow rate increases, relieving the pump pressure on the remaining valves.

Two pressure ranges available: 0-2.9 PSI and 0-8.7 PSI.

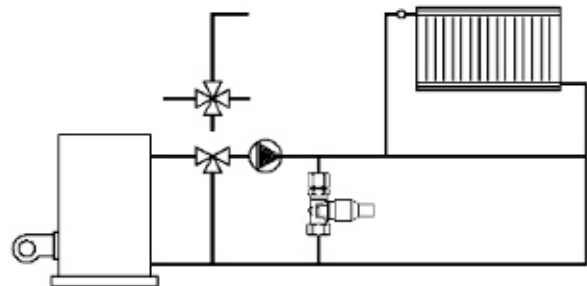
ADVANTAGES

- Regulates pressure changes in single and double pipe systems due to thermostatic radiator valve settings.
- Eliminates rushing noise and chattering in radiator thermostatic valves.
- Easy to fit.

DATA

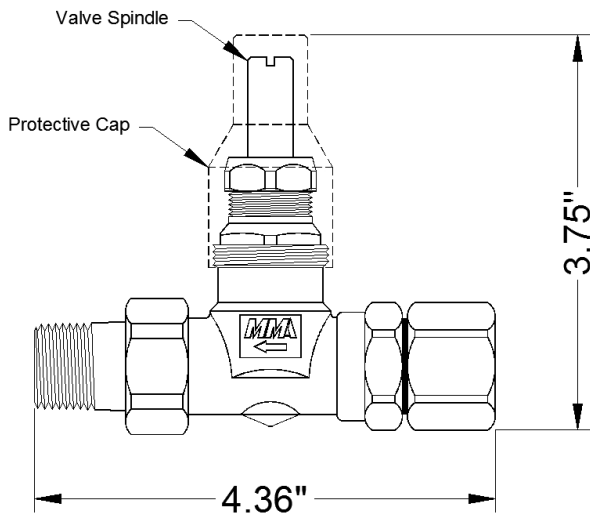
Material: Hot forged brass
Design: Straight connection, 1/2 NPT
Max. Temperature: 250°F
Max. Static Pressure: 145 psi

Application example



DR 15 valve installed in central heating system with 3- or 4-way shunt valve.



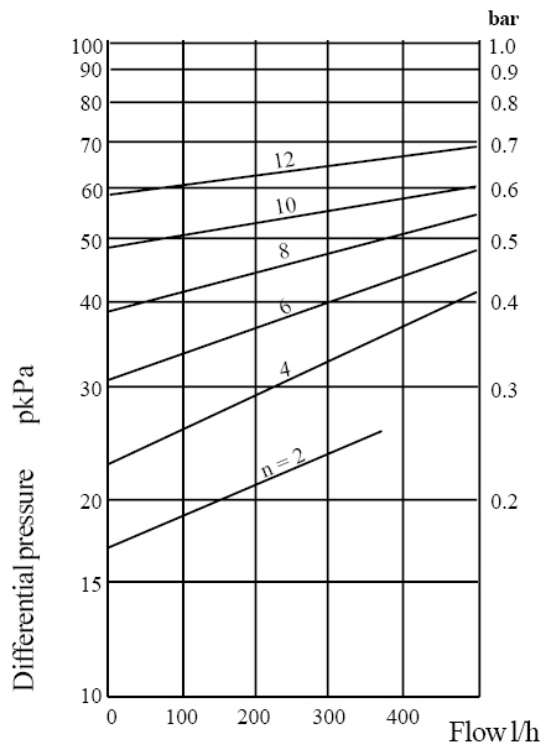


Setting the differential pressure

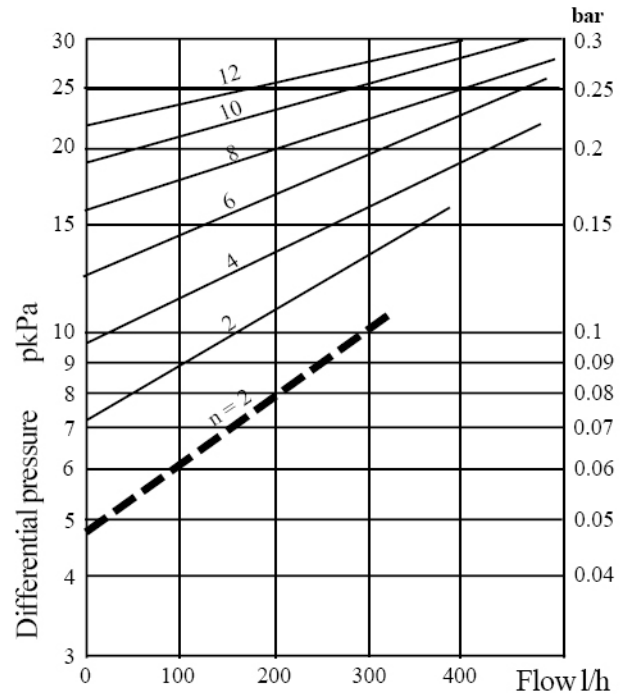
Turn the valve spindle (see fig.) until it is wide open. Locate the maximum differential pressure of the pump on the vertical axis of the graph and draw a horizontal line to intersect the “n” line corresponding to the required flow rate according to the horizontal axis.

Then turn the valve spindle clockwise the number of turns indicated by the selected “n” line.

The DR 15 pressure relief valve is delivered with a spring for a differential pressure range of 0-2.9 PSI in place. To alter the range to 0-8.7 PSI, exchange the spring in the valve for the separate one delivered with it.



Spring for 0.1-0.6 bar (10-60KPA) pressure range.



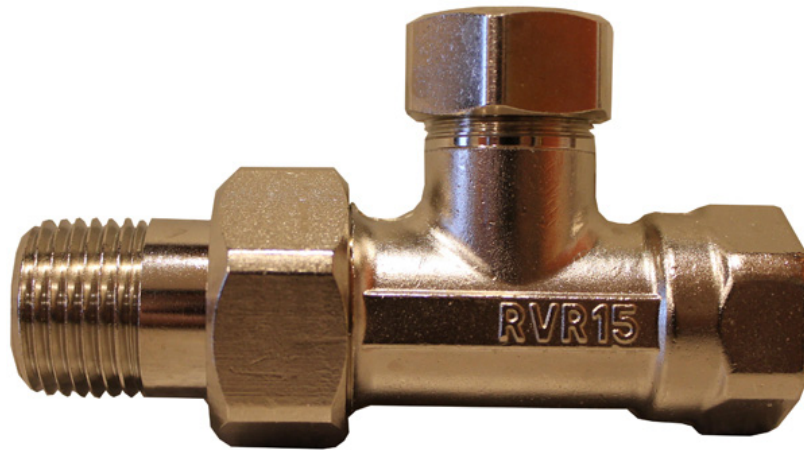
Spring for 0-0.2 bar (0-20KPA) pressure range.
KiloPASCALS - kPa x 0.1450 = pounds force per sq. inch.
BARS - bar x 14.504 = pounds force per sq. inch.

Reference numbers for ordering

Art. No.	Code	Conn. No.	Thread
4141501	DR 15	15	1/2" NPT

Compression fittings must be ordered separately.



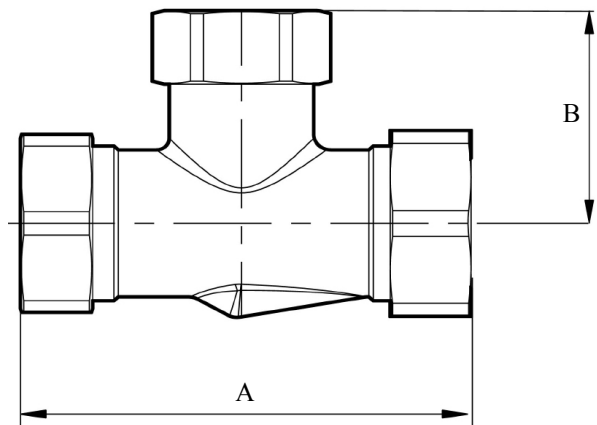


Areas of use

The RVR valves are used as a shut-off or isolation valve on radiators.

Specification Data

Disc Material: EPDM
 Body Style: Straight
 Maximum Steam Pressure: 15 psig
 Maximum Static Pressure: 145 PSI
 Maximum Water Temperature: 250 F
 Body Tappings: Female inlet, male union outlet
 Body Material: Forged brass, nickel plated



TECHNICAL DATA

Model	Cv - Value	A	B	Weight
RVR- 1/2 "	1.5	3.34"	1.30"	0.42 lb
RVR- 3/4 "	2.3	3.94"	1.69"	0.79 lb





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See reverse for
min/max field adjustment

The Macon MTW thermostatic operator will help you balance your heating system. The MTW operator has one of the most accurate sensors for individual radiator temperature control. The problem of over-heating, under-heating and wide temperature swings can now be controlled.

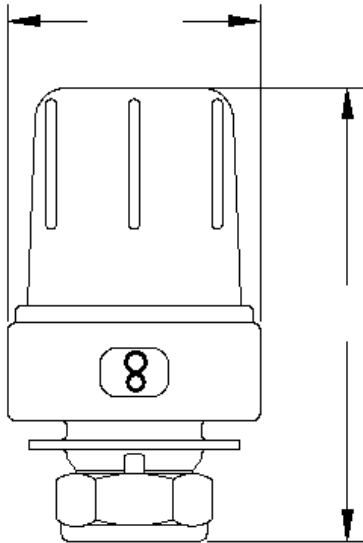
The MTW thermostatic operator by Macon Controls conserves energy by regulating temperature. Fuel costs can be reduced up to 30%!

The MTW is a self-acting adjustable non-electric thermostatic operator. It has anti-freeze position, adjustable max./min. temperature, selected temperature locking feature and can be shutoff completely if required. Each MTW thermostatic operator is individually calibrated and conforms to ASHRAE standardization rules for temperature regulation. The MTW's smooth shape and narrow air gaps gives a nice operation and makes it easy to keep clean. Can be mounted on all Macon NT series valves. Millions are in use throughout the world.



MTW shown with
Macon NT series valve





Maximum & Minimum Setting

Maximum setting

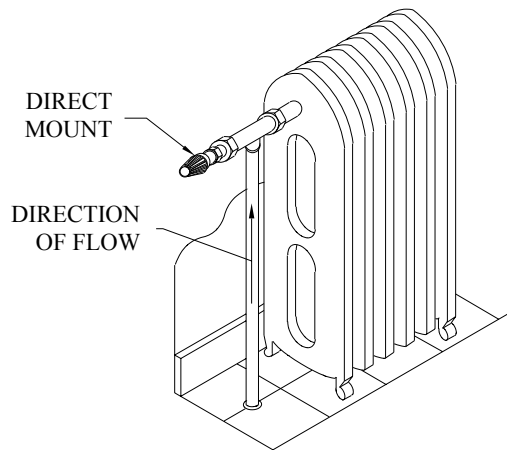
1. Turn the wheel to maximum and a red mark will occur in the indicating window (located opposite the dial setting window).
2. Push the mark in while turning the wheel to desired temperature according to below chart.
3. When reached desired temperature let go of the mark and the maximum temperature limit is set.

Minimum setting

1. Turn the wheel to minimum and a blue mark will occur in the indicating window (located opposite the dial setting window).
2. Push the mark in while turning the wheel to desired temperature according to below chart.
3. When reached desired temperature let go of the mark and the minimum temperature limit is set.

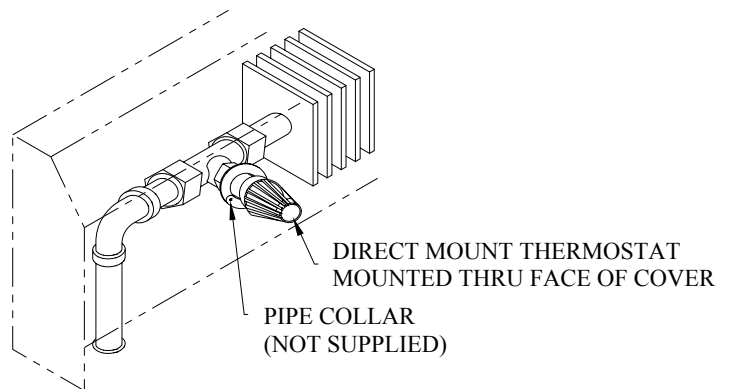
DATA

Temp. Range: 46° - 82°F
 Hysteresis: 0.9°F
 Heat Transfer: 1.1°F (Valve Housing Sensor)
 Dead Time: 0.8 Minutes
 Max. Differential Pressure: 20 psi
 Suggested Differential Pressure = 0.5 to 2.9 psi
 Max. Water Temp.: 250°F
 Max. Storage & Ambient Temp.: 122°F
 Max. Steam Pressure: 15 psig
 Max. Movement: 0.125
 Nominal Opening: 0.018 (3.6°F)
 Long Term Test: 5000 cycles (1.3°F)



DIAL SETTINGS:

- 0 = Off
- * = 46°F (Frost Protection)
- 1 = 54°F
- 3 = 61°F
- 5 = 68°F
- 6 = 72°F
- 7 = 76°F
- 8 = 80°F
- 9 = 82°F





See reverse for
min/max field adjustment

(MTWZ shown with
Macon NT series valve)

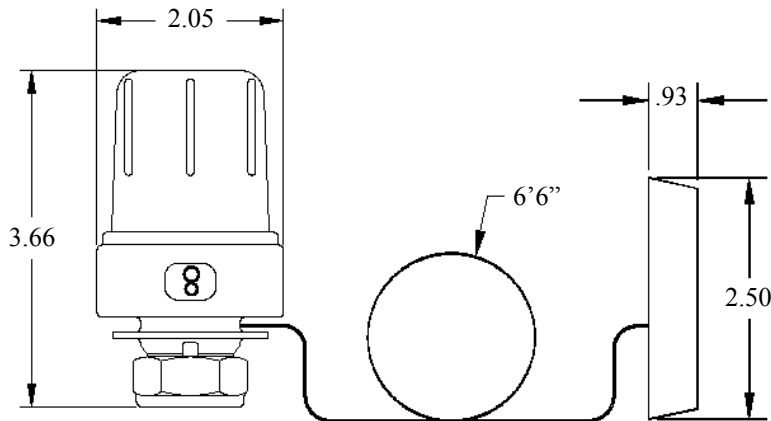
Operation

The sensor on the MTWZ is wax-filled and the wax volume varies according to ambient temperature. The volume changes are transmitted to the valve stem via a liquid capillary system. The valve body has a return spring which closes the valve when the stem is under low pressure. When the force from the sensor and the return spring are balanced to the room temperature selected, the valve disc stops in that position to allow a certain amount of water or steam to flow through the valve. Ambient temperature changes cause the valve disc to change position and thereby continuously modulate the flow so that the room temperature is maintained at the desired temperature. The unit is secured against damage from over-pressure by a built-in pressure absorbing spring.

Features and Benefits

- Valve-mounted setting knob and remote temperature sensor
- Brass sensor, High sensitivity
- Fiberglass valve plug shaft
- Stainless steel capillary tube, 6'6" standard length
- Longer capillary available, consult factory
- Fits all Macon NT series valves
- Replaces the valve-mounted sensors on built-in convectors, etc., and where the valve-mounted sensor is exposed to draft from doors and windows
- Fully automatic - nonelectric, no wiring
- Manufactured to exacting standards using exceptionally high quality materials
- Each sensor is tested and re-checked to achieve exact settings before leaving the factory
- Note that changing the actuator can be accomplished without draining the system
- All Macon thermostats can be locked at or limited to a specific temperature or temperature range
- Simple one-trade installation
- Sensor guard furnished at no extra cost
- All Macon valves and thermostats conform to ASHRAE Standard 102P-1983 and European Standard EN 215/1215. We are also ISO 9001 certified (2002) and ISO 14001 certified (2002).





DATA

- Temp. Range: 46° - 82°F
- Hysteresis: 0.9°F
- Heat Transfer: 1.1°F (Valve Housing Sensor)
- Dead Time: 0.8 Minutes
- Max. Differential Pressure: 20 psi
- Suggested Differential Pressure = 0.5 to 2.9 psi
- Max. Water Temp.: 250°F
- Max. Storage & Ambient Temp.: 122°F
- Max. Steam Pressure: 15 psig
- Max. Movement: 0.125
- Long Term Test: 5000 cycles (1.3°F)

DIAL SETTINGS:

- * = 46°F (Frost Protection)
- 1 = 54°F
- 3 = 61°F
- 5 = 68°F
- 6 = 72°F
- 7 = 76°F
- 8 = 80°F
- 9 = 82°F

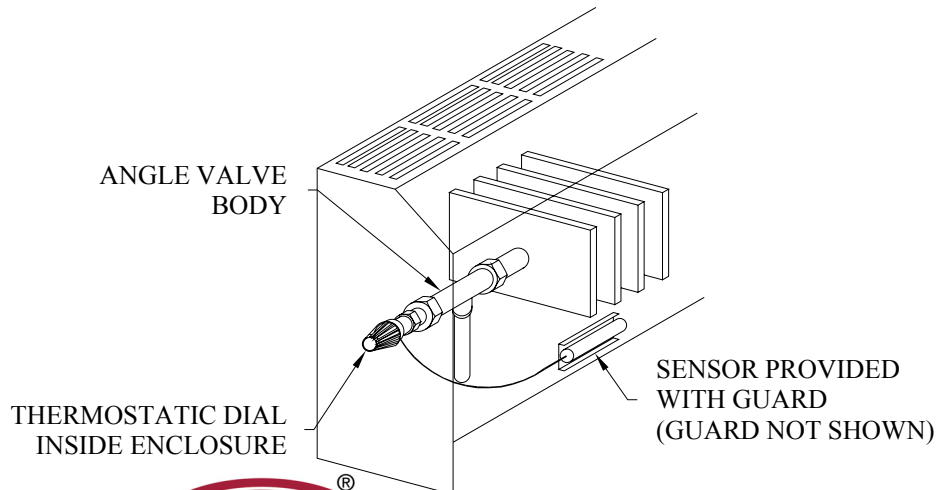
Each unit is factory pre-set per dial settings listed.
If field adjustments are necessary, see below.

Maximum setting

1. Turn the wheel to maximum and a red mark will occur in the indicating window (located opposite the dial setting window).
2. Push the mark in while turning the wheel to desired temperature according to below chart.
3. When reached desired temperature let go of the mark and the maximum temperature limit is set.

Minimum setting

1. Turn the wheel to minimum and a blue mark will occur in the indicating window (located opposite the dial setting window).
2. Push the mark in while turning the wheel to desired temperature according to below chart.
3. When reached desired temperature let go of the mark and the minimum temperature limit is set.





See reverse for
min/max field adjustment

(MTWZ shown with
Macon NT series valve)

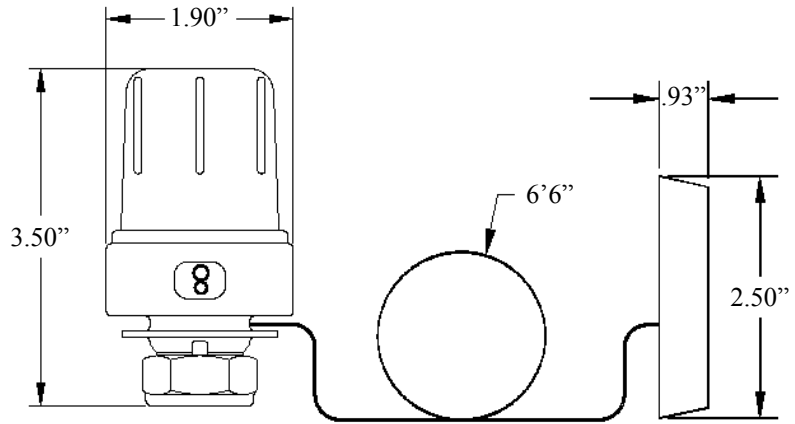
Operation

The sensor is wax-filled and the wax volume varies according to ambient temperature. The volume changes are transmitted to the valve stem via a liquid capillary system. The valve body has a return spring which closes the valve when the stem is under low pressure. When the force from the sensor and the return spring are balanced to the room temperature selected, the valve disc stops in that position to allow a certain amount of water or steam to flow through the valve. Temperature changes cause the valve disc to change position and thereby continuously modulate the flow so that the room temperature is maintained at the desired temperature. The unit is secured against damage from over pressure by a pressure absorbing spring.

Features

- Valve-mounted setting knob and remote temperature sensor
- Brass sensor, High sensitivity
- Fiberglass valve plug shaft
- Stainless steel capillary tube, 6'6" standard length
- Longer capillary available, consult factory
- Fits all Macon NT series valves
- Replaces the valve-mounted sensors on built-in convectors, etc., and where the valve-mounted sensor is exposed to draft from doors and windows
- Fully automatic - nonelectric, no wiring
- Manufactured to exacting standards using exceptionally high quality materials
- Each sensor is tested and re-checked to achieve exact settings before leaving the factory
- Note that changing of the actuator can be accomplished without draining of the system
- All Macon thermostats can be locked at or limited to a specific temperature or temperature range
- Simple one-trade installation
- Sensor guard furnished at no extra cost
- All Macon valves and thermostats conform to ASHRAE Standard 102P-1983 and European Standard EN 215/1215. We are also ISO 9001 certified (1994) and ISO 14001 certified (1998).



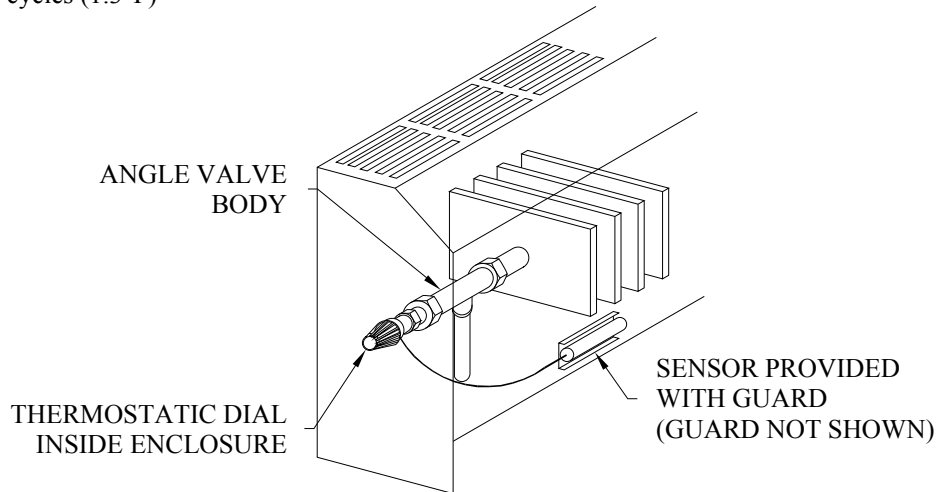


DATA

Temp. Range:

- T-1: 56° - 83°F
- T-2: 68° - 108°F
- T-3: 95° - 131°F
- T-4: 122° - 158°F

- Hysteresis: 0.9°F
- Heat Transfer: 1.1°F (Valve Housing Sensor)
- Dead Time: 0.8 Minutes
- Max. Differential Pressure: 20 psi
- Suggested Differential Pressure: 0.5 to 2.9 psi
- Max. Water Temp.: 250°F
- Max. Storage & Ambient Temp.: 122°F
- Max. Steam Pressure: 15 psig
- Max. Movement: 0.125
- Long Term Test: 5000 cycles (1.3°F)





ENTL shown with
Macon NT series valve

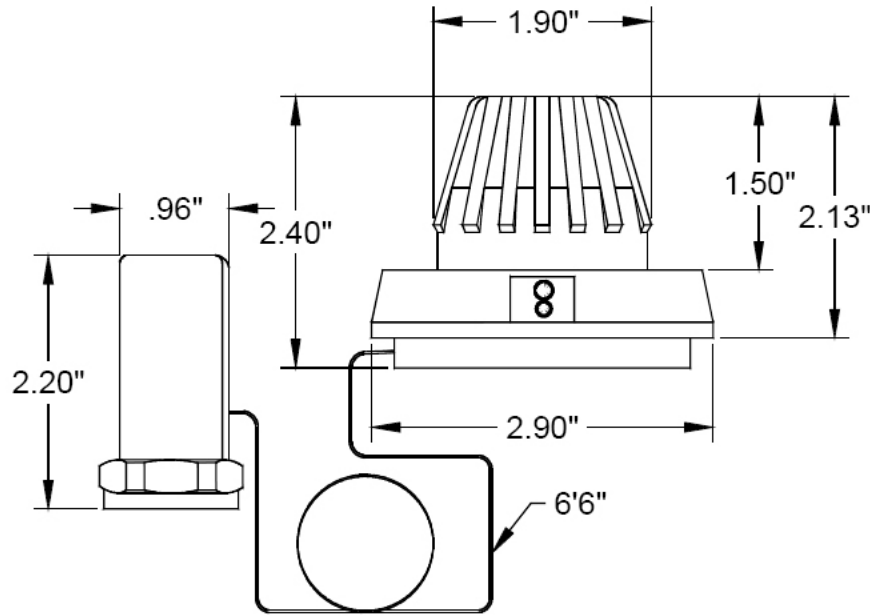
Operation

The sensor is wax-filled and the wax volume varies according to ambient temperature. The volume changes are transmitted to the valve stem via a liquid capillary system. The valve body has a return spring which closes the valve when the stem is under low pressure. When the force from the sensor and the return spring are balanced to the room temperature selected, the valve disc stops in that position to allow a certain amount of water or steam to flow through the valve. Temperature changes cause the valve disc to change position and thereby continuously modulate the flow so that the room temperature is maintained at the desired temperature. The unit is secured against damage from over pressure by a pressure absorbing spring.

