



# AIR CHILLER SYSTEM & CHILLER PANEL



**Accessory for  
DMA Q800, ARES-G2, RSA-G2, and DHR  
Getting Started Guide**

## **Notice**

The material contained in this manual, and in the online help for the software used to support this instrument, is believed adequate for the intended use of the instrument. If the instrument or procedures are used for purposes other than those specified herein, confirmation of their suitability must be obtained from TA Instruments. Otherwise, TA Instruments does not guarantee any results and assumes no obligation or liability. TA Instruments also reserves the right to revise this document and to make changes without notice.

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# Introduction

## **Important: TA Instruments Manual Supplement**

Please click the [TA Manual Supplement](#) link to access the following important information supplemental to this Getting Started Guide:

- TA Instruments Trademarks
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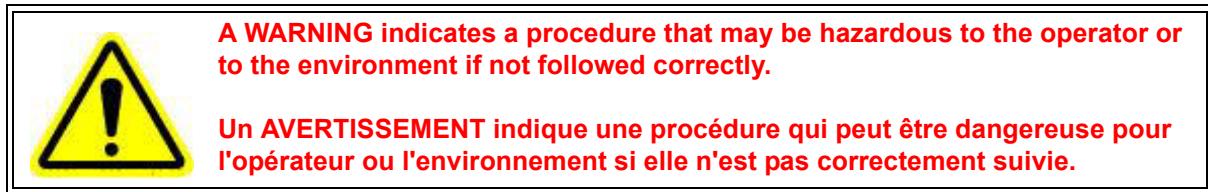
## Notes, Cautions, and Warnings

This manual uses NOTES, CAUTIONS, and WARNINGS to emphasize important and critical instructions. In the body of the manual these may be found in the shaded box on the outside of the page.

**NOTE:** A NOTE highlights important information about equipment or procedures.

**CAUTION:** A CAUTION emphasizes a procedure that may damage equipment or cause loss of data if not followed correctly.

**MISE EN GARDE:** UNE MISE EN GARDE met l'accent sur une procédure susceptible d'endommager l'équipement ou de causer la perte des données si elle n'est pas correctement suivie.



# **Regulatory Compliance**

## ***Safety Standards***

### **For the United States and Canada**

CAN/CSA-C22.2 No. 61010-1-12, Third Edition Issued: 2012/05/11 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

### **For the European Economic Area**

UL 61010-1, Third Edition, 2012 Issued: 2012/05/11 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

## **Provisions**

Machine Directive (2006/42/EC); EMC Directive (2004/108/EC); Low Voltage Directive (2006/95/EC); Pressure Equipment Directive (97/23/EC)

### **Harmonized Standards: Risk Assessment**

NEN-EN-ISO 14121-1

NPR/ISO-TR 14121-2

### **Harmonized Standards: Design and Manufacture**

NEN-EN-ISO 12100-1

NEN-EN-ISO 12100-2

NEN-EN 764

NEN-EN-IEC 60439

NEN-EN-IEC 60204-1

NEN-EN 349

NEN-EN 953

NEN-EN IEC 61310

NEN-EN-ISO 3744

NEN-EN-IEC 61000-6-2

NEN-EN-IEC 61000-6-4

NEN-EN 14276-2

## Safety



**WARNING:** The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.

**AVERTISSEMENT:** L'utilisateur de cet instrument est prévenu qu'en cas d'utilisation contraire aux indications du manuel, la protection offerte par l'équipement peut être altérée.



**WARNING:** Use gloves when touching parts that have become frosted during use. MAY CAUSE FROSTBITE.

**AVERTISSEMENT:** Utiliser des gants pour toucher les parties qui sont devenus givrés pendant l'utilisation. Peut causer des gelures.



**WARNING:** Do not turn on the ACS unless the transfer hose has been connected to the DMA/Rheometer temperature control system.

**AVERTISSEMENT:** Ne pas allumer le ACS tant que le tuyau de transfert n'a pas été connecté au système de contrôle de la température DMA/rhéomètre.

## Instrument Symbols

The following labels are displayed on the ACS for your protection:

Symbol	Explanation
	This symbol indicates that you should read this Getting Started Guide for important safety information. This guide contains important warnings and cautions related to the installation, operation, and safety of the ACS.  Ce symbole indique que vous devez lire entièrement ce guide de démarrage pour obtenir d'importantes informations relatives à sécurité. Ce guide contient d'importants avertissements et mises en garde relatifs à l'installation, à l'utilisation et à la sécurité du système ACS.

Please heed the warning labels and take the necessary precautions when dealing with those parts of the instrument. The *Air Chiller System (ACS) and Chiller Panel Getting Started Guide* contains cautions and warnings that must be followed for your own safety.

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# Chapter 1:

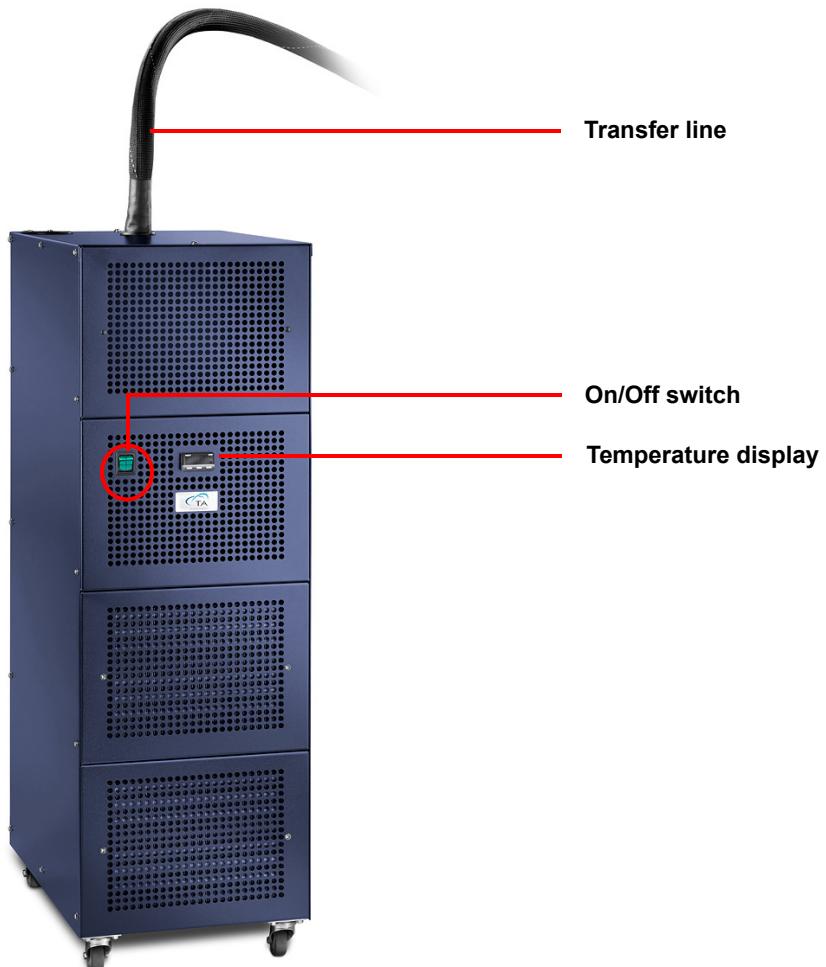
## Introducing the Air Chiller System

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### Overview

#### Air Chiller

The ACS is a unique multi-stage air chiller system for subambient temperature control and general cooling of select instrumentation from TA. Supported instruments and environmental systems include the DMA Q800 with standard furnace, Discovery Hybrid Rheometer models with Environmental Test Chamber, and ARES-G2/ RSA-G2 with Forced Convection Oven. The ACS units feature durable compressors, small footprint, uninterrupted operation, are CFC-free, and for specified temperature ranges, eliminate the recurring cost and safety concerns associated with handling and use of liquid nitrogen. The Air Chiller Systems requires an air supply at pressure of 7 bar (100 psi), flow rate of 200 L/min, and dew point of -40°C (-40°F), and appropriate instrument-specific Chiller Panel.



**Figure 1** ACS-3.

## Internal Timer

The ACS contains an internal timer that keeps the purge gas solenoid valve closed until the purge gas solenoid valve until the system is fully ready. When the ACS is powered on, each chiller stage energizes in sequence. The timer circuit begins counting after the final stage powers on. Once the final stage powers on, the timer counts 30 minutes before it allows the ACS purge gas solenoid valve to open. Therefore, it will take approximately 60 minutes from when the ACS is powered on until it is ready to operate, and for cold gas to flow.

If the unit is used on a recurring daily basis, the ACS can be plugged into a power outlet that has a timer set to turn the instrument on one hour before the system is to be used.

## Transfer Line

The ACS has a vacuum-isolated delivery line that carries the refrigerant to the evaporator and back. The very flexible delivery line is made of corrugated stainless steel tubing.

**CAUTION: Although this line is strong, it can be damaged to the point of rupture if it is repeatedly bent too sharply or twisted forcibly. This line must remain gas-tight in order to contain the refrigerant charge in the unit.**

**MISE EN GARDE:** Bien que cette ligne est forte, il peut être endommagé au point de rupture si elle est plié trop fortement ou tordu. Cette ligne doit rester étanche aux gaz afin de contenir la charge de fluide frigorigène dans l'unité.



