- Data Brochure

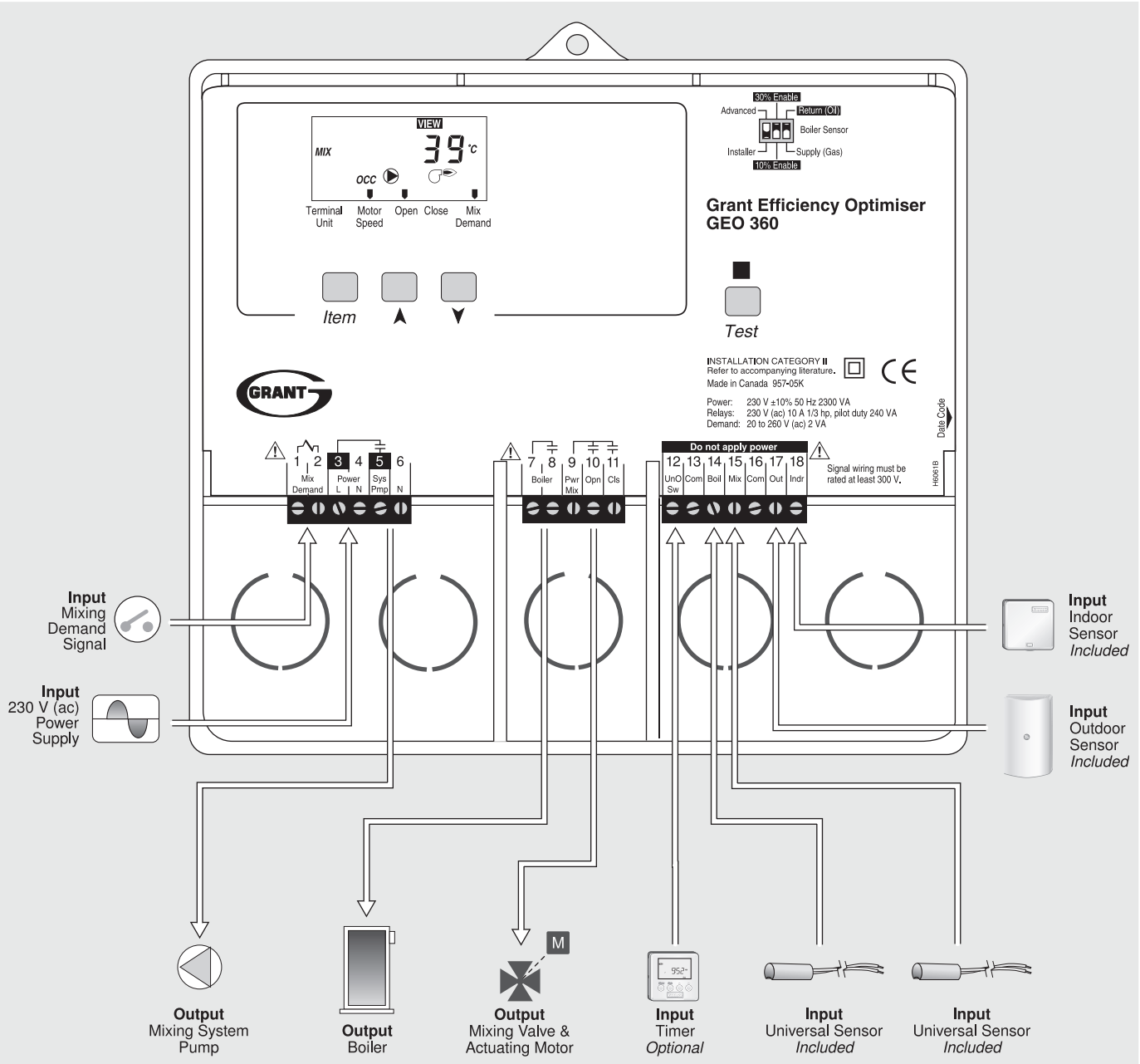
Grant Efficiency Optimiser GEO 360

GEO 360
06/06

The GEO 360 is designed to control the supply water temperature to a wet heating system in order to provide outdoor reset or setpoint operation. The control uses a floating action mixing valve to regulate the supply water temperature, while protecting the boiler against short cycling. The control has a Liquid Crystal Display (LCD) to view system status and operating information.

Additional Functions Include:

- Quick Setup for easy installation and programming of control
- User comfort adjustment to increase or decrease building space temperature
- Advanced settings to fine-tune building requirements
- Boiler Control for improved energy savings
- Powered mixing system pump output
- Indoor sensor included for room air temperature control
- Test sequence to ensure proper component operation
- Setback input for energy savings
- 230 V (ac) power supply
- CE Approved



How To Use The Data Brochure

This brochure is organised into four main sections. They are: 1) *Sequence of Operation,* 2) *Installation,* 3) *Control Settings,* and 4) *Troubleshooting. The Sequence of Operation* section has three sub-sections. We recommend reading Section A: *General Operation of the Sequence of Operation*, as this contains important information on the overall operation of the control. Then read the sub-sections that apply to your installation. For quick installation and setup of the control, refer to the *Installation* section, *DIP Switch Settings* section, followed by the *Quick Setup* section.

The *Control Settings* section (starting at *DIP Switch Settings*) of this brochure describes the various items that are adjusted and displayed by the control. The control functions of each adjustable item are described in the *Sequence of Operation*.

Table of Contents

User Interface

The GEO 360 uses a Liquid Crystal Display (LCD) as the method of supplying information. You use the LCD in order to set up and monitor the operation of your system. The GEO 360 has three push buttons (***Item***, ▲, ▼) for selecting, viewing, and adjusting settings. As you program your control, record your settings in the ADJUST menu table which is found in the second half of this brochure.

Item

The abbreviated name of the selected item will be displayed in the item field of the display. To view the next available item, press and release the ***Item*** button. Once you have reached the last available item, pressing and releasing the ***Item*** button will return the display to the first item.

Adjust

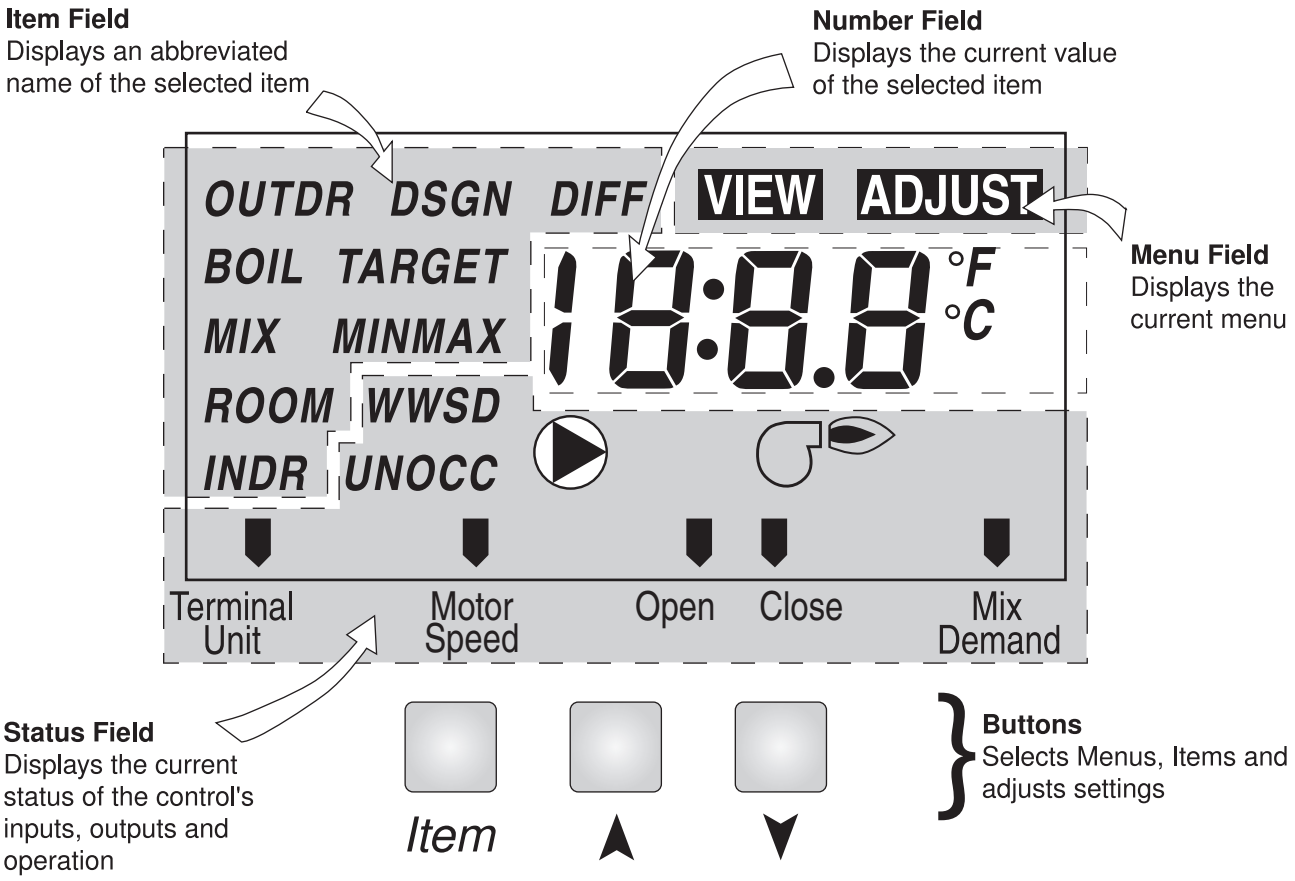
To make an adjustment to a setting in the control, press and hold all three buttons (***Item***, ▲ and ▼) for 1 second. The display will then show the word ADJUST in the top right corner. Then select the desired item using the ***Item*** button. Finally use the ▲ and/or ▼ button to make the adjustment.