Features

- Combined remote dial/sensor
- Brass sensor, High sensitivity
- Fiberglass valve plug shaft
- Stainless steel capillary tube, 6'6" std. length
- Longer capillary available, consult factory
- Fits all Macon NT series valves
- Replaces the valve-mounted sensors on built-in convectors, etc., and where the valve-mounted sensor is exposed to draft from windows or doors
- Fully automatic - nonelectric, no wiring
- Small dimensions
- Manufactured to exacting standards using exceptionally high quality materials
- Each sensor is tested and re-checked to achieve exact settings before leaving the factory
- Note that all changing of the actuator can be accomplished without draining the system
- All Macon thermostats can be locked at or limited to a specific temperature or temperature range
- Simple one-trade installation
- Sensor guard furnished at no extra charge
- All Macon valves and thermostats conform to ASHRAE Standard 102P-1983 and European Standard EN 215/1215. We are also ISO 9001 certified (1994) and ISO 14001 certified (1998).



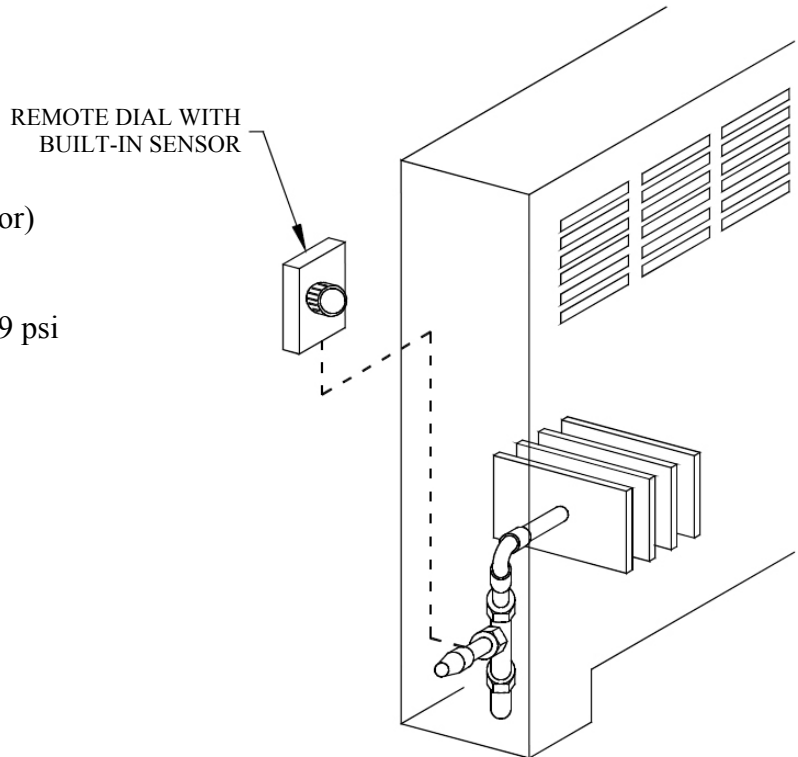


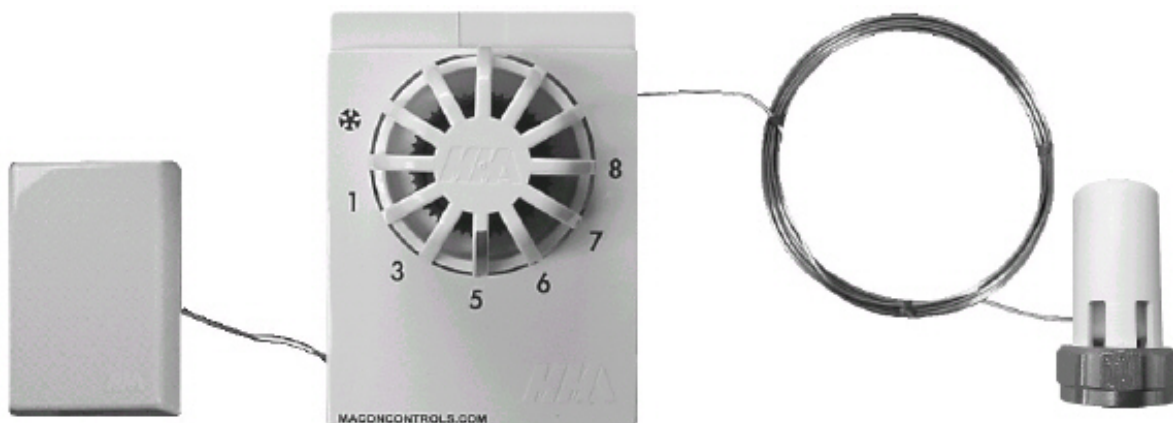
DATA

- Temp. Range: 46° - 80°F
- Hysteresis: 0.9°F
- Heat Transfer: 1.1°F (Valve Housing Sensor)
- Dead Time: 0.8 Minutes
- Max. Differential Pressure: 20 psi
- Suggested Differential Pressure = 0.5 to 2.9 psi
- Max. Water Temp.: 250°F
- Max. Storage & Ambient Temp.: 122°F
- Max. Steam Pressure: 15 psig
- Max. Movement: 0.125
- Nominal Opening: 0.018 (3.6°F)
- Long Term Test: 5000 cycles (1.3°F)

DIAL SETTINGS:

- 0 = Off
- * = 46°F (Frost Protection)
- 1 = 54°F
- 3 = 61°F
- 5 = 68°F
- 6 = 72°F
- 7 = 76°F
- 8 = 80°F





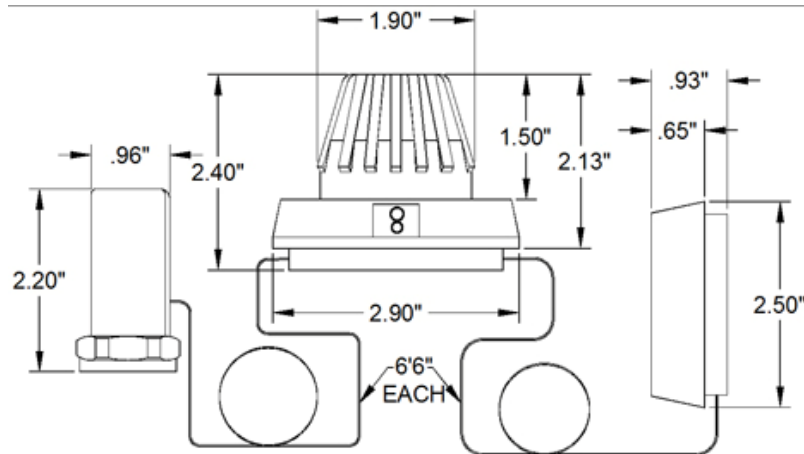
Operation

The sensor is wax-filled and the wax volume varies according to ambient temperature. The volume changes are transmitted to the valve stem via a liquid capillary system. The valve body has a return spring which closes the valve when the stem is under low pressure. When the force from the sensor and the return spring are balanced to the room temperature selected, the valve disc stops in that position to allow a certain amount of water or steam to flow through the valve. Temperature changes cause the valve disc to change position and thereby continuously modulate the flow so that the room temperature is maintained at the desired temperature. The unit is secured against damage from over pressure by a pressure absorbing spring.

Features

- Combined remote dial/sensor
- Brass sensor, High sensitivity
- Fiberglass valve plug shaft
- Stainless steel capillary tube, 6'6" x 6'6" std. length
- Longer capillary available, consult factory
- Fits all Macon NT series valves
- Replaces the valve-mounted sensors on built-in convectors, etc., and where the valve-mounted sensor is exposed to draft from windows or doors
- Fully automatic - nonelectric, no wiring
- Small dimensions
- Manufactured to exacting standards using exceptionally high quality materials
- Each sensor is tested and re-checked to achieve exact settings before leaving the factory
- Note that all changing of the actuator can be accomplished without draining the system
- All Macon thermostats can be locked at or limited to a specific temperature or temperature range
- Simple one-trade installation
- Sensor guard furnished at no extra charge
- All Macon valves and thermostats conform to ASHRAE Standard 102P-1983 and European Standard EN 215/1215. We are also ISO 9001 certified (1994) and ISO 14001 certified (1998).



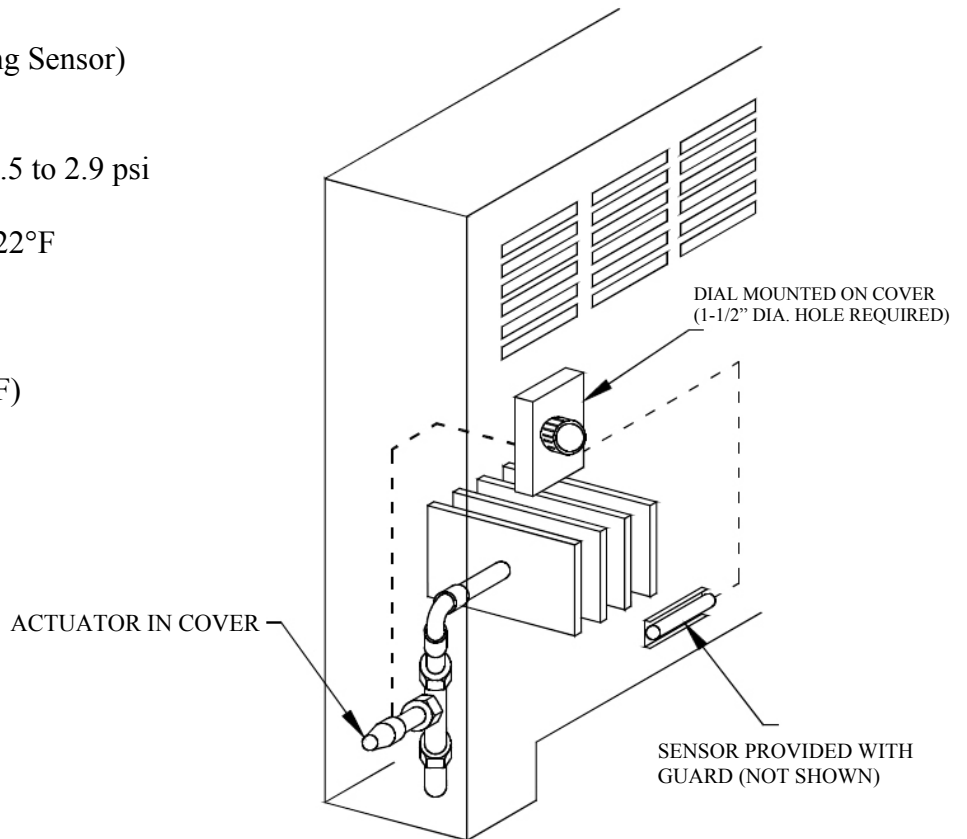


DATA

- Temp. Range: 46° - 80°F
- Hysteresis: 0.9°F
- Heat Transfer: 1.1°F (Valve Housing Sensor)
- Dead Time: 0.8 Minutes
- Max. Differential Pressure: 20 psi
- Suggested Differential Pressure = 0.5 to 2.9 psi
- Max. Water Temp.: 250°F
- Max. Storage & Ambient Temp.: 122°F
- Max. Steam Pressure: 15 psig
- Max. Movement: 0.125
- Nominal Opening: 0.018 (3.6°F)
- Long Term Test: 5000 cycles (1.3°F)

DIAL SETTINGS:

- 0 = Off
- * = 46°F (Frost Protection)
- 1 = 54°F
- 3 = 61°F
- 5 = 68°F
- 6 = 72°F
- 7 = 76°F
- 8 = 80°F





Accessory Valve Extender for Heat Dissipation
#MAC-NT-Valve-Ext (4032601)

Description

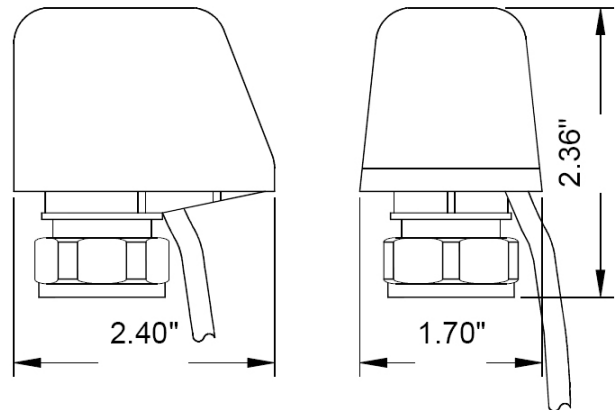
Designed for use with the Macon NT Series Valves, the VM series electric zone valve actuator is a new concept in zone controls. Utilizing a gearless electric thermic operator, this valve actuator operates off low power 24V AC. Proportional control can be realized by using time proportioning techniques. The VM series is ideal for control of Radiators, Fin-Tube, Zones, Solar Panels, Heat Pumps etc...

Features

- Normally open or normally closed
- Suitable for low pressure steam
- Low power consumption
- Noiseless operation
- Easy installation
- Compact size
- Low cost

Specifications

Data	VMO 24	VMC 24
Voltage	24V AC	24V AC
Current, initial	200mA	200mA
Current consump.	70mA/2W	70mA/2W
Closing and opening time	ca 3 minutes	ca 3 minutes
Stroke	ca 4 mm	ca 4 mm
Max amb. temp.	122 F	122 F
Design		
Body	plastic	plastic
Nut	brass	brass
Weight	2.8 oz.	2.8 oz
Conn. cable	2x0,22 white	2x0,22 white
	3 feet	3 feet
No current	open	closed



VMO 24 - Normally Open
VMC 24 - Normally Closed





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Description

The precise regulation of VM 2-10 V gives a constant valve flow corresponding to the signal from the temperature regulator resulting in a very high comfort. A built in processor is programmed with very useful functions such as self-calibration, valve flow linearity etc. It also has an every 24-hour stroke function preventing the valve spindle from getting stuck. It has a red visible position indicator located just above the connection nut. 2-10 voltage regulation gives a long life time cycle. Electrical connection is easily done by the means of push in modular cable. VM 2-10 V matches all MMA valves. To fit other makes it can be used in combination with one of our adaptors. VM is also available with M30x1.5 connection.



Specifications

Data

Power consumption start	5VA
Power consumptions operating	3VA
Flow position	NC
Supply voltage	24V AC + 10%
Control current	0.4mA
Closing and opening time	ca 3 min
Stroke	ca 0.157 inch
Operating force	22.5 lbs
Ambient temp. max	122 F

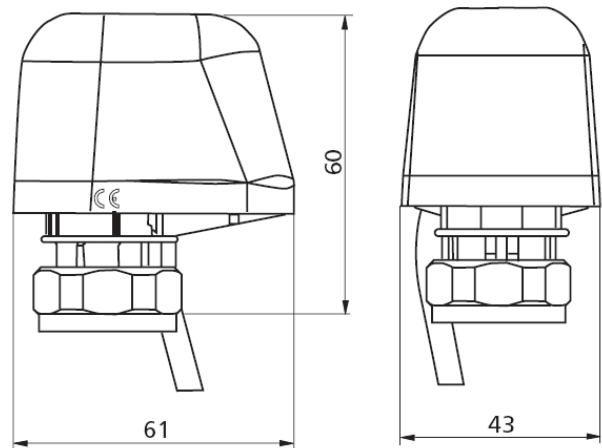
Design

Body material	Polyamide
Nut material	Brass
Connection cable	Modular cable (K121-1m) 3 ft.
Color	RAL 9016
Weight	4.94 oz.

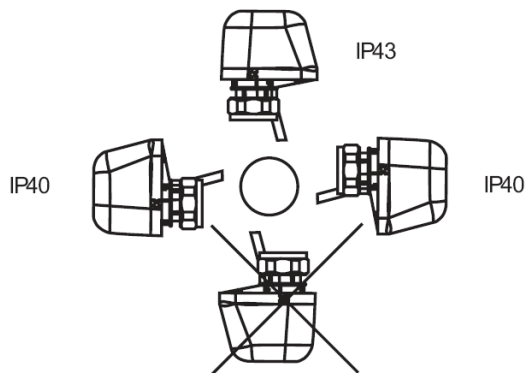
Areas of Use

Actuator VM 2-10V is used to regulate valves in heating and cooling systems.

Dimensions



Installation Position



Valve Function - Without Power (No Current)			
Actuator Type	Application		
	Radiator Valve	Cooling Valve	3-Way Valve
VM 2-10V	Closed	Open	Port B Closed





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Macon ZMC - DDC

The Macon Model ZMC-DDC Proportional is a thermoelectric actuator for the discrete control of heating and cooling systems in direct proportion to the applied control voltage. The control of the actuators is performed by a 0-10 V DC signal via a central DDC system or by a room thermostat. Principal area of application is the building management systems range.



1) Features

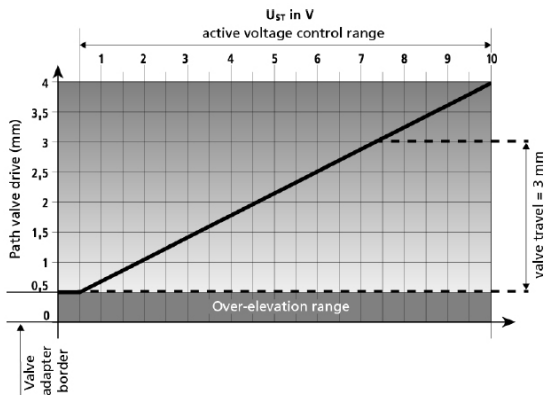
- Simple plug-in installation
- Travel path variants 4.0 mm / 5.0 mm (further variants on request)
- “normally closed” (NC)
- Power consumption of only 1 watt
- Control by a 0-10 V DC signal
- 360° installation position
- Short response times, resulting in improved control response
- Closing point verification and possible adaptation during operation
- All-round function display
- Complete compatibility to the valve adapter system
- Noiseless and maintenance-free
- High functional safety and long expected service life
- Patented 100% protection in case of leaky valves
- “First open” function
- Adaptation check on the valve
- Plug-in connecting cable
- Alignment aid on the valve
- Compact size, small dimensions

2) Function

The actuator mechanism of the Macon ZMC-DDC uses a PTC resistor-heated elastic element and a compression spring. The elastic element is heated by applying the operating voltage and moves the integrated plunger. The force generated by this movement is transferred to the plunger, thus opening or closing the valve.

2.1 Version NC: Normally Closed (valve closed)

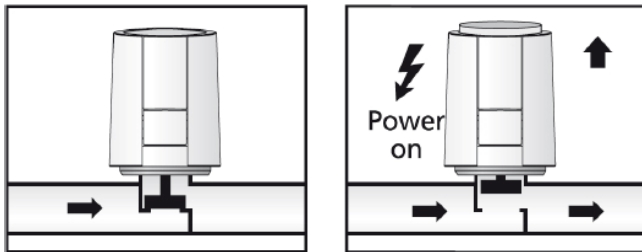
After switching on the operating voltage, the first-open function is unlocked. Directly after that, the actuator automatically detects the valve closing point and switches to regular operation. This process guarantees an optimum adaptation of the actuator to the valve. If a control voltage is applied after the closing point detection, the actuator opens the valve evenly with the plunger movement after the dead time has elapsed. An internal wear-free position detection controls the temperature required for the maximum stroke (minus over-elevation) and consequently the energy intake of the elastic element. No excess energy is stored inside the elastic element. If the control voltage is reduced, the electronic control system immediately adapts the heat input to the elastic element. In the range of 0 – 0.5 V (depending on the model) the actuator remains in a quiescent state in order to ignore ripple voltage occurring in long cables (rpm). The closing force of the compression spring is matched to the closing force of commercially available valves and keeps the valve closed when de-energized.



If a 4 mm actuator without valve path recognition is used or valves with an actuator travel of 3 mm, the actuators travel without load for control voltages from 7.5 V to 10 V.

2.2 Function Display

The function display (all-round display) of the Macon ZMC - DDC shows at first glance whether the valve is open or closed; this can be also felt in the dark.



- In case of the NC version, an extended function display shows opening of the valve.

2.3 “First Open” function (for NC only)

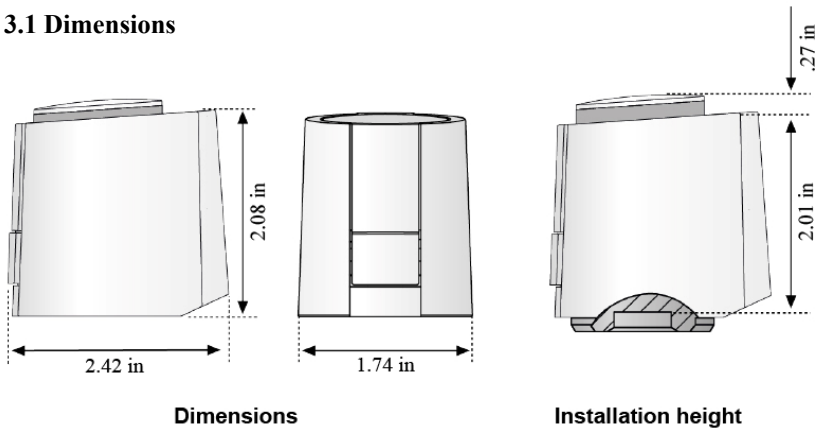
In its delivery condition, the Macon ZMC-DDC is normally open due to the “First Open” function. This enables heating operation during the construction phase even when the electric wiring of the single room control is not yet complete. When commissioning the system at a later date, the "First Open" function is automatically unlocked by applying the operating voltage (for more than 6 minutes) and the actuator is fully operable.

3) Technical Data

Voltage (according to variant)	24 V AC, -10% ... +20%, 50-60 Hz 24 V AC, -20% ... +20%,	
Control voltage range	0 V ... 10 V (reverse polarity protected)	
Max. inrush current	< 300 mA during max. 2 min.	
Operating power	1 W ¹⁾	
Resistance of control voltage input	100 kΩ	
Stroke (actuator travel)	4.0 / 5.0 mm (minus 0.5 mm over-elevation)	
Actuating force	100 N ± 5%	
Fluid temperature	32° F - 212° F ²⁾	
Storage temperature	-130° F - 149° F	
Ambient temperature	32° F - 140° F	
Degree / class of protection	IP 54 ³⁾ / III	
CE conformity according to	EN 60730	
Housing material / color	Polyamide / white	1) measured with precision reference meter LMG95
Connection line / color	3 x 0.22 mm ² PVC / white	
Cable length	3' 3"	2) depending on the adapter even higher
Weight with connecting cable (1 m)	approx. 3.9 oz	
Surge protection according to EN 60730-1	min. 1 kV	3) in all installation positions



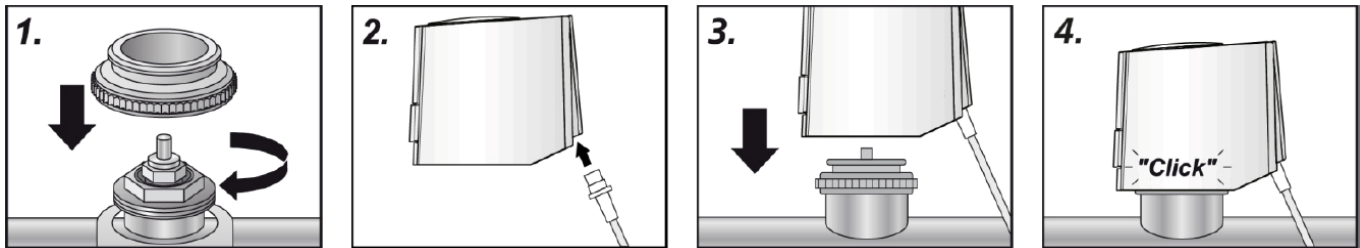
3.1 Dimensions



4) Installation notes

4.1 Installation with valve adapter

The valve adapter assortment guarantees a perfect match of the valve drive to almost any valve bottom and heating circuit distributor available on the market. Simply snap-on the Macon ZMC-ES to the manually pre-installed valve adapter.