**Figure 2** Transfer line.

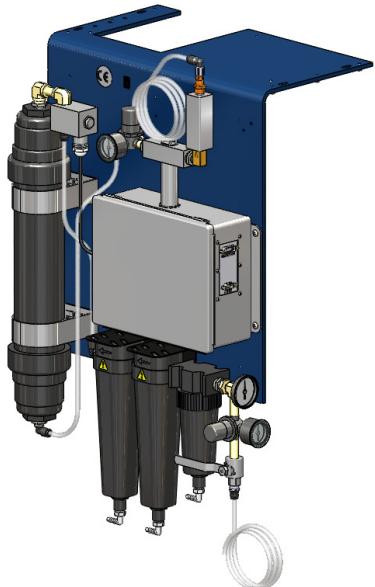
## **Continuous Operation**

The length of time the ACS can be left running will depend on the dew point of the supply. One of the internal evaporators is at -130°C (ACS-3) or -90°C (ACS-2), so any supply with a dew point higher than this will eventually result in frost build up, reduced gas flow, and reduced performance. If the supply has a dew point lower than -130°C (ACS-3) or -90°C (ACS-2), the ACS should run indefinitely. The dryer on the chiller panel supplies -40°C dew point gas which, under normal operating conditions, should result in the ACS staying frost-free and be adequate for most applications. If during your particular level of usage you experience issues with frost build up, you should build a regular shut down and purge period into your work schedule.

To keep the ACS frost-free, you should leave the gas flowing through the unit after it has been powered off. See [Shut Down Procedure](#) for more information.

## Chiller Panel

The Chiller Panel is mounted to the side of the ACS. Each instrument temperature control system requires its own specific chiller panel to interface to the ACS. The Chiller Panel assembly contains all of the pneumatic and electronic components needed to filter, regulate, and control the compressed gas (air or nitrogen) that is supplied to the temperature control systems.



**Figure 3** ARES-G2/RSA-G2 FCO Chiller Panel.

# *Accessory Specifications*

The tables below detail the ACS Accessory technical specifications.

**Table 1: ACS Accessory Characteristics**

Specifications	ACS-2	ACS-3
<b>Dimensions of Air Chiller (H x W x D):</b> Without Chiller Panel With Chiller Panel	88.5 cm (35 in) x 37 cm (14.5 in) x 56 cm (22 in) 88.5 cm (35 in) x 52 cm (20.5 in) x 56 cm (22 in)	112 cm (44 in) x 37 cm (14.5 in) x 56 cm (22 in) 112 cm (44 in) x 52 cm (20.5 in) x 56 cm (22 in)
<b>Weight of Air Chiller</b> Without Chiller Panel With Chiller Panel	90 kg (198 lbs) 106 kg (234 lbs)	118 kg (260 lbs) 134 kg (295 lbs)
<b>Dimensions of Chiller Panel</b>	Height: 86.4 cm (34 in) Width: 48.3 cm (19 in) Depth: 38.1 cm (15 in)	Height: 86.4 cm (34 in) Width: 48.3 cm (19 in) Depth: 38.1 cm (15 in)
<b>Weight of Chiller Panel</b>	15.8 kg (35 lbs)	15.8 kg (35 lbs)
<b>Refrigerants</b>	1st Stage: R404A 2nd Stage: R290 & R508B  Each in varying amounts and substantially less than 500g each.	1st Stage: R404A 2nd Stage: R290 & R508B 3rd Stage: R290 & R14  Each in varying amounts and substantially less than 500g each.

**Table 2: Accessory Cooling Gas Requirements for ACS-2 and ACS-3**

<b>Gas</b>	Air or nitrogen
<b>Pressure</b>	6.2–6.9 bar (90–100 psi)
<b>Flow Rate</b>	200 L/min
<b>Temperature</b>	20–30°C
<b>Dew Point</b>	Must not exceed the ambient air temperature by more than 5°C

**Table 3: Accessory Operating Environmental Conditions for ACS-2 and ACS-3**

Ambient air	12°C–21°C = Acceptable 21°C–24°C = Ideal 24°C–28°C = Acceptable, but a reduction in the cooling capacity of the unit is to be expected (about 1% cooling capacity reduction per degree above 24°C) 28°C–29.5°C = Expect reduced reliability. Warranty may be voided. Over 29.5°C = Not acceptable. Warranty will be voided.
Operating altitude	2000 meters maximum
Relative humidity	5% to 80% RH from 15°C to 30°C

**Table 4: Accessory Power Requirements for ACS-2 and ACS-3**

Electrical	220–230 VAC 50 Hz or 60 Hz (refer to the serial number plate on the rear of the unit) Nominal 9.3A, Max 12A
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**Table 5: Accessory Performance Specifications**

Specification	ACS-2	ACS-3
Lowest temperature	DMA Q800: -50°C ARES-G2/ RSA-G2 FCO: -55°C DHR ETC: -50°C	DMA Q800: -100°C ARES-G2/ RSA-G2 FCO: -100°C DHR ETC: -85°C
Cooling rate:	see below <sup>1</sup>	see below <sup>1</sup>

1. Ramp Rate: The maximum sustainable ramp rate will depend on a number of factors particularly the start and end temperature. To determine the maximum sustainable heating/cooling rate, perform the following test and analysis:

- a. Equilibrate to start temperature. Perform a time sweep or peak hold test with the temperature set (if possible) to a few degrees in excess of the end temperature. Set the time much longer than you expect; the test can be aborted when the temperature has reached a stable value.
- b. Plot a graph of temperature vs. time (min) and take the derivative. Inspect the derivative curve over your temperature range of interest. The maximum sustainable rate will be the lowest value on the derivative curve.

# *Chapter 2:*

## *Installing the Air Chiller System*

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### *Unpacking/Repacking the ACS*

Retain all of the shipping hardware and boxes from the accessory in the event you wish to repack and ship your accessory.

### *Preparing the Accessory*

Before shipment, the ACS is inspected so that it is ready for operation upon proper installation. Installation involves the following procedures:

- Inspecting the accessory for shipping damage and missing parts
- Connecting the ACS with Chiller Panel to the instrument

**CAUTION: To avoid mistakes, read this entire chapter before you begin installation.**

**MISE EN GARDE: Pour éviter de commettre des erreurs, lisez tout le chapitre avant de commencer l'installation.**

## Inspecting the System

When you receive the ACS Accessory, look over the accessory and shipping container carefully for signs of shipping damage, and check the parts received against the enclosed shipping list.

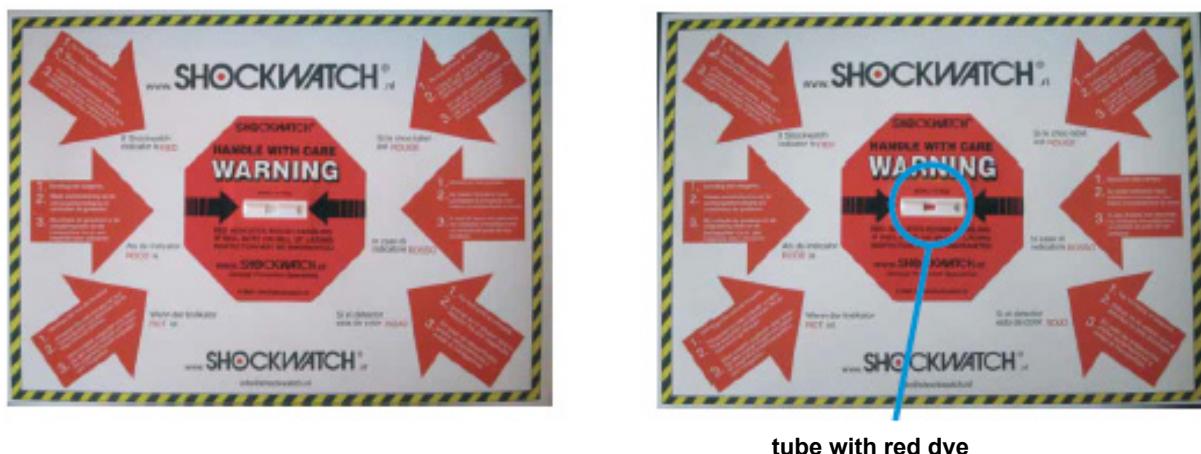
- If the accessory is damaged, notify the carrier and TA Instruments immediately.
- If the accessory is intact but parts are missing, contact TA Instruments.

Take note of the tilt sensor that is affixed to the packing container. The tilt sensor turns red if the container tips onto its side or is upended. The tile sensor will not activate under normal handling conditions or aircraft take-offs. Shipments that arrive with the indicator ball bearing in a different position from the companion label should inspect the product for possible damage and contact TA Instruments.



**Figure 4** TiltWatch tilt sensor: Correct position (left); incorrect position (right).

Inspect the ShockWatch device. ShockWatch devices contain a tube filled with red liquid held in suspension. When the device is subjected to an impact exceeding a specified G-level, the shock disrupts the surface tension of the liquid, releasing the highly visible red dye into the length of the tube — creating a permanent and immediate indication of mishandling. Normal movement or roadshock won't affect the device. Once activated, the device cannot be reset. Shipments that arrive with the tube filled with red liquid should inspect the product for possible damage and contact TA Instruments.



**Figure 5** Correct position (left); incorrect position (right).

## **Choosing a Location**

Choose a location for the accessory using the following guidelines. The ACS Accessory should be:

### ***In***

- A temperature-controlled area. Temperatures should be in the range specified in [Table 3](#)
- A clean environment
- An area with ample working and ventilation space

### ***On***

- A level floor surface capable of safely supporting the weight of the system

### ***Near***

- Your Q800 DMA, ARES-G2, RSA-G2, or DHR

### ***Away from***

- Dusty environments
- Exposure to direct sunlight
- Poorly ventilated areas

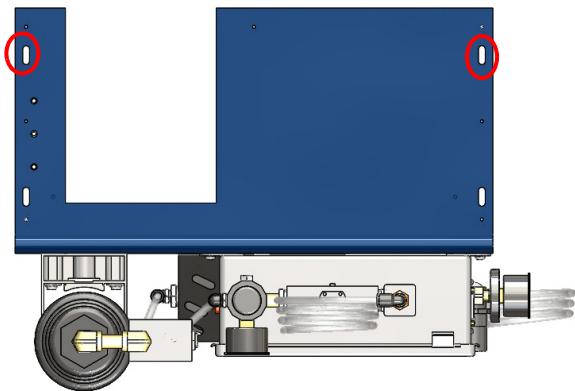
## *Installing the Chiller Panel to the Air Chiller*

- 1 Unscrew and remove the two (2) standoffs located on top of the Air Chiller.