To exit the ADJUST menu, either select the ESC item and press the ▲ or ▼ button, or leave the adjustment buttons alone for 20 seconds.

When the Item button is pressed and held in the VIEW menu, the display scrolls through all the adjust items in both access levels.

Additional information can be gained by observing the status field and pointers of the LCD. The status field will indicate which of the control's outputs are currently active. Most symbols in the status field are only visible when the VIEW menu is selected.

Display



Symbol Description

	**Pump** Displays when the mixing system pump is in operation.	*UNOCC*	**Unoccupied Schedule** Displays when the control is in unoccupied (Night) mode.
	**Burner** Displays when the boiler relay is turned on.	*°C, °F*	**°C, °F** Displays the unit of measure that all of the temperatures are to be displayed in the control.
OCC	**Occupied Schedule** Displays when the control is in occupied (Day) mode.		**Pointer** Displays the control operation as indicated by the text.

Definitions

The following defined terms and symbols are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

- Warning Symbol: Indicates presence of hazards which can cause severe personal injury, death or substantial property damage if ignored.

- Double insulated

INSTALLATION CATEGORY II

- Local level, appliances

Sequence of Operation

Section A —General Operation

POWERING UP THE CONTROL

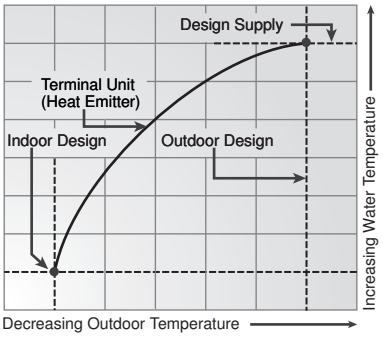
When the GEO 360 is powered up, the control displays the control type number in the LCD for 2 seconds. Next, the software version is displayed for 2 seconds. Finally, the control enters into the normal operating mode.

OPERATION

The GEO 360 uses a floating action mixing valve to vary the supply water temperature to a wet heating system. The supply water temperature is based on either the current outdoor temperature, or a fixed setpoint.

Outdoor Reset

When the outdoor design (OUTDR DSGN) setting is not set to OFF, the GEO 360 calculates a mixing supply water temperature based on the outdoor air temperature. The GEO 360 uses a *Characterised Heating Curve* and optionally indoor temperature feedback from an indoor sensor in this calculation.



Setpoint Control

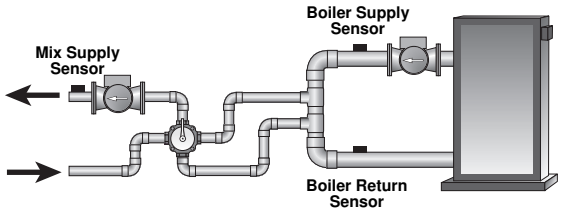
When the outdoor design (OUTDR DSGN) setting is set to OFF, the GEO 360 supplies a fixed mixing supply temperature equal to the MIX TARGET setting. An outdoor sensor is not required during this mode of operation.

FLOATING ACTION

A floating action actuator motor is connected to the GEO 360 on the *Pwr Mix*, *Opn*, and *Cls* terminals (9, 10 and 11). The GEO 360 pulses the actuator motor open or close to maintain the correct mixed supply water temperature at the mix sensor when there is a mixing demand. The actuator is connected to a 4-way mixing valve. A visual indication as to whether the control is currently opening or closing the mixing valve is displayed in the LCD.

BOILER PROTECTION (BOIL MIN)

The GEO 360 is capable of providing boiler protection from cold mixing system return water temperatures. If the boiler sensor temperature is cooler than the BOIL MIN setting while the boiler is firing, the GEO 360 reduces the output to the mixing valve. This limits the amount of cool return water to the boiler and allows the boiler temperature to recover. This feature can only be used if a boiler sensor is installed.



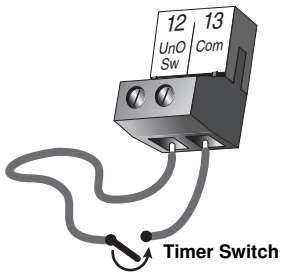
EXERCISING

The GEO 360 has a built-in exercising function. If the system pump or valve has not been operated at least once every 3 days, the control turns on the output for a minimum of 10 seconds. This minimizes the possibility of a pump or valve seizing during a long period of inactivity. The GEO 360 ensures that the mixing valve operates over its entire range at least once each exercising period. While the control is exercising the *Test* LED flashes.

Note: The exercising function does not work if power to the control, pump, or valve is disconnected.

SETBACK (UNOCCUPIED)

To provide greater energy savings, the GEO 360 has a setback capability. With setback, the supply water temperature in the system is reduced when the building is unoccupied. By reducing the supply water temperature, air temperature in the space may be reduced even when the thermostat(s) are not turned down. Any time the *UnO Sw* (12) and the *Com* (13) terminals are shorted together, the control operates in the unoccupied (Night) mode. When in the unoccupied (Night) mode, the UNOCC segment is displayed in the LCD. The GEO 360 adjusts the supply water temperature based on the UNOCC settings made in the control. This feature has no effect when the control is used as a setpoint control.



FACTORY DEFAULTS

The control comes preset with several factory defaults. These defaults are based on the terminal unit (heat emitter) selection (see section B2). To fine-tune building requirements, these defaults may be changed. If a factory default value for a terminal unit (heat emitter) is changed, the terminal unit (heat emitter) number will flash when selected in the ADJUST menu.

To reload the factory defaults listed in section B2, power down the control and wait for 10 seconds. Power up the control while simultaneously holding the ***Item*** and ▼ buttons. The terminal unit (heat emitter) number should now be displayed constantly in the LCD rather than flashing.

Section B: Mixing

Section B1
General

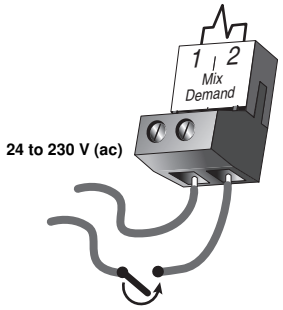
Section B2
Installer

Section B3
Advanced

Section B1: General

MIXING DEMAND

A mixing demand is required in order for the GEO 360 to provide heat. A mixing demand is generated by applying a voltage between 24 and 230 V (ac) across the *Mixing Demand* terminals (1 and 2). Once voltage is applied, the *Mixing Demand* pointer is displayed in the LCD. If the GEO 360 is not in Warm Weather Shut Down (WWSD), the GEO 360 closes the *Sys Pmp* contact. The GEO 360 calculates a MIX TARGET supply temperature based on the outdoor air temperature and settings. If required, the GEO 360 operates the boiler in order to provide heat to the mixing valve.



SYSTEM PUMP OPERATION *(SYS PMP)*

The system pump contact (Sys Pmp, terminal 5) closes whenever there is a mixing demand and the GEO 360 is not in Warm Weather Shut Down (WWSD). The system pump segment is displayed in the LCD. After the mixing demand has been satisfied, the GEO 360 continues to operate the system pump for 20 seconds. This allows some residual heat to be purged out to the heating system. During WWSD, the system pump is operated based on the exercise function.

INDOOR SENSOR

An indoor sensor may be used in order to provide indoor temperature feedback. The indoor sensor is connected to the *Com* and *Indr* terminals (16 and 18). In addition, power must be applied to the *Mixing Demand* terminals (1 and 2) as described in the MIXING DEMAND section. With the indoor sensor connected, the GEO 360 is able to sense the actual room temperature. Indoor temperature feedback fine-tunes the supply water temperature in the mixing system to maintain room temperature. To adjust the room temperature, use the ROOM OCC or ROOM UNOCC setting in the ADJUST menu at the control.

If a multiple zone system is used with an indoor sensor, proper placement of the indoor sensor is essential. The indoor sensor should be located in an area which best represents the average air temperature of the zones.

CHARACTERISED HEATING CURVE

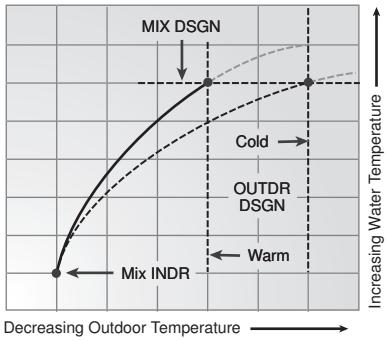
When used as a mixing reset control, the GEO 360 varies the supply water temperature based on the outdoor air temperature. The control takes into account the type of terminal unit (heat emitter) that the system is using. Since different types of terminal units (heat emitters) transfer heat to a space using different proportions of radiation, convection and conduction, the supply water temperature must be controlled differently. Once the control is told what type of terminal unit (heat emitter) is used, the control varies the supply water temperature according to the type of terminal unit (heat emitter). This improves the control of the air temperature in the building.