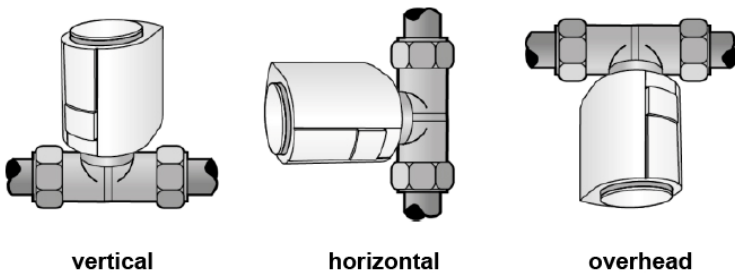
1. Screw the adaptor manually onto the valve.

2. Connect the line to the actuator.

3. Place the Macon ZMC-DDC manually in vertical position to the valve adaptor.

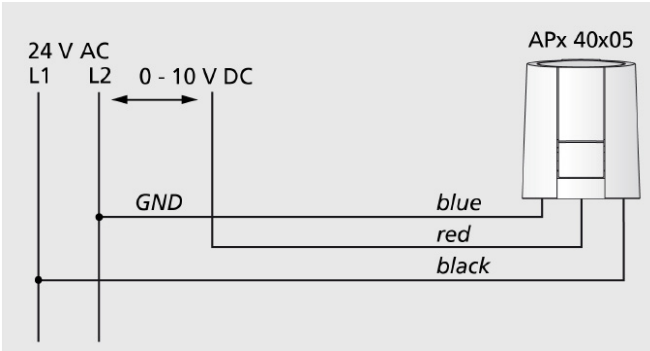
4. The Macon ZMC-ES snaps onto the valve adaptor with a “click” when pressed down vertically by hand.

4.2 Installation position



The Macon ZMC-DDC must be installed preferably in vertical or horizontal installation position. For overhead” installation special circumstances (e. g. drain-water) can reduce the lifetime of the actuator.

4.3 Electrical connection



Calculation of maximum cable length (copper cable) for 24 V rated voltage

$$L = C \times A / n$$

L Cable length in m
 K Constant (269 m/mm²)
 A Conductor cross-section in mm²
 n Number of Alpha-Actuators

We recommend the following cables for installing a 24 V system:

- Telephone wire: J-Y(ST)Y 0.8 mm²
- Light plastic-sheathed cable: NYM 1.5 mm²
- Flat webbed building wire: NYIF 1.5 mm²

Transformer:

A safety isolating transformer according to EN 61558-2-6 (Europe) must always be used. Transformer dimensioning results from the making capacity of the Macon ZMC-DDC.

Rule-of-thumb formula:

$$P_{\text{Transformer}} = 6 W \times n$$

n = Number of Actuators

5) Accessories

- Protection Cap AA SK 1004



Protection against theft and vandalism available for valve drives with a stroke of 4mm or 5mm.



Macon ZMC - ES

Macon Model ZMC- ES 24V End switch is a thermoelectric valve drive for opening and closing valves and small valves used in the scope of HVAC technology. The integrated micro switch with floating contact allows direct operation of a pump or fan control unit. The Macon ZMC - ES 24V End switch is controlled by a 24 V room thermostat with two-point output or pulse-width modulation.



1) Features

- 360° installation position
- Integrated switch with floating contact
- Patented 100% protection against leaky valves
- Available in normally closed (NC)
- Power consumption 1 watt
- Simple snap-on installation
- High functional safety and long expected service life

- First-Open function
- Adaptation check on valve
- Alignment aid on the valve
- Compact size, small dimensions
- All round function display
- Noiseless and maintenance-free

2) Function

The actuator mechanism of the Macon ZMC-ES with end switch uses a PTC resistor heated wax element and a compression spring. The wax element is heated by applying the operating voltage and moves the integrated ram. The force generated by this movement is transferred on the valve lifter and opens and closes the valve. The integrated micro switch allows the use of its switching signal depending on the opening of the valve.

2.1 Version NC: Normally Closed (valve closed)

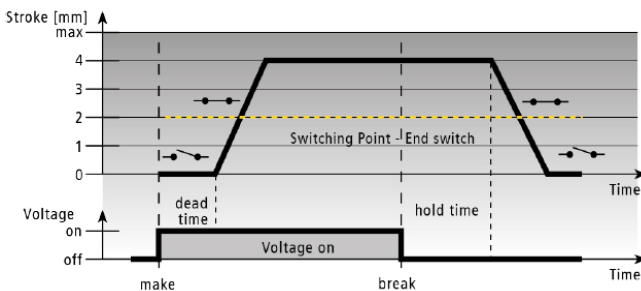


Figure: Example with respect to the travel path of 4 mm. The characteristic curves of the travel path of 5 mm result from this.

In case of the normally closed version, the valve is opened steadily by the ram motion upon switching on the operating voltage and after expiry of the dead time. The integrated micro switch is switched with a travel path of approx. 2 mm.

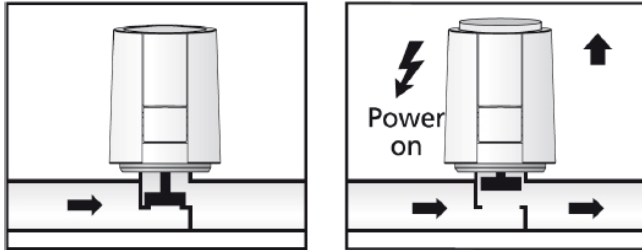
After the operating voltage is cut and after expiry of the hold time the valve is closed evenly by the closing force of the compression spring. The integrated switch is closed after an actuator travel of approx. 2 mm.

The closing force of the compression spring is matched to the closing force of commercially available valves and keeps the valve closed when de-energized.



2.2 Function Display

The function indicator of the Macon ZMC - ES (all around view) allows identifying the operating condition (valve open or closed) at a glance. It is also possible to feel the current operating state when it's dark.



- In case of the NC version, an extended function display shows opening of the valve.

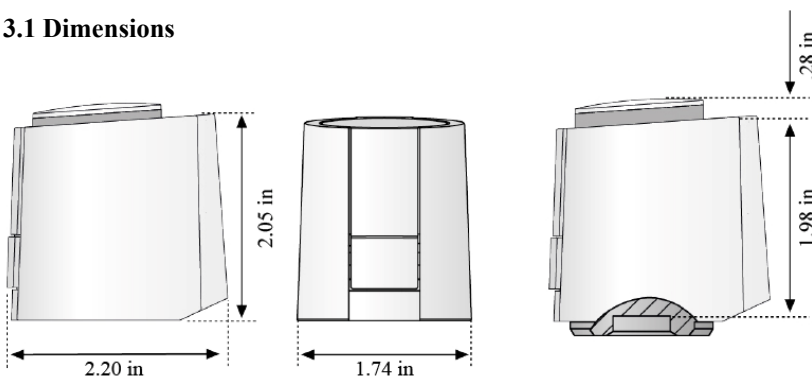
2.3 “First Open” function (for NC only)

In its delivery condition, the Macon ZMC - ES is kept open when de-energized due to the First-Open function. This enables heating operation during the construction phase even when the electric wiring of the individual room control is not yet complete. During the later electrical start-up, the First Open function is automatically unlocked by applying the operating voltage for more than 6 minutes. The valve drive is now fully operable.

3) Technical Data

Operating voltage	24 V AC/DC +20%...-10%	
Max. inrush current	< 300 mA during max. 2 min.	
Operating power	1 W ¹⁾	
Stroke (actuator travel)	4.0 / 5.0 mm	
Actuating force	100 N ±5%	
Switching current for micro switch	24 V AC: 3 A resistive load 1 A inductive load	
Switching point of micro switch NC	approx. 2 mm	
Fluid temperature	32° F - 212° F ²⁾	
Storage temperature	-130° F - 140° F	
Ambient temperature	32° F - 140° F	
Degree / class of protection	IP 54 ³⁾	
CE conformity according to	EN 60730	
Housing material / color	Polyamide / light grey (RAL 7035)	1) measured with precision reference meter LMG95
Connection line / color	4 x 0.75 mm ² PVC / light gray (RAL 7035)	2) depending on the adapter even higher
Cable length	3' 3"	3) in all installation positions
Weight with connecting cable (1 m)	approx. 5.3 oz	
Surge protection according to EN 60730-1	min. 2.5 kV	

3.1 Dimensions



Dimensions

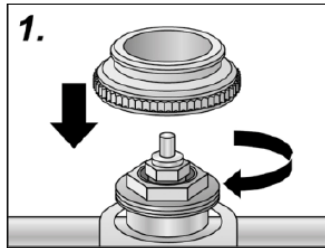
Installation height



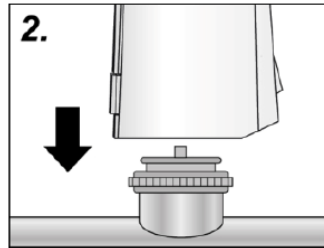
4) Installation notes

4.1 Installation with valve adapter

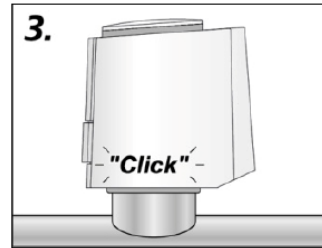
The valve adapter assortment guarantees a perfect match of the valve drive to almost any valve bottom and heating circuit distributor available on the market. Simply snap-on the Macon ZMC-ES to the manually pre-installed valve adapter.



1. Screw the adaptor manually onto the valve.

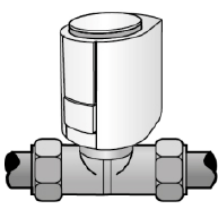


2. Place the Macon ZMC-ES vertically on the valve adaptor.

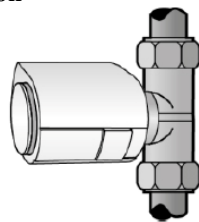


3. The Macon ZMC-ES snaps onto the valve adaptor with a "click" when pressed down vertically by hand.

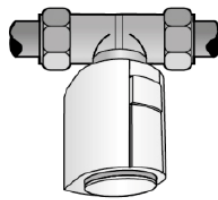
4.2 Installation position



vertical

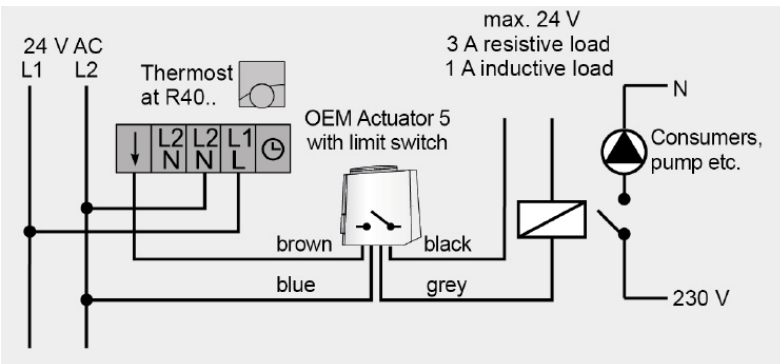


horizontal



overhead

Preferred installation position of the Macon ZMC-ES is vertical or horizontal. An upside down position may reduce product life through special circumstances (e.g. contaminated water).



Calculation of maximum cable length (copper cable) for 24 V rated voltage

- $L = C \times A / n$
- L Cable length in m
- K Constant (269 m/mm²)
- A Conductor cross-section in mm²
- n Number of Alpha-Actuators

We recommend the following cables for installing a 24 V system:

Telephone wire	J-Y(ST)Y	0.8 mm ²
Light plastic-sheathed cable:	NYM	1.5 mm ²
Flat webbed building wire:	NYIF	1.5 mm ²

Transformer:

A safety isolating transformer according to EN 61558-2-6 (Europe) must always be used. Transformer dimensioning results from the making capacity of the Macon ZMC-ES.

Rule-of-thumb formula:

$$P_{\text{Transformer}} = 6 W \times n$$

n = Number of Actuators



5) Accessories

- Protection Cap AA SK 1004



Protection against theft and vandalism, available for valve drives with a stroke of 4mm or 5mm



Areas of use

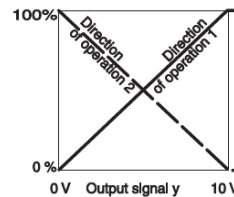
The Macon Motorized Actuator can be used on all Macon Valves (NT series 2-way valves, EDV 3-way mixing valves, EKV cooling valve and OPSK one pipe steam valve). For controllers with continuous output in conjunction with single-room control systems. Automatic valve adjustment and intelligent cut-off for maximum energy efficiency.



Specifications

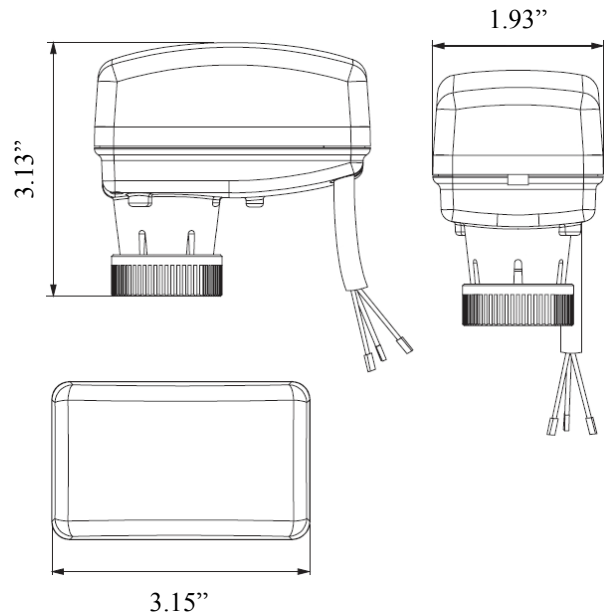
Design

- Two-piece plastic housing, light grey RAL7035
- Brass nut
- Plug-in cable, light grey, standard 1.50 m long, 3×0.35 mm², exchangeable
- Running time 13 s/mm
- Fitting position vertically upright to horizontal, not upside down.



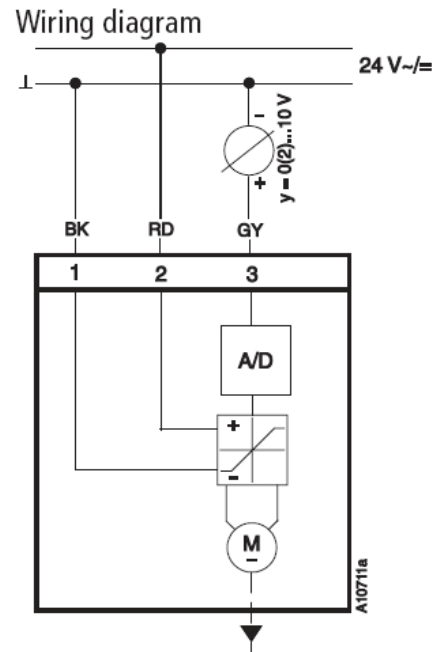
Data

Direction of operation	NO/NC DIP switches
Running time	43 - 72 s (8s/mm)
Stroke	5.5 mm
Pushing force	120 N
Power supply	24V AC/DC, ±15%, 50 - 60 Hz
Power consumption	2.5 VA
Control signal	0 (2) - 10V
Max operating temperature	203°F at the valve
Noise level	<30 dB(A)
Perm ambient temperature	0 - 122°F
Perm ambient humidity	<75%rh
Ingress protection	IP 43 (EN 60529)
Protection class	III (EC 60730)



Operating

When being put into service (with valve fitted), the actuator moves to both end positions and stores the associated increments. The range of the control signal is then assigned to this effective stroke. The motor positions the valve and cuts out as soon as the stroke position matches the controller's output signal. In the end positions or in the event of an overload, the motor cuts out after 2 minutes at the latest. If the control voltage has not changed after 2 hours (in the range of 0 - 0.5 V), the motor briefly runs to the end position and corrects its position memory (if necessary). The MVA 2-10 performs a complete cycle every 24 hours in order to prevent the valve plug from jamming or sticking. The LED lights up if power is applied and flashes as long as the motor is running.



1	BK (black)
2	RD (red)
3	GY (grey)

Direction of operation 1:

As the positioning signal increases, the actuator spindle extends on 2-way through valves and on the EDV 3-way valve the control passage opens.

Direction of operation 2:

As the positioning signal increases, the actuator spindle retracts on the 2-way through valves and on the EDV 3-way valve the control passage closes.

The black ground cable 1a (24 V~) and the blue ground cable 1b (control voltage) should both be connected to a common ground cable.

After removing the cap on the cover, the following settings can be made using jumpers:

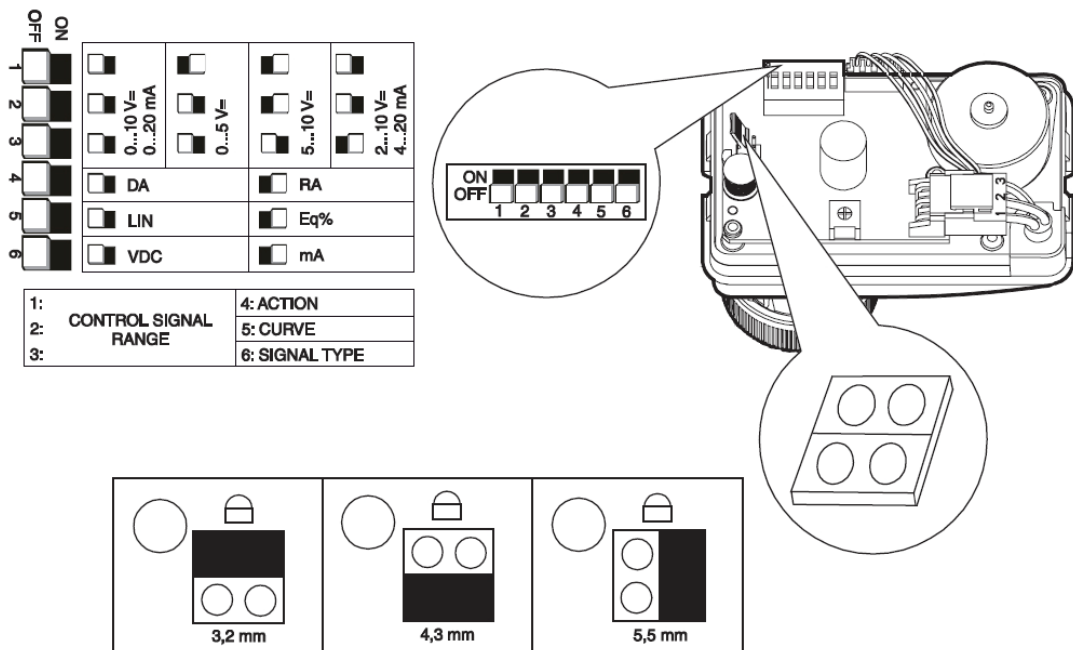
- The input signal can be set to 0 - 10 V, 5.2 - 10 V or 0 - 4.8 V.
- The direction of operation 1 or 2 can be selected; the factory setting is 1 (DA).

Put the cap back on after making the settings.

LED Status Indicator	
Status	Description
OFF	No power applied
Flashing green	Actuator moving to position
Continuous green light	Position reached
Flashing red	Calibration cycle
Continuous red light	No input signal



DIP switch setting



Factory Setting: All the DIP switches in OFF position.

DIP switches 1-2-3

The DIP switches 1-2-3 are used for setting the control signal range.

DIP switch 4

The direction of operation of the actuator is set with DIP switch 4:

- DIP switch 4 in OFF position: DA (Direct Acting)
- DIP switch 4 in ON position: RA (Reverse Acting)

DIP switch 5

This switch can set the actuator so that the characteristic of the combination of valve with actuator corresponds to a linear or equal-percentage characteristic.

- DIP switch 5 in OFF position: LIN
Use this setting if the valve has a linear or equal-percentage characteristic.
- DIP switch 5 in ON position: Eq%
Use this setting with an open/close or a high-speed valve.

DIP switch 6

The voltage (VDC) or current (mA) is set with DIP switch 6.

- DIP switch 6 in OFF position: VDC
- DIP switch 6 in ON position: mA

Setting the stroke

The stroke can be set using a jumper.
Factory Setting: 4.3mm





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MACON-RCM

Macon Controls technology with intelligent transmission management.

Application

Solar-powered room control module with LCD and controls, with intelligent transmission management for measuring room temperature and for wireless transmission of measured values, occupancy, setpoint and weekly schedule.

For direct communication with a technoLink[®] wireless partner, the integrated wireless interface of the MAC-RCM supports the non-proprietary EnOcean wireless protocol EEP A5-20-01 (Battery Powered Actuator).

Together with the MAC-WSA units, the MAC-RCM constitutes a functional unit for easy room temperature control.



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Remote Control Module - *MAC-RCM*

Important Information Regarding Product Safety

Safety Instructions

This data sheet contains information on installing and commissioning the product "MAC-RCM". Each person who carries out work on this product must have read and understood this data sheet. If you have any questions that are not resolved by this data sheet, you can obtain further information from the supplier or manufacturer.

If the product is not used in accordance with this data sheet, the protection provided will be impaired.

Applicable regulations must be observed when installing and using the device. Within the EU, these include regulations regarding occupational safety and accident prevention as well as those from the VDE (Association for Electrical, Electronic & Information Technologies). If the device is used in other countries, it is the responsibility of the system installer or operator to comply with local regulations.

Mounting, installation and commissioning work on the devices may only be carried out by qualified technicians. Qualified technicians are persons who are familiar with the described product and who can assess given tasks and recognize possible dangers due to technical training, knowledge and experience as well as knowledge of the appropriate regulations.

Legend



WARNING

Indicates a hazard of medium risk which can result in death or severe bodily injury if it is not avoided.



CAUTION

Indicates a hazard of low risk which can result in minor or medium bodily injury if it is not avoided.



NOTICE

Indicates a hazard of medium risk which can result in material damage or malfunctions if it is not avoided.



NOTE

Indicates additional information that can simplify the work with the product for you.

Notes on Disposal


For disposal, the product is considered waste from electrical and electronic equipment (electronic waste) and must not be disposed of as household waste. Special treatment for specific components may be legally binding or ecologically sensible. The local and currently applicable legislation must be observed.

Remote Control Module - *MAC-RCM*

Item

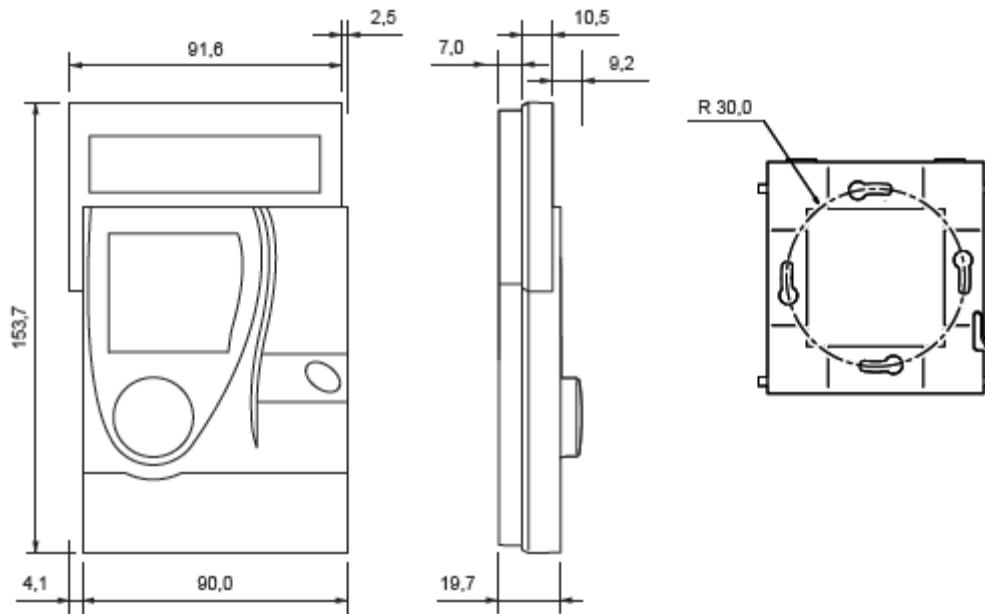
MAC-RMC Room control module with SolarFunk technology for direct wireless communication with MAC-WSA

Technical Data

Power	Dual solar cell power supplies and internal energy storage unit with priority management <ul style="list-style-type: none">■ Internal energy storage uses 2 replaceable 3.6 V AA lithium batteries
Measured value	Room temperature of spaces in homes or commercial premises
Measuring system	Integrated digital sensor
Measuring range	0 to 50 °C or 32 to 122 °F
Relative measurement precision	0.1 K
Display	LCD: <ul style="list-style-type: none">■ Time■ Weekly schedule■ Icon display to indicate operating mode■ Setpoint 10.0 to 30.0 °C, resolution 0.1 K or 50 to 85 °F, resolution 1 °F
Controls	<ul style="list-style-type: none">■ Knob with confirmation button for setting setpoint, party mode, vacation mode, weekly schedule, time, date and service data■  Occupancy button: Manual switch between present/absent
Interfaces	technoLink® wireless interface: <ul style="list-style-type: none">■ Radiogram: EnOcean radiogram■ Frequency: 868.3 MHz or 315 MHz■ Operating range: Approx. 30 m in buildings (depending on building structure)■ Duty cycle: < 1%■ Cycling transmission/reception intervals using time-slot method
Housing	Plastic housing, RAL 9010 (pure white) Other colors on request
Protection class	III
Degree of protection	IP30
Ambient temperature	32 to 122° F
Ambient humidity	During operation: 20 to 85 % r.h., non-condensing; Out of operation: 5 % to 90 % r.h.; non-condensing
Installation	Flexible mounting using screws or adhesive
Weight	0.5 L B
Dimensions	WxHxD: 90 x 153.7 x 26.7 mm

Remote Control Module - *MAC-RCM*

Dimensions



Wireless Interface

The communication with the wireless partner is conducted in a cyclical manner (time-slot method wireless cycle). During the cycle, a radio signal is sent to the wireless partner and values are received from the wireless partner.



