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# Compass R

## High-Efficiency Dry-Rotor Circulators

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### Installation and operating instructions

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**WARNING**



- Prior to installation, read these installations and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.
- The use of this product requires experience with and knowledge of the product. Only licensed or trained installers should install this product.
- For supply connection, use wires acceptable for at least 90°C (194°F).
- **Risk of shock:** this pump has not been tested for use in swimming pools or marine areas.
- To reduce risk of electric shock: Disconnect before servicing, see instructions for proper installation.
- For indoor use only.
- Use copper conductors only.
- Install with motor shaft horizontally
- Do not submerge.
- Do not run without fluid in the system.

**1.0 SYMBOLS USED IN THIS DOCUMENT**

**WARNING**



The safety instructions must be followed to prevent potential personal injury.

**CAUTION**



The safety instructions must be followed to prevent potential malfunction or damage to the equipment.

**HINT**



Hints or instructions that make the setup easier and ensure safe operation

**2.0 GENERAL INSTALLATION**

**2.1 THE ARMSTRONG COMPASS R CIRCULATOR**

The Armstrong Compass R circulator is designed for circulating water in closed hydronic heating, cooling systems or potable water systems.

Armstrong Compass R circulators incorporate Armstrong patented Design Envelope variable speed control technology with an Permanent Magnet motor, enabling optimum energy efficiency and occupant comfort, with built-in control algorithms that can adapt to continuously changing system requirements.

The Armstrong Compass R features a user-friendly front-mounted control panel and wiring box for ease of installation (see Fig 8).

Patented in Canada PCT/CA/05086, Patent Pending; USA, etc.

**2.2 BENEFITS OF INSTALLING AN ARMSTRONG COMPASS R CIRCULATOR**

Six different control types (including Pulse Width Modulation), 3 modes have adjustable levels i.e fixed speed, proportional pressure and fixed head, to suit different system requirements. AUTO mode provides Sensorless demand-based control. Lastly 0-10V DC and 0% to 100% PWM external control allows for system control. In addition to control options the Compass R also includes:

- Easily selectable from the front mounted display.
- Power consumption and flow rate clearly displayed.

Broad operating range, power levels of ½ hp to 1.5 hp to provide versatility to cover the performance of a wide range of fixed speed or variable speed circulators.

- Flange to flange compatibility with existing Armstrong circulators and many competing models.

**3.0 INSTALLATION & MOUNTING**

**NOTE:** For convenience in future servicing, isolation flanges can be used in place of standard flanges.

Fig 1

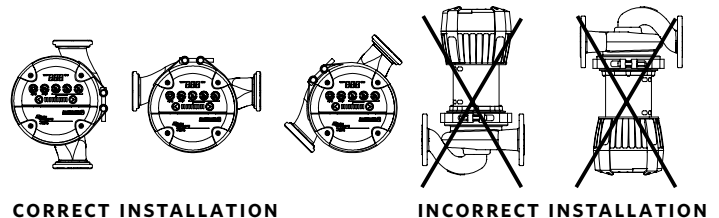
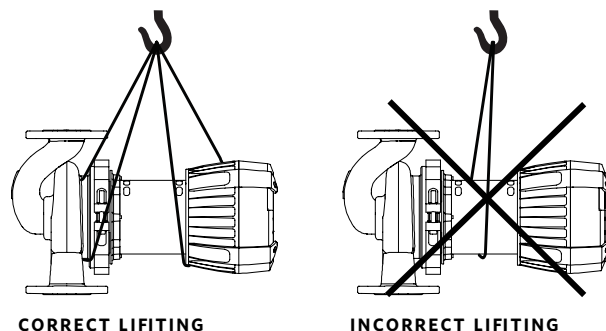


Fig 2



Arrows on the pump housing indicate the fluid direction through the pump.

- 1 Fit the two flange gaskets supplied when the pump is mounted into the piping system (pipe flanges not included).
- 2 Install the pump with the motor shaft horizontal (see **Fig 3**).