MIXING TARGET TEMPERATURE (MIX TARGET)

When used as a mixing reset control, the MIX TARGET temperature is calculated from the *Characterised Heating Curve* settings, outdoor air temperature and optionally, indoor air temperature. When used as a setpoint control, the installer sets the MIX TARGET temperature. The control displays the temperature that it is currently trying to maintain as the mixing supply temperature. If the control does not have a mixing demand,"– – –" is displayed as the MIX TARGET.

OUTDOOR DESIGN (OUTDR DSGN)

The OUTDR DSGN is the outdoor air temperature that is the typical coldest temperature of the year where the building is located. This temperature is used when doing the heat loss calculations for the building. If a cold outdoor design temperature is selected, the mixing supply temperature rises gradually as the outdoor temperature drops. If a warm outdoor design temperature is selected, the mixing supply temperature rises rapidly as the outdoor temperature drops.

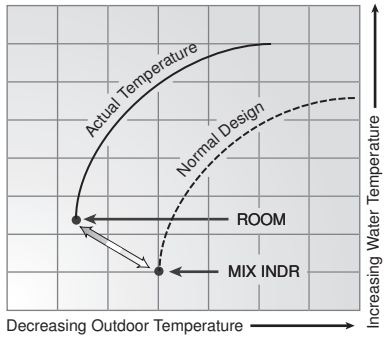


SETPOINT OPERATION (MIX TARGET)

For setpoint control, set the OUTDR DSGN to OFF. The MIX TARGET becomes the setpoint supply temperature that the control is to maintain. The MIX TARGET temperature is set by the installer in the ADJUST menu. An outdoor sensor is not required during this mode of operation.

ROOM OCC & UNOCC (ROOM)

The ROOM is the desired room temperature for the mixing zones, and it provides a parallel shift of the *Characterised Heating Curve*. The room temperature desired by the occupants is often different from the design indoor temperature (MIX INDR). If the room temperature is not correct, adjusting the ROOM setting increases or decreases the amount of heat available to the building. A ROOM setting is available for both the occupied (Day) and unoccupied (Night) modes.

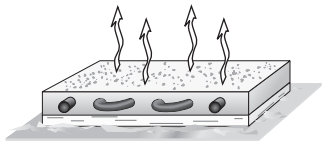


TERMINAL UNITS (HEAT EMITTERS)

When using a *Characterised Heating Curve*, the control requires the selection of a terminal unit (heat emitter). The terminal unit (heat emitter) determines the shape of the *Characterised Heating Curve* according to how the terminal unit (heat emitter) delivers heat into the building space. The GEO 360 provides for selection between six different terminal unit (heat emitter) types: two types of underfloor heating, fan heater, fin-tube convector, radiator, and baseboard. When a terminal unit (heat emitter) is selected, the control automatically loads the design supply temperature (MIX DSGN), maximum supply temperature (MIX MAX) and minimum supply temperature (MIX MIN). The factory defaults are listed below. To change defaults, refer to section B3. If a default has been changed, refer to Section A to reload the factory defaults. If using more than one type of terminal unit (heat emitter), then make a selection based upon the greater number of terminal units (heat emitters) of single type.

TERMINAL UNIT (HEAT EMITTER)	Underfloor Heating Screeded (1)	Underfloor Heating Plated (2)	Fan Heater (3)	Fin-Tube Convector (4)	Radiator (5)	Baseboard (6)
MIX DSGN	45°C	55°C	85°C	80°C	80°C	65°C
MIX MAX	55°C	65°C	100°C	90°C	85°C	80°C
MIX MIN	OFF	OFF	40°C	OFF	OFF	OFF

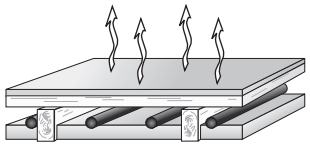
Underfloor Heating Screeded (1)



This type of a underfloor heating is embedded in a thick concrete slab. This heating system has a large thermal mass and is slow acting.

Default values: MIX DSGN = 45°C, MIX MAX = 55°C, MIX MIN = OFF

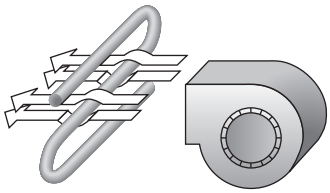
Underfloor Heating Plated (2)



This type of underfloor heating system is either attached to the bottom of a wood sub-floor, suspended in the joist space, or sandwiched between the sub-floor and the surface. This type of heating system has a relatively low thermal mass and responds faster than a high mass system.

Default values: MIX DSGN = 55°C, MIX MAX = 65°C, MIX MIN = OFF

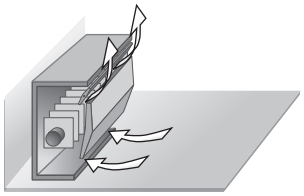
Fan Heater (3)



A fan heater or air handling unit (AHU) consists of a finned heat exchanger and either a fan or blower. Air is forced across the coil at a constant velocity by the fan or blower, and is then delivered into the building space.

Default values: MIX DSGN = 85°C, MIX MAX = 100°C, MIX MIN = 40°C

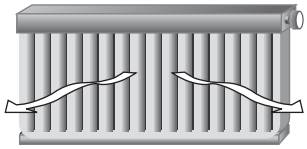
Fin-tube Convector (4)



A convector terminal (heat emitter) is made up of a heating element with fins on it. This type of terminal unit (heat emitter) relies on the natural convection of air across the heating element to deliver heated air into the space. The amount of natural convection to the space is dependant on the supply water temperature to the heating element and the room air temperature.

Default values: MIX DSGN = 80°C, MIX MAX = 90°C, MIX MIN = OFF

Radiator (5)



A radiator terminal unit (heat emitter) has a large heated surface that is exposed to the room. A radiator provides heat to the room through radiant heat transfer and natural convection.

Default values: MIX DSGN = 80°C, MIX MAX = 85°C, MIX MIN = OFF

Baseboard (6)

A baseboard terminal unit (heat emitter) is similar to a radiator, but has a low profile and is installed at the base of the wall. The proportion of heat transferred by radiation from a baseboard is greater than that from a fin-tube convector.

Default values: 65°C, MIX MAX = 80°C, MIX MIN = OFF

Section B3: Advanced

MIXING INDOOR (MIX INDR)

The MIX INDR is the room temperature used in the original heat loss calculations for the building. This setting establishes the beginning of the *Characterised Heating Curve* for the mixing zones.

MIXING DESIGN (MIX DSGN)

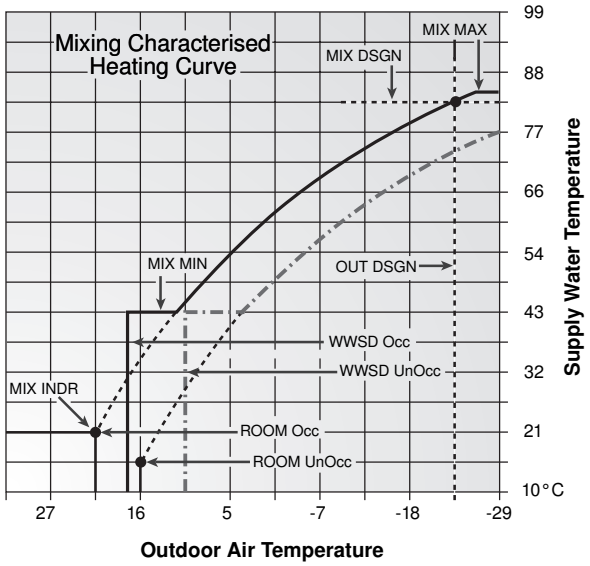
The MIX DSGN temperature is the supply water temperature required to heat the mixing zones when the outdoor air is as cold as the OUTDR DSGN temperature.

MIXING MAXIMUM (MIX MAX)

The MIX MAX sets the highest water temperature that the control is allowed to calculate as the MIX TARGET temperature. If the control does target the MIX MAX setting, and the MIX temperature is near the MIX MAX, the MAX segment will be displayed in the LCD while either the MIX TARGET temperature or the MIX temperature is being viewed.

MIXING MINIMUM (MIX MIN)

The MIX MIN is the lowest temperature that the control is allowed to use as a MIX TARGET temperature. During mild conditions, if the GEO 360 calculates a MIX TARGET temperature that is below the MIX MIN setting, the MIX TARGET temperature is adjusted to match the MIX MIN setting. During this condition, the MIN segment will be displayed in the LCD when either the MIX TARGET or MIX temperature is being viewed. If an indoor sensor is used, and the GEO 360 is operating at the MIX MIN temperature, the system pump is cycled using Pulse Width Modulation (PWM) with a 15 minute cycle length. By cycling the system pump and controlling the flow of supply water, the control provides an average supply water temperature to the system. This average temperature is equal to the original MIX TARGET. This minimizes overheating of the zone while the control is operating at the MIX MIN temperature.