NOTICE

This product uses only EnOcean radiograms.

When selecting a wireless partner, ensure that the wireless interface also works with EnOcean radiograms EEP A5-20-01 (Battery Powered Actuator).

Remote Control Module - *MAC-RCM*

Installation



NOTICE

This product description describes specific settings and functions of the MAC-RCM. In addition to these instructions, the product descriptions of other system components, such as wireless partners, are to be observed.

General installation instructions

It is not always possible to freely select the installation location of devices which communicate wirelessly, as wireless data transmission is influenced to a greater or lesser extent by structural or spatial factors.

Before installation and assembly, the building structure must be analyzed and a series of measurements must be made to determine the specific ranges within the building.

In order to establish operational and reliable communication paths, the following aspects must be considered before and during planning:

- Structural factors restrict the transmission ranges which can be reached. Building materials and screening elements (e.g. suspended ceiling elements, installation shafts, fire doors, etc.) must be taken into consideration during planning.



NOTICE

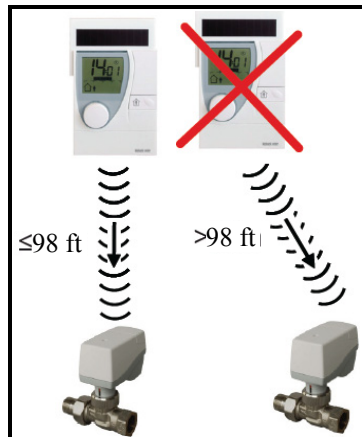
Elevated humidity increases natural signal damping.



NOTE

Recommendation: Plan radio paths horizontally on a single level with max. 98.5 ft between the transmitting and receiving modules.

- Observe minimum distances to potential sources of interference
 - Min. 1.6 ft to high-frequency sources of interference (such as microwaves, transformers or computers)
 - Min. 9.8 ft to transmitters of other wireless radio systems (such as cordless telephone or headphones)
 - Min. 0.3 ft to metal and door frames
- Minimize the effects of wall thicknesses, by ensuring that the radio signal passes through the walls at as close to a right angle as possible.

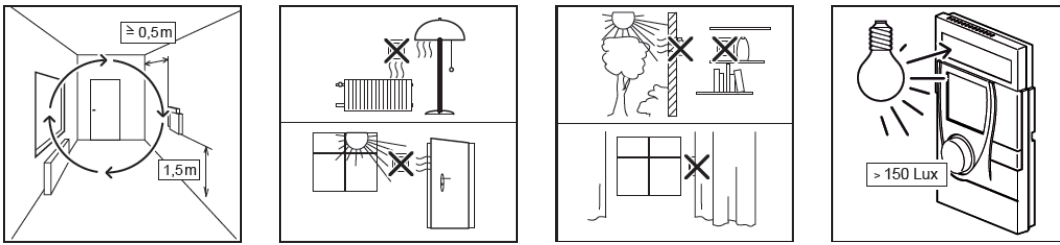


- Do not select installation locations in the radio shadow of screening building parts/structures → No direct reception possible.
- Where the device is installed at the limits of reliability, change the position of the transmitter/receiver slightly if possible (reduce overlapping effects of radio waves).



Remote Control Module - *MAC-RCM*

- The SolarFunk room control modules should be mounted in a location where they are exposed to the air circulation in the room, so that they can quickly and accurately detect the room temperature.



- As a result of the autonomous operation and wireless installation of MAC-RCM, the selected installation location can be changed and optimized at any time without additional work.

Mounting

An installation location must be selected that allows the device to receive sufficient illumination, i.e. it should not be used in unlit rooms (such as cellars).

The solar cell is optimized for indoor use and it works particularly efficiently with diffuse lighting.

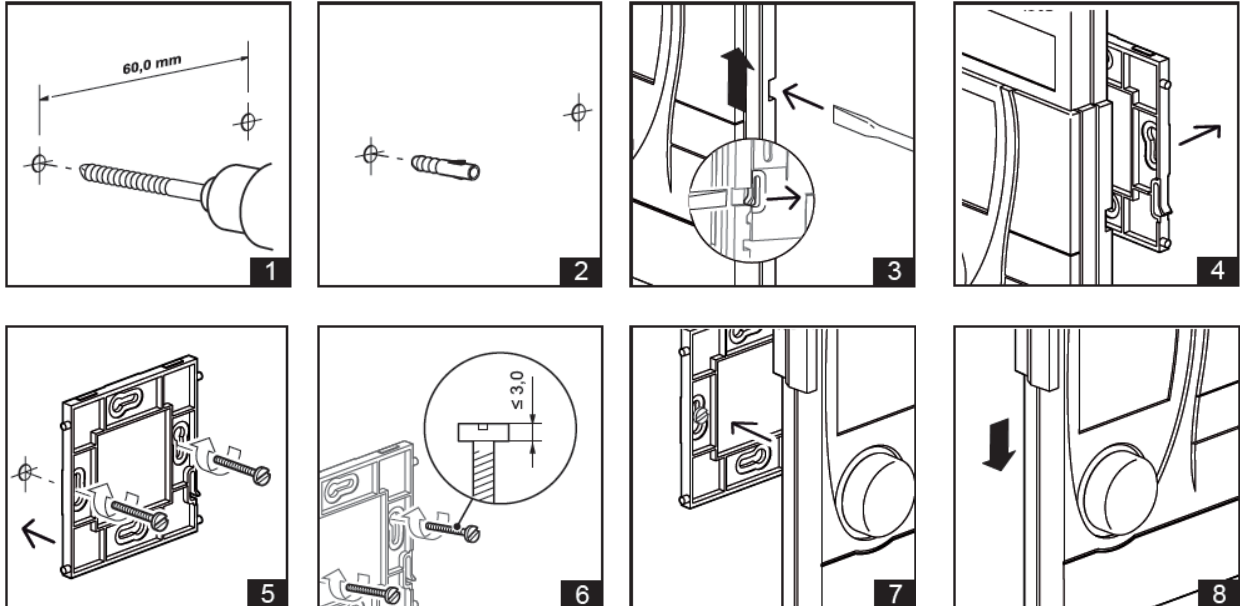


NOTE

Prolonged illumination at high intensities, e.g. via prolonged direct sunlight or indirect or direct illumination with high-intensity artificial light (such as halogen emitters) can cause damage to the solar cell.

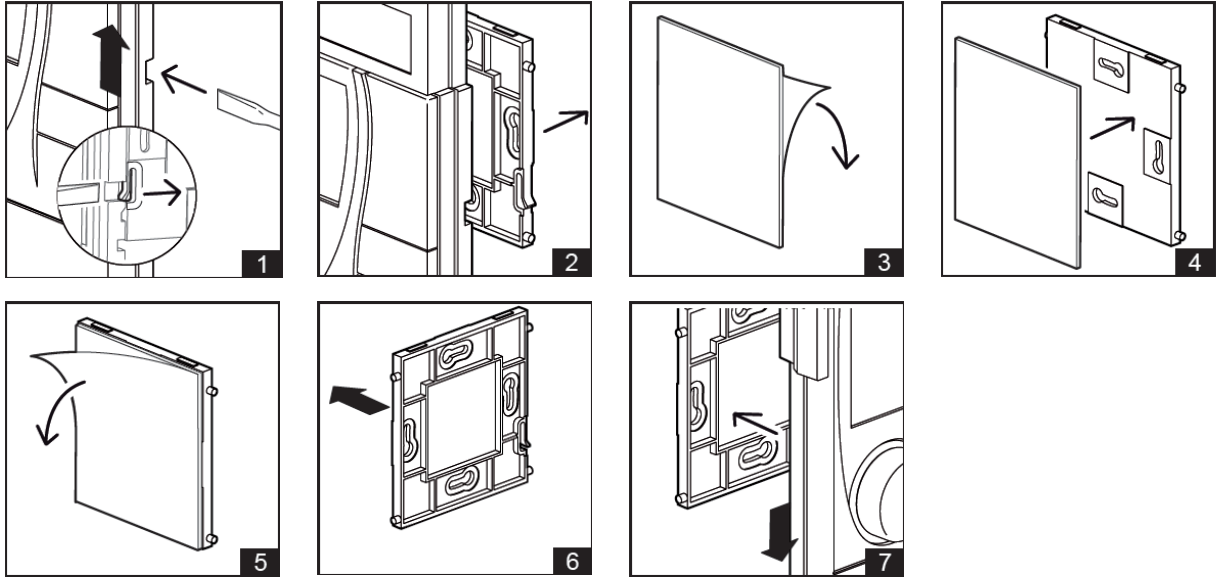
Wall mounting

- Flexible screw mounting

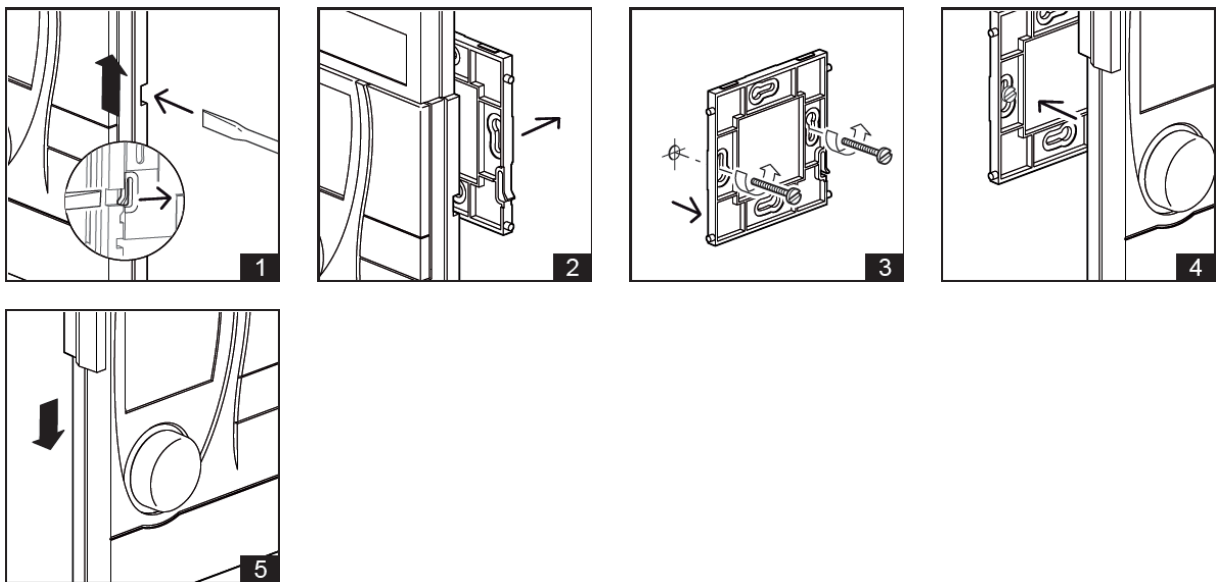


Remote Control Module - *MAC-RCM*

-Flexible adhesive mounting with double-sided transparent adhesive strips

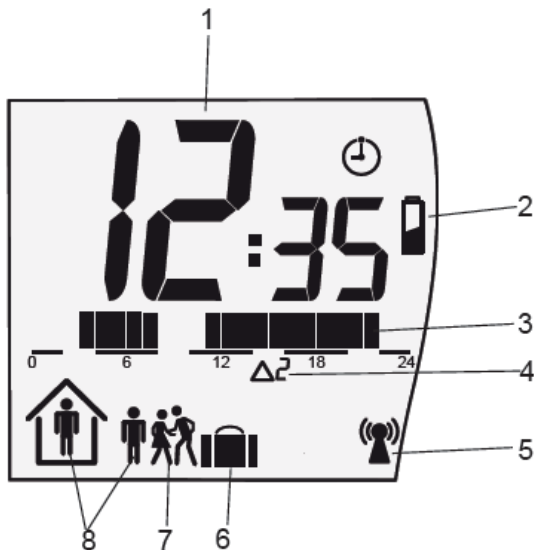


Removal



Remote Control Module - *MAC-RCM*

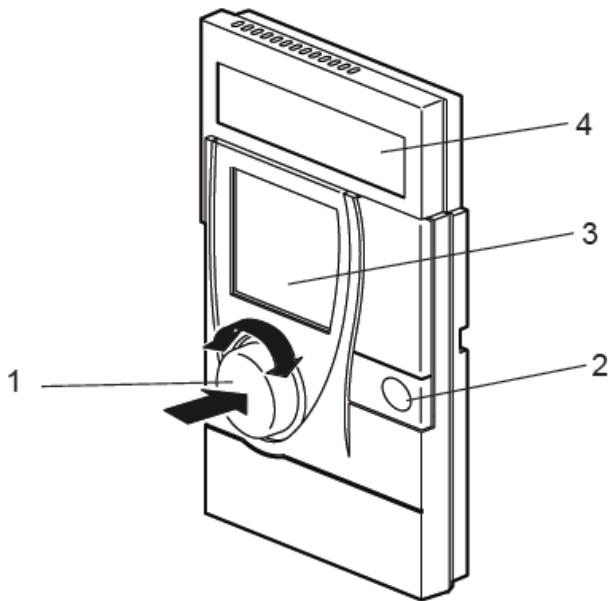
Indicators on the display




1	Time (initial display)
2	Energy storage indicator Indicator appears when the remaining charge in the energy storage unit is < 30 %.
3	Weekly schedule
4	Malfunction message, operating message
5	Wireless control indicator Wireless icon visible = wireless communication present Wireless icon not visible = wireless communication not present Wireless icon flashes = radiogram in transmission/registering
6	Vacation mode indicator This icon appears on the display when vacation mode is activated.
7	Party mode indicator This icon appears on the display when party mode is activated.
8	Occupancy indicator

Remote Control Module - *MAC-RCM*

Setting and operation



1	[Knob] + [confirmation key]	Rotate: set value (e.g. setpoint). Left: reduce. Right: increase. Press: confirm display setting.
2		Occupancy button: switch between “present” (comfort mode) and “absent” (reduced temperature mode).
3	Display	
4	Solar panel	

Comfort mode: Operating mode for a room that is in use. The controller operates with a daytime setpoint. The room temperature remains in a comfortable range.

Reduced temperature mode: Energy-saving operating mode (economy mode) for a room that is not in use. The controller operates with a nighttime setpoint.

Switching on the device

The device is delivered in storage mode.

- ▶ This standby state can be ended by simultaneously pressing the knob and the occupancy button for approx. 3 s.

General



NOTE


The individual setting functions are ended if the knob is pressed for approx. 2 s or if no settings are entered within approx. 30 s.

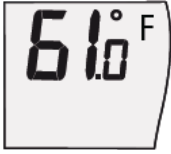


Remote Control Module - *MAC-RCM*

Operating level

Setting the setpoint

- The setpoint can only be changed in comfort mode  .



- ▶ Briefly press the knob.

The setpoint indicator flashes for 2 s.

- ▶ Set the desired setpoint using the knob.

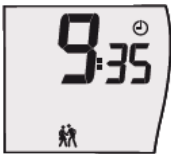
The new selected value is displayed for approx. 2 s; it is then automatically applied and the room control module switches to the initial display.

A new setpoint can be also applied by pressing the knob for approx. 2 s.

Configuration level

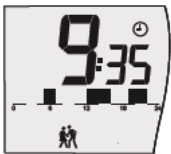
Setting party mode (program time extension)

- The maximum party time is 8 h.
- This can be set in steps of 30 minutes.



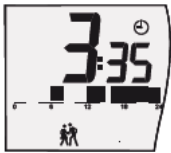
- ▶ Press the knob for 2 s.

- ▶ Select the “Party mode” function using the knob.



- ▶ Briefly press the knob.

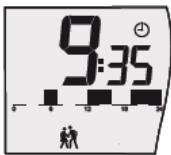
Current time displayed = start of party mode (program time extension).



- ▶ Set the end time for party mode (program time extension) using the knob.

- ▶ Confirm the entry by briefly pressing the knob.

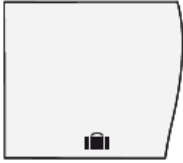
The display switches back to the initial display.



- The party time is effective immediately and comfort mode is switched on. The activated party mode is represented by the party icon on the display.
- Party mode can be ended prematurely by pressing the occupancy button.

Remote Control Module - *MAC-RCM*

Setting vacation mode



- ▶ Press the knob for 2 s.
- ▶ Select the “Vacation mode” function using the knob.
- ▶ Briefly press the knob.
The display flashes.



Vacation start and vacation end are then set in sequence:

- ▶ Vacation start:
Set the month. Confirm setting by pressing the knob. Set the day. Confirm setting by pressing the knob.



- ▶ Vacation end:
Set the month. Confirm setting by pressing the knob. Set the day. Confirm setting by pressing the knob.
The display switches back to the initial display.



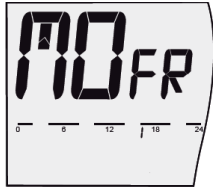
- Vacation mode begins at 00:00 (12 AM) on the set start date and ends at 24:00 (midnight) on the set end date.
- If vacation mode is activated, the vacation end date and the corresponding icon are shown on the display. Reduced temperature mode is active during this time.
- Once the vacation end has passed, the vacation mode function is deleted.

Delete or end vacation mode

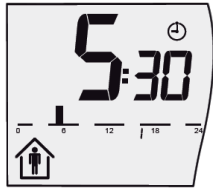
- ▶ Vacation start = set vacation end.
If no vacation is set, the date 01.01 is displayed for vacation start and vacation end.

Remote Control Module - *MAC-RCM*

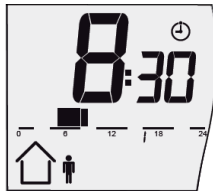
Set weekly schedule



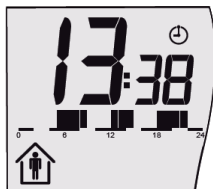
- A weekly schedule is available with the following weekday ranges: Monday - Friday **MOFR**, Saturday- Sunday **SASU**, Monday - Sunday **MOSU** as well as the individual days **MO**, **TU**, **WE**, **TH**, **FR**, **SA** and **SU**.
- 4 usage times can be set per day.
A usage time consists of a start time and an end time (usage time block)
- This can be set in steps of 15 minutes.
- ▶ Press the knob for 2 s.
- ▶ Select the weekly schedule function **MOFR** using the knob and set the desired weekday range.





- ▶ Press the knob.
First usage time Start time is displayed and flashes.
- ▶ Turn the knob to set the start time.
Press the knob to confirm the setting.



- ▶ Press the knob.
First usage time End time is displayed and flashes.
- ▶ Turn the knob to set the end time.
Press the knob to confirm the setting.
The display switches to the start time of the second usage time.
Set the **second, third and fourth usage times**, if desired.
The setting procedure is the same as for the first usage time.



- The usage times of the current day are shown by the bar indicator on the display.
- If a usage time is activated, comfort mode is active. In addition, the icon  is shown on the display.
- If the current time is outside of the set usage block, reduced temperature mode is active. In addition, the icon  is shown on the display.

Delete usage time:

- ▶ Select the end time of the specific usage time as described above.
- ▶ Turn the knob left until the end time = start time and then press the knob.
The corresponding usage time is deleted and is no longer displayed.



NOTE

If the first usage time is deleted, all other subsequent usage times for this weekday range are also deleted.



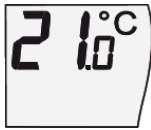
NOTE

If during an active usage time the occupancy button is used to switch to absent/reduced temperature mode, this reduced temperature mode is active until the next usage time switches on.

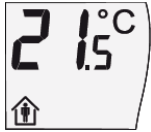


Remote Control Module - *MAC-RCM*

Set setpoint for comfort mode and reduced temperature mode



- ▶ Press the knob for 2 s.
- ▶ Select the “Setpoint” function using the knob.



- ▶ Press the knob.
The setpoint for comfort mode flashes and can now be set.
- ▶ Confirm the chosen setpoint for comfort mode by pressing the knob.



- ▶ The setpoint for reduced temperature mode flashes and can now be set.
- ▶ Confirm the chosen setpoint for reduced temperature mode by pressing the knob.

Setting the time and date



- ▶ Press the knob for 2 s.
- ▶ Use the knob to select the “Time + Date” function **TIME** and press the knob.
The hour, minutes, year, month and day can then be set in sequence.
- ▶ Set the time:
Set the hour. Confirm setting by pressing the knob.
Set the minutes. Confirm setting by pressing the knob.
- ▶ Set the year:
Confirm setting by pressing the knob.
- ▶ Set the month and day:
Set the month. Confirm setting by pressing the knob.
Set the day. Confirm setting by pressing the knob.
- The switch to daylight saving time occurs automatically according to Central Europeans standards.

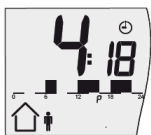
Setting 24/12 hour display



- ▶ Press the knob for 2 s.
- ▶ Use the knob to select the “24/12 hour display” function **24h** and press the knob.



- ▶ Set 24 or 12 hour display.
Confirm setting by pressing the knob.



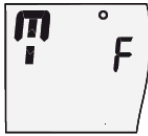
- If the 12 hour display is activated, an additional **A** for AM or **P** for PM is shown in the display.

Switching the temperature units °C/°F



- ▶ Press the knob for 2 s.
- ▶ Use the knob to select the “Set the temperature units °C/°F” function **TEMP** and press the knob.

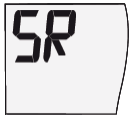
Remote Control Module - *MAC-RCM*



- ▶ Set the desired temperature units and confirm by pressing the knob.
The display switches to the initial display.

Service level

Access code



- ▶ Press the knob for 2 s.
- ▶ Use the knob to select the “Service level” function SR.
- ▶ Press the knob.



- ▶ Enter the 4-digit access code 4321.
Each digit is entered individually and the entry is confirmed by pressing the knob.
If the access code was entered incorrectly, the display **ER** appears.

Registration function



- ▶ See chapter “Registering the MAC-RCM on MAC-WSA wireless small actuator wireless partners”, page 16.

Delete function



- ▶ See chapter “Deleting the wireless partner on the MAC-RCM, page 17.

Software version display



- ▶ Use the knob to select the “Software version display” function F.
 - The current software version is displayed.

Remote Control Module - *MAC-RCM*

Replacing batteries

If the battery icon appears on the display, the batteries must be replaced.



NOTICE

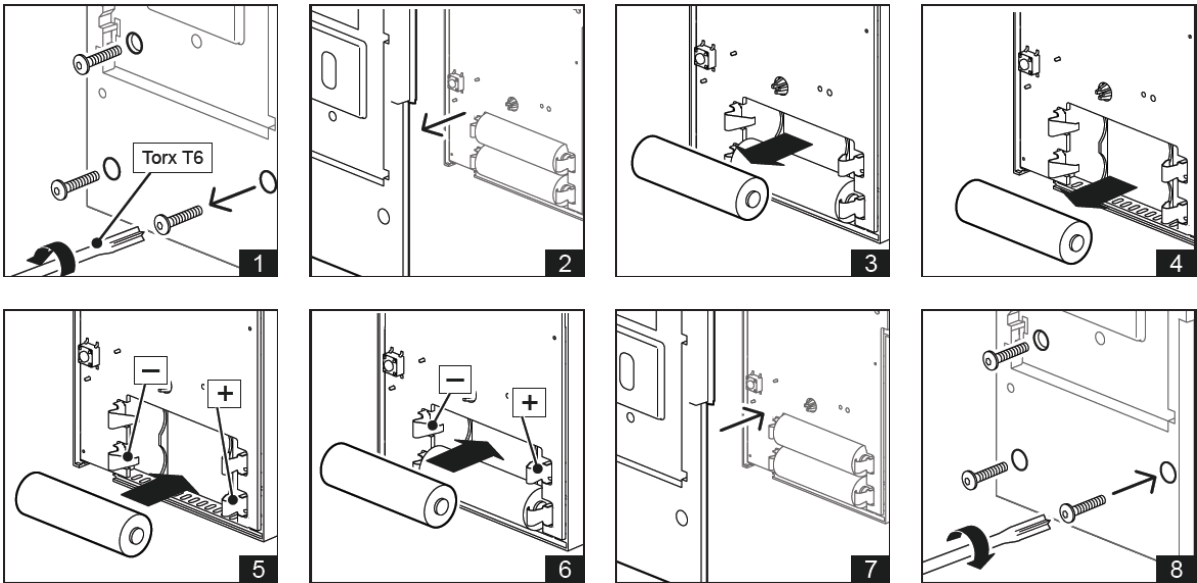
Insert the battery with the correct polarity.



