

# Model 9210

## Multichannel Lock-in Amplifier

### Quick Start Guide

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## Introduction

This guide gives instructions for quickly setting up the **SIGNAL RECOVERY** Model 9210 Precision Lock-in Amplifier and a procedure to verify that it has arrived in good order with no shipping damage.

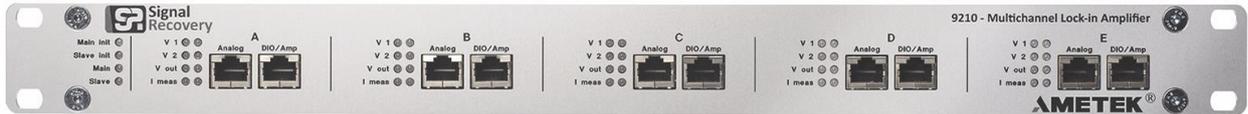


Figure 1, Model 9210 Lock-in Amplifier

## Procedure – Hardware Setup

- 1) After unpacking the box(es), check that you have the following items:
  - Model 9210 Lock-in Amplifier
  - Multi Country Line Power Cord
  - USB Memory Stick
- 2) Check the model 9210 for shipping damage. If any is noted, **SIGNAL RECOVERY** should be notified immediately and a claim filed with the carrier. The shipping container should be saved for inspection by the carrier.
- 3) Check that the power switch on the rear of the model 9210 is set to the “Off” position (O side pressed in).
- 4) Select the correct plug to suit the line power receptacle in your location and use the IEC power cord to connect this plug to the power inlet socket on the rear of the model 9210. The instrument uses a universal power supply so unlike some other **SIGNAL RECOVERY** models there is no need to adjust a line voltage setting or change a fuse.
- 5) Plug in the line power cord and turn on the model 9210’s power switch. The red **Main** LED on the front panel should light, followed other LEDs as the instrument performs a self-check routine. The internal cooling fan should also be heard to operate.

## Procedure – Software Setup

The supplied USB memory stick includes the MCL (multichannel lock in) application software, the LabVIEW driver, and the product manual in PDF format. To install the software, proceed as follows.

- 1) Plug the USB stick into a PC running Windows 7 or later, and use File Explorer to navigate to the folder (figure 2):