WARM WEATHER SHUT DOWN (WWSD) OCC & UNOCC

When the outdoor air temperature rises above the WWSD setting, the GEO 360 turns on the WWSD segment in the display. When the control is in Warm Weather Shut Down, the *Mixing Demand* pointer is displayed if there is a demand. However the control does not operate the heating system to satisfy this demand. If the control is in setpoint mode, the WWSD feature is not functional.

Section C: Boiler Operation

Section C1
General
Operation

Section C2
Boiler Sensor
Placement

Section C1: General Operation

BOILER OPERATION

When the GEO 360 determines that boiler operation is required, the *Boiler* contact terminals (7 and 8) close. While the *Boiler* contact is closed, the burner segment in the LCD is displayed.

BOILER MINIMUM (BOIL MIN)

Most boilers require a minimum water temperature in order to prevent flue gas condensation. The BOIL MIN adjustment is set to the boiler manufacturer's minimum recommended operating temperature. Only when the boiler temperature is measured by a boiler sensor can the GEO 360 provide boiler protection. In this case when the boiler is firing and the boiler temperature is below the BOIL MIN Setting the GEO 360 turns on the MIN segment and reduces the heating load on the boiler by limiting the output of the mixing valve. If the installed boiler is designed for low temperature operation, set the BOIL MIN adjustment to OFF.

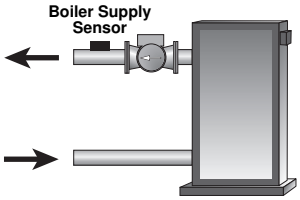
BOILER PROTECTION

Refer to section A for a description of boiler protection.

Section C2: Boiler Sensor Placement

BOILER SENSOR ON THE SUPPLY

(Boiler Sensor DIP switch = Supply)



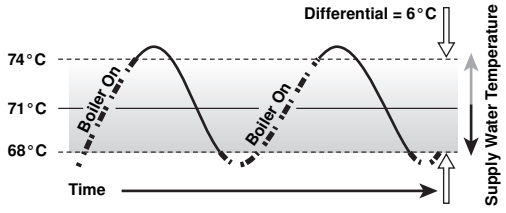
The boiler sensor can be located on the boiler supply if the GEO 360 is the only control that is operating the boiler. When in the supply mode, the GEO 360 determines the required operating temperature of the boiler using *Boiler Load Reset*. With *Boiler Load Reset*, the GEO 360 operates the boiler at the lowest possible supply temperature that is sufficient to satisfy the requirements of the mixing valve. If this mode of operation is selected, the boiler pump should either operate continuously, or be operated in parallel with the system pump contact (*Sys Pmp*).

Note: The boiler pump should not be operated by the boiler's thermostat, as this may lead to improper cycling of the boiler because of inconsistent flow past the boiler supply sensor.

BOILER DIFFERENTIAL

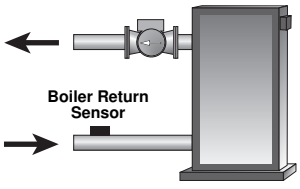
(BOIL DIFF)

An on / off heat source such as a boiler must be operated with a differential in order to prevent short cycling. When the boiler supply temperature drops below the bottom rail of the differential, the GEO 360 closes the *Boiler* contact to fire the boiler. When the boiler supply temperature rises above the top rail of the differential, the GEO 360 opens the *Boiler* contact to turn off the boiler. With the GEO 360, either a fixed or automatic differential setting is selected. If automatic differential (**Ad**) is selected, the GEO 360 automatically adjusts the boiler differential under the current load conditions to avoid short cycling.



BOILER SENSOR ON THE RETURN

(Boiler Sensor DIP switch = Return)

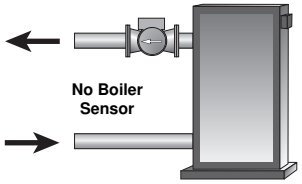


The boiler sensor should be located on the boiler return if the GEO 360 is one of many controls that can call for boiler operation. When in the return mode, the GEO 360 provides a boiler enable as described in the BOILER ENABLE section. The GEO 360 no longer tries to control the boiler supply water temperature directly but allows the boiler to operate at its operating thermostat setting when required. If this mode of operation is selected, the boiler pump should either operate continuously or be operated in parallel with the system pump contact (*Sys Pmp*).

Note: The boiler pump should not be operated by the boiler's thermostat, as this may lead to improper cycling of the boiler because of inconsistent flow past the boiler return sensor.

NO BOILER SENSOR

The GEO 360 is capable of operating without a boiler sensor if desired. Without a boiler sensor, the GEO 360 provides a boiler enable as described in the BOILER ENABLE section, but is unable to provide boiler protection. This type of application is typical if the GEO 360 is drawing heat from a heat source that already incorporates some form of boiler protection.



BOILER ENABLE

(**30% Enable** / **10% Enable**)

The GEO 360 has a DIP switch that allows for the selection between a 30% boiler enable and a 10% boiler enable. This switch is only functional when the *Boiler Sensor* DIP switch is set to *Return*. i.e. on an Oil Fired Boiler.

In the 30% position, the GEO 360 closes the *Boiler* contact when the position of the mixing valve exceeds 30%. The *Boiler* contact remains closed until the position of the mixing valve reduces below 15%. This setting would normally be chosen for low mass boilers (copper fin-tube, etc.) or systems with low thermal mass in the loop between the boiler and the mixing valve.

In the 10% position, the GEO 360 closes the *Boiler* contact when the position of the mixing valve exceeds 10%. The *Boiler* contact remains closed until the position of the mixing valve reduces below 5%. This setting is normally chosen for high mass boilers (cast iron, steel, fire-tube, etc.) or systems with large thermal mass in the loop between the boiler and the mixing valve.

In order to prevent short cycling, the *Boiler* contact has a minimum on time, and a minimum off time.

Installation

CAUTION

Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury. It is your responsibility to ensure that this control is safely installed to all applicable codes and standards. This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into the control circuit. Do not open the control. Refer to qualified personnel for servicing. Opening voids warranty and can result in damage to the equipment and possibly even personal injury.

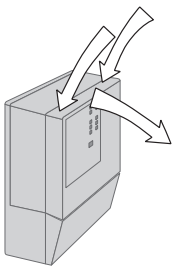
STEP ONE — GETTING READY

Check the contents of this package. If any of the contents listed are missing or damaged, please contact your place of purchase for assistance.

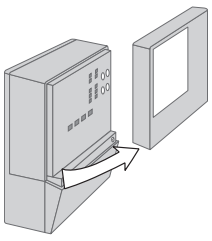
Type GEO 360 includes: One Grant Efficiency Optimiser GEO 360, One GEO 360 Outdoor Sensor, Two GEO 360 Universal Sensors, One GEO 360 Wall Plate, One GEO 360 Indoor Sensor, One GEO 360 Sensors Data Brochure, and One GEO 360 Data Brochure

Note: Carefully read the details of the *Sequence of Operation* to ensure that you have chosen the proper control for your application.

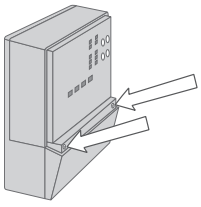
STEP TWO — MOUNTING THE BASE



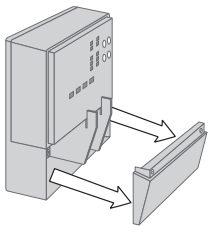
Press down at the fingertip grips on top of the front cover and pull out and down.



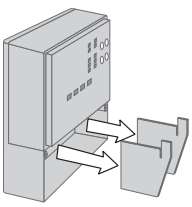
Lift the front cover up and away from the control.



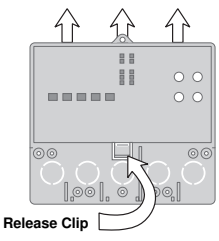
Loosen the screws at the front of the wiring cover.



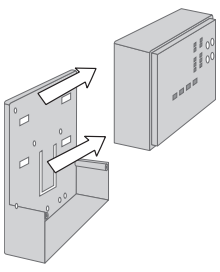
The wiring cover pulls straight out from the wiring chamber.



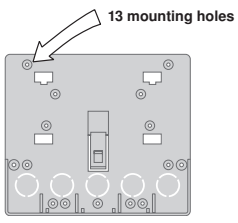
Remove the safety dividers from the wiring chamber by pulling them straight out of their grooves.



Press the control release clip on the base inside the wiring chamber and slide the control upwards.

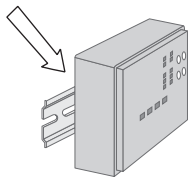


The control lifts up and away from the base.

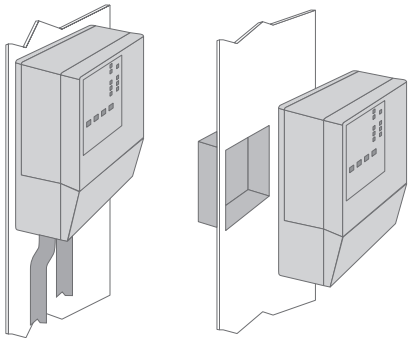


The base is ready for mounting. There are 10 conduit knock-outs at the back and bottom of the wiring chamber.

The control can be mounted on a standard DIN rail. This will be a popular option for those who prefer to mount the control inside a larger electrical panel.



