thermoscientific

TSC Series

Recirculating Chillers

Installation and Operation

U01566 • Revision A

IMPORTANT: Read this instruction manual. Failure to follow the instructions in this manual can result in damage to the unit, injury to operating personnel, and poor equipment performance.

CAUTION: All maintenance must be performed by qualified service personnel.

Material in this manual is for informational purposes only. The contents and the product it describes are subject to change without notice. Thermo Fisher Scientific makes no representations or warranties with respect to this manual. In no event shall Thermo Fisher Scientific be held liable for any damages, direct or incidental, arising from or related to the use of this manual.

Contents

Preface

Unpacking

If the chiller has a line cord it is located under the shipping crate's lid. Do not discard the lid until the cord is located. Retain all cartons and packing material until the chiller is operated and found to be in good condition.

Warranty

Thermo Fisher Scientific TSC Series Recirculating Chillers have a warranty against defective parts and workmanship for 24 months from date of shipment. Contact your sales representative for more information on the warranty.

After-sale Support

Thermo Fisher Scientific is committed to customer service both during and after the sale. If you have questions concerning the chiller operation, spare parts, or service contracts, contact our Sales Service and Customer Support. See the manual last page for contact information.

Before contacting, you can note down the chiller model number and serial number from the chiller's data plate. When contacting, inform the chiller model number and serial number.

Out of Box Failure

An Out of Box Failure is defined as any product that fails to operate in conformance with sellers' published specifications at initial power up.

To avoid that, ensure:

- To immediately open the box when you receive the shipment and inspect the unit for any damages. Report any damages from shipment to the seller within 5 days of receipt of the chiller.
- Install the chiller in accordance with manufacturer's recommended operating conditions within 30 days of receipt.

Any Temperature Control product meeting the definition of an Out of Box Failure must be packed and shipped back in the original packaging to Thermo Fisher Scientific for replacement with a new chiller; seller to pay the cost of shipping.

Customer must receive a Return Material Authorization (RMA) from Thermo Fisher Scientific prior to shipping.

Intended Use

Thermo Fisher Scientific TSC Series Recirculating Chillers are intended to provide a continuous supply of fluid at a constant temperature and flow rate to remove heat from a process or piece of equipment for maintaining a stable temperature.

These products are not considered as medical devices and have not been evaluated for use in environment or applications involving the diagnosis of diseases or other conditions, or in the cure, mitigation, treatment, or prevention of disease in man or other animal.

Safety Glossary

In this manual, the following symbols and conventions are used:

To indicate Legal Manufacturer.

To indicate Manufacturers model number.

To indicate Manufacturer's catalogue number.

To indicate Manufacturer's serial number so that a specific medical device can be identified.

To indicate the date of Manufacture.

To indicate Authorized Representative in the European Union.

To indicate Country of origin.

To indicate the need for the user to consult the instructions for use.

To indicate Attention: Consult Accompanying Documentation; Caution is necessary when operating the device.

To indicate that the equipment is suitable for alternating current only.

To indicate that the equipment is suitable for three phase alternating current only.

To identify the protective conductor ground terminal (Primary).

To Identify the Earth ground terminal.

To identify a port or plug as meeting the generic requirements of the Universal Serial Bus (USB).

To identify the switch or switch position in order to bring it into the “On” condition.

To identify the switch or switch position in order to bring it into the “Off” condition.

To identify the switch or switch position in order to bring it into the “Standby” condition.

DANGER: If the danger is not avoided, it will cause death or serious injury. This situation will result in serious injury or death.

WARNING: If the warning is not heeded, it can cause death or serious injury. This situation could result in serious injury or death.

CAUTION: If the precaution is not taken, it may cause minor or moderate injury. Should specify the precaution to avoid injury. This situation could result in minor injury.

NOTICE: Indicates information considered important but not hazard related.

Indicates caution is necessary when operating the device.

To identify equipment power source, that has risk of electric shock.

To indicate that the marked item can be hot and should not be touched without taking care.

To warn of flammability potential.

Do not dispose of this product in unsorted municipal waste stream.

Degrees of protection provided by enclosures (IP Code). The first digit indicates the protection against ingress of solid foreign objects. The second digit indicates the protection against ingress of liquids.

Intertek Certification mark. Tested and certified to USA and Canadian safety standards.

European Certification mark.

United Kingdom Certification mark.

South Korean KC Registration.

Minimum room floor area.

Safety Precautions

Safety Warnings

Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your chiller. If you have any questions concerning the operation or the information in this manual, please contact us. See inside cover for contact information.

WARNING: Indicates an immediately hazardous situation, if not avoided, will result in death or serious injury.

This symbol when used alone indicates important operating instructions which reduce the risk of injury or poor performance of the unit.

CAUTION: Indicates an immediately hazardous situation, if not avoided, may result in minor to moderate injury.

WARNING: Indicates situations where dangerous voltages exist and potential for electrical shock is present.

CAUTION: Indicates hot surface. Do not touch. To avoid possible skin burns, see manual for instructions.

Before installing, using or maintaining this product, please be sure to read the manual and product warning labels carefully. Failure to follow these instructions may cause the product to malfunction, which could result in injury or damage.

Note: Do not upload non Thermo Fisher Scientific approved files. This can cause the User Interface to become inoperable and requires a qualified service technician to repair.

Note: All maintenance must be performed by qualified service personnel.

Risk of cancer from exposure to Lead and reproductive harm from exposure to Lead. For more information, go to www.P65Warnings.ca.gov

The unit construction provides protection against the risk of electrical shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided.

WARNING: This unit must have a protective earth ground. Connect this unit to the correct power source. Incorrect voltage can damage unit.

WARNING: Disconnect unit from mains power before maintenance or repair.

CAUTION: Failure to follow these procedures the unit may cause undue stress on the compressors or jeopardize user product safety.

WARNING: Never cut the grounding prong from the service cord plug. If the prong is removed, the warranty is invalidated.

Risk of Fire: Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must Be Followed.

Risk of Fire: Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.

Risk of Fire or Explosion: Dispose Of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.

WARNING: Ensure that the power cord is securely connected before operating or moving the equipment. Do not operate the equipment if the power cord connection is loose or damaged.
A loose connection of the power supply cord can result in electrical arcing, fire hazard, or equipment malfunction.

WARNING: Ensure all ventilation openings are not obstructed.

WARNING: Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.

WARNING: Do not damage the refrigerant circuit.

- Performance of installation, operation, or maintenance procedures other than those described in this manual may result in a hazardous situation and may void the manufacturer's warranty and safety compliance.
- Observe and never remove warning labels.
- The chiller is not designed for outdoor use. Position the system for clear access to the front panel, where all controls, indicators and readouts are located. Access to the top and side panels is required to perform maintenance and repair procedures.
- Never operate equipment with damaged power cords.
- The circuit protector located on the rear is not intended to act as a disconnecting means.
- Never operate the chiller with panels removed. In the case of TSC210-TSC260 series, the unit will not function properly without the panels.
- Never operate the chiller without process fluid in the reservoir.
- Never connect the process fluid inlet or outlet fittings to your building water supply or any water pressure source.
- Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's SDS for handling precautions and PPE requirements.
- To prevent freezing/glazing of the plate exchanger, TSC series chillers require the use of 50/50 EG/water or 50/50 PG/water below 10°C process temperature.
- When using a process fluid mixture of ethylene glycol and water or propylene glycol and water, check the fluid concentration and pH on a regular basis. Changes in concentration and pH can impact system performance.
- Do not use automotive antifreeze. Commercial antifreeze contains silicates that can damage the pump seals. Use of automotive antifreeze will void the manufacturer's warranty.
- Many refrigerants which may be undetectable by human senses are heavier than air and will replace the oxygen in an enclosed area causing loss of consciousness. Contact with leaking refrigerant will cause skin burns. Refer to the chiller's nameplate for the type of refrigerant used and then the refrigerant's SDS for additional information.
- Drain the chiller before it is transported and/or stored, Refer to **Draining**. Store the chiller in the temperature range -40°C to +65°C and <90% relative humidity.
- Always turn off the chiller and disconnect the power cord from the power source before performing any service or maintenance procedures, or before moving.
- Transport the chiller with care. Sudden jolts or drops can damage its components.
- Never operate damaged or leaking equipment.
- Only authorized personnel may service this equipment. See manual for safety information.
- The equipment shall be stored in a room without continuously operating ignition sources.
(For example: open flames, an operating gas equipment or an operating electric heater).
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odor.
- Keep any required ventilation openings clear of obstruction.
- Servicing shall be performed only as recommended by the manufacturer.
- Ducts connected to the unit shall not contain a potential ignition source.
- An unventilated space where the equipment using flammable refrigerants is installed shall be so constructed that in the event of any refrigerant leak, it will not stagnate so as to create a fire or explosion hazard.
- A non-fixed equipment shall be stored in an area where the room size corresponds to the room are as specified for operation.
- Any fluid circuits connected to the equipment shall safely release abnormal pressure.
- The equipment shall not allow the release of flammable refrigerant into areas served by the other circuits if these do not comply with minimum room area limit.

- The equipment is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the equipment by a person responsible for their safety. Children should be supervised to ensure that they do not play with the equipment.
- Leave the electrical service disconnect ON (energized) for a minimum of 12 hours prior to start up. This will energize the crankcase heater to ensure refrigerant is vaporized in the compressor.
- Proper fluid selection is essential for operation of chiller and your instrument. Please Refer to instruction on cooling fluids in manual. Failure to read the manual before adjusting the pressure may result in injury or damage to your instrument.
- Never drill holes in or near the panels. Drilling could damage the insulation and make the unit inoperable.
- Never operate the chiller without process fluid in the reservoir.
- Do not modify system components, especially the controller. Use OEM replacement equipment or parts only.
- Always connect cables through the factory provided connector (if provided). Incorrect connector can result in severe damage to the equipment.
- Operational room ambient temperature range 10°C to 40°C (50°F to 104°F). In case of water cooled units, Facility Water Temperature: 5°C to 40°C (41°F to 104°F); Facility Water pressure: <150PSIG and <50PSID.
- Condensers should be cleaned at least every six (6) months. In heavy traffic areas, more frequent cleaning will be necessary.
- It is important to make sure the unit is level. Be sure to set the brakes for units equipped with casters.
- Never place the chiller in a location where excessive heat, moisture, or corrosive materials are present.
- Always connect the equipment to a dedicated (separate) circuit. Electrical codes require fuse or circuit breaker protection for branch circuit conductors. Use time delay fuses for all circuits.

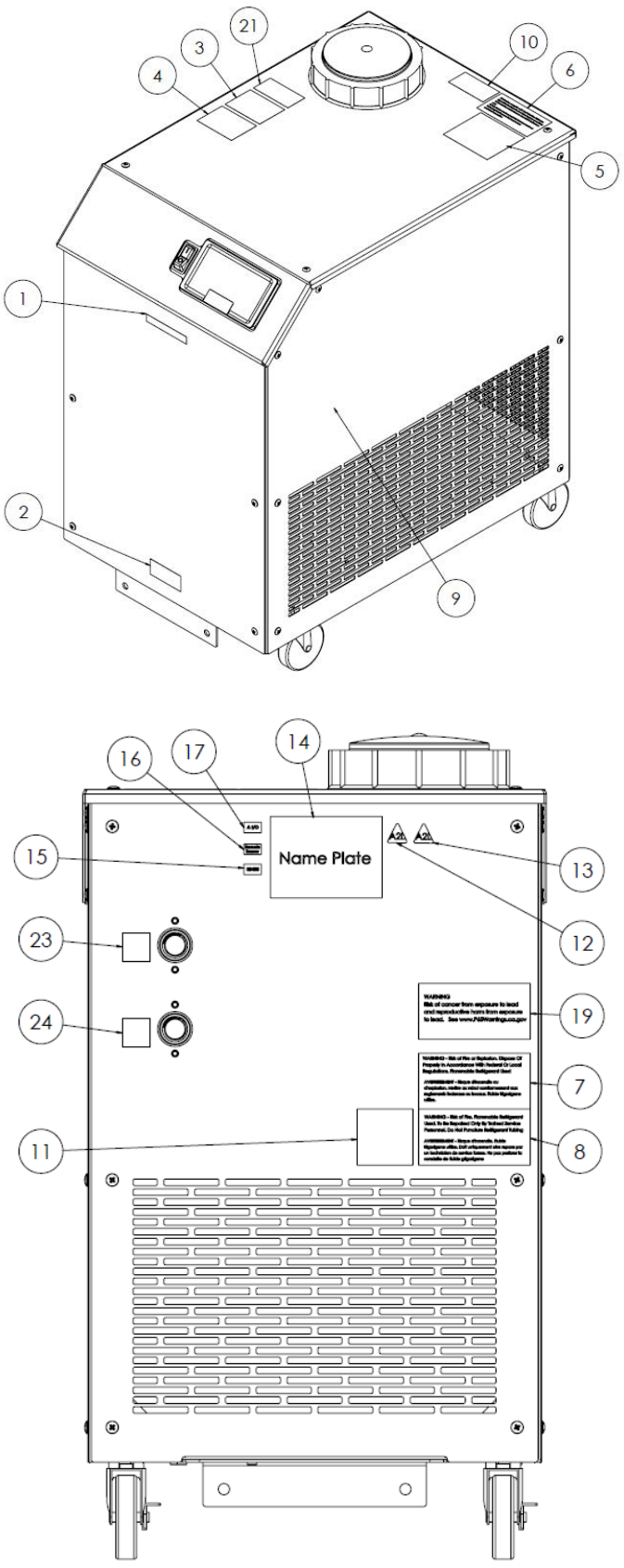
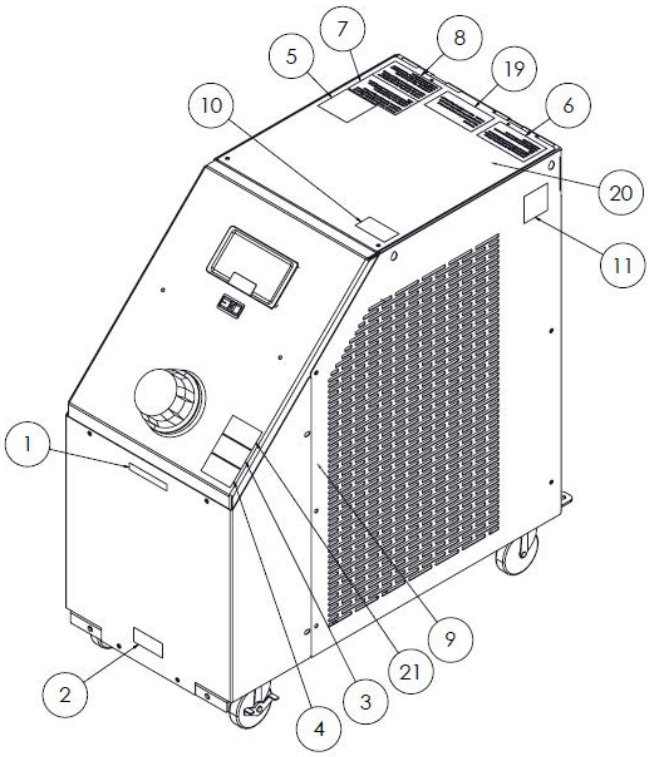
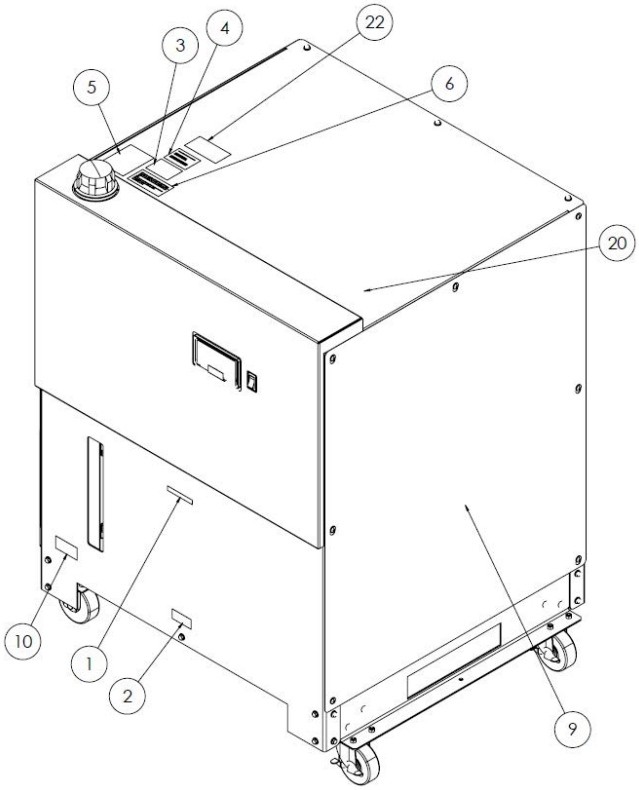


Figure 1. TSC08 Series





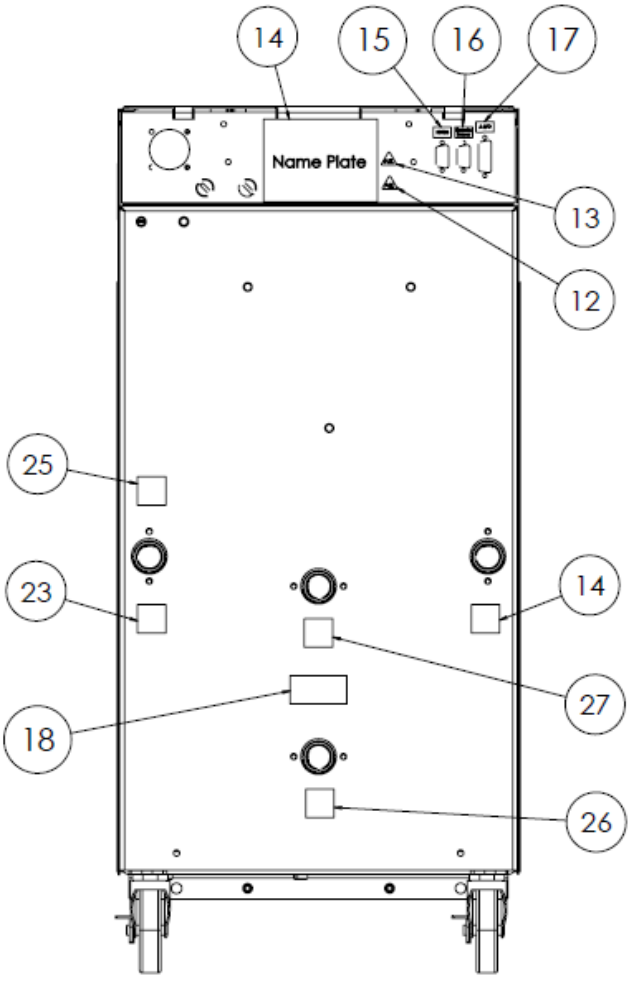


Figure 2. TSC16-TSC90 Series

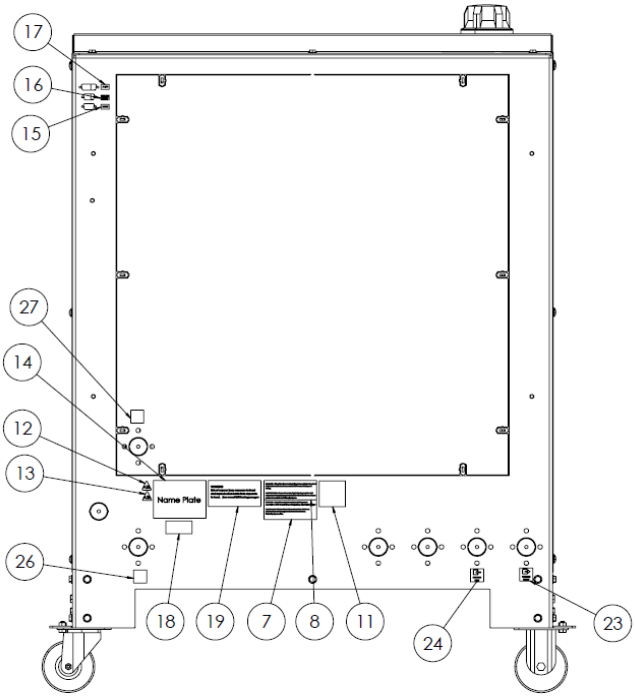


Figure 3. TSC210-TSC260 Series

Refer to the below table for unit label descriptions.

Ref No	Unit Label Description
1	Brand Label
2	Model Series Label
3	Proper Fluid Selection Label **CAUTION**: PROPER FLUID SELECTION IS ESSENTIAL FOR OPERATION OF THE CHILLER AND YOUR INSTRUMENT. PLEASE REFER TO THE INSTRUCTIONS ON COOLING FLUIDS IN THE MANUAL. FAILURE TO READ THE MANUAL BEFORE ADJUSTING THE PRESSURE MAY RESULT IN INJURY OR DAMAGE TO YOUR INSTRUMENT.
4	Preventative Maintenance Label DURING PREVENTATIVE MAINTENANCE ALWAYS: • CHECK THE COOLING FLUID LEVEL • CLEAN THE COOLING FLUID STRAINER
5	Customer Service Label
6	FCC label This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: • This device must not cause harmful interference. • This device must accept interference received including interference that may cause undesired operation.
7	Risk of Fire or Explosion. Dispose of Properly in Accordance with Federal or Local Regulations. Flammable Refrigerant Used.
8	Risk of Fire. Flammable Refrigerant Used. To be repaired only by Trained Service Personnel. Do Not Puncture Refrigerant Tubing.
9	Risk of Fire. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide before attempting to service this product. All Safety Precautions must be Followed. (Label inside unit).
10	No User Serviceable Parts Inside Label
11	China A1 Label
12	CE A2L Label

Ref No	Unit Label Description
13	UL A2L Label
14	Data Plate Label
15	RS-485
16	Remote Sensor
17	Analog I/O
18	Max Pressure (Water-cooled only)
19	Prop 65 Label
20	Line Connections (Label inside for applicable models)
21	Hot Surface Warning Label (for TSC08-TSC90 only)
22	Minimum Room Floor Area Label (for TSC210 and TSC260 only)
23	Process Out
24	Process In
25	Flow Control (Water-cooled only)
26	Facility In (Water-cooled only)
27	Facility Out (Water-cooled only)

Note: The labels are common among all the models except for ref no.18, 20, 21 and 22.

Regulatory Compliance

Market-Specific Labels

European Union: The European CE marking is applied on products that meet all the applicable requirements of the European Directives. Products not marked with a CE marking either do not operate in the 230V / 50Hz voltage range or are not intended to be sold to the EU Member States or European Economic area (EEA). The Declaration of Conformity is located in the back of this manual.

United Kingdom: The UKCA marking is applied on products that meet all the applicable requirements of the UK Directives. Products not marked with a UKCA marking either do not operate in the 230V / 50Hz voltage range or are not intended to be sold to the UK region.

Australia / New Zealand: The RCM marking is applied on products that meet all the applicable requirements of the regulations. Products not marked with the RCM marking either do not operate in the 230V / 50Hz voltage range or are not intended to be sold to the Australian or New Zealand region.

Reach out to the manufacturer for declaration requests or questions regarding regulatory conformity.

Product Safety

This product family has been tested to applicable global product safety standards by a Nationally Recognized Test Laboratory (NRTL) and may bear the NRTL's mark of safety compliance to those applicable standards. Additionally, this testing may be used to secure regional market-specific markings.

It is important to use only accessories as supplied or recommended by Thermo Fisher Scientific.

The maximum limit of 10 mA shall not be exceeded when tested according to Clause 5.5 (Measurement of protective conductor current) of EN 50678 VDE 0701.

Fluorinated Gas Refrigerant Service Notes

This product contains fluorinated greenhouse gases in a hermetically sealed system. For Example: R1234yf, R454C, R454B.

For mechanical repair, such as leak recharge or compressor replacement, it should only be carried out by a certified refrigeration technician due to the nature of fluorinated gases. Refrigerant recovery should be used to minimize release into the atmosphere.

Compliant with Regulation (EU) No 2024/573 of the European Parliament and of the Council on fluorinated greenhouse gases, this product contains fluorinated greenhouse gases in a hermetically sealed system. In conformity with Article 19 of Regulation (EU) No 2024/573 of the European Parliament and of the Council, a declaration of conformity for F-Gas has been supplied with this unit. Please refer to that document for details regarding our compliance to this regulation.

Electromagnetic Compatibility

The TSC series chillers requires special precautions regarding electromagnetic compatibility (EMC) and needs to be installed and put into service according to the EMC information provided in this instruction manual.

Recommendations for actions to ensure the product remains safe regarding Electromagnetic disturbances:

1. Do not modify the product beyond the intended user-adjustable settings.
2. It is important to use only accessories as supplied or recommended by Thermo Fisher Scientific.
3. The equipment should be visually inspected regularly for damaged cables and connectors. Damaged cables should be replaced.
4. This equipment should not be used adjacent to or stacked with other equipment. However if adjacent or stacked use is necessary, the equipment should be observed to verify normal operation in the configuration in which it will be used.

FCC Statement (USA, 47 CFR Part 15)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian ISED IC Notice

This ISM digital apparatus complies with Canadian ICES-001, Class A.

Cet appareil ISM est conforme á la norme NMB-001 du Canada, Classe A.

South Korean KC Registration

사 용 자 안 내 문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

[Translation of the above user notification: Equipment for business broadcasting and communication specified in Article 11, Subparagraph 1), Items (가), (바), and (사 1). This device has undergone suitability assessment for use in a business environment. If used in a residential environment, there may be concerns regarding radio interference.]

Material Content and Evaluation of Chemicals

Thermo Fisher Scientific is determined to reduce the impact we have on the environment, and committed to meeting all compliance obligations to evaluate, communicate, and register any Substances of Very High Concern (SVHC), and finding alternates where appropriate.

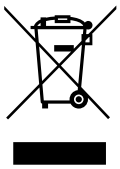
Our compliance is witnessed by written declaration from our suppliers and/or component testing. This confirms that any potential trace contamination levels of the substances listed above are below the maximum level set by the latest regulations or follow established exemptions of the regulation due to their application.

Proposition 65 – California

Risk of cancer from exposure to Lead and reproductive harm from exposure to Lead. For more information, go to www.P65Warnings.ca.gov

WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with 'wheelie bin' symbol: Thermo Fisher Scientific has contracted with one or more recycling/ disposal companies in each EU Member State, dispose of or recycle this product through them. Further information on Thermo Fisher Scientific's compliance with these Directives is available at www.thermofisher.com/WEEERoHS



End of Life Care

Some considerations and suggestions are listed below for proper disposal of this product. While addressing these actions for safe recycling and disposal, please follow all guidelines, Safety Data Sheets (SDS), or regulations applicable to your country and region.

- This product has materials and components that may be recycled or reused according to local guidelines and regulations.
- Remove any batteries present before disposal. Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.
- Remove all samples and items before defrosting a unit to room ambient temperatures.
- Clean up any chemical or biological safety hazards using appropriate methods.
- Remove the cabinet door to help prevent entrapment inside of a unit.
- Have a certified technician remove the refrigerant and compressor, drain the compressor and oil from the system, and dispose properly. Note that oil may be infused with refrigerant and should be handled with care by someone experienced with refrigerants used in this product, as listed on the serial data plate.
- Have a certified technician remove the Refractory Ceramic insulation from the unit then dispose properly.

Quick Start Guide

In order to quickly set up with basic settings and start using the chiller as fast as possible follow the procedures in this section.

For comprehensive setup and to use all features and functions, use the information from **General Information** section onwards.

This quick start guide is intended for initial start up only. For all other procedures you must refer to the manual. Also, if any of these steps are not clear download the manual before proceeding.

Safety

- The chiller is designed for indoor use only. Never place the chiller in a location where excessive heat, moisture, inadequate ventilation, or corrosive materials are present.
- Connect the chiller to a properly grounded outlet.
- Refrigerants used are heavier than air and will replace the oxygen causing loss of consciousness. Contact with leaking refrigerant will cause skin burns. Refer to the chiller's nameplate and the manufacturer's most current MSDS for additional information.
- Move the chiller with care. Sudden jolts or drops can damage its components. Always turn the equipment off and disconnect it from its supply voltage before moving it.
- Never operate damaged or leaking equipment.
- Use only the approved fluids shown in **Approved Fluids**. Before using any fluid or performing maintenance where contact with the fluid is likely, refer to the manufacturer's MSDS for handling precautions.
- To prevent freezing/glazing of the plate exchanger, All TSC series recirculating chillers require the use of 50/50 EG/water or 50/50 PG/water below 10°C process temperature.

What you need to get started

- An adjustable wrench.
- Facility water supply and return (water-cooled chillers).
- Appropriate hose or plumbing.
- Appropriate size clamps or connection type.
- Teflon® tape or appropriate sealant.

Approved Fluids

Note: Use of any other fluid will void the manufacturer's warranty.

- Distilled water (pH 7-8)
- Filtered water
- Deionized water (1-3 MΩ-cm, compensated)
- Distilled water with Nalco biocide and inhibitor
- Distilled water with chlorine (5 ppm)
- 0 – 50% Laboratory Grade Ethylene Glycol/Water
- 0 – 50% Laboratory Grade Propylene Glycol/Water

Facility Water Connections (FNPT)	
TSC08 - TSC90 Inlet/Outlet	1/2" stainless steel
TSC210 - TSC260 Inlet/Outlet	1" stainless steel

Process Fluid Connections (FNPT)	
Outlet	
TSC08 - TSC90	1/2" stainless steel
TSC210 - TSC260	1" stainless steel

Note: Inlet size is same size as outlet and all chillers have stainless steel connections.

Quick Installation

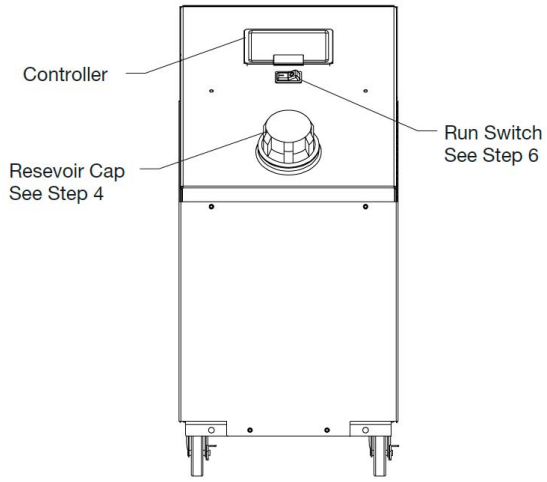


Figure A

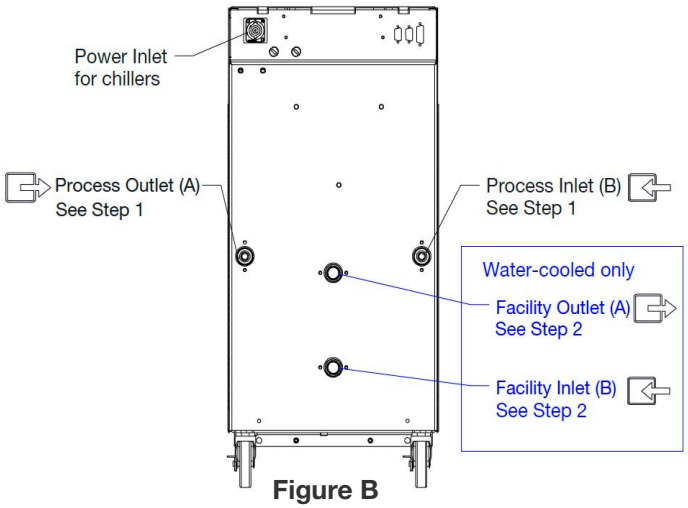


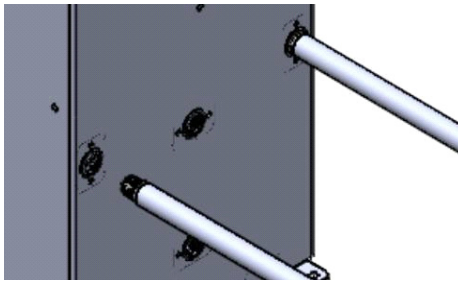
Figure B

Step-1:

1. Connect the TSC PROCESS OUTLET (A) to the fluid inlet on your application.
2. Connect the TSC PROCESS INLET (B) to the fluid outlet on your application.
3. Ensure the connections are sealed and secure. For air-cooled chillers skip to step 3.

Note: Never connect process fluid lines to your facility water supply or to any pressurized liquid source.

See Figure B.



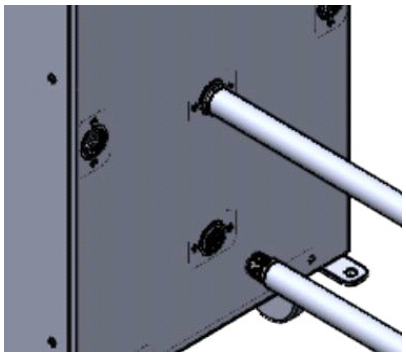
Step-2:

1. Connect the TSC FACILITY OUTLET (A) to a facility water return or drain.
2. Connect the TSC FACILITY INLET (B) to a facility water supply.
3. Ensure the Connections are sealed and secure.

For Water Cooled Only:

- Facility Water Maximum Inlet Pressure must not exceed 150 PSIG.
- Facility Water Maximum Pressure Differential must not exceed 50 PSID.

See Figure B.



Step-3:

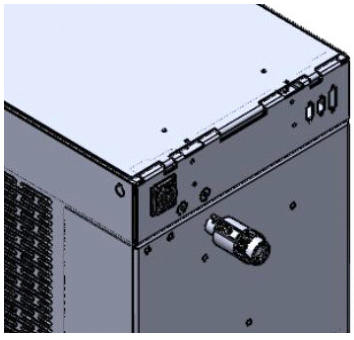
1. Refer to the name plate on the rear of the chiller and verify the appropriate voltage.
2. For chillers supplied with a line cord, insert female end of line cord into chiller and then insert male end of line cord into power outlet. (The line cord is located under the upper box cavity. Do not discard the upper box cavity until the cord is located).

- Never operate the chiller with a damaged line cord.

Note: Providing power to the unit will automatically boot the controller. Complete the remaining steps prior to flipping the run switch for operation.

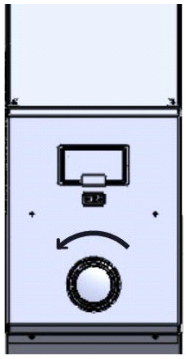
Note: For chillers requiring hard wiring see the Installation section in the manual.

See Figure B.



Step-4:

1. Never operate the chiller without process fluid in the reservoir or without the fluid fill strainer installed.
2. Remove the reservoir cap from the housing by unscrewing it counterclockwise.
3. Remove pin red highlighted in below image, before turning cap (for extended temp units).



See **Figure A** in previous page.

Step-5:

1. Slowly fill reservoir with clean process fluid (see **Approved Fluids**).
2. Fill fluid until it reaches the bottom of the strainer.
3. When the reservoir is full replace the reservoir cap, hand tighten it.

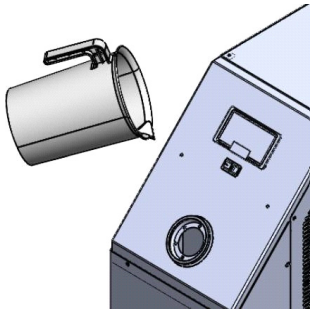
Since the reservoir capacity may be small compared to your application and air may need to be purged from the lines, have extra fluid on hand to keep the system topped off when external circulation is started.

Note: If the fluid level drops too low the chiller will shut down to prevent the pump from running dry.

4. Acknowledge the alarm and re-start the priming process.

Note: Be careful not to overfill the reservoir. Use a funnel to help facilitate filling with smaller caps.

See **Figure A** in previous page.



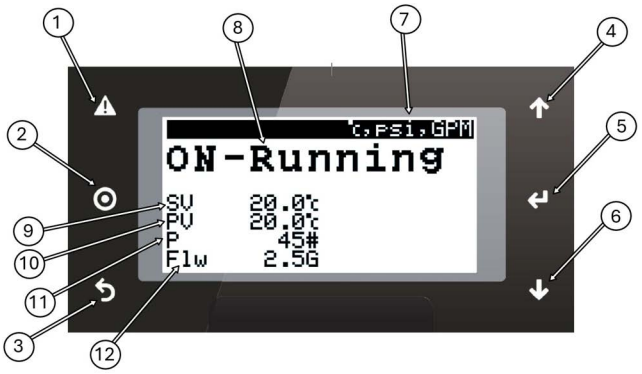
Step-6:

- Press Run switch to begin chiller operation.

See **Figure A** in previous page.

Basic Settings

Menu Options



1. Alarm Button
2. Program Button
3. Escape Button
4. Up Button
5. Enter Button
6. Down Button
7. Current Unit of Measure
8. Chiller Status
9. Set Value – Supply
10. Present Value – Supply
11. Pressure – Supply
12. Flow - Supply

Menu Navigation Details

Program Button:

- Used to enter the main menu

Enter Button:

- When a sub-menu is highlighted, the enter button is used to enter that sub-menu.
- When the cursor is on a line in a sub-menu, the **Enter** button saves the value and moves to the next line.

Arrow Buttons:

- When the cursor is in the top left, the arrow buttons change screens.
- When the cursor is on a line, the arrows buttons change a value.

Escape Button:

- When the cursor is in the top left, the **Escape** button returns to the previous menu.
- When the cursor is on a line, the **Escape** button returns to the top left corner.

Option - Enable Features - Section 8

1. Navigate to **Section 8 - Enable Features**.
2. Enable the desired features by pressing enter to move to the desired line, and the arrows keys to enable the feature.
3. Press **Enter** to save the change.

Option - Temperature, Pressure, and Flow Settings - Section 4

1. Navigate to **Section 4 - Set Points.**
2. In Section 4 there are 3 available screens.
   - Fluid Temperature Settings,
   - Fluid Pressure Settings, and
   - Fluid Flow Settings (when enabled)
3. When the Cursor is blinking in the top left, screens can be toggled.
4. Toggle to the desired screen by pressing the ↓ or ↑ arrow to adjust desired settings.

Option - Serial Communications Section 6

1. Navigate to **Section 6 - Communications.**
2. The Serial Communication screen is used to select the Protocol. Use the navigation buttons to select the protocol. Available Protocols include:
   - None
   - AC Protocol
   - NC Protocol
   - Modbus

3. The Serial Settings screen is used to select the data transmission parameters.

General Information

Description

Thermo Fisher Scientific TSC Series Recirculating Chillers are designed to provide a continuous supply of fluid at a constant temperature and flow rate. The chiller consists of an air-cooled or water-cooled refrigeration system, heat exchanger, recirculating pump, polyethylene reservoir for low temperature units and stainless steel reservoir for extended temp units and a microprocessor controller.