SR9210\Application\Full Installer

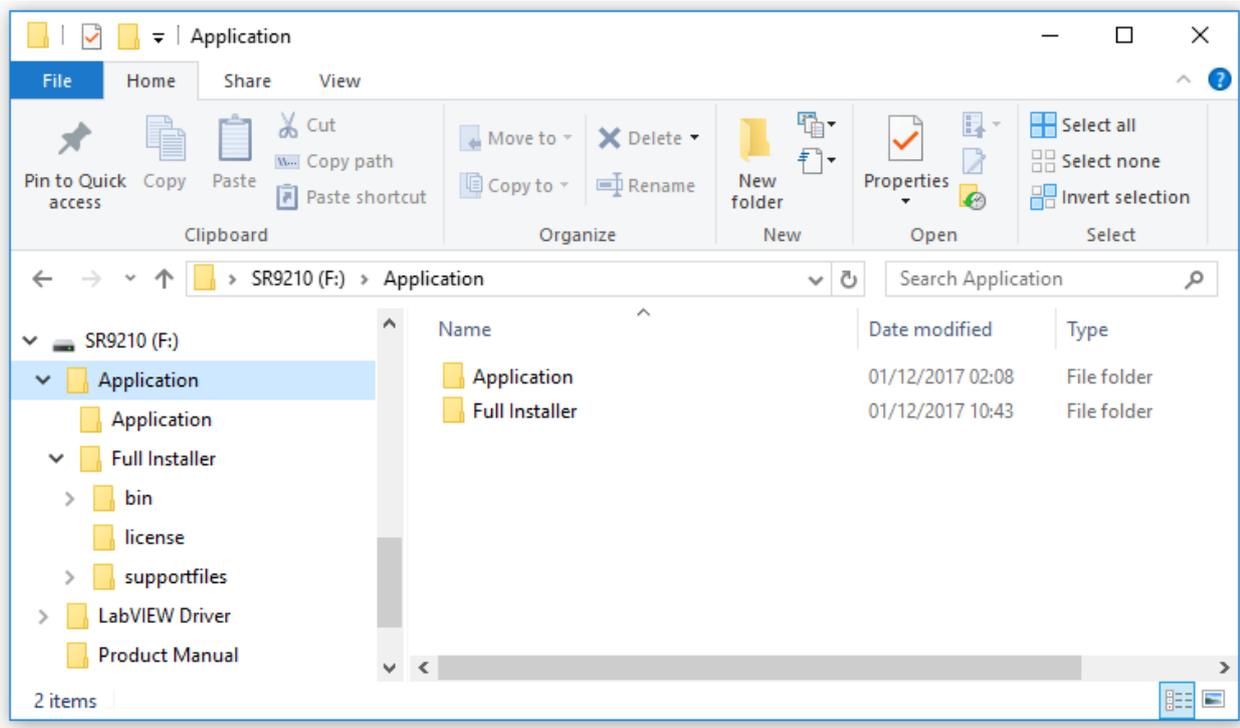


Figure 2, USB Memory Stick Contents

- 2) Double click the **Setup.exe** file to start the MCL software installation.
- 3) After accepting a warning indicating the software is signed by AMETEK, Inc (the parent company of **SIGNAL RECOVERY**), the installation program will start, as shown in figure 3 below.

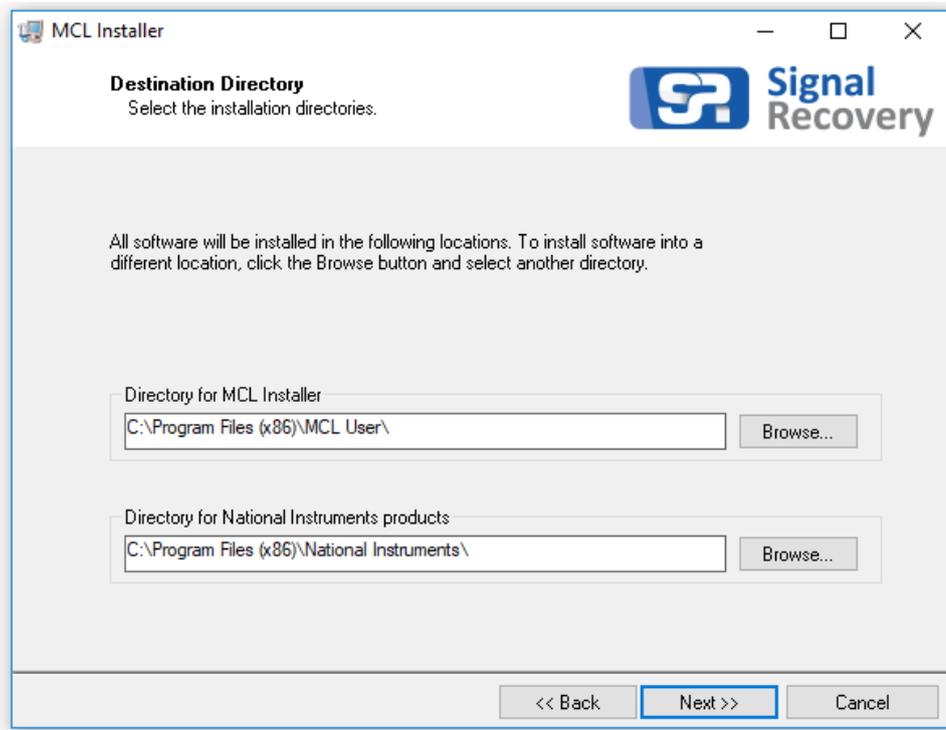


Figure 3, MCL Software Installation Program

- 4) Follow the prompts until the software is installed. On completion, the MCL icon (figure 4) will be placed on the desktop.



Figure 4, MCL Software Shortcut Icon

## Initial Checks

The following procedure checks the performance of the model 9210. In general, this procedure should be carried out after inspecting the instrument for obvious shipping damage.

**NOTE:** Any damage must be reported to the carrier and to **SIGNAL RECOVERY** immediately. In addition the shipping container must be retained for inspection by the carrier.

Note that this procedure is intended to demonstrate that the instrument has arrived in good working order, not that it meets specifications. Each instrument receives a careful and thorough checkout before leaving the factory, and normally, if no shipping damage has occurred, will perform within the limits of the published specifications. If any problems are encountered in carrying out these checks, contact **SIGNAL RECOVERY** or the nearest authorized representative for assistance.

