Room Temperature Transmitters (with LCD Display)

STE-6012/6016

Application Guide

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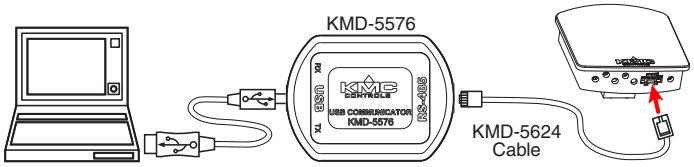
NOTE: For more product information, see the **STE-6000 Series Room Temperature Sensors/ Transmitters Data Sheet** on the KMC Controls web site.

NOTE: For mounting and wiring information, see the **STE-6012/6016 Installation Guide**.

Models

Model Number	Connections		
	Screw Clamp Terminals	RJ-45 Connector	EIA-485 Data Port
STE-6012-10	X		
STE-6016-10		X	X

PC Port Network Connection



At the bottom of the STE-6016 case is an EIA-485 (formerly RS-485) computer port. This port provides a temporary connection to the digital network for network setup or troubleshooting.

To use the port to connect to a computer, a means of converting the EIA-485 signal to a USB or EIA-232 (formerly RS-232) signal will be needed. The exact connection depends on the computer and the operator workstation software. (See also the instructions included with those devices and software.)

- For **USB** (to WinControl or BACstage), use a KMD-5576 USB Communicator (see the illustration above).
- For **EIA-232 to BACstage**, use a third-party interface.
- For **EIA-232 to WinControl**, use a KMD-5559 CommTalk and KMD-5624 cable (or equivalent interface).

To access the network through the STE-6016's port:

1. Connect the keyed, flat end of the KMD-5624 interface cable (included with the KMD-5576 but not the KMD-5559) to the port on the sensor.
2. Connect the other end of the cable to the interface device that converts the EIA-485 signal into an EIA-232 or USB signal.
3. Connect the suitable cable from the interface device to the computer's serial or USB port. Install any required software and configure the port as necessary.

Sensor Configuration

Overview

Each STE-6012/6016 includes an LCD display for the room temperature and setpoint, which can be toggled between Fahrenheit (the default) and Celsius scales. The sensor allows a user to adjust the setpoint via the up and down arrow buttons on the front panel. If the system is in standard/occupied mode (12 VDC applied to terminal D or the green wire), pressing a button will raise or lower the setpoint. When either button is pushed, the display will toggle from room temperature to the setpoint. The setpoint will increment or decrement (a degree with each press) depending on the button being pressed. When the button is released, the number displayed is the new setpoint, and the display will return to room temperature after ten seconds. If the system is in unoccupied setback (for heating or setup for cooling) mode (7.5 VDC applied to terminal D or the green wire), pressing either button also selects override mode (and "OVERRIDE" is shown on the LCD display).

NOTE: Pressing the ▼ **Down button** momentarily sends **0 VDC** to the controller for a **SENSOR-ON** signal; pressing the ▲ **Up button** sends **greater than 5 VDC** for a **SENSOR-OFF** signal.

Controller Connection

For the STE-6012/6016, the **controller** will need signal lines for two inputs (thermistor and setpoint), one output (7.5/12 VDC supply), and common (ground).

Since each STE-6012/6016 has 0–5 volt DC outputs for both the temperature and the setpoint lines, turn OFF the corresponding 10,000 ohm pull-up resistors on the controller board! Consult the controller's setup instructions for information on turning off the pull-up resistors. (For the other STE-6000 series sensors, do **not** turn off the resistors on the controller board as stated for the STE-6012/6016.)

NOTE: For controller configuration instructions, see the appropriate section in the Controller Configuration section.

Fahrenheit/Celsius Display Selection

The STE-6012/6016 has an LCD display for showing room temperature and setpoint. The display can be toggled between Fahrenheit (the default) and Celsius scales by performing the following procedure.

NOTE: Doing this **erases any stored calibration offset value** (see below) and returns the calibration to the default setting!

1. Press and hold either the down or up arrow buttons for at least 20 seconds. The display will toggle from one temperature scale to the other.
2. Release the button.

NOTE: This setting is written to nonvolatile memory and will be saved even if power to the sensor is lost.

Displayed Temperature Calibration (Offset)

NOTE: The total offset value is limited to +/– 3 degrees from the default value.

The temperature value displayed by the STE-6012/6016 may be fine-tuned if desired by performing the following steps. The sensor must be in a stable location and operating at least ten minutes before calibrating. Hold an accurate thermometer about an inch under the unit as a reference during this procedure.