The wiring can enter the bottom or the back of the enclosure. Knock-outs provided in the base allow the wiring to be run in conduit up to the enclosure. The base also has holes that line up with the mounting holes of most common electrical boxes.



STEP THREE — FIRST FIX WIRING

All electrical wiring terminates in the control base wiring chamber. The base has standard 22 mm (7/8") knockouts which accept common wiring hardware and conduit fittings. Before removing the knockouts, check the wiring diagram and select those sections of the chamber with common voltages. Do not allow the wiring to cross between sections, as the wires will interfere with safety dividers, which should be installed at a later time.

Power must not be applied to any of the wires during the first fix wiring stage.

- All wires are to be stripped to a length of 9 mm to ensure proper connection to the control.
- This control unit must be wired in the same circuit as all other heating system components.
- The system must be isolated by a double pole fused switch, with contact separation of at least 3 mm.
- The fuse rating must comply with the central heating boiler manufacturers installation instructions.
- Install the Outdoor Sensor according to the installation instructions in the GEO 360 Sensor Data Brochure and run the wiring back to the control.
- Install the Mixing Sensor according to the installation instructions in the GEO 360 Sensor Data Brochure and run the wiring back to the control.
- If a Boiler Sensor is used, install the sensor according to the installation instructions in the Sensor Data Brochure and run the wiring back to the control.
- If an Indoor Sensor is used, install the sensor according to the installation instructions in the GEO 360 Sensor Data Brochure and run the wiring back to the control.
- Run wire from other system components (pumps, boilers, etc.) to the control.
- Run wires from the 230 V (ac) power to the control. Use a clean power source with a 13 A circuit to ensure proper operation. Multi-strand 1.5 mm^2 - 2 core wire is recommended for all 230 V (ac) wiring due to its superior flexibility and ease of installation into the terminals.

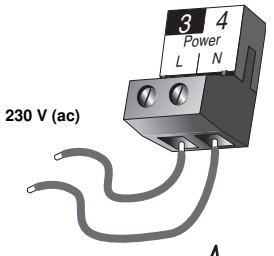
STEP FOUR — ELECTRICAL CONNECTIONS TO THE CONTROL

The installer should test to confirm that no voltage is present at any of the wires. Push the control into the base and slide it down until it snaps firmly into place.

⚠ *Powered Input Connections*

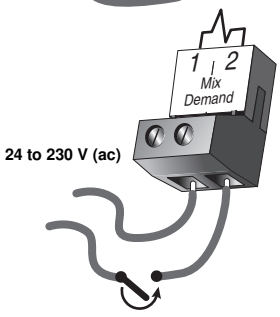
230 V (ac) Power

Connect the 230 V (ac) power supply to the *Power L* and *Power N* terminals (3 and 4). This connection provides power to the microprocessor and display of the control. As well, this connection provides power to the *Sys Pmp* terminal (5) from the *Power L* terminal (3).



Mixing Demand

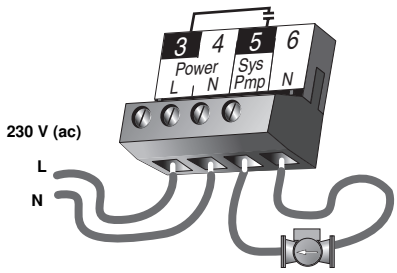
To generate a mixing demand, a voltage between 24 V (ac) and 230 V (ac) must be applied across the *Mixing Demand* terminals (1 and 2).



⚠ *Output Connections*

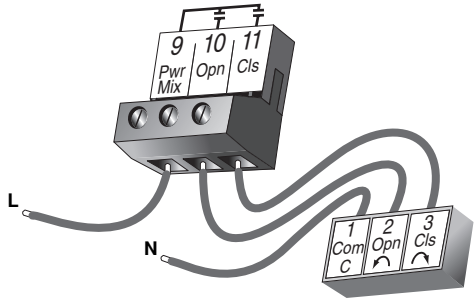
System Pump Contact (*Sys Pmp*)

The *Sys Pmp* output terminal (5) on the GEO 360 is a powered output. When the relay in the GEO 360 closes, 230 V (ac) is provided to the *Sys Pmp* terminal (5) from the *Power L* terminal (3). To operate the system pump, connect one side of the system pump circuit to terminal (5), and the second side of the pump circuit to the neutral (*N*) terminal 6.



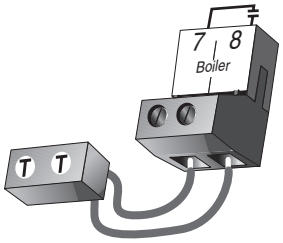
Mixing Valve Actuator

Terminals 9, 10 and 11 are isolated outputs from the control. Connect one side of the actuator power to the Pwr Mix terminal (9) on the control. The output relay Opn (10) is then connected to the open terminal of the actuator and the output relay Cls (11) is connected to the close terminal of the actuator. Connect the second side of the actuator power to the common terminal of the actuator.



Boiler Contact

The *Boiler* terminals (7 and 8) are an isolated output in the GEO 360. There is no power available on these terminals from the control. These terminals are to be used as a switch to either make or break the boiler circuit. When the GEO 360 requires the boiler to fire, it closes the contact between terminals 7 and 8.

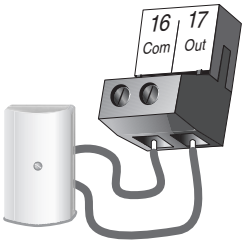


⚠ *Sensor and Unpowered Input Connections*

Do not apply power to these terminals as this will damage the control.

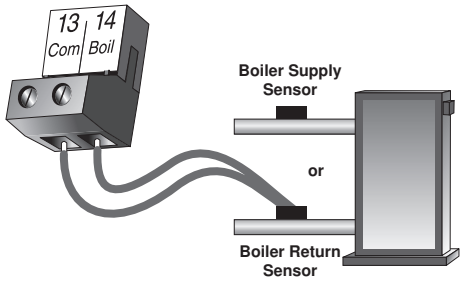
Outdoor Sensor

Connect the two wires from the Outdoor Sensor to the *Com* and *Out* terminals (16 and 17). The outdoor sensor is used by the GEO 360 to measure the outdoor air temperature.



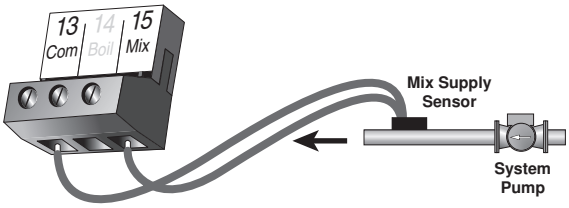
Boiler Sensor

Connect the two wires from the Boiler Sensor to the *Com* and *Boil* terminals (13 and 14). The boiler sensor is used by the GEO 360 to measure the boiler temperature.



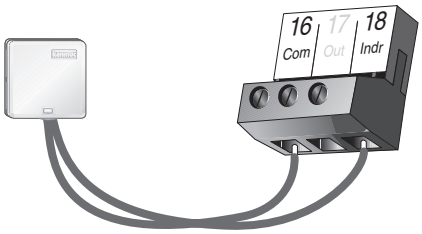
Mixing Sensor

Connect the two wires from the Mixing Sensor to the *Com* and *Mix* terminals (13 and 15). The mixing sensor is used by the GEO 360 to measure the supply water temperature after the mixing valve. Normally the sensor is attached to the pipe downstream of the system pump.



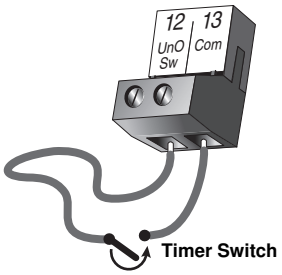
Indoor Sensor

If an indoor sensor is used, connect the two wires from the sensor to the *Com* and *Indr* terminals (16 and 18). The indoor sensor is used by the GEO 360 to measure the room air temperature.



Unoccupied Switch

If an external timer or switch is used, connect the two wires from the external switch to the *UnO Sw* and *Com* terminals (12 and 13). When these two terminals are shorted together, the control registers an unoccupied signal.



STEP FIVE — TESTING THE WIRING

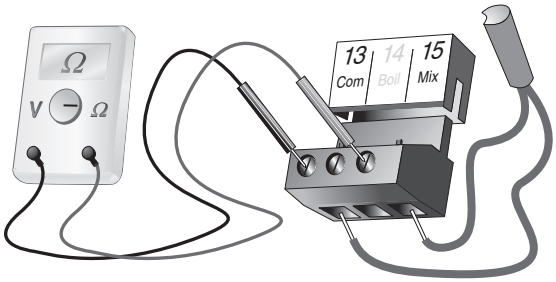
Each terminal block ***must be unplugged*** from its header on the control before power is applied for testing. To remove a terminal block, pull it straight down from the control.

The following tests are to be performed using standard testing practices and procedures, and should only be carried out by properly trained and experienced persons.

A good quality electrical test meter, capable of reading from at least 0 - 300 V (ac) and at least 0 - 2,000,000 Ohms, is essential to properly test the wiring and sensors.