**Figure 6** Standoff.

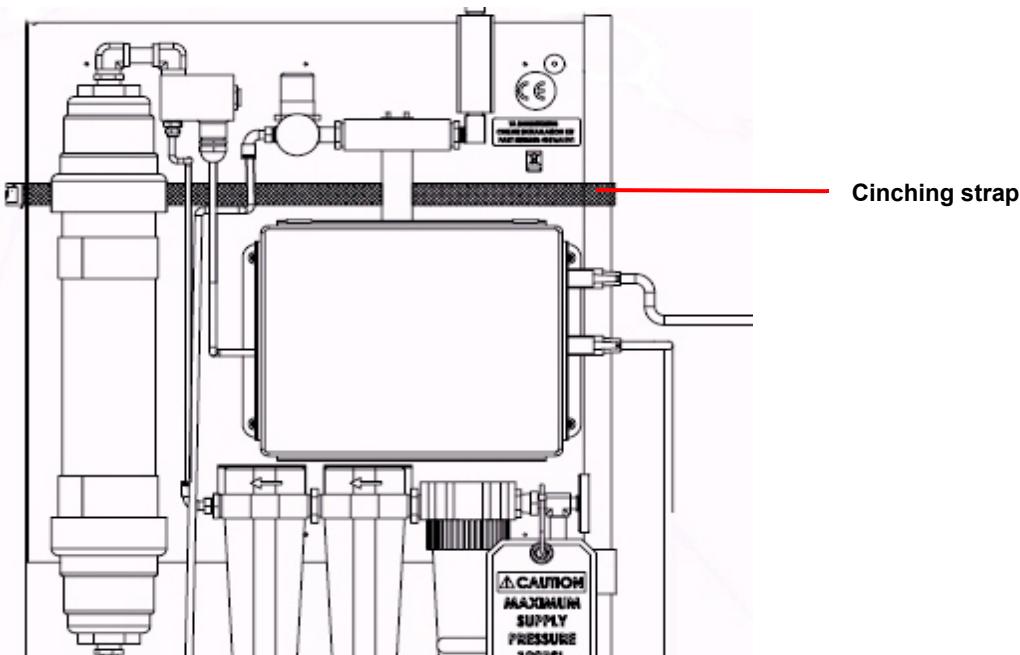
- 2 Place the Chiller Panel on top of the Chiller, aligning the slots on the panel with the standoff holes.



**Figure 7** Top of the Chiller Panel (FCO panel shown).

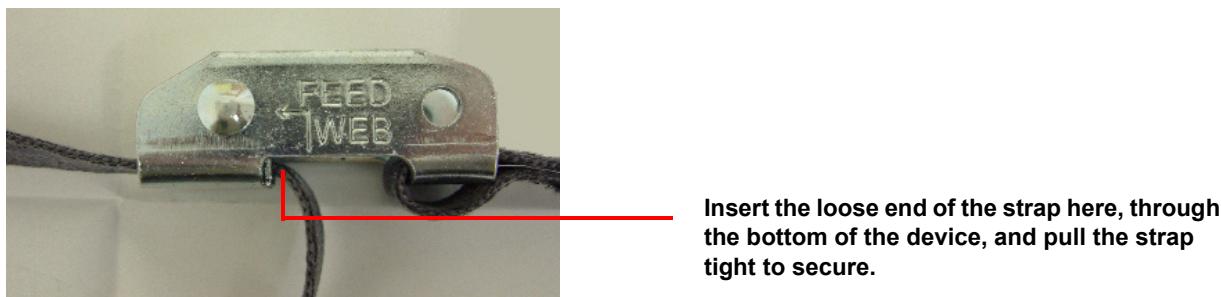
- 3 Replace the standoffs so that the Chiller Panel is secured to the Air Chiller.

- 4 Fit the cinching wrap around the chiller. Thread the strap under the filter and pressure lines as shown in the figure below. Make sure that the strap is not twisted and that it lies flat against the panel.



**Figure 8** Cinching strap (FCO Chiller Panel shown).

- 5 Insert the loose end of the strap into the opening on the underside of the buckle by holding the clamp open and feeding the strap through. See the figure below. Pull the cinching strap taut to secure the Chiller Panel.



**Figure 9** Cinching strap buckle.

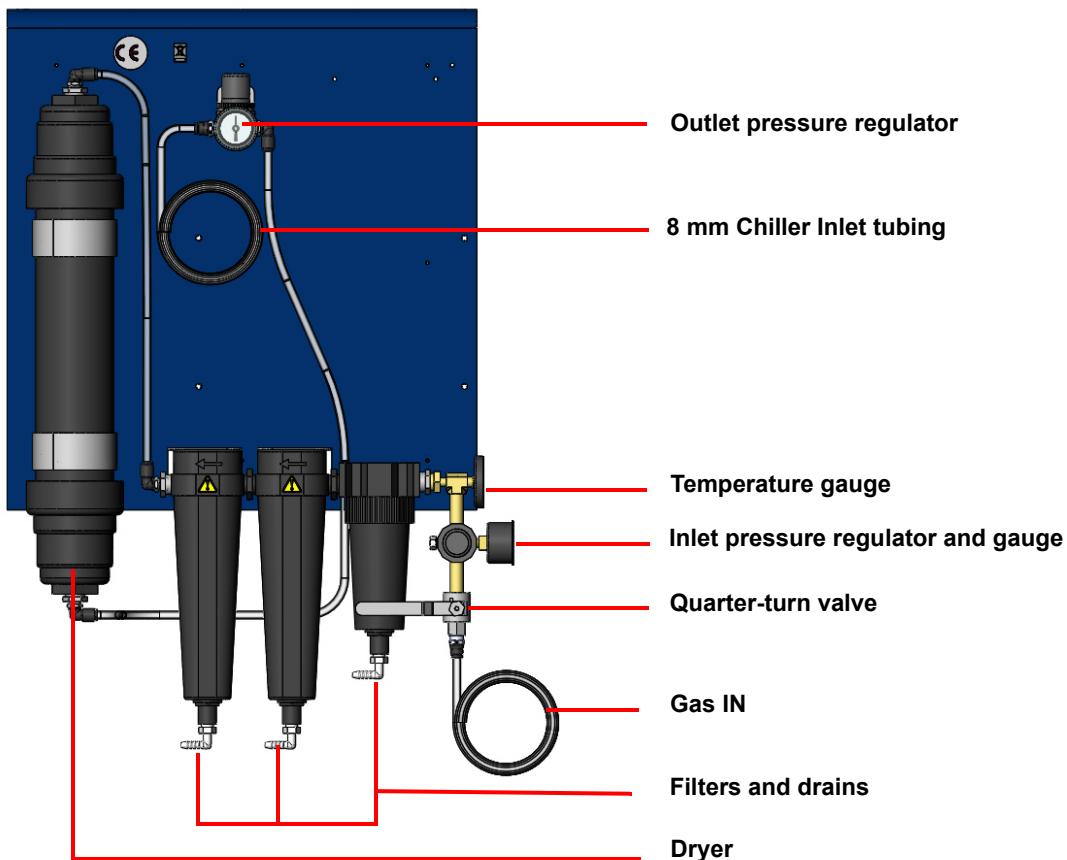
- 6 Connect the 8 mm Gas IN tube from the Chiller Panel to the air source. An additional 8 mm fitting is provided with the Chiller Panel, if needed.
- 7 Turn the quarter-turn valve to the **ON** position.
- 8 Set the inlet pressure regulator to 90–100 psi.

# *Connecting the ACS*

## **Q Series DMA**

To connect the ACS, access the rear panel of the DMA and follow the instructions below:

- 1 Place the Air Chiller with attached Chiller Panel next to the DMA.



**Figure 10** Q Series Chiller Panel.

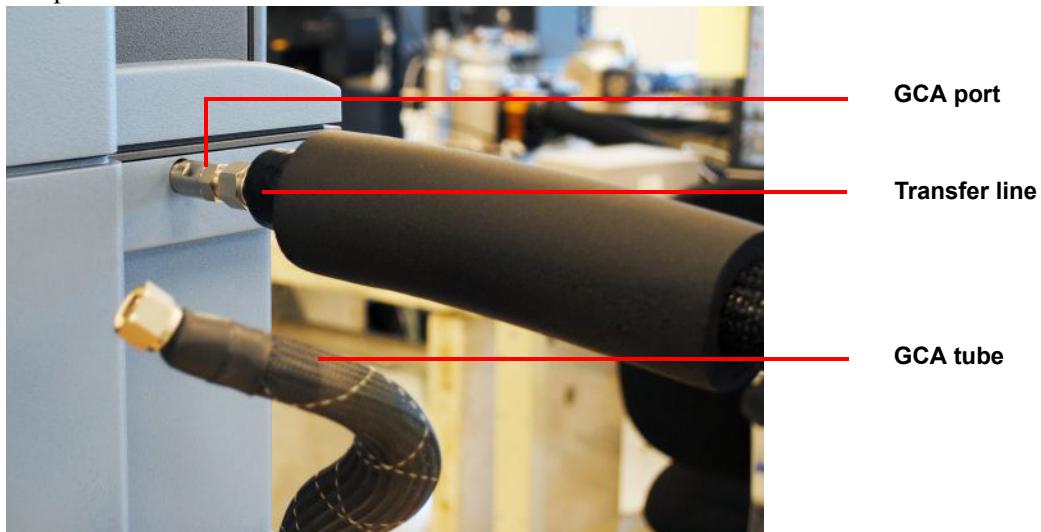
- 2 Connect one end of the Event cable to the **Event** port on the back of the DMA. Connect the other end to the **Event Control** port on the back of the chiller.