NOTE

Comply with regulations on battery usage and disposal.

Used batteries do not belong in household garbage. They must be disposed of at local battery collection points.



Remote Control Module - *MAC-RCM*

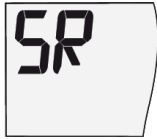
Registering the MAC-RCM on MAC-WSA wireless small actuator wireless partners



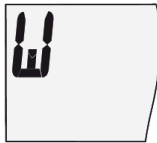
NOTICE

This product description describes specific settings and functions of the MAC-RCM. In addition to these instructions, the product descriptions of other system components, such as wireless partners, are to be observed.

- ▶ Before beginning the registration process, check for the wireless icon on the display of the MAC-RCM to determine if a wireless partner is already registered. If so, delete it (see section “Deleting wireless partners”).



- ▶ Press the knob for 2 s.
- ▶ Use the knob to select the “Service level” function **SR**.
- ▶ Press the knob.



- ▶ Use the knob to select the “Register weekly schedule” function **W**.



- ▶ Press the knob.
Indicator **A** flashes.



- ▶ Press the knob.
The wireless icon flashes.
- ▶ Trigger a registration radiogram on the MAC-WSA. Details can be found in the documentation of the wireless partner.

Data such as device ID, setpoint, etc. are exchanged via radiogram.

- If the registration process is successful, the wireless icon will be continuously displayed and the MAC-WSA wireless small actuator confirms this visually (status LED lights up for approx. 2 s) and acoustically (beeping tone sounds twice).
- Up to 4 MAC-WSA wireless small actuators can be registered simultaneously.
All wireless small actuators must be registered during a registration process.
Adding a further wireless small actuator is not possible afterwards.

NOTE



After a successful registration, the device ID of the wireless partner is permanently stored in the SolarFunk room control module. The registration process does not need to be performed again when the internal energy storage is changed.

- If the registration process fails, the wireless icon is no longer visible on the display.
- ▶ The registration process must be performed again, or you must check the wireless path. See chapter “General installation instructions”, page 5.



Remote Control Module - *MAC-RCM*

Deleting the wireless partner on the MAC-RCM



- ▶ Use the knob to select the “Delete” function **dEL** in the service level.
- ▶ Press the knob until the wireless icon on the display flashes (approx. 3 s).

Malfunction messages

Icon on display	Meaning
ΔI	Wireless communication to at least one registered wireless partner has been interrupted for more than one hour. This error message disappears once a resynchronization of the wireless path occurs. If wireless communication to all registered wireless partners is interrupted, the wireless icon is also no longer displayed.
$\Delta 2$	Wireless communication to at least one registered wireless partner has been interrupted for more than four hours and a resynchronization has failed. If wireless communication to all registered wireless partners is interrupted, the wireless icon is also no longer displayed.
ΔE	The battery capacity of a wireless partner is too low. The batteries of the wireless partner must be replaced.
ΔB	Room control module is defective.

i NOTE

If the malfunction message appears, the batteries of the wireless partner must be changed or the wireless path must be checked. See chapter “General installation instructions”, page 5.



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MAC-WSA Wireless Small Actuator

Application

Wirelessly controlled, battery-powered small actuator for continuous closed-loop control systems. For thermostat valve bodies for direct mounting on commercially available radiator valves for room-specific temperature control in heating systems. The actuator is controlled wirelessly based on the non-proprietary EnOcean wireless protocol.



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Wireless Small Actuator - *MAC-WSA*

Important Information Regarding Product Safety

Safety Instructions

This data sheet contains information on installing and commissioning the product MAC-WSA. Each person who carries out work on this product must have read and understood this data sheet. If you have any questions that are not resolved by this data sheet, you can obtain further information from the supplier or manufacturer.

If the product is not used in accordance with this data sheet, the protection provided will be impaired. Applicable regulations must be observed when installing and using the device. Within the EU, these include regulations regarding occupational safety and accident prevention as well as those from the VDE (Association for Electrical, Electronic & Information Technologies). If the device is used in other countries, it is the responsibility of the system installer or operator to comply with local regulations.

Mounting, installation and commissioning work on the devices may only be carried out by qualified technicians. Qualified technicians are persons who are familiar with the described product and who can assess given tasks and recognize possible dangers due to technical training, knowledge and experience as well as knowledge of the appropriate regulations.

Legend



WARNING

Indicates a hazard of medium risk which can result in death or severe bodily injury if it is not avoided.



CAUTION

Indicates a hazard of low risk which can result in minor or medium bodily injury if it is not avoided.



NOTICE

Indicates a hazard of medium risk which can result in material damage or malfunctions if it is not avoided.



NOTE

Indicates additional information that can simplify the work with the product for you.

Notes on Disposal

For disposal, the product is considered waste from electrical and electronic equipment (electronic waste) and must not be disposed of as household waste. Special treatment for specific components may be legally binding

Wireless Small Actuator - *MAC-WSA*

MAC-WSA Wireless Small Actuator

MAC-WSA Wireless small actuators for valves with connection M30x1.5 manufactured by Macon Controls.



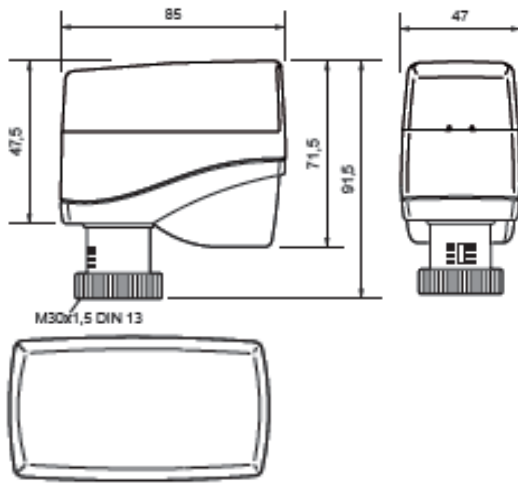
Technical Data

Nominal voltage	Battery-operated, 3 alkaline AA batteries (LR6 1.5 V 3,400 mAh)
Battery life	Approx. 3 years (depending on frequency and method of operation)
Measuring system	Integrated digital temperature sensor; 0 °C to 40 °C; ±0.5 °C at 25 °C 32 °F to 104 °F ±0.5 °F at 77 °C
Interfaces	technoLink® wireless interface: <ul style="list-style-type: none">■ Radiogram: EnOcean radiogram■ EEP 07-20-01 (heating valve)■ Frequency: 868.3 MHz - 315 MHz■ Operating range: Approx. 30 m in buildings (depending on building structure)■ Duty cycle: < 1 %■ Transmission and reception interval: every 10 min.
Motor switch-off	Actuator spindle: extending = load-dependant, retracting = path dependant
Indicator	Status LED
Actuating noise	<31 dB (A)
Nominal stroke	Up to 3 mm
Travel time	15 s/mm
Positioning force	100 N (nominal)
Position indicator	Stroke range scale
Manual adjustment	Only when disconnected from the power supply Socket for hexagon key under the actuator cover, key socket 4 mm Housing
Ambient temp.	0 °C to 200 °C / 32 °F to 392 °F
Degree of protection	IP40
Installation position	Anywhere from vertical to horizontal
Maintenance	Maintenance-free
Weight	180 g / 6.35 oz <ul style="list-style-type: none">■ When used properly, this device complies with the requirements of the R&TTE Directive (1999/5/EC).



Wireless Small Actuator - *MAC-WSA*

Dimensions



Small Actuator Functions

Actuator mode

If an external 0 to 100% EnOcean radiogram is received, the internal loop controller is not active. The transmitted actuating signal is translated into a positioning movement. A suitable wireless single room controller takes over the control functions.

Self-controlling operation

The integrated room temperature controller is activated if no external 0 to 100% EnOcean radiogram is received.

- Without external operator panel (= emergency mode):

The temperature is controlled to a fixed setpoint of 20 °C / 68 °F using the integrated temperature sensor (actual value) and the integrated control function of the actuator.

- With external operator panel (EnOcean technology):

Using the operator panel, the user can freely determine the setpoint or enter his own schedule. The actual value and the setpoint are transmitted via the EnOcean radiogram (EEP 07-20-01). The integrated control algorithm makes room control easy and convenient. If no external temperature sensor (actual value) is connected, the value of the integrated temperature sensor is used as the command value for room temperature control, which is not the proper method of operation (=emergency mode).

Battery monitoring

The battery capacity is continuously monitored. If the battery capacity is too low, this is communicated to the wireless partner and an acoustic signal sounds every 6 hours. If this message is activated, the remaining capacity of the batteries is < 10%.

If the battery voltage continues to drop, the actuator assumes the safety position of 50% (= safety position).

Valve block protection

Block protection prevents the cone from jamming when the valve is inactive for a long time. When block protection is active, the actuator performs a displacement of 50% once every 7 days.

Wireless Small Actuator - *MAC-WSA*

Communication test

A communication test can be started manually by pressing the button located under the hood. Pressing this button (approx. 2 s) checks the signal path to the wireless partner saved in the device. A successful communication test is visually acknowledged (by the status LED) and acoustically acknowledged after the pushbutton is released. The status LED lights up for approx. 3 s.

An unsuccessful communication test is signaled by rapid blinking of the status LED for approx. 3 s.

Energy block (automatic “Window open” recognition)

When a window is open, the flow of heat energy to the room is interrupted. An open window is signified by a large and rapid temperature drop at the MAC-WSA small actuator. If such a drop is measured by the internal temperature sensor, the small actuator closes the valve for 30 min.

After 30 min, the small actuator returns to normal operation and the energy block function is active again.

Frost protection function

If the temperature at the integrated temperature sensors drops below 43 °F, the small actuator opens the valve until 48 °F is reached.

Wireless Interface

Communication with the wireless partner is cyclical (wireless cycle approx. every 10 minutes). At this time, the entire wireless protocol is sent to the wireless partner and values are received from the wireless partner.



NOTICE

This product uses only EnOcean radiograms.

When choosing a wireless partner, make sure that the wireless interface works with EnOcean radiograms and that the wireless actuators being controlled support the particular heating valve standard actuator profile (EEP 07-20-01).



Wireless Small Actuator - *MAC-WSA*

EnOcean Equipment Profiles EEP 07-20-01 (heating valve)

DATA BYTES

Notes

Transmit mode: Message from the actuator to the controller

DB_3:	Actual value 0 to 100%, linear n=0 to 100	■ Positioning feedback of the current stroke position.
DB_2.BIT_7:	Service on	■ BIT for evaluating whether service mode is active. When service mode is active, DB2.BIT4 to 7 can be used to carry out service functions like “Learn stroke” (not implemented in MAC-WSA); “Forced OPEN”; “Forced CLOSED”; and “Set zero point” – in combination with a suitable wireless partner.
DB_2.BIT_6:	Energy input enabled	■ Not applicable for MAC-WSA This BIT is required for actuators that have a wired power supply.
DB_2.BIT_5:	Energy memory > xx% charged	■ Not applicable for MAC-WSA This BIT is required for actuators that have a wired power supply.
DB_2.BIT_4:	Battery capacity > 10%	■ Monitoring of the battery capacity If the capacity of the batteries is below 10%, a message of Bit4 = 0 is issued.
DB_2.BIT_3:	Contact, cover open	■ Not applicable for MAC-WSA BIT for evaluation of a cover contact
DB_2.BIT_2:	Failure temperature sensor, out of range	■ BIT for evaluation of whether the temperature sensor is working correctly.
DB_2.BIT_1:	Detection, window open	■ For evaluation of whether the “Window open” identification is active. The “Window open” identification occurs via the evaluation of the internal temperature sensor (gradient).
DB_2.BIT_0:	Actuator obstructed	■ Currently not used by MAC-WSA All types of malfunctions are evaluated and reported (not in a differentiated manner, but only as a general malfunction message).
DB_1:	Temperature 0 °C to 40 °C / 32 °F to 104 °F, linear n=0 to 255	■ Current measurement value of the internal temperature sensor
DB_0.BIT_7:	Not used	
DB_0.BIT_6:	Not used	
DB_0.BIT_5:	Not used	
DB_0.BIT_4:	Not used	
DB_0.BIT_3:	Learn button 0b0 Teach-in telegram 0b1 Data telegram	■ The identification for the teach-in frame and the normal data frame is stored here. The teach-in radiogram is only sent to the wireless partner with the “Teach-in” function.
DB_0.BIT_2:	Not used	
DB_0.BIT_1:	Not used	
DB_0.BIT_0:	Not used	

Wireless Small Actuator - *MAC-WSA*

Receive mode:	Commands from the controller to the actuator	Notes
rx time:	max. 1 s	<ul style="list-style-type: none"> ■ The bidirectional data transfer from the wireless partner to the wireless small actuator must be completely finished within a maximum time window of 1 s.
DB_3:	Valve set point 0 to 100%, linear n=0 to 100 Temperature set point 0 °C to 40 °C / 32 °F to 104 °F, linear n= 255 to 0	<ul style="list-style-type: none"> ■ The temperature value (setpoint) or control value is transferred here from the external wireless partner. Which information is sent to the actuator is defined by DB_1.BIT_2.
DB_2:	Temperature actual from RCU 0 °C to 40 °C / 32 °F to 104 °F , n=255 to 0 Room controller unit	<ul style="list-style-type: none"> ■ The current temperature value (actual value) or control value is transferred here from the external wireless partner. Which information is sent to the actuator is defined by DB_1.BIT_2.
DB_1.BIT_7:	Run init sequence	<ul style="list-style-type: none"> ■ A “Set zero point” service function is stored here. This function needs a suitable wireless partner that supports the function.
DB_1.BIT_6:	Lift set	<ul style="list-style-type: none"> ■ Not applicable for MAC-WSA The service function “Learn stroke” is here. However, it requires a suitable wireless partner that supports the function.
DB_1.BIT_5:	Valve open	<ul style="list-style-type: none"> ■ A “Forced OPEN” service function is stored here. However, it requires a suitable wireless partner that supports the function.
DB_1.BIT_4:	Valve closed	<ul style="list-style-type: none"> ■ A “Forced CLOSED” service function is stored here. However, it requires a suitable wireless partner that supports the function.
DB_1.BIT_3:	Summer bit, reduction of energy consumption	<ul style="list-style-type: none"> ■ The “summer function” is stored in this BIT and is transferred to the actuator. If the “summer bit” is transferred from the wireless partner, the communication cycle is extended from 10 minutes to 30 minutes. This reduces the energy consumption of the actuator during phases in which no heating occurs and has a positive effect on the service life of the batteries. The function must be supported by an external wireless partner of the actuator and can be optionally set.
DB_1.BIT_2	Set point selection DB_3 0b0 set point 0 to 100%, 0b1 temperature set point 0°C to 40°C / 32 °F to 122 °F	<ul style="list-style-type: none"> ■ Here you specify whether the temperature measurement value or the actuating signal is made available to the wireless actuator as an input signal.
DB_1.BIT_1	Set point inverse	<ul style="list-style-type: none"> ■ The inversion of the actuating signal is possible with this BIT.
DB_1.BIT_0	Select function 0b0 RCU 0b1 service on	<ul style="list-style-type: none"> ■ You use this BIT to specify whether the actuator should operate in normal mode (RCU) or service mode (service on). However, it requires a suitable wireless partner that supports this function.



NOTE

You can find detailed information about the protocol description on the Internet page www.enocean.com



Wireless Small Actuator - *MAC-WSA*

General Information

- The actuator operates in a 10-minute communication cycle (except for summer bit = active; the cycle is 30 minutes in this case). There is no communication with the wireless partner on an automatic basis between these cycles.

A connection can be established manually through a communication check triggered on the actuator (e.g. for checking the wireless path during commissioning). A complete data transfer does not occur when a communication check is manually triggered. The data relevant to the control technology is not updated.

A new calculation of the control deviation and an associated repositioning of the valve occurs every 10 min. after the data exchange with the wireless partner.

- If the “summer bit” is transferred from the wireless partner, the communication cycle is extended from 10 minutes to 30 minutes. This reduces the energy consumption during phases in which no heating occurs and has a positive effect on the service life of the batteries.

The function must be supported by an external wireless partner and can be optionally set.

- The external wireless partner determines when summer mode is active. This operating mode is active, for example, during the period in which no heating occurs (i.e., the primary power supply for heating is switched off).
- The batteries are dimensioned so that approx. 5,500 actuating cycles of 15 s each are possible. Avoiding an oscillating control circuit thus depends greatly on how the settings of the loop controller parameters (for external loop controllers) were selected.

We recommend that the external loop controller be set to have as long a time delay as possible.

Wireless Small Actuator - *MAC-WSA*

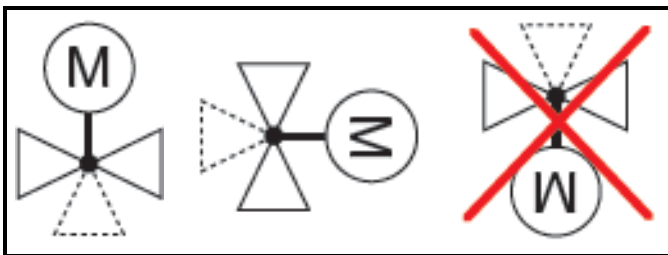
Valve Installation



WARNING!

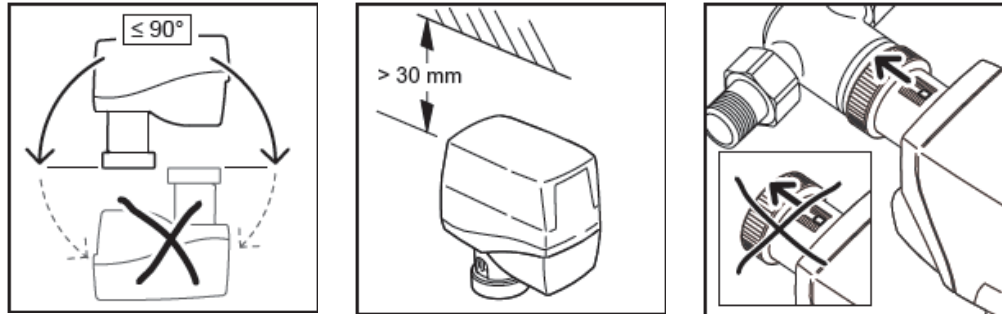
The valve may only be installed by qualified technicians. In addition to the generally valid installation guidelines, the following points are to be observed:

- The pipeline system and the interior of the fitting must be free of foreign objects. In the event of contaminated media, dirt collectors are to be inserted upstream of the valves with fine screens, mesh width 0.25 mm.
- There must be no tension between the valve and the pipeline connection.
- To avoid eddy formations in the valve body, the valve should be installed in a straight section of the pipe. A distance of 10 times the nominal diameter is recommended between the valve flange and manifold or other similar parts.
- The installation location is to be selected so that the ambient temperature at the actuator is kept between 0 – +50 °C / 32 °F TO 122 °F
- When carrying out installation, the permissible maximum pressure difference Δp and the specified direction of flow must be observed (see table in "Types" section).
- The three-way valves are to be used as mixing valves. Observe the specified direction of flow.
- Once the valve is installed, make sure the ball in the valve seating can be moved easily by pushing in the valve stem.
- Approximately 30 mm of free space is required above the actuator to install the actuator and remove the housing cover.
- For safety reasons, do not suspend the small actuators from under the valve.
- Observe the direction of flow arrow on the valve body. Inverting the direction of flow impairs control behavior.



Wireless Small Actuator - *MAC-WSA*

Installing the Small Actuator



NOTICE

MAC-WSA Wireless Small Actuator must not be operated without a valve.



NOTICE

Insert the batteries with the correct polarity.

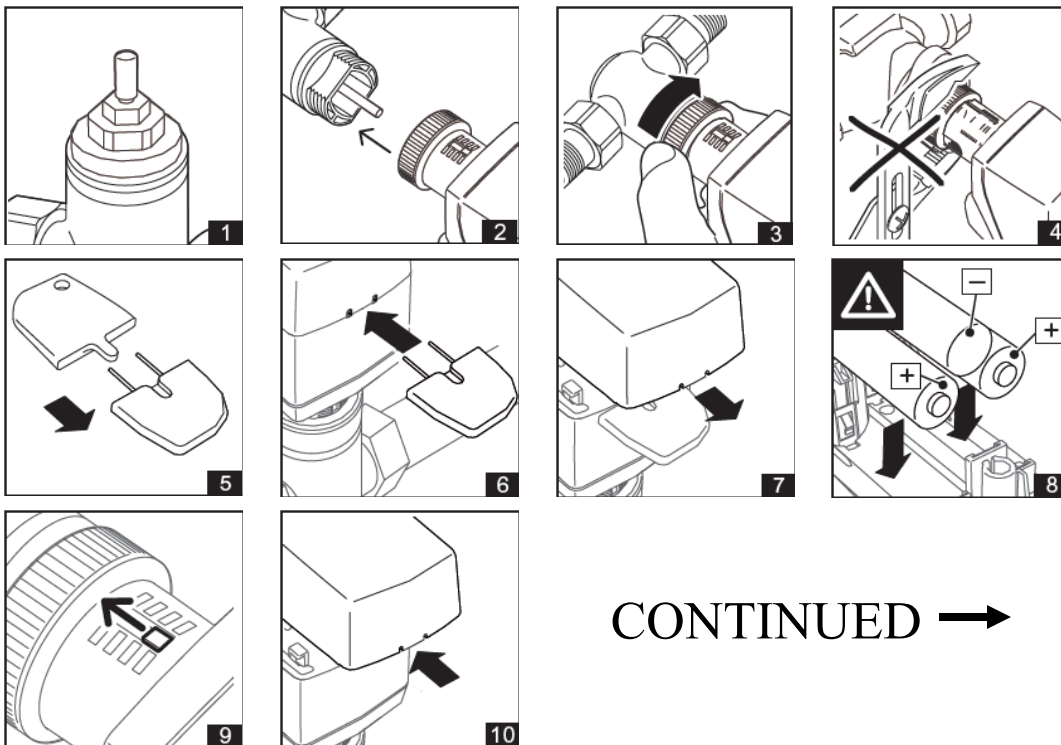
When inserting the batteries, observe the polarity as marked in the battery compartment.

Use only alkaline batteries (type: AA, LR6 1.5 V).



CAUTION

Do not dispose of used batteries in the household garbage. Dispose of them in an environmentally friendly manner.



CONTINUED →



Wireless Small Actuator - *MAC-WSA*

- ▶ Place the small actuator on the threaded connection of the valve and hand tighten using the union nut.
- ▶ Open the battery compartment cover using the special key supplied by inserting it into the intended place. Remove the cover.
The special key is included with delivery of the small actuator.
- ▶ After all batteries have been inserted into the battery compartment, an initialization run is performed automatically.
The status LED flashes during the installation run.
 - The teach-in function can now be used for small actuator on the wireless partner.
 - If the teach-in function has not been used for a wireless partner within 1 h, the actuator goes into emergency mode.



NOTE

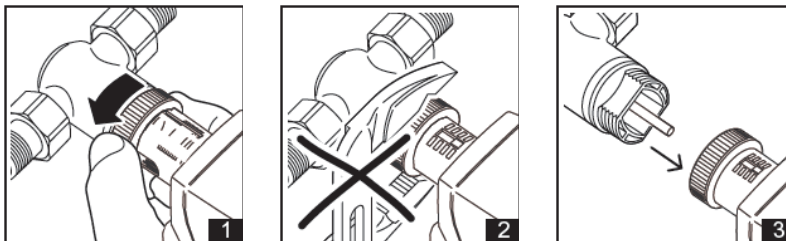
After the batteries are changed, it is necessary to carry out an initialization run by pressing the pushbutton (2) briefly.

Removing the Small Actuator



CAUTION

Before beginning to remove the unit, make sure that no differential pressure builds up in the valve body before beginning work. If necessary, close the gate valve and turn off pumps.
After the pipeline has cooled off, you can begin removal of the small actuator.