### 3.1 CONTROL BOX POSITIONS

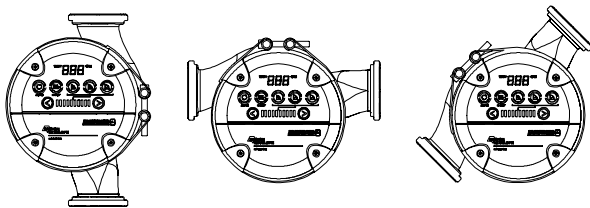
**WARNING**



Pump must be isolated from the system before making this adjustment.

The orientation of the display can be adjusted by loosening the clamp and adjusting the control box display position to the desired orientation (see section **7.0** for a visual of the clamp).

**Fig 3:** Control box rotation on Vertical or Horizontal pipe



**WARNING**



The pumped liquid may be scalding hot and under high pressure. Drain the system or close the isolating valves on either side of the pump before loosening the clamp.

**CAUTION**



After the position of the control box has been rotated, refill the pump with system liquid before startup.

**WARNING**



Disconnect power before servicing the pump.

### 3.2 INSTALLING POWER WIRING

The power wiring must be installed strictly in accordance with national electrical codes, local codes and regulations.

- 1 Electrical installation should be conducted by a qualified electrician.
- 2 Always make sure electric power is disconnected/ turned off at the power service panel

To install the power wiring, unscrew the two screws from the cover under the control buttons and remove the cover. (see **Fig 6**). The motor is available for 50/60 Hz, 1 phase, 115 volt or 208-240 volt input.

Strip insulation from the ends of the three wires to be connected.

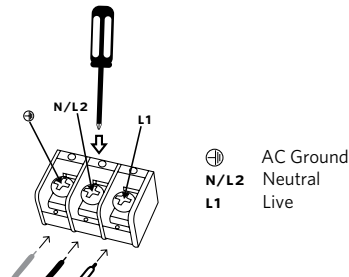
Insert wires through the power wiring opening (not included). The opening is available to connect a strain relief connector (provided loose).

Wire shall be 14 to 16 gauge solid wire or 16 to 18 gauge stranded wire.

Unscrew each terminal screw with a standard Philips Head #2 style screw driver.

Insert the stripped wire under each screw according to **Fig 4**.

**Fig 4:** Three wire power terminal box



Re-tighten the screws to secure the wire, tug and check the wire is secure. Re-install the cover, ensuring the provided rubber gasket is still in place.

### 4.0 INSTALLING CONTROL WIRING

The control wiring must be installed strictly in accordance with national electrical codes, local codes and regulations.

- 1 Electrical installation should be conducted by a qualified electrician.
- 2 Always make sure electric power is disconnected/ turned off at the power service panel

Wire shall be 18 to 22 gauge standard wire.

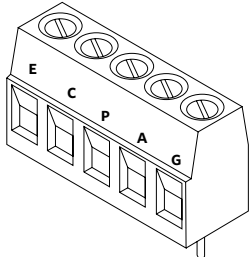
To wire, unscrew the two screws of the wiring box cover and remove the cover.

Insert wires through the strain relief and through the control box opening.

Strip insulation from the ends of the three wires to be connected.

Unscrew the control terminal screws using a 1/8" flat head screw driver. This will open the wire insets. Insert the stripped wire into the opening and re-tighten the screw (see **Fig.5**). Tug on the wire gently to ensure it is secured.

**Fig 5:** Control Screw Terminal



**NOTE:**  
Selecting PWM, instead of 0-10 V DC, as control input, requires specific key strokes as follows

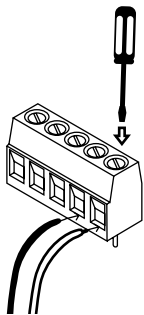
For PWM input (pulse width modulation) control, once the wiring is in place hold Analog Input button and the decrease level adjust button together for 5 seconds. P will be displayed on the control panel if PWM connection is successful.