**NOTE:** If a shorting wire is installed in the Event Control port on the back of the chiller (shown in [Figure 11](#) below), remove and discard it. This wire is not needed for DMA installation.



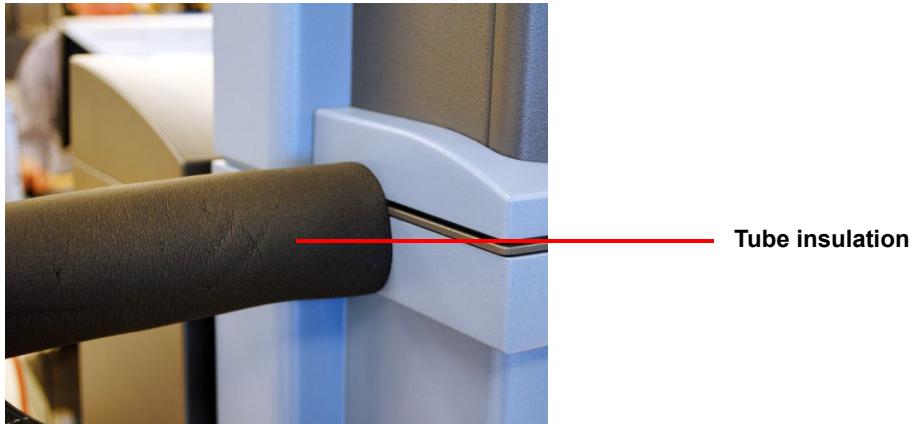
**Figure 11** Event connections: DMA **Event** port (left) and Air Chiller with shorting piece in the **Event Control** port (right).

- 3 Disconnect the GCA tube from the DMA, and then connect the transfer line from the chiller to the GCA port on the DMA.



**Figure 12** Disconnect the GCA tube.

- 4 Slide the tube insulation piece over the GCA port connection.



**Figure 13** Tube insulation piece and velcro strap covering the GCA connection.

- 5 Connect the 8 mm chiller inlet tubing from the Chiller Panel to the **INLET** port on the back of the chiller.
- 6 Set the outlet pressure regulator to 30 psi.
- 7 Insert the power cable into the power port on the back of the chiller. Plug the cord into a wall outlet rated for the chiller.
- 8 Turn on the Chiller. Wait 60 minutes before operating the system. The built-in timer will not allow flow through the ACS until all the stages have started. See [Internal Timer](#) for more information.



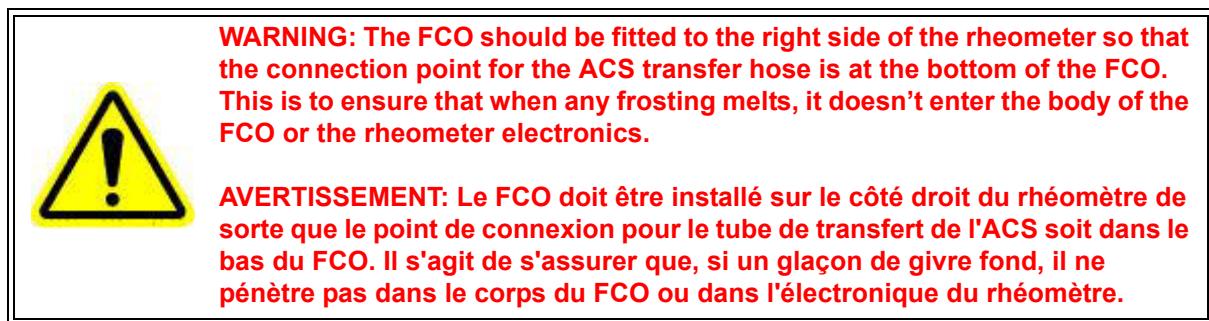
**WARNING:** When the chiller is running and/or cold, it is important to keep the end of the transfer line horizontal. Do not allow the end of the transfer line to droop or hang downward while the chiller is running or when the transfer line is cold. This could allow coolant to clog the capillary tube, degrading the performance of the system. If it is suspected the capillary tube may be clogged due to mishandling, follow the instructions for Shutting Down the ACS found on page 41 of this document.

**AVERTISSEMENT:** Lorsque le refroidisseur est en cours d'exécution et / ou froid, il est important de maintenir horizontalement l'extrémité de la ligne de transfert. Ne laissez pas s'affaisser la fin de la ligne de transfert quand le refroidisseur est en marche ou lorsque la ligne de transfert est froid. Cela pourrait permettre à du liquide de refroidissement d'obstruer le tube capillaire, ce qui dégraderait les performances du système. Si vous suspectez que le tube capillaire peut être obstrué en raison de mauvaise manipulation, suivez les instructions à la page 41 de ce document pour arrêter l'ACS.

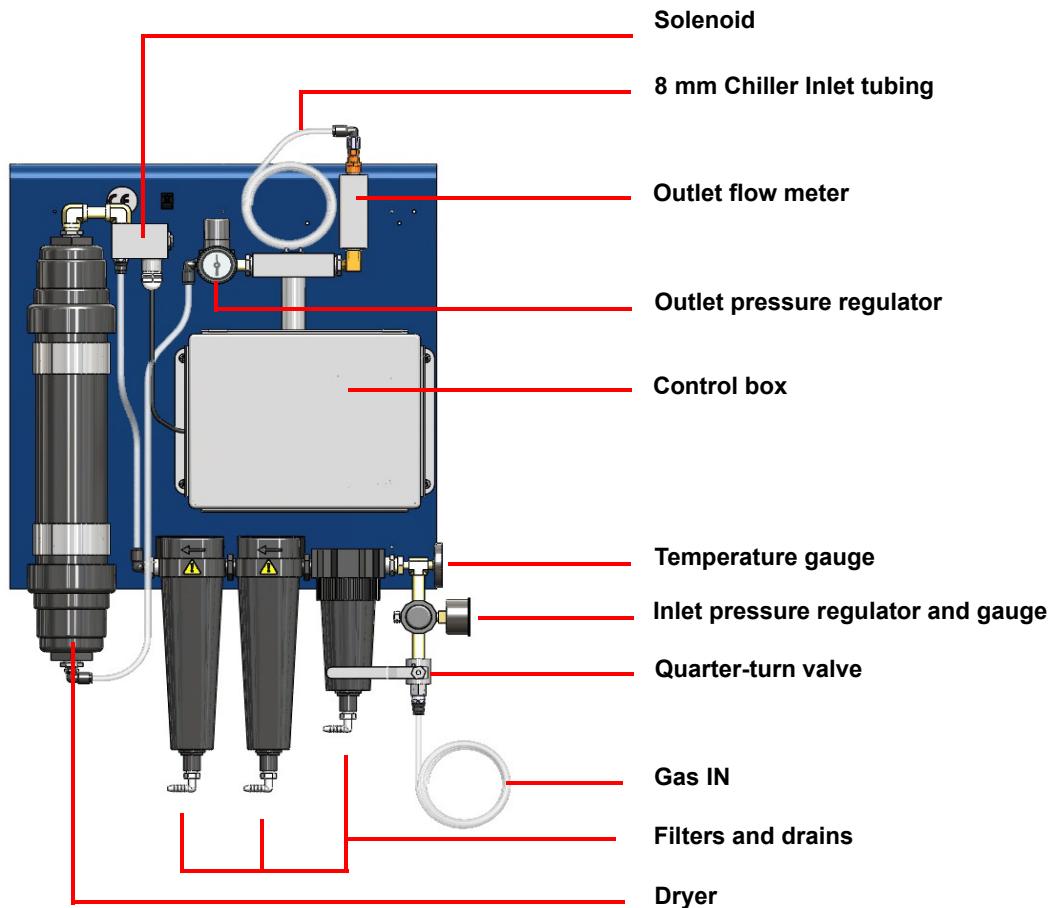
## ARES-G2/RSA-G2

To connect the ACS, access the rear panel of the ARES-G2/RSA-G2 and follow the instructions below:

**NOTE:** The FCO must already be installed on the ARES-G2/RSA-G2.

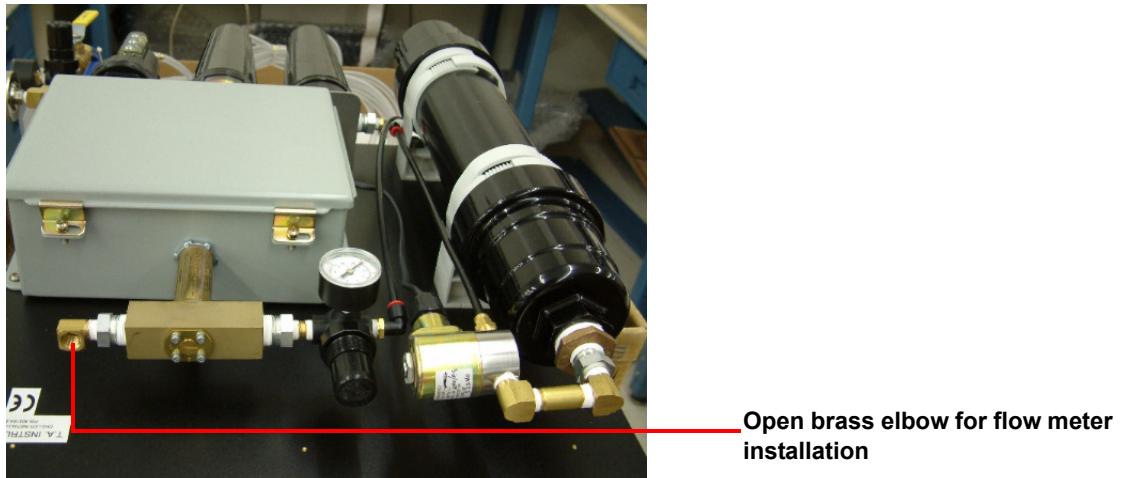


- 1 Place the Air Chiller with attached Chiller Panel next to the ARES-G2/RSA-G2.