Specifications

Table 1. Specifications Table for Models TSC08, TSC16, TSC35 & TSC66

Specifications		TSC08	TSC16	TSC35	TSC66
Standard Temperature Chiller Process Fluid Temperature/ Setpoint Range		+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F
Extended Temperature Chiller Process Fluid Temperature/ Setpoint Range		-5°C to +90°C +23°F to +194°F	-5°C to +90°C +23°F to +194°F	-5°C to +90°C +23°F to +194°F	-5°C to +90°C +23°F to +194°F
Ambient Temperature Range (All Chillers)		+10°C to +40°C	+10°C to +40°C	+10°C to +40°C	+10°C to +40°C
Temperature Stability (All Chillers)		± 0.1 °C	± 0.1 °C	± 0.1 °C	± 0.1 °C
Cooling Capacity at 20°C	60 HZ	800 W	1550 W	3500 W	6600 W
	50 HZ	660 W	1280 W	2900 W	5470 W
Refrigerant		R1234yf	R1234yf	R1234yf	R454C
Reservoir Volume (Standard Temperature Units)	Gallons	2.9	1.5	1.5	2.3
	Litres	11	5.7	5.7	8.7
Reservoir Volume (Extended Temperature Units)	Gallons	-	1.6	1.6	3
	Litres	-	6	6	11.3

Table 1. Specifications Table for Models TSC08, TSC16, TSC35 & TSC66 (Continued)

Specifications		TSC08	TSC16	TSC35	TSC66
Footprint or Dimensions (HxWxD) (Air Cooled - Standard Temp. Units)	Inches	30.1 x 16.7 x 26.1	30.5 x 14.2 x 32	30.5 x 14.2 x 32	34.7 x 18 x 32.4
	Centimeters	76.4 x 42.2 x 66.2	77.5 x 36.1 x 81.4	77.5 x 36.1 x 81.4	88.1 x 45.8 x 82.2
Footprint or Dimensions (HxWxD) (Air Cooled - Extended Temp. Units)	Inches	-	30.5 x 14.2 x 31.7	30.5 x 14.2 x 31.7	34.7 x 18 x 31.8
	Centimeters	-	77.5 x 36.1 x 80.5	77.5 x 36.1 x 80.5	88.1 x 45.8 x 80.7
Footprint or Dimensions (HxWxD) (Water Cooled - Standard Temp. Units)	Inches	-	30.5 x 14.2 x 30.6	30.5 x 14.2 x 30.6	34.7 x 18 x 30.4
	Centimeters	-	77.5 x 36.1 x 77.6	77.5 x 36.1 x 77.6	88.1 x 45.8x 77.3
Footprint or Dimensions (HxWxD) (Water Cooled - Extended Temp. Units)	Inches	-	30.5 x 14.2 x 30.2	30.5 x 14.2 x 30.2	34.7 x 18 x 29.2
	Centimeters	-	77.5 x 36.1 x 76.7	77.5 x 36.1 x 76.7	88.1 x 45.8x 75.7
Weight (Air Cooled) T1/T2/ T3/C1/C2/C3	lbs	250	261	275	360
	kg	113	118	125	163
Weight (Water Cooled) T1/T2/ T3/C1/C2/C3	lbs	-	261	275	360
	kg	-	118	125	163
Pumping Capacity C1	60Hz	-	4GPM @ 50 psid (15.2lpm @ 3.45 bar)	4GPM @ 50 psid (15.2lpm @ 3.45 bar)	4GPM @ 50 psid (15.2lpm @ 3.45 bar)
	50Hz	-	4GPM @ 38 psid (15.2lpm @ 2.62 bar)	4GPM @ 38 psid (15.2lpm @ 2.62 bar)	4GPM @ 38 psid (15.2lpm @ 2.62 bar)
C2	60Hz	-	4GPM @ 80 psid (15.2lpm @ 5.52 bar)	4GPM @ 80 psid (15.2lpm @ 5.52 bar)	4GPM @ 80 psid (15.2lpm @ 5.52 bar)
	50Hz	-	4GPM @ 57 psid (15.2lpm @ 3.93 bar)	4GPM @ 57 psid (15.2lpm @ 3.93 bar)	4GPM @ 57 psid (15.2lpm @ 3.93 bar)
T1	60Hz	3.3GPM @ 60 psid (12.5lpm @ 4.14 bar)	3.3GPM @ 60 psid (12.5lpm @ 4.14 bar)	3.3GPM @ 60 psid (12.5lpm @ 4.14 bar)	-
	50Hz	2.3GPM @ 60 psid (8.7lpm @ 4.14 bar)	2.3GPM @ 60 psid (8.7lpm @ 4.14 bar)	2.3GPM @ 60 psid (8.7lpm @ 4.14 bar)	-

Table 1. Specifications Table for Models TSC08, TSC16, TSC35 & TSC66 (Continued)

Specifications		TSC08	TSC16	TSC35	TSC66
T2	60Hz	-	-	-	5.0GPM @ 60 psid (18.9lpm @ 4.14 bar)
	50Hz	-	-	-	2.4GPM @ 60 psid (9.1lpm @ 4.14 bar)

Table 2. Specifications Table for Models TSC90, TSC210 & TSC260

Specifications		TSC90	TSC210	TSC260
Standard Temperature Chiller Process Fluid Temperature/ Setpoint Range		+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F	+5°C to +40°C +41°F to +104°F
Extended Temperature Chiller Process Fluid Temperature/ Setpoint Range		-5°C to +90°C +23°F to +194°F	-5°C to +90°C +23°F to +194°F	-5°C to +90°C +23°F to +194°F
Ambient Temperature Range (All Chillers)		+10°C to +40°C	+10°C to +40°C	+10°C to +40°C
Temperature Stability (All Chillers)		± 0.1 °C	± 0.1 °C	± 0.1 °C
Cooling Capacity at 20°C	60 HZ	9000 W	21000 W	26000 W
	50 HZ	7470 W	17430 W	21580 W
Refrigerant		R454C	R454B	R454B
Reservoir Volume (Standard Temperature Units)	Gallons	2.3	14	14
	Litres	8.7	53	53
Reservoir Volume (Extended Temperature Units)	Gallons	3	16	16
	Litres	11.3	60.6	60.6
Footprint or Dimensions (HxWxD) (Air Cooled - Standard Temp. Units)	Inches	34.7 x 18 x 32.4	53.1 x 36.5 x 34.6	56.7 x 36.5 x 34.6
	Centimeters	88.1 x 45.8 x 82.2	134.9 x 92.7 x 87.9	144.1 x 92.7 x 87.9

Table 2. Specifications Table for Models TSC90, TSC210 & TSC260 (Continued)

Specifications		TSC90	TSC210	TSC260
Footprint or Dimensions (HxWxD) (Air Cooled - Extended Temp. Units)	Inches	34.7 x 18 x 31.8	53.1 x 36.5 x 34.6	56.7 x 36.5 x 34.6
	Centimeters	88.1 x 45.8 x 80.7	134.9 x 92.7 x 87.9	144.1 x 92.7 x 87.9
Footprint or Dimensions (HxWxD) (Water Cooled - Standard Temp. Units)	Inches	34.7 x 18 x 30.4	53.1 x 36.5 x 34.6	53.1 x 36.5 x 34.6
	Centimeters	88.1 x 45.8x 77.3	134.9 x 92.7 x 87.9	134.9 x 92.7 x 87.9
Footprint or Dimensions (HxWxD) (Water Cooled - Extended Temp. Units)	Inches	34.7 x 18 x 29.2	53.1 x 36.5 x 34.6	53.1 x 36.5 x 34.6
	Centimeters	88.1 x 45.8x 75.7	134.9 x 92.7 x 87.9	134.9 x 92.7 x 87.9
Weight (Air Cooled) T1/T2/ T3/C1/C2/C3	lbs	375	575	625
	kg	170	261	284
Weight (Water Cooled) T1/T2/ T3/C1/C2/C3	lbs	375	575	625
	kg	170	261	284
Pumping Capacity C1	60Hz	4GPM @ 50 psid (15.2lpm @ 3.45 bar)	4GPM @ 50 psid (15.2lpm @ 3.45 bar)	4GPM @ 50 psid (15.2lpm @ 3.45 bar)
	50Hz	4GPM @ 38 psid (15.2lpm @ 2.62 bar)	4GPM @ 38 psid (15.2lpm @ 2.62 bar)	4GPM @ 38 psid (15.2lpm @ 2.62 bar)
C2	60Hz	4GPM @ 80 psid (15.2lpm @ 5.52 bar)	4GPM @ 80 psid (15.2lpm @ 5.52 bar)	4GPM @ 80 psid (15.2lpm @ 5.52 bar)
	50Hz	4GPM @ 57 psid (15.2lpm @ 3.93 bar)	4GPM @ 57 psid (15.2lpm @ 3.93 bar)	4GPM @ 57 psid (15.2lpm @ 3.93 bar)
C3	60Hz	-	15GPM @ 63 psid (57lpm @ 4.34 bar)	15GPM @ 63 psid (57lpm @ 4.34 bar)
	50Hz	-	15GPM @ 43 psid (57lpm @ 2.96 bar)	15GPM @ 43 psid (57lpm @ 2.96 bar)
T2	60Hz	5.0GPM @ 60 psid (18.9lpm @ 4.14 bar)	-	-
	50Hz	2.4GPM @ 60 psid (9.1lpm @ 4.14 bar)	-	-

Table 2. Specifications Table for Models TSC90, TSC210 & TSC260 (Continued)

Specifications		TSC90	TSC210	TSC260
T3	60Hz	-	28GPM @ 50 psid (106lpm @ 3.45 bar)	28GPM @ 50 psid (106lpm @ 3.45 bar)
	50Hz	-	18.5GPM @ 50 psid (70lpm @ 3.45 bar)	18.5GPM @ 50 psid (70lpm @ 3.45 bar)

Table 3. Refrigerant Quantity and GWP

Models	Condenser Type	Refrigerant Type	Refrigerant Quantity (Kg)	GWP
TSC08	Air cooled	R1234yf	0.283	4
TSC16	Air cooled	R1234yf	0.567	4
	Water Cooled	R1234yf	0.907	4
TSC35	Air cooled	R1234yf	1.021	4
	Water Cooled	R1234yf	1.049	4
TSC66	Air cooled	R454C	1.191	148
	Water Cooled	R454C	1.191	148
TSC90	Air cooled	R454C	1.673	148
	Water Cooled	R454C	1.503	148
TSC210	Air cooled	R454B	4.309	466
	Water Cooled	R454B	3.402	466
TSC260	Air cooled	R454B	4.423	466
	Water Cooled	R454B	3.629	466

Note: Heat input from the pump will result in a reduction in cooling capacity. The cooling capacity reduction will vary based on the pump chosen as well as pump back pressure and flow. Unit cooling capacities are derived with below pump configuration.

Model	Pump Name
TSC08	T1 - Turbine
TSC16	T1 - Turbine
TSC35	T1 - Turbine
TSC66	T2 - Turbine
TSC90	T2 - Turbine
TSC210	C3 - Centrifugal
TSC260	C3 - Centrifugal

- In the extended temperature range TSC90-260 models, when the return temperature of process fluid exceeds 98°C due to higher heat loads and less flow rate (TSC90 < 6gpm, TSC210 < 10gpm & TSC260 < 13.5gpm), the setpoint will automatically change to 80°C to ensure safe operation of the unit. When the setpoint is lowered to 80°C, a **"Near Boiling SV Lowered warning"** appears on the screen and the unit will continue to run. The controller will not allow the setpoint to be changed back to 90°C when the warning is present. The Warning can be cleared when the parameters are within limits to change the setpoint back to 90°C. Refer to the **Alarms and Warnings** section for more details. For achieving 90°C setpoint with higher heat loads,
alternate pumps with higher flow rates should be used.
- Specifications obtained at sea level using 35% Propylene Glycol as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage. Other fluids, fluid temperatures, ambient temperatures, altitude or operating voltages will affect performance.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

Cooling Capacity

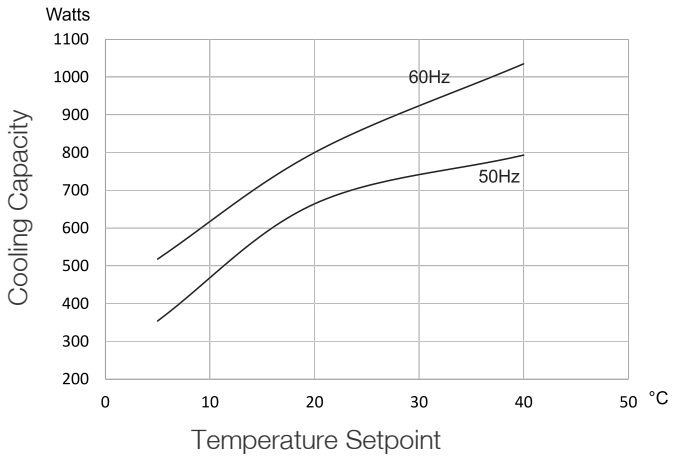


Figure 4. TSC08 Series

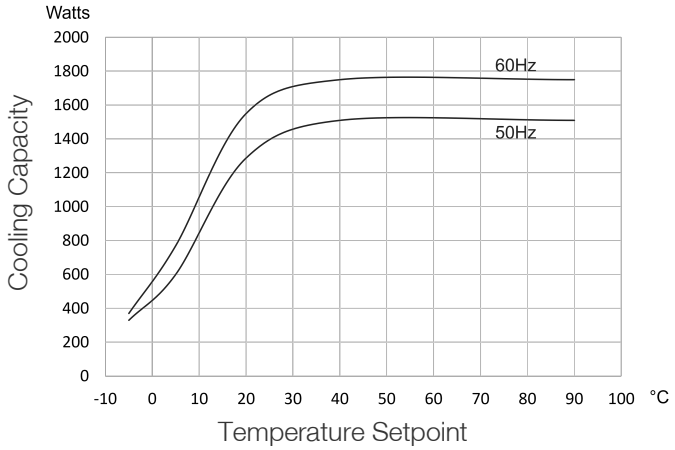


Figure 5. TSC16 Series

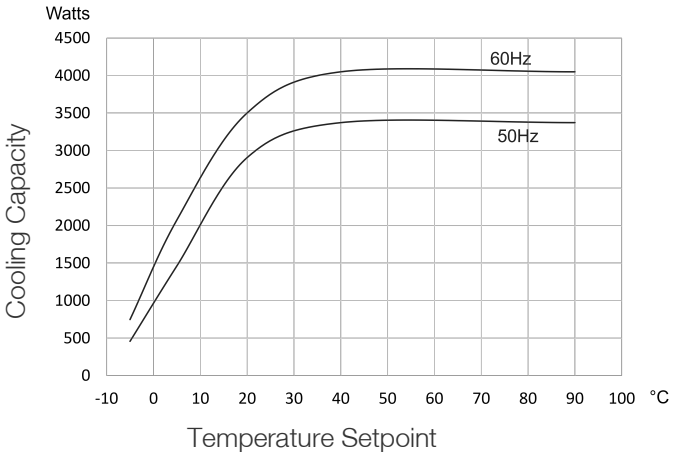


Figure 6. TSC35 Series

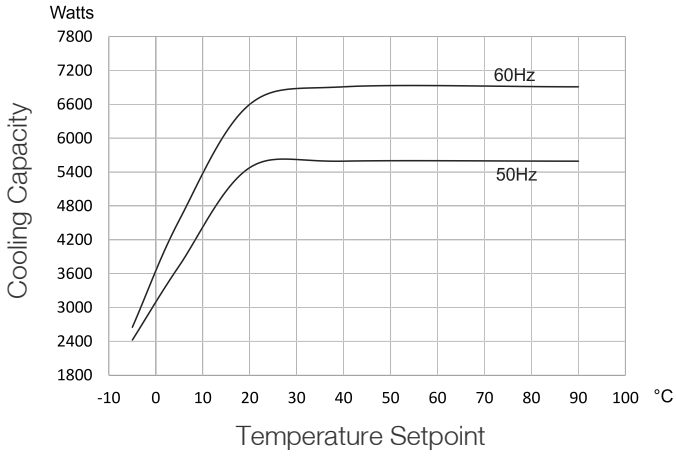


Figure 7. TSC66 Series

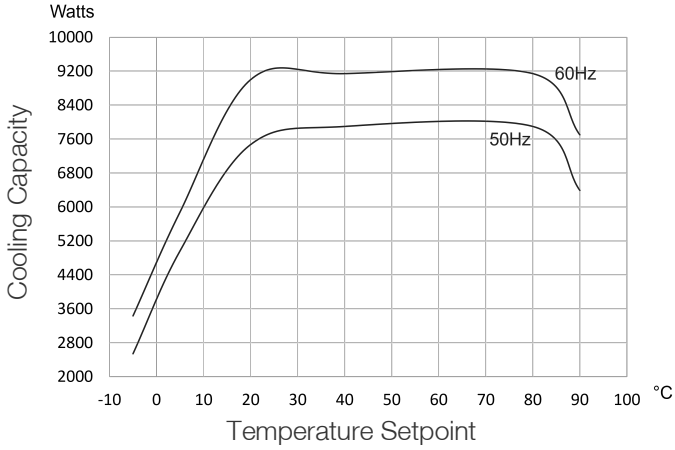


Figure 8. TSC90 Series

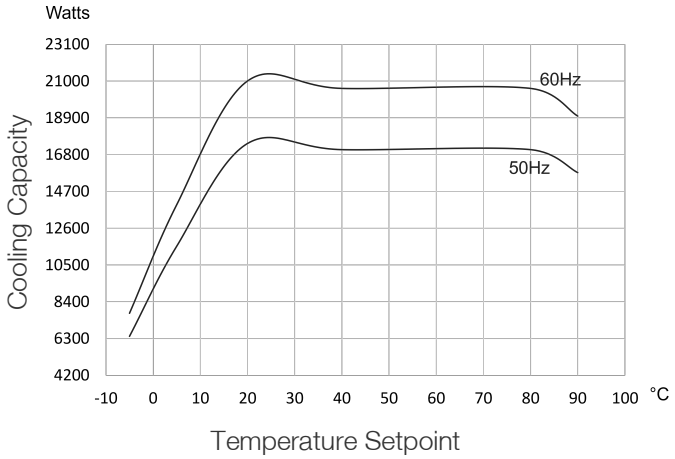


Figure 9. TSC210 Series

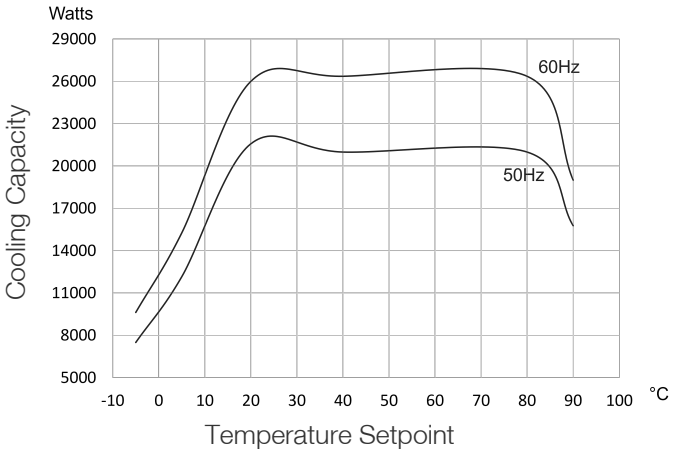


Figure 10. TSC260 Series

Note:

- Specifications obtained at sea level using 35% Propylene Glycol as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage.
- Other fluids, fluid temperatures, ambient temperatures, altitude or operating voltages will affect performance.
- To prevent freezing/glazing of the plate exchanger, TSC series chillers require the use of 50/50 EG/water or 50/50 PG/water below 10°C process temperature.
- Unit capacities are derived at the rated pump flow rate (TSC08-TSC90:4 gpm ±0.5gpm and TSC210-TSC260:10 gpm ±0.5gpm).
- Thermo Fisher Scientific reserves the right to change specifications without notice.

Pumping Capacity

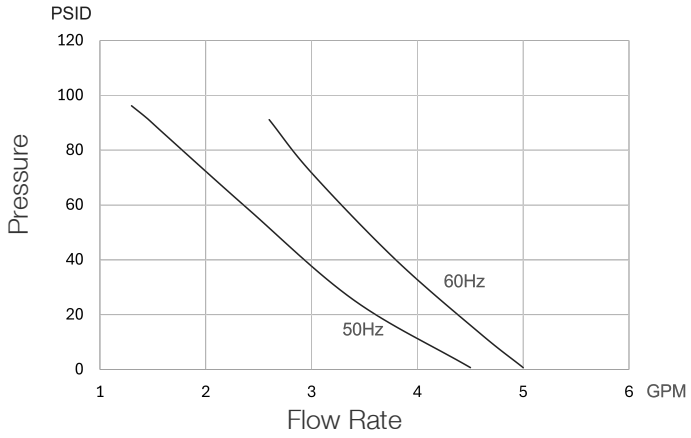


Figure 11. Turbine Pump - T1

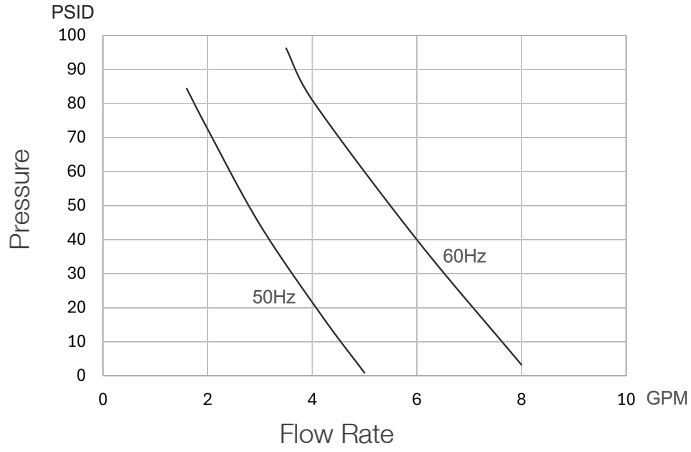


Figure 12. Turbine Pump - T2

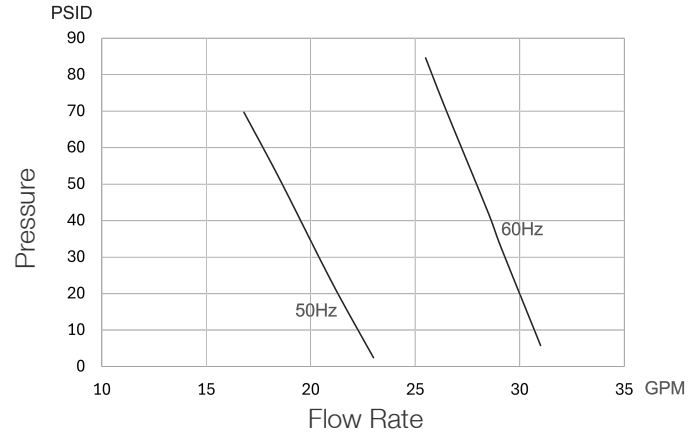


Figure 13. Turbine Pump - T3

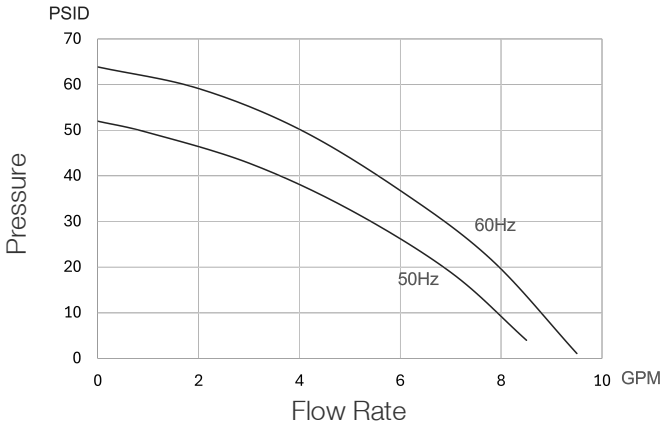


Figure 14. Centrifugal Pump - C1

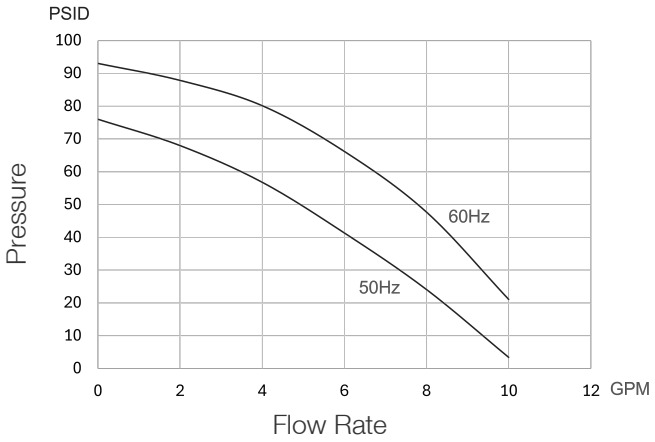


Figure 15. Centrifugal Pump - C2

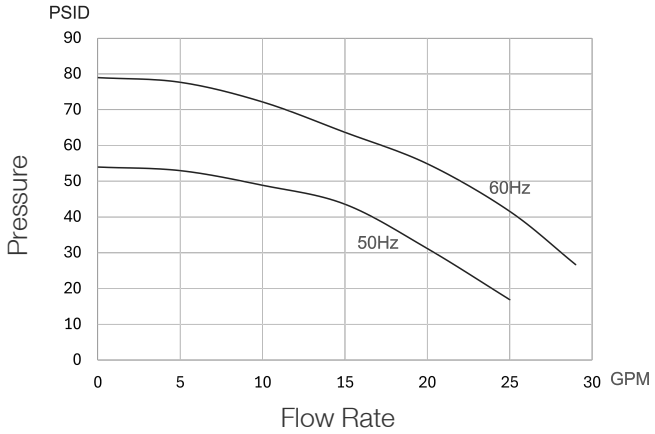


Figure 16. Centrifugal Pump - C3

Note:

- Pump curves are nominal values. Pressure values for centrifugal pumps are differential pressures between the inlet and the outlet of the chiller.
- Pump performance results were obtained with no restrictions on the return to the system or with any options installed. For example, utilizing the DI option will result in a 0.5 gpm flow reduction.
- Specifications obtained at sea level using 35% Propylene Glycol as the recirculating fluid, at a 20°C process setpoint, 25°C ambient condition, at nominal operating voltage.
- Thermo Fisher Scientific reserves the right to change specifications without notice.

Model Dimensions

Note: Thermo Fisher Scientific reserves the right to change specifications without notice.

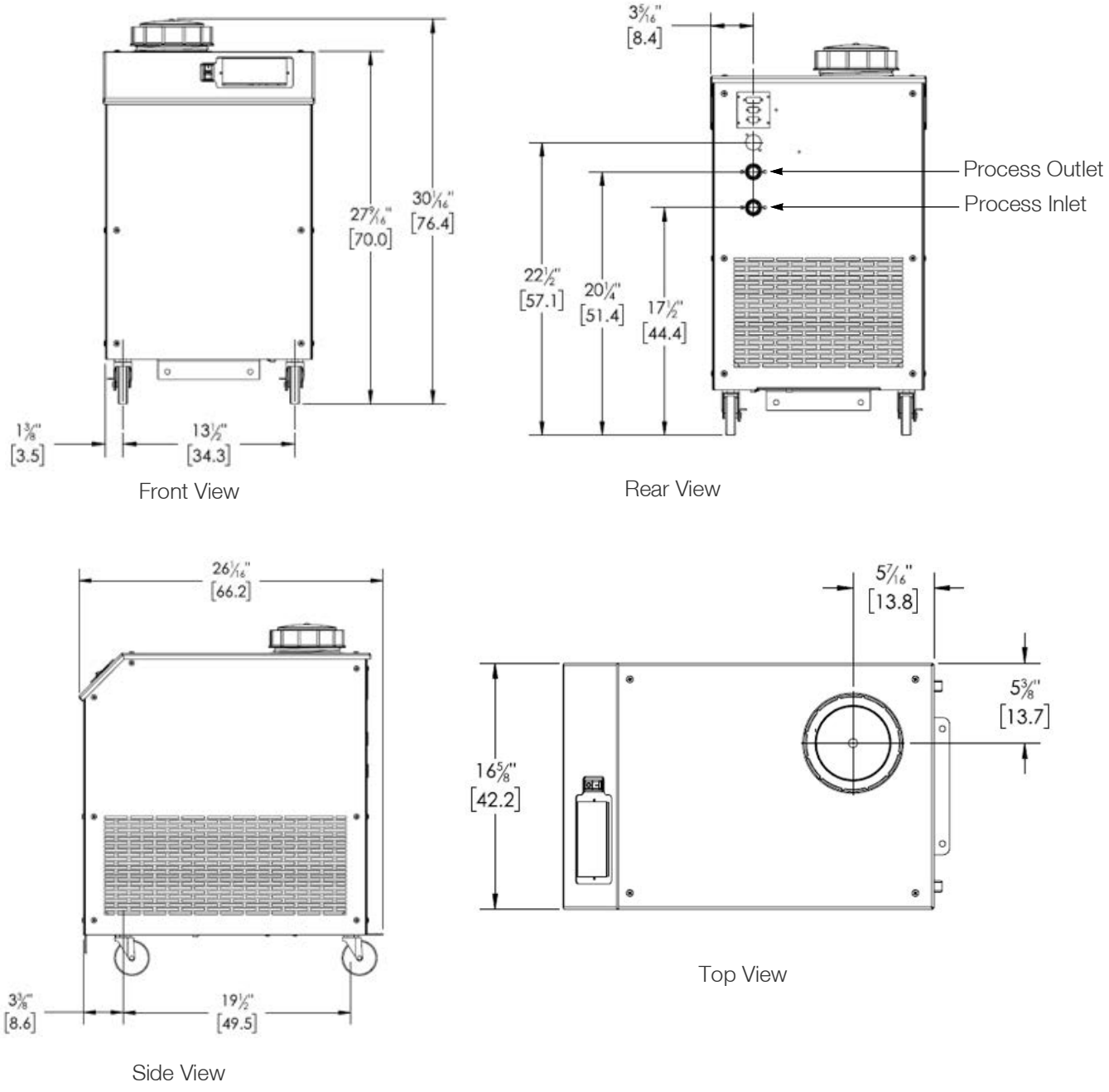
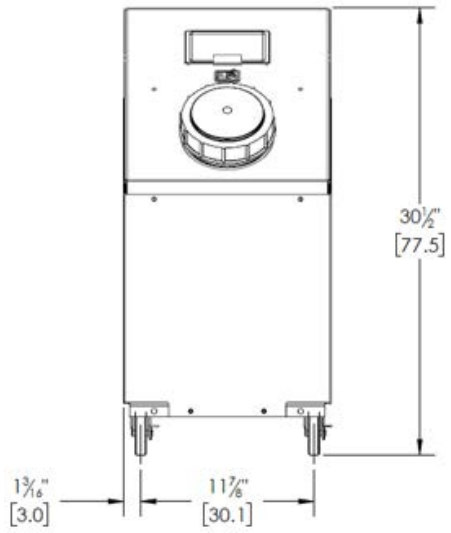
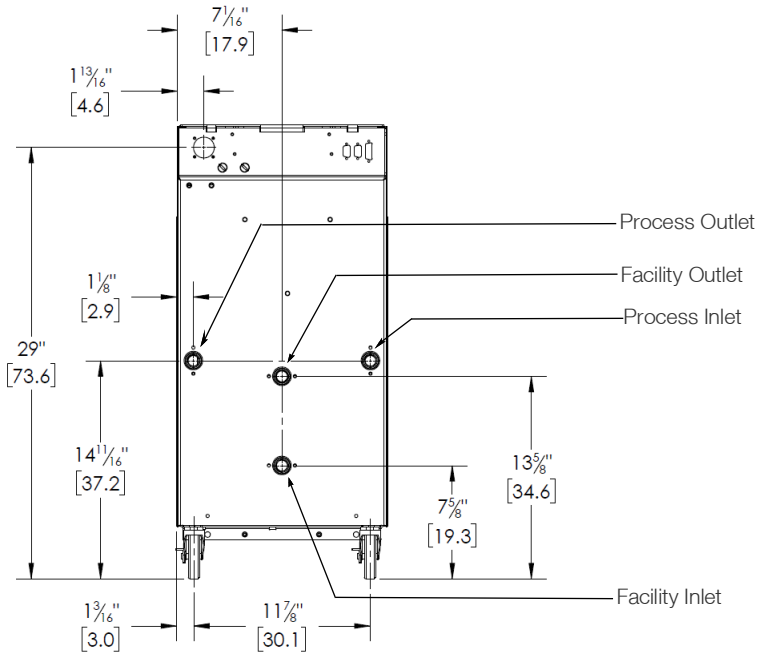


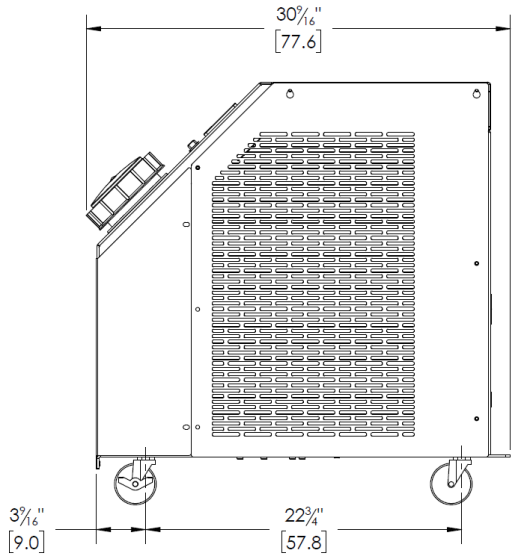
Figure 17. TSC08 Air Cooled - Standard Temperature