Once the wiring is tight, refasten the terminal box cover and tighten the two cover screws.

| STICKER            | CONTROL                   |
|--------------------|---------------------------|
| E - Emitter        | Do not use                |
| C - Collector      | Do not use                |
| P - PWM control    | 0-100% control (Fig 7)    |
| A - Analog control | 0-10 V DC Control (Fig 6) |
| G - Ground         | Ground                    |

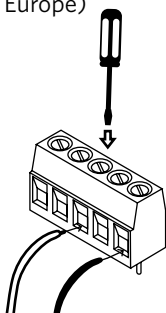
**Fig 6**



0-10 v AC (External Control input) - once wired, press the **INPUT** button on the control panel. If connection is successful 'A' will be displayed.

**Fig 7**

0-100% mode, PWM input (This is commonly seen in Europe)



The motor is thermally protected so overload protection is not necessary. All that is required is a fused plug or circuit breaker in the power line. Electrical information can be found on the side of the terminal box.

The electrical connections and protection must be carried out in accordance with local regulations.

**WARNING**



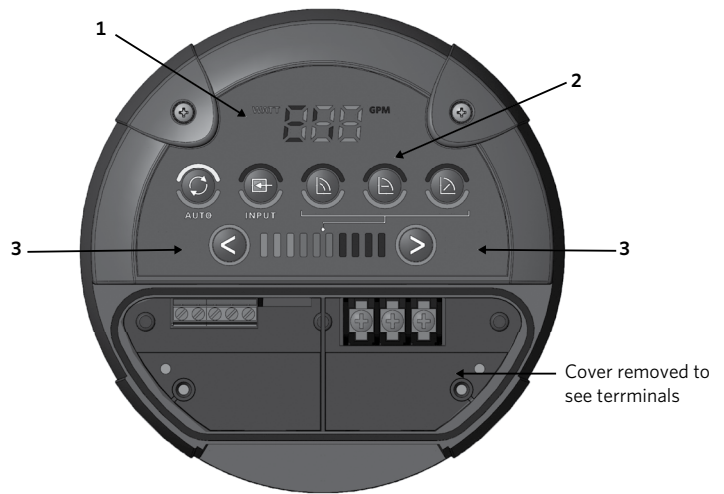
The pump must be connected to ground.

The RJ45 port (internet port) in the terminal box is for service testing of the Compass, if required.

**5.0 CONTROL PANEL**

**5.1 ELEMENTS ON THE CONTROL PANEL**

**Fig 8:** Armstrong Compass R control panel



The control panel on the Armstrong Compass R includes:

| NUMBER | DESCRIPTION   |
|--------|---|
| 1      | Display showing the actual pump power consumption in Watt and reference flow in USgpm. Display alternates between Watt and USgpm every 2 seconds. |
| 2      | Mode Select button for changing of pump setting   |
| 3      | Level Adjust button (< and >) for changing the pump speed and curve setting   |

**5.2 FIRST POWER-UP**

The display is defaulted to Auto mode (position 1 in Fig 9) when the power wiring is connected and the power has been switched on.

The display shows the actual pump power consumption in Watts and reference flow in USgpm during operation.

**Note:** The USgpm value is a flow indicator only, not calibrated.

**WARNING**



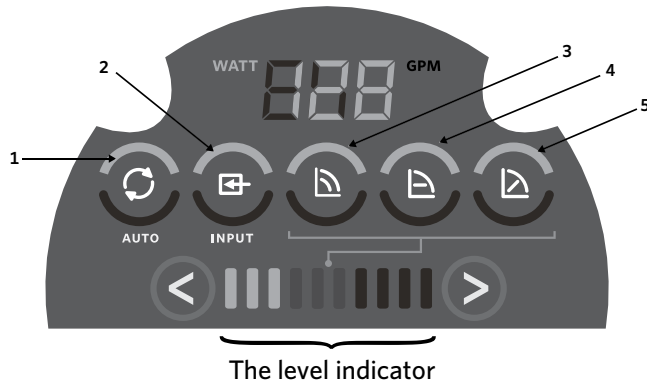
Do Not switch on power unless the fluid fill is complete.