1. Click the down arrow button to decrement the setpoint to its lowest value, 40° Fahrenheit or 4° Celsius, then press and hold the down arrow button.
2. After holding the down arrow button for about ten seconds, the display will start flashing the room temperature value and start an approximately 15-second "exit calibration" timer.

NOTE: Entering the calibration mode erases any previous saved offset value and will return to the default setting.

3. While the room temperature value is flashing, press the up or down arrow button to modify the room temperature value. Each press of the up or down arrow button will change the temperature value by one degree.
4. The display will continue to flash for approximately 15 seconds after the last button press. Then the STE-6012/6016 will write the modified value to memory and return to normal operation.

NOTE: This procedure affects only the temperature displayed on the LCD screen. It does **not** affect the calibration or temperature value in the controller.

Controller Configuration

Overview

For an STE-6012/6016 sensor, the controller will need two inputs (thermistor and setpoint), one output, and a common (ground) signal lines.

Since an STE-6012/6016 sensor has 0–5 volt outputs for both the temperature and the setpoint lines, turn OFF the corresponding 10,000 ohm pull-up resistors on the controller board! Consult the controller's setup instructions for information on turning off the pull-up resistors. For the other STE-6000 series sensors, do **not** turn off the resistors on the controller board as stated for the STE-6012/6016.

See the relevant software section for controller configuration instructions.

BACstage Software

Room Temperature (Thermistor) Input

NOTE: On the controller board, turn OFF the 10,000 ohm pull-up resistor.

1. In the BACstage software main menu, select *Objects* > *Inputs*.
2. Click *Edit*.
3. Type in a name in the appropriate *Description* field (up to 32 characters) and/or *Name* field (up to 16 characters).

NOTE: No two labels or descriptions in a controller can be identical.

4. Select *Object Type: Analog* if it is not the default.
5. Select *Device Type: KMC10K Type II*.
6. Select *Units: °F* or *°C*.
7. Optionally, change the *Filter Weight* (under *More*) to the desired number of thermistor readings averaged before displaying the result. If the override is being used, *Filter Weight* may need to be reduced down toward *1* to ensure reliable recognition of the button press, depending on the controller.

NOTE: The Up and Down buttons need to be pressed and held for at least a half a second to be reliably recognized for override mode.

8. Click *End Edit*.
9. Click *Yes* for "Send Update Notification Now?"
10. In the BACstage software main menu, select *Device* > *Device Tables* > *KMC10K Type II Table*.
11. Click *Edit*.
12. Click *Defaults* (values will fill in).
13. Click *End Edit*.
14. Click *Yes* for "Send Update Notification Now?"
15. Click *OK*.

Setpoint Input

NOTE: On the controller board, turn OFF the 10,000 ohm pull-up resistor.

1. In the BACstage software main menu, select *Objects* > *Inputs* (if the screen was closed previously).
2. Click *Edit*.
3. Type in a name in the appropriate *Description* field and/or *Name* field.
4. Select *Object Type: Analog* if it is not the default.
5. Select *Device Type: Custom* (at the bottom of the list).
6. In the upper field, type 40, and in the lower field, type 90 (or 4 and 32 for Celsius).
7. Click *Calculate Offset and Multiplier*.
8. Click *OK*.
9. Click *End Edit*.
10. Click *Yes* for "Send Update Notification Now?"
11. Click *OK*.

Supply Voltage

NOTE: The STE-6012/6016 is powered by the controller on terminal D or the green wire. With 7.5 VDC applied, the sensor is in setback/unoccupied mode; with 12 VDC applied, the sensor is in normal/occupied mode.

Pressing the **Down** button momentarily sends 0 VDC to the controller for a **SENSORON** signal on terminal C or orange wire; pressing the **Up** button sends greater than 5 VDC for a **SENSOROFF** signal.

Pressing a button raises or lowers the setpoint voltage. When in unoccupied mode, pressing either button selects override mode (and "OVERRIDE" is shown on the LCD display). "OVERRIDE" will continue to be displayed until the voltage is restored to 12 VDC. **To remove "OVERRIDE" from the display at the end of a timed override period, momentarily change the voltage to 12 VDC and then back to 7.5 VDC.** See, for example, the

Control Basic example in the Override section below.