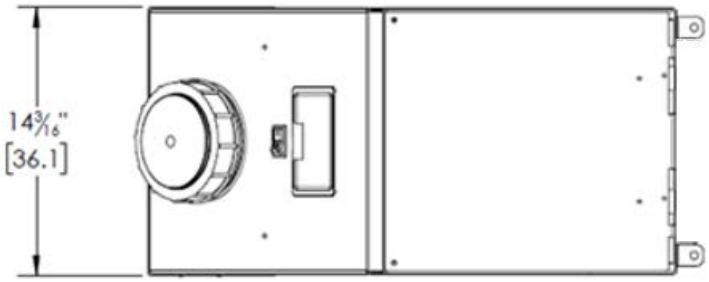
Front View



Rear View



Side View



Top View

Figure 18. TSC16 and TSC35 Water Cooled - Standard Temperature

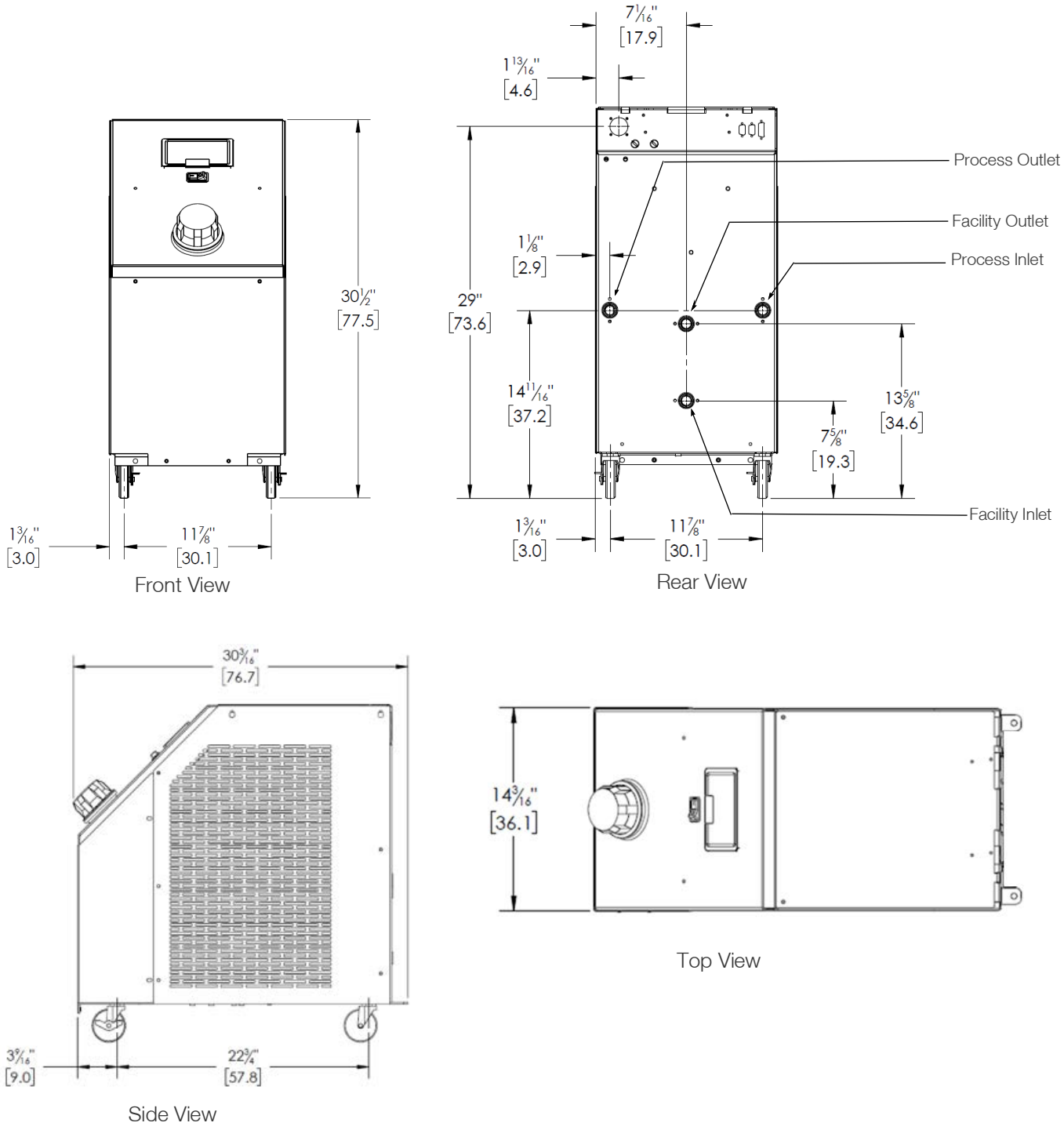


Figure 19. TSC16 and TSC35 Water Cooled - Extended Temperature

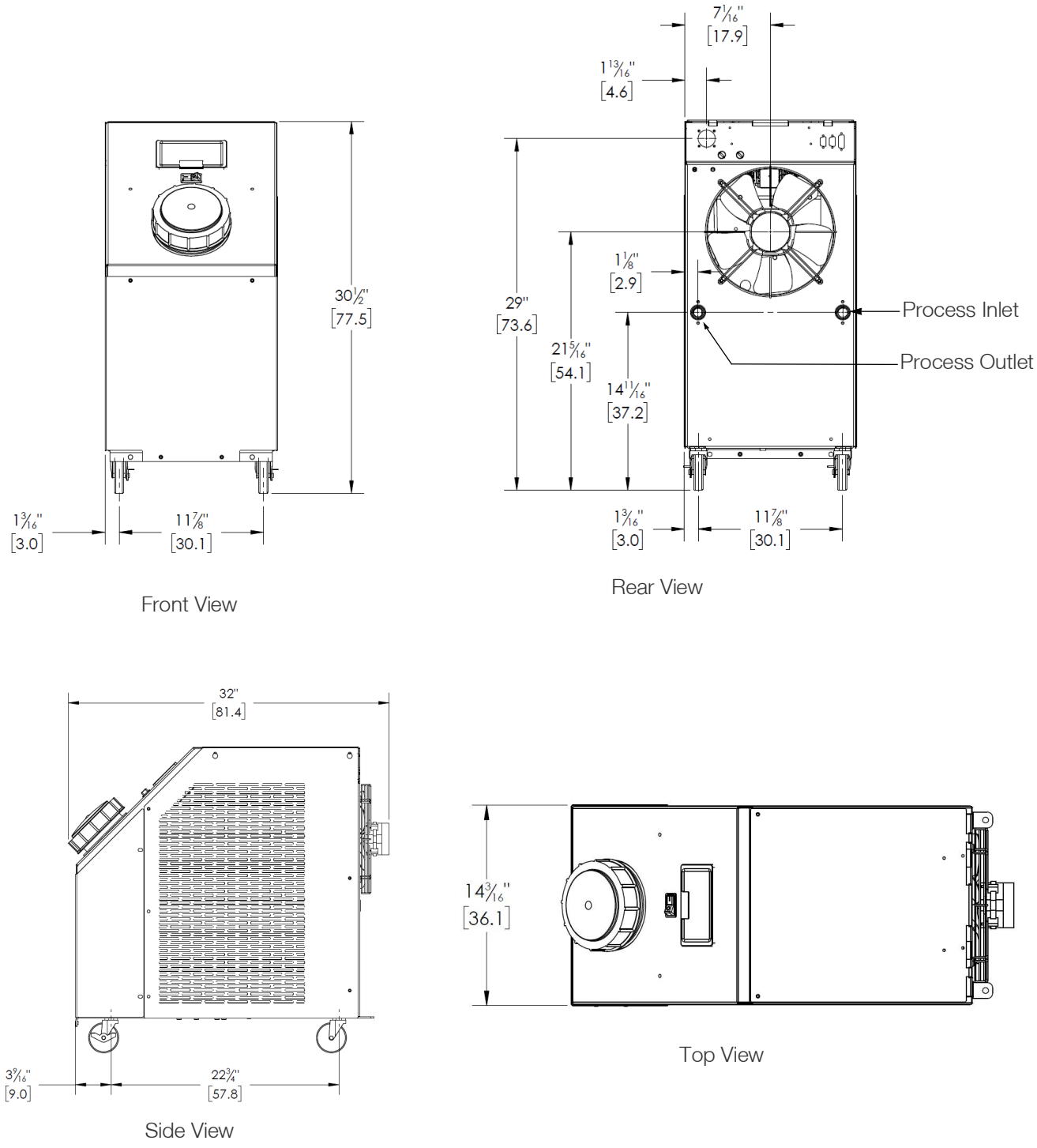


Figure 20. TSC16 Air Cooled - Standard Temperature

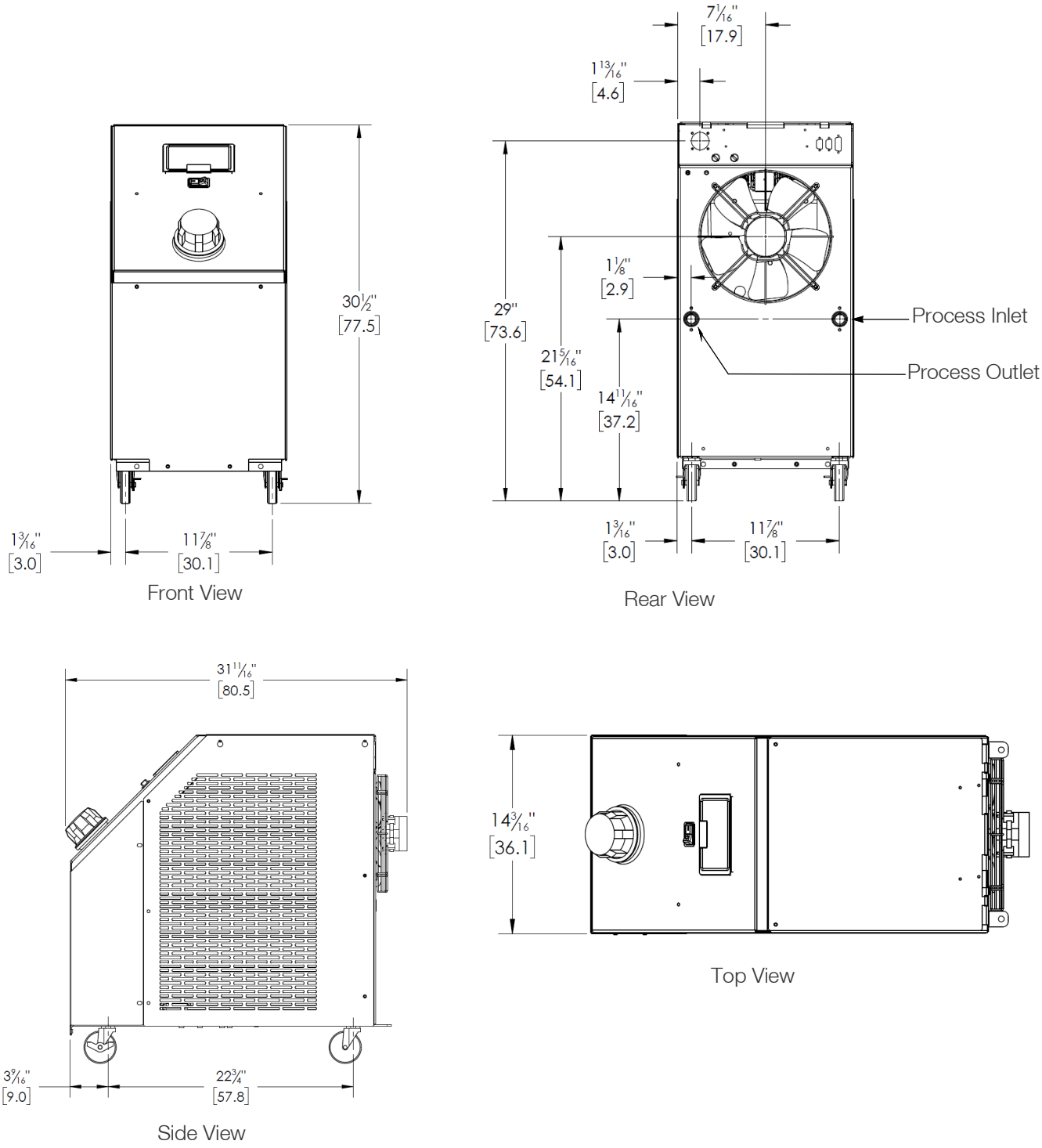


Figure 21. TSC16 Air Cooled - Extended Temperature

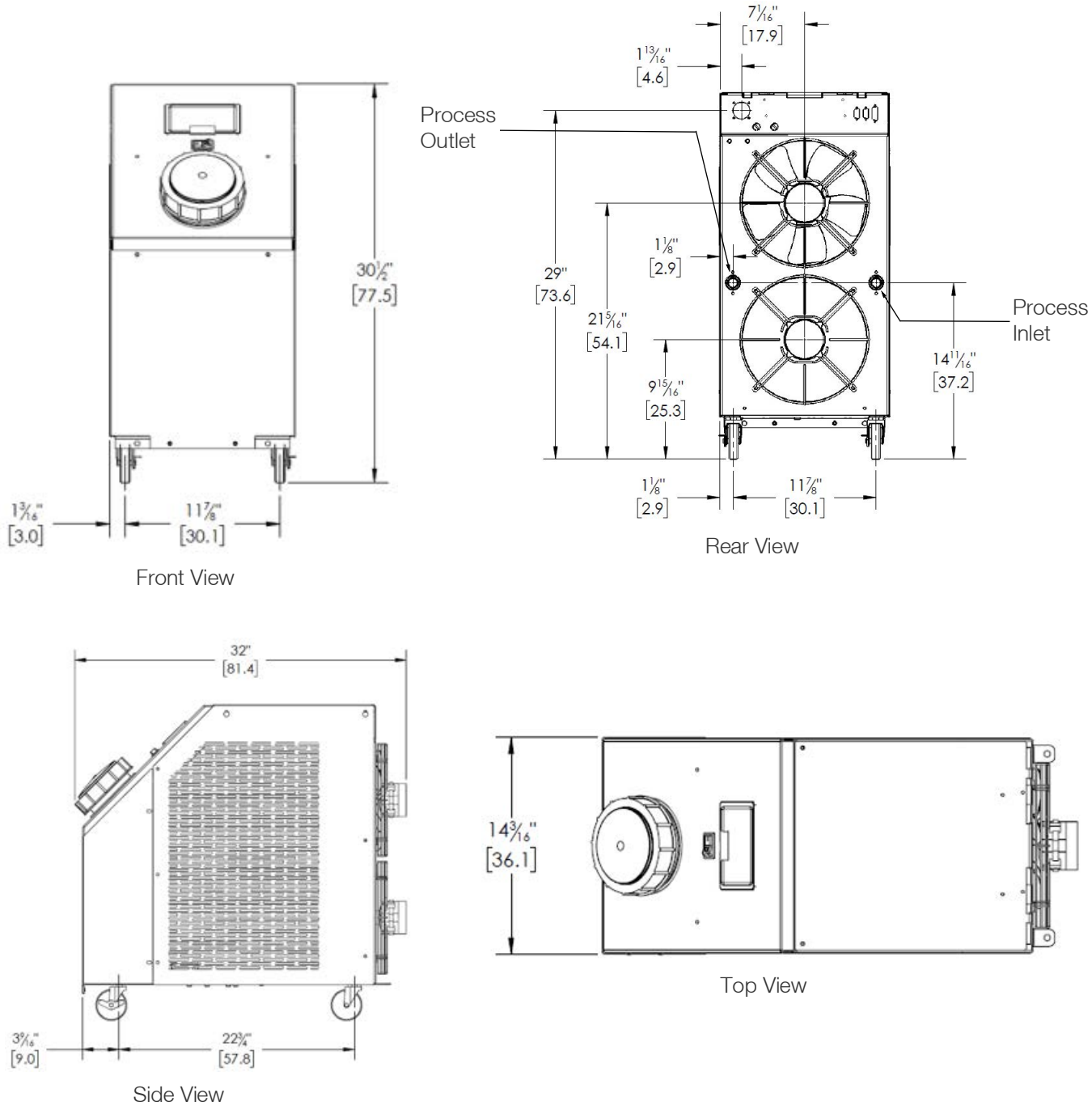


Figure 22. TSC35 Air Cooled - Standard Temperature

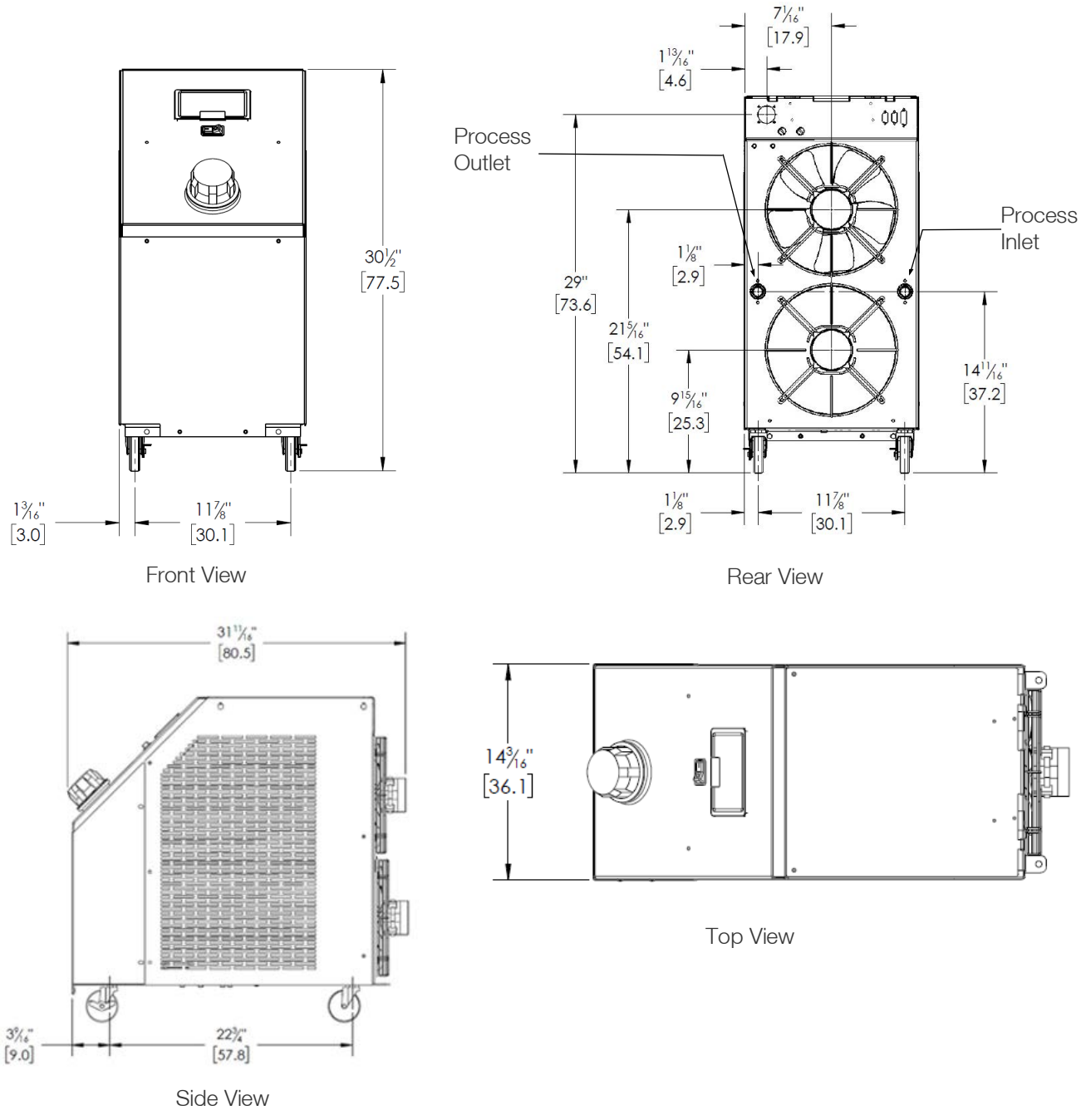


Figure 23. TSC35 Air Cooled - Extended Temperature

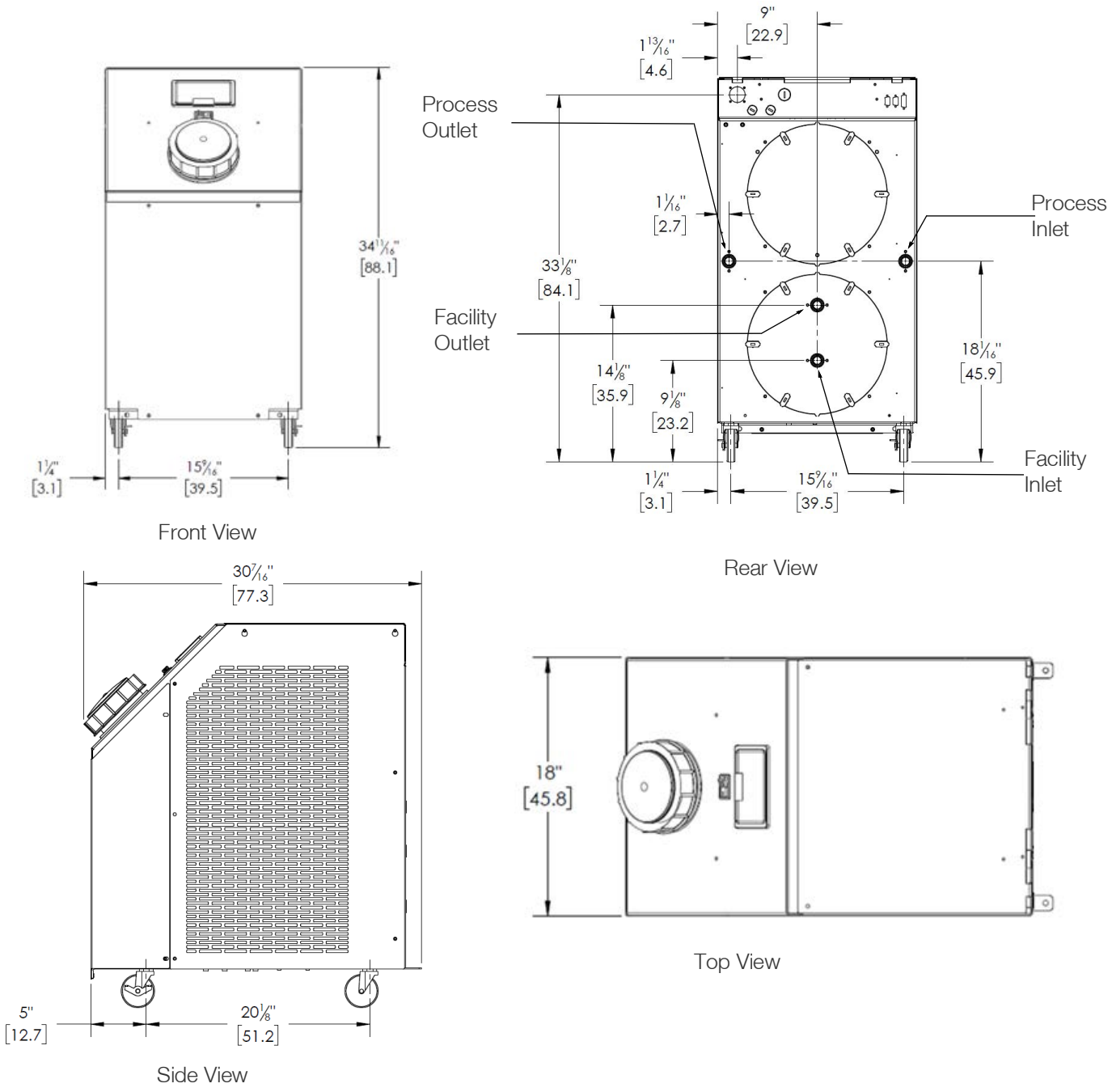


Figure 24. TSC66-TSC90 Water Cooled - Standard Temperature

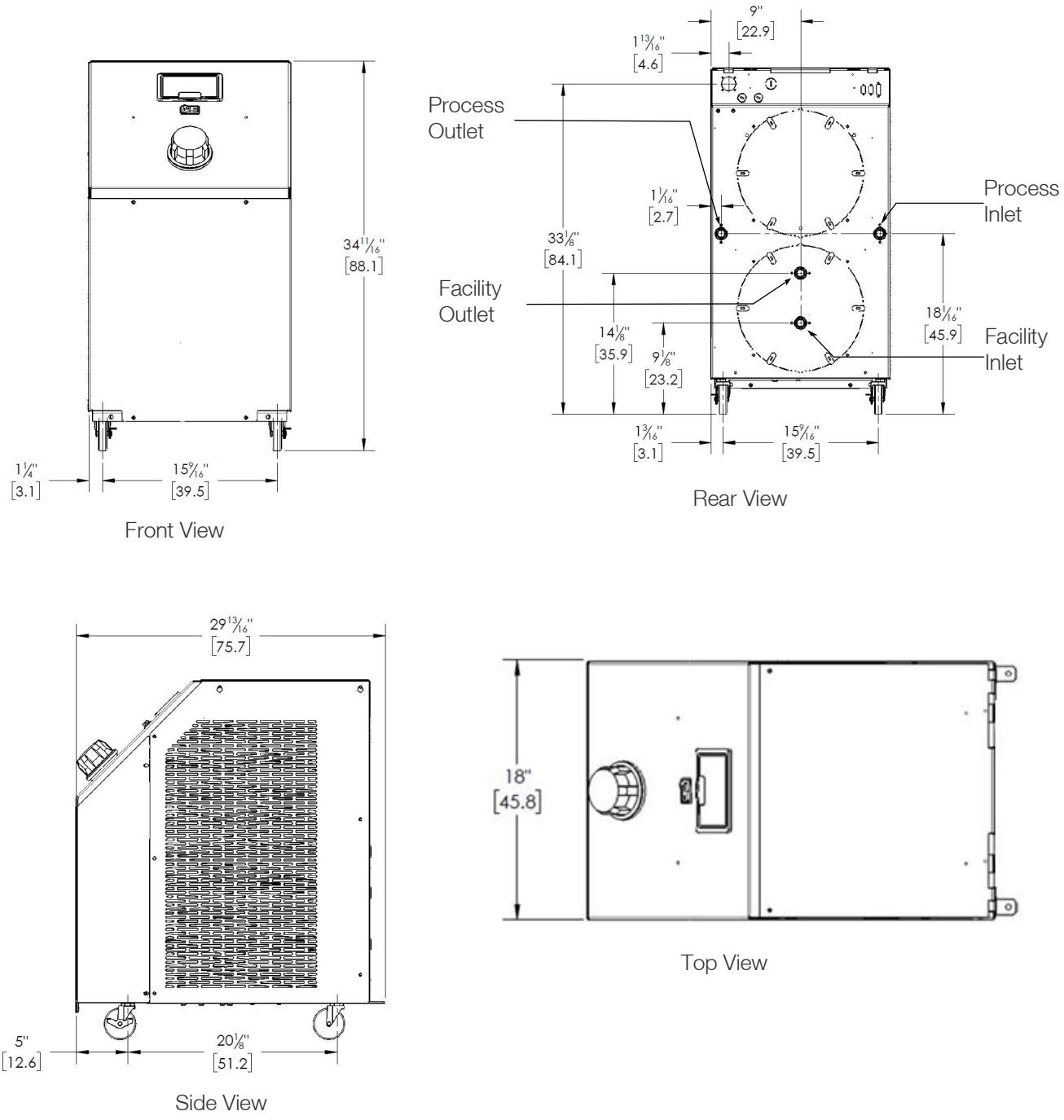


Figure 25. TSC66-TSC90 Water Cooled - Extended Temperature

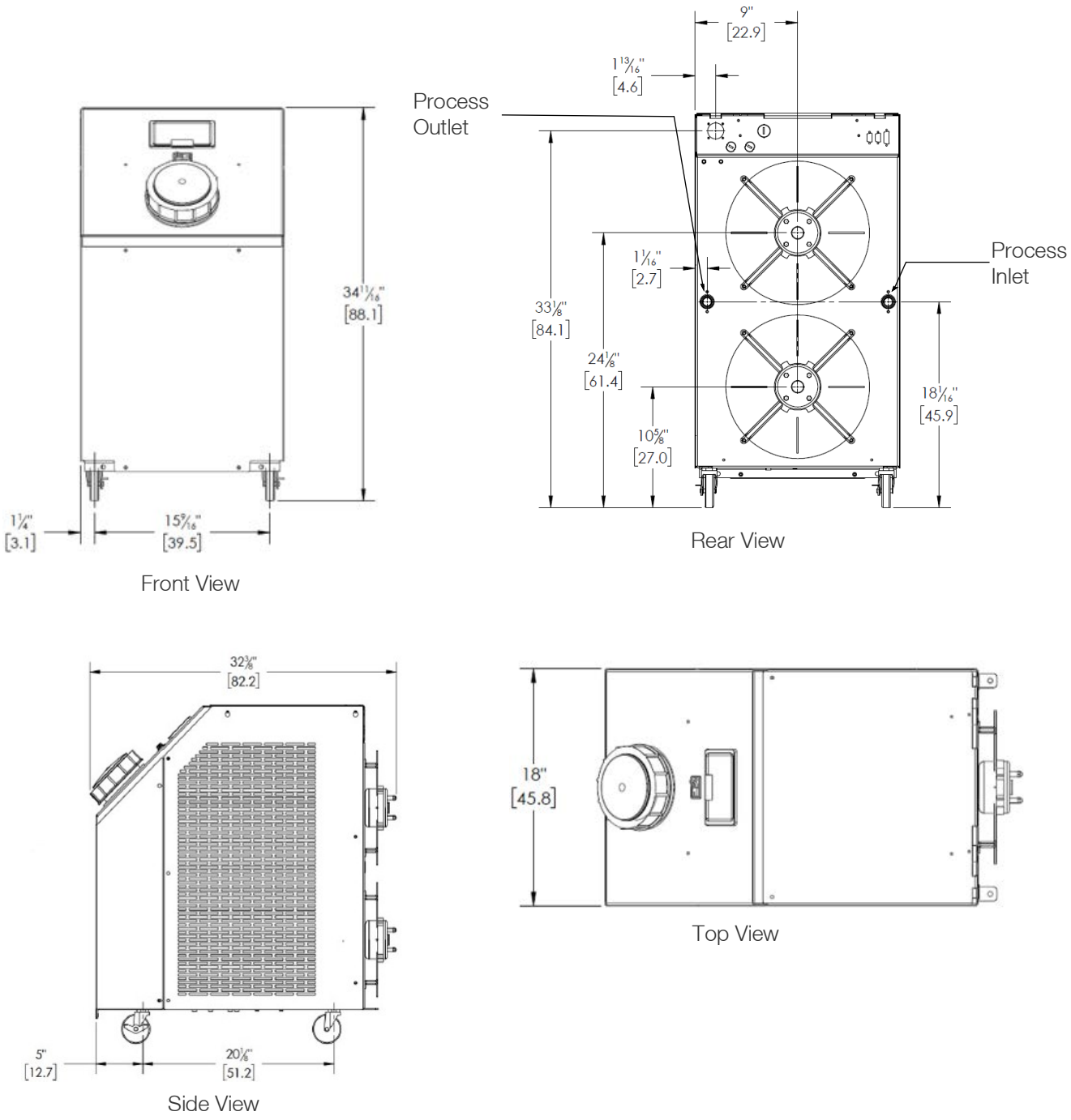


Figure 26. TSC66 Air Cooled - Standard Temperature

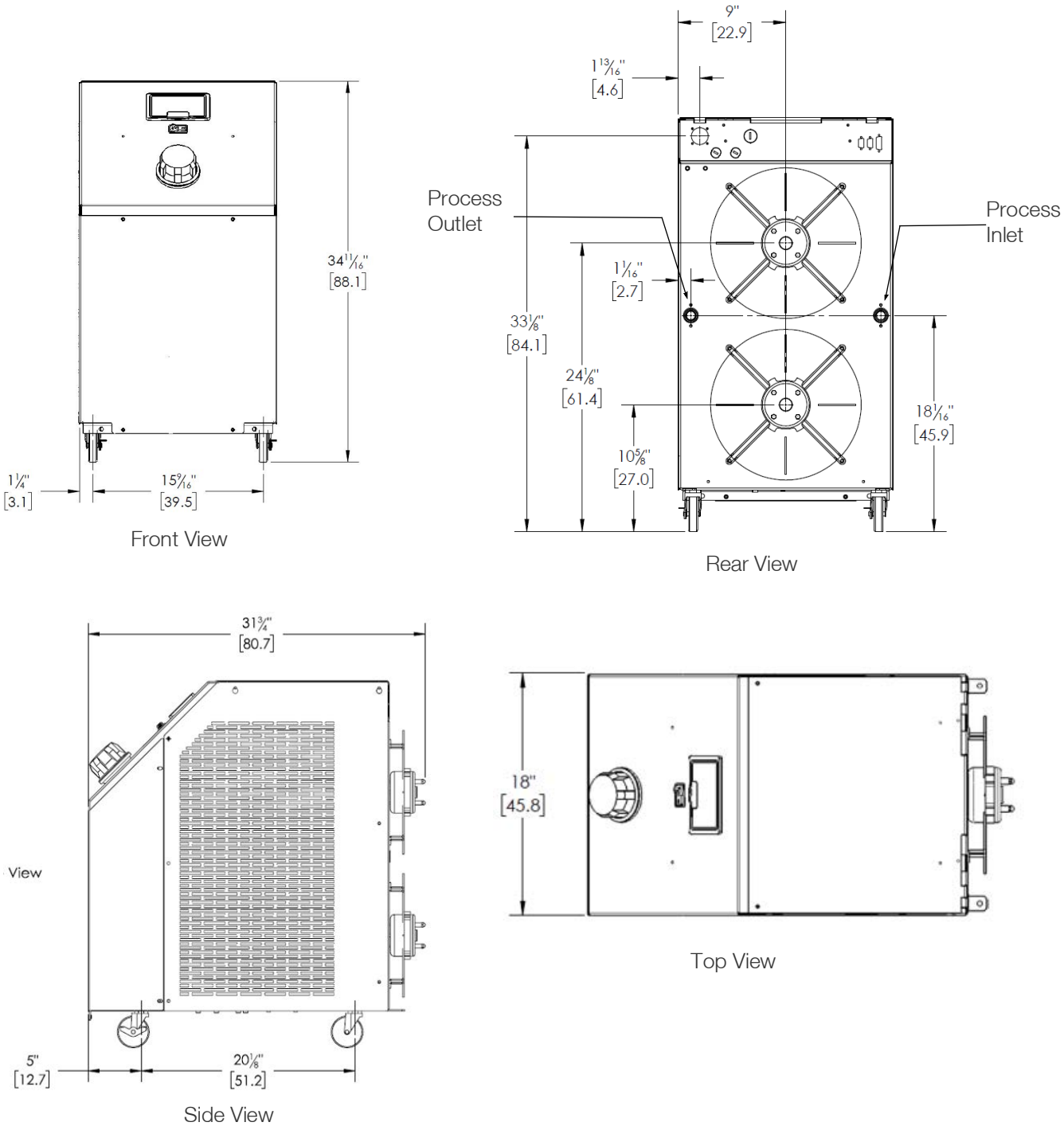
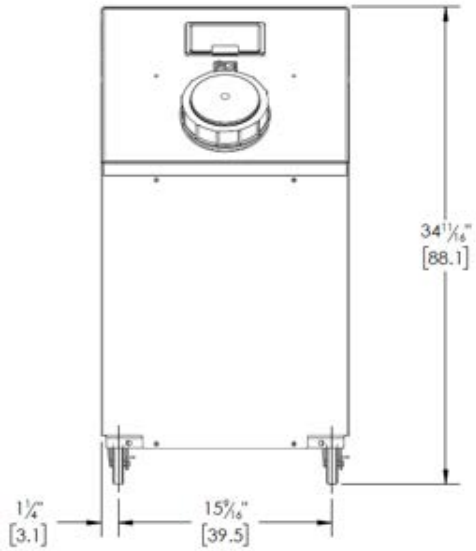
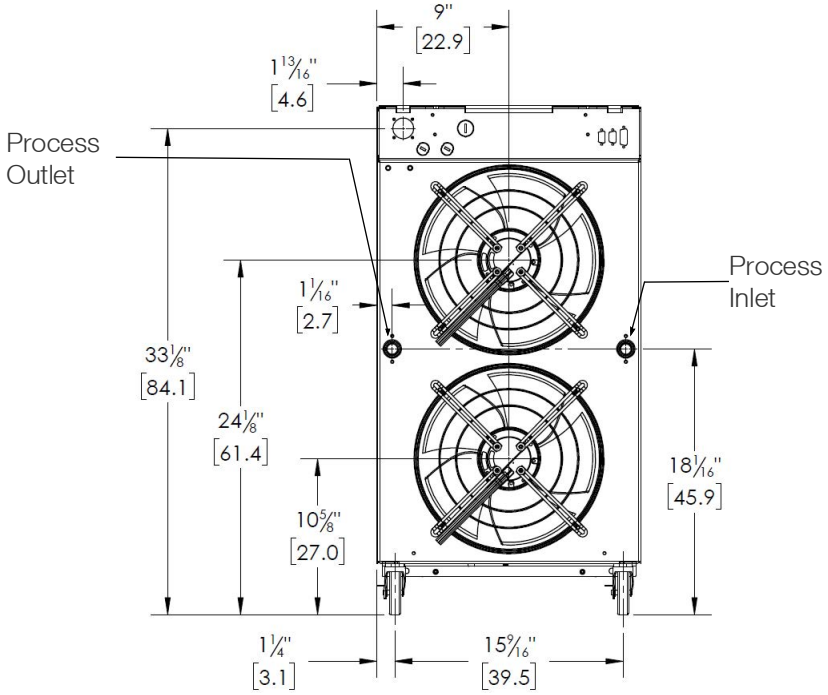


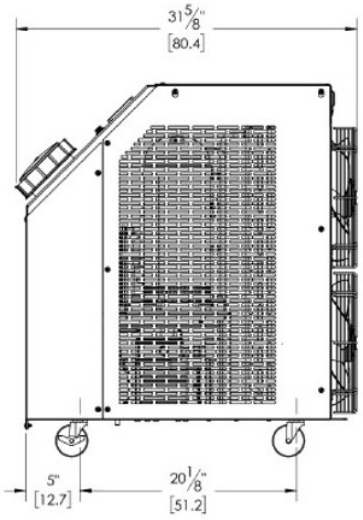
Figure 27. TSC66 Air Cooled - Extended Temperature