**First power-up important note:** Permanent Magnet motors have a 15 second soft start-up time once plugged in, and a 30 second time to achieve full speed (thus different from a standard induction motors)

**5.3 DISPLAY**

The Armstrong Compass R has 5 pump settings which can be selected on the control panel. For the proportion pressure, fixed head and fixed speed modes the level is indicated by one of ten light fields (see Fig 9). Technically to reach any level it required only three button presses.

**Fig 9:** Five light fields, 10 Level indicators



| NUMBER | DESCRIPTION                             |
|--------|---|
| 1      | AUTO (factory setting)                  |
| 2      | 0-10 V DC external control INPUT or PWM |
| 3      | Fixed speed curve                       |
| 4      | Fixed head/pressure curve               |
| 5      | Manual proportional pressure curve      |

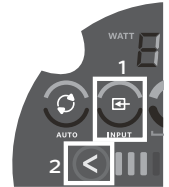
The proportional pressure, fixed speed and fixed head pressure curves default to the maximum level, and can be decreased/increased using the level adjust buttons. The maximum level is achievable, indicated by dim lights. See the list below for the maximum levels per Compass R model.



**HINT**

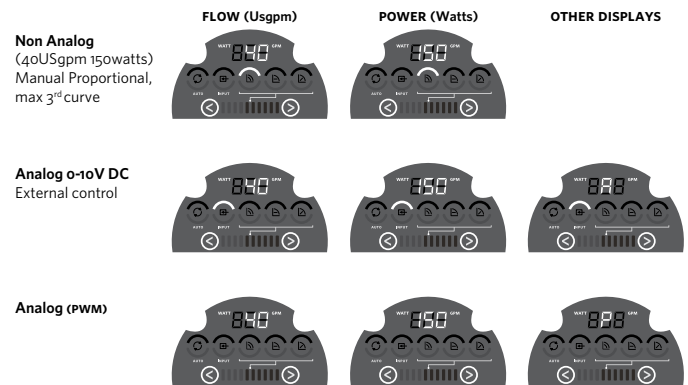
The number of levels varies by model. Dim lights show the levels available, bright lights indicate the selected level.

For the 0-10V DC control, PWM control, one must be set up following the diagrams in **Section 4.0** INSTALLING CONTROL WIRING. For PWM input (pulse width modulation) control, as discussed earlier once the wiring is in place hold Analog Input button 1 and the decrease button 2 together for 3 seconds. For AUTO, proportional pressure, fixed head and fixed speed no additional control wiring is required.



For the different modes the displays on the control panel will change, see below. During the Analog 0-10V operation or if the **input** button has been pushed the **A** will appear, however only if the 0-10V is wired properly and is operating correctly will the flow and power consumption appear, otherwise these will appear as 000 for power and flow.

