

Instruction Sheet

00e™ Series VR3452

SUPERSEDES: February 29, 2016

EFFECTIVE: February 17, 2017

1. GENERAL INFORMATION:

The circulating pumps are used for the transfer of liquid media within a closed-looped hot-water heating or air-conditioning hydronic system. They are designed as single or parallel main/standby operation variable-speed pumps, where the speed is regulated by an on-board electronic device. They are to be used with a water or glycol/water mixture.

2. SAFETY:

These instructions should be studied carefully before installing or operating the pump. They are meant to help you with installation, use and maintenance and to increase your safety. Installation should be performed with regards to local or national standards. Only qualified personnel should maintain and service these products. Failure to comply with safety precautions could cause personal injury or machinery damage.



WARNING: Do not use in swimming pool or spa areas. Pump has not been investigated for these applications.
AVERTISSEMENT: Ne pas utiliser dans une piscine ou un spa. La pompe n'a pas été étudiée pour ces applications.



WARNING: To avoid electrical shock, disconnect the power supply to the circulator and the main electrical unit. Follow all local electrical and plumbing codes.
AVERTISSEMENT: Pour éviter tout choc électrique, débranchez l'alimentation électrique vers le circulateur et l'unité électrique principale. Respectez tous les codes de plomberie et électriques locaux.



WARNING: Hot surfaces can cause burns. The motor can also reach temperatures that could cause injury.
AVERTISSEMENT: Les surfaces chaudes peuvent provoquer des brûlures. Le moteur peut également atteindre des températures qui peuvent entraîner des blessures.



CAUTION: The addition of petroleum based fluids or certain chemical additives to systems using TACO equipment voids the warranty.
ATTENTION: L'ajout de liquides à base de pétrole ou de certains additifs chimiques à des systèmes utilisant un équipement TACO annule la garantie.



CAUTION: Use supply wires suitable for 90°C.
ATTENTION: Employer des fils d'alimentation adéquats pour 90°C.



CAUTION: Misconnection or overload of electrical or signal connections could cause pump to shut-down or cause permanent damage.
ATTENTION: Toute erreur de raccordement ou surcharge des connexions électriques ou de signalisation peut entraîner un arrêt de la pompe ou des dommages permanents.



CAUTION: Do not operate pump without the electrical cover securely attached.
ATTENTION: Ne pas actionner la pompe si le couvercle électrique n'est pas correctement fixé.



CAUTION: Pump motor, electronics enclosure and condensate drain openings should not be thermally insulated as it could interfere with cooling and condensate drainage.
ATTENTION: Le moteur de pompe, l'enceinte électronique et les ouvertures de drainage de condensat doivent être thermiquement isolés car il peut y avoir interférence avec l'évacuation de condensat et de liquide de refroidissement.

3. PUMP DESCRIPTION:

The high efficiency, electronically commutated Vr3452 pumps consist of two main parts, the centrifugal pump and the electronic regulator. The hydraulic part is hermetically sealed from the motor assembly and has no mechanical seals. Vr3452 pumps are powered by an ECM permanent magnet motor which does not consume energy to magnetize the rotor, providing superior energy efficiency.

The ECM motor is run by an on-board frequency converter with an integrated PFC (Power Factor Correction) filter. The converter estimates current flow and head from the motor load, information essential for differential pressure control.

4. USE:

The Taco 00e VR3452 pumps are intended for circulation of solid-free fluid in pressurized, hot and chilled hydronic systems. The self-sensing ECM pump constantly calculates pressure and flow, and adapts its speed to the appropriate flow.

5. PUMPED FLUIDS:

Use water and water/glycol mixtures only. Water/glycol mixtures must be HVAC-system compatible and should have no more than 50% concentration of glycol. The fluid shall not consist of aggressive or explosive additives and mixtures of mineral oils and solid or fibrous particles. The pump should not be used for pumping flammable, explosive fluids, and in an explosive environment.