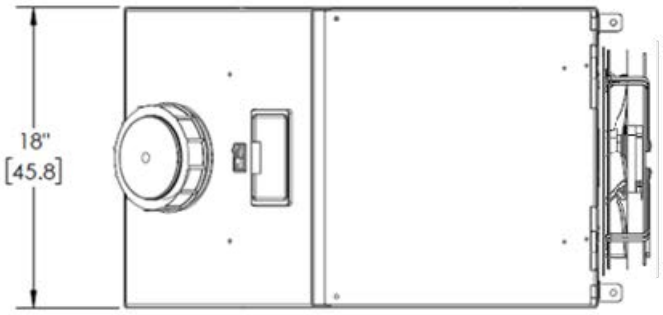
Front View



Rear View



Side View



Top View

Figure 28. TSC90 Air Cooled - Standard Temperature

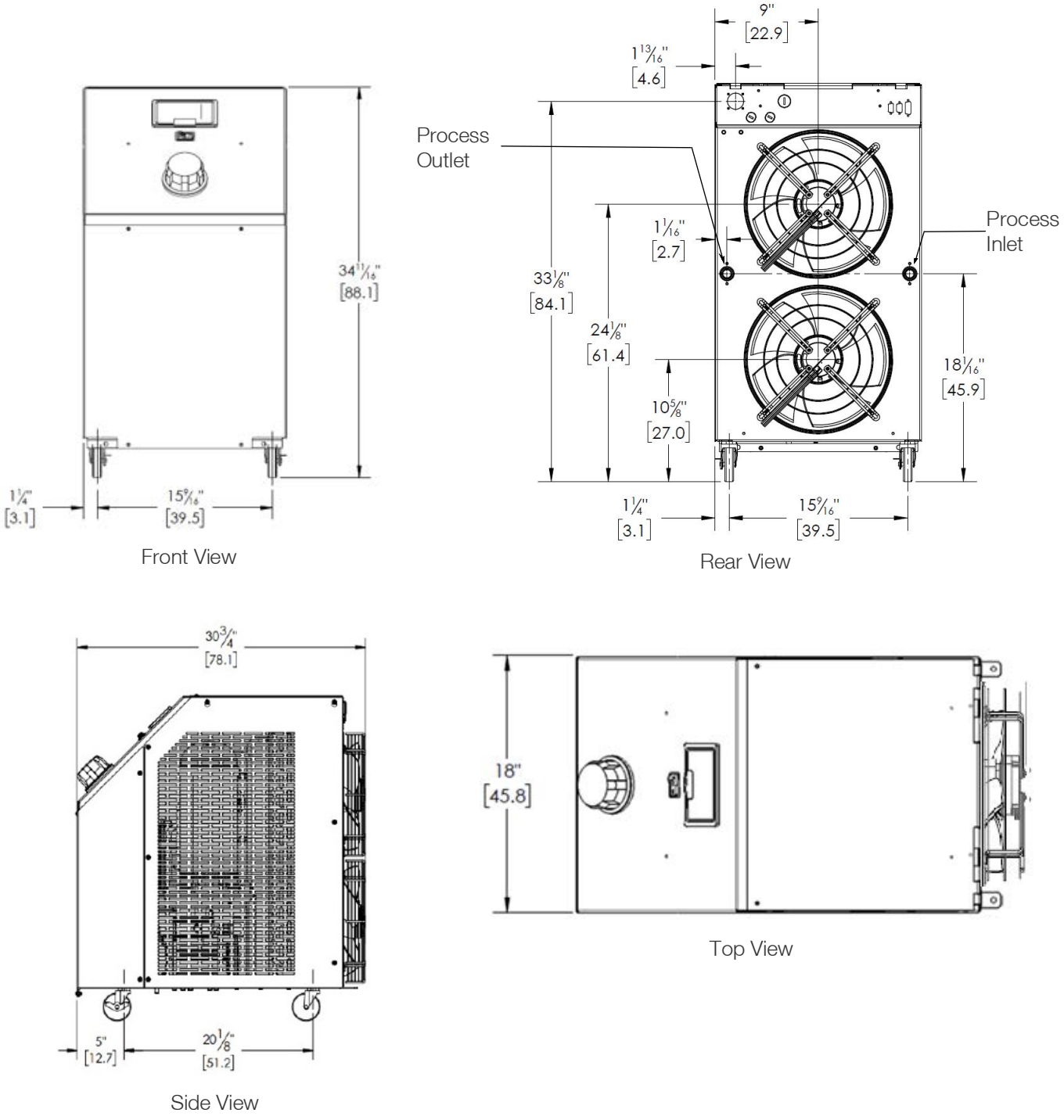


Figure 29. TSC90 Air Cooled - Extended Temperature

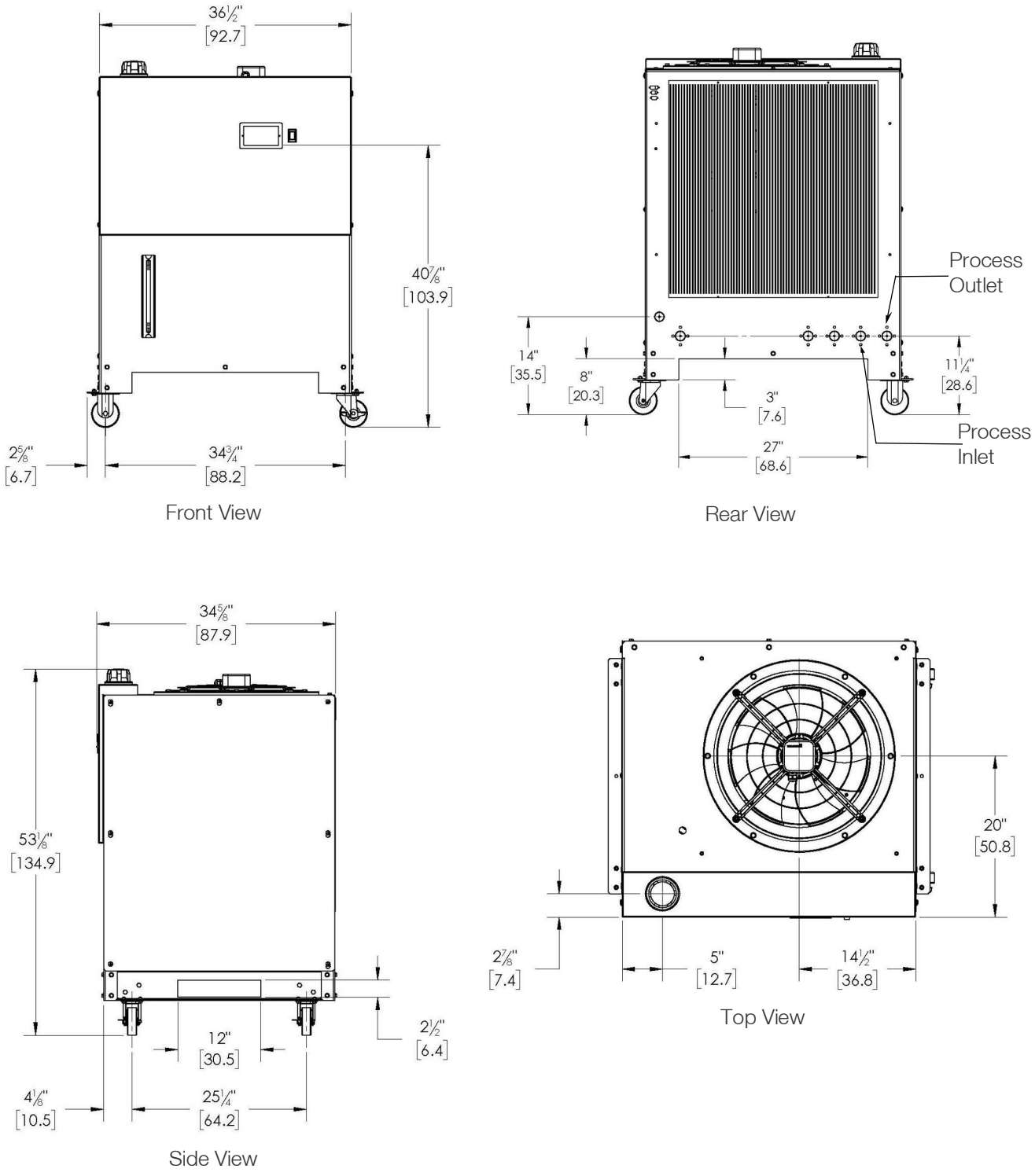


Figure 30. TSC210 Air Cooled - Standard and Extended Temperature

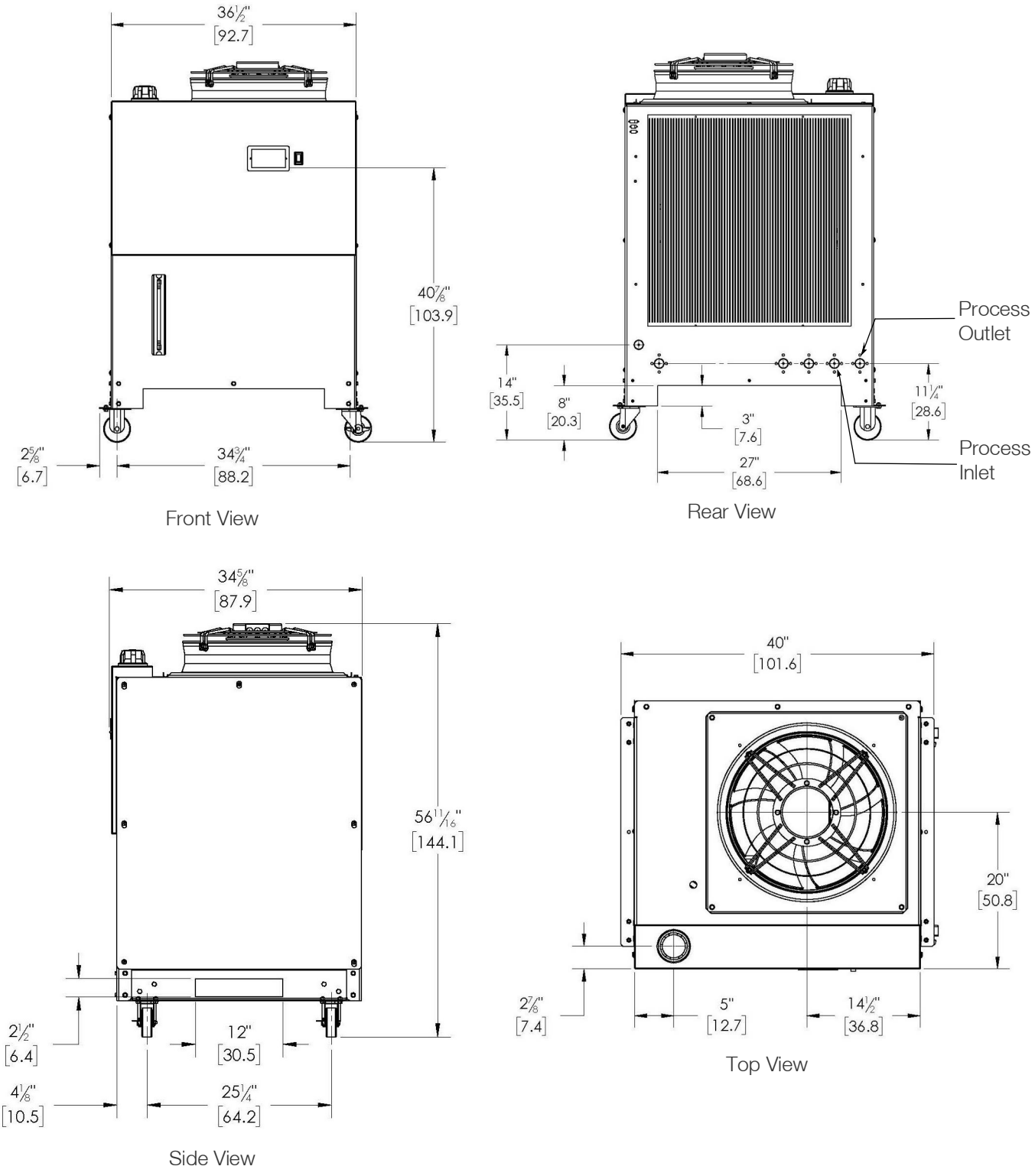


Figure 31. TSC260 Air Cooled - Standard and Extended Temperature

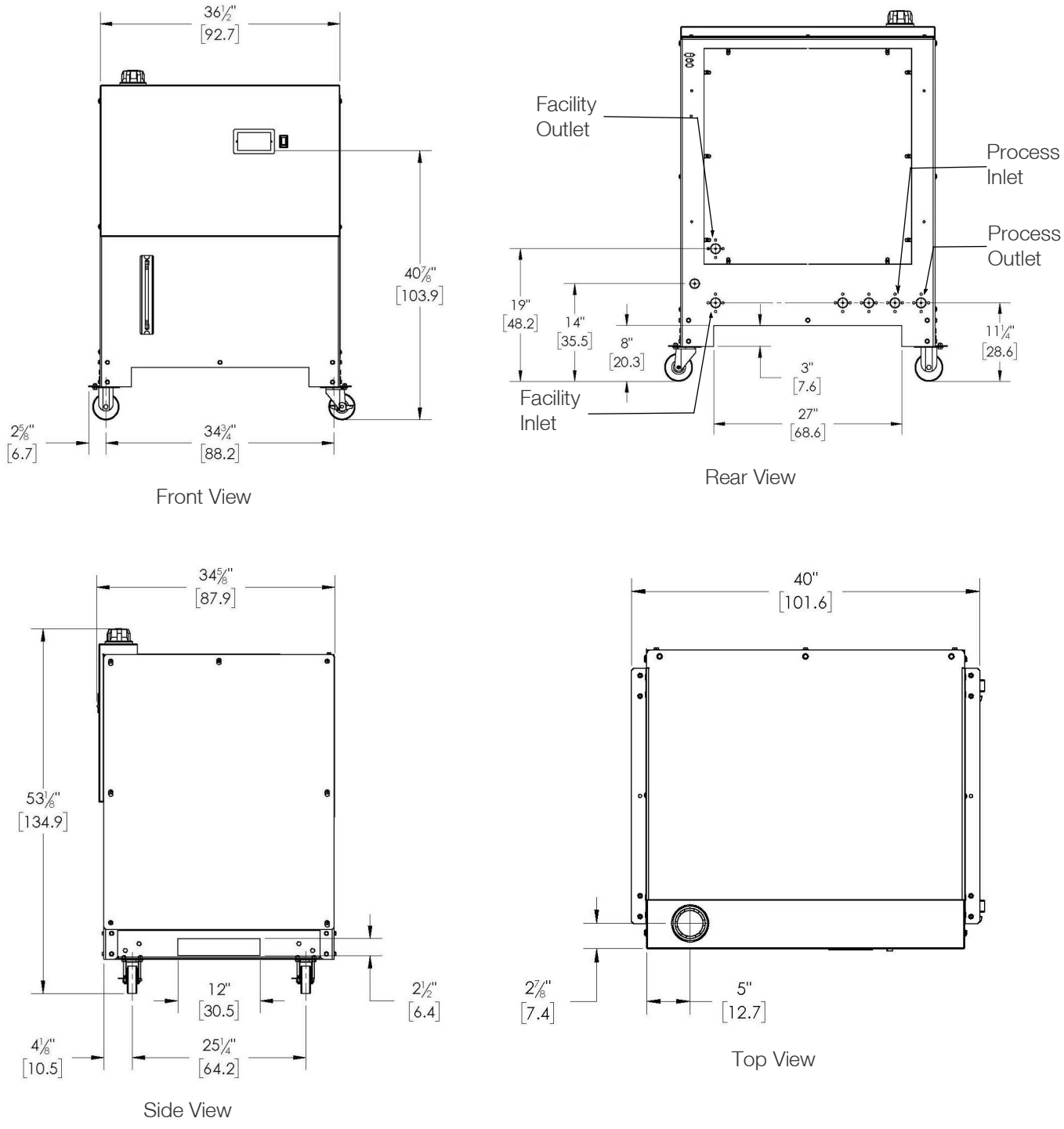


Figure 32. TSC210 and TSC260 Water Cooled - Standard and Extended Temperature

Installation

Note:

- Any external electrical equipment connected to these TSC Chillers must meet the insulation requirements of IEC/UL 61010-1.
- The safety of any system incorporating this equipment is the responsibility of the assembler of the system.

Unloading Instructions

For TSC08 -TSC90 Series

Please follow the below steps:

Step-1: Remove all side panels of the wooden box.

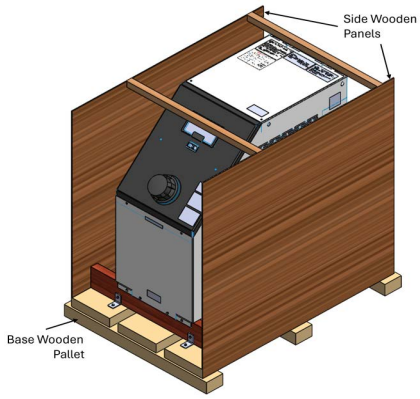


Figure 33. Side Panel Removal

Step-2: The unit is fixed with front and rear wooden blocks with 2 screws each, and the wooden blocks are fixed to the base wooden pallet with 2 screws each side.

Remove 2 screws from the front and 2 screws from the rear (highlighted in yellow) of the unit. Also, take out the front wooden block by removing 2 screws (highlighted in red) as shown in **Figure 34**. Use 5/16" socket tool to remove the screws and save all screws.

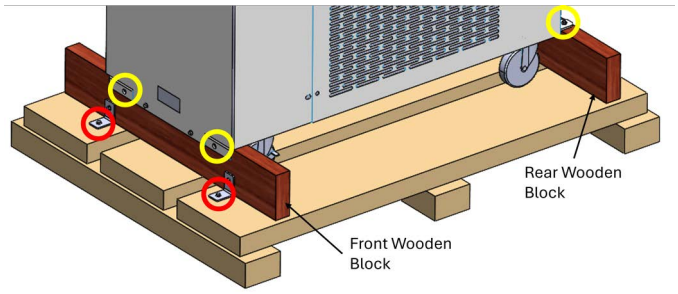


Figure 34. Screw Removal

Step-3: Roll the front wooden block to release the chiller.

Step-4: Prepare assembly of two side panels and one front wooden block using 4 no. of screws as shown in **Figure 35**.

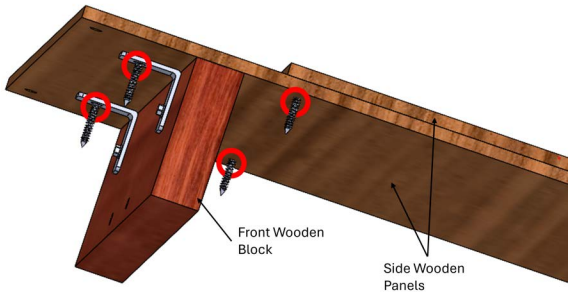


Figure 35. Assembly Preparation

Step-5: Place the assembly of the side panel and wooden block on the tip of the base wooden pallet and secure it with 2 screws, as shown in **Figure 36**.

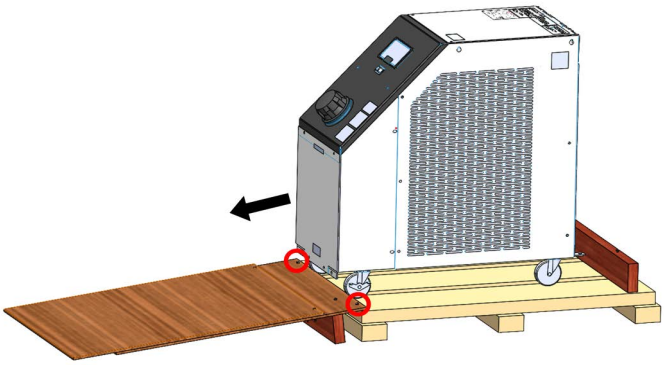


Figure 36. Placing Assembly on Wooden Pallet

Step-6: Carefully roll the unit down the ramp.

For TSC210 - TSC260 Series

Note: Use forklift for product handling and installation.

Ambient Conditions

Ambient Temperature Range*	10°C to 40°C (50°F to 104°F)
Relative Humidity Range	10% to 90% (non-condensing)
Operating Altitude*	2000m
Over voltage Category	Units with hardwired connections: Category III Units with detachable power cords: Category II
Pollution Degree	Pollution degree II
Degree of Protection	IPX0
Short Circuit Current Rating	5kA
Application Use	Indoor use
Voltage Fluctuation	± 10% of rated voltage

Note:

- Because of the decrease in air density, maximum temperature for the air entering an air-cooled TSC series Chillers is reduced by 1°C per 304.8m above sea level. In addition, cooling capacity is reduced 1.2% per 304.8m above sea level.
- For over voltage category refer electrical section for more details.

CAUTION: Never place the chiller in a location where excessive heat, moisture, inadequate ventilation, or corrosive materials are present.

Air-cooled chillers retain their full rated capacity at 20°C setpoint in ambient temperatures up to 25°C (77°F). For ambient temperatures above 25°C please de-rate the cooling capacity 3% for every 1°C above 25°C (77°F), up to a maximum ambient temperature of 40°C (104°F). Note that when operating at a process temperature lower than 20°C the de-rate percentage may increase due to additional gains from losses to ambient.

Note:

- Refer to the nameplate information on the rear of the chiller.
- Depending on the setpoint and ambient temperatures, there may be a heat gain or loss through the plumbing resulting in a variation from setpoint temperature at the application inlet. Applications with large temperature variations between ambient and setpoint temperatures, and/or long plumbing lengths, may require additional insulation like insulated hoses and fittings.
- Chillers installed below the end-user application may enable system fluid to drain back into the chiller and cause spillage.
- The unit is designed to operate in environments with relative humidity (RH) up to 90%. However within the operating range, at higher RH, the unit may experience some condensation on the surface of cold parts. It is recommended to use a drip pan or dehumidifier to manage the condensation if observed.

Ventilation

Refer to **Table 4** for air flow clearances of Air-Cooled units.

Table 4. Air Flow Clearances - Air Cooled Units

Air Flow Clearances				
Model	**Front**	**Side**	**Top**	**Back**
TSC08 - TSC35	12 Inch (30 cm)	30 Inch (76 cm)	15 Inch (38 cm)	12 Inch (30 cm)
TSC66	12 Inch (30 cm)	30 Inch (76 cm)	18 Inch (46 cm)	12 Inch (30 cm)
TSC90	12 Inch (30 cm)	30 Inch (76 cm)	18 Inch (46 cm)	18 Inch (46 cm)
TSC210 - TSC260	12 Inch (30 cm)	30 Inch (76 cm)	72 Inch (183 cm)	24 Inch (61 cm)

- Units reject heat into the air surrounding the chiller. Total heat rejection equals the heat removed from the application plus 30% additional heat.

- Before operating the chiller in conditions outside any of those listed on this page please contact Thermo Fisher Scientific's Sales, Service and Customer Support to review your installation.
- Mechanical (general) ventilation may be adequate for other operating and storage areas.

Minimum Room Area and Airflow for TSC210 and TSC260 Models

TSC210/TSC260 models contain relatively larger charges of A2L lower flammability refrigerants and must be installed in a sufficiently large room. The minimum room area increases as the amount of refrigerant charge that can leak out increases. For more details, refer to **Table 5**.

Note: These requirements do not apply to Thermo Fisher Scientific TSC08 to TSC90 chillers as their charge level exempts them from these requirements.

Table 5. Minimum room size for TSC210-TSC260 models

Model	Charge	Room Size
TSC210-AC	144 oz	24.53 m^2
TSC210-WC	120 oz	20.44 m^2
TSC260-AC	156 oz	26.6 m^2
TSC260-WC	128 oz	21.8 m^2

Refer the **Table 6** below to find:

- Minimum room area for rooms with no ventilation. Room sizes meeting or exceeding this minimum can use the chiller without restriction.
- Minimum room area for rooms with ventilation. The ventilation must be signaled to engage by a refrigerant leak detection sensor.
- For rooms with ventilation requirements, the minimum ventilation required for the unit to be installed in the room.

Calculations below are based on ceiling height of 2.2 m (7 ft 2.6 in).

- If the ceiling height is less than 2.2 m then the room size must increase accordingly.

Table 6. Reference table from standard 60335 2-89

Minimum room area (A min)...							
Charge amount of R454b A2L refrigerant		...for no ventilation restriction		...for ventilation engaged by refrigerant detection sensor		Minimum ventilation for smaller rooms requiring ventilation	
lbm	kg	ft^2	m^2	ft^2	m^2	ft^3/min	m^3/hr
4	1.8	118	10.9	59	5.5	106	180
8	3.6	235	21.8	118	10.9	212	360
16	7.3	469	43.6	235	21.8	423	719

Mechanical Ventilation

Wiring to External Ventilation

For units with A2L lower flammability refrigerants that are installed in smaller rooms that require ventilation, a refrigerant leak detection sensor must be incorporated in the room ventilation system design. The refrigerant leak detection sensor must be wired to external ventilation such that when the sensor detects refrigerant the ventilation is signaled to engage.

Position

The air extraction opening from the room shall be located equal or below the refrigerant release point. For floor mounted units, it shall be as low as practicable. The air extraction openings shall be located in a sufficient distance from the air intake openings to prevent re-circulation to the space.

The lower edge of the air extraction opening where are is exhausted from the room shall not be more than 100 mm (3.9 in) above the floor. The location where the mechanical ventilation air extracted from the space is discharged shall be separated by a sufficient distance, but not less than 3 m (118.1 in), from the mechanical ventilation air intake openings, to prevent re-circulation to the space.

Installation in public corridors

If the charge amount is greater than 1.91 lbm (0.867 kg), the equipment shall not be installed in public corridors or lobbies.

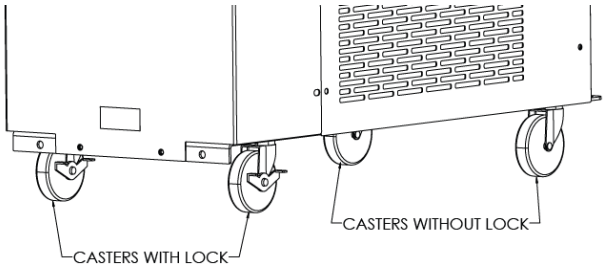
Units Connected to a Water Supply for Cooling Purposes

Critical conditions for the inlet water supply include:

- The maximum permitted temperature of the inlet water is 40°C.
- The maximum permitted inlet water pressure is 150 PSID.
- The minimum inlet water pressure. is 25 PSID.

Caster Details

Each TSC chiller comes equipped with four casters.



For models TSC08 to TSC90: Four swivel casters (two with locks and two without locks).

For models TSC210 to TSC260: Two rigid casters without lock and two swivel casters with lock.

Electrical Requirements

DANGER: The chiller's construction provides protection against the risk of electrical shock by grounding appropriate metal parts. The protection will not function unless the power cord is connected to a properly grounded outlet. It is the user's responsibility to assure a proper ground connection is provided.

The chiller must be installed in accordance with the National Electrical Code and the with reference to the information on the chiller's nameplate located on the rear.

Locate the chiller so it is near, and has easy access to, its disconnecting device.

The user is responsible to ensure that the line cord provided meets local electrical codes. If not, contact qualified installation personnel.

Identify the proper connector for the units shipped with line cords, insert connector in receptacle and turn clockwise.

To remove the connector, pull tab back, twist counter-clockwise and pull connector out.

The chiller is intended for use on a dedicated outlet. The TSC Series Chillers has an internal circuit protection that is equivalent (approximately) to the branch circuit rating. This is to protect the TSC Series Chillers, and is not intended as a substitute for branch circuit protection. For permanently connected device, the customer and a qualified licensed electrician are responsible for installing the proper branch over current protection and disconnecting device per local electrical requirements.

Electrical Service Requirements

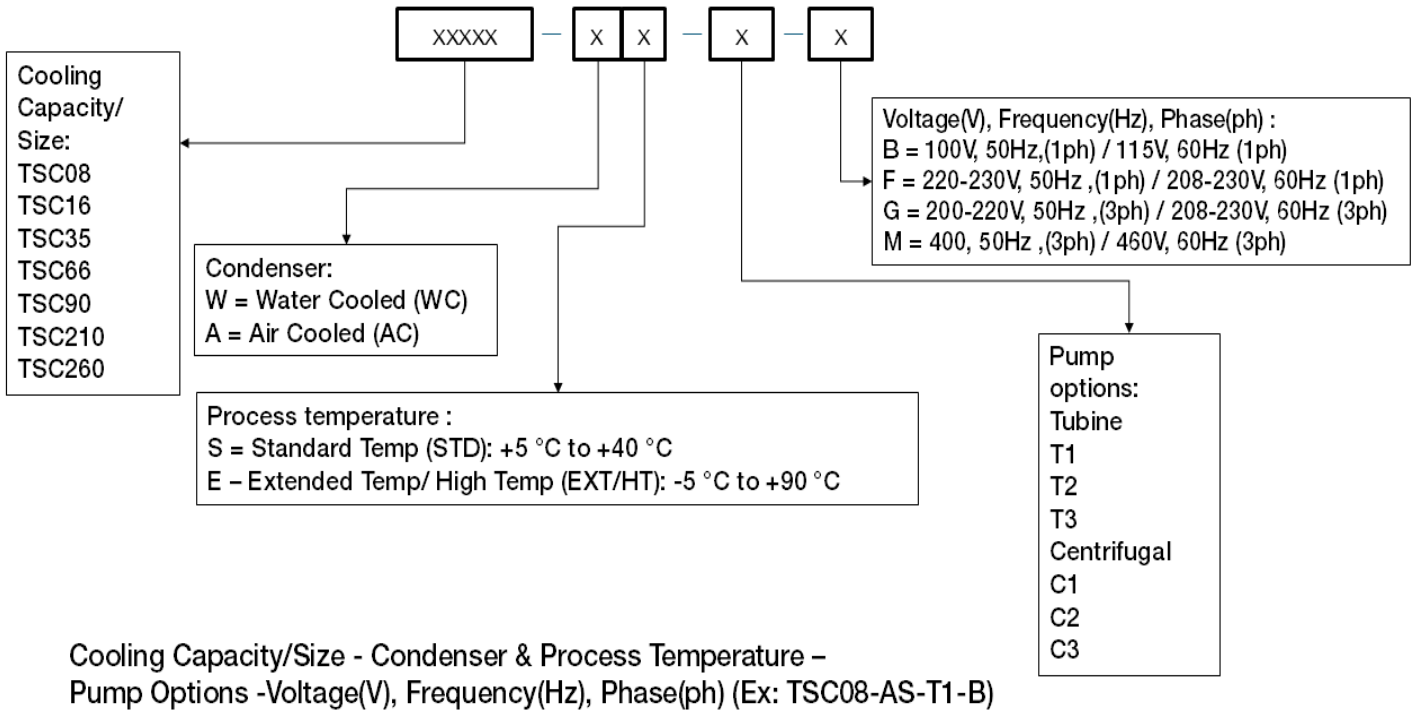


Figure 37. TSC Chillers Model Nomenclature

Note: Refer **Figure 37** to decode specific model number.

Table 7. TSC08 Electrical Service Requirement Table

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC08-AS-T1-B	60Hz	15.07	17.01	20	5-20P
	50Hz	16.27	18.22	20	
TSC08-AS-T1-F	60Hz	7.40	8.33	15	6-15P
	50Hz	8.30	9.35	15	

Table 8. TSC16 Electrical Service Requirements Table

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC16-AS-T1-B	60Hz	12.76	14.48	20	5-20P
	50Hz	13.96	15.98	20	
TSC16-WS-T1-B	60Hz	12.06	13.78	15	5-20P
	50Hz	13.26	15.28	20	
TSC16-WE-T1-F	60Hz	19.27	23.39	25	6-30P
	50Hz	20.17	24.52	25	

Table 8. TSC16 Electrical Service Requirements Table (Continued)

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC16-AS-C1-B	60Hz	13.76	15.73	20	5-20P
	50Hz	13.76	15.73	20	
TSC16-WS-C1-B	60Hz	13.06	15.03	20	5-20P
	50Hz	13.06	15.03	20	
TSC16-WE-C1-F	60Hz	19.87	24.14	25	6-30P
	50Hz	19.87	24.14	25	
TSC16-AS-C2-B	60Hz	16.76	19.48	25	5-20P
	50Hz	16.76	19.48	25	
TSC16-WS-C2-B	60Hz	16.06	18.78	20	5-20P
	50Hz	16.06	18.78	20	
TSC16-WE-C2-F	60Hz	21.37	26.02	30	6-30P
	50Hz	21.37	26.02	30	
TSC16-AS-T1-F	60Hz	6.67	7.54	15	6-15P
	50Hz	7.57	8.67	15	
TSC16-WS-T1-F	60Hz	6.27	7.14	15	6-15P
	50Hz	7.17	8.27	15	
TSC16-AE-T1-F	60Hz	19.67	23.79	25	6-30P
	50Hz	20.57	24.92	30	
TSC16-AS-C1-F	60Hz	7.27	8.29	15	6-15P
	50Hz	7.27	8.29	15	
TSC16-WS-C1-F	60Hz	6.87	7.89	15	6-15P
	50Hz	6.87	7.89	15	
TSC16-AE-C1-F	60Hz	20.27	24.54	25	6-30P
	50Hz	20.27	24.54	25	
TSC16-AS-C2-F	60Hz	8.77	10.17	15	6-15P
	50Hz	8.77	10.17	15	
TSC16-WS-C2-F	60Hz	8.37	9.77	15	6-15P
	50Hz	8.37	9.77	15	
TSC16-AE-C2-F	60Hz	21.77	26.42	30	6-30P
	50Hz	21.77	26.42	30	

Table 9. TSC35 Electrical Service Requirement Table

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC35-AS-T1-F	60Hz	13.07	15.32	20	6-20P
	50Hz	15.67	18.34	20	
TSC35-WS-T1-F	60Hz	12.27	14.52	20	6-20P
	50Hz	14.87	17.54	20	
TSC35-AE-T1-F	60Hz	26.07	31.57	35	Hard Wire
	50Hz	28.67	34.59	40	
TSC35-WE-T1-F	60Hz	25.27	30.77	35	Hard Wire
	50Hz	27.87	33.79	40	
TSC35-AS-C1-F	60Hz	13.67	15.92	20	6-20P
	50Hz	15.37	18.04	20	
TSC35-WS-C1-F	60Hz	12.87	15.12	20	6-20P
	50Hz	14.57	17.24	20	
TSC35-AE-C1-F	60Hz	26.67	32.17	35	Hard Wire
	50Hz	28.37	34.29	40	
TSC35-WE-C1-F	60Hz	25.87	31.37	35	Hard Wire
	50Hz	27.57	33.49	35	
TSC35-AS-C2-F	60Hz	15.17	17.42	25	6-30P
	50Hz	16.87	19.54	25	
TSC35-WS-C2-F	60Hz	14.37	16.62	25	6-30P
	50Hz	16.07	18.74	25	
TSC35-AE-C2-F	60Hz	28.17	33.67	35	Hard Wire
	50Hz	29.87	35.79	40	
TSC35-WE-C2-F	60Hz	27.37	32.87	35	Hard Wire
	50Hz	29.07	34.99	40	

Table 10. TSC66 Electrical Service Requirement Table

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC66-AS-C1-F	60Hz	21.41	25.46	30	6-30P
	50Hz	21.41	25.46	30	
TSC66-WS-C1-F	60Hz	20.07	24.12	30	6-30P
	50Hz	20.07	24.12	30	
TSC66-AE-C1-F	60Hz	34.46	41.76	50	Hard Wire
	50Hz	34.46	41.76	50	
TSC66-WE-C1-F	60Hz	33.12	40.42	50	Hard Wire
	50Hz	33.12	40.42	50	
TSC66-AS-T2-F	60Hz	21.01	25.06	30	6-30P
	50Hz	21.71	25.76	30	
TSC66-WS-T2-F	60Hz	19.67	23.72	30	6-30P
	50Hz	20.37	24.42	30	
TSC66-AE-T2-F	60Hz	34.06	41.36	50	Hard Wire
	50Hz	34.76	42.06	50	
TSC66-WE-T2-F	60Hz	32.72	40.02	50	Hard Wire
	50Hz	33.42	40.72	50	
TSC66-AS-C2-F	60Hz	22.91	26.96	30	6-30P
	50Hz	22.91	26.96	30	
TSC66-WS-C2-F	60Hz	21.57	25.62	30	6-30P
	50Hz	21.57	25.62	30	
TSC66-AE-C2-F	60Hz	35.96	43.26	50	Hard Wire
	50Hz	35.96	43.26	50	
TSC66-WE-C2-F	60Hz	34.62	41.92	50	Hard Wire
	50Hz	34.62	41.92	50	

Table 11. TSC90 Electrical Service Requirement Table

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC90-AS-C1-G	60Hz	20.90	24.51	35	Hard Wire
	50Hz	21.10	24.71	35	
TSC90-WS-C1-G	60Hz	17.50	21.11	35	Hard Wire
	50Hz	17.70	21.31	35	
TSC90-AE-C1-G	60Hz	35.97	43.33	50	Hard Wire
	50Hz	35.54	42.75	50	
TSC90-WE-C1-G	60Hz	32.57	39.93	50	Hard Wire
	50Hz	32.14	39.35	50	
TSC90-AS-T2-G	60Hz	20.40	24.01	35	Hard Wire
	50Hz	20.40	24.01	35	
TSC90-WS-T2-G	60Hz	17.00	20.61	30	Hard Wire
	50Hz	17.00	20.61	30	
TSC90-AE-T2-G	60Hz	35.47	42.83	50	Hard Wire
	50Hz	34.84	42.05	50	
TSC90-WE-T2-G	60Hz	32.07	39.43	45	Hard Wire
	50Hz	31.44	38.65	40	
TSC90-AS-C2-G	60Hz	22.10	25.71	35	Hard Wire
	50Hz	22.55	26.16	35	
TSC90-WS-C2-G	60Hz	18.70	22.31	35	Hard Wire
	50Hz	19.15	22.76	35	
TSC90-AE-C2-G	60Hz	37.17	44.53	50	Hard Wire
	50Hz	36.99	44.20	50	
TSC90-WE-C2-G	60Hz	33.77	41.13	50	Hard Wire
	50Hz	33.59	40.80	50	
TSC90-AS-C1-M	60Hz	11.75	11.69	15	Hard Wire
	50Hz	11.75	11.69	15	
TSC90-WS-C1-M	60Hz	8.35	9.99	15	Hard Wire
	50Hz	8.35	9.99	15	
TSC90-AE-C1-M	60Hz	19.28	21.07	25	Hard Wire
	50Hz	18.31	19.94	25	
TSC90-WE-C1-M	60Hz	15.88	19.40	20	Hard Wire
	50Hz	14.91	18.18	20	

Table 11. TSC90 Electrical Service Requirement Table (Continued)

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC90-AS-T2-M	60Hz	11.25	11.19	15	Hard Wire
	50Hz	11.45	11.39	15	
TSC90-WS-T2-M	60Hz	7.85	9.49	15	Hard Wire
	50Hz	8.05	9.69	15	
TSC90-AE-T2-M	60Hz	18.78	20.60	25	Hard Wire
	50Hz	18.01	19.58	25	
TSC90-WE-T2-M	60Hz	15.38	18.90	20	Hard Wire
	50Hz	14.61	17.88	20	
TSC90-AS-C2-M	60Hz	12.65	12.59	15	Hard Wire
	50Hz	12.65	12.59	15	
TSC90-WS-C2-M	60Hz	9.25	10.89	15	Hard Wire
	50Hz	9.25	10.89	15	
TSC90-AE-C2-M	60Hz	20.18	21.97	25	Hard Wire
	50Hz	19.21	20.84	25	
TSC90-WE-C2-M	60Hz	16.78	20.30	25	Hard Wire
	50Hz	15.81	19.08	20	

Table 12. TSC210 Electrical Service Requirement Table

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC210-AS-C3-G	60Hz	31.75	37.43	50	Hard Wire
	50Hz	30.05	35.73	50	
TSC210-WS-C3-G	60Hz	30.40	36.08	50	Hard Wire
	50Hz	28.95	34.63	50	
TSC210-AE-C3-G	60Hz	46.82	56.26	60	Hard Wire
	50Hz	44.49	53.77	60	
TSC210-WE-C3-G	60Hz	45.47	54.91	60	Hard Wire
	50Hz	43.39	52.67	60	
TSC210-AS-C1-G	60Hz	27.15	32.83	50	Hard Wire
	50Hz	27.10	32.78	50	
TSC210-WS-C1-G	60Hz	25.80	31.48	50	Hard Wire
	50Hz	26.00	31.68	50	

Table 12. TSC210 Electrical Service Requirement Table (Continued)

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC210-AE-C1-G	60Hz	42.22	51.66	60	Hard Wire
	50Hz	41.54	50.82	60	
TSC210-WE-C1-G	60Hz	40.87	50.31	60	Hard Wire
	50Hz	40.44	49.72	60	
TSC210-AS-C2-G	60Hz	28.35	34.03	50	Hard Wire
	50Hz	28.55	34.23	50	
TSC210-WS-C2-G	60Hz	27.00	32.68	50	Hard Wire
	50Hz	27.45	33.13	50	
TSC210-AE-C2-G	60Hz	43.42	52.86	60	Hard Wire
	50Hz	42.99	52.27	60	
TSC210-WE-C2-G	60Hz	42.07	51.51	60	Hard Wire
	50Hz	41.89	51.17	60	
TSC210-AS-T3-G	60Hz	37.25	42.93	60	Hard Wire
	50Hz	36.20	41.88	60	
TSC210-WS-T3-G	60Hz	35.90	41.58	60	Hard Wire
	50Hz	35.10	40.78	60	
TSC210-AE-T3-G	60Hz	52.32	61.76	70	Hard Wire
	50Hz	50.64	59.92	70	
TSC210-WE-T3-G	60Hz	50.97	60.41	70	Hard Wire
	50Hz	49.54	58.82	70	
TSC210-AS-C3-M	60Hz	14.15	16.67	25	Hard Wire
	50Hz	13.44	15.96	25	
TSC210-WS-C3-M	60Hz	13.35	15.87	25	Hard Wire
	50Hz	12.80	15.32	25	
TSC210-AE-C3-M	60Hz	42.39	51.97	60	Hard Wire
	50Hz	38.02	46.67	50	
TSC210-WE-C3-M	60Hz	41.59	51.17	60	Hard Wire
	50Hz	37.38	46.03	50	
TSC210-AS-C1-M	60Hz	12.65	15.17	20	Hard Wire
	50Hz	12.49	15.01	20	
TSC210-WS-C1-M	60Hz	11.85	14.37	20	Hard Wire
	50Hz	11.85	14.37	20	

Table 12. TSC210 Electrical Service Requirement Table (Continued)

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC210-AE-C1-M	60Hz	40.89	50.47	60	Hard Wire
	50Hz	37.07	45.72	50	
TSC210-WE-C1-M	60Hz	40.09	49.67	50	Hard Wire
	50Hz	36.43	45.08	50	
TSC210-AS-C2-M	60Hz	13.55	16.07	25	Hard Wire
	50Hz	13.39	15.91	25	
TSC210-WS-C2-M	60Hz	12.75	15.27	25	Hard Wire
	50Hz	12.75	15.27	25	
TSC210-AE-C2-M	60Hz	41.79	51.37	60	Hard Wire
	50Hz	37.97	46.62	50	
TSC210-WE-C2-M	60Hz	40.99	50.57	60	Hard Wire
	50Hz	37.33	45.98	50	
TSC210-AS-T3-M	60Hz	17.05	19.57	25	Hard Wire
	50Hz	16.89	19.41	25	
TSC210-WS-T3-M	60Hz	16.25	18.77	25	Hard Wire
	50Hz	16.25	18.77	25	
TSC210-AE-T3-M	60Hz	45.29	54.87	60	Hard Wire
	50Hz	41.47	50.12	60	
TSC210-WE-T3-M	60Hz	44.49	54.07	60	Hard Wire
	50Hz	40.83	49.48	50	

Table 13. TSC260 Electrical Service Requirement Table

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC260-AS-C3-M	60Hz	19.65	23.32	35	Hard Wire
	50Hz	19.10	22.77	35	
TSC260-WS-C3-M	60Hz	17.95	21.62	35	Hard Wire
	50Hz	17.40	21.07	35	
TSC260-AE-C3-M	60Hz	47.89	58.62	60	Hard Wire
	50Hz	43.68	53.48	60	
TSC260-WE-C3-M	60Hz	46.19	56.92	60	Hard Wire
	50Hz	41.98	51.78	60	

Table 13. TSC260 Electrical Service Requirement Table (Continued)

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC260-AS-C1-M	60Hz	18.15	21.82	35	Hard Wire
	50Hz	18.15	21.82	35	
TSC260-WS-C1-M	60Hz	16.45	20.12	30	Hard Wire
	50Hz	16.45	20.12	30	
TSC260-AE-C1-M	60Hz	46.39	57.12	60	Hard Wire
	50Hz	42.73	52.53	60	
TSC260-WE-C1-M	60Hz	44.69	55.42	60	Hard Wire
	50Hz	41.03	50.83	60	
TSC260-AS-C2-M	60Hz	19.05	22.72	35	Hard Wire
	50Hz	19.05	22.72	35	
TSC260-WS-C2-M	60Hz	17.35	21.02	35	Hard Wire
	50Hz	17.35	21.02	35	
TSC260-AE-C2-M	60Hz	47.29	58.02	60	Hard Wire
	50Hz	43.63	53.43	60	
TSC260-WE-C2-M	60Hz	45.59	56.32	60	Hard Wire
	50Hz	41.93	51.73	60	
TSC260-AS-T3-M	60Hz	22.55	26.22	40	Hard Wire
	50Hz	22.55	26.22	40	
TSC260-WS-T3-M	60Hz	20.85	24.52	35	Hard Wire
	50Hz	20.85	24.52	35	
TSC260-AE-T3-M	60Hz	50.79	61.52	70	Hard Wire
	50Hz	47.13	56.93	60	
TSC260-WE-T3-M	60Hz	49.09	59.82	60	Hard Wire
	50Hz	45.43	55.23	60	
TSC260-AS-C3-G	60Hz	35.40	41.58	60	Hard Wire
	50Hz	34.00	40.18	60	
TSC260-WS-C3-G	60Hz	32.40	38.58	60	Hard Wire
	50Hz	31.00	37.18	60	
TSC260-AE-C3-G	60Hz	50.47	60.41	70	Hard Wire
	50Hz	48.44	58.22	70	
TSC260-WE-C3-G	60Hz	47.47	57.41	70	Hard Wire
	50Hz	45.44	55.22	70	

Table 13. TSC260 Electrical Service Requirement Table (Continued)

Model Number	Frequency	FLA	MCA	MOPD	Line Cord Plug
TSC260-AS-C1-G	60Hz	30.80	36.98	60	Hard Wire
	50Hz	31.00	37.18	60	
TSC260-WS-C1-G	60Hz	27.80	33.98	50	Hard Wire
	50Hz	28.00	34.18	50	
TSC260-AE-C1-G	60Hz	45.87	55.81	70	Hard Wire
	50Hz	45.44	55.22	70	
TSC260-WE-C1-G	60Hz	42.87	52.81	70	Hard Wire
	50Hz	42.44	52.22	70	
TSC260-AS-C2-G	60Hz	32.00	38.18	60	Hard Wire
	50Hz	32.45	38.63	60	
TSC260-WS-C2-G	60Hz	29.00	35.18	50	Hard Wire
	50Hz	29.45	35.63	50	
TSC260-AE-C2-G	60Hz	47.07	57.01	70	Hard Wire
	50Hz	46.89	56.67	70	
TSC260-WE-C2-G	60Hz	44.07	54.01	70	Hard Wire
	50Hz	43.89	53.67	70	
TSC260-AS-T3-G	60Hz	40.90	47.08	70	Hard Wire
	50Hz	40.10	46.28	70	
TSC260-WS-T3-G	60Hz	37.90	44.08	60	Hard Wire
	50Hz	37.10	43.28	60	
TSC260-AE-T3-G	60Hz	55.97	65.91	70	Hard Wire
	50Hz	54.54	64.32	70	
TSC260-WE-T3-G	60Hz	52.97	62.91	70	Hard Wire
	50Hz	51.54	61.32	70	

Refer to the nameplate label located on the rear of the chiller for specific electrical requirements.