## Procedure

It is first necessary to connect the 9210 to the computer on which the MCL software has been installed. This can be done in one of two ways, using either an Ethernet or USB connection. Use whichever is more convenient in your situation.

*Either*

- 1) Plug one end of a USB A-B cable into the connector marked **Main** on the rear panel of the model 9210, and plug the other end into a free USB port on the computer. The MCL software installation program automatically installs any required drivers so there is no need to do this manually.

*or*

- 2) Plug an Ethernet cable which is connected to a network with a DHCP server on it into the RG45 socket marked **Main** on the rear panel of the model 9210. The DHCP server will automatically allocate an IP address to the model 9210, allowing it to be controlled by any computer that is also connected to the same network within the same subnet mask.

Then:

- 3) Start the MCL software by double clicking the desktop shortcut icon. You may receive a Windows firewall warning message – you must allow the program to access the network as otherwise it will not be able to communicate with the model 9210.
- 4) When the program loads it will search for compatible hardware and display the main screen, as shown below in figure 5. The System Configuration section of the display shows the hardware that is found; in the screen below (figure 5) the unit has one signal processing board fitted in position A.

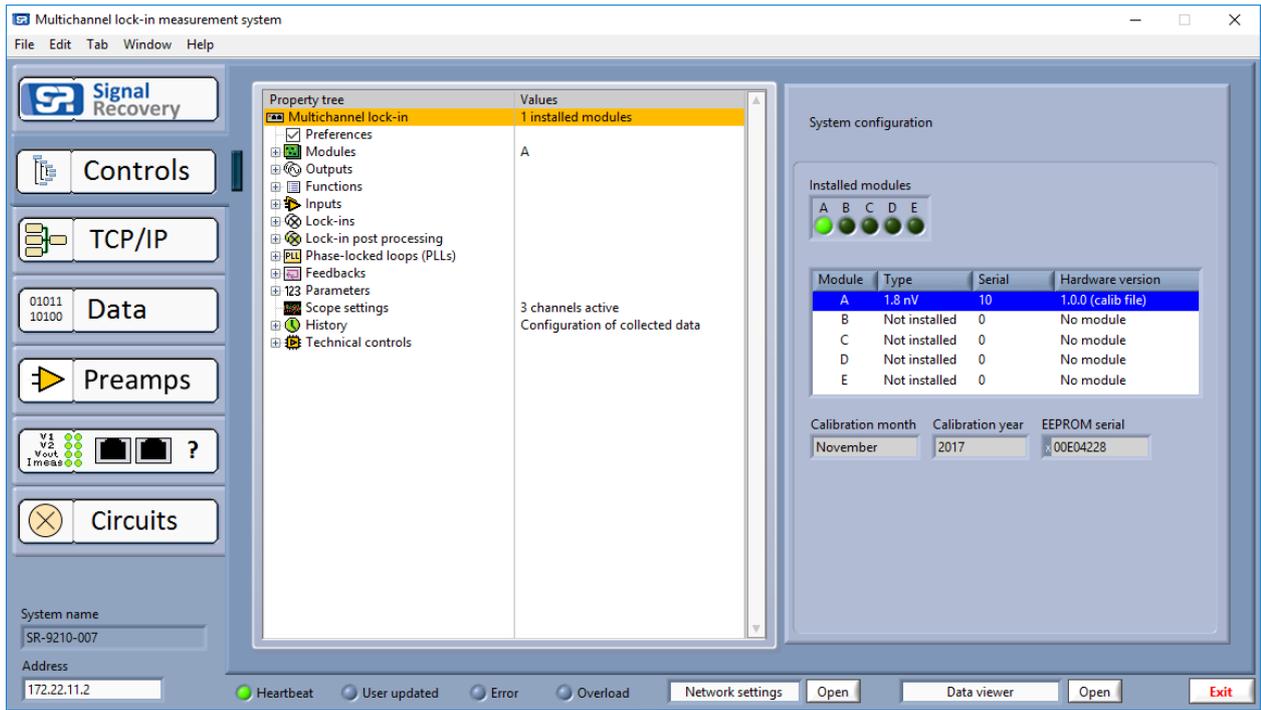


Figure 5, MCL Software Main Display

- The initial test procedure works by using a simple fixture consisting of a 1 kΩ resistor which is driven by the 9210’s oscillator output, while the two voltage inputs measure the resulting voltage and the current monitoring stage measures the output current. The schematic of the fixture is as shown below in figure 6.