- ▶ Remove the battery.
- ▶ Loosen the union nut.
- ▶ Remove the small actuator from the valve.



Wireless Small Actuator - *MAC-WSA*

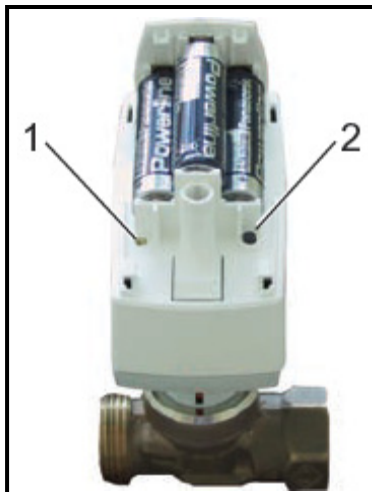
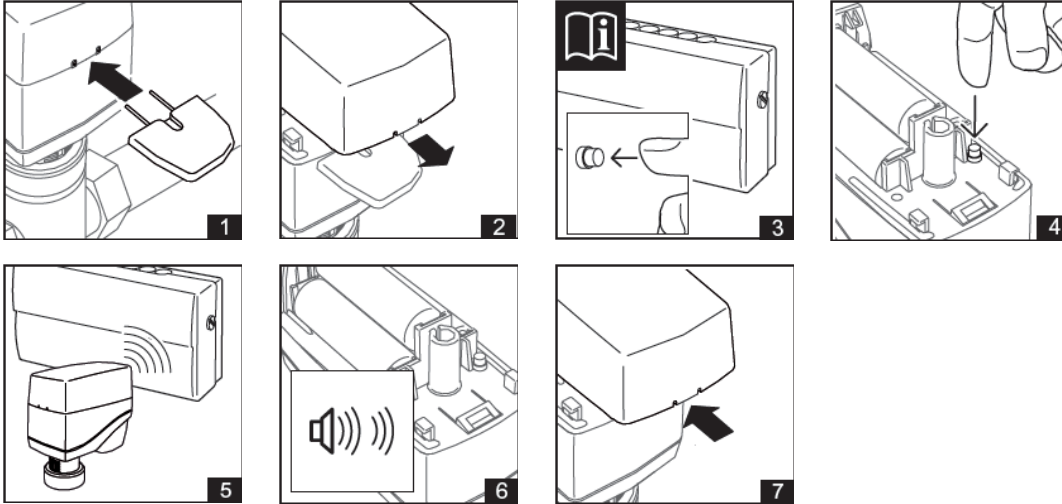
Commissioning



NOTICE

This product description describes specific settings and functions of the MAC-WSA. In addition to these instructions, the product descriptions of other system components, such as wireless partners, are to be observed.

- The buttons and LED displays that are used during commissioning are located inside the housing.
- Remove the housing cover before commissioning (Figures 1 and 2).



(1) Status LED
(2) Pushbutton



Wireless Small Actuator - *MAC-WSA*

Using the Teach-In Function for the MAC-WSA on a Wireless Partner

- ▶ Set the wireless partner to teach-in standby mode (fig. 3). Details can be found in the documentation of the wireless partner.
- ▶ Trigger a teach-in radiogram on the MAC-WSA by pressing the button (2) on the MAC-WSA for approx. 1 s (fig. 4). The status LED (1) should briefly light up once and a short signal tone should sound after the pushbutton is released (fig. 6).
 - The wireless partner confirms that the teach-in function was successful. Details can be found in the documentation of the wireless partner.
 - The wireless small actuator confirms visually that the teach-in function was successful (status LED lights up for approx. 2 s) and acoustically (beeping tone sounds twice).
- ▶ Close the housing of the MAC-WSA by snapping the cover back into place (fig. 7).



NOTE

After successful registration, the device ID of the wireless partner of the MAC-WSA is permanently stored in the small actuator. The registration process does not need to be performed again when the batteries are changed.

- Example: Data exchange teach-in frame while teach-in function is running, excerpt from the WinEtel Program by Enocean

					DB3	DB2	DB1	DB0	ID3	ID2	ID1	ID0	Stat	
Learn button of actuator	A5	5A	0B	07	80	08	0A	80	01	00	0F	1C	00	50
Loop controller response	A5	5A	0B	07	80	0F	FF	F0	FF	EE	CD	81	00	CB

Turning Valve Block Protection On and Off

Switching on

- ▶ Press the button (2) for 5 s. Release the button when the status LED has flashed 5 times. After the button (2) is released, the status LED briefly lights up for approx. 2 s.

Switching off

- ▶ Press the button (2) for 5 s. Release the button when the status LED has flashed 5 times. After the button (2) is released, the status LED (1) is off for approx. 3 s.

Performing a Communication Test

- ▶ Press the button (2) for 2 s. Release the button when the status LED (1) has flashed 2 times. A successful communication test is visually acknowledged (by the status LED) and acoustically acknowledged after the pushbutton is released. The status LED lights up for approx. 3 s. An unsuccessful communication test is signaled by rapid blinking of the status LED for approx. 3 s.



NOTE

A successful communication test does not result in an adjustment of the valve position. This does not occur until the next regular data exchange.



Wireless Small Actuator - *MAC-WSA*

i **NOTE**
In case of an unsuccessful communication test, check the wireless partner and the wireless path.

i **NOTE**
If wireless communication to the wireless partner is interrupted for >1 h, the wireless small actuator goes into emergency mode.
When a proper radiogram is received, the wireless small actuator returns to normal operation automatically.

Status Message and Data Reception

- When the actuator comes out of sleep mode (every 10 min.), it sends its status to an external wireless partner.
-

i **NOTE**
The data transfer from the wireless partner to the wireless small actuator must be completely finished within a maximum time window of 1 s.

- Example: General data communication

Excerpt from the WinEtel Program by Enocean

Wireless small actuator runs with an external wireless partner (operator panel). The actual and setpoint value is transferred.

					DB3	DB2	DB1	DB0	ID3	ID2	ID1	ID0	Stat	
Actuator status	A5	5A	0B	07	1E	10	0A	08	01	00	0F	1C	00	14
Loop controller response	A5	5A	0B	07	93	6A	04	08	FF	EE	CD	81	00	56



Wireless Small Actuator - *MAC-WSA*

Manual adjustment



NOTICE

Manual adjustment may only be performed when the actuator is installed.

- The small actuator must be disconnected from the power supply when performing manual adjustment, which means at least one of the batteries must be removed.
- A hexagon key (key socket 4 mm) can be used to move the actuator into any position.



NOTICE

If you manually adjust until the slip clutch responds, turn the hexagon key half a turn in the opposite direction after the manually set stroke position has been reached.





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OPERATION

The Macon one-pipe steam valve assembly consists of the reliable MTW direct mounting thermostat. The thermostatic head contains a temperature sensitive wax which expands and contracts on a rise and fall of temperature in the sensed area. When the temperature rises above the temperature selected, pressure from the expanding wax closes the valve, preventing or restricting the flow of steam through the radiation unit. When the room temperature drops below the selected temperature, the valve opens and allows an increase of steam flow through the radiation unit. This modulating process continues automatically to maintain the temperature you selected. The OPSK controls room temperature by regulating the amount of air and steam in the radiator.

FEATURES & BENEFITS

- Compact dimensions
- Nickel-plated, forged brass valve
- Thermostat may be locked at or limited to any desired temperature or temperature range
- Actuators may be changed without shutting down the system
- Valve may be installed by dropping the system down to zero pressure
- Individual room control for greater comfort
- Replaceable insert
- Stainless steel spindle
- Fuel savings up to 30%
- Nonelectric - fully automatic
- Prevents over- and under-heating
- Reliability
- Remote thermostats available - call or write for the distributor nearest you!
- Vent and vacuum breaker included
- The OPSK helps to minimize large temperature swings inherent in one pipe steam systems.

OPTIONS

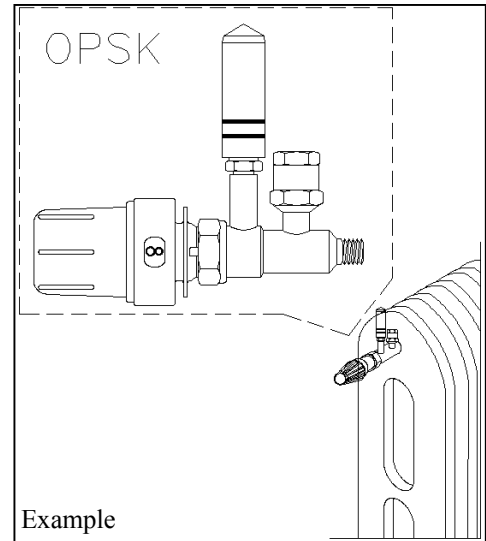
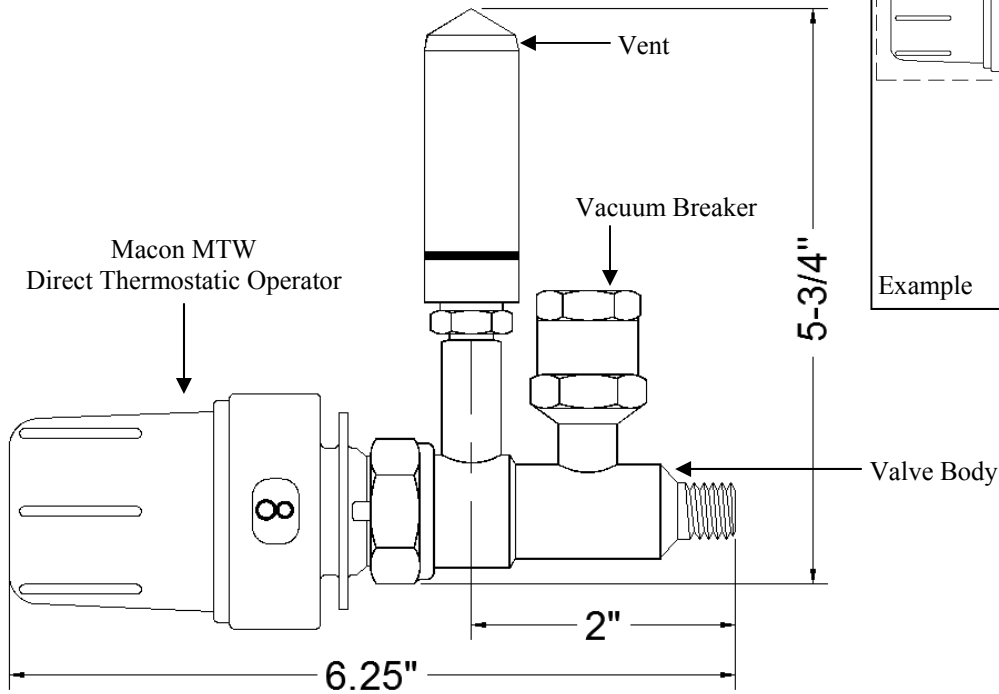
The OPSK can be fitted with the following thermostatic operators:

- MTW (Standard) - direct mount
- MTWZ - direct mount w/remote sensor
- ENTL - remote dial
- ENTLZ - remote dial w/remote sensor
- VM Series - electric actuator
- Other operators available - contact factory

Important:

1. Installing the OPSK does not eliminate other controls in the system. The boiler must be cycled in some manner so that condensate can return to the boiler and eliminate boiler flooding.
2. If the boiler is cycled from a space thermostat in one zone, do not apply a radiator valve to that zone's radiation.
3. Do not apply a radiator valve in a one-pipe steam system that does not use steam air vents venting to the atmosphere on each radiation unit.
4. The VB-18 vacuum breaker is recommended and assists in the return of condensate. Integral installation reduces vacuum problems.
5. Very effective with system pressure range 0-1½ PSI. Suggested maximum operating pressure 2 PSI.





DATA - One-pipe Steam Valve Assembly

Maximum temperature: 248°F
 Disc Material: EPDM
 Valve body material: Forged, nickel-plated brass
 Body style: Angle pattern
 Connections: 1/8" male NPT, fits in vent tapping of the radiator
 Temperature range: 46°-82°F
 Maximum movement: .125 (3mm)
 Movement per 1°F change in ambient: .007 (.15mm)

Note: Additional information and installation instructions can be found in Technical & Service Section.

Dial Setting	Room Temperature (F)
0	Off
*	46°
1	54°
3	61°
5	68°
6	72°
7	76°
8	80°
9	82°



T23000

NT Series Valve Insert for all 1/2", 3/4"
Valves & 1" N10877



T25000 (LBSD)

NT Series Valve Insert (Large Body, Small
Disc) for 1" N10777, 1" N10970



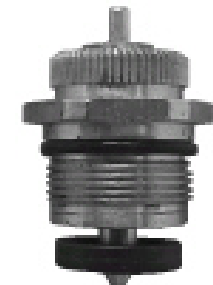
T25000 (LBLD)

NT Series Valve Insert (Large Body, Large
Disc) for 1" N10677, 1-1/4" N10697, 1-1/4"
N10797, 1-1/4" N10897



OPSK-Insert

Valve Insert for OPSK One Pipe Steam Valve



ICT

Insert Changer Tool for Valves using T23000
Insert



NHN

Metal Handwheel Operator w/Key (allen wrench) for NT Series Valves



ENH

Manual Handwheel Operator for NT Series Valves



PBR

Protection Ring for MTW, MTWZ, ENTL B46000 & ENTLZ B56000 (prevents removal of Thermostatic Operators)



MFK

Protection Cover for MTW & MTWZ Thermostatic Operators



T23000-Wrench

Wrench for T23000 Insert

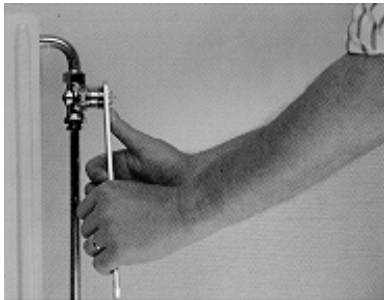


NT-Valve-Ext

Accessory Valve Extender for Heat Dissipation



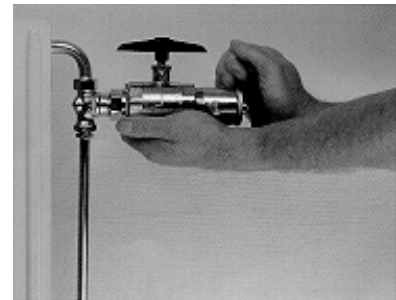
The Macon Insert Changer allows removing an insert without shutting down a hot water or low pressure steam heating system. Follow the easy steps under the photographs. Reverse the procedure when re-installing the insert.



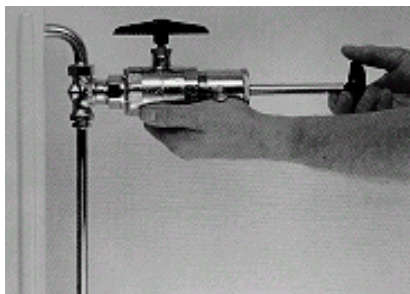
1. Using a 15/16" or 23 mm wrench, loosen the insert in the valve body by turning counterclockwise to break the metal to metal seal. Do not turn the insert out. Turn it back clockwise, tighten it lightly, if needed to prevent any objectionable leakage.



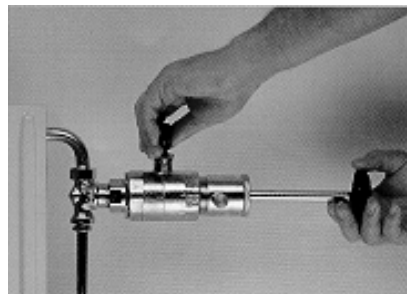
2. Place the socket of the insert changer onto the valve insert. Press in the stem handle of the tool to ensure a firm engagement.



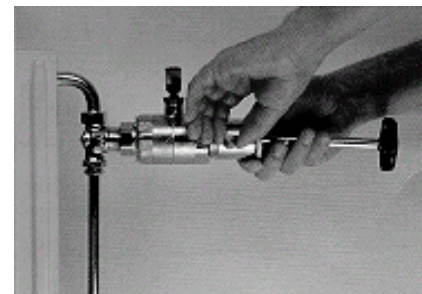
3. While continuing to press in on the stem handle, engage the thread of the union tailpiece of the changer with the thread on the neck of the valve. Turn the changer onto the valve neck until it is firmly in place and sealed.



4. Check that the drain cock is closed and that the bonnet of the outer chamber of the changer is assembled securely. Turn the changer handle counterclockwise at least 3 full turns to ensure that the insert is free. Pull out on the changer handle to clear the ball valve.



5. Close the ball valve by turning its handle so that it is across the axis of the changer.



6. Open the drain cock to relieve water or steam pressure in the chamber.



7. Holding the changer so that it does not turn, turn the bonnet out of the chamber.



8. Remove the insert and replace it.

**Suitable for all
NT - T23000 Inserts**



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**Existing Warren Webster
1/2" Siphon Hand Valve**

+

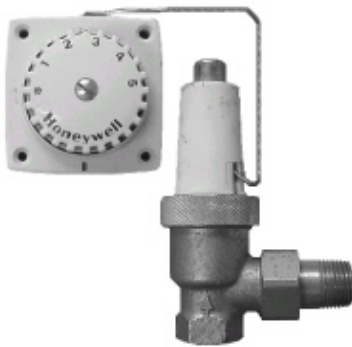


**Tunstall/Macon E-Z Fit
Conversion Kit #RSWW-1/2-SYL**

=



**New Self-Contained Valve w/Macon
ENTZ Thermostatic Operator Shown**



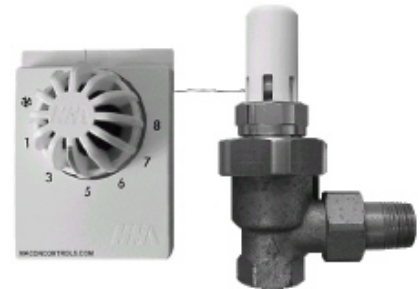
**Existing Honeywell Braukmann
V110 Series Valve with
Remote Dial**

+



**Tunstall/Macon E-Z Fit
Conversion Kit #RSBRK**

=



**New Self-Contained Valve w/Macon
ENTL Thermostatic Operator Shown**



**Existing Flair Valve
with Direct Mount**

+



**Tunstall/Macon E-Z Fit
Conversion Kit #RSFL**

=



**New Self-Contained Valve w/Macon
ENT Thermostatic Operator Shown**

NOTE: ENT (old style) = MTW-28 (new style)
ENTZ (old style) = MTWZ (new style)



**Existing Flair Valve
with Direct Mount T'Stat**

+



**Tunstall/Macon E-Z Fit
Conversion Kit #RSFL**

=



**New Self-Contained Valve w/Macon
ENT Thermostatic Operator Shown**



**Existing Danfoss RA
with RA-6 Control**

+



**Tunstall/Macon E-Z Fit
Conversion Kit #RSDNF-RA**

=



**New Self-Contained Valve w/Macon
ENTZ Thermostatic Operator Shown**



**Existing Danfoss RA2000
1/2" #013G8015**

+



**Tunstall/Macon E-Z Fit
Conversion Kit #RSDNF-TT4**

=



**New Self-Contained Valve w/Macon
ENT Thermostatic Operator Shown**



NOTE: ENT (old style) = MTW-28 (new style)
ENTZ (old style) = MTWZ (new style)

Tunstall / Macon E-Z Fit™ Conversion Kits for Manual Radiator Valve Applications

Part #	Valve Manufacturer
RSARM	Armstrong MV2, MV3
RSBJ	Barnes & Jones Series 88
RSBJ-F,K	Barnes & Jones Series F,K
RSDL	DAHL - Canada
RSDNB	Dunham 740, 840
RSHA	Hammond
RSHF	Hoffman 180
RSIL	Illinois 65
RSMA	Marsh
RSMEP	MEPCO
RSSA	Sarco
RSST	Sterling
RSTR	Trane
RSWW	Warren Webster
RSWW-SYL	Warren Webster Sylphon

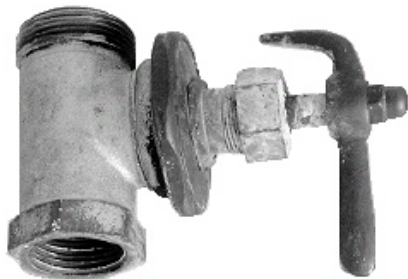
Macon RS Inserts for Conversion to Macon Thermostatic Operators

Part #	Valve Manufacturer
RSAMK-TT6	Ammark-SYR ½, ¾ 70 Series
RSBRK	Braukmann: V110, V105
RSB&G	Bell & Gossett (ITT)
RSDNF-RA	Danfoss: RA
RSDNF-TT1	Danfoss: RAV ¾" & 1" Hor. Angle
RSDNF-TT2	Danfoss: RAV ½", ¾" Vert. Angle, Straight
RSDNF-TT3	Danfoss: RA2000 ¾" Vert. Angle, Straight
RSDNF-TT4	Danfoss: RA2000 ½" Vert. Angle, Straight
RSFL	Flair
RSBRK-V100	Honeywell Braukmann V100
T23000	Minneapolis Honeywell V5061
RSTACO	Taco (Heat - Gard)
RSTACO-TT5	Taco (1990 On), Eire Techmate
RSTND	Tour & Andersson

If not listed, contact a distributor.

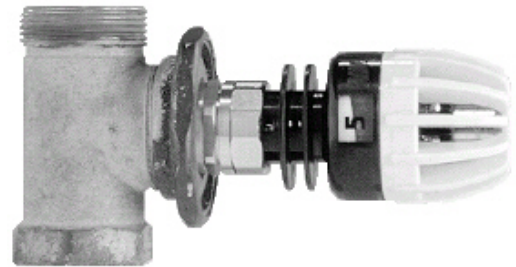
Tunstall E-Z Fit conversions can be engineered for all manual radiator valves. Sample may be required.

If not listed, contact your representative or the engineering staff at Tunstall Corporation.



Manual Radiator Valve

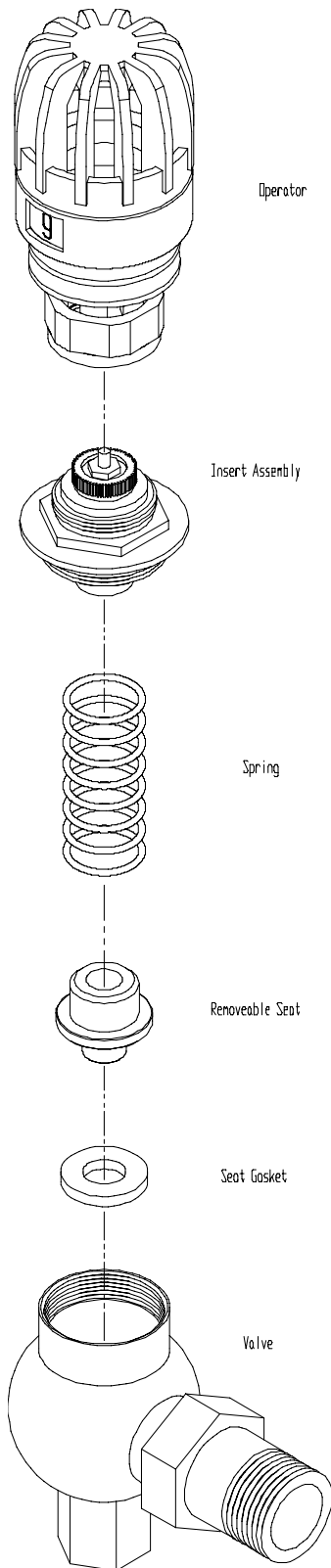
Converts into:



Macon ENT B26000 (old style shown)
Macon MTW-28 (new style)

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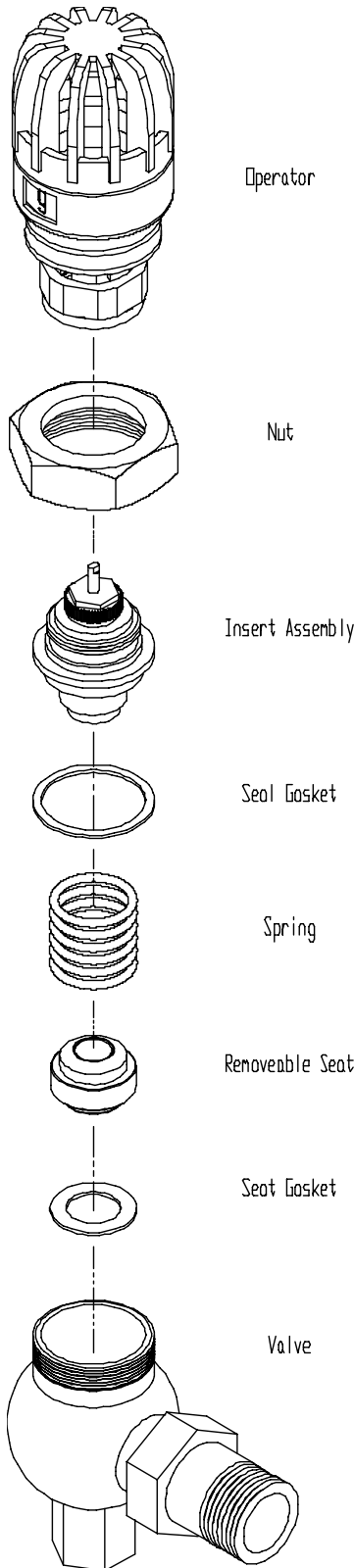
1. Remove existing valve components. Thoroughly clean and inspect interior of valve.
2. Drop in the supplied removable seat. The seat should have a gasket on the bottom side and a spring affixed to the top.
3. Thread in Tunstall insert assembly and secure.
4. Affix the operator to the top of the insert assembly.