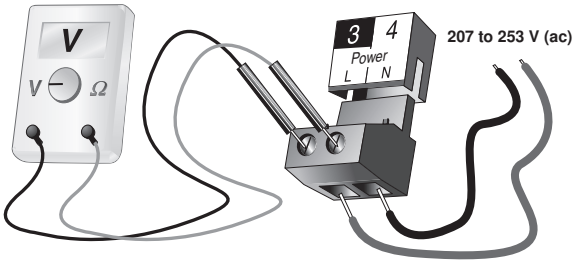
⚠ *Test The Sensors*

In order to test the sensors, the actual temperature at each sensor location must be measured. A good quality digital thermometer with a surface temperature probe is recommended for ease of use and accuracy. Where a digital thermometer is not available, a spare sensor can be strapped alongside the one to be tested, and the readings compared. Test the sensors according to the instructions in the GEO 360 Sensors Data Brochure.



⚠ *Test The Power Supply*

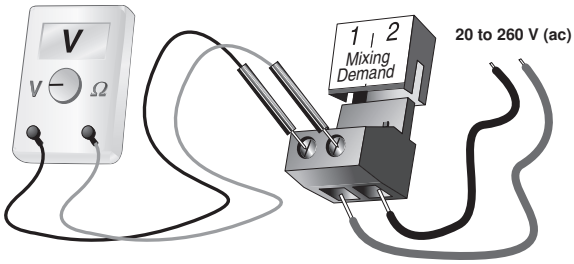
Make sure exposed wires and bare terminals are not in contact with other wires or grounded surfaces. Turn on the power and measure the voltage between the *Power L* and *Power N* terminals (3 and 4) using an AC voltmeter. The reading should be between 207 and 253 V (ac).



⚠ *Test The Powered Inputs*

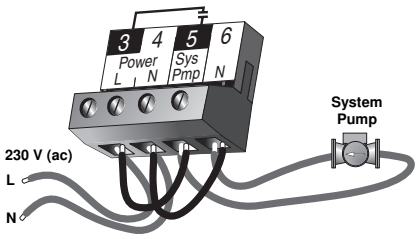
Mixing Demand

Measure the voltage between the *Mixing Demand* terminals (1 and 2). When the mixing demand device calls for heat, you should measure between 20 and 260 V (ac) at the terminals. When the mixing demand device is off, you should measure less than 5 V (ac).



⚠ *Test The Outputs*

System Pump (Sys Pmp)



If a system pump is connected to the *Sys Pmp* terminal (5) and N terminal (6), make sure that power to the terminal block is off, and install a jumper between the *Power L* and the *Sys Pmp* terminals (3 and 5). Install a second jumper between the *Power N* and *N* terminals (4 and 6). When power is applied to the *Power L* and *Power N* terminals (3 and 4), the system pump should start. If the pump does not turn on, check the wiring between the terminal block and pump, and refer to any installation or troubleshooting information supplied with the pump. If the pump operates properly, disconnect the power and remove the jumpers.

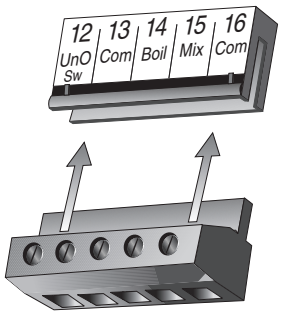
Boiler

If the boiler circuit is connected to the *Boiler* terminals (7 and 8), make sure power to the boiler circuit is off, and install a jumper between the terminals. When the boiler circuit is powered up, the boiler should fire. If the boiler does not turn on, refer to any installation or troubleshooting information supplied with the boiler (The boiler may have a flow switch that prevents firing until the boiler loop pump is running). If the boiler operates properly, disconnect the power and remove the jumper.

Mixing Valve Actuator

Make sure power to the actuator circuit is off and install a jumper between the Pwr Mix (9) and the Opn (10) terminals. When the circuit is powered up, the actuator should move in the open direction. If it does not, check the wiring between the terminals and the actuator. Refer to any installation or troubleshooting information supplied with the actuator. If the motor closes instead of opening, the wiring of the actuator must be reversed. If the valve opens correctly, turn off the power to the circuit and remove the jumper. Install a jumper between the Pwr Mix (9) and the Cls (11) terminals. When the circuit is powered up, the valve should move in the closing direction. If it does not, check the wiring between the terminals and the actuator. Refer to any installation or troubleshooting information supplied with the motor. If the motor closes correctly, turn off the power to the circuit and remove the jumper.

⚠ *Connecting The Control*



Make sure all power to the devices and terminal blocks is off, and remove any remaining jumpers from the terminals.

Reconnect the terminal blocks to the control by carefully aligning them with their respective headers on the control, and then pushing the terminal blocks into the headers. The terminal blocks should snap firmly into place.

Install the supplied safety dividers between the unpowered sensor inputs and the powered 230 V (ac) or 24 V (ac) wiring chambers.

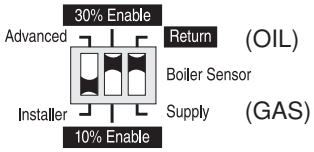
Apply power to the control. The operation of the control on power up is described in the Sequence of Operation section of this brochure.

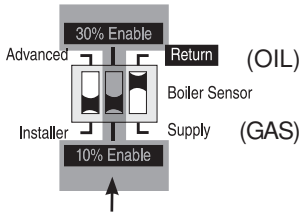
Cleaning

The control's exterior can be cleaned using a damp cloth. Moisten cloth with water and wring out prior to wiping control. Do not use solvents or cleaning solutions.

DIP Switch Settings

The DIP Switch settings on the control are very important and should be set to the appropriate settings prior to making any adjustments to the control through the user interface. The DIP switch settings change the items that are available to be viewed and / or adjusted in the user interface.





Not applicable when Boiler Sensor = Supply

ADVANCED / INSTALLER

The *Advanced* / *Installer* DIP switch is used to select which items are available to be viewed and / or adjusted in the user interface.

30% ENABLE / 10% ENABLE

The position of the *30% Enable* / *10% Enable* DIP switch determines at which valve position the control will close the Boiler contact under normal conditions. This switch is only operational if the *Boiler Sensor* DIP switch is set to *Return*. Refer to section C2.

BOILER SENSOR (RETURN / SUPPLY)

The Boiler Sensor DIP switch selects the installation location for the boiler sensor. When the boiler sensor is installed on the supply side of the boiler loop, the DIP switch must be set to *Supply*. The boiler thermostat should be set at least 11°C higher than the required design boiler water temperature. The boiler is controlled as described in section C.

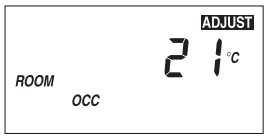
For systems where the GEO 360 provides a heat demand to an external boiler control, the boiler sensor should be installed on the return side of the boiler loop. When the boiler sensor is installed on the return side of the boiler loop, the DIP switch must be set to Return. The GEO 360 enables the boiler when the position of the mixing valve exceeds the boiler enable DIP switch setting. The Boiler contact is controlled as described in section C. The boiler's operating temperature is controlled by its thermostat, or an external boiler reset control.

Quick Setup

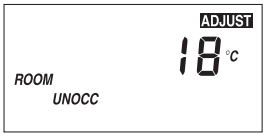
The quick setup can be used for both outdoor reset and setpoint operation. To enter the installer programming mode, set the *Advanced* / *Installer* DIP switch to *Installer.*

OUTDOOR RESET

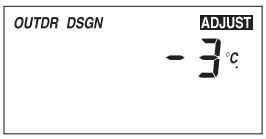
Access the ADJUST menu by pressing and holding simultaneously for 1 second, the ***Item,*** ▲ and ▼ buttons. The display will now show the word ADJUST in the top right corner.



The ROOM OCC adjustment is the first item displayed. Use the ▲ or ▼ button to set the ROOM temperature. The ROOM OCC setting is set to the desired room air temperature during the occupied (Day) mode.
Note: To increase or decrease space temperature during the occupied (Day) mode, only adjust the ROOM OCC setting.

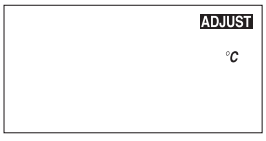


Press and release the ***Item*** button to advance to the ROOM UNOCC adjustment. Use the ▲ or ▼ button to set the desired temperature. The ROOM UNOCC setting is set to the desired room air temperature during the unoccupied (Night) mode.
Note: To increase or decrease space temperature during the unoccupied (Night) mode, only adjust the ROOM UNOCC setting.

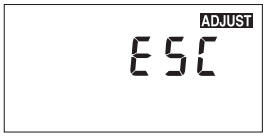


Press and release the ***Item*** button to advance to the OUTDR DSGN adjustment. Use the ▲ or ▼ button to set the outdoor design temperature. The OUTDR DSGN setting is set to the typical coldest temperature of the year.

Press and release the ***Item*** button to advance to the *terminal unit (heat emitter)* adjustment. Use the ▲ or ▼ button to select the desired terminal unit (heat emitter). The terminal unit (heat emitter) number corresponds to the type of terminal that is being used. The table below lists the terminal units (heat emitters) and their default values.



Press and release the ***Item*** button to advance to the units adjustment. Use the ▲ or ▼ button to set the scale to °C or °F.