1. In the BACstage software main menu, select *Objects* > *Outputs*.
2. Click *Edit*.
3. Type in a name in the appropriate *Description* field and/or *Name* field.
4. Select *Object Type: Analog* if it is not the default.
5. Select *Device Type: Volts 0–10*.

NOTE: This only sets the scale; the actual voltage may go up to 12 volts DC.

6. Click *End Edit*.
7. Click *Yes* for "Send Update Notification Now?"
8. Click *OK*.

Override

1. In the BACstage software main menu, select *Objects* > ***Binary*** *Values*.
2. Click *Edit*.
3. Type in a name in the appropriate *Description* field and/or *Name* field (see Control Basic example).
4. Click in the *Units* column and select *Off/On* (or *No/Yes*, *Stop/Start*, *Disabled/Enabled*, *Inactive/Active* according to preference).
5. Click *End Edit*.
6. Click *Yes* for "Send Update Notification Now?"
7. Click *OK*.
8. In the BACstage software main menu, select *Objects* > *BASIC Programs*.
9. Click *Edit*.
10. Type in a name in the *Description* field and/or *Name* field.
11. Click *Autorun*.
12. Click *End Edit*.
13. Click *Yes* for "Send Update Notification Now?"
14. Click once in the # column.
15. Type in program lines (see the following example).

NOTE: This is only an example. Details need to fit the controller configuration.

```
10 REM ** STE-6012/6016 OVERRIDE **
20 REM ** AI1 IS STE-6012/6016
   TEMPERATURE SENSOR INPUT **
30 REM ** BV3 IS OCCUPIED/UNOCCUPIED
   (ON/OFF) MODE **
40 IF NOT BV3 THEN AO1@9 = 7.5 ELSE
   AO1@9 = 12 : REM ** AO1 IS SUPPLY
   VOLTAGE TO SENSOR **
50 IF NOT BV3 THEN GOSUB 70
60 END
70 REM ** IN1 IS ROOM TEMP VOLTAGE FROM
   SENSOR (FROM INPUT SCREEN) **
80 REM ** PUSH UP OR DOWN BUTTON TO
   START OVERRIDE MODE (BV2) **
90 IF+ SENSOROFF( AI1 ) OR SENSORON(
   AI1 ) THEN START BV2
100 REM ** CHANGE DEFAULT TIMEON TO
   DESIRED AMOUNT OF OVERRIDE TIME **
110 IF TIMEON( BV2 ) > 02:00:00 THEN
   GOTO 120 ELSE GOTO 140
120 STOP BV2 : AO1@8 = 12 : REM **
   REMOVES OVERRIDE DISPLAY FROM LCD
   SCREEN **
130 WAIT 0:00:04 : RLQ AO1@8
140 RETURN
```

16. Click *Send*.
17. Click *OK*.
18. Click *Yes* for "Execute Program Now?"
19. Click *Close*.
20. Click *OK*.

TotalControl Software

NOTE: Follow the relevant hardware instructions in the BACstage Software section (above) or KMDigital Software section (starting on the next page). Then see the TotalControl Help information for the equivalent software configuration in TotalControl.

WinControl Software

Control Basic (Setpoint Calculation and Override)

1. In the WinControl software main menu, select *Control* > *Control Basic*.
2. Click *Edit*.
3. Type in a name in the *Description* field and/or *Label* field.
4. Place an x in the *On* column.
5. Click *End Edit*.
6. Click once in the # column.
7. Type in program lines (see the following example).

NOTE: This is only an example. Details need to fit the controller configuration.

```
10 REM ** STE-6012/6016 OVERRIDE **
20 REM ** IN2 IS SETPOINT VOLTAGE FROM
   SENSOR (FROM INPUT SCREEN) **
30 REM ** VAR2 IS THE ROOM SETPOINT
   (FROM SETPOINTS/VARIABLES SCREEN) **
40 VAR2 = IN2 / 0.1 + 40
50 REM ** SETPOINT RANGE FOR ROOM
   SENSOR IS 40-90 DEGREES F **
60 REM ** FOR 4-32 DEGREES C USE VAR2 =
   IN2 / 0.17857 + 4 **
70 IF NOT VAR5 THEN OUT3 = 7.5 ELSE
   OUT3 = 12 : REM ** SUPPLY VOLTAGE **
80 REM ** VAR5 IS OCCUPIED/UNOCCUPIED
   (ON/0FF) MODE **
90 IF NOT VAR5 THEN GOSUB 110
100 END
110 REM ** IN1 IS ROOM TEMP VOLTAGE
   FROM SENSOR (FROM INPUT SCREEN) **
120 REM ** USE BUTTON ON SENSOR TO
   START OVERRIDE (VAR4) **
130 REM ** VAR4 IS OVERRIDE (FROM
   SETPOINTS/VARIABLES SCREEN)**
140 IF+ SENSOR-ON( IN1 ) OR SENSOR-OFF(
   IN1 ) THEN START VAR4
150 REM ** CHANGE DEFAULT TIME-ON TO
   DESIRED AMOUNT OF OVERRIDE TIME **
160 IF TIME-ON( VAR4 ) > 02:00:00 THEN
   GOTO 170 ELSE GOTO 190
170 STOP VAR4
180 OUT3 = 12 : WAIT 0:00:02
190 RETURN
```