**Figure 14** FCO Chiller Panel.

- 2** To protect from shipping damage the Chiller Panel is shipped without the flow meter attached. Obtain the flow meter (PN 603.03874) from the kit and install it on the open brass elbow at the top of the Chiller Panel. Do not overtighten.



**Figure 15** Brass elbow for flowmeter installation.

- 3** Install the 3/8-inch reducing elbow (PN 200387.001) on the Chiller inlet pipe.

- 4** Connect 8 mm tubing from the top of the flow meter to the air **INLET** port on the chiller.



**Figure 16** Flow meter (left) and air INLET port (right).

Verify that the gas supply meets the requirements listed in [Table 2](#).

**NOTE:** The correct flow of gas is set at the factory and no adjustment of the flow meter or pressure regulator is necessary. The pressure regulator is preset for 60 psi; the flow at 60 psi is approximately 60 scfm when the chiller is actively running.

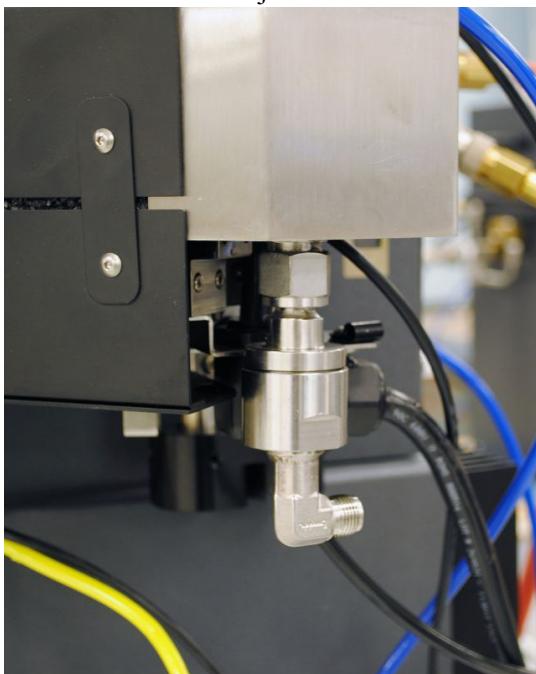
- 5** Install the transfer line:

- a** Remove the plug from beneath the FCO; this is where the swivel joint is installed.



**Figure 17** Plug to be removed.

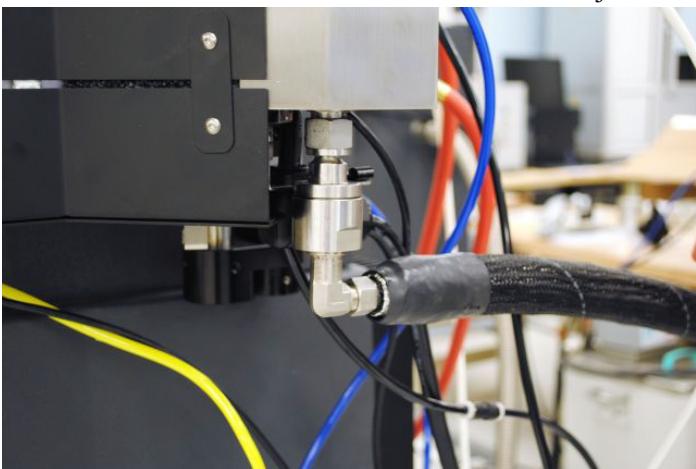
**b** Install the swivel joint onto the FCO.



**Figure 18** Swivel joint installed.

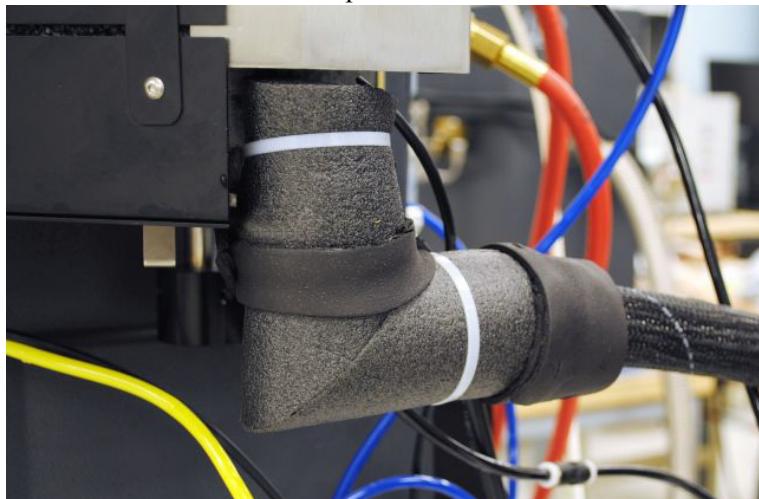
**NOTE:** If the oven is on the left side of the instrument, the swivel joint connects on top of the FCO.

**c** Connect the chiller transfer hose to the swivel joint.



**Figure 19** Transfer hose installed on swivel joint.

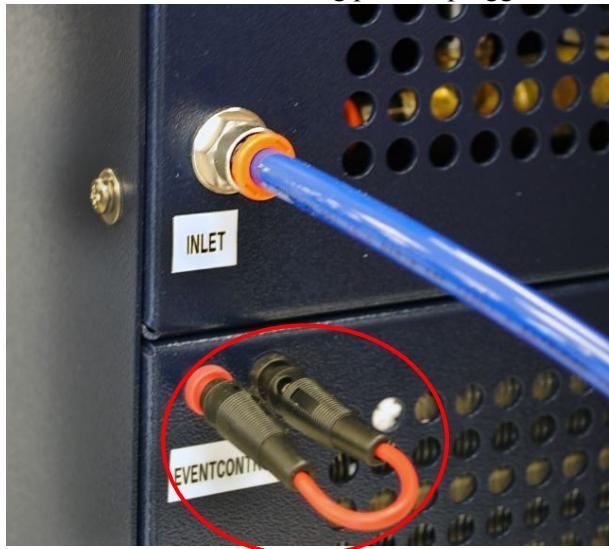
6 Fit insulation over the exposed FCO connection to minimize heat gains and frosting.



**Figure 20** Insulated FCO connection.

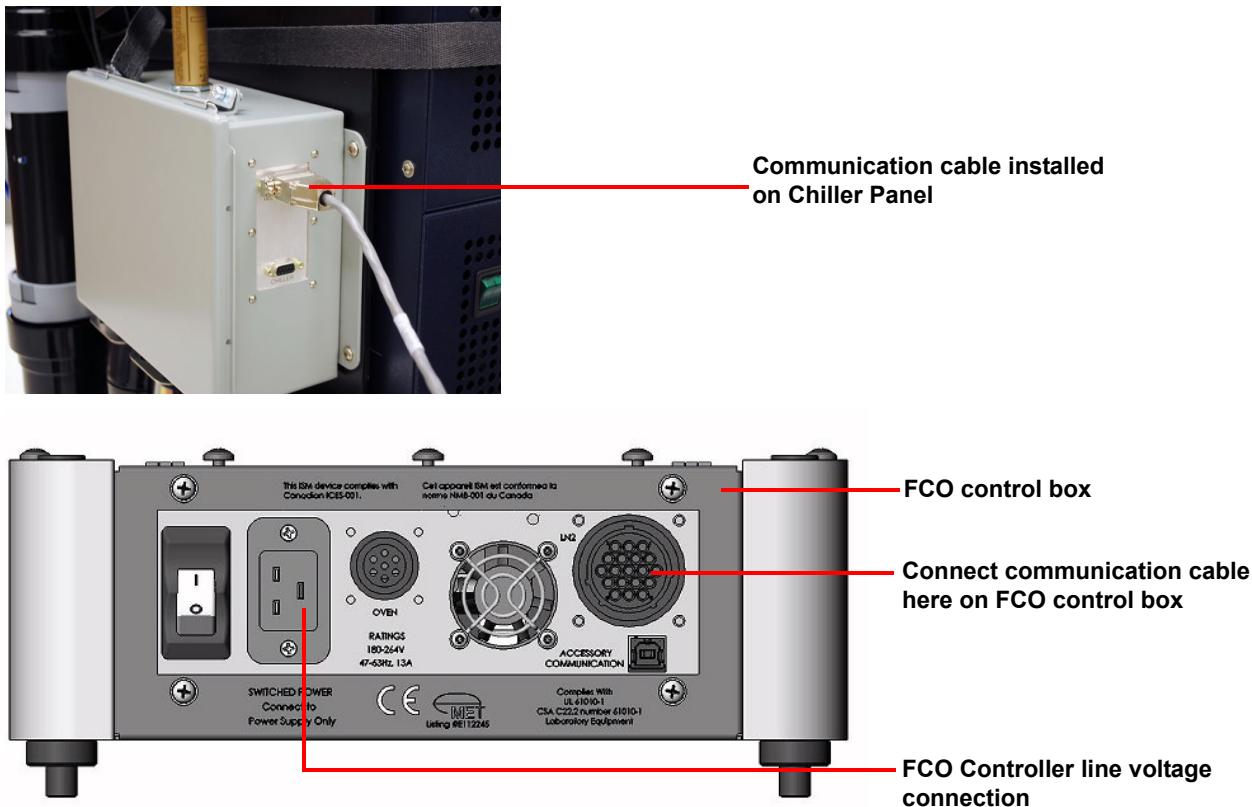
**NOTE:** External frosting only occurs when cold gas is flowing. If very lengthy experiments are being run, consider melting water that could become an issue once the test has been completed. A conditioning end of test step setting the temperature to ambient and the FCO Gas Source to **Enable air** or **Enable gas** is good practice for minimizing external frosting.