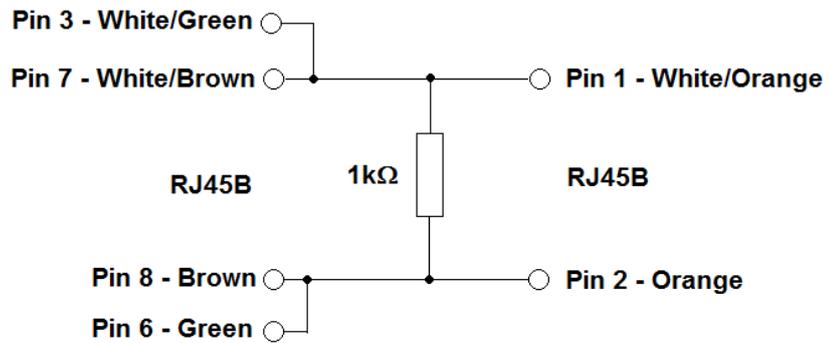


Figure 6, Model 9120 Test Fixture

- Plug the fixture into the 9210’s front panel **A Analog** RJ45 connector, as shown below in figure 7.



Figure 7, Model 9120 Test Fixture Connected to Module A Analog Input

- 7) In the software, select the **Signal Recovery** tab and then use the **Config/View** control to select the **Output** display. Set the controls to 1000 Hz, 1 V rms output, output enabled, and auto-range current measurement, as shown in figure 8, below.