**Fig 10**



**6.0 SETTING THE PUMP**

**6.1 PUMP SETTING FOR SYSTEM TYPE**

**Note:** Optimum energy savings & comfort can be achieved by careful selection of the correct operation mode.

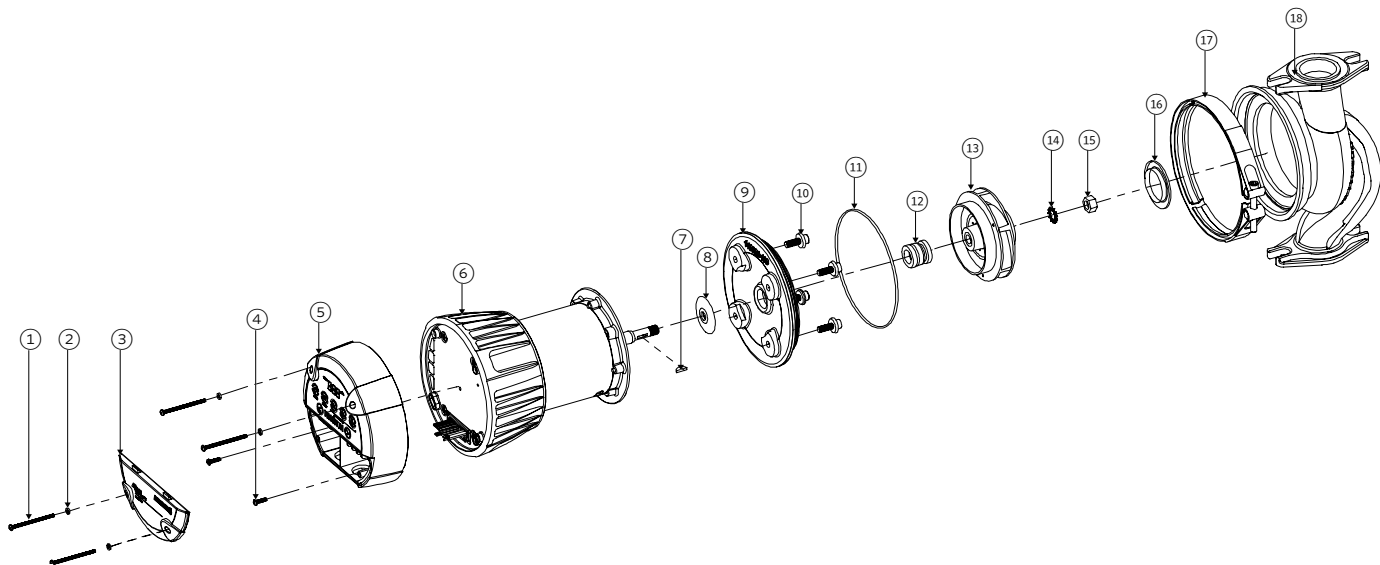
Recommended and alternative pump settings according to the below chart.

| NUMBER | MODE | APPLICATION   |
|--------|------|---|
| 1      | AUTO | (Default factory setting)<br>Self Adjusting to seasonal changes where there the flow rate and head pressure greatly differ. |

| NUMBER FROM FIG 10 | MODE                         | APPLICATION   |
|--------------------|------------------------------|---|
| 2                  | 0-10V DC & PWM               | A system where an external control device regulates the speed of the circulator to satisfy the system.<br>For example <ul style="list-style-type: none"> <li>Multi-zone flow distribution</li> <li>Multiple mode pumping (heating, cooling, charge heat storage, discharge heat storage)</li> </ul> |
| 3                  | Manual proportional pressure | Secondary and tertiary pumping in systems where in Auto mode some loads have been under-flowed at times.  |

| NUMBER FROM FIG 10 | MODE                | APPLICATION  |
|--------------------|---------------------|--|
| 4                  | Fixed head/pressure | Primary systems where the flow rate from the different loads vary greatly. <ul style="list-style-type: none"> <li>Applications where pressure is approximately constant, such as primary boiler and chiller circulators, condenser pumps and heat storage charging</li> <li>Pressure booster applications, where flow availability is not a concern and there is no chance of dead heading the pump</li> </ul> |
| 5                  | Fixed speed         | Behaves exactly like a traditional fixed speed circulator, as commonly specified for boilers.  |

## 7.0 EXPLODED ASSEMBLY VIEW



| INDEX | DESCRIPTION   |
|-------|---|
| 1     | Screw for controller housing M3×0.5×50                    |
| 2     | Screw gasket  |
| 3     | Controller plate cover                                    |
| 4     | Screw from controller housing to driver housing M3×0.5×12 |
| 5     | Controller  |
| 6     | Permanent Magnet motor                                    |
| 7     | Shaft key   |
| 8     | Water slinger   |
| 9     | Motor plate   |
| 10    | Plate bolts / washers                                     |
| 11    | O-ring  |

| INDEX | DESCRIPTION        |
|-------|--------------------|
| 12    | Mechanical seal    |
| 13    | Impeller           |
| 14    | Impeller washer    |
| 15    | Impeller nut       |
| 16    | Casing insert      |
| 17    | Motor casing clasp |
| 18    | Casing             |