7 Confirm that the shorting piece is plugged into the **EVENT CONTROL** port on the back of the chiller.



**Figure 21** Shorting piece.

- Make sure the FCO control box is powered off, and then connect the communication cable from the Chiller Panel to the FCO control box. Turn the FCO control box on.



**Figure 22** Connecting the communication cable.

- Insert the power cable into the power port on the back of the chiller. Plug the cord into a wall outlet rated for the chiller.
- Turn on the Chiller. Wait 60 minutes before operating the system. The built-in timer will not allow flow through the ACS until all the stages have started. See [Internal Timer](#) for more information.

**WARNING: When the chiller is running and/or cold, it is important to keep the end of the transfer line horizontal. Do not allow the end of the transfer line to droop or hang downward while the chiller is running or when the transfer line is cold. This could allow coolant to clog the capillary tube, degrading the performance of the system. If it is suspected the capillary tube may be clogged due to mishandling, follow the instructions for Shutting Down the ACS found on page 41 of this document.**



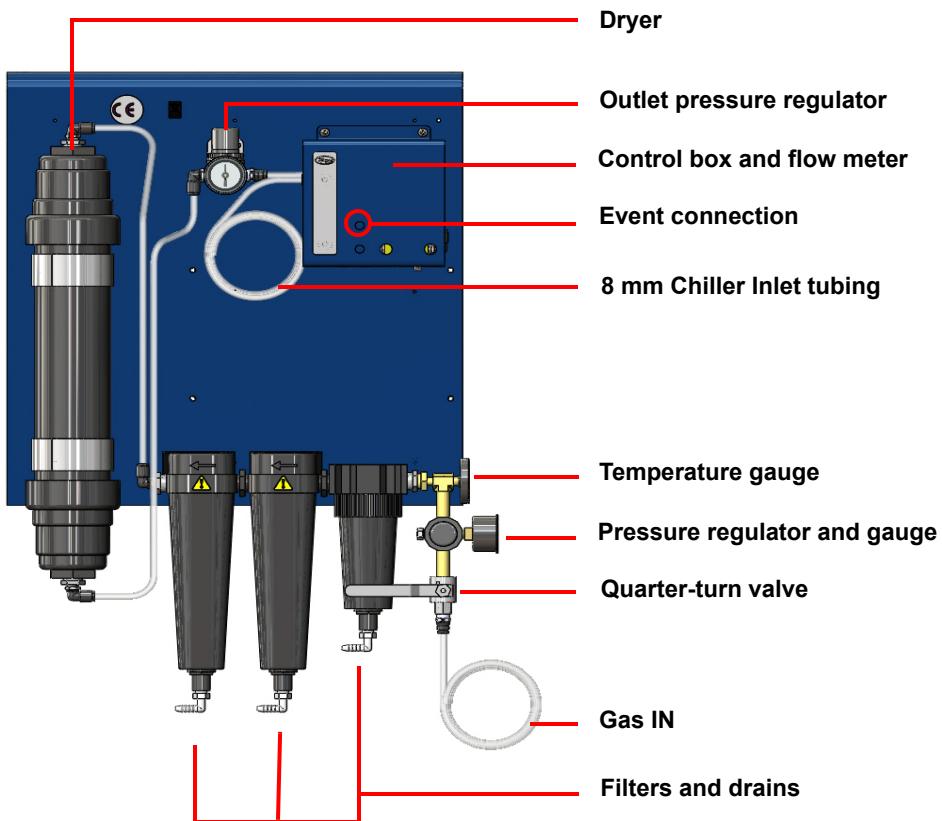
**AVERTISSEMENT:** Lorsque le refroidisseur est en cours d'exécution et / ou froid, il est important de maintenir horizontalement l'extrémité de la ligne de transfert. Ne laissez pas s'affaisser la fin de la ligne de transfert quand le refroidisseur est en marche ou lorsque la ligne de transfert est froid. Cela pourrait permettre à du liquide de refroidissement d'obstruer le tube capillaire, ce qui dégraderait les performances du système. Si vous suspectez que le tube capillaire peut être obstrué en raison de mauvaise manipulation, suivez les instructions à la page 41 de ce document pour arrêter l'ACS.

## DHR

To connect the ACS, access the rear panel of the DHR and follow the instructions below:

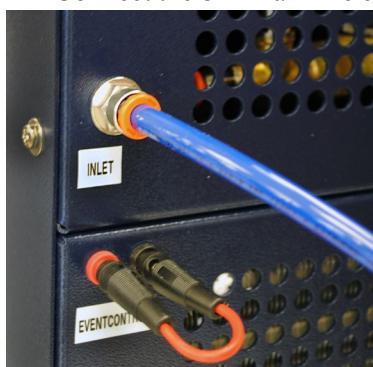
**NOTE:** The ETC must already be installed on the DHR. For installation instructions, refer to the ETC Getting Started Guide, which can be found in TRIOS Help.

- 1 Place the Air Chiller with attached Chiller Panel next to the DHR.



**Figure 23** ETC Chiller Panel.

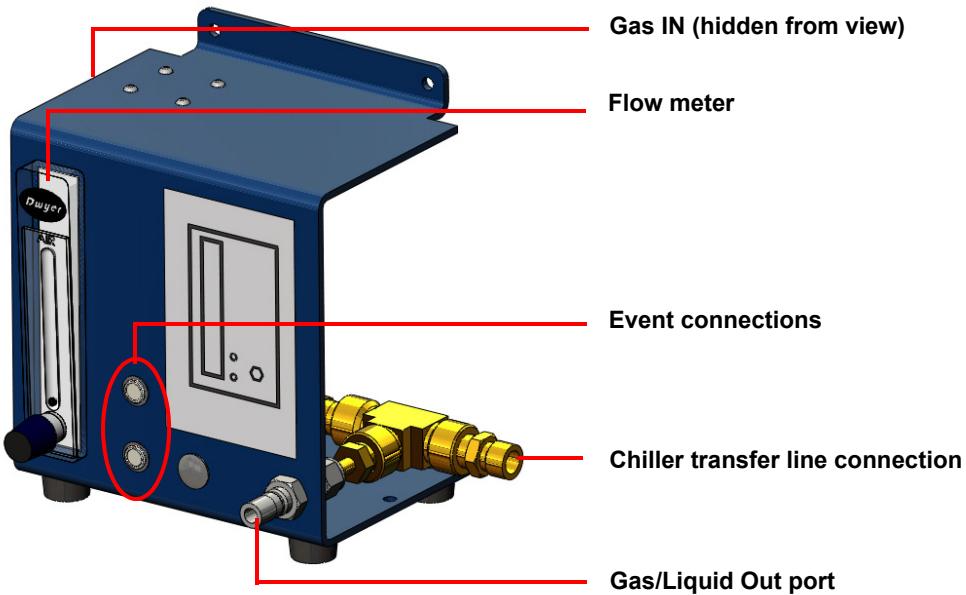
- 2 Connect the 8 mm air line exiting from the left side of the Control box to the **INLET** port on the chiller.



**Figure 24** INLET port.

**NOTE:** The outlet pressure regulator is factory set to 60 psi. When running at this pressure, the flow meter should indicate 60 L/min. Setting a lower pressure will reduce the flow rate and the minimum temperature.

- 3 Connect the 3 pin event cable from the Chiller Panel to the ETC manifold.



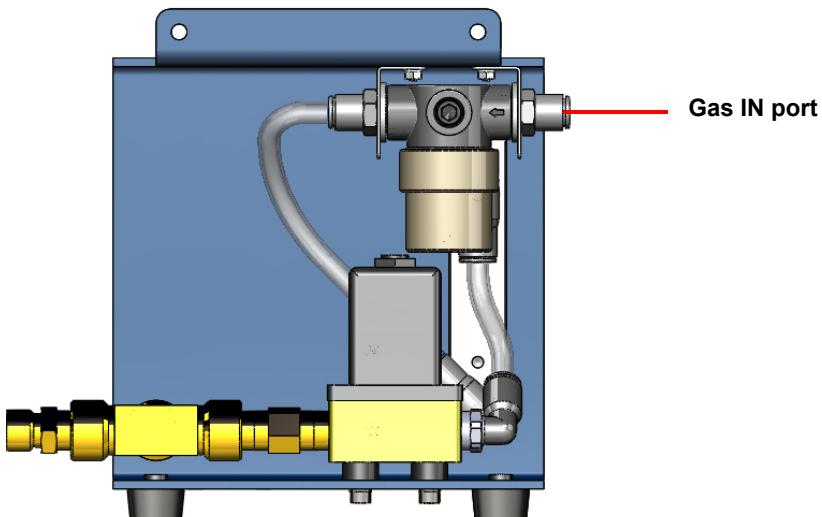
**Figure 25** ETC manifold.