8. Click *Send*.
9. Click *OK*.
10. Click *Close*.
11. Click *OK*.

NOTE: See also the Override section below and ***Setpoint Voltage Input and Variable on page 6***.

NOTE: For another sample application of programming override timers, adapt the information in the Application Note AN0504F Programming Override Timers section of the Digital Designer's Guide (SP-022)

Override

1. In the WinControl software main menu, select *Control* > *Setpoint/Variables*.
2. Click *Edit*.
3. Type in a name in the *Description* field and/or *Label* field.
4. Click *Units* (which opens the Configure Variables screen).
5. Select *Type: Digital*.
6. Select *Off/On* (or *No/Yes*, *Stop/Start*, *Dis/Enabled* according to preference).
7. Click *OK*.
8. Click *End Edit*.
9. Click *OK*.

NOTE: See also the previous section Control Basic (for Setpoint Calculation and Override).

Room Temperature (Thermistor) Input

NOTE: On the controller board, turn OFF the 10,000 ohm pull-up resistor.

1. In the WinControl software main menu, select *Control* > *Inputs*.
2. Click *Edit*.
3. Type in a name in the *Description* field (up to 20 characters) and/or *Label* field (up to 8 characters).

NOTE: No two labels or descriptions in a controller can be identical.

4. Click *Units* (which opens the Configure Inputs screen).
5. Select *Type: Analog* if it is not the default.
6. Select *Deg F* (or *C*) *KMC10K Type II*.
7. Optionally, to match the STE-6012/6016 LCD display value with the value used by the controller, adjust the *Calibration* value if desired.

8. Optionally, change *Format* to the desired number of temperature decimal places.
9. Optionally, change the *Average* to the desired number of thermistor readings averaged before displaying the result. If the Override Input is being used, *Average* may need to be reduced down toward *1* to ensure reliable recognition of the button press, depending on the controller.

NOTE: The up and down buttons need to be held down for at least a half a second to be reliably recognized for override mode.

10. Click *OK*.
11. Click *End Edit*.
12. Click *OK*.

Setpoint Voltage Input and Variable

NOTE: On the controller board, turn OFF the 10,000 ohm pull-up resistor.

1. In the WinControl software main menu, select *Control* > *Inputs*.
2. Click *Edit*.
3. Type in a name in the *Description* field and/or *Label* field.
4. Click *Units* (which opens the Configure Inputs screen).
5. Select *Type: Analog* if it is not the default.
6. **Select *0–5 Volts*.**

NOTE: The voltage will be used in the formula of line 40 of the Control Basic sample on page 5 to equal the setpoint temperature. See also Setpoint Via Table Alternate Method below.

7. Click *OK*.
8. Click *End Edit*.
9. Click *OK*.
10. In the WinControl software main menu, select *Control* > *Setpoint/Variables*.
11. Click *Edit*.
12. Type in a name in the *Description* field and/or *Label* field.
13. Click *Units* (which opens the Configure Variables screen).
14. Select *Type: Analog* if it is not the default.
15. Select *Degrees Fahrenheit* (or *Celsius*).
16. Set *Format* to 0.
17. Click *OK*.
18. Click *End Edit*.
19. Click *OK*.

NOTE: See also ***Control Basic (Setpoint Calculation and Override) on page 5***.

Setpoint Via Table Alternate Method

If tables are still available, an alternate approach shows the setpoint input (IN2) as a **temperature** rather than a **voltage**.