MCA = Minimum Current Ampacity

MOPD = Maximum Overcurrent Protective Device

FLA: Full Load Amps

Values reflect those on the nameplate located on the rear of the chiller.

Hard Wire Installation

For personal safety and equipment reliability, only a qualified technician should perform the following procedure.

Note: The technician is responsible for installing circuit protection for incoming power. Before wiring consult the nameplate on the rear of the chiller. Ensure installation is in accordance with the National Electrical Code and any other applicable country and local codes.

For TSC16 - TSC90 chillers:

- Remove the two screws securing the electrical box cover to the chiller.
- Remove the knock out (1").
- Insert the cable and strain relief through the hole.
- Refer to the label in the electrical box to configure your chiller, Refer to **Figure 38**.
- Secure the cable's ground wire to the ground stud.
- Resecure the electrical box lid.

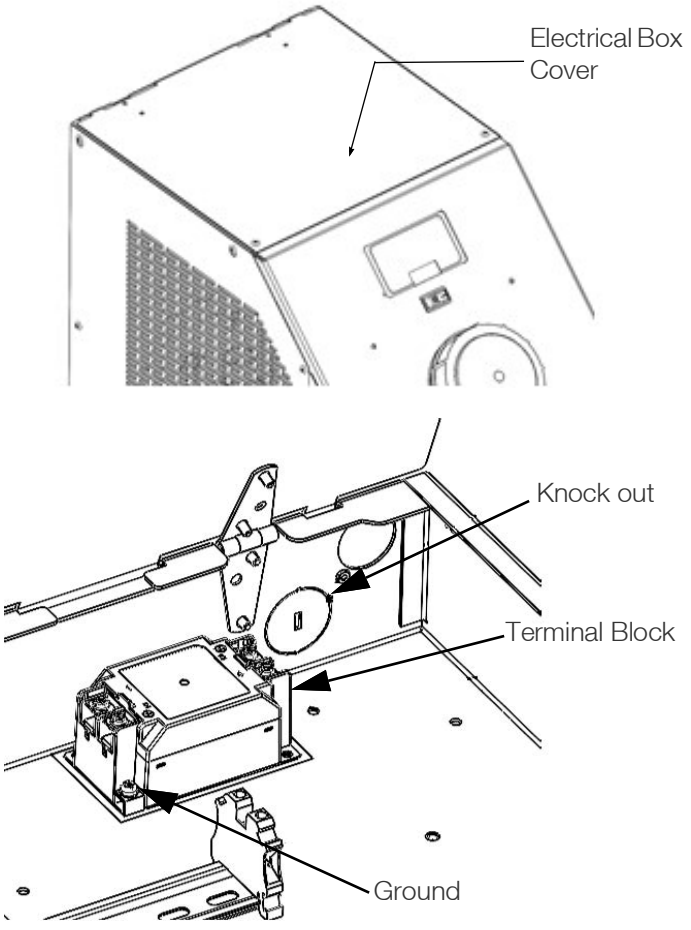


Figure 38. TSC16-90 Electrical Box

For TSC210 and TSC260 chillers:

- First remove the side panel and then remove the electrical box cover by removing 11 screws to access the electrical box access panel.
- The electrical box access panel is hinged on the left side (swing open) and secured with 2 screws on the right side.
- Open the electrical box access panel by removing the 2 screws to access the inside of the electrical box.
- Route power cables from the rear panel knockouts to the electrical box through the knockout provided on the electrical box. Refer to **Figure 39**.
- Refer to the label in the electrical box to configure your chiller. Refer to **Figure 39**.
- Secure the cable's ground wire to the ground stud.
- Reinstall the side panel, electrical box access panel, and electrical box cover.

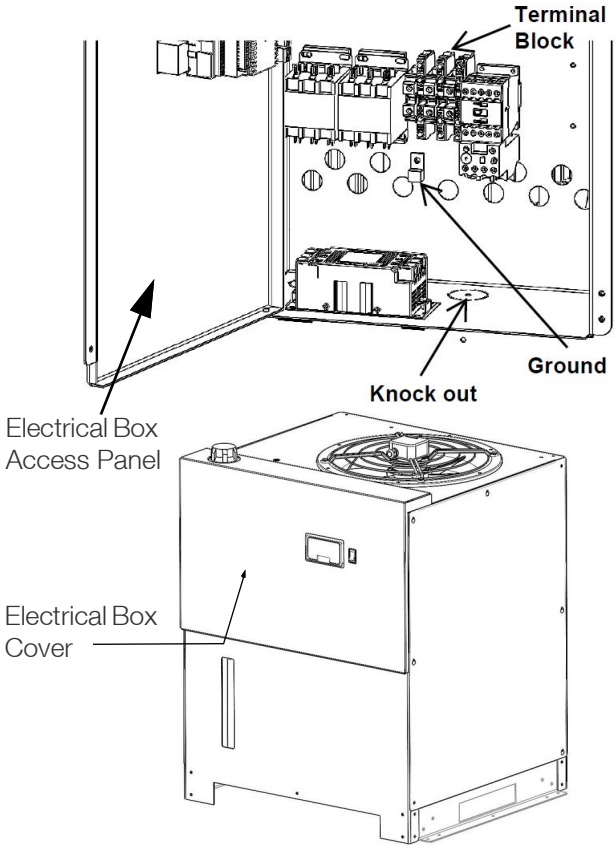


Figure 39. TSC210-260 Electrical Box

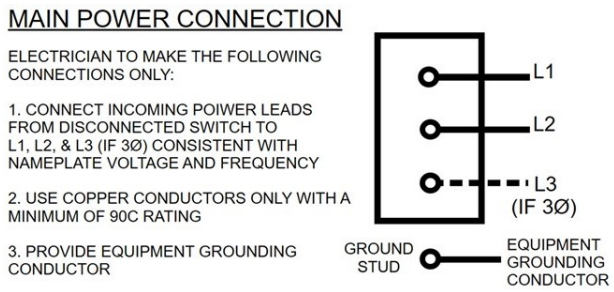


Figure 40. Main power connection label (TSC16-260) 3 phase models

Voltage selector for 400V, 50Hz, 3ph/ 460V, 60Hz, 3ph units

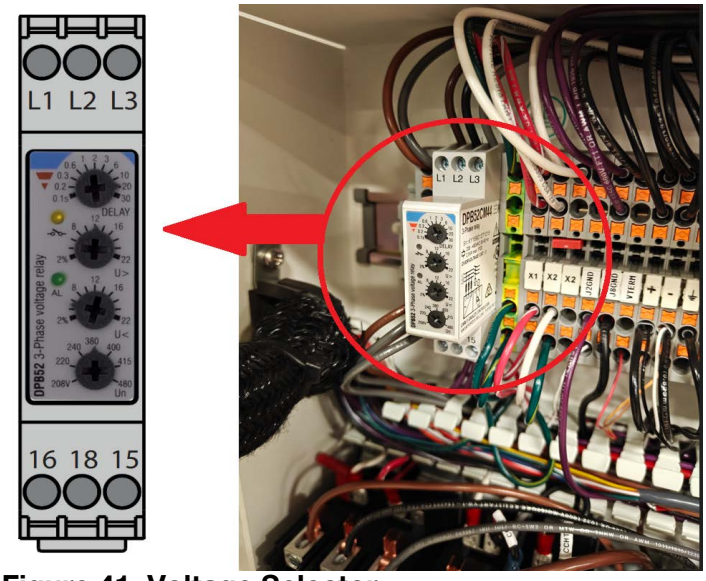


Figure 41. Voltage Selector

- Locate the mains nominal voltage dial knob in the electrical box as shown in **Figure 41** and adjust for 50Hz and 60Hz as mentioned below.

For 400V,50Hz, 3ph units:

- Select mains nominal voltage dial knob at 400V.

For 460V,60Hz, 3ph units:

- Default factory setting would be 460V.
- If different setting found, adjust the mains nominal voltage dial knob to 460V.

Plumbing Requirements

Ensure that all shipping plugs are removed before installation.

Note: If diameter reductions must be made, make them at the inlet and outlet of your application, not the chiller.

CAUTION: Never connect the process fluid lines to your facility water supply or any pressurized liquid source.

Note: Ensure your plumbing installation develops a back pressure according to the selected pump configuration. If the minimum pressure requirement is not met the unit will shutoff with the low pressure alarm. Refer to the table below for minimum back pressure requirements.

Minimum Back pressure (PSI)		
Pump Type	**50Hz**	**60Hz**
T1	3	3
T2	3	3
T3	5	5
C1	25	20
C2	40	30
C3	45	34

The process fluid connections are located on the rear of the chiller and are labeled (PROCESS OUTLET) and (PROCESS INLET).

Process Fluid Connection (FNPT) - Inlet and Outlet

TSC08 to TSC90: 1/2" FNPT for process, Stainless Steel Material.

TSC210 to TSC260: 1" FNPT for process, Stainless Steel Material.

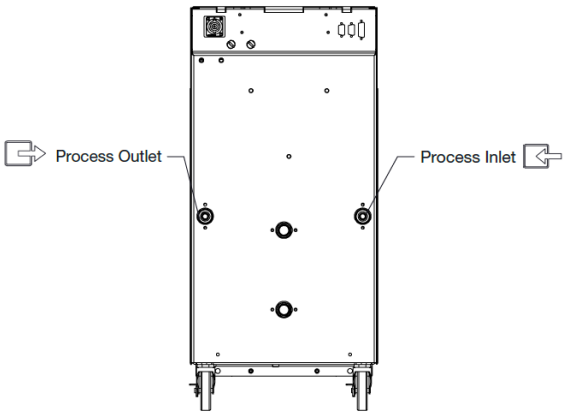


Figure 42. Typical Plumbing Connections, Air-Cooled Chillers

Connect the PROCESS OUTLET to the fluid inlet on your application. Connect the PROCESS INLET to the fluid outlet on your application. Ensure all connections are secure and that the proper sealant/lubricant for the fitting material is used. (If Teflon® tape is used, ensure the tape does not overhang the first thread as it could shred and get into the fluid.) Keep the distance between the chiller and the instrument being cooled as short as possible. Ensure tubing is straight and without bends. If diameter reductions are required, make them at the inlet and outlet of your application, not at the TSC Series Chillers.

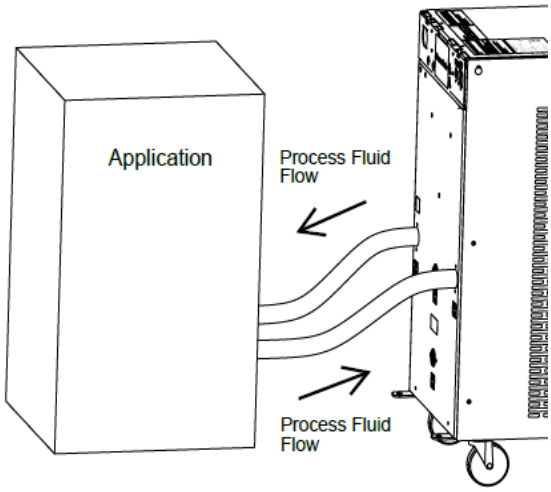


Figure 43. Typical Plumbing Connections

Water-cooled Chillers only

The facility water plumbing connections are also located on the rear and are labeled FACILITY INLET and FACILITY OUTLET. The connections are ½" Female NPT for TSC08-TSC90, 1" Female NPT for TSC210-TSC260. Both connections for TSC series chiller are stainless steel. The supply and return connections for TSC series chiller are stainless steel.

Connect the FACILITY INLET to your facility water supply. Connect the FACILITY OUTLET to your facility water return or drain. Ensure all connections are secure and that the proper sealant/lubricant for the fitting material is used. (If Teflon® tape is used, ensure the tape does not overhang the first thread as it could shred and get into the fluid).

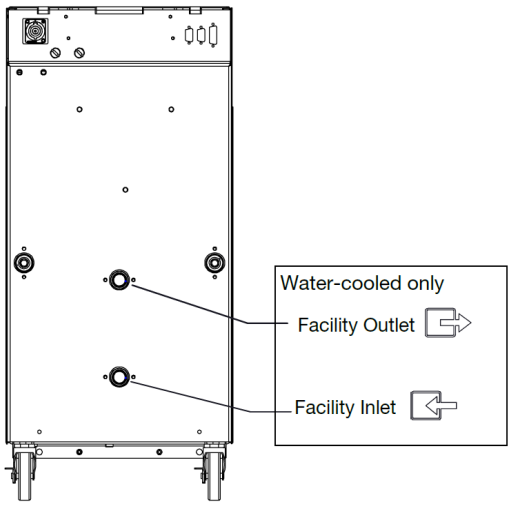


Figure 44. Typical Plumbing Connections, Water-cooled Chillers

Process Fluid Requirements

WARNING: Do not use automotive antifreeze. Commercial antifreeze contains silicates that can damage the pump seals. Use of any fluid not listed below will void the manufacturer's warranty. Approved fluids are:

- Distilled water
- Filtered water
- 0 - 50% Laboratory Grade Ethylene Glycol/ Water
- 0 - 50% Laboratory Grade Propylene Glycol/Water
- Deionized water (3 MΩ-cm max, compensated)

For applications requiring resistivity greater than 1 MΩ-cm please call and speak to an applications engineer for additional information.

WARNING: Ethylene glycol (EG) is poisonous and flammable. Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's most current SDS for handling precautions.

CAUTION: EG is also hygroscopic, it will absorb water from its environment. This can affect the freezing point and boiling point of the fluid over time and may result in system failure.

CAUTION: To prevent freezing/glazing of the plate exchanger, TSC series chillers require the use of 50/50 EG/water or 50/50 PG/water below 10°C process temperature.

CAUTION: When using a process fluid mixture of ethylene glycol and water or propylene glycol and water, check the fluid concentration and pH on a regular basis. Changes in concentration and pH can impact system performance.

CAUTION: When using EG/water or PG/water, top-off with filtered/distilled water. After top-off check the fluid concentration.

Compatibility with Approved Fluids

Filtered/Distilled Water:

Filtered drinking water and single distilled water are good choices for recirculating chillers because the filtering/distilling process used removes microorganisms that could create biological fouling as well as harmful particulates and excessive minerals that could cause deposits and scaling.

Chlorine:

Short term usage of tap water may not cause any adverse affects on the chiller or your application, but in the long term problems may arise. To help alleviate these problems Thermo Fisher Scientific recommends the use of chlorine.

The duration of time that chlorine remains in solution depends on factors such as water temperature, pH and availability of direct sunlight. We recommend maintaining chlorine levels at proper levels using chlorine test strips, generally 1 to 5 ppm is adequate.

For best results, maintain the pH of the fluid between 6.5 and 7.5. Do not add additional chlorine without first determining the concentration ratio that

already exists in the fluid supply. Corrosion and degradation of the circulation components can result from concentration ratios that are too high. Contact our customer support for additional information.

Deionized Water:

Deionized water is water that has had its mineral ions removed using ion exchange resins. The purpose of this process is to remove the ions that allow electrical current to flow more easily through water. This helps to prevent electrical leaks to ground through the recirculating fluid. Deionized water is classified by the electrical resistance of the water, usually measured in MΩ cm, with pure water having a resistance of 18 MΩ-cm.

Deionized water is in an unbalanced state and will leach the missing ions from the materials it comes in contact with. The aggressive nature of this leaching can cause pitting on metal surfaces. Note that the deionizing process does not remove microorganisms. Because of this, we recommend deionized water only with applications that have it as a specified requirement.

In any case, only deionized water with 3 MΩ-cm resistivity maximum is approved for use in Thermo Fisher Scientific recirculating chillers.

Recommended Biocides and Inhibitors:

Thermo Fisher Scientific offers a biocide and inhibitor package Thermo 200 (Nalco) premixed with 5 gallons of water or as a kit to be added to water. No other biocide or inhibitor is recommended for use in our recirculating chillers.

WARNING: Biocides are corrosive and can cause irreversible eye damage and skin burns. They are harmful if inhaled, swallowed or absorbed through the skin. Refer to the manufacturer's most current SDS for handling and PPE requirements.

CAUTION: To prevent freezing/glazing of the plate exchanger, all TSC series recirculating chillers require the use of 50/50 EG/water or 50/50 PG/water below 10°C process temperature.

Uninhibited Ethylene Glycol/Water:

Ethylene glycol is used to depress the freezing point of water and should only be used at temperatures where freeze point suppression is required. Ethylene glycol does not improve heat transfer and is not recommended for use as a biocide. Because glycols lower the surface tension of water and do not evaporate as readily as water, they may cause visible weepage past the pump seals. If weepage cannot be tolerated, seal-less, use magnetically driven pumps where available.

Uninhibited simply means that the glycol does not contain any additives to prevent corrosion. While uninhibited ethylene glycol is acceptable for use, the pH level must be closely monitored and the fluid may need to be replaced more often. Since all glycols produce acids in the presence of air and the fluid, change the glycol if the pH falls below 8. Note that litmus paper will not work to test the pH of ethylene glycol/water.

Inhibited Ethylene Glycol/Water and Inhibited Propylene Glycol/ Water:

Inhibited glycol can help protect the wetted metals within the cooling circuit from corrosion caused by poor water quality, ethylene glycol oxidation (low pH) and mixed metals (electrolysis). The inhibitor works by either leaving a barrier coating on metal surfaces to buffer them from the corrosive fluid or by creating an oxidized layer that protects the

underlying metal (passivating). Inhibited automotive glycols are never acceptable. They use either silicates or Organic Acid Technology (OAT) as the inhibitor and these components are not compatible with the polymers used in recirculating chillers including the pump seals and internal hoses. Inhibitors may also accelerate pump seal wear and seal-less, Use magnetically driven pumps where available.

Uninhibited Propylene Glycol/Water:

Propylene glycol does not transfer heat as well as ethylene glycol, but can be used when freeze point suppression is required as well as lower toxicity.
Propylene glycol does not function as a biocide and the pH needs to be maintained the same as with ethylene glycol as it also produces acid when oxidized.

Additional Fluid Information

When using the TSC Series Chillers to circulate through aluminum, use a compatible corrosion inhibitor to prevent galvanic corrosion.
Ensure fluid viscosity is 50 cSt or less at the lowest temperature used.

Process Water Quality and Standards

Facility Water	Permissible (PPM)	Desirable (PPM)
Microbiologicals		
(algae, bacteria, fungi)	0	0
Inorganic Chemicals		
Calcium	<25	<0.6
Chloride	<25	<10
Copper	<1.3	<1.0
	0.020 ppm if fluid in contact with aluminium	
Iron	<0.3	<0.1
Lead	<0.015	0
Magnesium	<12	<0.1
Manganese	<0.05	<0.03
Nitrates \Nitrites	<10 as N	0
Potassium	<20	<0.3
Silicate	<25	<1.0
Sodium	<20	<0.3
Sulfate	<25	<1
Hardness	<17	<0.05
Total Dissolved Solids	<50	<10
Other Parameters		
pH	6.5-8.5	7-8
Resistivity	0.01*	0.05-0.1*

* MΩ-cm (compensated to 25°C)

Unfavorably high total ionized solids (TIS) can accelerate the rate of galvanic corrosion. These contaminants can function as electrolytes which increase the potential for galvanic cell corrosion and lead to localized corrosion such as pitting. Eventually, the pitting will become so extensive that refrigerant will leak into the water reservoir.

As an example, raw water in the United States averages 171 ppm (of NaCl). The recommended level for use in a water system is between 0.5 to 5.0 ppm (of NaCl).

Recommendation: Initially fill the reservoir with distilled or 3 MΩ-cm deionized water. (It is acceptable to have the fluid drop to the other levels over-time.)

Do not use tap water as the total ionized solids level may be too high. This will reduce the electrolytic potential of the water and prevent or reduce the galvanic corrosion observed.

Facility Water Quality and Standards (water-cooled chillers)

Facility Water	Permissible (PPM)	Desirable (PPM)
Microbiologicals		
(algae, bacteria, fungi)	0	0
Inorganic Chemicals		
Calcium	<40	<0.6
Chloride	<250	<25
Copper	<1.3	<1.0
	0.020 ppm if fluid in contact with aluminium	
Iron	<0.3	<0.1
Lead	<0.015	0
Magnesium	<12	<0.1
Manganese	<0.05	<0.03
Nitrates \Nitrites	<10 as N	0
Potassium	<20	<0.3
Silicate	<25	<1.0
Sodium	<20	<0.3
Sulfate	<250	<50
Hardness	<17	<0.05
Total Dissolved Solids	<50	<10
Other Parameters		
pH	6.5-8.5	7-8
Resistivity	0.01*	0.05-0.1*

*MΩ-cm (compensated to 25°C)

Note: A corrosion inhibitor is recommended if mixed metals are in the facility water loop.

Facility Water Requirements (water cooled chillers)

Facility Water Maximum Inlet Pressure must not exceed 150 PSIG.

Facility Water Maximum Pressure Differential must not exceed 50 PSID. (Pressure Differential = Inlet Pressure - Outlet Pressure)

Note: Contact Thermo Fisher Scientific Technical Representative before using facility water that is above 35°C.

CAUTION: The facility water must meet the following conditions for the chiller to maintain its full rated capacity.

Note: Please refer to the below example before reviewing the graphs.

Example:

- Follow the lines.
- Start with a known, e.g., facility water temperature.
- A - go across to temperature curve
- B - drop down to determine the minimum required facility flow.
- C - Where B crosses the PSID curve, go across to determine the minimum required PSID.

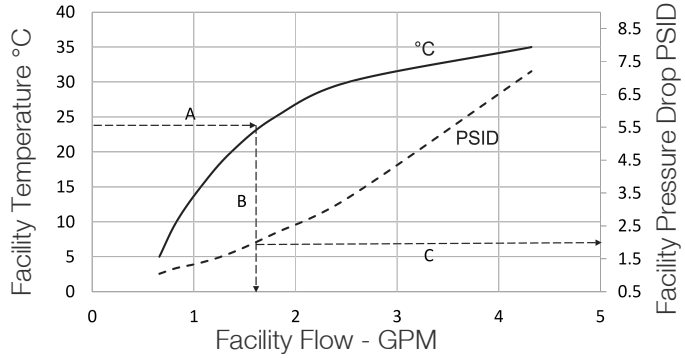


Figure 45. TSC16 Series

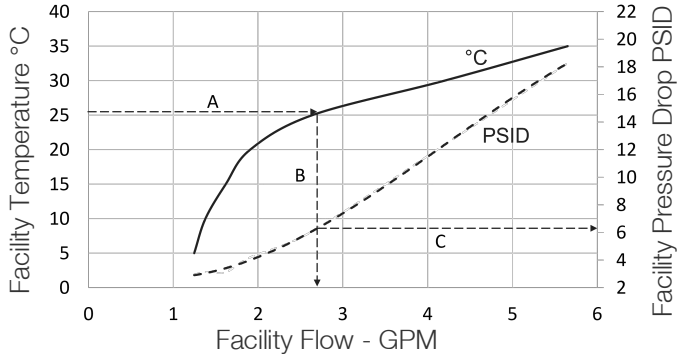


Figure 46. TSC35 Series

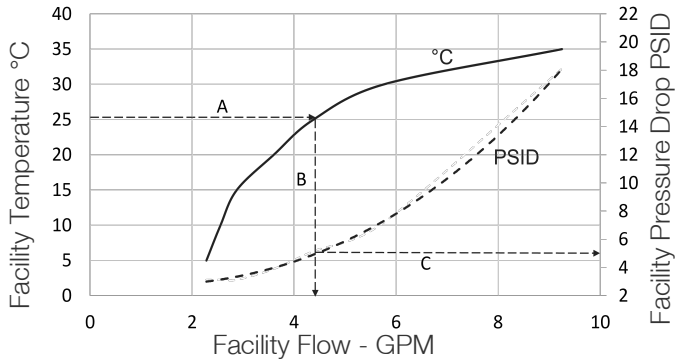


Figure 47. TSC66 Series

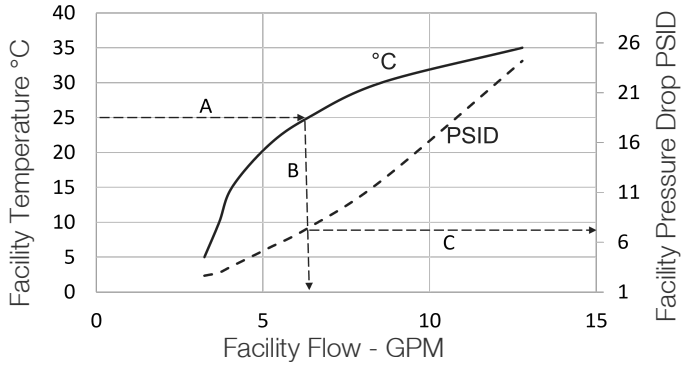


Figure 48. TSC90 Series

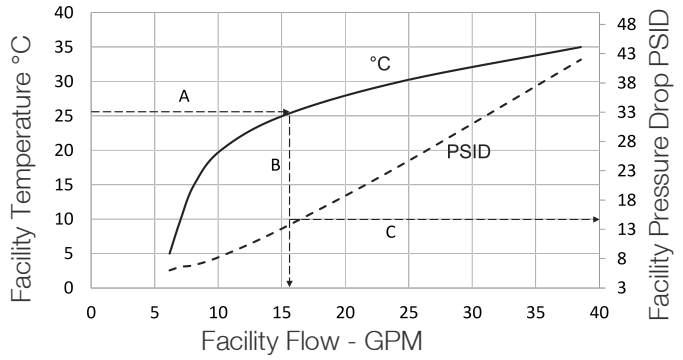


Figure 49. TSC210 Series

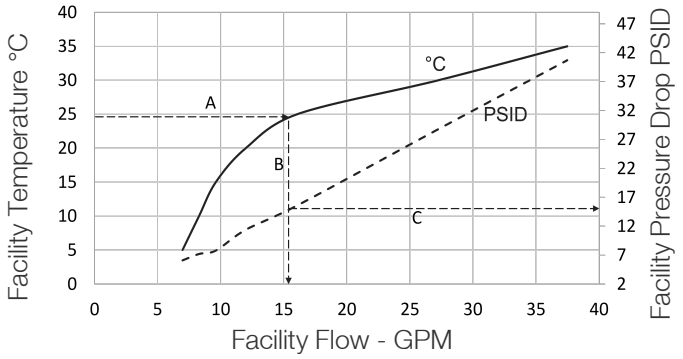


Figure 50. TSC260 Series

Fluid Fill Strainer

The reservoir includes a fluid fill strainer to prevent particulates from entering the system.

TSC08–TSC90 standard temperature models are equipped with a 5-inch fill strainer.

TSC210–TSC260 models and all extended temperature models include a 2.5-inch high-temperature-grade fill strainer.

Standard Temperature Units

Extended Temperature Units

Figure 51. Fluid Strainer

Initial Filling Requirements

Ensure the reservoir drain plug inside of the chiller is closed, and that all plumbing connections are secure.

WARNING: Before using any fluid refer to the manufacturer's SDS for handling precautions and PPE requirements.

Locate and remove the reservoir cap by pulling the set pin red highlighted in below image (for extended temp units) and unscrewing it counterclockwise.

Figure 52. Cap with Set Pin Location

To prevent the introduction of particulates into the system, fill the chiller with the reservoir strainer in place.

Standard Temperature Units

Extended Temperature Units

Figure 53. Reservoir Cap

Slowly fill the reservoir with clean process fluid using a funnel, failure to comply may result in internal spillage.

Note: Fill the reservoir until fluid is visible in the tank strainer, or to the **MAX LEVEL** if a sight glass is incorporated.

Note: To ensure proper operation, maintain the fluid level above the minimum required level. If not, low level alarm will be triggered and unit will shut down. The low-level alarm clears when the fluid is above the minimum level.

Since the reservoir capacity may be small compared to your application and air may need to be purged from the lines, have extra cooling fluid on hand to keep the system topped off when external circulation is started.

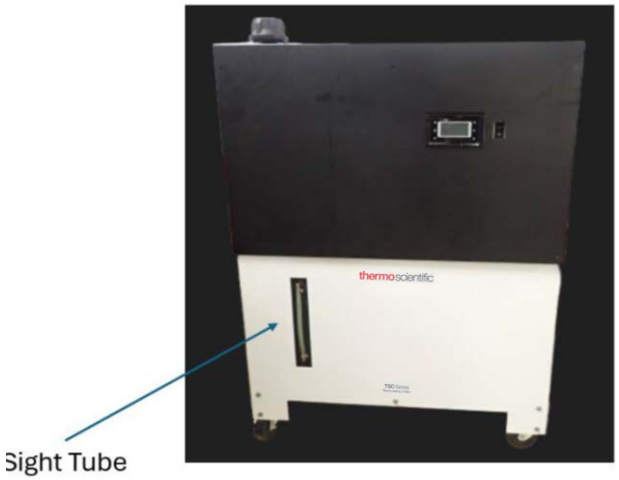


Figure 54. Reservoir Sight Tube (TSC210-TSC260)

Replace the reservoir cap by screwing it clockwise. Cap should be hand tight.

Fluid Top Off

Ensure the reservoir cap is at a safe handling temperature before removing.

Remove the reservoir cap by pulling the set pin (if available) and unscrewing it counterclockwise. Refer to **Figure 52**.

To prevent the introduction of particulates into the system, fill the chiller with the reservoir strainer in place.

Slowly fill the reservoir with clean process fluid using a funnel, failure to comply may result in internal spillage.

Note: Adding fluid that has a temperature differential with the fluid already in the reservoir will temporarily affect the chiller's stability performance.

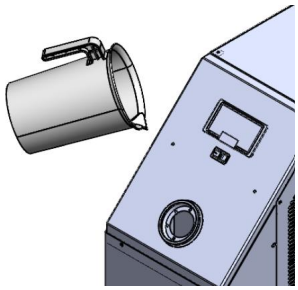
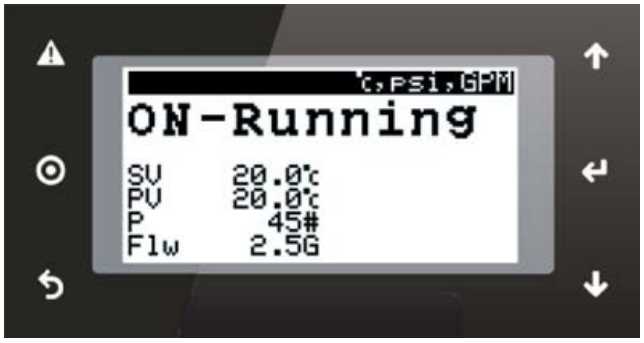


Figure 55. Fluid Top Off

Operation

The controller changes temperature using a Proportional Integral Derivative (PID) algorithm and is designed with easy-to-use operator interface.



Note: Once power is applied, the screen display will turn on and show status of chiller.

Press the ON/OFF Switch to start and stop the chiller.

Press this button to navigate through the controller displays and to increase adjustable values.

Press this button to navigate through the displays and to decrease adjustable values.

Press button to navigate through the lines displays. Pressing again saves changes made to that line and allows you to continue to the other lines.

Press this button to make changes to the controller settings.

Press this button to abort any changes and at the same time return the controller to its previous display. Aborting a change can only be made before the change is saved.

Alarm Button: Press alarm button to navigate to active alarm.

Start-up

Before starting the chiller, double check all electrical and plumbing connections. Have extra recirculating fluid on hand. If the chiller will not start refer to **Troubleshooting**.

Do not run the chiller until fluid is added.

CAUTION: Ensure the chiller's casters are locked.

Press the ON/OFF switch on the chiller, the pump and the refrigeration system will automatically start.

If the fluid level is not above the required minimum value, the controller will display a low level alarm. See **Initial Filling Requirements**. If the fluid is above the required level, the pump will start immediately and the compressor will start with a delay. After start up, check the plumbing connections for leaks.

Process Fluid Temperature and Status Display

The Unit status is displayed on the main line. Available status will include:

- OFF-Switch: Unit Off by the local ON/OFF Switch.
- OFF-Remote: Unit Off by the remote interlock.
- OFF-Alarm: Unit Off by an Alarm.
- ON-Startup: Unit On, but in its startup sequence (heating/cooling to starting setpoint).
- ON-Running: Unit On and controlling to setpoint.

The Black Bar indicates current unit of measure for temperature, pressure, and flows.

The process indicators are:

- SV/SVr: Unit Set Value or Remote Set Value.
- PV/PVr: Current Process Valve or Remote Process Value.
- P: Pump Discharge Pressure.
- Flw: Customer/External Flow readout (if included).

Note: Controller utilizes a backlight when being interacted with. Backlight turns off when inactive for 5 minutes. Backlight will illuminate again once a button is pressed.

Menu Display

The controller uses menus to view/change the controller's settings.

1. Press the program button to enter the user menu.
2. The controller brings up the User Menu Display.
3. Press the up and down arrow keys cycle through the menu selections.
4. Press the enter button to enter a sub-menu.
5. Press the escape key to return to previous menu.