Pictured to the left is a typical installation. Retrofit kit may or may not include spring and removable seat. Skip the steps that do not apply and proceed with your installation.

That's it!

Now your radiator is under "Macon Control."

If you have any questions do not hesitate to call your representative or the factory.



1. Remove existing valve components. Thoroughly clean and inspect valve seat.
2. Drop in the supplied removable seat. Be certain the seat gasket is on the bottom. Now place the spring on top of the seat and make sure that it reaches the valve shoulder.
3. Drop the insert assembly and seal gasket (if applicable). Secure the Tunstall E-Z Fit™ conversion kit with the nut supplied.
4. Affix the operator to the top of the insert assembly.

Pictured to the left is a typical installation. Kit may or may not include spring, removable seat, or upper insert seal gasket. Skip the steps that do not apply and proceed with your installation.

That's it!

Now your radiator is under "Macon Control."

If you have any questions do not hesitate to call your representative or the factory.

Macon Controls has a solution that upgrades an existing thermostatic control operator while the heating system is functioning. There is no need to shut off or drain the system with the Macon UA. Just identify the existing thermostatic operator, select the Macon UA, add a Macon thermostat and your valve is upgraded to the Macon Controls standard of quality!



American Steam



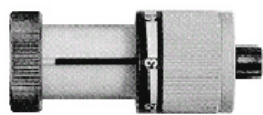
UA-AMS



Ammark Series 6



UA-AMK/6



Ammark Series 7



UA-AMK/7



Armstrong LV-4



UA-ARM



Bell & Gossett (ITT)
(Thermomate)



UA-B&G



Braukmann
V110, V105



UA-BRK-V110, V105



Honeywell
Braukmann V100



UA-BRK-V100



Danfoss/RAV



UA-DNF-RAV



Danfoss/RAVL



UA-DNF-RAVL



Danfoss/RA2000



UA-DNF-RA2000



MACON:

NT



NTB



ENT



MTW

®





Drayton TRV2



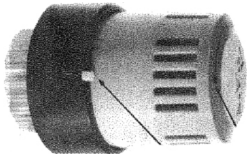
UA-DRY



Erie/Techmate



UA-ER



Flair RP367, RP610



UA-FL-SP



Flair RP257, RP266
RP258, RP518



UA-FL-SP2



Flair RP510, RP511,
RP512, RP513



UA-FL-SP3



Heimeier



UA-HEIM



Honeywell Minor



UA-NM



ISTA



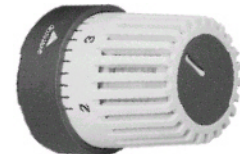
UA-ISTA



MNG/Regin



UA-MNG



Oventrop/Stadler/MEPCO



UA-OV



Taco



UA-TACO



Tour & Anderson RVT



UA-TND-RVT



Tour & Anderson RVT



UA-TND-RVT

Custom Engineering Available.

Consult Factory.



12-Month Warranty

WARRANTY: All MACON products are under warranty for a period of 12 months from date of purchase against faulty workmanship or defective material under normal usage and service. Under the warranty we will replace any product or part F.O.B. our factory when goods have been returned prepaid to us, and which upon our examination shall disclose to have been defective. The company shall not be held liable for consequential damage of any kind and no other claims will be met. All goods repaired under warranty will be shipped back to customer transportation collect. Under no circumstances is the valve to be subjected to more than 15 psi steam.

RETURNED GOODS: Unauthorized return of materials is not accepted. Credit for authorized returns only will be issued at the invoice price or prevailing price, if lower, less a restocking charge of minimum 25%. Minimum charge \$25.00.

Obsolete materials and articles made to order or specification cannot be returned.

If inspection shows goods returned are defective due to:

1. Manufacture - goods will be replaced or repaired at no charge under the guarantee and shipping costs will be reimbursed.
2. Usage - e.g., valves full of dirt, rust or any foreign material, incorrect usage, over-tightening on threads, abuse or incorrect reassembly, etc. Goods will be replaced or repaired at cost and charged to the user, and cost of shipment will be charged to user.

Macon Controls obligation under this warranty is limited to the repair or replacement of defective parts and does not include reimbursement for expense of removing or installing the product.

NOTES:

- Prices subject to change without notice
- Design, specification and details subject to change without notice
- Full Terms and Conditions can be found at www.tunstall-inc.com



Straight valve with straight nipple.
NPT - female inlet, male union outlet.
1/2" - N10737
3/4" - N10757
1" - N10777
1-1/4" - N10797



Vertical angle valve with straight nipple.
NPT - female inlet, male union outlet.
1/2" - N10637
3/4" - N10657
1" - N10677
1-1/4" - N10697



Horizontal angle valve with straight nipple.
NPT - female inlet, male union outlet.
1/2" - N10837
3/4" - N10857
1" - N10877
1-1/4" - N10897



Sweat valve with female inlet and outlet.
1/2" - N10930
3/4" - N10950
1" - N10970



EDV - Designed for mixing or diverting flows in various water based heat or cooling transmission systems, such as radiator loops, floor heating, etc. Add appropriate operator.



OPSK - Consists of the reliable MTW direct mounting thermostat. It controls room temperature by regulating the amount of air and steam in the radiator.



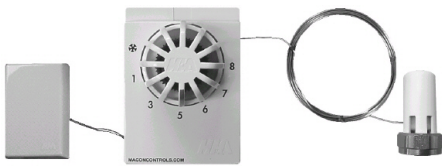
MTW - Non-Electric direct mounting thermostat with a numerical window reading that corresponds to various temperatures. May be limited or locked if required. Features heat diffusing rings to dissipate heat away from sensor for added accuracy.



MTWZ - Non-Electric, fully automatic thermostat with valve mounted temperature setting dial and remote sensor.



ENTL B46000 - Non-Electric, fully automatic remote thermostat with built-in remote sensor and temperature setting dial.



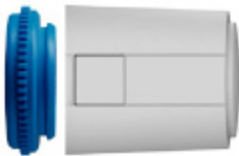
ENTLZ B56000 - Non-Electric, fully automatic thermostat with separate remote sensor and remote temperature setting dial.



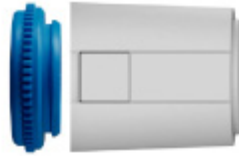
VMC (normally closed) & VMO (normally open) - 24-Volt controller designed for use with the Macon NT series valves. Ideal for control of radiators, fin-tube, zones, fan coils, heat pumps, radiant floor, etc...



VM 2-10V is used to regulate valves in heating and cooling systems using a built-in processor.



ZMC ES (End Switch - normally closed) is controlled by a 24V room thermostat with two-point output or pulse-width modulation.



ZMC-DDC (Proportional - normally closed) is used to regulate valves via a central DDC system or by a room thermostat.



MVA 2-10V - Motorized Electric zone control actuator for controllers with continuous output in conjunction with single-room control systems.



Valves - Macon Straight, Vertical Angle, Horizontal Angle or Copper x Copper Sweat as Required:

Forged brass, nickel plated, female inlet, male union outlet or copper x copper brass body.

EPDM seat suitable for 15 psi steam, 250°F hot water, maximum static pressure 145psi.

Replaceable insert assembly with raised knurled serrations and stainless steel spindle and stainless steel spring.



Vertical Angle Valve with straight nipple. NPT - female inlet, male union outlet.
1/2" N10637
3/4" N10657
1" N10677
1 1/4" N10697



Straight valve with straight nipple NPT - female inlet, male union outlet.
1/2" N10737
3/4" N10757
1" N10777
1 1/4" N10797



Horizontal angle valve with straight nipple. NPT - female inlet, male union outlet.
1/2" N10837
3/4" N10857
1" N10877
1 1/4" N10897



Sweat valve with female inlet and outlet.
1/2" N10930
3/4" N10950
1" N10970

Direct Mount Thermostat - Macon Model MTW:

Direct acting, built in sensor, wax filled, hysteresis .9°F, max movement per 1°F = .007

Range 46°-82°F with limit and locking features

Must have positive shut off, maximum differential pressure 20psi H2O

Heat diffusing rings and knurled serration that lock the thermostatic dial to the valve body

Tamper proof, Non-Removable high impact plastic protection rings

12 month warranty, and must conform to ASHRAE Standard 102p-1983



MTW

Remote Sensor Thermostat - Macon Model MTWZ:

Valve mounted setting knob with remote temperature sensor

Capillary to be stainless steel, 78" long minimum

Provide high impact plastic sensor guard

Temperature range 46-82°F, with limit and locking features

Must have positive shut off, maximum differential pressure 20psi H2O

Heat diffusing rings and knurled serration that lock the thermostatic dial to the valve body

12 month warranty, and must conform to ASHRAE Standard 102p-1983



MTWZ (Shown with Valve)

Remote Dial Thermostat Model Macon ENTL-B46000:

Remote mounted dial with sensor behind dial, minimum 78" stainless steel capillary

High impact plastic dial operator, range 46°-80°F with limit and locking features

Must have positive shut off, maximum pressure differential 20psi H2O

12 month warranty, and must conform to ASHRAE Standard 102p-1983



ENTL B46000
(Shown with Valve)

Combination Remote Dial / Remote Sensor Thermostat - Macon Model ENTLZ-B56000:

Combination remote setting dial/remote sensor, minimum 78" stainless steel capillary to

Setting dial and 78" stainless steel capillary to temperature sensor

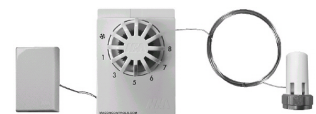
Requires the capability to remove temperature sensor from dial with minimum 78" S.S. capillary

Provide high impact plastic sensor guard

Temperature range 46-80°F, with limit and locking features

Must have positive shut off, maximum differential pressure 20psi H2O

12 month warranty, and must conform to ASHRAE Standard 102p-1983



ENTLZ B56000



HELPFUL HEATING HINTS

- 1 sq. ft. steam radiation in a room at 70° gives off 240 BTU/hr.
- 1 boiler horsepower is equivalent to 134 sq. ft. of steam radiation.
- 1 gal. of oil per hour heats 400 sq. ft. of steam radiation in 0°F weather.
- 1/3 gal. of oil per hour produces 1 boiler horsepower.
- 1 lb. of steam per hour is equivalent to 4 sq. ft. EDR.
- 1 lb. of steam per hour produces 1000BTU/hr.
- 1 boiler horsepower equals 33,500 BTU/hr.
- 1 kw equals 3412 BTU.
- 1 ton of refrigeration equals 12,000 BTU/hr.
- When multiple zoning and existing single zone system, be sure to install a condensate pump and vacuum breakers to avoid water hammer and related problems.
- On steam to water heat exchanges with steam in the shell, a vacuum breaker is required to break any induced vacuum.
- 1 GPM flowing through a heating system produces 10,000 BTU/hr. based on 20°F temperature drop.
- Based on a 20°F temperature drop:
 - ¾" copper will handle up to 35,000 BTU
 - 1" copper will handle up to 75,000 BTU
 - 1-1/4" copper will handle up to 130,000 BTU
 - 1-1/2" copper will handle up to 200,000 BTU
- To estimate heat loss for a concrete block warehouse with average amount of glass, multiply length x width x height x 6 to arrive at BTU/hr.

A MULTIPLY	B BY	C TO OBTAIN
Atmospheres	14.697	Pounds per sq. in.
Atmospheres	1.033	Kilograms per sq. in.
Atmospheres	29.92	Inches of mercury
Atmospheres	760	Millimeters of mercury
Atmospheres	407	Inches of water
Atmospheres	33.90	Feet of water
Barrels (petroleum)	42	Gallons
Barrels per day	0.0292	Gallons per minute
Bars-G.	14.5	Pounds per sq. in.
Centimeters	0.3937	Inches
Centimeters	0.03281	Feet
Centimeters	0.01	Meters
Centimeters	0.01094	Yards
Cubic Centimeters	0.06102	Cubic Inches
Cubic feet	7.48055	Gallons
Cubic feet	0.17812	Barrels
Cubic feet per second	448.833	Gallons per minute
Cubic inches	16.39	Cubic centimeters
Cubic inches	0.004329	Gallons
Cubic meters	264.17	Gallons
Cubic meters per hour	4.4	Gallons per minute
Feet	0.3048	Meters
Feet	0.3333	Yards
Feet	30.48	Centimeters
Feet of water	0.882	Inches of mercury
Feet of water	0.433	Pounds per sq. in.
Gallons (U.S.)	3785	Cubic centimeters
Gallons (U.S.)	0.13368	Cubic feet
Gallons (U.S.)	231	Cubic inches
Gallons (Imperial)	277.4	Cubic inches
Gallons (U.S.)	0.833	Gallons (Imperial)
Gallons (U.S.)	3.785	Liters
Gallons of water	8.328	Pounds (at 70°F)
Gallons of liquid per minute	500 x Sp Gr	Pounds per hr. liquid (at 70°F)
Gallons per minute	0.002228	Cubic feet per second
Horsepower (boiler)	34.5	Pounds water per hr. evaporation
Horsepower (boiler)	33479	Btu per hour
Inches	2.54	Centimeters
Inches	0.0833	Feet
Inches	0.0254	Meters
Inches	0.02778	Yards

A MULTIPLY	B BY	C TO OBTAIN
Inches of mercury	1.133	Feet of water
Inches of mercury	0.4912	Pounds per sq. in.
Inches of mercury	0.0345	Kilograms per sq. cm.
Inches of water	0.03613	Pounds per sq. in.
Inches of water	0.07355	Inches of mercury
Kilograms	2.205	Pounds
Kilograms	0.001102	Short tons (2000 lbs.)
Kilograms per minute	132.3	Pounds per hour
Kilograms per sq. cm	14.22	Pounds per sq. in.
Kilograms per sq. cm	0.9678	Atmospheres
Kilograms per sq. cm	28.96	Inches of mercury
Kilopascals	0.145	Pounds per sq. in.
Liters	1000	Cubic centimeters
Liters	0.2642	Gallons
Liters per hour	0.0044	Gallons per minute
Meters	3.281	Feet
Meters	1.0936	Yards
Meters	100	Centimeters
Meters	39.37	Inches
Megapascals	145.0	Pounds per sq. in.
Pounds	0.0005	Short tons (2000 lbs.)
Pounds	0.4536	Kilograms
Pounds	0.000454	Metric tons
Pounds	16	Ounces
Pounds per hour	6.32/M W	Cubic feet per minute
Pounds per hour liquid	0.002/Sp. Gr.	Gallons per minute Liquid (at 70°F)
Pounds per sq. in.	27.684	Inches of water
Pounds per sq. in.	2.307	Feet of water
Pounds per sq. in.	2.036	Inches of mercury
Pounds per sq. in.	0.0703	Kilograms per sq. cm.
Pounds per sq. in.	51.71	Millimeters of mercury
Pounds per sq. in.	0.7037	Meters of water
Specific Gravity (of gas or vapors)	28.97	Molecular wt. (of gas or vapors)
Square centimeters	0.1550	Square inches
Square inches	6.452	Square centimeters
Tons (short ton 2000 lbs.)	907.2	Kilograms
Tons (short ton 2000 lbs.)	0.9072	Metric tons
Tons (metric) per day	91.8	Pounds per hour
Water (cubic feet)	62.3	Pounds (at 70°F)
Yards	0.9144	Meters
Yards	91.44	Centimeters

This table may be used in 2 ways: (1) Multiply the unit under column A by the figure under column B. the result is the unit under column C.
 (2) Multiply the unit under column C by the figure under column B. the result is the unit under column A.



Temperature Conversion - °C / °F

°C	°F
-17.8	0.0
-15.0	5
-12.2	10
-10.0	14
-9.4	15
-6.7	20
-5.0	23
-3.9	25
-1.1	30
0.0	32
1.7	35
4.4	40
5.0	41
7.2	45
10.0	50
12.8	55
15.0	59
15.6	60
16.1	61
16.7	62
17.2	63
17.8	64
18.3	65
18.9	66
19.4	67
20.0	68
20.6	69
21.1	70

°C	°F
21.7	71
22.2	72
22.8	73
23.3	74
23.9	75
24.4	76
25.0	77
25.6	78
26.1	79
26.7	80
27.2	81
27.8	82
28.3	83
28.9	84
29.4	85
30.0	86
30.6	87
31.1	88
31.7	89
32.2	90
35.0	95
37.8	100
40.6	105
43.3	110
46.1	115
48.9	120
51.7	125
54.4	130

°C	°F
57.2	135
60.0	140
62.8	145
65.6	150
68.3	155
71.1	160
73.9	165
76.7	170
79.4	175
82.2	180
85.0	185
87.8	190
90.6	195
93.3	200
96.1	205
98.9	210
100.0	212
101.7	215
104.4	220
110.0	230
115.6	240
121.1	250
126.7	260
132.2	270
137.8	280
143.3	290
148.9	300

Other Conversions:

- C_v = K_v x 1.16
- GPM = M³/HR x 4.13
- GPM = Liters/second x 15.85
- Inches = Meters (M) x 39.37
- Inches = Millimeters (mm) x 0.03937
- Pounds = Gallons on water (@65°F) x 8.34
- Pounds = Gallons on water (@212°F) x 7.99
- PSI = KPa x 0.145
- PSI = Feet of water (@62°F) x 0.434

C_v Formulas:

The valve capacity is generally expressed by a C_v factor.

The equations used for the C_v factor calculations are:

$$C_v = \frac{GPM}{\sqrt{\Delta P}}$$

$$GPM = C_v \sqrt{\Delta P}$$

$$P = \left(\frac{GPM}{C_v} \right)^2$$

Where:

GPM = The water volume in gpm

P = The pressure drop in PSI across the valve

ENGLISH to ENGLISH

- Atmospheres x 14.7 = psi
- Ft. of H₂O x 0.4335 = psi
- In. of H₂O x 0.03613 = psi
- In. of Hg x 0.4912 = psi

Lb/hr (LIQ) x $\frac{.002}{S.G.}$ = GPM

Lb/hr (GAS) ÷ Density* = SCFH
°R - 460 = °F

ENGLISH to METRIC

- psi x 6.895 = Kpa
- Lb/hr x 0.4536 = Kg/hr
- USGPM x 0.2271 = M³/hr
- Ft/sec x 0.3048 = M/sec
- Ft³/hr x 0.02832 = M³/hr
- In. x 25.4 = mm
- [°F - 32] x 5/9 = °C

METRIC to METRIC

- BARS x 100 = KPa
- Kg/Cm² x 98.07 = KPa
- PASCALS x 1000 = KPa
- mm of Hg x 0.1333 = KPA
- °K - 273 = °C

METRIC to ENGLISH

- KPa x 0.145 = psi
- BARS x 14.5 = psi
- Kg/hr x 2.2 = Lb/hr
- M³/hr x 4.4 = USGPM
- M/sec x 3.28 = Ft/sec
- M³/hr x 35.31 = Ft³/hr
- Mm x 0.03937 = In.
- °C (1.8) + 32 = °F

*Density at Standard Atmospheric Conditions



**MACON CONTROLS
NON-ELECTRIC
THERMOSTATICALLY
CONTROLLED RADIATOR
VALVES**

APPLICATION

The Valve Body is used with the Thermostatic Head to provide automatic control of baseboard units, convectors, or standing radiators in hot water systems and in 2-pipe steam heat systems. For 1-pipe steam systems, a 1-pipe steam radiator adapter assembly is available. A temperature sensitive element in the head modulates the valve in response to room temperature. Neither the valve nor the thermostatic head requires the use of electric power.

INSTALLATION

CAUTION

1. Installer must be a trained, experienced serviceperson.
2. When installing the valve body, the arrow must be in the direction of flow.
3. Always conduct a thorough checkout when installation is complete.

IMPORTANT

1. On Straight-through body models, do not install with thermostatic head directly above valve body. On angle body models, assemble with thermostatic head on the far side of the valve from the heating surfaces to minimize the effects of radiant heat.
2. If boiler for 1-pipe steam system is cycled by a space thermostat in one zone, do not apply a radiator valve to the radiator in that zone.
3. Do not apply a radiator valve in 1-pipe steam systems that do not use steam air vent valves venting to atmosphere on each radiation unit.

LOCATION

The valve may be used to control radiators, baseboard units or convectors in single or multi-zone hot water systems. The valve is used in 1-pipe (mono) or 2-pipe heating systems. When the valve is used to control a single radiator, baseboard unit or convector, the valve is installed on the inlet side of (Fig. 1A). When a valve is used to control a series of radiators or baseboards, the valve should be installed on the return side of the series run (Fig. 1B). In a multi-zone heating system with a single radiator, baseboard unit, or convector in each zone, a valve is installed on the inlet side of each radiator in each zone (Fig. 1C).

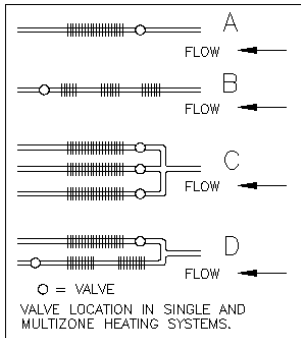


Fig. 1 Valve Location in Single and Multi-zone Hot Water Heating.

series of radiators or baseboards in a single zone, install the valve on the return side of the series run (Fig. 1D). In a 1-pipe steam system, a vacuum breaker must be installed between the steam vent and the radiator (Fig. 9).

IMPORTANT

The location of the valve depends on the location of the thermostatic head. Be sure the thermostatic head is NOT located where it is subject to drafts, exposed to direct sunlight, or covered by draperies or curtains. Note: When installing the Thermostatic Head for remote mounting, the hole in the mounting surface must be plugged with suitable insulation to insure that it receives minimal radiated heat and properly senses room temperature.

VALVE BODY INSTALLATION

The valve body must be installed within the following specified limits:
Max. Static Pressure: 145 psig
Max. Differential Pressure: 20 psig
Sug. Differential Pressure: .5 to 2.9 psi
Max. Steam Pressure: 15 psig
Max. Water Temperature: 250°F

When installing the valve body in water and 2-pipe steam systems, the arrow must point in the direction of flow. For valve bodies with NPT threads, use new, properly reamed pipe, free of chips. Valve distortion or malfunction may result from excess pipe within the valve body.

For valves with sweat fittings:

IMPORTANT

- Insert assembly **MUST** be removed from valve bodies with sweat fittings before installation to avoid heat damage to rubber components (Fig. 2).
1. Use steel wool to thoroughly clean areas inside of valve into which copper tubing fits and approximately ¼ inch (19mm) at ends of tubing.
 2. Apply small amount of solder flux around outside ends of tubing.
 3. Insert both pieces of tubing completely into valve body.
 4. Use a propane torch to heat valve body at the general area in which tubing is fitted. Note: The hole in cover must be at least as large as the knurled setting knob on the thermostatic head to allow for baseboard cover removal.
 5. When valve body and tubing reach melting temperature of solder, apply solder to joint. Solder should draw evenly around fitting.
 6. Do not disturb until solder sets up.
 7. After cooling reinstall insert and visibly inspect for leaks with water supply turned on.
 8. If leak is found, drain water and repeat soldering procedure. Remember, only a clean, fluxed joint which is free from water will accept solder.

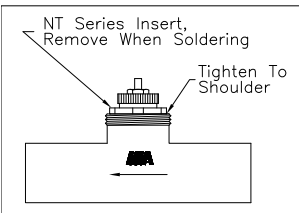


Fig. 2 NT Series Insert

Note: Protective cap on body may be used to manually operate valve before head is installed.