6. INSTALLATION:

The pump must be mounted with motor shaft in a horizontal position (see Figure 1). The permitted and prohibited positions are shown in Figure 2. The arrow on the hydraulic part indicates the proper direction of the fluid flow. Pumping in a downward direction may cause system issues but will not shorten the life of the pump.

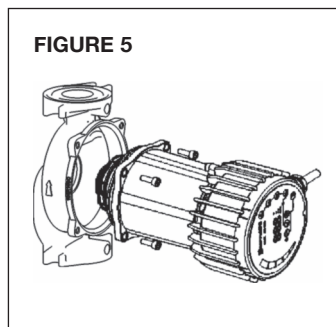
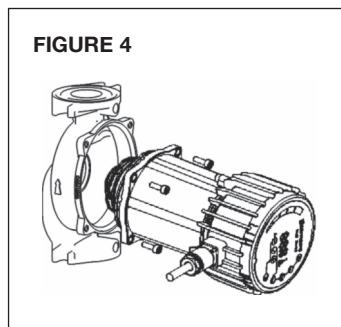
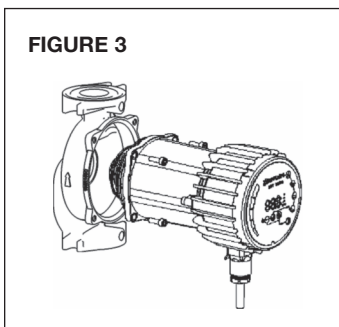
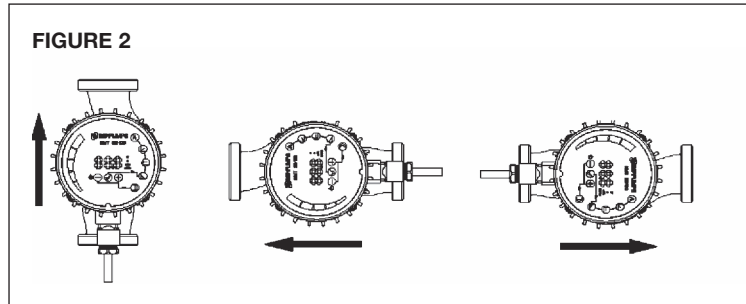
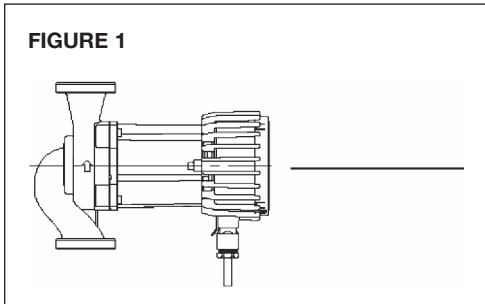
Installing the pump with the electrical connector vertically above the motor is not recommended (see Figure 3). Where the installation causes the electrical connector vertically above the motor, the motor can be rotated so that the electrical connector is in a horizontal position as described in Section 6.1.

PERMITTED AMBIENT AND MEDIA TEMPERATURE:

Ambient Temperature [°F]	Fluid Temperature	
	Min. [°F]	Max. [°F]
Up to 75	36	230
85	36	212
95	36	203
105	36	175

Ambient Temperature [°C]	Fluid Temperature	
	Min. [°C]	Max. [°C]
Up to 25	2	110
30	2	100
35	2	90
40	2	80

Note: Operation outside recommended conditions may shorten pump lifetime and void the warranty.