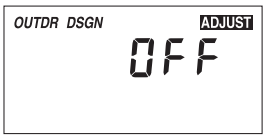


To exit the ADJUST menu, press and release the ***Item*** button to advance to the ESC item. Then either press the ▲ or ▼ button, or leave the buttons alone for 20 seconds.

TERMINAL UNIT (HEAT EMITTER)	Underfloor Heating Screeded (1)	Underfloor Heating Plated (2)	Fan Heater (3)	Fin-Tube Convector (4)	Radiator (5)	Baseboard (6)
MIX DSGN	45°C	55°C	85°C	80°C	80°C	65°C
MIX MAX	55°C	65°C	100°C	90°C	85°C	80°C
MIX MIN	OFF	OFF	40°C	OFF	OFF	OFF

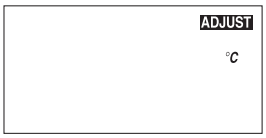
SETPOINT CONTROL

Access the ADJUST menu by pressing and holding simultaneously for 1 second, the ***Item***, ▲ and ▼ buttons. The display will now show the word ADJUST in the top right corner.

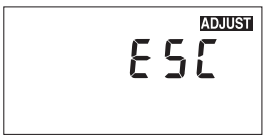


Press and release the ***Item*** button to advance to the OUTDR DSGN adjustment. Press and hold the ▲ button until OFF is displayed.

Press and release the ***Item*** button to advance to the MIX TARGET adjustment. Use the ▲ or ▼ button to select the desired temperature. The MIX TARGET setting is set to the desired setpoint supply temperature.

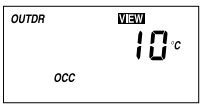
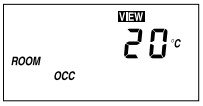
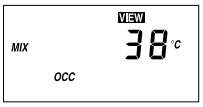
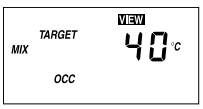
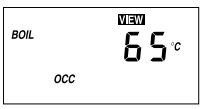


Press and release the ***Item*** button to advance to the units adjustment. Use the ▲ or ▼ button to set the scale to °C or °F.

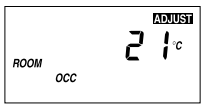
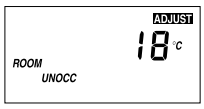
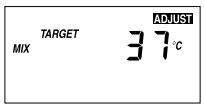
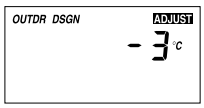
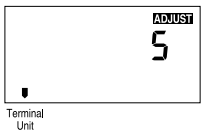
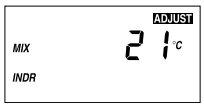
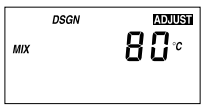
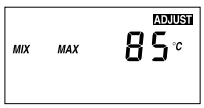
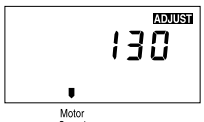
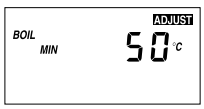


To exit the ADJUST menu, press and release the Item button to advance to the ESC item. Then either press the ▲ or ▼ button, or leave the buttons alone for 20 seconds.

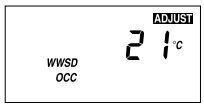
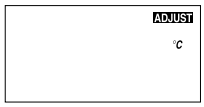
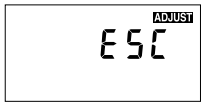
View Menu (1 of 1)

Display	Section	Installer	Advanced	Description	Range
		●	●	Current outdoor air temperature as measured by the outdoor sensor. This is also the default display for the control. **(OUTDR DSGN ≠ OFF)**	-55 to 65°C
	B1	●	●	Current room air temperature as measured by the indoor sensor. **(Indoor Sensor is present)**	-5 to 45°C
	B3	●	●	Current mixed supply water temperature as measured by the mixing sensor.	-10 to 130°C
	B1 B2 B3	●	●	Target mixed supply is the temperature the control is currently trying to maintain at the mixing sensor.	– – –, -10 to 130°C
		●	●	Current boiler temperature as measured by the boiler sensor. **(Boiler sensor is present)**	-10 to 130°C

Adjust Menu (1 of 2)

Display	Section	Installer	Advanced	Description	Range	Actual Setting
	B2	●	●	The desired room air temperature during an occupied (Day) period. **(OUTDR DSGN ≠ OFF)**	2 to 38°C	
	B2	●	●	The desired room air temperature during an unoccupied (Night) period. **(OUTDR DSGN ≠ OFF)**	2 to 38°C	
	B2	●	●	Mixing setpoint temperature. (OUTDR DSGN = OFF)	16 to 93°C	
	B2	●	●	The design outdoor air temperature used in the heat loss calculation for the heating system. For setpoint operation, set the OUTDR DSGN to OFF.	-51 to 0°C, OFF	
	B2	●	●	The type of terminal unit (heat emitter) that is being used in the heating system. **(OUTDR DSGN ≠ OFF)**	**1** Underfloor Heating Screeded **2** Underfloor Heating Plated **3** Fan Heater **4** Fin-tube Convector **5** Radiator **6** Baseboard	
	B3		●	The design indoor air temperature used in the heat loss calculation for the heating system. **(OUTDR DSGN ≠ OFF)**	2 to 38°C	
	B3		●	The design supply water temperature used in the heat loss calculation for the heating system. **(OUTDR DSGN ≠ OFF)**	21 to 104°C	
	B3		●	The maximum supply water temperature for the mixing system. **(OUTDR DSGN ≠ OFF)**	26 to 100°C	
	A		●	The time that the actuating motor requires to operate from fully closed to fully open.	30 to 230 seconds (1 sec. increments)	
	B3		●	The minimum supply temperature for the mixing system. **(OUTDR DSGN ≠ OFF)**	OFF, 2 to 65°C	
	C1		●	The minimum temperature allowed for the boiler target temperature. (Boiler sensor is present)	OFF, 27 to 82°C	

Adjust Menu (2 of 2)

Display	Section	Installer	Advanced	Description	Range	Actual Setting
	C2		●	The differential that the control is to use when it is operating the boiler. **(Boiler Sensor DIP switch = Supply AND Boiler sensor is present)**	Ad, 1 to 23°C	
	B3		●	The system's warm weather shut down during the occupied (Day) period. **(OUTDR DSGN ≠ OFF)**	2 to 38°C, OFF	
	B3		●	The system's warm weather shut down during the unoccupied (Night) period. **(OUTDR DSGN ≠ OFF)**	2 to 38°C, OFF	
		●	●	The units of measure that all of the temperatures are to be displayed in the control.	°C ,°F	
		●	●	This item exits the ADJUST menu by pressing either the ▲ or ▼ button.		

Testing the Control

The GEO 360 has a built-in test routine which is used to test the main control functions. The GEO 360 continually monitors the sensors, and displays an error message whenever a fault is found. See the following pages for a list of the GEO 360's error messages and possible causes. When the ***Test*** button is pressed, the test light is turned on. The individual outputs and relays are tested in the following test sequence.


Test

off not testing
red testing
red testing paused

TEST SEQUENCE

Each step in the test sequence lasts 10 seconds.

During the test routine, the test sequence may be paused by pressing the ***Test*** button. Only if there is a mixing demand can the control be paused in a step. If the ***Test*** button is not pressed again for 5 minutes while the test sequence is paused, the control exits the entire test routine. If the test sequence is paused, the ***Test*** button can be pressed again to advance to the next step. This can also be used to rapidly advance through the test sequence. To reach the desired step, repeatedly press and release the ***Test*** button until the appropriate device and segment in the display turn on.

Step 1 - The mixing valve is run fully open.

Step 2 - The mixing valve is run fully closed, and then the system pump (*Sys Pmp*) is turned on.

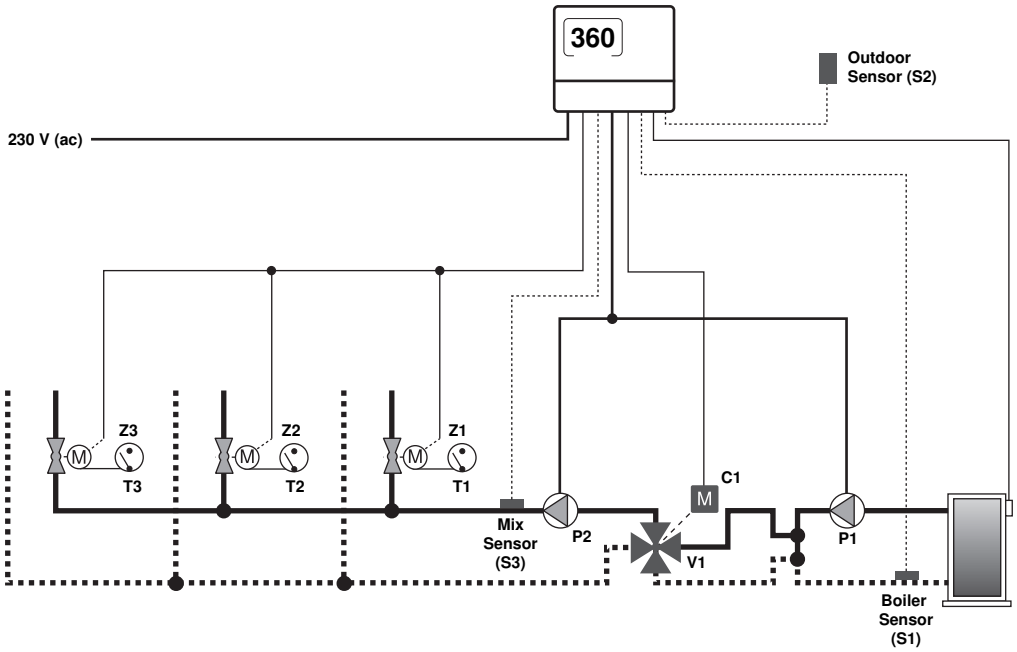
Step 3 - The *Boiler* contact is turned on for 10 seconds. After 10 seconds, the *Boiler* and *Sys Pmp* contacts are shut off.