1. In the WinControl software main menu, select Control > Tables.
2. Click Unused in the first available column.
3. Select Deg. F (or Deg. C).
4. Click OK.
5. Enter the following values under Table x and Deg. F (or C):

	Table x [1 or next available number]	***Deg. F***	***Deg. C***
1	*0.00*	*40*	*4*
2	*5.00*	*90*	*32*

6. Click OK.
7. In the WinControl software main menu, select *Control* > *Inputs*.
8. Click *Edit*.
9. Under Units, instead of selecting *0–5 Volts*, select *Table x*.
10. Click *OK*.
11. Click *End Edit*.
12. Click *OK*.
13. In the WinControl software main menu, select *Control* > *Control Basic*.
14. Click once in the # column of the program from the previous section on page 5.
15. Change line 40 to `40 VAR2 = IN2` (deleting `/ 0.1 + 40`) and delete the unnecessary REM lines in 50 and 60.
16. Click *Send*.
17. Click *OK*.
18. Click *Close*.
19. Click *OK*.

In this example IN2 under Inputs and VAR2 under Variables/Setpoints should now both show the same value.

Supply Voltage

NOTE: The STE-6012/6016 is powered by the controller on terminal D or the green wire. With 7.5 VDC applied, the sensor is in setback/unoccupied mode; with 12 VDC applied, it is in normal/occupied mode.

Pressing the **Down** button momentarily sends 0 VDC to the controller for a **SENSOR-ON** signal on terminal C or orange wire; pressing the **Up** button sends greater than 5 VDC for a **SENSOR-OFF** signal.

Pressing a button raises or lowers the setpoint voltage. When in unoccupied mode, pressing either button selects override mode (and "OVERRIDE" is shown on the LCD display). "OVERRIDE" will continue to be displayed until the voltage is restored to 12 VDC. **To remove "OVERRIDE" from the display at the end of a timed override period, momentarily change the voltage to 12 VDC and then back to 7.5 VDC.** See, for example, the Control Basic example in *Override on page 5*.

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1. In the WinControl software main menu, select *Control* > *Output*.
2. Click *Edit*.
3. Type in a name in the *Description* field and/or *Label* field.
4. Select *Units*.
5. Select *Type: Analog* if it is not the default.
6. Select *0–10 Volts*.
7. Leave the rest of defaults.
8. Click *OK*.
9. Click *End Edit*.
10. Click *OK*.

BAC-A1616BC BACnet Building Controller

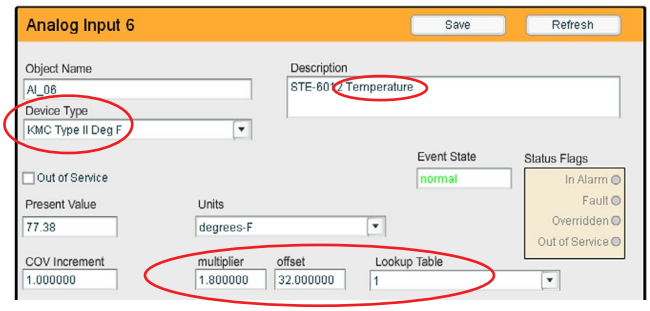
Tables and Jumpers

Select the 0–12 VDC jumper position for the corresponding inputs. (See the Installation section of the BAC-A1616ABC Building Controller Installation and Operation Guide, P/N 912-019-01.)

Because the Building Controller has a 0–12 VDC total input range, different tables are required than in other (0–5 VDC) KMC controllers. **Download the sensor tables (CSV) file from the KMC Controls Partners web site and import the needed tables as described in the Tables section of the BAC-A1616ABC Building Controller Installation and Operation Guide. (You must log into the Partners site to see the zipped tables file on the Building Controller product page downloads.)**

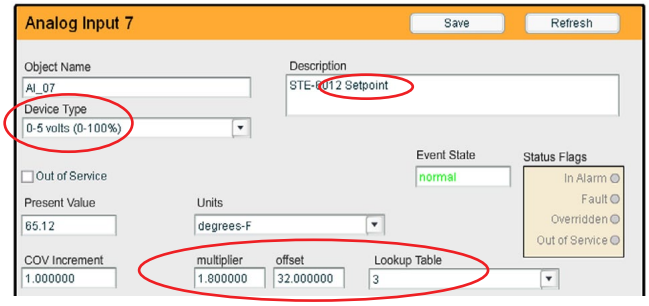
Room Temperature Input

1. In the desired Analog Input setup screen of the web page interface, select KMC Type II Degree Fahrenheit or KMC Type II Degree Celsius.
2. Select the Lookup Table for the STE-6012 Temperature BBC table.
3. For the Fahrenheit scale, the multiplier is 1.8 and the offset is 32. For Celsius, the multiplier is 1 and the offset is 0.
4. Click *Save*.