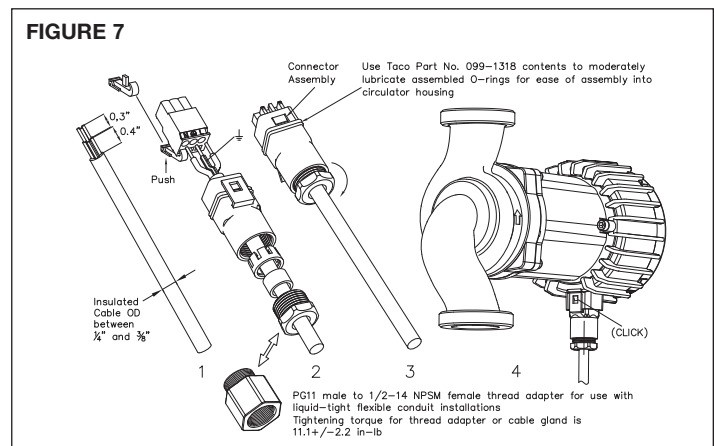
6.1 Motor Rotation Procedure

1. If possible, change the orientation of the motor before installing pump in piping. With motor in a vertical position, remove the 4 bolts (Figure 4 - $\frac{5}{32}$ " or 4mm Allen hex wrench required) and turn the motor (Figures 5 or 6) to conform with the desired orientation of pump (see Figure 2). If motor won't rotate, insert a screwdriver between pump casing and motor stator housing and raise slightly. Try turning motor. Insert screwdriver on opposite side, raise slightly, and try turning the motor. Motor should now turn - line up bolt holes when desired orientation is achieved.
2. **Caution:** If system is filled and pressurized, shut off valve before and after the Vr3452. Allow to cool if system fluid is hot.
3. If the pump is already installed in the piping, remove the 4 bolts ($\frac{5}{32}$ " or 4mm hex wrench required) and try rotating the motor without backing it out from the pump casing. Try lifting the motor approximately .020" using a screwdriver between the motor and pump housing and try turning the motor.
4. If motor will not move, remove motor completely.
5. Remove impeller, rotor, and rotor can from the motor. **Note: Rotor and impeller assembly will come out first. Remove rotor can from motor and put aside.**
6. Install impeller and rotor assembly into pump.
7. While holding rotor, install O-ring in casing, and then slide rotor can over rotor and slide all the way in. **Note: The rotor and rotor can is a sealed unit.**
8. Pick up the motor with the terminals properly orientated and carefully start to slide the motor over the rotor can. The resistance of the sliding will keep the rotor and rotor can assembly in place and the screwdriver can be moved. **Note: Do not allow the motor to droop or the O-ring might get out of position.**

Before starting the pump, the system (and pump) must be filled with fluid, and air completely bled out of the system. For proper operation, pressure must be maintained on the suction side of the pump. The pump does not have screws for bleeding the air, as it is automatically bled as a function of the design of the pump. Temporary air in the pump will generate noise that disappears after a short time.

WARNING!

- The maximum system pressure is 145 psi (1 MPa or 10 bar).
- The pump must always be filled with system fluid as it is water lubricated and water cooled.
- The motor stator openings and stator housing (Figure 7) should not be insulated, since the thermal insulation might prevent motor cooling and the evacuation of condensate from the pump's motor housing in high ambient humidity applications where the system fluid temperature is below the motor temperature.



7. ELECTRICAL CONNECTION:

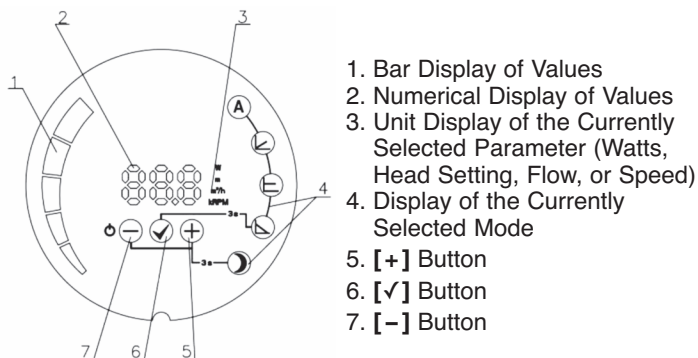
Connection of the pump must comply with local electrical codes and be carried out by qualified personnel. Connection to the power supply is carried out with the enclosed connector, the mounting of which is shown in the picture accompanying the connector. When connecting the pump, the following must be considered:

- Liquid tight power connection required to maintain IP44 enclosure rating. Use supplied thread adapter option for flexible or armored cable installations.
- Maximum power input wire size: 16 & 12 AWG solid or multi-strand copper for portable cord & flexible conduit installations; respectively.
- Local or national electrical code requirements supersede Taco's specification.
- Install an electrical disconnect to comply with national electrical code.
- Connection of the power supply electrical cable must be done in a manner that ensures it does not contact the motor housing and volute of the device, due to potential high temperatures of both.