**NOTE:**

Repair part numbers can be found in the Circulator Parts List, **File#** 6010.201 (not all parts shown here are available for sale, this is to show an entire breakdown of the Compass R)



## 8.0 SYSTEMS WITH BYPASS VALVE BETWEEN FLOW AND RETURN PIPES

### 8.1 PURPOSE OF BYPASS VALVE

The purpose of a differential pressure bypass valve is to ensure that the heat from the boiler can be distributed when all valves in the underfloor-heating circuits and/or thermostatic radiator valves are closed. These valves were commonly applied in multi zone systems with traditional fixed speed pumps.

A Compass R circulator can eliminate the need for a differential bypass valve when used in Auto or proportional pressure modes, because the circulator will reduce speed when the valves in the system close and the heat demand is reduced.

If you are servicing an existing system with a bypass valve and you are replacing a fixed speed circulator with a Compass R circulator, there is no need to remove the bypass valve.

## 9.0 START-UP

### 9.1 BEFORE START- UP

Fill the system with liquid and properly vent the system before starting the pump.

### 9.2 VENTING THE PUMP

Even with system vented, air may be still be present in the pump. The air in the pump may cause noise but the noise should cease after a few minutes running.

The venting process can be shortened by setting the pump to run at max speed for a short period of time (60 seconds).

Once the pump is vented (the noise has ceased), set the pump mode according to the recommendations (see **section 6**).

#### CAUTION



The pump must not run dry.

## 10.0 TROUBLESHOOTING WARNING



Before starting any work on the pump, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on.

| FAULT                        | CONTROL PANEL         | CAUSE  | REMEDY  |
|------------------------------|-----------------------|--|---|
| The pump does <b>not</b> run | Light off             | A fuse in the installation is blown                    | Replace the fuse  |
|                              |                       | The circuit breaker has tripped out                    | Switch the circuit breaker on   |
|                              |                       | The pump is defective                                  | Replace the pump  |
|                              | Shows <b>E01</b>      | Voltage too high or too low                            | Consult your local licensed electrician to check the voltage level of the electricity supply  |
|                              | Shows <b>E02</b>      | Stalled or locked rotor                                | Remove the casing a check for any contaminants or blockages preventing the impeller rotating. Clean accordingly and work to prevent future contaminants by checking the line  |
|                              | Shows <b>E03</b>      | No Liquid in the system<br>Voltage too high or too low | Check for system blockages preventing water getting to the pump. If there are no blockages, fill the system with water. If the system is full and there are no blockages, check the voltage supply to the voltage of the Compass R and consult your local licensed electrician if required. |
|                              | Shows <b>E04</b>      | Communication error                                    | Check the Internal Flat cable connection between Pump Controller and Permanent Magnet Motor   |
| Noise in the system          | Shows wattage and gpm | Air in the system                                      | See <b>section 9.2</b> venting of the pump system   |
|                              |                       | If there is liquid in the system, free of air.         | Select a lower speed or pressure curve (see <b>section 10</b> ). Pump settings and pump performance   |
|                              |                       | Pump may be running dry. No liquid in system           | Fill up the system  |
| Noise in the pump            | Shows wattage and gpm | Air in the pump  | Let the pump run. It vents itself over time (see <b>section 9.2</b> ) venting the pump  |
|                              |                       | The inlet pressure is too low                          | Increase the inlet pressure or check the air volume in the expansion tank, if installed   |
| Insufficient heat in space   | Shows wattage and gpm | The pump performance setting may be too low            | Select a higher speed or pressure curve setting (see <b>section 10</b> ). Pump settings and pump performance  |
|                              |                       |  | Confirm that the system requirement can be met by this pump capacity or larger pump may be required   |

## 11.0 RE-START PROTOCOL

Accumulated debris in piping can block fluid flow, which can cause motor seizing. When restarting after an extended period of no operation, the Compass R circulator uses a series of **pulsing** impeller rotations, in alternate directions, to dislodge in-line debris.