- 4 Connect the 5 pin event cable from the ETC manifold to Event A on the rear of the Rheometer.
- 5 Connect the Chiller transfer hose to the ETC manifold. The ETC manifold is fitted with a straight 3/8" Swagelock fitting, but this can be replaced with an elbow (supplied with the accessory) if this aids in positioning the chiller.
- 6 Connect the short black insulated hose from the **Gas/Liquid Out** port on the manifold to the **Purge Gas** port on the ETC.



**Figure 26** ETC Purge Gas port.

- 7 Connect a gas feed to the **Gas IN** port of the ETC manifold using 8 mm tubing. If the main air supply is used as the feed gas, the line should be split upstream of the flow meter assembly and rheometer filter/regulator. An 8 mm 'Y'-piece is provided.



**Figure 27** Rear view of ETC manifold.

- 8 Set a flow rate of 10 L/min on the flow meter assembly. Make sure the oven is closed and **Purge Gas only** is selected in the TRIOS control panel. Once set, uncheck **Purge Gas only**.
- 9 Insulate all exposed cold connections to minimize heat gains and frosting.
- 10 Plug the shorting piece into the **EVENT CONTROL** port on the back of the chiller.



**Figure 28** Shorting piece.

- 11 Insert the power cable into the power port on the back of the chiller. Plug the cord into a wall outlet rated for the chiller.
- 12 Turn on the Chiller. Wait 60 minutes before operating the system. The built-in timer will not allow flow through the ACS until all the stages have started. See [Internal Timer](#) for more information.

**NOTE:** External frosting only occurs when cold gas is flowing. If very lengthy experiments are being run, consider melting water that could become an issue once the test has been completed. A conditioning end of test step setting the temperature to ambient and a conditioning options step to set **Gas Purge Only** is good practice for minimizing external frosting.



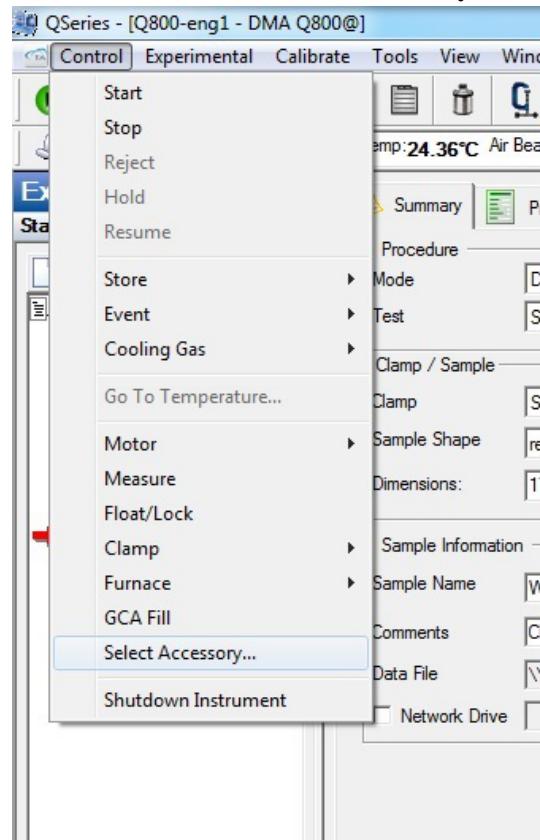
**WARNING:** When the chiller is running and/or cold, it is important to keep the end of the transfer line horizontal. Do not allow the end of the transfer line to droop or hang downward while the chiller is running or when the transfer line is cold. This could allow coolant to clog the capillary tube, degrading the performance of the system. If it is suspected the capillary tube may be clogged due to mishandling, follow the instructions for Shutting Down the ACS found on page 41 of this document.

**AVERTISSEMENT:** Lorsque le refroidisseur est en cours d'exécution et / ou froid, il est important de maintenir horizontalement l'extrémité de la ligne de transfert. Ne laissez pas s'affaisser la fin de la ligne de transfert quand le refroidisseur est en marche ou lorsque la ligne de transfert est froid. Cela pourrait permettre à du liquide de refroidissement d'obstruer le tube capillaire, ce qui dégraderait les performances du système. Si vous suspectez que le tube capillaire peut être obstrué en raison de mauvaise manipulation, suivez les instructions à la page 41 de ce document pour arrêter l'ACS.

# *Setting up the ACS Accessory using Instrument Control Software (Q800 DMA Only)*

After successfully installing the ACS Accessory, access the DMA Thermal Advantage Software and follow the instructions below.

## **1 Select Control > Select Accessory**



**Figure 29** Select Accessory.

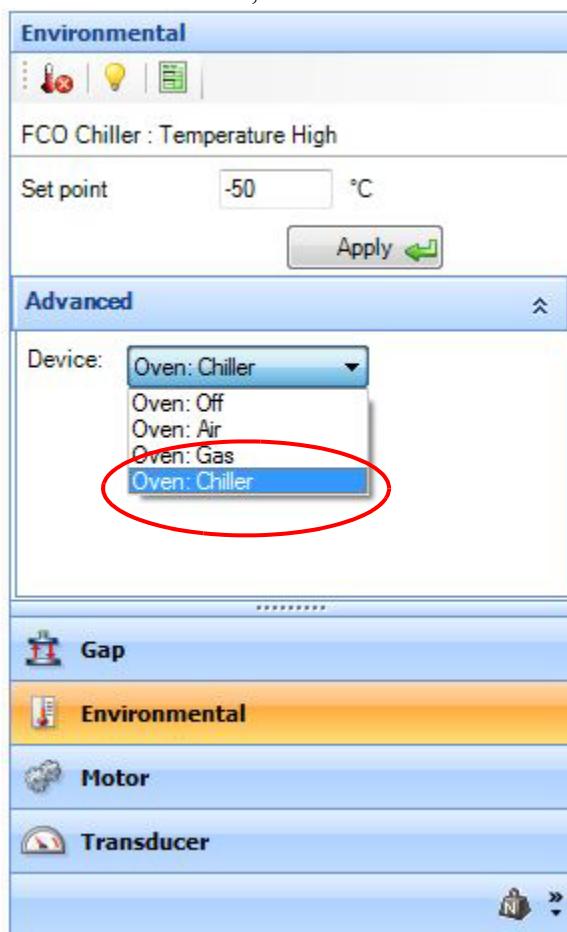
## **2 In the DMA Cooler Selection dialog box, select ACS-2 or ACS-3.**



**Figure 30** Select your ACS chiller.

## *Setting Up the ACS Accessory using TRIOS (ARES-G2/ RSA-G2 only)*

For use with the FCO, select **Chiller** in the TRIOS Environmental Control panel. Refer to Online Help.



## *Installing the ACS Clamp Screen (Q800 DMA only)*

**NOTE:** It is important to use the included ACS Clamp Screen found in the kit when using either the ACS-2 or ACS-3. The screen helps maintain a uniform temperature around the sample and thermocouple, allowing for more accurate temperature readings of the sample.



**Figure 31** Clamp Screens (left); Screen installed (right).

After mounting the sample, slide the appropriate ACS Clamp Screen over the clamp.

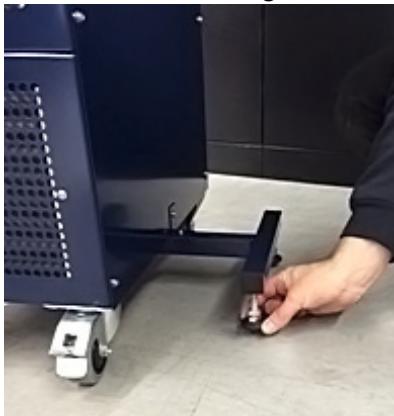


**WARNING: The metal band on the ACS Clamp Screen is made of aluminum. The upper temperature of the Q800 with ACS is limited to 400°C, and the Instrument Control Software will not allow a temperature higher than 400°C when the ACS is the chosen accessory. It is vitally important not to request a temperature higher than 400°C at any time when the ACS Clamp Screen is installed. Major damage to the Q800 can occur if the furnace is commanded to go above 400°C when an ACS Clamp Screen is installed.**

**AVERTISSEMENT: L'échangeur de chaleur de l'ACS est en aluminium. La température maximale du Q800 avec l'ACS est donc limitée à 400 ° C et le logiciel de contrôle d'instruments n'autorise pas une température supérieure à 400 ° C lorsque l'ACS est l'accessoire choisi. Il est extrêmement important de ne pas demander une température supérieure à 400 ° C à tout moment lorsque l'ACS est installé . Des dommages importants au Q800 peuvent se produire si le four est programmé pour aller au-dessus de 400 ° C quand un ACS est installé.**

## *Adjusting the Anti-Tilt Bar Feet*

Adjust the anti-tilt bar feet until they touch the floor. Slide the 17 mm nut on the bottom of each foot to the top of the foot, and then tighten the nut using a 17 mm wrench or an adjustable wrench.



**Figure 32** Adjust the feet on the anti-tilt bar.



**Figure 33** Anti-tilt bar installed.

# *Chapter 3:*

## Use and Maintenance

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### *Using the Air Chiller System Accessory*

All of your ACS Accessory experiments will follow the same general outline. In some cases, not all of these steps will be performed. The majority of these steps are performed using the instrument control software. See the instrument control online help for instructions on performing these actions.

- Selecting and preparing the sample
- Creating or choosing a test procedure and entering experiment information through the TA Instruments instrument control software
- Loading the prepared sample
- Starting the experiment

### **Before You Begin**

Before using the ACS Accessory, ensure that the instrument is installed properly. Also make sure you have:

- Connected the ACS
- Powered on the instrument
- Specified the ACS in the instrument control software, if required (see [Chapter 2](#))
- Become familiar with controller operations

## *Starting the ACS*

**NOTE:** Do not turn off the unit and immediately turn it back on. After the compressor has shut down, allow five minutes for the internal pressures to equalize before restarting the unit.