The pump has built-in over current fuse protection, temperature protection, and basic overvoltage protection. It does not require additional overload protection devices unless required by local electrical codes. Power supply cabling should be capable of carrying rated power and be properly fused. Grounding connection is essential for safety and should be connected first. Grounding is only meant for pump safety. System piping should be grounded separately.

8. SETUP AND OPERATION:

8.1 Control Panel



8.2 Switching the Pump Motor On and Off

When the pump is powered for the first time, it operates with the factory default settings in automatic mode.

With subsequent motor start-ups and/or power-ups, due to the non-volatile memory the pump will operate with the last settings that were set prior to its shut-down. Battery back-up is not required.

To switch the pump off, press and hold the [-] key for 5 seconds, until OFF is shown on the display. When the pump is switched off, the numerical display shows OFF.

To turn the pump on, press the [-] key briefly.

8.3 Pump Functions

[-] Key

Short press:

- Scrolling through parameters downwards, not changing parameter values.
- Scrolling through modes downwards when mode selection is selected.
- Changing parameters downwards when setting parameter values.

Long press:

- 3 seconds together with [+] key to select night setback mode.
- 5 seconds to switch off the pump.

- 5 seconds together with [✓] and [+] keys to restore pump to factory default settings.

[✓] Key

Short press:

- To confirm currently selected values of both mode and parameter.

Long press:

- 3 seconds to enable mode selection.
- 5 seconds together with long press on [+] and [-] keys to restore pump to factory default settings.

[+] Key

Short press:

- Scrolling through parameters upwards, not changing parameter values.
- Scrolling through modes upwards when mode selection is selected.
- Changing parameters downwards when setting parameter values.

Long press:

- 3 seconds together with [-] key to enable night setback mode.
- 5 seconds together with [✓] and [-] keys to restore pump to factory default settings.

8.4 Operation and Setting of Pump Modes

To switch between modes (except night mode) press and hold the [✓] key for 3 seconds then select the desired mode with the [+] or [-] key. Once desired mode is selected, press the [✓] key to confirm.

Once the desired mode is selected, the factory default parameter is displayed numerical display (except for Auto Mode). If required, the parameter value can be changed with the [+] or [-] key, then confirm the parameter setting by pressing the [✓] key.

To activate or deactivate the night setback feature, simultaneously press and hold the [+] and [-] keys for 3 seconds.

To scroll through the parameter values within a mode, use the [+] or [-] keys. The desired parameter is selected (see individual mode) with the [✓] key. The parameter value is then selected using the [+] or [-] keys. The selected value is confirmed using the [✓] key.

8.5 Mode Descriptions

The pump can operate in 4 different modes to optimize the performance of the pump and maximize the system efficiency, based on the specific system type.

The pump modes are:

- Automatic Mode (factory default)
- Proportional Pressure (increased differential head as flow increases)
- Constant Pressure (constant pressure as flow increased)
- Constant Speed (user selectable to match system requirements)

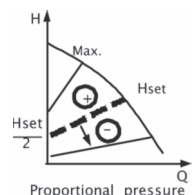
Each mode can be combined together with night mode.

Automatic Mode (factory default)

In automatic mode the pump automatically sets the operating pressure, depending on the hydronic system. By doing so, the pump finds the optimal operating setting. **This mode is recommended in most systems.** The parameters cannot be set; they can only be scrolled through.