**THERMOSTATIC HEAD
INSTALLATION**

Models MTW

Direct Mounting on Radiator

- Use the following procedure (Fig. 3):
1. Install the valve body on the radiator.
 2. Remove the protective dust cover from the valve body. Do not discard it.
 3. Open thermostat to highest number.
 4. Install the thermostatic head to the valve body. **do not over tighten thermostat nut, finger tighten, snug 1/4 turn with wrench.**

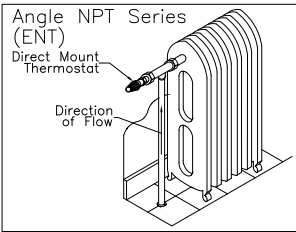


Fig. 3 Typical Installation of Valve (Angle Body) on Radiator

Direct Mounting on Radiator

Use the following procedure (Fig. 4):

1. Install the valve body on the baseboard unit.
2. Cut a hole in the baseboard unit directly in front of the valve connection. Note: The hole must be at least as large as the knurled setting knob on the thermostatic head to allow for base board cover removal.
3. Remove the protective dust cover from the valve body.
4. Open thermostat to highest number.
5. Install the thermostatic head to the valve body. **do not over tighten thermostat nut, finger tighten, snug 1/4 turn with wrench.**
6. Replace the baseboard cover.
7. Install pipe collar (collar not supplied) around the insulating sleeve.

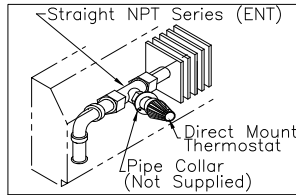


Fig. 4 Typical Installation of Direct Mount Thermostatic Head in Baseboard

Models B46000 (ENTL) Fig. 5

Remote Wall Mounting

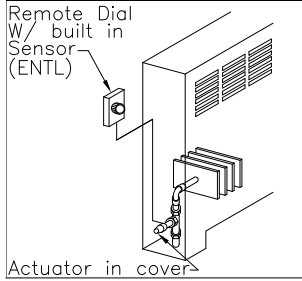
The Thermostatic Sensor is remote mounted from the valve on a plasterboard wall.

IMPORTANT

- When selecting a location to mount the thermostatic head, remember it must not be subject to drafts, exposed to direct sunlight, or covered by draperies or curtains. To mount the thermostat on a wall, use the following procedure (Figs. 5 & 8):
1. Select a location to mount the thermostatic head. In making the selection, locate the wall studs. Unnecessary and troublesome work can be avoided by mounting the thermostatic head and running the capillary between 2 wall studs.
 2. After selecting a location, prepare two

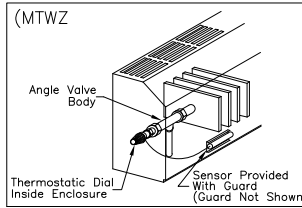
openings 1½ inches in diameter. Prepare one opening near the actuator behind the baseboard unit or convector and one at the thermostatic head location.

- Note: Capillary is 6'6" long.
3. Open thermostat to highest number.
 4. Install the thermostatic head to the valve body. **do not over tighten thermostat nut, finger tighten, snug 1/4 turn with wrench.**
 5. Replace the baseboard unit or convector cover.



Important: Do not mount thermostat directly over cover.

Fig. 5 Typical Wall Mounting of ENTL Installation for Convectors



Important: Do not mount sensor directly over baseboard unit.

Fig. 6 Typical Wall Mounting of MTWZ Installation for Baseboard

Models MTWZ (Fig. 7)

Remote Sensor Mounting

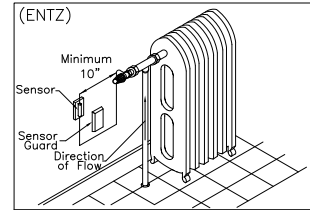
- Use the following procedure (Fig. 6 & 7):
1. Install the valve body on the radiator.
 2. Remove the protective dust cover from the valve body.
 3. Open thermostat to highest number.
 4. Install the thermostatic head to the valve body. **do not over tighten thermostat nut, finger tighten, snug 1/4 turn with wrench.**
 5. Select a sensor location. Note: When selecting a location, remember that the sensor must not be exposed to drafts or direct sunlight, or covered by curtains or draperies.
 7. Mount the sensor guard to the wall with 2 screws (not supplied).
 8. Snap the sensor bulb into place on the sensor guard base.
 9. Snap the sensor guard cover into place on the sensor guard base.

Models B56000-ENTLZ (Fig. 8)

Remote Wall Mounting

- Use the following procedure (Fig. 8):
1. Select a location on the wall to mount the dial. In making the selection, locate the wall studs and mount the dial so the capillary can be flush mounted.
 2. After selecting a location, drill 2 holes 1½

inches in diameter, one at the dial location, the other behind the baseboard or convector unit. Note: Each capillary is 6'6" long.



Important: Do not locate sensor behind curtains, drapes or in direct sunlight.

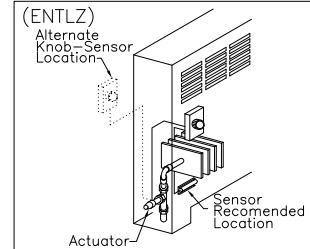
Fig. 7 Typical Free Standing Radiator Installation

3. Feed the actuator through the hole at the dial location behind the wall and out through the second hole.
4. Install the valve body.
5. Remove the protective cover from the valve body.
6. Open thermostat to highest number.
7. Install the thermostatic head to the valve body. **do not over tighten thermostat nut, finger tighten, snug 1/4 turn with wrench.**
8. Secure the dial to the unit cover with 4 screws (not supplied). Snap cover into place.
9. Mount the sensor below the radiation in the return air. Note: Secure the sensor guard base to the wall with 2 screws (not supplied). Snap the sensor bulb into place. The sensor guard cover may be used if desired.

Remote Mounting on Unit Cover

Use the following procedure (Fig. 8):

1. Install the valve body.
2. Select a location for the dial and drill a 1½ inch diameter hole at the location.
3. Feed the actuator through the hole to the valve body.
4. Remove the protective cover from the valve body.
5. Install the actuator on the valve body.



Important: Do not locate sensor behind curtains, drapes or in direct sunlight.

Fig. 8 Typical Wall Mounting of ENTLZ Installation for Convectors

CHECKOUT

When the installation is complete, rotate the dial until steam or water flow is detected. After the room temperature has stabilized (4 or 5 hours), reset the dial to the desired setting between 1 and 7 for MTW Series. (See chart on back page for temperature settings.) The set point will vary with the location of the sensor. A floor level sensor on a baseboard radiator will control at a different set point than a wall level sensor.

Note: Repositioning of the actuator head may be necessary for convenient visibility of the index mark. Loosen the union between the actuator head and the valve body. Turn the actuator head to the desired position and retighten the actuator nut.

SERVICE (All Models)

Recalibration

The thermostatic head is factory calibrated and should not need calibration. If, however, you feel that recalibration is required please contact factory.

CAUTION

Be careful not to damage "O" rings.

Insert Replacement

1. Relieve system pressure and drain below level of valve.
2. Remove thermostatic head.
3. Unscrew insert.
4. Screw new insert into body.
5. Replace thermostatic head and refill system.

ONE-PIPE STEAM SYSTEMS (Fig. 9)

Be sure boiler is cycled. Keep pressure as low as possible (1-1/2 psi recommended).

1. Use direct or remote Thermostat with one-pipe steam valve.
2. Install as shown in Fig. 9. Note: Steam air vent must be mounted in upright position. Vacuum breaker required.
3. If the boiler is being cycled by a space thermostat, do not install a valve in this space (improper boiler control may result).

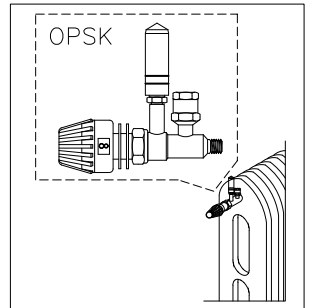


Fig. 9 One-Pipe Steam Valve Model OPSK

Contact your local distributor for parts



Tunstall Corporation

118 Exchange St

Chicopee, MA 01013

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**Bulletin-MC-INST-MMA-0115
Warranty & Engineering Data**

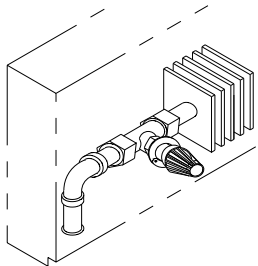
ADJUSTING ROOM TEMPERATURE

Set the dial on the thermostat to achieve the desired temperature as indicated by the charts below.

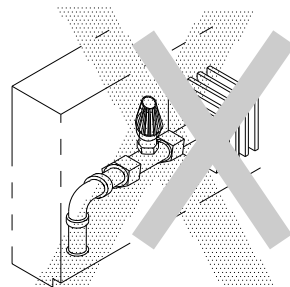
MTW Series Thermostats

Dial Setting	0	*	1	3	5	6	7	8	9
Room Temperature (°F)	Off	46	54	61	68	72	76	80	82

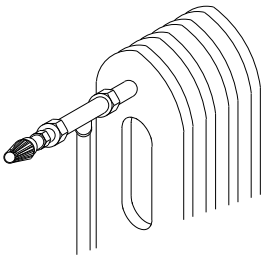
INSTALLATION EXAMPLES (Direct Mount)



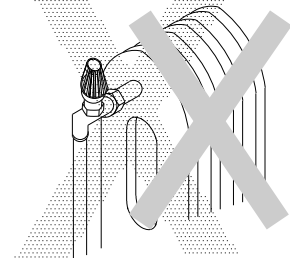
RECOMMENDED



NOT RECOMMENDED



RECOMMENDED



NOT RECOMMENDED

NT SERIES VALVES Valve bodies for MTW & NT series thermostats are non-electric temperature control valves for radiators, convectors, fan coil units and hydronic central heating systems. The valve can be actuated by a handknob or thermostats with remote or direct sensors or VM electric actuators.



Vertical angle valve with straight nipple. NPT - female inlet, male union outlet.

1/2" N10637
3/4" N10657
1" N10677
1-1/4" N10697



Straight valve with straight nipple. NPT - female inlet, male union outlet.

1/2" N10737
3/4" N10757
1" N10777
1-1/4" N10797



Horizontal angle valve with straight nipple. NPT - female inlet, male union outlet.

1/2" N10837
3/4" N10857
1" N10877
1-1/4" N10897



Sweat valve with female inlet and outlet.

1/2" N10930
3/4" N10950
1" N10970

TROUBLE SHOOTING GUIDE		
SYMPTON	POSSIBLE REASON	SOLUTION
Not all sections of radiator heating up	1. Many radiators are over-sized and all sections are not required to heat up to maintain the set room temperature.	1. System is "A" OK.
Underheating	1. Sensor in the wrong location. 2. Thermostatic control mounted in vertical position. 3. Remote sensor located in convector or near heat source. 4. Flow through valve is in the wrong direction. 5. Inadequate system temperature or pressure. 6. Steam traps defective. 7. Air lock in hot water system. 8. Scale or debris blocking flow. 9. Heating cabinet dampers are closed.	1. Change the sensor location, or control type. See installation instructions. 2. These control types must be mounted horizontally. 3. Remove sensor away from direct heat source. 4. Check arrow on valve body. It should be in the direction of flow. Change valve direction, or flow direction. 5. Check operating and limiting controls on boiler. Check circulating pump and isolating valves. 6. Repair or replace traps with Tunstall traps. 7. Open valve fully to allow air to pass. Install vents. 8. Flush System. Do not use oil base additives. 9. Open or remove dampers.
Overheating	1. Sensor in the wrong location. 2. Control not properly installed. 3. Capillary tube broken, kinked, or bent sharply. 4. Dirt or scale under seat, preventing tight shutoff. 5. Flow through valve is in the wrong direction, damaging the valve seat. 6. Steam traps defective. 7. Excessive differential pressure is forcing valve open. (Hot water systems)	1. Change sensor location, or change control type. 2. Set bosses in grooves and tighten knurled ring to valve body. Do not over tighten. 3. Replace control. 4. Remove control from valve body, allowing valve to open fully and flush away scale and debris. Reinstall control and turn fully clockwise. If valve does not fully close, remove control and inspect valve seat area using cartridge changer tool or service socket tool. Change insert assembly. 5. Check arrow on valve body. It should be in the direction of flow. Change valve direction, or flow direction. Remove valve cartridge and inspect for damage to seat disc. 6. Repair or replace traps with Tunstall traps. 7. Install differential pressure regulator to maintain less than 2.9 psi differential between supply and return pipes.
Chattering or knocking	1. Flow through valve is in wrong direction. 2. Vacuum in system. 3. Excessive differential pressure. (Refer to Valve/TStat Specifications) 4. Binding of piping.	1. Check arrow on valve body. It should be in the direction of flow. 2. Steam - Check traps and vents. Hot water - check expansion tank operation and location. 3. Install differential pressure regulator to maintain less than 2.9 psi differential between supply and return pipes. 4. Ensure adequate space for piping.

MTW SERIES THERMOSTATS MTW & ENT Series Thermostats are installed on NT series valves to automatically control the actions of the valve, thus monitoring room temperature and conserving fuel.



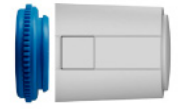
MTWZ

Nonelectric, fully automatic thermostat with valve mounted temperature setting dial and remote sensor.



ENTL-B46000

Nonelectric, fully automatic remote thermostat with remote sensor and temperature setting dial.



Zone Control ZMC-ES & ZMC-DDC
Electric zone actuator with end switch (ES) or proportional (DDC).



MTW

A non-electric positive mechanical shut-off direct mounting thermostat. Anti-freeze position and adjustable maximum / minimum temperature. Highly sensitive with very accurate temperature settings and reactions.



ENTLZ-B56000

Non-electric, fully automatic thermostat with separate remote sensor and remote temperature setting dial.

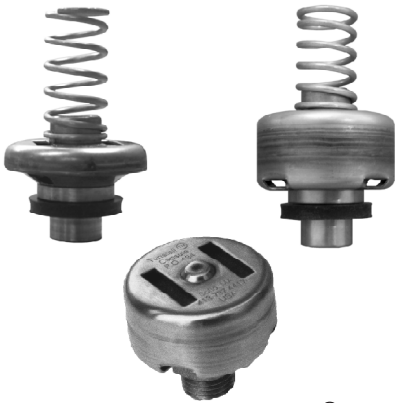


Zone Control VMC-24 & VMO-24
24-volt electric zone control for controlling individual room temperatures or zones (VMC-24 Normally Closed & VMO-24 Normally Open).

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Steam Products



Tunstall Capsule[®]



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Steam Traps**



**Float & Thermostatic
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**Inverted Bucket
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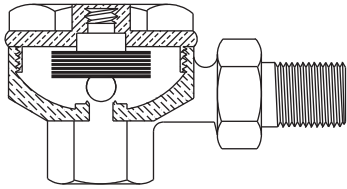
Pressure Action Pumps

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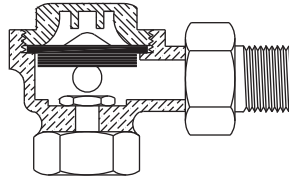
Tunstall Steam Trap Capsules[®]

100% Stainless Steel

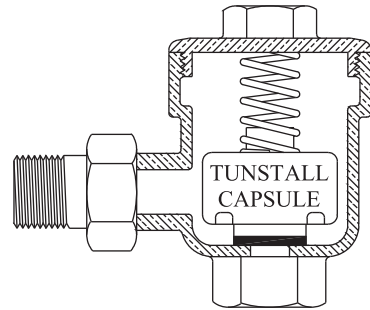
“Made in America”



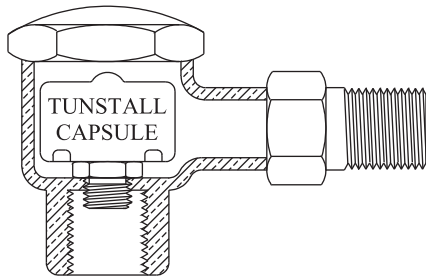
Dunham-Bush #1E
TCDB-1301



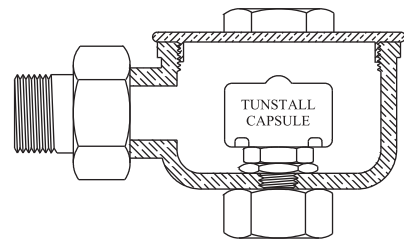
Sarco TB25
TCSA-2231



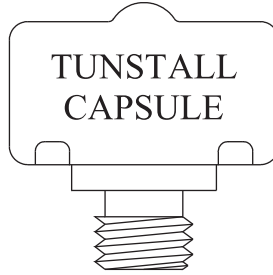
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TCTR-2402



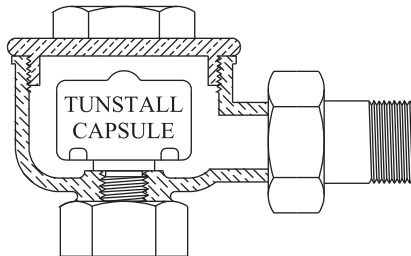
Sarco H
TCSA-2203



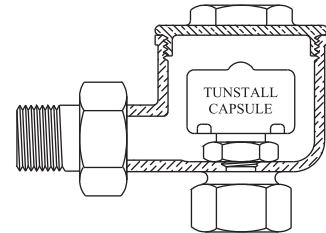
Warren Webster 512
TCWW-2507



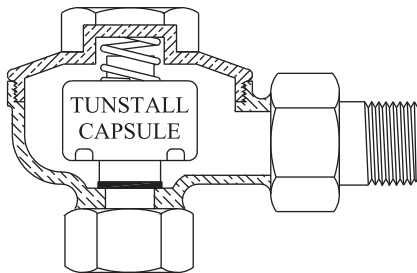
Sarco FT-15
Air Vent
TCSA-2230



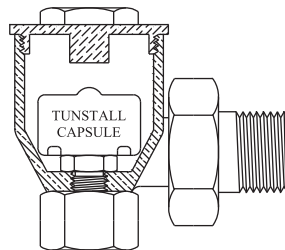
Illinois 1G
TCIL-1501



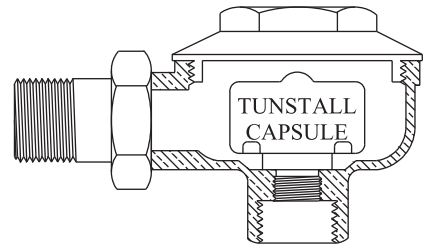
Warren Webster 02H
TCWW-2501



Barnes & Jones 122A
TCBJ-1001



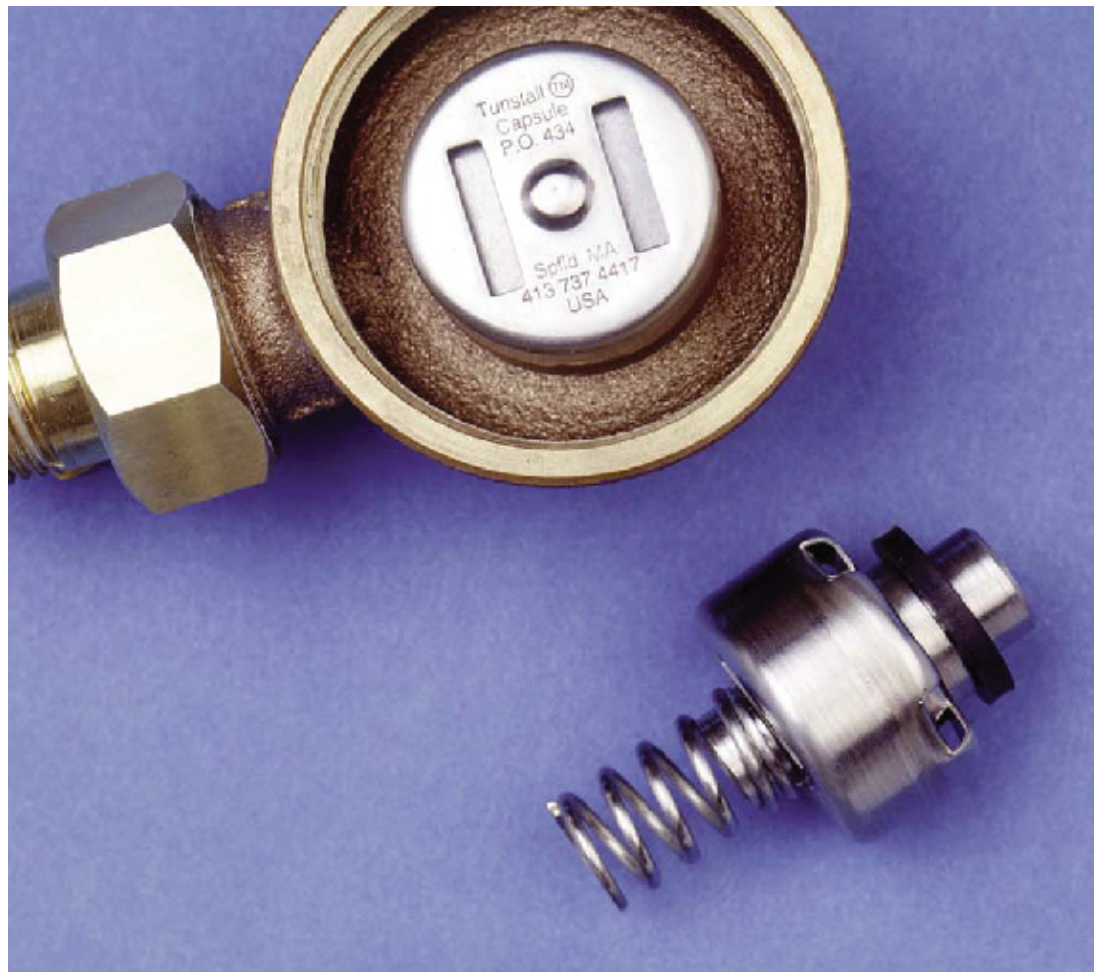
Hoffman 17C
TCHF-1409



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TCTA-2901

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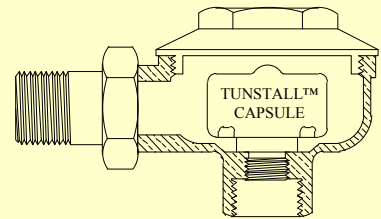
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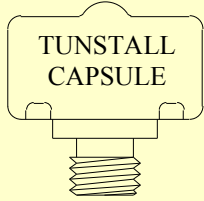
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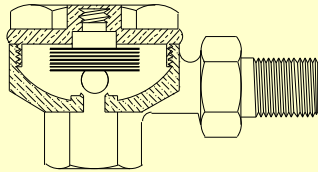
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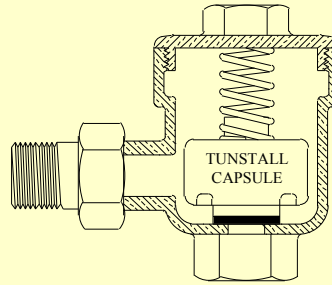
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- NAFCO
- NATIONAL PUMP-AMERICAN STEAM
- NICHOLSON
- SARCO
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- TRANE
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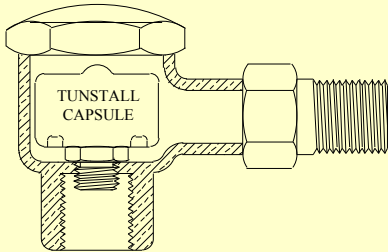
*** Consult factory or local representative for any and all applications.*



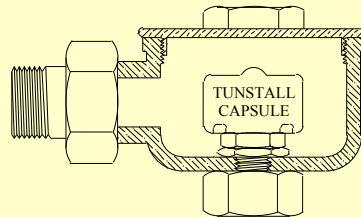
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TCDB-1301**



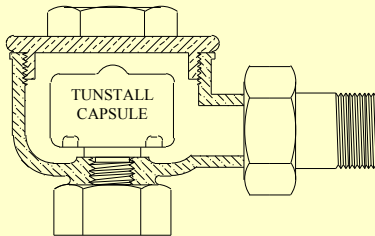
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TCTR-2402**



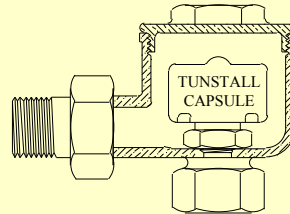
**SARCO H
TCSA-2203**



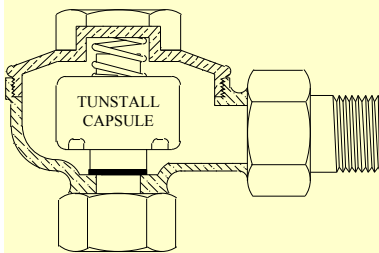
**WARREN WEBSTER 512
TCWW-2507**



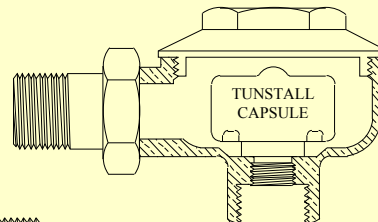
**ILLINOIS 1G
TCIL-1501**



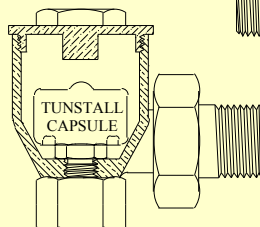
**WARREN WEBSTER 02H
TCWW-2501**



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