### 11.1 RE-START PROTOCOL DETAIL

If the impeller is seized the error code B-P (for Bump-Pulse) will be displayed. The controls will then stop the circulator and re-start 2 times, this takes approximately 10 minutes. After which, the controls will bump or rotate the impeller clockwise 30° then counter clockwise 30°, this will be done 3 times to hopefully free the impeller. The Pump will then try restarting, if this fails the control will restart this process once more. If this second test fails the pump will stop and the error code E02 will appear on the screen, pump repair/cleaning is required.

## 12.0 TECHNICAL DATA AND INSTALLATION DIMENSIONS

### 12.1 TECHNICAL DATA

**Supply voltage:** 1×115 V & 1×208-240V 50/60 Hz

**Motor protection:** The pump requires no external motor protection

**Maximum working temperature:** 230°F (110°C) maximum

**Maximum working pressure:** 175 psi (12 bar)

**Maximum relative air humidity (rh):** 95%

**Enclosure class:** ODP

**Insulation class:** F

**Certification:** ETL listed for US and Canada (conforms to UL778 certified to CSA STD. C22.2 NO.108)

\*NSF 372 and NSF 61 (for stainless steel models)

**Sound pressure level:** The sound pressure level of the pump is lower than 43 dB(A)

**Ambient temperature:** -4°F (-20°C) to 104°F (40°C)

**Pumped liquids:** Water or water Glycol mix

#### WARNING



No flammable liquids such as diesel oil, petrol or similar liquids

**Liquid temperature:** 36°F (2°C) – 230°F (110°C)

To avoid condensation in the control box and stator, the liquid temperature must always be higher than the ambient temperature.

#### CAUTION



Since water conditions can vary with geographical location (i.e. amount and type of dissolved solids) it is recommended that the operating temperature of the liquid for open (potable) systems be kept as low as possible (i.e. below 150°F OR 65°C) to avoid precipitation of calcium.

#### Volute material

**Ductile iron:** For closed systems (boiler loops)

**Stainless steel:** Open or closed systems (potable hot water or boiler loops)

Certified <0.25 weighted average percent lead (NSF 372) and complies with California Health and Safety code section 116875 (commonly known as AB1953).

For any replacement part, please see our replacement parts catalog.

## APPENDIX A

### SPOOL PIECE

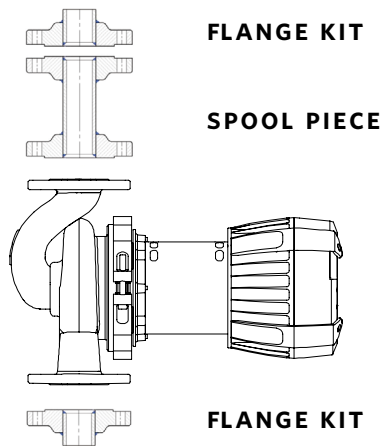
A spool piece is included with the following Compass R models:

- Compass R 25-140
- Compass R 40-45

For installations in which the flange-to-flange length of a Compass R casing is less than the flange-to-flange length of the circulator being replaced, the spool piece can be used to make up the difference. Adding the spool piece may eliminate the need for changes to piping.

### Installation Instructions

1. Connect the spool piece to one of the Compass R casing flanges using the provided spool gasket and hardware kit
2. Connect this assembly to piping flanges



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## APPENDIX B

### INSULATION

Insulation is included with every Compass R circulator, both for protection during shipping, and for thermal insulation during operation. The insulation can be used in both heating and cooling applications to reduce heat transfer to or from the casing. When installed, the insulation will slightly increase the overall dimensions of the Compass R casing.