Proportional Pressure

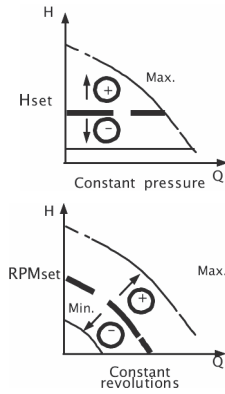
The pump maintains the pressure with relation to the current flow. The maximum differential head is the set pressure (Hset on the diagram) at maximum speed; at 0 flow the differential pressure is 50% of the Hset setting. As the



system flow changes the pump's differential pressure changes linearly along the line between Hset and 0 flow.

Constant Pressure

The pump maintains the current set pressure (Hset on the drawing), from 0 flow to maximum flow, where the pressure begins to drop.



Constant Speed

The pump operates with the currently set speed (RPMset on the drawing). In the unregulated mode, we can only set the speed at which the pump will operate and scroll through the other parameters.

Night Mode

When the pump operates in night mode, it automatically switches between the selected operating mode and night curve. The transition to the night mode depends on the fluid temperature in the system.

When the night mode is enabled, its icon illuminates and the pump operates in the selected operating curve of the mode. When the pump identifies the media temperature falling by 60 to 70 F° (15-20 C°) over a 2 hour time period, the icon starts to blink and the pump switches to the night curve. When the fluid temperature rises again, the icon stops blinking and the pump switches to the operating curve in the selected operating mode. The night mode operates only in combination with the above indicated modes. It is not an independent operating mode.

8.6 Setting the Pump to Factory Settings

To restore factory defaults, press and hold all three buttons for 5 seconds. The pump will be set to the automatic mode of operation. Any previously set values for pressure and RPM will be deleted.

9. OVERVIEW OF POSSIBLE ERRORS AND SOLUTIONS

If a pump failure or overload occurs, the error code will appear on the display screen as indicated in the table below. X is the error group and Y is the service code (intended for service personnel).

Error Group (X)	Error Description	Possible Cause & Solution
1	Low Load Detected	Pump running dry - purge/fill the system.
2	Motor Overload	Excessive amperage and/or sticking rotor assembly. Confirm voltage/amperage and check rotor/impeller spins freely.
3	Motor Too Hot	Motor exceeded temperature limitation and is stopped to allow the motor to cool down. Once cooled the pump will automatically restart and the error code recorded.
4	Electronics Error	An electronic error was detected. The pump can still operate but requires servicing.
5	Motor/Stator Failure	Possible motor wiring failure. Pump motor requires servicing.

See page 5 for error codes.

10. SPECIFICATIONS AND PUMP CHARACTERISTICS:

10.1 Application:

- Maximum Operating Pressure: 145 PSI (10 bar)
- Water Temperature Range: 36° – 230°F (-10° – 110°C)
- Ambient Operation Temperature Range: 32° – 104°F (0° – 40°C). Ambient temperature should be 104°F (40°C) or lower when fluid temperature exceeds 194°F (90°C).
- Minimum static inlet pressure at pump suction to avoid damage to the bearing assembly:
- Relative Humidity: Max. 95%
- System Pressure: Up to 145 PSI (10 bar)
- Designed for closed loop heating and cooling systems pumping water or a water/glycol mixture.
- For indoor use only - employer uniquement a l'interieur.

FLUID TEMPERATURES	PSI / bar
112°F (50°C)	0.73 / 0.05
176°F (80°C)	5.80 / 0.40
230°F (110°C)	15.95 / 1.10

10.2 Electrical Data:

- Pump Ratings: 1 phase, 110 - 120V, 47 - 63Hz (VR3452-HY1)
1 phase, 200 - 240V, 47 - 63Hz (VR345-HB1)
- Power Consumption (HP): ¼ HP
- Power Consumption (W): 10 - 180 W
- Rated Current (1 phase, 115V): 0.1 - 2.5 A
- Rated Current (1 phase, 230V): 0.1 - 1.5 A