Setpoint Input

1. Select the Lookup Table for the STE-6012 Setpoint BBC table.
2. For the Fahrenheit scale, the multiplier is 1.8 and the offset is 32. For Celsius, the multiplier is 1 and the offset is 0.
3. Click *Save*.



Override Control Basic

NOTE: This is only an example. Change details as needed to fit your controller configuration. Building Controllers use Next Generation Control Basic, and the example code below will not work on older controllers.

```
10 REM ** AI6 IS STE-6012/6016
   TEMPERATURE SENSOR INPUT **
20 REM ** AO1 IS SUPPLY VOLTAGE (7.5
   UNOCCUPIED, 12 OCCUPIED MODE) **
30 REM ** BV3 IS OCCUPIED/UNOCCUPIED
   (ON/OFF) MODE **
40 REM ** PUSH UP OR DOWN BUTTON TO
   START OVERRIDE MODE (BV2) **
50 IF NOT BV3 THEN AO1@9=7.5 ELSE
   AO1@9=12
60 IF SENSORON ( AI6 ) AND NOT BV3 OR
   SENSOROFF ( AI6 ) AND NOT BV3 THEN
   START BV2
70 REM ** CHANGE DEFAULT OVERRIDE
   TIMEON OF 2 HRS TO DESIRED VALUE **
80 IF TIMEON ( BV2 ) > 02:00:00 THEN
90 STOP BV2 : AO1@8=12 : WAIT 00:00:04
   : RLQ AO1@8 : REM ** REMOVES
   OVERRIDE DISPLAY FROM LCD SCREEN **
100 ENDIF
110 END
```

Mounting Considerations

Sensors must **NOT** be:

- Mounted on an exterior wall.
- Mounted on or near a large thermal mass (e.g., concrete block wall).
- Blocked from normal air circulation by obstructions.
- Exposed to heat sources (e.g., lights, computers, copiers, or coffee makers) or to sunlight (at **any** time of the day).
- Exposed to drafts from windows, diffusers, or returns.
- Exposed to air flow through the conduit (from leaks in plenum ducts)—put plumber's putty or similar material inside the conduit to block air flow.

Troubleshooting

- Be sure the 10,000 ohm pull-up resistors on the controller board are turned **OFF**.
- Check wiring. To prevent excessive voltage drop, use a conductor size that is adequate for the wiring length!
- Check sensor configuration and tables in the controller.
- Check voltage from the controller.
- Check that the sensor is **NOT** mounted on an exterior wall, mounted on or near a large thermal mass, blocked from normal air circulation by obstructions, exposed to heat sources or to sunlight, exposed to drafts from windows or air vents, or exposed to air flow through the conduit from leaks in plenum ducts. (See the Mounting Considerations section.)

Specifications

Connections	Clamp (screw-type) terminals or modular RJ-45 jack (see Models chart)
Material	Flame-retardant plastic, light almond or white
Weight	Approx. 1.25 oz. (35 grams)
Sensor	
Type	Type II thermistor
Accuracy	± 0.36° F (± 0.20° C)
Resistance	10,000 ohms @ 77° F (25° C)
NTC	4.37%/° C @ 25° C
Dissipation Constant	2 mW/° C
Temp. Reading	0–5 VDC voltage output
Front Buttons	Two momentary push buttons, signal override condition, adjust setpoint, toggle ° C or F, calibrate temperature reading
Power Requirements	**7.5 VDC** (10.4 mA max. current draw) for setback/setup mode or **12 VDC** (9.7 mA) for normal/override modes
Approvals	CE compliant
Environmental Limits	
Display	35° to 90° F (2° to 32° C)
Operating	34° to 125° F (1.1° to 51.6° C)
Shipping	–40° to 140° F (–40° to 60° C)
Humidity	0 to 95% RH non-condensing

Accessories

HMO-6036	Universal Backplate, Almond
HMO-6036W	Universal Backplate, White
KMD-569**x**	STE-6010/6014/6015/6016/6017/6018 to Controller Cable with RJ-45 to RJ-11 Connectors (-569**3** = 25 ft.; -569**4** = 50 ft.; -569**5** = 75 ft.)
KMD-5624	PC Data Port (EIA-485) Cable
KMD-5576	EIA-485 to USB Communicator
SP-001	Flat Blade and Hex End Screwdriver

Important Notices

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