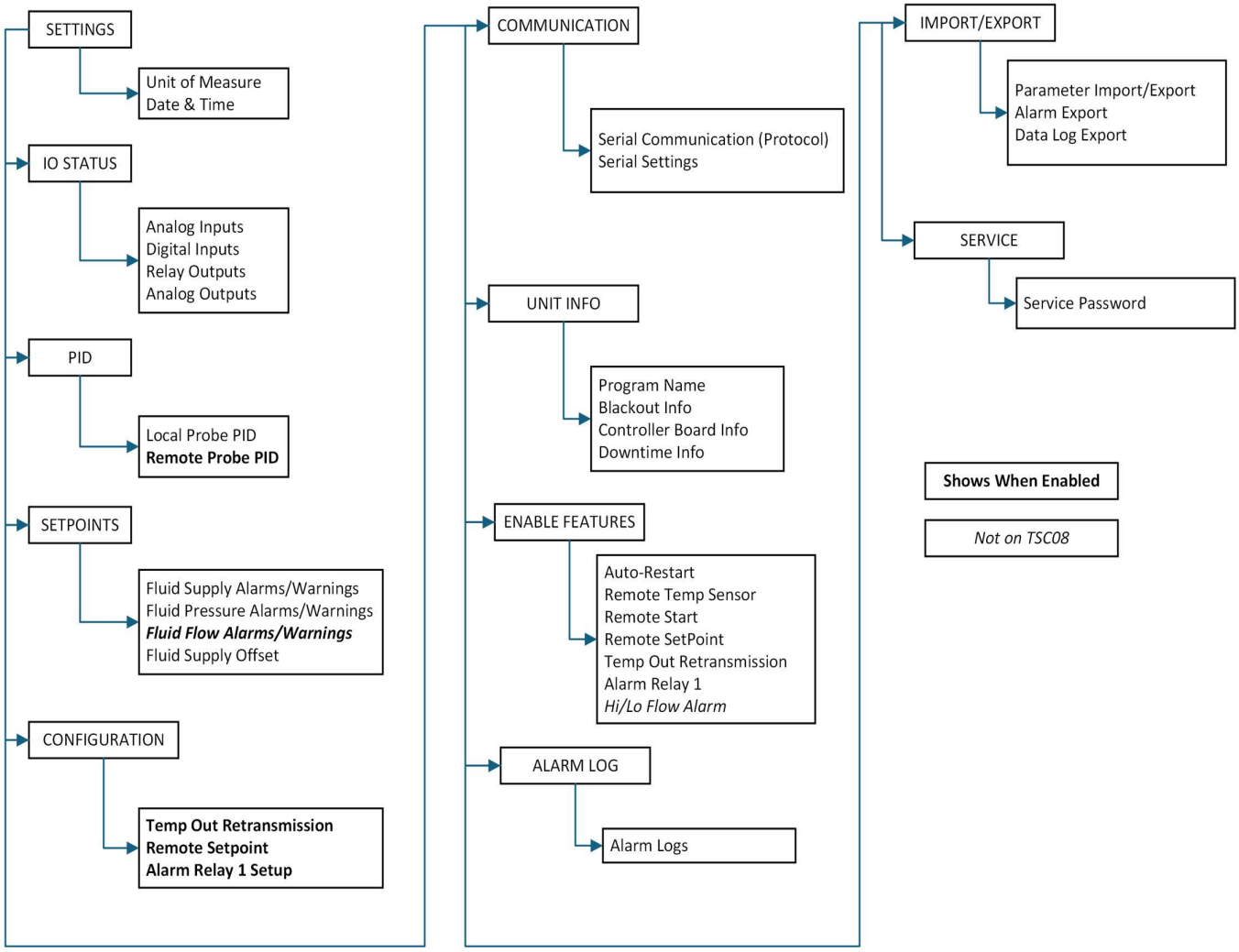
Main Menu Tree

Note: The controller can only Display 3 lines at a time. Press the up and down arrows to scroll through and highlight each line.

Menu	
1	Settings
2	IO Status
3	PID
4	Setpoints
5	Configuration
6	Communication
7	Unit Info
8	Enable Features
9	Alarm log
10	Import/Export
11	Service

Menu	Menu Options
Settings	Unit of Measure. Date/Time.
IO Status	Internal PLC Input and Output Values.
PID	Local and Remote PID values.
Setpoints	Fluid Temperature Setpoints. Fluid Pressure Setpoints. Flow Setpoints. Calibration Offset.
Configuration	Analog and Digital Communications.
Communication	Serial Communication Setup, Enable/Disable.
Unit Info	Program and Controller Information.
Enable Features	Enable/Disable Optional Features.
Alarm log	Display Alarm Log History.
Import/Export	Import/Export System Parameter, Alarm Logs, and Data logs.
Service	Service Menus used only by qualified technicians.

USER MENU TREE



User Menu

To navigate through the user menu, press the program button to enter the user menu. Once in the user menu, press the up or down arrow keys to select a sub-menu.

Once a sub-menu is highlighted, press the enter key to access that screen.

The blinking cursor will appear in the top left corner. When the cursor is in this position, the up or down arrows can be pressed to select the available screens on that sub-menu.

To return to a previous menu or the home screen, press the escape button .

Note: If a menu is left untouched for 5 minutes, the controller will revert to the main display screen. Any changes not saved, will be lost.

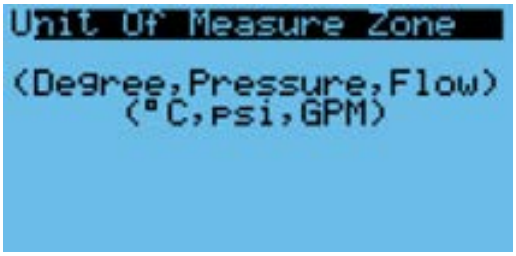
Settings

Settings allows you to view/change settings.

Note: The controller only displays (3) lines at a time. Press the up and down arrows to scroll through and highlight each line.

If a change to a setting is needed, highlight the desired line and then press the enter button. Each line has its own sub-menu. The sub-menus, shown on the following screens, allow you to view/change the applicable settings.

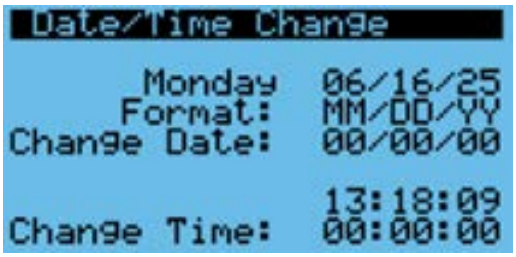
1. **Unit of Measure** Zone allows you to change the units of the displayed unit of measures from the following options:
   - °C, psi, GPM
   - °F, psi, GPM
   - °C, bar, LPM
- To change value, press Enter to move the blinking cursor to the selection line, press Up or Down to select units, then press enter to save the value.



2. **Date/Time** Change allows you to change the date and time on the controller.

- To change the value, press Enter to move the blinking cursor to the selection line. Press Up or Down to select the value, then press enter to save the value. Press Escape to go back to previous menu. Selectable sections include:
  - Format Type (MM/DD/YY, DD/MM/YY…)
  - Month, Day, and Year
  - Hour, Minute, and Second

Note: Time is based on a 24hour clock.

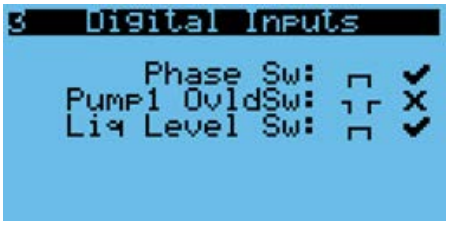


IO Status

IO Status allows you to view the direct input value to the controller.

This provides current status and values (of components) to assist in troubleshooting the unit. These values are not be used for normal operation.

Note: Only Enabled Features are Displayed.



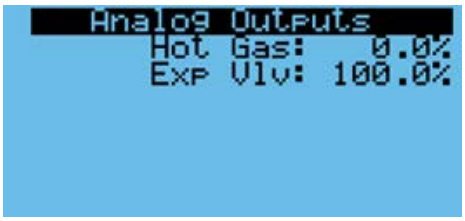


Table 14. Internal controller Inputs/ Outputs

Analog Inputs	Fluid Supply Temp
	Fluid Heat Exchanger Outlet Temp
	Fluid Return Temp
	Fluid Pressure
	Fluid Flow Rate
	Fluid Remote Temperature
	Compressor Suction Temp
	Compressor Suction Pressure
	Compressor Discharge Pressure
	Refrigerant Liquid Temperature
Digital Inputs	Liquid Level Switch
	Pump Overload Switch
	Phase Monitor Switch
Relay Outputs	Pump Contactor
	Compressor Contactor
	Fan Relay #1
	Fan Relay #2
	Frequency Relay
	Alarm Relay
Analog Outputs	Hot Gas Output
	Expansion Valve Output
	Heater SSR Output

Note: Fluid return temp and flow rates are readable on the units with flow readouts.

PID

The controller controls temperature using a Proportional-Integral-Derivative (PID) algorithm.

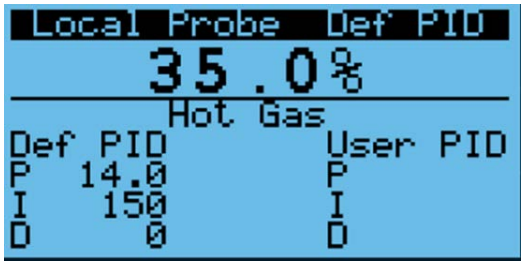
PID Menu allows you to view the default PID values (Def PID) and view/adjust customer adjustable values (User PID).

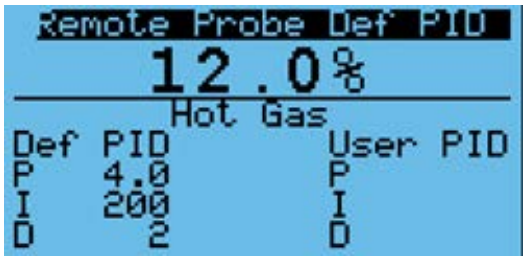
If your chiller experience temperature control issues due to any change in user PID values, it is recommended to use default PID and seek Thermo Fisher Scientific customer support.

Note: It is recommended that only a qualified technician adjust the user adjustable PID values (User PID). Changes from default values will affect chiller performance. Contact Thermo Fisher Scientific sales representative for support.

Unit will utilize the default PID values (Def PID) unless the User PID setting is enabled in PID menu.

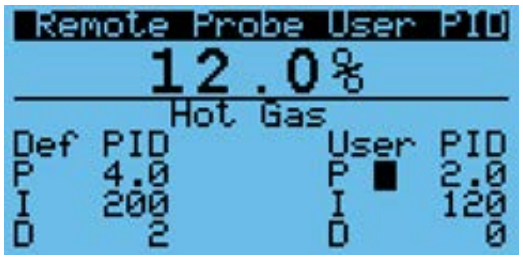
When the remote sensor is disabled, the unit controls work with unit's internal control sensor input. When the remote sensor is enabled, the unit controls work with remote control sensor input.





If User Defined PID is required, press the Enter button to move the blinking cursor highlights the right side of the black bar (Def PID/User PID). Press Up or Down arrow to select Default or User defined PID. Press enter to save the selection.

Once the User Defined PIDs are enabled, press enter to move the blinking cursor to each PID line, press up or down arrow to select value, and press enter to save the value. Press Escape button to go back to previous menu.



- P: Proportional Value - Range: 0.0-999.9
- I: Integral Value - Range: 0-999
- D: Derivative Value - Range: 0-99

Note: Default PID values are always displayed for reference.

Setpoints

Setpoints menu allows you to view and adjust default and customer adjustable set points for alarms, warnings, and their time delays.

Setpoints supply Temperature can be used to view/ change the controller's setpoint temperature.

The Warning feature will display a warning message, but allow the chiller to continue to run. The Alarm feature will display an alarm message and shut down the chiller.

Once a fault condition exists, the warning or alarm feature is delayed per the specified time delay.

The unit ships with default values. To change the values, press the enter button to move the blinking cursor to the desired line, press the up or down arrow to change the value, and press the enter button to save the value.

Setpoint Alarm/Warning Range:

- +2°C to +45°C for standard temperature chillers.
- -8°C to +95°C for extended temperature chillers.
- 0-180s range for time delays.

Note: In the extended temperature range TSC90-260 models, when the return temperature of process fluid exceeds 98°C due to higher heat loads and less flow rate (TSC90 < 6gpm, TSC210 < 10gpm & TSC260 < 13.5gpm), the setpoint will automatically change to 80°C to ensure safe operation of the unit. When the setpoint is lowered to 80°C, a **"Near Boiling SV Lowered Warning"** appears on the screen and the unit will continue to run. The controller will not allow the setpoint to be changed back to 90°C when the warning is present. The Warning can be cleared when the parameters are within limits to change the setpoint back to 90°C. Refer to the **Alarms and Warnings** section for more details. For achieving 90°C setpoint with higher heat loads, alternate pumps with higher flow rates should be used.

Setpoints fluid Pressure can be used to view/change the controller's setpoint pressures.

The Warning feature will display a warning message, but allow the chiller to continue to run. The Alarm feature will display an alarm message and shut down the chiller.

Once a fault condition exists, the warning or alarm feature is delayed per the specified time delay.

The unit ships with default values. To change the values, press the enter button to move the blinking cursor to the desired line, press the up or down arrow to change the value, and press the enter button to save the value.

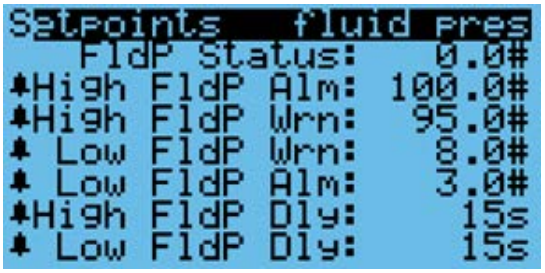


Table 15. Default Values

Pump	Fault Range	High Default	Low Default
T1&T2	3 to 100 psi	100 psi	3 psi
T3	5 to 100 psi	100 psi	5 psi
C1	20 to 72 psi	72 psi	20 psi
C2	35 to 100 psi	100 psi	35 psi
C3	40 to 79 psi	79 psi	40 psi

Note: 0-180s range for time delays.

Setpoints fluid Flow can be used to view/change the controller's setpoint flow rates.

The Warning feature will display a warning message, but allow the chiller to continue to run. The Alarm feature will display an alarm message and shut down the chiller.

Once a fault condition exists, the warning or alarm feature is delayed per the specified time delay.

The unit ships with default values. To change the values, press the enter button to move the blinking cursor to the desired line, press the up or down arrow to change the value, and press the enter button to save the value. Press Escape button to go back to previous menu.

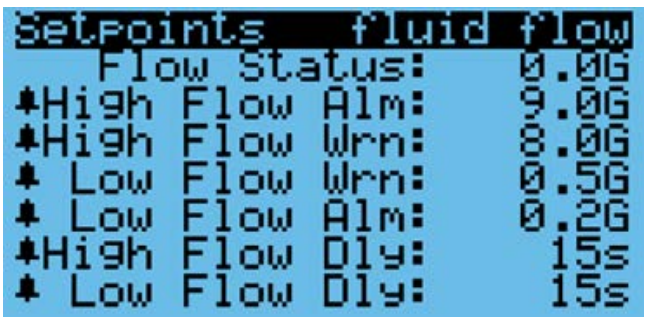


Table 16. Default Values

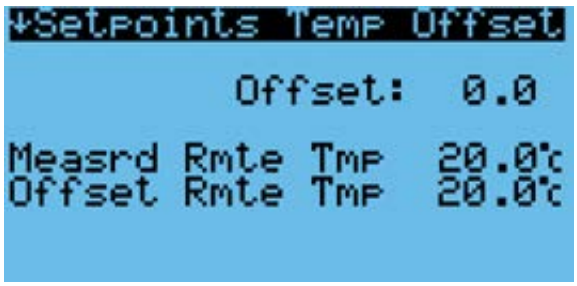
Pump	Fault Range	High Default	Low Default
T1	0.2 to 6.0 gpm	5.3 gpm	0.2 gpm
T2	0.2 to 10.0 gpm	9.0 gpm	0.2 gpm
T3	0.5 to 35.0 gpm	34.0 gpm	0.5 gpm
C1	0.2 to 12.0 gpm	10.0 gpm	0.2 gpm
C2	0.5 to 14.0 gpm	12.0 gpm	0.5 gpm
C3	0.5 to 32.0 gpm	30.0 gpm	0.5 gpm

Note: 0-180s range for time delays.

Setpoints Temp Offset can be used to modify/calibrate the controller's process temperature.

This is considered a single point calibration, which allows the user to offset the fluid supply temperature to match an external reference temperature. If the remote sensor is enabled, the screen will display a remote temperature and remote offset temperature used to control the process temperature in that mode.

If a Supply Temperature Offset is required, press the Enter button until the blinking cursor highlights the Offset temperature value. Press Up or Down arrow to select the offset value required to match the offset temperature to the reference thermometer. Press enter to save the selection.



Configuration

Configuration menu allows you to view and adjust the features that have been enabled from the Enable Features screen.

Note: If any of the following feature is not displayed, go to the **Enable Features** screen to enable that feature.

Temp Out Config is menu allows you to customize the scaling of the process supply temperature Analog output signal. Retransmission sends a 0-10V scale that retransmits the process supply temperature. The signal range can be adjusted to meet the desired output requirements, if this differs from the default values.

To change the temperature retransmission range, press the Enter button until the blinking cursor highlights the 0.0V Range or 10.0V Range value. Press Up or Down arrow to select the retransmission temperature desired. Press enter to save the selection.

The resultant voltage output is displayed on the Voltage Val line for reference. Adjusting the signal range can also be used to calibrate the outgoing signal if required.

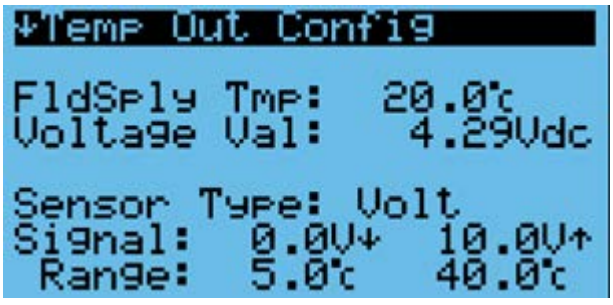
Analog Output Resolution: 8-bit, providing 256 discrete steps (0–255).

Example-1:

Full Range (-20°C to +120°C)
Temperature Span: 140°C
Temperature Resolution: ~0.55°C per step
Voltage Resolution: ~0.03906V per step

Example-2:

Narrow Range (10°C to 35.6°C)
Temperature Span: 25.6°C
Temperature Resolution: ~0.1°C per step
Voltage Resolution: ~0.03906V per step



Signal Temperature Range: -20°C to +120°C

Remote SetPt Config allows the user to customize the scaling of the Analog input to meet the application needs.

The TCS supports (2) standard analog interface types and defaults to the following scaling:

- Voltage: 0v – 10v is the operating range of the chiller.

- Current: 4mA – 20mA is the operating range of the chiller.

The following values reflect the standard scaling and are the factory defaults:

Voltage (0v – 10v is the operating range of the chiller).

- High volts 10.0v
- Low volts 0.0v
- High temp 40.0°C (standard temp chillers), 90.0°C (extended temp chillers)
- Low temp 5.0°C (standard temp chillers), -5.0°C (extended temp chillers)

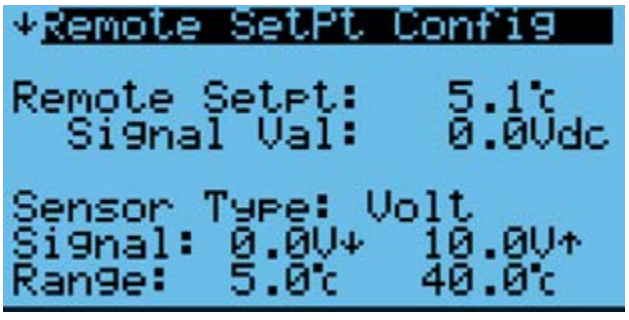
These scales allow a remote set point control of the process supply temperature. The signal range and type can be adjusted to meet the desired input requirements.

To change the remote setpoint input type, press the Enter button until the blinking cursor highlights the Sensor Type value. Press Up or Down arrow to select one of the following input setpoint signal types, and press enter to save the selection.

- 0-10VDC
- 4-20mA

To change the temperature input signal range, press the Enter button until the blinking cursor highlights the minimum range value (0.0V or 4.0mA) or the maximum range value (10.0V/20.0mA). Press the Up or Down arrow to select the minimum or maximum value and press enter to save the selection

The signal input and resultant Remote Set Point value is displayed on the Remote Setpt and Signal Val lines for reference.



Remote Setpoint Ranges:

- +5°C to +40°C for standard temperature.
- -5°C to +90°C for extended temperature chillers.

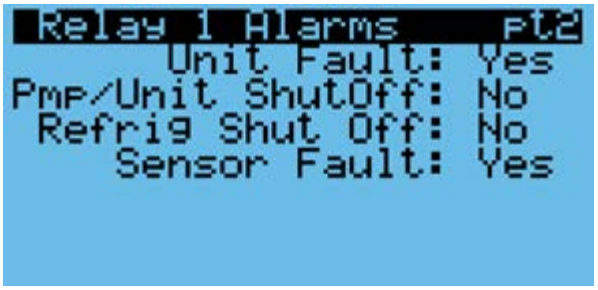
Relay 1 Alarms is a configurable digital output for the output alarm interlock. It is a potential free, configurable alarm relay with both Normally Open and Normally Closed outputs available.

Refer to **Appendix B- Analog I/O and Remote Sensor** for pinout information.

When enabled, the user can select what actions trigger the alarm relay. Default settings trigger the alarm relay on any Unit Fault or Sensor Fault occurrence.

If a different alarm condition is desired, press the enter button until the blinking cursor blinks on the desired line to adjust. Press the up or down arrow to enable or disable a desired feature, the press enter to save the selection.

Note: If the Unit Fault configuration is selected, it enables all of the faults shown on PT1. If a particular fault is not desired, disable the Unit Fault feature and select the desired fault relay triggers:



Communication

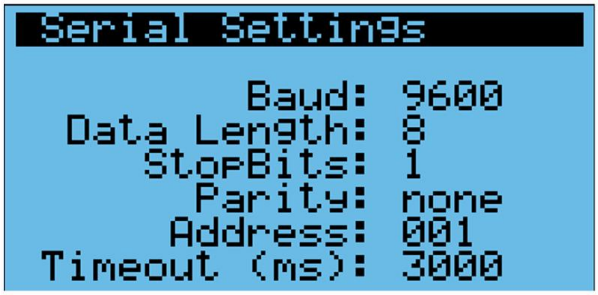
Serial Communication screen allows the user to enable and select from the available serial communication outputs. Available serial communication outputs are:

- AC Protocol
- NC Protocol
- Modbus

To select the protocol, press enter to move the blinking cursor to the protocol line, press the up or down arrow to select the communication type, and press enter again to save the selection. Once the selection is saved, it is immediately activated. Default setting is None.

Note: To activate Modbus after saving the selection, power cycle (restart) the chiller.

Once a Protocol has been selected, the blinking cursor will return to the top band of the screen. From there, press down arrow to go to the serial settings screen.



- Serial type: RS485
- Baud Range: 9600, 4800, 2400, 1200, 38400, 19200
- Stop Bits: 1 or 2
- Parity: Even, Odd or None
- Address: 1 to 99
- Timeout (ms): 1 to 9999 (default 3000ms)

Press enter to move the blinking cursor to each line to adjust the settings as required on each line to match your communication requirements. Press the up or down arrow to change the setting and press the enter button again to save the change. Press the Escape button to return to the previous menu.

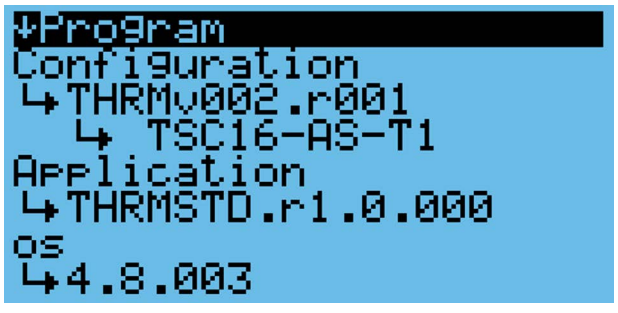
For RS232 Communication, connect an in-line RS485-RS232 converter on the DB9 connector in the rear of the unit. When using the RS485-RS232 converter, ensure the Address is set to 1 for proper communication functionality.

Note: Contact a Thermo Fisher Scientific sales representative to purchase accessories.

Unit Info

Unit Info screen allows the user to view the existing program information, view power outage and downtime information.

The **Program screen** displays the existing program information and operating system on the first sub-screen:



The **Blackout info** screen displays the system power outage information. This includes:

- Current date and time
- Total working hours
- Last power outage time and duration
- Total days, hours and minutes when power is not connected to the units.

The **DownTime** screen displays information on alarm state time including:

- Last alarm.
- Total alarms (since last cleared).
- Total downtime from alarm events (since last cleared).

Enable Features

Enable Features screen allows the user to enable and disable any of the optional features available on an existing system. The available selectable features include:

- Auto-Restart: Auto-Restart Feature on power outage.
- Rem Temp Sensor: Remote Temperature Sensor.
- Remote Start: Remote Digital On/Off Signal.
- Remote SetPt: Remote Analog Fluid Supply Set Point.
- Temp Out: Temperature Retransmission Signal.
- Relay 1: Alarm output Relay.
- Hi/Lo Flow Alm: High/Low flow alarm.

Auto Restart is used to turn the auto restart feature on/off. The factory default setting is On (Yes).

CAUTION: When the auto restart is enabled and the chiller shuts down as a result of a power failure, when power is restored the chiller will automatically restart and operate at the saved values. Consider any possible risks when enabling this mode of operation.

Remote Temp Sensor enables the remote temperature probe. Once this is enabled, the chiller will regulate temperature based off of the remote (external) temperature probe connected to the DB9 type connector labeled as "Remote Sensor" located at the rear of the unit.

When this feature is enabled, the main screen will change from PV (process value) to PVr (remote process value) to indicate the chiller is being operated off of a remote sensor.

Remote Start enables the remote (external) digital On/Off signal connected through the DB15 type connector labeled as "Analog I/O" located at the rear of the unit.

When this feature is enabled, the main screen will show OFF – REMOTE as its status to indicated the chiller is disabled from the remote signal. To turn the chiller on from the remote start feature, both the physical ON switch and Remote Signal must be enabled ON for the chiller to start.

Remote SetPt enables the Remote (External) Analog Fluid Supply Set Point. Once this is enabled, the chiller will regulate the chiller fluid set point temperature based off of the remote (external) signal connected to the DB15 type connector labeled as "Analog I/O" located at the rear of the unit.

When this feature is enabled, the main screen will change from SV (set value) to SVr (remote set value) to indicate the chiller is being operated off of a remote temperature set point control.

Temp Out enables the temperature retransmission signal. Once this is enabled, the chiller will begin transmitting a 0-10V temperature signal in the DB15 type connector labeled as "Analog I/O" located at the rear of the unit. The temperature set point is based off of the temperature parameters set up in the Configuration -> Relay 1 Alarms screen. Refer to **Configuration** menu for more details.

Relay 1 enables the Alarm output Relay signal in the DB15 type connector labeled as "Analog I/O" located at the rear of the unit. Once this is enabled, the alarm output relay signals (both NO & NC) will be available to the user based on the configuration setup which is explained in the Configuration -> Relay 1 Alarms screen. Refer to **Configuration** menu for more details.

Hi/Lo Flow Alm enables the High and Low flow alarm logic in the chiller. Once this is enabled, the chiller will fault in accordance with the setup in the Setpoint -> Setpoints fluid flow screen. Refer to **Setpoints** menu for more details.

Alarm Log

Alarm/Event screen allows the user visibility of the chiller alarm history.

This screen includes alarm event information including:

1. **Log#:** The order of the alarm in the log since the last reset, with 1 being the most recent.
2. **Description:** This indicates a brief description of what alarm/warning event occurred.
3. **Start/Stop/Time:** The controller logs both the time the alarm/ warning first occurred (start) and when the alarm/ warning was cleared (stop). This indicates if it was a start or stop alarm event.
4. **Code:** This is the fault lookup code for the event type that occurred.

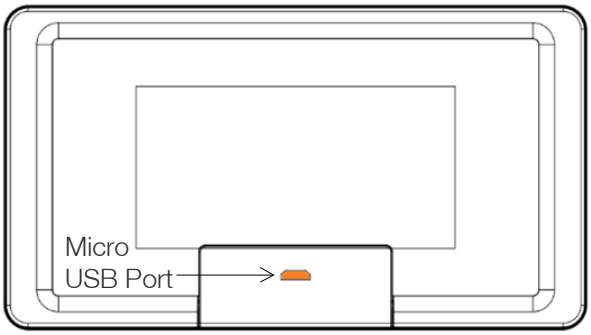
Alarm history can be cleared only by Thermo Fisher Scientific service representative.

Import/Export

Import/Export screen allows the user to import or export saved parameters, export alarm logs, and export data logs to a USB device.

The micro-USB port is located under the front flap of the controller display. To access the port, flip down the plastic door located at the bottom front center of the controller.

Remove the rubber dust cover, and insert a micro-USB memory storage device:



Params Import/Export: This screen allows the user to export or import any customized settings from one chiller to another. This may be useful if there are multiple chillers of the same type located near each other with multiple customized settings.

To export settings from a chiller, utilize the following steps:

1. Plug in the USB storage device, then navigate down to the Import/Export screen.
2. Navigate down to the Import/Export row, select Export, then press enter.
3. Navigate down to the File Name row and select the EXPORT_## number to name the file, then press enter.
4. Navigate to the Confirm row, toggle the selection up to yes, and press the enter button. The file will now be saved on the USB device by the selected File Name.

To Import a settings file to another chiller, follow the steps below:

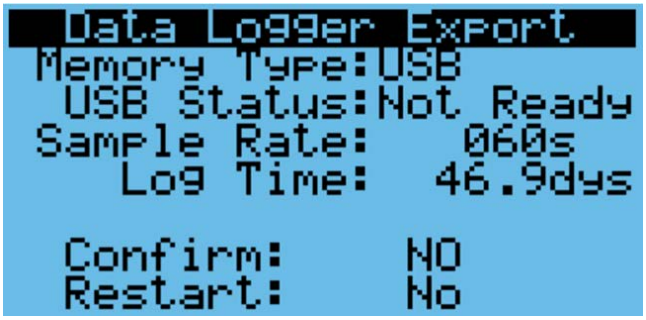
1. Plug in the USB storage device, then navigate down to the Import/Export row, select Import, then press enter.
2. Navigate down to the File Name row and select the EXPORT_## number to match the name of the file that was previously Exported, then press enter.
3. Navigate to the Confirm row, toggle the selection up to yes, and press the enter button. The controller will now load the file saved on the USB device by the selected File Name.

Alarm Export: This screen allows the user to export the alarm history from the chiller.

To export the alarm log from the chiller, utilize the following steps:

1. Plug in the USB storage device, then navigate down to the Alarm Export screen.
2. Navigate down to the File Name row and select the AL_EXPORT_## number to name the file, then press enter.
3. Navigate to the Confirm row, toggle the selection up to yes, and press the enter button. The file will now be saved on the USB device by the selected File Name.

Data Logger Export: This screen allows the user to export the data log from the chiller. The data logger will always be running in the background. The sample rate can be set on this page, along with an indicator of how long the resultant data log will be.



Sample Rate Range: 1 – 999s

To export the data log from the chiller, utilize the following steps:

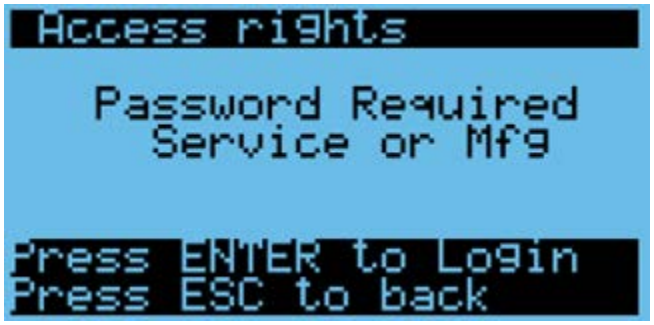
1. Plug in the USB storage device, then navigate down to the Data Logger Export screen.
2. Navigate to the Confirm row, toggle the selection up to yes, and press the enter button. The file will now be saved on the USB device

If the Data Logger needs restarting or a reset, the Restart line can be used to clear the existing logs and begin logging again.

Service

Service screen allows the login to the Service or Manufacturer screens.

These screens will only be accessed by a trained Thermo Fisher Scientific technician.



Options/Accessories

T1, T2, T3 Pump Pressure Relief Valve Adjustment

The pressure relief valve is located just inside the right side panel of the unit. It is located on the top of the pump, is used to set the desired system back pressure to your application. The valve is factory preset to 60 ± 5 psi (4 ± 0.4 bar).

If the chiller is not plumbed to an application, set the pressure by installing a loop of hose equipped with a shut-off valve between the supply and return fittings. Start the chiller and allow it to prime, then close the valve.

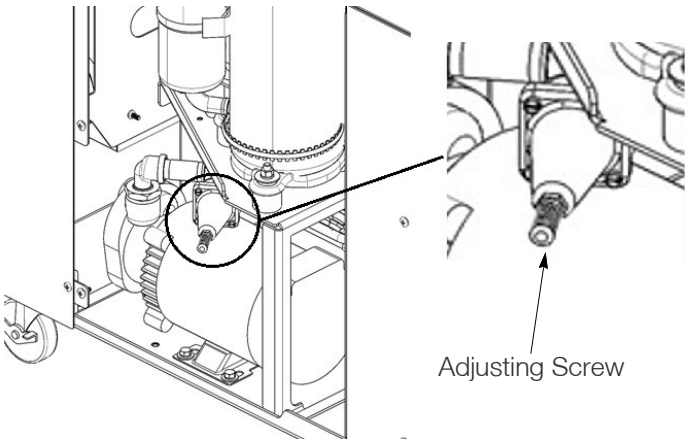


Figure 56. Nut and Screw

Use controller display to verify that the pressure is 60 ± 5 psi.

Remove the bypass valve cap and unscrew the locking nut, then use a screwdriver to turn the adjusting screw (counterclockwise to reduce pressure) until the controller displays the desired setting. Once the desired setting is reached, tighten the locking nut to prevent slight shifts in the pressure setting over time. Ensure to fit the bypass valve cap back in its place once pressure adjustments done.

If the chiller is plumbed to an application, ensure the chiller is off. Then back out the adjusting screw counterclockwise to reduce pressure. Turn the chiller on after ensuring minimum back pressure is available to avoid chiller shut down due to low back pressure. Turn the adjusting screw until the controller displays the desired setting. Once the desired setting is reached, tighten the locking nut to prevent slight shifts in the pressure setting over time.

CAUTION: Do not exceed 100 psi (6.9 bar).

Flow Readout

Note: Flow readouts are available only in the TSC16-TSC260 models.

Flow rates can be read through controller display. It is displayed in the Status Display screen. Refer the Operation section for details.

Flow Control

Flow control for C1, C2, and C3 pumps is achieved using a 2-way valve plumbed in the standard process outlet of the chiller. The flow control valve is used to adjust the flow rate. The valve's handle is designed to identify the valve's position, from full flow to full bypass.

When the handle is parallel with the process Outlet (inline), the application is receiving full flow. With the handle perpendicular to the process outlet the valve is in full bypass.

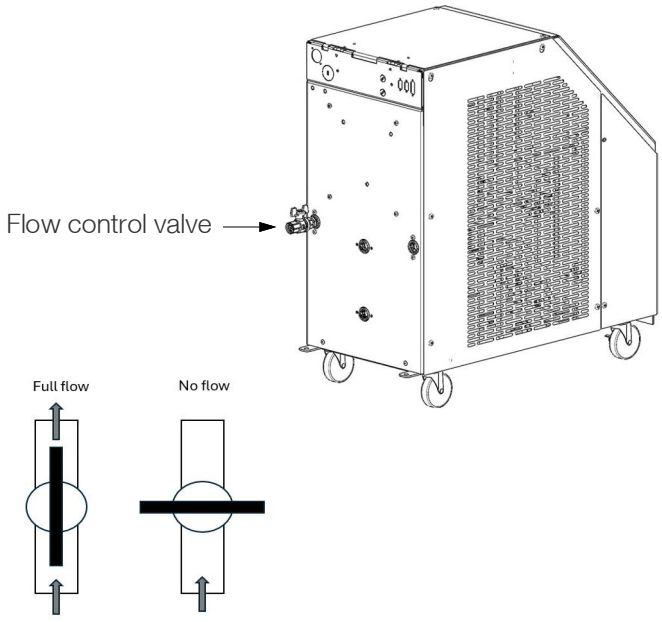


Figure 57. Flow Control

TSC08-TSC90 with C1 or C2 pumps use a 2-way valve located on the rear of the chiller with ½" connections.

TSC210-TSC260 with C1, C2, or C3 pumps use a 2-way valve located on the rear of the chiller with 1" connections.

Use the controller's Status Display to view the flow rate. Turn the valve handle until the desired rate is displayed.

Note: The valve is sensitive to slight adjustments.

Other Accessories

- Installation kit - includes a set of hoses, adaptor fittings and Teflon® tape
- Fluids
- Fluid treatment kit

Please contact Thermo Fisher Scientific's sales representative to assist you with questions that you may have regarding accessories for your TSC Series Chillers, see the manual last page for contact information.

Preventive Maintenance

Note:

- Only Thermo Fisher Scientific should provide any required replacement parts.
- All preventive maintenance measures should be taken at a minimum of every 6 months until a site specific cadence is established.

Tank Fluid Strainer

The reservoir has a fluid strainer at the tank inlet designed to prevent the introduction of particulates into the system.

TSC08-TSC90: For extended and standard temperature range the fluid fill strainer is available just below the fill tank cap. Refer to **Figure 58**.

TSC210-TSC260: On standard and extended-temperature range, the wye strainer is located in line with the fill tube. Refer to **Figure 59**. Fluid tank can be accessed by removing side panel for maintenance and service purposes. Reservoir can be filled through fill port on the top without removing the side panel.

Note:

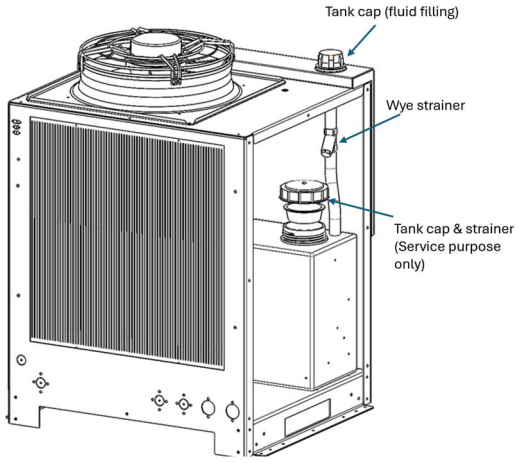
- Fluid strainer should not to be removed, while the chiller is in operation.
- Never operate the chiller with panels removed. In the case of TSC210-TSC260 series, the unit will not function properly without the panels.

WARNING: Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's SDS for handling precautions and PPE requirements.
For extended-temperature chillers, ensure the fluid is at a safe temperature (5°C to 40°C) before handling.

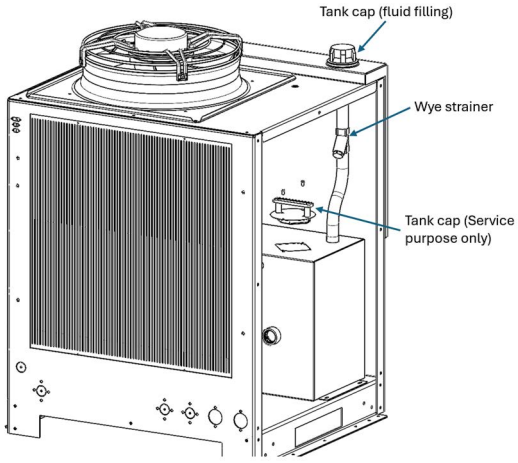
Standard temperature units (TSC08 - TSC90)

Extended temperature units (TSC16 - TSC90)

Figure 58. TSC08-90 Fluid Fill Strainer



Standard temperature units (TSC210 - TSC260)



Extended temperature units (TSC210 - TSC260)

Figure 59. TSC210-260 Fluid Fill Strainer

Fluid Diffuser

Note: Fluid Diffuser is available only for TSC08-TSC90 standard temp models.