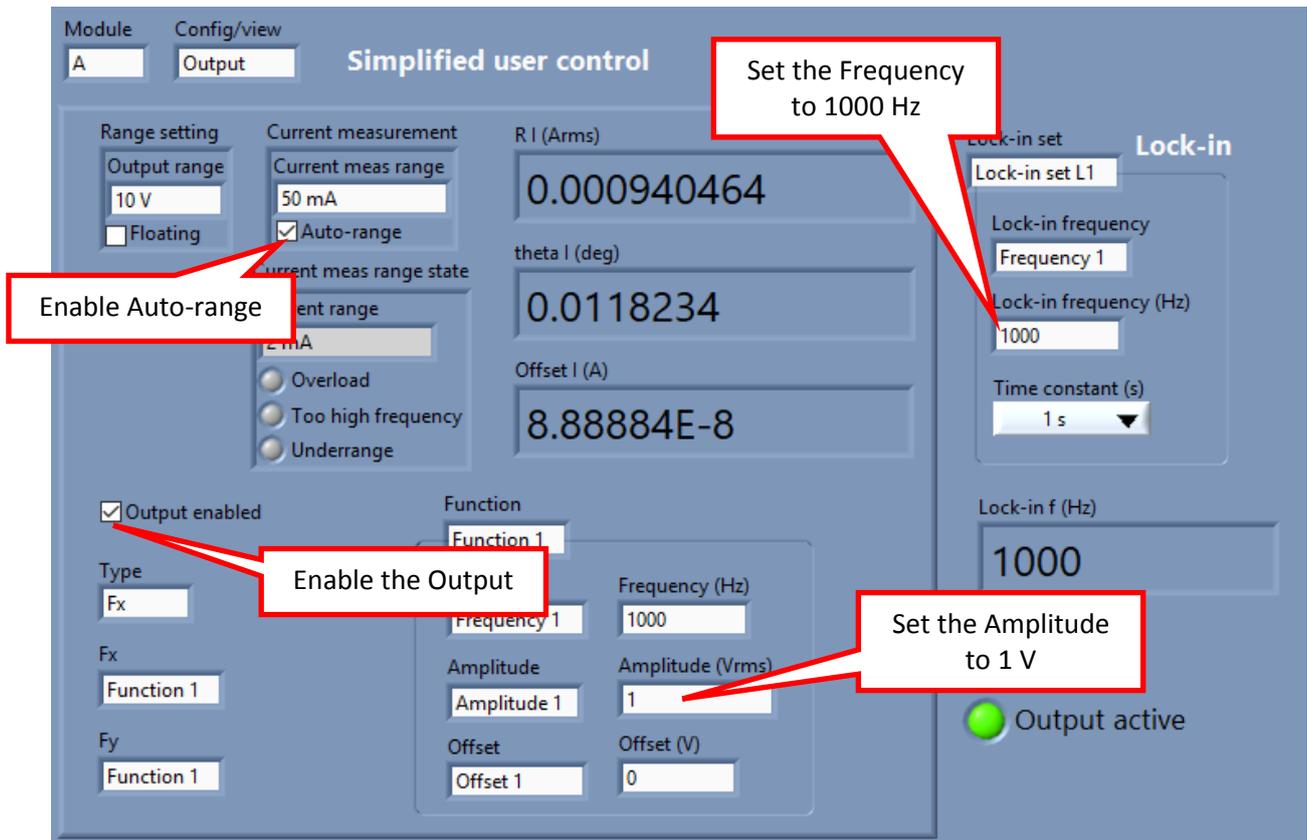


Figure 8, MCL Software Output Control Display

- 8) Use the **Config/View** control to select the **Input V1** display (figure 9), and check the **AC Coupling** control, uncheck the **GND** controls, and check the **Auto-range** control.

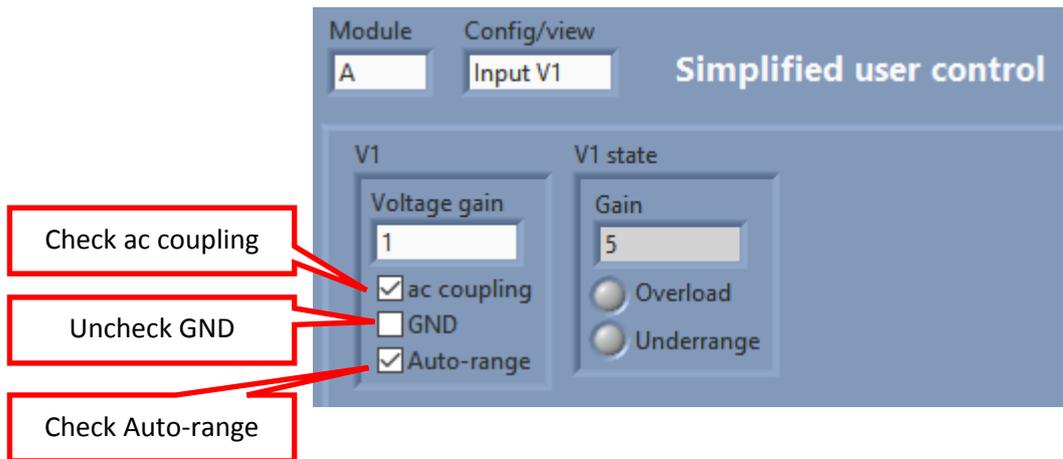


Figure 9, MCL Software Input V1 Control Display

- 9) Use the **Config/View** control to select the **Input V2** display (figure 10), and check the **AC Coupling** control, uncheck the **GND** controls, and check the **Auto-range** control.