Step 4 - After the test sequence is completed, the control resumes its normal operation.

- Application

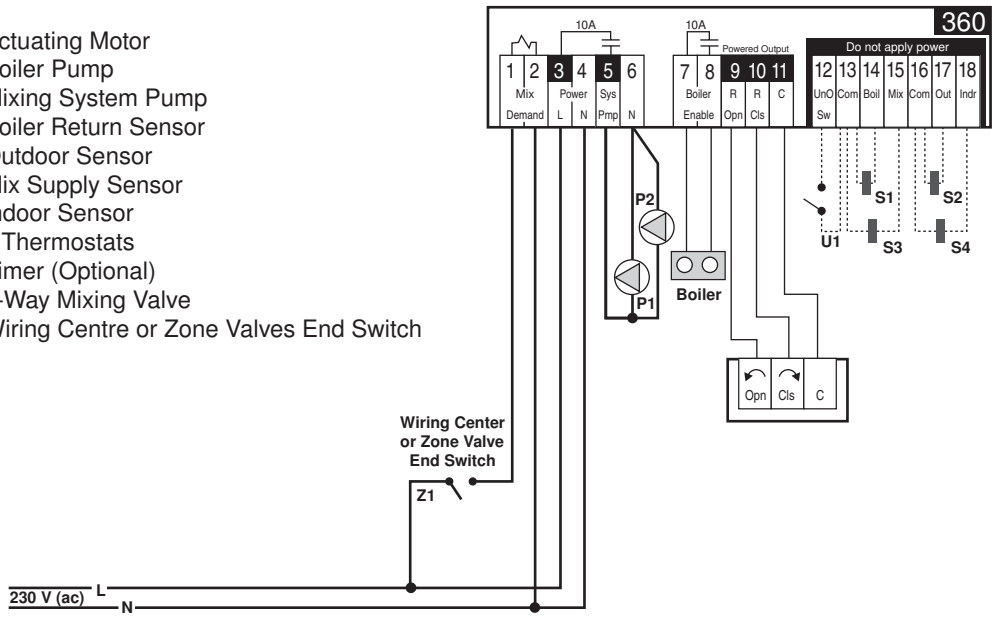
Grant Efficiency Optimiser GEO 360

Mechanical



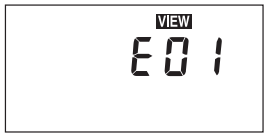
Electrical

C1 = Actuating Motor
P1 = Boiler Pump
P2 = Mixing System Pump
S1 = Boiler Return Sensor
S2 = Outdoor Sensor
S3 = Mix Supply Sensor
S4 = Indoor Sensor
T1...T3 = Thermostats
U1 = Timer (Optional)
V1 = 4-Way Mixing Valve
Z1 = Wiring Centre or Zone Valves End Switch



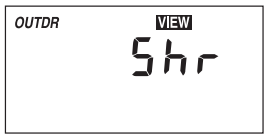
Concept Drawing
This is only a concept drawing, not an engineered drawing. It is not intended to describe a complete system, nor any particular system. It is up to the system designer to determine the necessary components for and configuration of the particular system being designed, including additional equipment, isolation relays (for loads greater than the control's specified output ratings), and any safety devices which in the judgement of the designer are appropriate, in order to properly size, configure and design that system and to ensure compliance with building and safety code requirements.

Error Messages

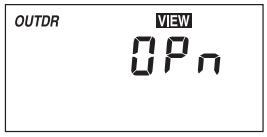


The control was unable to read a piece of information from its EEPROM. This error can be caused by a noisy power source. The control will load the factory defaults and stop operation until all the settings are verified.

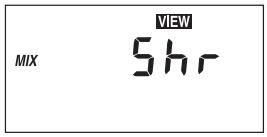
Note: The access level must be set to Advanced in order to clear the error.



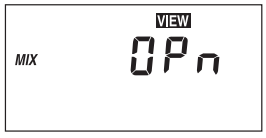
The control is no longer able to read the outdoor sensor due to a short circuit. In this case the control assumes an outdoor temperature of 0°C and continues operation. Locate and repair the problem as described in the GEO 360 Sensors Data Brochure. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



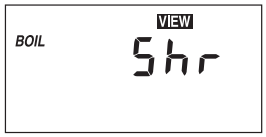
The control is no longer able to read the outdoor sensor due to an open circuit. In this case the control assumes an outdoor temperature of 0°C and continues operation. Locate and repair the problem as described in the GEO 360 Sensors Data Brochure. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



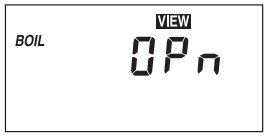
The control is no longer able to read the mixing supply sensor due to a short circuit. In this case the control will operate the mixing valve at a fixed output as long as there is a mixing demand. Locate and repair the problem as described in the GEO 360 Sensors Data Brochure. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



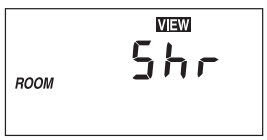
The control is no longer able to read the mixing supply sensor due to an open circuit. In this case the control will operate the mixing valve at a fixed output as long as there is a mixing demand. Locate and repair the problem as described in the GEO 360 Sensors Data Brochure. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



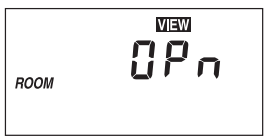
The control is no longer able to read the boiler sensor due to a short circuit. If the BOIL MIN adjustment is higher than 38°C, the control closes the Boiler contact when the mixing valve starts to operate. The boiler temperature is then limited by the operating thermostat. If the BOIL MIN adjustment is lower than 38°C, the control does not operate the Boiler contact. Locate and repair the problem as described in the GEO 360 Sensors Data Brochure. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



The control is no longer able to read the boiler sensor due to an open circuit. If the BOIL MIN adjustment is higher than 38°C, the control closes the Boiler contact when the mixing valve starts to operate. The boiler temperature is then limited by the operating thermostat. If the BOIL MIN adjustment is lower than 38°C, the control does not operate the Boiler contact. Locate and repair the problem as described in the GEO 360 Sensors Data Brochure. If the boiler sensor is deliberately removed, the control must be powered down, and then powered back up. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.

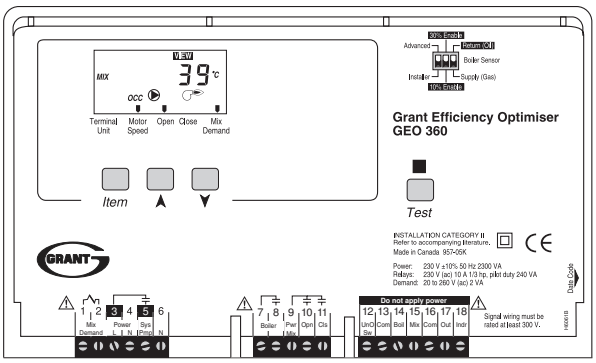


The control is no longer able to read the indoor sensor due to a short circuit. The control will continue to operate as if there was nothing connected to the indoor sensor input. Locate and repair the problem as described in the GEO 360 Sensors Data Brochure. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.



The control is no longer able to read the indoor sensor due to an open circuit. The control will continue to operate as if there was nothing connected to the indoor sensor input. Locate and repair the problem as described in the GEO 360 Sensors Data Brochure. If the indoor sensor is deliberately removed, the control must be powered down, and then powered back up. To clear the error message from the control after the sensor has been repaired, press the ***Item*** button.

Technical Data



GRANT EFFICIENCY OPTIMISER GEO 360	
Control	Microprocessor PID control; This is **not a safety (limit) control.**
Packaged Weight	1250 g, Enclosure A, white PVC plastic
Dimensions	170 H x 193 W x 72 D mm
Approvals	CE approved, meets ICES & FCC regulations for EMI/RFI.
Ambient Conditions	Indoor use only, 0 to 39°C, < 90% RH non-condensing. Altitude <2000 m Installation Category II, Pollution Category II.
Power Supply	230 V ±10% 50 Hz 2300 VA
System Pump Relay	230 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Boiler Relay	230 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Open Relay	230 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Close Relay	230 V (ac) 10 A 1/3 hp, pilot duty 240 VA
Mix Demand	20 to 260 V (ac) 2 VA
Sensors Included	NTC thermistor, 10 kΩ @ 25°C ±0.2°C ß=3892 Outdoor Sensor, Indoor Sensor, Wall Plate with screws and 2 Universal Sensors.

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All specifications are subject to change without notice.
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