On Chiller, when you remove the tank strainer you will notice a plastic mesh fluid diffuser at the bottom of the reservoir return line. The diffuser is used to help streamline the flow into the reservoir. Periodically inspect the diffuser for debris/damage.

To remove the diffuser, follow below steps:

1. First, remove the tank cap.
2. Locate the diffuser inside the tank.
3. Unscrew the diffuser to remove it.

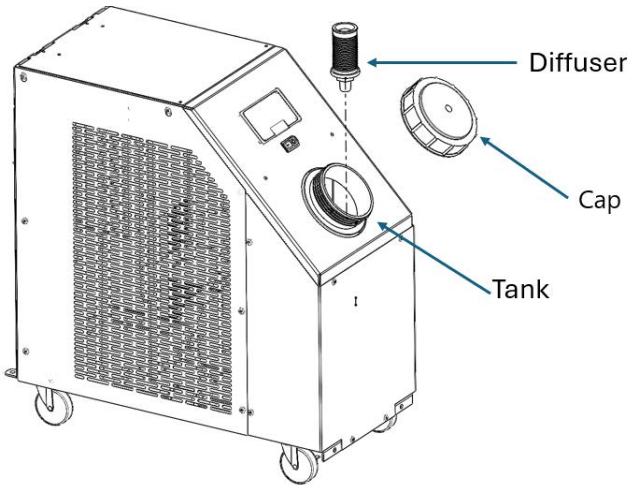


Figure 60. Cleaning the reservoir and diffuser

WARNING: The fluid velocity into the reservoir will rapidly increase with the diffuser removed and cause fluid foaming which may impact system performance. Turn the chiller off before removing the diffuser. This is especially critical when using ethylene or propylene glycol.

Note: Do not operate the chiller unless the diffuser is installed.

Fluid Wye Strainer

On extended-temperature range TSC16 - TSC90 models, the units include a fluid strainer externally mounted on the return fluid line, refer to **Figure 61**. This is used to strain any fluid returning from the process application. Periodically open and clean the strainer for debris/damage. This can be done by unscrewing the cap located on the bottom of the wye strainer. Remove and clean the mesh strainer located inside the strainer assembly.

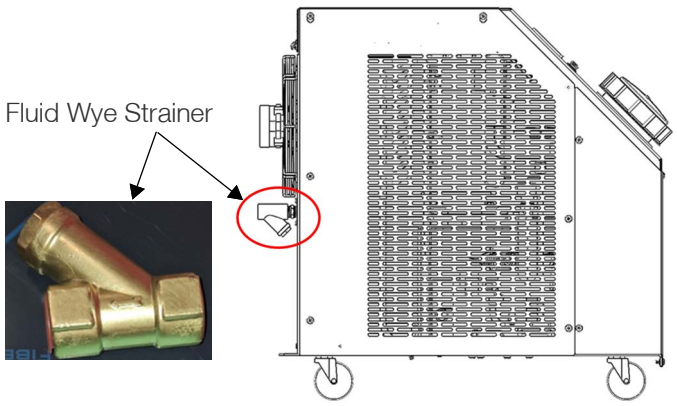


Figure 61. TSC16-90 Extended Temp Wye strainer

On standard and extended-temperature range TSC210-TSC260 models, the wye strainer is located in line with the fill tube, refer to **Figure 59**. In order to access and clean the strainer, remove the side panel and gain access to the strainer.

Note: Once the wye strainer assembly is put back together, ensure the cap is properly tightened. In TSC16-TSC90 models check for leaks once the system is running and pressurized. In TSC210-260 check leaks while filling and carefully replace the side panel.

Fluid maintenance and Reservoir cleaning

WARNING: Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's SDS for handling precautions and PPE requirements. For extended-temperature chillers, ensure the fluid is at a safe temperature (5°C to 40°C) before handling.

The user is responsible for maintaining reservoir fluid quality. Check the fluid on a regular interval. Start with frequent checks until a regular interval (based on your application) is established. An effective recommended maintenance plan would include changing the fluid every six months to optimize chiller reliability. The fluid should be free of particles and biological growth. If there is substantial debris and biological growth, consider flushing the system.

If cleaning is necessary, flush the reservoir with an approved process fluid. Refer to process Fluid Requirements for details.

WARNING: Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's SDS for handling precautions and PPE requirements.
For extended-temperature chillers, ensure the fluid is at a safe temperature (5°C to 40°C) before handling.

Air Cooled Condenser Inspection/Cleaning

Regular inspection of the air condenser for any accumulation of any debris is required to avoid any loss of cooling.

For proper operation, the chiller needs to pull air through the condenser. A build up of dust or debris on the fins of the condenser leads to a loss of cooling capacity.

For TSC08-TSC90, to inspect the condenser, remove the side panels and visually check for buildup of debris on the condenser face.

For TSC210-TSC260, to inspect the condenser, inspect on the rear of chiller for buildup of debris on the condenser face.

If a visible amount of debris has accumulated, vacuum with a soft bristle brush. For additional questions, contact technical support.

CAUTION: The condenser framing and fins located behind the side panels are very sharp. Be cautious when cleaning.

Chiller Surface

If needed, clean the chiller's surface with a soft cloth and warm water only.

Hoses

Inspect the chiller's external hoses and clamps on a daily basis.

Testing the Alarm Features

Ensure the fluid is below the safe-handling temperature (below 40°C) before draining the chiller.

Using the setpoint section in the user interface, adjust each temperature alarm limit towards the setpoint and ensure the chiller reacts accordingly. Reset each alarm limit to the desired value. Refer to Operation.

Slowly drain the chiller's reservoir, refer to **Additional Information**, and ensure the chiller shuts down.

Troubleshooting

WARNING and ALARM Messages are a result of exceeding one of the controllers SETTINGS (see **Operation**) exceeding a sensor factory preset safety value, or a safety switch is activated.

In the case of a WARNING message the chiller, if running, will continue to run. Press the ⚠ button to see the warning. A limit may have been only temporarily exceeded. Press the DOWN button to go to the clear alarms page. Press and hold the ⚠ button to clear active alarm notifications.

Figure 62. Warning Message

In the case of an ALARM message the chiller will shut down and the controller will display the OFF-ALARM status on the home screen. Press the ⚠ button to see the ALARM. The unit will not run if the alarm condition still exists. Once the alarm condition has been met, the alarm can be cleared. Press the DOWN button to go to the clear alarms page. Press and hold the ⚠ button to clear active alarm notifications.

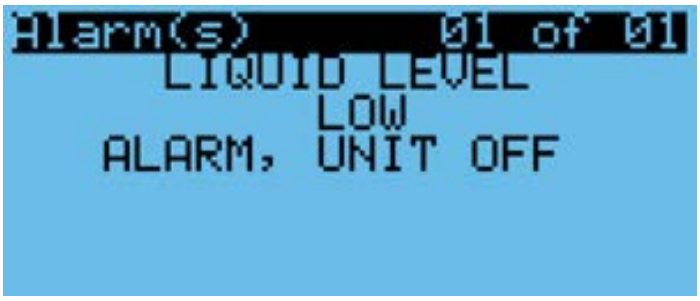


Figure 63. Alarm Message

Alarms and Warnings

Table 17. Alarms and Warnings

Message	Reaction	Cause	Action
EVD Communication Error - ALARM, UNIT OFF AL*4	Chiller will shut down	Communication error between the controller and the EVD valve driver board	Contact our Sales, Service and Customer Support.
Refrigerant Pressure High, Check Condenser - ALARM, UNIT OFF AL*5	Chiller will shut down	High Refrigeration pressure cutout activated	**Air-Cooled Chillers**: Ensure that the ambient temperature is not exceeding the recommended range, see **Installation**. Ensure chiller has adequate ventilation, see **Installation**. Visually inspect condenser for debris. Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan. Contact our Sales, Service, and Customer Support. **Water-cooled chillers**: Ensure facility water is on and connected. Check facility water flow rate and pressure. Contact our Sales, Service, and Customer Support.
Refrigerant Pressure Low-ALARM, UNIT OFF AL*6	Chiller will shut down	Low Refrigeration pressure cutout activated 3x	Contact our Sales, Service, and Customer Support.
Liquid Level Low - ALARM, UNIT OFF AL*8	Chiller will shut down. If off, will not start	Fluid level in tank too low for normal operation	Evaporation. Ensure the chiller is operating with lid securely closed/in place. Check for leaks. On Initial fill, make sure lines are filled, see **Initial Filling Requirements**.

Table 17. Alarms and Warnings (Continued)

Message	Reaction	Cause	Action
Process Fluid High Temp - ALARM, UNIT OFF AL*9	Chiller will shut down.	The process fluid temperature exceeded the adjustable high value.	Verify Controller's SETTINGS, see **Operation**.
			Ensure all environmental requirements are met, see **Installation**.
			Ensure chiller has adequate ventilation, see **Installation**.
			Visually inspect condenser for debris (for air cooled units).
			Ensure that the heat load being applied to the chiller is not too high. Contact Thermo Fisher Scientific sales representative for assistance on calculating heat loads.
			Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan.
			Verify/adjust controller PID values, see TUNING in this section.
			Contact our Sales, Service and Customer Support.
Process Fluid High Temp - WARNING AL*40	Chiller will continue to run.	The process fluid temperature exceeded the adjustable high value.	If the chiller is still running, try to clear the alarm message, the limit may have been only temporarily exceeded.
			Verify Controller's SETTINGS, see **Operation**.
			Ensure all environmental requirements are met, see **Installation**.
			Ensure chiller has adequate ventilation, see **Installation**.
			Visually inspect condenser for debris (for air cooled units).
			Ensure that the heat load being applied to the chiller is not too high. Contact Thermo Fisher Scientific sales representative for assistance on calculating heat loads.
			Bring cooler air in from another area or exhaust the hot air into another location using an auxiliary fan.
			Verify/adjust controller PID values, see TUNING in this section.
			Contact our Sales, Service and Customer Support.
Power Check See Phase Monitor – ALARM, UNIT OFF AL*7	Chiller will shut down.	Incoming Power Rotation or Fault Detected	Disconnect chiller from power source and reverse any two line conductors on the line side of the main circuit breaker.
			Contact our Sales, Service and Customer Support.

Table 17. Alarms and Warnings (Continued)

Message	Reaction	Cause	Action
Pump Overload Detected - ALARM, UNIT OFF AL*10	Chiller will shut down.	Pump motor exposed to excessive current	Allow pump to cool down. Contact our Sales, Service and Customer Support.
Pump Pressure High – ALARM, UNIT OFF AL*11	Chiller will shut down.	The pump's discharge pressure exceeded the adjustable high value	Verify controller's SETTINGS, see **Operation**. Check application valves and ensure that they have not changed or been closed. Check for debris in the application or external filters. Double check fluid lines. Excessive bends, long tubing and diameter reductions can affect the pump's discharge pressure. Refer to **Plumbing Requirements**. Contact our Sales, Service and Customer Support.
Pump Pressure High – WARNING AL*43	Chiller will continue to run.	The pump's discharge pressure exceeded the adjustable high value	If the chiller is still running, try to clear the alarm message, the limit may have been only temporarily exceeded. Verify controller's SETTINGS, see **Operation**. Check application valves and ensure that they have not changed or been closed. Check for debris in the application or external filters. Double check fluid lines. Excessive bends, long tubing and diameter reductions can affect the pump's discharge pressure. Refer to **Plumbing Requirements**. Contact our Sales, Service and Customer Support.
Pump Pressure Low - ALARM, UNIT OFF AL*12	Chiller will shut down.	Pump's discharge pressure is below adjustable low setting.	Verify controller's SETTINGS, see **Operation**. Ensure that chiller reservoir is having adequate process fluid. Chiller requires a minimum pressure drop based on pump type, see **Installation**. This may be achieved by adjusting the chiller flow control valve for centrifugal pumps and the pressure relief valve for turbine pumps. Pump may not be primed, refer to trouble shooting section. Contact our Sales, Service and Customer Support.
Pump Pressure Low - WARNING AL*44	Chiller will continue to run.	Pump's discharge pressure is below adjustable low setting.	If the chiller is still running, try to clear the alarm message, the limit may have been only temporarily exceeded. Verify controller's SETTINGS, see **Operation**. Contact our Sales, Service and Customer Support.

Table 17. Alarms and Warnings (Continued)

Message	Reaction	Cause	Action
Process Fluid Flow Low - ALARM, UNIT OFF AL*13	Chiller will shut down.	The process fluid flow rate has gone below the adjustable setting's low value	Verify controller's SETTINGS, see **Operation**.
			Adjust flow, if chiller is equipped with flow control valve, see **Options/Accessories**.
			Check all valves in your application and plumbing lines to ensure that they have not changed or closed.
			Contact our Sales, Service and Customer Support.
Process Fluid Flow Low - WARNING AL*41	Chiller will continue to run.	The process fluid flow rate has gone below the adjustable setting's low value	If the chiller is still running, try to clear the alarm message, the limit may have been only temporarily exceeded.
			Verify controller's SETTINGS, see **Operation**.
			Adjust flow, if chiller is equipped with flow control valve, see **Options/Accessories**.
			Check all valves in your application and plumbing lines to ensure that they have not changed or closed.
Process Fluid Temp Low - ALARM, UNIT OFF AL*16	Chiller will shut down.	The process fluid temperature has gone below the adjustable setting's low value	Verify controller's SETTINGS, see **Operation**.
			Ensure that the ambient temperature is not below the recommended low-range, see **Installation**.
			Add insulation to external plumbing lines to reduce the heat-gain from the environment.
			Contact our Sales, Service and Customer Support.
Process Fluid Temp Low - WARNING, COMP CYCLING AL*17	Chiller will continue to run, but compressor cycle will on/off up to 5x	The process fluid temperature has gone below the adjustable setting's low value	Verify controller's SETTINGS, see **Operation**.
			Ensure that the ambient temperature is not below the recommended low-range, see **Installation**.
			Add insulation to external plumbing lines to reduce the heat-loss to the environment.
			For water-cooled chillers, check facility water temperature.
			Contact our Sales, Service and Customer Support.
Process Fluid Temp Low - WARNING AL*39	Chiller will continue to run.	The process fluid temperature has gone below the adjustable setting's low value	If the chiller is still running, try to clear the alarm message, the limit may have been only temporarily exceeded.
			Verify controller's SETTINGS, see **Operation**.
Refrigerant Charge Loss - ALARM, UNIT OFF AL*22	Chiller will not start or run.	Unit detects complete loss of refrigerant	Contact our Sales, Service and Customer Support.

Table 17. Alarms and Warnings (Continued)

Message	Reaction	Cause	Action
Probe Error Supply Temp – ALARM, UNIT OFF AL*24	Chiller will shut down.	Supply Temperature Probe is not functioning properly	Contact our Sales, Service and Customer Support.
Probe Error Pump Pressure – ALARM, UNIT OFF AL*25	Chiller will shut down.	Process Pump Pressure Sensor is not functioning properly	Contact our Sales, Service and Customer Support.
Probe Error RFG Suction Temp – ALARM, UNIT OFF AL*26	Chiller will shut down.	Refrigeration Suction Line Probe is not functioning properly	Contact our Sales, Service and Customer Support.
Probe Error RFG Liquid Temp – WARNING, CHECK SENSOR AL*27	Chiller will continue to run.	Refrigeration Liquid Line Probe is not functioning properly	Contact our Sales, Service and Customer Support.
Probe Error RFG High Pressure – ALARM, UNIT OFF AL*29	Chiller will shut down.	Refrigeration High Pressure Transducer is not functioning properly	Contact our Sales, Service and Customer Support.
Probe Error RFG Low Pressure – ALARM, UNIT OFF AL*30	Chiller will shut down.	Refrigeration Low Pressure Transducer is not functioning properly	Contact our Sales, Service and Customer Support.
Process Flow Meter Communication Error – WARNING, Check Sensor AL*31	Chiller will continue to run.	Communication error between the controller and the Process Flow Meter	Contact our Sales, Service and Customer Support.

Table 17. Alarms and Warnings (Continued)

Message	Reaction	Cause	Action
Refrigerant Subcool Low - WARNING, SERVICE AL*32	Chiller will continue to run.	Refrigerant Sub cooling is below the factory preset low value	Contact our Sales, Service and Customer Support.
Refrigerant Superheat Low - ALARM, UNIT OFF AL*33	Chiller will shut down.	Refrigerant Superheat is below the factory preset low value	Contact our Sales, Service and Customer Support.
Probe Error Remote Temp – ALARM, UNIT OFF AL*34	Chiller will shut down.	Remote temperature sensor not connected or open	Check connections on the rear of the chiller. Contact our Sales, Service and Customer Support.
Process Fluid Flow High - ALARM, UNIT OFF AL*37	Chiller will shut down.	The process fluid flow rate has gone above the adjustable settings high value	Verify controller's SETTINGS, see **Operation**. Adjust flow, if chiller is equipped with flow control valve, see **Options/Accessories**. Check all valves in your application and plumbing lines to ensure that they have not changed. Contact our Sales, Service and Customer Support.
Process Fluid Flow High - WARNING AL*42	Chiller will continue to run.	The process fluid flow rate has gone above the adjustable settings high value	If the chiller is still running, try to clear the alarm message, the limit may have been only temporarily exceeded. Verify controller's SETTINGS, see **Operation**. Adjust flow, if chiller is equipped with flow control valve, see **Options/Accessories**. Check all valves in your application and plumbing lines to ensure that they have not changed.
Memory Error Too Many Writes – WARNING, C.PCO ERR AL*0	Chiller will continue to run.	Chiller has been written to too more than 30 times in 1 minute	SetPoint or value (P.I.D, etc.) in the Chiller is being changed too frequently through DB communication or controller interface.
Memory Error Write Retain Fault – WARNING, C.PCO ERR AL*1	Chiller will continue to run.	Chiller controller is having issues saving values.	Potentially corrupt memory. Contact our Sales, Service and Customer Support.

Table 17. Alarms and Warnings (Continued)

Message	Reaction	Cause	Action
I/O Override Active – WARNING AL*14	Chiller will continue to run.	Chiller Override function has been active for more than 5 minutes	Return Test Override value to default control settings
Probe Error HX Out Temp – WARNING, CHECK SENSOR AL*36	Chiller will continue to run.	Heat Exchanger Temperature Probe is not functioning properly	Contact our Sales, Service and Customer Support.
Near Boiling SV Lowered – WARNING AL*38	Chiller will continue to run, but will automatically lower the SV Value.	Return temperature exceeded 98°C	Check flowrate on chiller. TSC210 and TSC260 units may need >10GPM if run at temperatures close to 90°C and full capacity. Increase flowrate if possible.
			Ensure that the heat load being applied to the chiller is not too high. Contact Thermo Fisher Scientific for assistance on calculating heat loads.
			Contact our Sales, Service and Customer Support.

Alarms Log/ History

Displays the most recent 99 warnings and alarms. The date and time each warning or alarm occurred is shown. There are log files dedicated to both when the warning or alarm started and when it stopped. Use the arrow buttons to scroll through the list of messages.

Troubleshooting

Chiller will not start

- Check the electrical connections.
- For first time use, please refer to the quick start instructions included with your chiller or the copy in this manual. The manual's copy follows the Table of Contents.
- Check the controller for messages, see Messages in this Section.
- Ensure the unit ON/OFF switch is pressed in the On Position.
- Make sure supply voltage is connected and matches the chiller's nameplate rating ±10%.

Chiller shuts down

- Check the electrical connections.
- Ensure ON/OFF switch wasn't accidentally pressed.
- Check the controller for messages, see Messages in this Section.
- The chiller is designed to shut down if not properly primed, refer to **Installation** for instructions.
- Make sure supply voltage is connected and matches the chiller's nameplate rating ±10%.
- Restart the chiller.

Clearing Messages

- Note the code in case it clears before you are done troubleshooting.
- If desired, silence the audible alarm by pressing ⚠.
- If the chiller shuts down, the controller will continue to display the home page with the current system Status. Press ⚠ to see the alarm and silence the buzzer. Refer to Messages in this section. Once the cause of the shutdown is identified and corrected, start the chiller. Press the Escape button to return to the home screen. If the cause is not corrected the message will reappear.
- If the chiller is still running press ⚠ to see if the message, a limit may have been only temporarily exceeded. Press the Down arrow until the Clear Alarms page displays. Press and hold the ⚠ button to clear alarms. Press the escape button to return to the home screen. If the message does not clear, the warning is likely still active.

Inadequate Pump Flow

- Ensure any user installed in-line valves are in the desired position.
- Ensure the chiller's process fluid outlet is connected to the application's fluid inlet and not the application's fluid outlet, see **Installation**.
- Ensure all connections are secure and that the proper sealant/lubricant for the fitting material is used.
- Keep the distance between the chiller and the instrument being cooled as short as possible.
- Ensure tubing is straight and without bends. If diameter reductions are required, make them at the inlet and outlet of your application, not at the chiller.

Chiller will not circulate process fluid

- Check the reservoir level. Fill, if necessary.
- Ensure the diffuser or wye strainer is not clogged.
- Check the application for restrictions in the cooling lines.
- Chiller requires a minimum pressure drop based on pump type, see **Installation**. This may be achieved by adjusting a process line ball valve.
- The pump motor overloaded. The pump's internal over temperature over current device will shut off the pump causing the flow to stop. This can be caused by low fluid, debris in system, operating chiller in a high ambient temperature condition or excessively confined space. Allow time for the motor to cool down. Unit will show pump overload alarm, alarm must be cleared before start of the unit.
- Make sure supply voltage matches the chiller's nameplate rating ±10%.
- Ensure the pump is primed:
  - If the tank level is sufficient, strainers are clean, and no restrictions are present, the pump may need to be primed. If this is required, complete the following steps:

a. For Turbine pumps, this is located at the base of the pump head.

Note: Turbine Pumps on TSC08-TSC90 also need to remove the front panel by using a Phillips head screwdriver to remove the (5) screws holding it on. The drain plug will be behind the panel.

b. For Centrifugal pumps, this is located underneath the pump head. An access hole is located underneath the frame for accessibility.

- Place a rag or towel under the plug.
- Slowly loosen without removing the plug to allow water to exit without removing the plug. Turbine pumps utilize a 7/16" hex head and centrifugal pumps utilize a 10 mm hex key.
- Once water begins to leak out, the pump is sufficiently primed. Re-tighten the plug, reattach the panels, and start the unit.

Inadequate temperature control

- Adding fluid that has a temperature differential with the fluid already in the reservoir will temporarily affect temperature stability performance.
- Verify the setpoint.
- If the chiller is over-cooling, cycle the power.
- Visibly inspect condenser for debris and clean if necessary.
- Check the fluid concentration, see **Installation**.
- Ensure your chiller's installation complies with the site requirements listed in **Installation**.
- Make sure supply voltage matches the chiller's nameplate rating ±10%.
- If the temperature continues to rise, make sure your application's heat load does not exceed the rated specifications.
- Check for high thermal gradients (e.g., the application load is being turned on and off or rapidly changing).
- If operating at high altitude note that heat removal capacity decreases 1.2% per 1,000 feet above sea level. Also, reduce the maximum temperature for the air entering the TSC Chiller by 1°C per 1,000 feet above sea level.
- Verify/adjust controller PID values to default. Ensure the chiller was shut down properly, see PID section in **Operation**.

Tuning Verifying/Adjusting the Controller PID Values

The controller controls temperature using a Proportional-Integral-Derivative (PID) algorithm.

PID Menu allows you to view the default PID values (Def PID) and view/adjust customer adjustable values (User PID).

If your chiller experience temperature control issues due to any change in user PID values, it is recommended to use default PID and seek Thermo Fisher Scientific customer support.

Note: It is recommended that only a qualified technician adjust the user adjustable PID values (User PID). Changes from default values will affect chiller performance. Contact Thermo Fisher Scientific sales representative for support.

See **Operation** for more details.

Additional Information

Draining

Before using any fluid or performing maintenance where contact with the fluid is likely refer to the manufacturer's SDS for PPE requirements.

Ensure the fluid is below the safe-handling temperature (<40°C) before draining the chiller.

The drain port is located inside the unit just inside the left side panel.

Draining Procedure

WARNING: Disconnect chiller from the application before draining.

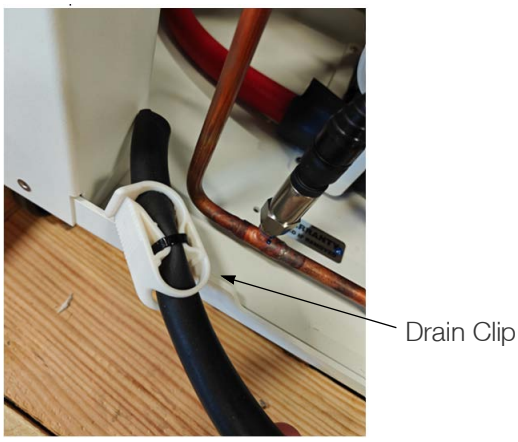
Position a suitable pan beneath the drain port. The drain pan must be shallow (under 3½" in height) and have a volume of approximately 3 gallons (16 gallons for TSC210-260). Remove the hose and clip assembly, open the clip (remove the transport cable tie if still attached), and place the drain hose in the pan. This will drain the return line, reservoir, plate exchanger, and the suction side of the pump.

1. Obtain a container with enough volume to recover the circulating water.
2. Shut down the system according to shut down procedure.
3. Find the drain hose and drain clip on the bottom of the left side of the unit. (Remove left side panel using phillips head screwdriver to access drain hose)
4. Open the drain clip and allow the water to discharge into the container.
5. Remove the nylon return diffuser from the return port inside the tank (applicable for std temp models TSC08-TSC90).
6. Use Wet-Vac to pull out any additional fluids in supply, return and drain lines.
7. Plug the supply and return ports on the rear of the system.

To drain the discharge side of the pump disconnect the Female NPT outlet connection on the rear of the chiller.

Note: Internally the chiller does not contain large quantity of fluid on the discharge side however take care to contain what fluid does drain, a wet-vac can be employed to minimize the potential for spoilage.

Close the drain clip, place the drain hose back inside the chiller, and reinstall the side panel prior to refilling the chiller.



Draining Procedure for water-cooled chillers

Draining the condenser circuit of TSC water cooled chillers is only required for transportation purposes. This is accomplished by first removing the right side panel. Use a Phillips head screwdriver to remove the right side panel indicated in the **Figure 64**.

Locate the slot on the side of the valve and insert a flat head screwdriver to release the spring pressure to drain the condenser. Use a Wet-Vac on the facility water inlet connection to thoroughly drain any remaining fluid from the lines.

For Storage purposes, manually opening the regulating valve is not required. Using a Wet-Vac only on the facility water inlet and outlet connections is sufficient.

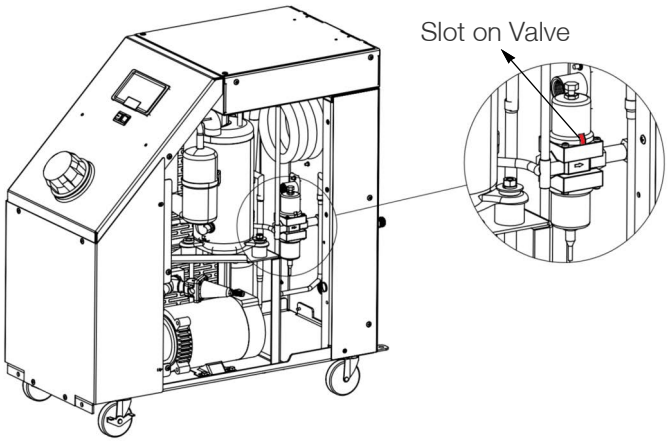


Figure 64. Water Cooled

Wetted Materials

For T1, T2, and T3 Pumps:

- Stainless Steel AISI 304
- Bronze ASTM B62
- Bronze ASTM B16
- Buna N
- Graphite Loaded Silicone Carbide

For C1, C2, and C3 Pumps:

- Stainless Steel AISI 304
- EPDM
- Silicone Carbide

For Tanks:

- Polyethylene (standard temp chiller)
- Stainless Steel AISI 304 (extended temp chiller)
- Buna N
- Polypropylene

Plumbing:

- Brass
- Stainless Steel AISI 304
- Copper
- Glass Filled PPS
- Glass Filled Nylon
- EPDM
- Nitrile
- Teflon
- Neoprene
- Polypropylene
- Acetol
- Polyphenylsulfone
- Buna N
- Methacrylate ester

For Cap and Funnel:

- Glass fiber reinforced polyamide

Decommissioning/ Disposal

Decommissioning prepares equipment for safe and secure transportation.

Note: Decommissioning must be performed only by qualified dealer using certified equipment. All prevailing regulations must be followed.

Laboratory Grade Ethylene glycol (EG) is poisonous and flammable. Before disposing refer to the manufacturer's most current SDS for handling precautions.

Decommissioning must be performed only by qualified dealer using certified equipment. All prevailing regulations must be followed.

Consider decommissioning the chiller when:

- It fails to maintain desired specifications.
- It no longer meets safety standards.
- It is beyond repair for its age and worth.

Refrigerant and compressor oil must be recovered from equipment before disposal.

Note: Keep in mind any impact your application may have had on the chiller.

Direct questions about chiller decommissioning or disposal to our Sales, Service and Customer Support.

To dispose of the unit consign the specialized industrial waste disposal agency in accordance with local laws and regulations.

The unit contains Refrigerant steel, copper and brass. The following lists the location of the aforementioned materials that should be recycled:

- Frame and panels are fabricated from carbon steel.

- Pump motor contains copper windings and its housing is made from steel.
- Pump's housing and parts are comprised of brass.
- All the metal parts on the water circuit are made from non-ferrous materials. All the water fittings have pipe sealant on them (contact Thermo Fisher Scientific for material data safety sheet).
- The compressor has copper windings, steel parts and shell.
- The refrigeration circuit is comprised of copper.
- Electric wiring is comprised of copper.
- Water hose is constructed from Versigard synthetic rubber, RMA Class C with Spiral synthetic yarn.

The controller, contactors and transformer (See supplied wiring diagram) contain heavy metals and shall be removed from the unit and recycled or returned to Thermo Fisher Scientific for recycling.

Handle and dispose in accordance with the manufacturers specification and/or the SDS for the material used.

Shipment Storage

Follow the manufacturer's SDS instructions if decontamination is required.

Before the system is transported and/or stored drain all circulating and building water from it. Store the unit from -40°C to +65°C and <90% relative humidity.

If the chiller is stored for more than 90 days it must be flushed with clean fluid before operating.

Appendix A- Country Specific 230 VAC, 50 Hz, 1Ø Requirements

Refer to the nameplate label located on the rear of the chiller for specific electrical requirements.

1. Chillers shipped to the following locations require a 16 Amp service:

Afghanistan, Albania, Algeria, Andorra, Angola, Argentina, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, Comoros, Congo, Croatia, Czech Republic, Denmark, Djibouti, DR Congo, Ecuador, Egypt, Eritrea, Estonia, Ethiopia, Finland, France, French Guiana, Gabon, Georgia, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Iraq, Israel, Italy, Ivory Coast, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Lebanon, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Mauritania, Moldova, Monaco, Mongolia, Morocco, Mozambique, Namibia, Nepal, Netherlands, Niger, North Korea, Norway, Paraguay, Peru, Poland, Portugal, Romania, Russia, Rwanda, Saint Vincent and the Grenadines, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia, Somalia, South Africa, South Korea, Spain, Sweden, Switzerland, Syria, Tajikistan, Thailand, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Uruguay, Uzbekistan, Vanuatu, Vatican City, Vietnam.

2. Chillers shipped to the following locations require a 15 Amp service:

Australia, China, Fiji Islands, Nauru, New Zealand, Papua New Guinea, Solomon Island, Tonga, Tuvalu.

3. Chillers shipped to the following locations require a 13 Amp service:

Abu Dhabi, Bahrain, Bangladesh, Botswana, Brunei, Cyprus, Dominica, Gambia, Ghana, Gibraltar, Grenada, Hong Kong, India, Ireland, Kenya, Kiribati, Kuwait, Lesotho, Malawi, Malaysia, Maldives, Malta, Mauritius, Myanmar, Nigeria, Oman, Pakistan, Qatar, Saint Lucia, Seychelles, Sierra Leone, Singapore, Sri Lanka, Sudan, Swaziland, Tanzania, Uganda, United Arab Emirates, United Kingdom, Yemen, Zambia, Zimbabwe.

Appendix B- Analog I/O and Remote Sensor

Analog I/O DB15 Connector Pinout

Install your analog input/output device to the DB15 female connector on the rear of the chiller. Analog I/O is activated using the controller, see **Operation**.

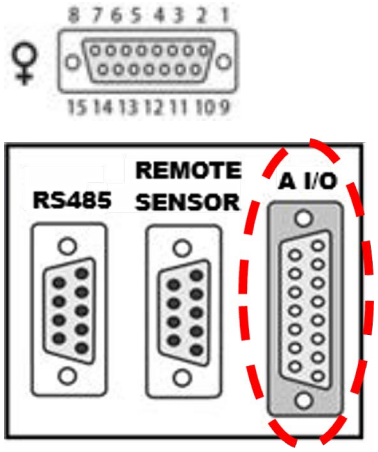


Figure 65. Analog I/O Connector Pinout

PIN	NAME	NOTES	DEFINITION
1	DIGITAL/ANALOG GROUND		Common Ground connection for pins 7, 14 and 15.
2	NOT USED		
3	NOT USED		
4	NOT USED		
5	NOT USED		
6	DIGITAL/ANALOG GROUND		Common Ground connection for pins 7, 14 and 15.
7	RESERVOIR TEMP OUT OR REMOTE TEMPERATURE IF REMOTE SENSOR IS ENABLED	Note 2	Analog Voltage Output 0-10VDC: This voltage output is proportional to the reservoir fluid temperature.
8	NOT USED		
9	CONFIGURABLE RELAY (Normally Open)	Note 1	Dry Relay Contact: Reference to pin 11. Closes when any of the configured faults occur.
10	CONFIGURABLE RELAY (Normally Closed)	Note 1	Dry Relay Contact: Reference to pin 11. Complement of pin 9 (open when pin 9 is closed).

PIN	NAME	NOTES	DEFINITION
11	RELAY COMMON		Common for all relay contacts (pins 9 & 10).
12	NOT USED		
13	NOT USED		
14	REMOTE START		Connect to pin 1 to turn chiller on. Disconnect to turn chiller off. **Note:** Remote Start Feature must be enabled to allow operation from this pin.
15	REMOTE SETPOINT	Note 2, 3	Analog Voltage Input 0-10VDC or 4-20mA: Reference to pin 6. Apply a DC voltage to this pin to adjust the setpoint: Default Range = 0 – 10V (where: 0V = Low Temp Span, 10V = Hi Temp Span) Optional Range = 4-20mA, 4mA = low temp span, 20 mA = high temp span

Note 1: Configurable Relay contact Pin 9 is normally OPEN when power is off. Pin 10 contacts are normally CLOSED when power is off. Relay contacts are rated: 24V AC maximum switching voltage, 1A Resistive, 1A FLA.

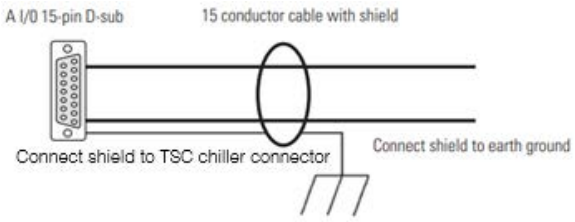
Note 2: Default = 0-10VDC. These ranges are set by the user.

Note 3: Remote setpoint must be enabled in controller from ENABLE FEATURES menu.

Never apply line voltage to any of the connections.

When making your connection to the TSC Chiller Analog I/O connector, in order to comply with the EMC directive:

- Use a shielded I/O cable.
- Connect the remote end of the cable shield to earth ground.
- Connect cable shield to TSC end connector.



Remote Sensor DB9 Connector Pinout

Connect the remote sensor (PT1000 only) to the DB9 male connector located on the rear of the chiller.

Use the controller to enable the remote sensor function.

For more information, refer to **Operation**.

Note: The remote sensor type is fixed as PT1000.

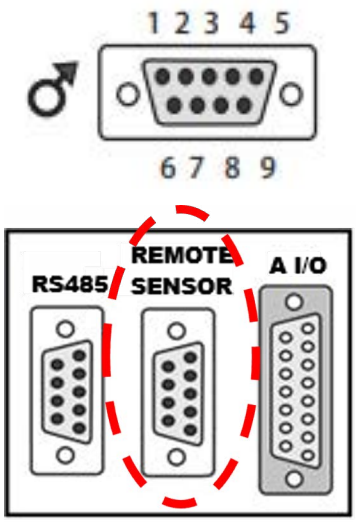


Figure 66. Remote Sensor DB9 Connector Pinout

Table 18. Remote Sensor Connector Pinout

Pin	
1	White
2	NA
3	NA
4	White
5	NA
6	NA
7	Red
8	NA
9	Red (4th wire not connected to the control board)

Never apply line voltage to any of the connections.

Remote Sensor Calibration

This procedure requires a running chiller and a calibrated reference thermometer.

Do not pick calibration points that are outside the safe operating limits of the fluid in your application.

Place the remote sensor and a calibrated reference thermometer in the high temperature remote reservoir. Ensure the fluid temperature is stabilized.

Note: The sensor calibration menu is accessible by navigating with the up or down arrows in the Settings screen. Refer to **Configuration**.

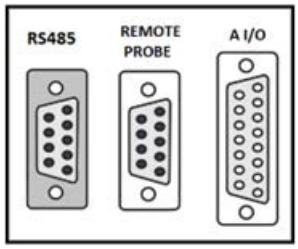
Measure the difference between the sensor temperature and the reference thermometer and enter that difference in the OFFSET line.

Appendix C- Serial Communication Protocols

NC Serial Communications Protocol

Note: Appendix C assumes you have a basic understanding of communications protocols.

Connect your PC to the applicable connector on the rear of the chiller. Use the controller, see **Operation**, to enable serial communications.



Never apply line voltage to any of the connections.

All data is sent and received in binary form, do not use ASCII. In the following pages the binary data is represented in hexadecimal (hex) format.

The NC Serial Communications Protocol is based on a master-slave model. The master is a host computer, while the slave is the chiller's controller. Only the master can initiate a communications transaction (half-duplex). The slave ends the transaction by responding to the master's query. The protocol uses RS-485 serial interface with the default parameters: 9600 baud, 8 data bits, 1 stop bit, and no parity. RS-485 offers a slave address selection, default parameter: 1.

The chiller can be controlled through your computer's serial port by using the chiller's standard female 9-pin connection.

Table 19. RS-485 COMM

Pin#	Function
1	T+
2	T-
3-7	No Connection
8	T+
9	T-

Note: For RS485, the pins 1-2 or 8-9 can be used.