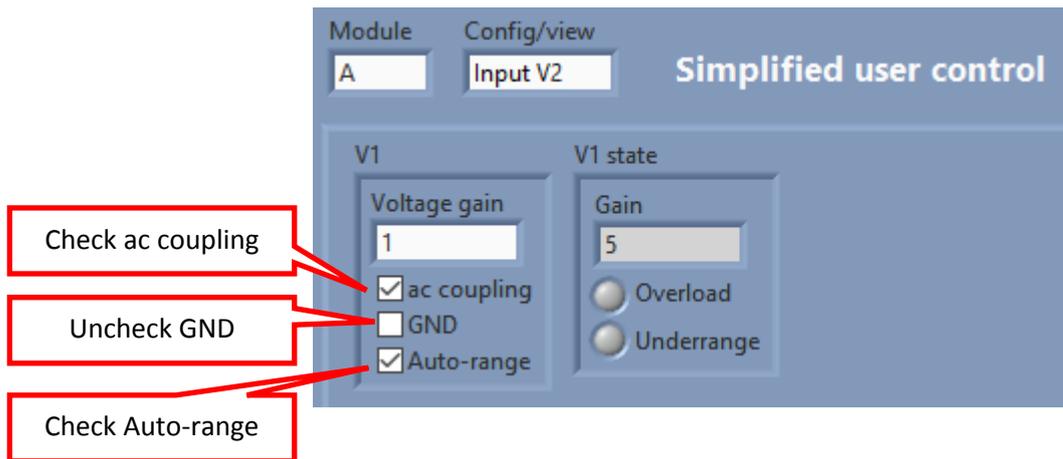


Figure 10, MCL Software Input V2 Control Display

- 10) The instrument is now generating a 1000 Hz sinewave of 1 V rms which in turn will result in a current of nominally 1 mA through the 1 kΩ resistor of the test fixture. Both the Input V1 and Input V2 inputs are measuring the actual voltage present across the resistor, while the current measuring stage of the oscillator output is measuring the actual current being supplied.
- 11) On the meter section of the **Input V2** display, record the measured magnitude, which should be close to 1.0 V rms, and the phase, which should be close to zero degrees.

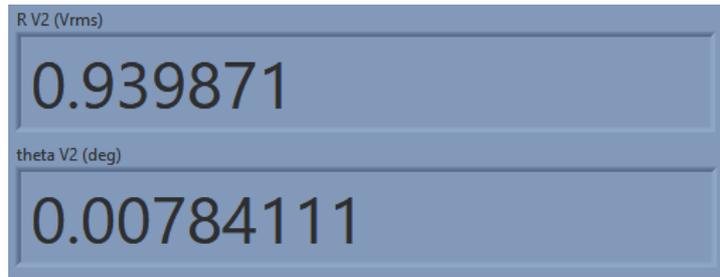


Figure 11, MCL Software Input V2 Meter Display

In the example above the voltage is 0.94 V rms (to 2 significant figures). This will result in a current of 0.94 mA rms in the 1 k $\Omega$  test resistance.

- 12) Use the **Config/View** control to select the **Output** display, and in the meter section check that the measured current is that calculated as above, with a phase close to zero degrees.

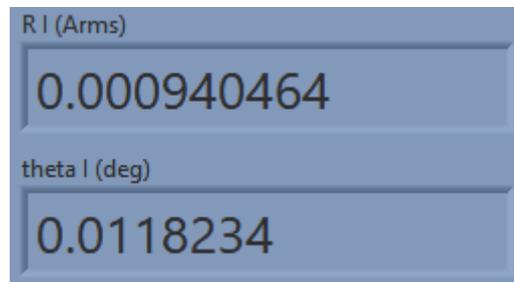


Figure 12, MCL Software Output Meter Display

- 13) Finally, use the **Config/View** control to select the **Input V1** display and verify that the measured magnitude and phase match that shown on the **Input V2** display and recorded earlier, to within  $\pm 1\%$  and  $\pm 0.5^\circ$

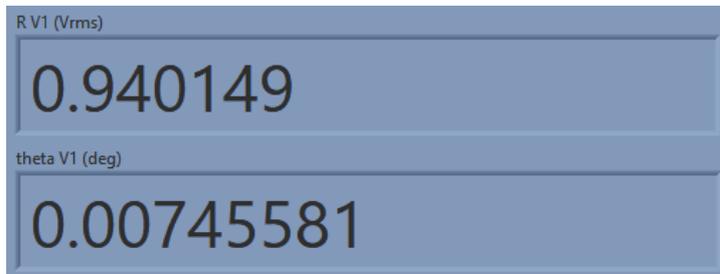


Figure 13, MCL Software Input V1 Meter Display

- 14) If the model 9210 is fitted with more than one signal processing board (i.e. in slots **B**, **C**, **D** and/or **E**) then repeat the above tests for each slot after first plugging the test fixture into the slot being checked.

This completes the initial checks. The procedure leaves many functions untested, but if the indicated results were obtained then the user can be reasonably sure that the unit incurred no hidden damage in shipment and is in good working order.

## **SIGNAL RECOVERY**

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**SIGNAL RECOVERY** is part of **AMETEK** Advanced Measurement Technology, Inc

801 SOUTH ILLINOIS AVENUE  
OAK RIDGE  
TN 37831-2011  
USA

Phone: +1 865 483 2121  
Fax: +1 865 483 2410

5 ASHVILLE WAY  
MOLLY MILLARS LANE  
WOKINGHAM, BERKS RG41 2PL  
UNITED KINGDOM

Phone: +44 (0) 1252 556 800  
Fax: +44 (0) 1252 556 899

E-mail: [si.info@ametek.com](mailto:si.info@ametek.com)

Web Site: [www.ameteks.com](http://www.ameteks.com)