- 1 Adjust the Bypass valve flow rate: Open the valve by turning the manual knob on the back of the ACS until the desired flow rate is achieved—typically this valve will be opened fully. Allow the dry gas to purge through the ACS for 10–15 minutes before powering on the ACS. This will ensure that the ACS internal tubing is free of moisture, which, if present, could freeze when the ACS is turned on.



**Figure 38** Bypass valve.

**NOTE:** This is only for drying the internal tubing of the ACS before and after use. The bypass purge will be turned off automatically when the ACS is powered on and will turn on automatically when the ACS is powered off. See “[Shutting Down the ACS-Q800 DMA](#)” or “[Shutting Down the ACS-ARES-G2/RSA-G2 FCO and DHR ETC](#)” for more information.

- 2 Turn the power switch on the front of the Air Chiller to the **On** position.

**NOTE:** Before turning the unit on for the first time, make sure it has been in an upright position for more than 24 hours.

**NOTE:** Run the ACS for 60 minutes before beginning your experiment. The built-in timer will not allow flow through the ACS until all the stages have started. See [Internal Timer](#) for more information.

**NOTE:** It is important to power off the ACS occasionally and purge with dry gas for a period of time, typically over-night. This prevents build-up of frost inside the ACS, which can slowly degrade the performance of the chiller. It is recommended to power off the chiller approximately every 2 weeks when the ACS is used continually.



**WARNING:** When the chiller is running and/or cold, it is important to keep the end of the transfer line horizontal. Do not allow the end of the transfer line to droop or hang downward while the chiller is running or when the transfer line is cold. This could allow coolant to clog the capillary tube, degrading the performance of the system. If it is suspected the capillary tube may be clogged due to mishandling, follow the instructions for Shutting Down the ACS found on page 41 of this document.

**AVERTISSEMENT:** Lorsque le refroidisseur est en cours d'exécution et / ou froid, il est important de maintenir horizontalement l'extrémité de la ligne de transfert. Ne laissez pas s'affaisser la fin de la ligne de transfert quand le refroidisseur est en marche ou lorsque la ligne de transfert est froid. Cela pourrait permettre à du liquide de refroidissement d'obstruer le tube capillaire, ce qui dégraderait les performances du système. Si vous suspectez que le tube capillaire peut être obstrué en raison de mauvaise manipulation, suivez les instructions à la page 41 de ce document pour arrêter l'ACS.

## *Shutting Down the ACS–Q800 DMA*

- 1 Turn the power switch on the front of the Air Chiller to the **Off** position.

**NOTE:** It is important to power off the ACS occasionally and purge with dry gas for a period of time, typically over-night. This prevents build-up of frost inside the ACS, which can slowly degrade the performance of the chiller. It is recommended to power off the chiller approximately every 2 weeks when the ACS is used continually.

**NOTE:** The ACS is equipped with a normally open solenoid valve that purges the chiller with dry gas when turned off. This is to help prevent frosting within the ACS while it is still cold. It is best to leave the purge gas on for a period of time to allow the ACS to come up to room temperature.

**NOTE:** Do not turn off the unit and immediately turn it back on. After the compressor has shut down, allow five minutes for the internal pressures to equalize before restarting the unit.

**CAUTION: Do not move the flexible line when it is cold, always warm the system to ambient (+20°C) before making any adjustments to the placement of the delivery line.**

**MISE EN GARDE:** Ne pas déplacer la ligne flexible quand il fait froid, toujours réchauffer le système à la température ambiante (20°C) avant de faire des ajustements à la placement de la ligne de livraison.

## *Shutting Down the ACS–ARES-G2/RSA-G2 FCO and DHR ETC*

- 1 Turn the power switch on the front of the Air Chiller to the **Off** position.

**NOTE:** It is important to power off the ACS occasionally and purge with dry gas for a period of time, typically over-night. This prevents build-up of frost inside the ACS, which can slowly degrade the performance of the chiller. It is recommended to power off the chiller approximately every 2 weeks when the ACS is used continually.

**NOTE:** The ACS is quipped with a normally open solenoid valve that purges the chiller with dry gas when turned off. This is to help prevent frosting within the ACS while it is still cold. It is best to leave the purge gas on for a minimum of 2 hours (although overnight is preferred) to allow the ACS to come up to room temperature.

**NOTE:** Do not turn off the unit and immediately turn it back on. After the compressor has shut down, allow five minutes for the internal pressures to equalize before restarting the unit.

- 2 Enter a temperature of 10°C in the control software and leave the oven closed so as to ensure a flow of dry gas through the system until the unit warms to prevent internal frosting. Check the flow meter on the Chiller Panel to ensure there is flow through the system. The oven doors can be opened and the gas turned off when the measured temperature reaches ambient or later. It is recommended that the gas be left flowing, if possible, so that any built-up moisture can be forced out through the flexible line.

# Maintaining the Accessory

The primary maintenance procedures described in this section are the customer's responsibility. Any further maintenance should be performed by a representative of TA Instruments or other qualified service personnel.

## Changing the Filter Cartridges

The cartridges in each filter should be replaced every 12 months or when the pointer in the central filter is in the red CHANGE section- whichever occurs first.

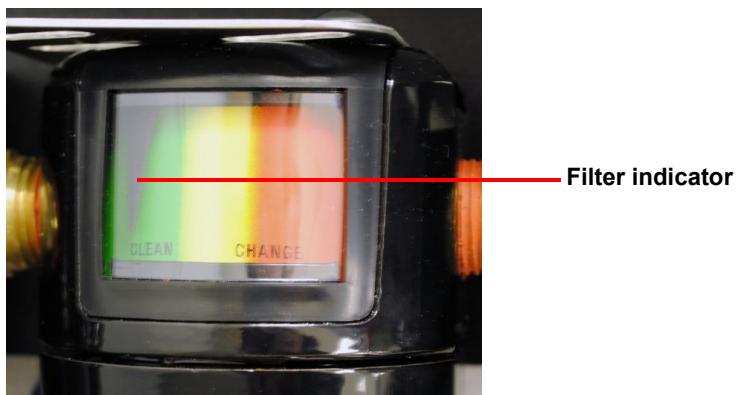


Figure 39 Filter indicator showing CLEAN.

## Cleaning the Accessory

To clean the ACS Accessory, wipe down the exterior of the chiller with a damp, soft cloth.

**CAUTION: Do not use harsh chemicals, abrasive cleansers, steel wool, or any rough materials to clean the cabinet, as you may scratch the surface and degrade its properties.**

**MISE EN GARDE: N'utilisez pas de produits chimiques agressifs, de nettoyants abrasifs, de la laine d'acier ou tout autre matériau rugueux pour nettoyer l'armoire [écran tactile], car vous pourriez égratigner sa surface et dégrader ses propriétés.**

**NOTE:** It is important to power off the ACS occasionally and purge with dry gas for a period of time, typically over-night. This prevents build-up of frost inside the ACS, which can slowly degrade the performance of the chiller. It is recommended to power off the chiller approximately every 2 weeks when the ACS is used continually.

## Troubleshooting

Issue	Reason	Action
Compressor shuts OFF and then turns itself back on in 3-4 minutes	Low voltage  High ambient temperature  Dirty or blocked condenser fins  Fan out of order	Check the voltage on the unit while it is underload. The voltage must be within 5% of the voltage listed on the serial tag on the back of the unit.  Check room temperature and compare with the Ambient Air Requirement listed in Installation. Take steps to reduce this temperature if it is too high.  Clean condenser  Check for operation of fan (you can feel the air being drawn across the condenser). If it isn't working, contact TA Instruments.
Compressor fails to restart after it has been shut off	High pressure/temperature in the refrigeration system	Wait five minutes and try starting the unit again.
Gradual loss of temperature	Frost build-up inside ACS  Dirty or blocked condenser fins  High ambient temperature  Loss of refrigerants	Power down the ACS (see page 41) and purge with dry gas overnight.  Clean the condenser fins.  Check room temperature and compare with the Ambient Air Requirement listed in installation. Take steps to reduce this temperature if it is too high.  Call TA Instruments.

## *Replacement Parts*

**Table 6: Q800 DMA Chiller and Chiller Panel Replacement Parts**

613.06190	Air Regulator Type R07
200750.001	Cinching strap 8 ft. long
578050.001	Tubing 8 mm OD x 6 mm ID
986301.901	Chiller Panel Filter Replacement Pack (BX filter, DX filter, Element filter)
986300.901	Q800 DMA Chiller Panel
985730.901	Clamp Screen Kit DMA ACS

**Table 7: DHR Chiller and Chiller Panel Replacement Parts**

552796.001	3 Pin Liquid Cable
552795.001	5 Pin Event A
578036.001	Small insulated line
613.04787	1/4 turn ball valve
613.06190	Air Regulator Type R07
200750.001	Cinching strap 8 ft. long
578050.001	Tubing 8 mm OD x 6 mm ID
986301.901	Chiller Panel Filter Replacement Pack (BX filter, DX filter, Element filter)
404040.901	DHR ETC Chiller Panel

**Table 8: ARES-G2/RSA-G2 Chiller and Chiller Panel Replacement Parts**

613.06190	Air Regulator Type R07
200750.001	Cinching strap 8 ft. long
578050.001	Tubing 8 mm OD x 6 mm ID
986301.901	Chiller Panel Filter Replacement Pack (BX filter, DX filter, Element filter)
404041.901	ARES-G2/RSA-G2 FCO Chiller Panel