Note: For RS232, use the RS232 to RS485 converter connected in series with the RS485 port at the back of the unit. The RS232 to RS485 converter must utilized pin 1-2 or 8-9 on RS485 side.

Table 20. RS-232 COMM

Pin#	Function
1	No Connection
2	TX
3	RX
4	No Connection
5	Ground
6-9	No Connection

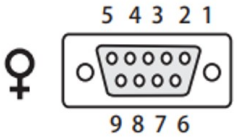


Figure 67. Hardware Mating Connector AMP Part# 745492-2 or equivalent

Communication cables are available from Thermo Fisher Scientific. Contact us for additional information.

Note: Contact a Thermo Fisher Scientific sales representative to purchase accessories.

All commands must be entered in the exact format shown in the tables on the following pages. The tables show all commands available, their format and responses. Controller responses are either the requested data or an error message. The controller response must be received before the host sends the next command.

The host sends a command embedded in a single communications packet, then waits for the controller's response. If the command is not understood or the checksums do not agree, the controller responds with an error command. Otherwise, the controller responds with the requested data. If the controller fails to respond within 1 second, the host should resend the command.

Note: All byte values are shown in hex, hex represents the binary values that must be sent to the chiller. Do not use ASCII.

The framing of the communications packet in both directions is:

Lead char	0xCA (RS-232) 0xCC (RS-485) Device address is 1 (RS-232)
Addr-msb	Most significant byte of slave address (RS-232: 0)
Addr-lsb	Least significant byte of slave address (RS-232: 1)
Command	Command byte (see Table of Commands)
n d-bytes	Number of data bytes to follow
d-byte 1	1st data byte (the qualifier byte is considered a data byte)
...	...
d-byte n	n^{th} data byte
Checksum	Bitwise inversion of the 1 byte sum of bytes beginning with the most significant address byte and ending with the byte preceding the checksum. (To perform a bitwise inversion,"exclusive OR" the one byte sum with FF hex.)

When a command has no value associated with it, (e.g., REQ ACK), "n d-bytes" will be set to 0. Values such as temperature and flow are sent as either 2 or 4 byte signed integers, depending on how they are stored in the controller RAM.

When the controller sends a value, a qualifier byte is sent first, followed by a 2 or 4 byte integer (the least significant byte is sent last). The qualifier indicates the precision and units of the value. The host does not send the qualifier byte; it must send the value using the correct precision, units and number of bytes. The host first inquires about a value it wants to change, then uses the number of data bytes and the qualifier byte it receives to generate the proper integer to send.

Analog Values

Qualifier Byte	
b.7 b.6 b.5 b.4	Precision of measurement
b.3 b.2 b.1 b.0	Unit of measure index

Example: The integer 200 (00 C8 as hex data bytes), preceded by a qualifier byte of 0x11, represents 20.0°C.

Note: The Unit of Measure is fixed in this protocol at °C, Bar, & GPM.

Example

To read the current setpoint (20°C):

Step1:

Master sends: CA 00 01 70 00 8E (REQ SETPOINT1)

Step2:

Slave responds: CA 00 01 70 03 11 00 C8 B2 (0.1°C x 200)

Response Indicates

uses a 2 byte integer (nn=03)

precision and units are 0.1°C (d1=11)

To set setpoint to 25°C:

Step 1:

Master sends: CA 00 01 F0 02 00 FA 12 (SET SETPOINT1 to 25.0°C)

Step 2:

Slave responds: CA 00 01 F0 03 11 00 FA 00 (0.1°C x 250)

Refer to the Additional Command Examples in the Appendix.

Set Commands – When a Set Command is received and the value is within the allowable limits, the new value will take affect immediately and the new value will be returned as part of the response to the command. If the value is outside the allowable limits, it will be rejected, the previous setting will be retained, and an error message will be included in the response to the command.

Error Response F0 - The "Bad Data" and "Bad Checksum" error responses will not be used. Reject out of range values and retain old settings. Do not reply to message frames with bad checksums. This behavior is compatible with existing implementations of the protocol.

Command	M: Master Sends S: Slave Responds		Notes
REQUEST STATUS			
REQ ACK	M: S:	lc a1 a2 **00** 00 cs lc a1 a2 **00** 02 v1 v2 cs	Protocol version v1=0; v2=1
REQ CONTROLLER SW VER	M: S:	lc a1 a2 **02** 01 d1 cs lc a1 a2 **02** nn d1 … dn cs	d1 = 0 Controller SW version in ASCII
REQ STATUS	M: S:	lc a1 a2 **09** 00 cs lc a1 a2 **09** nn d1 … dn cs	see Request Status Table in this Appendix
ERROR	M: S:	N/A lc a1 a2 **0F** 02 en ed cs	Response Only! ed = Error Data en = Error Number 1: Bad Command See Error in this Appendix
REQUEST MEASUREMENTS			
REQ SETPT1	M: S:	lc a1 a2 **70** 00 cs lc a1 a2 **70** 03 d1 d2 d3 cs	Process Fluid Setpoint (SV)
REQ FLOW1	M: S:	lc a1 a2 **10** 00 cs lc a1 a2 **10** 03 d1 d2 d3 cs	Process Fluid Flow (Flw)
REQ TEMP1	M: S:	lc a1 a2 **20** 00 cs lc a1 a2 **20** 03 d1 d2 d3 cs	Process Fluid Supply Temperature (PV)
REQ TEMP2	M: S:	lc a1 a2 **21** 00 cs lc a1 a2 **21** 03 d1 d2 d3 cs	Process Fluid Return Temperature (Return Temp)
REQ ANALOG1	M: S:	lc a1 a2 **28** 00 cs lc a1 a2 **28** 03 d1 d2 d3 cs	Process Fluid Supply Pressure (Fluid P #1)
REQ ANALOG2	M: S:	lc a1 a2 **29** 00 cs lc a1 a2 **29** 03 d1 d2 d3 cs	Refrigeration Suction Pressure (Comp#1 LoP)
REQ ANALOG4	M: S:	lc a1 a2 **2B** 00 cs lc a1 a2 **2B** 03 d1 d2 d3 cs	Condensing Pressure (Comp#1 HiP)
REQ REMOTE RTD	M: S:	lc a1 a2 **1B** 00 cs lc a1 a2 **1B** 03 d1 d2 d3 cs	Remote Temperature from Analog Board (Remote T)

REQUEST LOW ALARM VALUES			
REQ LO FLOW1	M: S:	lc a1 a2 **30** 00 cs lc a1 a2 **30** 03 d1 d2 d3 cs	Flow Process Supply Low Warning (Low Flow Wrn)
REQ LO FLOW3	M: S:	lc a1 a2 **32** 00 cs lc a1 a2 **32** 03 d1 d2 d3 cs	Flow Process Supply Low Fault (Low Flow Alm)
REQ LO ANALOG1	M: S:	lc a1 a2 **48** 00 cs lc a1 a2 **48** 03 d1 d2 d3 cs	Process Supply Pressure Low Warning (Low FldP Wrn)
REQ LO ANALOG2	M: S:	lc a1 a2 **49** 00 cs lc a1 a2 **49** 03 d1 d2 d3 cs	Process Supply Pressure Low Fault (Low FldP Alm)
REQ LO TEMP1	M: S:	lc a1 a2 **40** 00 cs lc a1 a2 **40** 03 d1 d2 d3 cs	Temperature Process Supply Low Warning (Low Temp Wrn)
REQ LO TEMP2	M: S:	lc a1 a2 **41** 00 cs lc a1 a2 **41** 03 d1 d2 d3 cs	Temperature Process Supply Low Fault (Low Temp Alm)
REQUEST HIGH ALARM VALUES			
REQ HI FLOW1	M: S:	lc a1 a2 **50** 00 cs lc a1 a2 **50** 03 d1 d2 d3 cs	Flow Process Supply High Warning (High Flow Wrn)
REQ HI FLOW3	M: S:	lc a1 a2 **52** 00 cs lc a1 a2 **52** 03 d1 d2 d3 cs	Flow Process Supply High Fault (High Flow Alm)
REQ HI TEMP1	M: S:	lc a1 a2 **60** 00 cs lc a1 a2 **60** 03 d1 d2 d3 cs	Temperature Process Supply High Warning (High Temp Wrn)
REQ HI TEMP2	M: S:	lc a1 a2 **61** 00 cs lc a1 a2 **61** 03 d1 d2 d3 cs	Temperature Process Supply High Fault (High Temp Alm)
REQ HI ANALOG1	M: S:	lc a1 a2 **68** 00 cs lc a1 a2 **68** 03 d1 d2 d3 cs	Process Supply Pressure High Warning (High FldP Wrn)
REQ HI ANALOG2	M: S:	lc a1 a2 **69** 00 cs lc a1 a2 **69** 03 d1 d2 d3 cs	Process Supply Pressure High Fault (High FldP Alm)
REQUEST PID SETTINGS			
REQ COOL P	M: S:	lc a1 a2 **74** 00 cs lc a1 a2 **74** 03 d1 d2 d3 cs	P term of Def PID
REQ COOL I	M: S:	lc a1 a2 **75** 00 cs lc a1 a2 **75** 03 d1 d2 d3 cs	I term of Def PID
REQ COOL D	M: S:	lc a1 a2 **76** 00 cs lc a1 a2 **76** 03 d1 d2 d3 cs	D term of Def PID
REQ CUST PID EN	M: S:	lc a1 a2 **77** 00 cs lc a1 a2 **77** 02 d1 d2 cs	Customer PID Enable/Disable (d1 d2 -> 00 00 = Def PID. 00 01 = User PID)
REQ USER P	M: S:	lc a1 a2 **78** 00 cs lc a1 a2 **78** 03 d1 d2 d3 cs	P term of User PID

REQ USER I	M: S:	lc a1 a2 **79** 00 cs lc a1 a2 **79** 03 d1 d2 d3 cs	I term of User PID
REQ USER D	M: S:	lc a1 a2 **7A** 00 cs lc a1 a2 **7A** 03 d1 d2 d3 cs	D term of User PID
SET STATUS SETTINGS			
SET ON/OFF ARRAY	M: S:	lc a1 a2 **81** nn d1 ... dn cs lc a1 a2 **81** nn d1 ... dn cs	Chiller Remote On/Off d1: 0 = OFF, 1 = ON, 2 = no change
SET MEASUREMENTS			
SET SETPT1	M: S:	lc a1 a2 **F0** 02 d1 d2 cs lc a1 a2 **F0** 03 d1 d2 d3 cs	Process Fluid Setpoint (SV)
SET LOW ALARM VALUES			
SET LO FLOW1*	M: S:	lc a1 a2 **B0** 02 d1 d2 cs lc a1 a2 **B0** 03 d1 d2 d3 cs	Flow Process Supply Low Warning (Low Flow Wrn)
SET LO FLOW3*	M: S:	lc a1 a2 **B2** 02 d1 d2 cs lc a1 a2 **B2** 03 d1 d2 d3 cs	Flow Process Supply Low Fault (Low Flow Alm)
SET LO TEMP1	M: S:	lc a1 a2 **C0** 02 d1 d2 cs lc a1 a2 **C0** 03 d1 d2 d3 cs	Temperature Process Supply Low Warning (Low Temp Wrn)
SET LO TEMP2	M: S:	lc a1 a2 **C1** 02 d1 d2 cs lc a1 a2 **C1** 03 d1 d2 d3 cs	Temperature Process Supply Low Fault (Low Temp Alm)
SET LO ANALOG1	M: S:	lc a1 a2 **C8** 02 d1 d2 cs lc a1 a2 **C8** 03 d1 d2 d3 cs	Process Supply Pressure Low Warning (Low FldP Wrn)
SET LO ANALOG2	M: S:	lc a1 a2 **C9** 02 d1 d2 cs lc a1 a2 **C9** 03 d1 d2 d3 cs	Process Supply Pressure Low Fault (Low FldP Alm)
SET HIGH ALARM VALUES			
SET HI FLOW1*	M: S:	lc a1 a2 **D0** 02 d1 d2 cs lc a1 a2 **D0** 03 d1 d2 d3 cs	Flow Process Supply High Warning (High Flow Wrn)
SET HI FLOW3*	M: S:	lc a1 a2 **D2** 02 d1 d2 cs lc a1 a2 **D2** 03 d1 d2 d3 cs	Flow Process Supply High Fault (High Flow Alm)
SET HI TEMP1	M: S:	lc a1 a2 **E0** 02 d1 d2 cs lc a1 a2 **E0** 03 d1 d2 d3 cs	Temperature Process Supply High Warning (High Temp Wrn)
SET HI TEMP2	M: S:	lc a1 a2 **E1** 02 d1 d2 cs lc a1 a2 **E1** 03 d1 d2 d3 cs	Temperature Process Supply High Fault (High Temp Alm)
SET HI ANALOG1	M: S:	lc a1 a2 **E8** 02 d1 d2 cs lc a1 a2 **E8** 03 d1 d2 d3 cs	Process Supply Pressure High Warning (High FldP Wrn)
SET HI ANALOG2	M: S:	lc a1 a2 **E9** 02 d1 d2 cs lc a1 a2 **E9** 03 d1 d2 d3 cs	Process Supply Pressure High Fault (High FldP Alm)

SET PID SETTINGS			
SET COOL P	M: S:	lc a1 a2 **F4** 02 d1 d2 cs lc a1 a2 **F4** 03 d1 d2 d3 cs	P term of Def PID
SET COOL I	M: S:	lc a1 a2 **F5** 02 d1 d2 cs lc a1 a2 **F5** 03 d1 d2 d3 cs	I term of Def PID
SET COOL D	M: S:	lc a1 a2 **F6** 02 d1 d2 cs lc a1 a2 **F6** 03 d1 d2 d3 cs	D term of Def PID
SET CUST PID EN	M: S:	lc a1 a2 **F7** 02 d1 d2 cs lc a1 a2 **F7** 03 d1 d2 d3 cs	Customer PID Enable/Disable (M: d1 d2 -> 00 00 = Def PID. 00 01 = User PID)
SET USER P	M: S:	lc a1 a2 **F8** 02 d1 d2 cs lc a1 a2 **F8** 03 d1 d2 d3 cs	P term of User PID
SET USER I	M: S:	lc a1 a2 **F9** 02 d1 d2 cs lc a1 a2 **F9** 03 d1 d2 d3 cs	I term of User PID
SET USER D	M: S:	lc a1 a2 **FA** 02 d1 d2 cs lc a1 a2 **FA** 03 d1 d2 d3 cs	D term of User PID

***Note:** Limit capping may not be supported when using the SET command for the Flow parameters. For fault range, please refer to Setpoints in Operation section. Exceeding the range limits can hamper the chiller performance.

Request Status Table		
nn	4	
D1	B0	Chiller Running
	B1	Chiller Faulted
	B2	Process Supply Sensor open/shorted
	B3	Process Return Sensor open /shorted
	B4	Suction Sensor open/shorted
	B5	Not Used
	B6	High Temp Warning
	B7	Low Temp Warning
D2	B0	High Pressure Fault
	B1	Low Pressure Fault
	B2	High Flow Warning
	B3	Low Flow Warning
	B4	Not Used
	B5	Not Used
	B6	Not Used
	B7	Not Used

Request Status Table		
D3	B0	High Temp Fault
	B1	Low Liquid Fault
	B2	Pump Motor Overload
	B3	Power Fault
	B4	High Refrigerant Pressure Fault
	B5	Low Refrigerant Pressure Fault
	B6	Not Used
	B7	Not Used
D4	B0	Not Used
	B1	Not Used
	B2	Not Used
	B3	Not Used
	B4	Not Used
	B5	Temp Fault Startup Bypass
	B6	Low Flow Fault
	B7	Not Used

Error

The slave detected an error in the message it received from the master, so it returns this command instead of echoing the command sent by the master. The slave returns the command it received from the master in the ed byte, and an error code in the en byte.

en	Error
1	Bad command – not recognized by slave
2	Reject value and retain old setting
3	Do not respond at all

Some errors may not result in any response. The slave ignores incoming bytes until it sees the valid lead character and its slave address. Then it must receive the correct number of bytes (determined by the length byte) before it can respond. If an incomplete frame is received, the slave will time out and clear its input buffer without responding.

AC Serial Communications Protocol

AC Protocol is an ASCII serial communications protocol and is based on a master-slave model.

The master (host computer) will send a command, then the slave (chiller) will respond. The master will wait for the slave to respond before sending the next command.

The slave will clear incomplete commands after an inter-character timeout of 30 seconds. If the slave does not respond in 1 second, the master may re-transmit the command. The slave will respond only to messages with a valid start and termination characters.

- Commands are case sensitive. Upper case letters must be used.
- All messages from master and slave are terminated with a carriage return [CR].
- Commands consist of 2 or more characters beginning with an R or S.
- R denotes a read command requesting a value or setting, while S denotes a set command to change a setting.

Table 21. Table of Commands

Commands		
Command Description	**Master Sends**	**Slave Responds**
Request process temperature	RT	[V][U]
Request setpoint value	RS	[V][U]
Set setpoint setting	SS [V]	OK

Table 22. Error Table

Error Description	Slave Responds
Not defined, not implemented or incorrectly formatted	Unsupported command
Extra characters…	Format error
Set value too high	Maximum allowed is [VMAX]
Set value too low	Minimum allowed is [VMIN]

Note: [V] indicates a Numerical Value, and [U] indicates the unit of measure.

Modbus Serial Communications Protocol

When Modbus Protocol is enabled, ensure the correct Address, Baud rate, Parity, and Stop bits are set correctly.

Note: To activate Modbus after saving the selection, power cycle (restart) the chiller.

Chiller communication utilizes RS485 for Modbus. If RS232 communication is required, utilize the RS232-RS485 converter available through Thermo Fisher Scientific.

Below is the list of available variable points to interface with the chiller:

Table 23. Modbus Points List

Variable Type	Index	Size	Variable
Coil	21	1	Modbus Remote OnOff
Coil	22	1	Compressor Contactor Status
Coil	23	1	Pump Contactor Status
Discrete Input	0	1	Active Alarm
Discrete Input	1	1	Liquid Level Alarm
Discrete Input	2	1	High Fluid Temperature Alarm
Discrete Input	3	1	Pump Overload Alarm
Discrete Input	4	1	Pump High Pressure Alarm
Discrete Input	5	1	Pump Low Pressure Alarm
Discrete Input	6	1	Compressor High Pressure Alarm
Discrete Input	7	1	Compressor Low Pressure Alarm
Holding Register	23	2	Fluid Supply Temperature SetPoint
Holding Register	27	2	Remote Supply Temperature SetPoint
Input Register	0	2	Fluid Supply Temp Status
Input Register	2	2	Fluid Pressure Status
Input Register	6	2	Compressor High Pressure Status
Input Register	23	2	Fluid Flow Rate Status
Input Register	25	2	Compressor Low Pressure Status
Input Register	27	2	Remote Supply Temperature Status

Declaration of Conformity

F-Gas Declaration of Conformity

ThermoFisher SCIENTIFIC

F-GAS DECLARATION OF CONFORMITY

Declaration of conformity with Article 19 of Regulation (EU) No 2024/573 of the European Parliament and of the Council

We, Thermo Fisher Scientific (Asheville) LLC, F-Gas Portal Registration Number 23643, declare under our sole responsibility that when placing on the market pre-charged equipment, which we import to or manufacture in the Union, the hydrofluorocarbons contained in that equipment are accounted for within the quota system referred to in Chapter IV of Regulation (EU) No 2024/573 as:

We hold authorisation(s) issued in accordance with Article 21(2) of Regulation (EU) No 2024/573 and registered in the F-gas portal referred to in Article 20 of that Regulation, at the time of release for free circulation to use the quota of a producer or importer of hydrofluorocarbons subject to Article 16 of Regulation (EU) No 2024/573 that cover(s) the quantity of hydrofluorocarbons contained in the equipment.

August 7, 2025

Date

Manogaran Krishnamoorthy, Director - Regulatory Affairs, LED

[name and position of legal representative]

Electronically signed by: Manogaran Krishnamoorthy
Reason: Approver of the GxP document
Date: Aug 7, 2025 09:47:59 GMT+5.5

[signature of legal representative]

Manufacturer:

Thermo Fisher Scientific (Asheville) LLC
275 Aiken Road
Asheville, NC 28804
U.S.A.

EU Only Representative:

Thermo Electron LED GmbH
Robert-Bosch-Strasse 1
D-63505 Langenselbold
Germany
VAT ID Number: DE 812 403 137

EU Declaration of Conformity

ThermoFisher SCIENTIFIC
Laboratory Equipment

EU DECLARATION OF CONFORMITY
(According to EN ISO/IEC 17050-1:2010)

CE

[1] **Manufacturer**
Thermo Fisher Scientific (Asheville) LLC
275 Aiken Road
Asheville, NC 28804
United States of America (USA)

[2] **Authorized Representative**
Thermo Electron LED GmbH
Robert-Bosch-Str. 1
63505 Langenselbold
Germany

[3] **Product Type**

TSC product line of chillers for process flow applications, non-medical equipment

[4] **Model Name(s)**

$TSC_1XXX_2\text{-}Y_3Z_4\text{-}PP_5\text{-}E_6\text{-}000$

Where:

Brand $(TSC)_1$	Cooling Capacity/Size $(XXX)_2$	Condenser Cooling$(Y)_3$	Process Temperature Options$(Z)_4$	Pump Options $(PP)_5$	Voltage$(E)_6$
TSC (Thermo Scientific)	08(800W) 16(1550W) 35(3500W) 66(6600W) 90(9000W) 210(21000W) 260(26000W)	W = Water cooled (WC) A = Air Cooled (AC)	S = Standard Temp (STD): +5 to +40C E = Extended temp/High temp (EXT/HT): -5 to +90C	A combination of characters A-Z and numerals 0-9	B = 100V, 50Hz (1 ph)/115V, 60Hz (1 ph) F = 220-230V, 50Hz (1ph)/208-230V, 60Hz (1 ph) G = 200-220V, 50Hz (3 ph)/208-230V, 60Hz (3 ph) M = 400V, 50Hz (3 ph)/460V, 60Hz (3 ph)

"-000" is optional reserved space for "special" configurations and is not included in the standard portfolio offering.

[5] The object of the declaration described above is in conformity with the relevant Union harmonization legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.

[6] **EC Directives**

2014/35/EU	Low Voltage (LVD)
2014/30/EU	Electromagnetic Compatibility (EMC)
2011/65/EU	Restriction of Hazardous Substances (RoHS 2, including Delegated Directive (EU) 2015/863)

[7] The product(s) mentioned on this declaration are outside the scope of the 2011/65/EU RoHS Directive per Article 2 (4) (c) or (d) or (e).

[8] **Standards**

EN 61010-1:2010/A1:2019	Safety Requirements for electrical equipment for measurement, control, & laboratory use
EN IEC 61010-2-011:2021/A11:2021	Particular requirements for refrigerating equipment
EN IEC 61326-1 :2021 (Class A)	EMC Requirements – Electrical Equipment for Laboratory Use
EN IEC 63000:2018	RoHS Assessment of Electrical & Electronic Products (Technical Documentation)

[9] This declaration was signed for and on behalf of Thermo Fisher Scientific (Asheville) LLC on date 2025-11-28

This document will expire three (3) years after issuance.

Electronically signed by: Manogaran Krishnamoorthy
Reason: Approver of the GxP document
Date: Nov 28, 2025 17:06:08 GMT+5.5

Manogaran Krishnamoorthy
Director- Regulatory Affairs
Laboratory Equipments Division
Thermo Fisher Scientific

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CE

Bulgarian (BG) [1] Производител - [2] Оторизиран представител - [3] Тип продукт - [4] Име на модел– [5] Предметът на декларацията, описан по-горе, отговаря на съответното законодателство на Съюза за хармонизация: [6] Директиви на ЕО - [7] Продуктът(ите), упоменати в тази декларация, не попадат в приложното поле на Директива 2011/65/ЕС относно ограничението на опасните вещества съгласно член 2 (4) (в) или (г), или (д). - [8] Стандарти - [9] Тази декларация е с дата, подписана за и от името на упоменатото местоположение на законните производители.
Croatian (HR) [1] Proizvođač - [2] Ovlašteni zastupnik - [3] Vrsta proizvoda - [4] Naziv(i) modela– [5] Predmet navedene izjave u skladu je s mjerodavnim zakonodavstvom Unije o usklađivanju: [6] Direktive EZ-a - [7] Proizvod(i) koji se spominje(u) u ovoj izjavi izvan je(su) opsega Direktive 2011/65/EU o ograničenju uporabe određenih opasnih tvari u električnoj i elektroničkoj opremi (EEO) u skladu s člankom 2. stavkom 4. točkom (c) ili (d) ili (e). - [8] Norme - [9] Ova izjava je datirana, potpisana za i u ime navedene lokacije pravnih proizvođača.
Czech (CS) [1] Výrobce - [2] Autorizovaný zástupce - [3] Typ produktu - [4] Názvy modelů– [5] Výše popsaný předmět prohlášení je ve shodě s příslušnými harmonizačními právními předpisy Unie: [6] Směrnice ES - [7] Produkty uvedené v tomto prohlášení nespadají do oblasti působnosti směrnice 2011/65/EU RoHS podle článku 2 (4) (c) nebo (d), nebo (e). - [8] Normy - [9] Toto prohlášení bylo datováno, podepsáno pro a jménem uvedeného místa právních výrobců.
Danish (DA) [1] Producent - [2] Autoriseret repræsentant - [3] Produkttype - [4] Modelnavn(e)– [5] Genstanden for erklæringen, som beskrevet ovenfor, er i overensstemmelse med den relevante EU-harmoniseringslovgivning: [6] EU-direktiver - [7] De(t) produkt(er), der nævnes i denne erklæring, er ikke med i omfanget af RoHS-direktivet 2011/65/EU i henhold til artikel 2 (4) (c) eller (d) eller (e). - [8] Standarder - [9] Denne erklæring var dateret, underskrevet for og på vegne af de nævnte lovlige producenters placering.
Dutch (NL) [1] Producent - [2] Gemachtigd vertegenwoordiger - [3] Producttype - [4] Modelnaam/namen– [5] Het hierboven beschreven voorwerp is in overeenstemming met de desbetreffende harmonisatiewetgeving van de Unie: [6] EC-richtlijnen - [7] De producten die worden vermeld in deze verklaring vallen niet onder het toepassingsgebied van de Richtlijn 2011/65/EU volgens artikel 2 (4) (c) of (d) of (e). [8] Normen - [9] Deze verklaring is gedateerd, ondertekend voor en namens de genoemde vestigingsplaats van de legale fabrikant.
Estonian (ET) [1] Tootja - [2] Volitatud esindaja - [3] Toote tüüp - [4] Mudeli nimetused– [5] Eelkirjeldatud deklareeritav toode on kooskõlas asjaomaste liidu ühtlustamisaktidega: [6] EL Direktiivid - [7] Selles deklaratsioonis nimetatud toode/tooted jäävad 2011/65/EÜ ohtlike ainete piiramise direktiivi artikli 2 (4) (c) või (d) või (e) kohaldamisalast välja. - [8] Standardid - [9] See deklaratsioon oli dateeritud, allkirjastatud seaduslike tootjate asukoha eest ja nende nimel.
Finnish (FI) [1] Valmistaja - [2] Valtuutettu edustaja - [3] Tuotetyyppi - [4] Mallin nimi/nimet– [5] Edellä kuvattu vakuutuksen kohde on asiaa koskevan unionin yhdenmukaistamislainsäädännön vaatimusten mukainen: [6] EY-direktiivit - [7] Tässä vaatimustenmukaisuusvakuutuksessa mainitut tuotteet eivät kuulu RoHs-direktiivin 2011/65/EU piiriin artiklan 2 (4) (c) tai (d) tai (e) mukaan. - [8] Standardit - [9] Vakuutus on päivätty, allekirjoitettu mainitun laillisen valmistajan sijaintipaikan puolesta ja puolesta.
French (FR) [1] Fabricant - [2] Représentant agréé - [3] Type de produit - [4] Désignation(s) du modèle - [5] L'objet de la déclaration décrit ci-dessus est conforme à la législation d'harmonisation de l'Union applicable : [6] Directives européennes - [7] Le ou les produits mentionnés dans la présente déclaration sont exclus du champ d'application de la directive RoHS 2011/65/UE en vertu de l'article 2 (4) (c) ou (d) ou (e). - [8] Normes - [9] Cette déclaration était datée, signée pour et au nom de l'emplacement légal du fabricant mentionné.
German (DE) [1] Hersteller - [2] Bevollmächtigter Vertreter - [3] Produkttyp - [4] Modellbezeichnung(en) - [5] Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Union: [6] EG-Richtlinien - [7] Das bzw. die in dieser Erklärung genannten Produkte unterliegen gemäß Artikel 2 (4) (c) oder (d) oder (e) nicht der RoHS-Richtlinie 2011/65/EU. - [8] Normen - [9] Diese Erklärung wurde datiert, für und im Namen des genannten offiziellen Herstellerstandorts unterzeichnet.
Greek (EL) [1] Κατασκευαστής - [2] Εξουσιοδοτημένος αντιπρόσωπος - [3] Είδος προϊόντος - [4] Ονομασία μοντέλου– [5] Ο στόχος της δήλωσης που περιγράφεται παραπάνω είναι σύμφωνος με τη σχετική ενωσιακή νομοθεσία εναρμόνισης:: [6] Οδηγίες ΕΚ - [7] Τα προϊόντα που αναφέρονται σε αυτήν τη δήλωση εμπίπτουν εκτός του πεδίου εφαρμογής της οδηγίας 2011/65/EU RoHS βάσει του άρθρου 2, παράγραφος (4), στοιχείο (γ) ή (δ) ή (ε). - [8] Πρότυπα - [9] Η δήλωση αυτή χρονολογείται, υπογράφηκε για λογαριασμό και για λογαριασμό του αναφερόμενου νομικού τόπου των κατασκευαστών.
Hungarian (HU) [1] Gyártó – [2] Meghatalmazott képviselő – [3] Terméktípus – [4] Modell(ek) neve– [5] A fent ismertetett nyilatkozat tárgya megfelel a vonatkozó uniós harmonizációs jogszabálynak: [6] EC-irányelvek – [7] A jelen nyilatkozatban megnevezett termék/termékek kívül esik/esnek a 2011/65/EU jelű, egyes veszélyes anyagok elektromos és elektronikus berendezésekben való alkalmazásának korlátozásáról szóló (RoHS) irányelv hatályán annak 2. cikke (4) bekezdésének c), d) vagy e) pontja alapján. - [8] Szabványok – [9] Ezt a nyilatkozatot keltezéssel, aláírással és a jogi gyártók említett helyének nevében írták alá.
Irish (GA) [1] Monaróir - [2] Ionadaí údaraithe - [3] Cineál Táirge - [4] Ainm (neacha) Samhail - [5] Tá cuspóir an dearbhaithe a bhfuil tuairisc air thuas i gcomhréir le reachtaíocht ábhartha an Aontais maidir le comhchuibhiú: [6] Treoracha CE - [7] Tá an táirge/na táirgí atá luaite san fhógra seo lasmuigh de raon feidhme na Treorach maidir le Srian ar Shubstaintí Guaiseacha (RoHS) 2011/65/AE de réir Airteagal 2 (4) (c) nó (d) nó (e). - [8] Caighdeáin - [9] Rinneadh an dearbhú seo a dhátú, a shíniú le haghaidh agus thar ceann shuíomh na monaróirí dlíthiúla atá luaite.
Italian (IT) [1] Produttore - [2] Rappresentante autorizzato - [3] Tipo di prodotto - [4] Nomi dei modelli - [5] L'oggetto della dichiarazione di cui sopra è conforme alla pertinente normativa di armonizzazione dell'Unione [6] Direttive CE - [7] I prodotti menzionati in questa dichiarazione esulano dalla direttiva 2011/65/EU RoHS ai sensi dell'articolo 2 (4) (c) o (d) o (e). - [8] Standard - [9] Tale dichiarazione è stata datata, firmata a nome e per conto dell'ubicazione legale dei fabbricanti menzionata.

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EU DECLARATION OF CONFORMITY
(According to EN ISO/IEC 17050-1:2010)

CE

Latvian (LV) [1] Ražotājs - [2] Pilnvarotais pārstāvis - [3] Produkta veids - [4] Modeļa nosaukums(i)– [5] Iepriekš aprakstītais deklarācijas priekšmets atbilst attiecīgajam Savienības saskaņošanas tiesību aktam: [6] EK Direktīvas - [7] Šajā deklarācijā minētais(-ie) produkts(-i) ir ārpus Direktīvas 2011/65/EU RoHS darbības jomas, kā minēts 2. panta 4.c, 4.d vai 4.e punktā. - [8] Standarti - [9] Šī deklarācija tika datēta, parakstīta un parakstīta minēto juridisko ražotāju atrašanās vietas vārdā.
Lithuanian (LT) [1] Gamintojas - [2] Įgaliotas atstovas - [3] Gaminio tipas - [4] Modelio pavadinimas (-ai)– [5] Pirmiau aprašytas deklaracijos objektas atitinka susijusius derinamuosius Sąjungos teisės aktus: [6] EB direktyvos - [7] Šioje deklaracijoje minimam (-iems) produktui (-ams) nėra taikoma 2011/65/ES RoHS direktyva, pagal straipsnį 2 (4) (c), arba (d) arba (e). - [8] Standartai - [9] Ši deklaracija buvo datuota, pasirašyta ir minėtos teisinės gamintojo vietos vardu.
Maltese (MT) [1] Manifattur - [2] Rappreżentant Awtorizzat - [3] Tip ta' Prodott - [4] Isem(Ismijiet) tal-Mudell– [5] L-għan tad-dikjarazzjoni deskritt hawn fuq huwa konformi mal-leġislazzjoni ta' armonizzazzjoni rilevanti tal-Unjoni: [6] Direttivi tal-KE - [7] Il-prodott(i) imsemmi(ja) f'din id-dikjarazzjoni jaqgħu barra mill-ambitu tad-Direttiva RoHS 2011/65/UE skont l-Artikolu 2 (4) (c) jew (d) jew (e). - [8] Standards - [9] Din id-dikjarazzjoni kienet datata, iffirmata għal u f'isem il-post tal-manifatturi legali msemmi.
Polish (PL) [1] Producent - [2] Autoryzowany Przedstawiciel - [3] Typ produktu - [4] Nazwa(y) modelu -[5] Wymieniony powyżej przedmiot niniejszej deklaracji jest zgodny z odnośnymi wymaganiami unijnego prawodawstwa harmonizacyjnego: [6] dyrektywy KE - [7] W odniesieniu do produktów, o których mowa w niniejszej deklaracji, nie stosuje się Dyrektywy 2011/65/UE w sprawie ograniczenia stosowania niektórych niebezpiecznych substancji (RoHS) na mocy jej Artykułu 2 (4) (c), (d) lub (e). - [8] Standardy - [9] Oświadczenie to zostało opatrzone datą, podpisane na rzecz i w imieniu wskazanej siedziby legalnych producentów.
Portuguese (PT) [1] Fabricante - [2] Representante Autorizado - [3] Tipo de Produto - [4] Nome(s) do Modelo– [5] O objeto da declaração acima descrito está em conformidade com a legislação de harmonização da União aplicável: [6] Directivas da CE - [7] Os produtos mencionados nesta declaração estão fora do âmbito da Diretiva RoHS 2011/65/UE de acordo com o Artigo 2 (4) (c), (d) ou (e). - [8] Normas - [9] Esta declaração foi datada, assinada para e em nome da localização legal dos fabricantes mencionada.
Romanian (RO) [1] Producător - [2] Reprezentant Autorizat - [3] Tipul Produsului - [4] Nume model(e)– [5] Obiectul declarației descris mai sus este în conformitate cu legislația relevantă de armonizare a Uniunii: [6] Directive CE - [7] Produsele menționate în această declarație nu se încadrează în Directiva 2011/65/UE, RoHS, articolul 2 (4) (c) sau (d) sau (e). - [8] Standarde - [9] Această declarație a fost datată, semnată pentru și în numele locației producătorilor legali menționați.
Slovak (SK) [1] Výrobca – [2] Autorizovaný zástupca – [3] Typ produktu – [4] Názov modelu(-ov) – [5] Uvedený predmet vyhlásenia je v zhode s príslušnými harmonizačnými právnymi predpismi Únie: [6] Smernice ES – [7] Výrobky uvedené v tomto vyhlásení nepatria do rozsahu pôsobnosti smernice 2011/65/EÚ o obmedzení používania určitých nebezpečných látok podľa článku 2 ods. 4 písm. c) alebo d) alebo e). - [8] Normy – [9] Toto vyhlásenie bolo datované, podpísané pre uvedené sídlo právnych výrobcov a v jeho mene.
Slovenian (SL) [1] Proizvajalec- [2] Pooblaščeni zastopnik - [3] Tip izdelka - [4] Naziv(i) modela(ov)– [5] Predmet navedene izjave je v skladu z ustrezno zakonodajo Unije o harmonizaciji: [6] Direktive EU - [7] Izdelek/izdelki omenjen/omenjeni v tej izjavi niso v skladu z Direktivo 2011/65/EU RoHS glede na 2. (4) (c) ali (d) ali (e) člen. - [8] Standardi - [9] Ta izjava je bila datirana, podpisana za navedeno pravno lokacijo proizvajalcev in v imenu nje.
Spanish (ES) [1] Fabricante - [2] Representante autorizado - [3] Tipo de producto - [4] Modelos - [5] El objeto de la declaración descrita anteriormente es conforme con la legislación de armonización pertinente de la Unión: [6] Directivas CE - [7] Los productos mencionados en esta declaración están fuera del ámbito de aplicación de la Directiva 2011/65/UE sobre restricciones a la utilización. - [8] *Normas* - [9] Esta declaración fue fechada, firmada para y en nombre de la ubicación legal de los fabricantes mencionada.
Swedish (SV) [1] Tillverkare - [2] Auktoriserad representant - [3] Produkttyp - [4] Modellnamn– [5] Hänvisningar till de relevanta harmoniserade standarder, inklusive datum för standarden, som använts eller hänvisningar till de andra tekniska specifikationer, inklusive datum för specifikationen, enligt vilka överensstämmelsen försäkras: [6] EU-direktiv - [7] Den eller de produkter som nämns i denna försäkran berörs inte av RoHS-direktivet 2011/65/EU enligt artikel 2 (4) (c) eller (d) eller (e). - [8] Standarder - [9] Denna deklaration var daterad, undertecknad för och på uppdrag av de rättsliga tillverkarnas plats som nämns.
Chinese (Simple) [1] 制造商 - [2] 授权代表 - [3] 产品类型 - [4] 型号– [5] 上述声明对象符合相关欧盟协调法规 [6] 欧盟指令 - [7] 根据第 2 (4) 条 (c) 或 (d) 或 (e)，本声明提及的产品超出了 2011/65/EU RoHS 指令的范围。– [8] 标准 - [9] 此声明的日期，签署和代表上述合法制造商的位置。

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