10.3 Standards, Protection and Connection:

- Insulation: Class H (VR3452-HY1)
Class F (VR3452-HB1)
- Enclosure: Class 2, IP44
- Integrated Motor Protection (electronically protected)
- UL 778, 1004-1, 508C
- CAN/CSA C22.2 #108, #100, #107.1
- EMC (89/366 EEC): EN 61000
- LVD (73/23/EC): EN 60335-1, EN 60335-2-51
- Machine Safety (98/37/EC): EN ISO 12100
- Flange Connections: Residential 2 bolt flange from 3/4" to 1½" NPT - See Freedom Flange catalog (100-7.3), Shut-off Freedom Flange catalog (100-31), and Shut-off Freedom Swivel Flange catalog (100-56) on www.taco-hvac.com. The VR3452 uses the same flanges as "00" series (exc 0012).

10.4 Materials of Construction:

- Casing: Cast Iron, Cataphoresis Coated
- Impeller: PES
- Shaft: Stainless Steel
- Bearing: Carbon

ERROR CODES		
The following codes will show up on display panel and on the appropriate Modbus registers to help you diagnose the cause of improper operation.		
Error code	Description	Probable cause
E1x	Load errors	
E10 (drY)	Low motor load	Low load detected. Pump is running dry.
E11	High motor load	Motor might be faulty or viscous medium is present.
E2x	Protection active	
E22 (hot)	Converter temperature limit	Circuit is too hot and power was reduced to less than 2/3 of rated power.
E23	Converter temperature protection	Circuit is too hot to run, pump stopped.
E24	Converter overcurrent	Hardware overcurrent protection triggered.
E25	Overvoltage	Line voltage is too high.
E26	Undervoltage	Line voltage is too low for proper operation.
E3x	Pump errors	
E31	Software motor protection active	Average motor current was too high, pump load is much higher than expected.
E4x	Device specific error codes	
E40	General frequency converter error	Electrical circuitry did not pass self-test.
E42 (LEd)	LED faulty	One of the display segment diodes is faulty (open/short).
E43 (con)	Communications failed	Display board does not detect proper connection to main board, but power supply is present.
E44	DC link current offset	Voltage on DC link shunt (R34) not in expected range.
E45	Motor temperature outside limits	During MFG. TEST, this is 10 kΩ, 1% resistor for 10 °C..30 °C During operation, expected values are -55 °C..150 °C.
E46	Circuit temperature outside limits	During MFG. TEST, this is 0 °C..50°C. During operation, expected values are -55 °C..150 °C.
E47	Voltage reference outside limits.	Comparison between internal references does not match.
E48	15V outside limits	15 V supply not 15 V.
E49	Test load does not match	No test load detected or current measurement does not work properly (MFG. TEST).
E5x	Motor error codes	
E51	Motor parameters out of range	Motor does not behave as expected.

LIMITED WARRANTY STATEMENT

Taco, Inc. will repair or replace without charge (at the company's option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local Taco stocking distributor or Taco in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local Taco stocking distributor or Taco. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subject to misuse, misapplication, the addition of petroleum-based fluids or certain

chemical additives to the systems, or other abuse, will not be covered by this warranty.

If in doubt as to whether a particular substance is suitable for use with a Taco product or part, or for any application restrictions, consult the applicable Taco instruction sheets or contact Taco at [401-942-8000].

Taco reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. Taco reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

TACO OFFERS THIS WARRANTY IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY WARRANTY IMPLIED BY LAW INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS IS IN EFFECT ONLY FOR THE DURATION OF THE EXPRESS WARRANTY SET

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TACO WILL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS OR ANY INCIDENTAL COSTS OF REMOVING OR REPLACING DEFECTIVE PRODUCTS.

This warranty gives the purchaser specific rights, and the purchaser may have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts or on the exclusion of incidental or consequential damages, so these limitations or exclusions may not apply to you.

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