



Reference Manual
Compact Signal Calibrator
AMETEK JOFRA CSC200

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temperature
pressure
signal
software



1. Introduction

The Ametek Jofra CSC200 is designed to calibrate a wide range of thermocouple and RTD devices. It can source or measure up to 14 different thermocouple (TC) types (including millivolts) and up to 17 RTD types (including ohms). A unique digital "knob" along with selectable decade controls allows quick and easy adjustment of the desired output. The user can also store up to 3 setpoints for any output range for quick recall. Setpoints are stored in non-volatile memory and will remain until new setpoints are stored.

1.1 Contacting Ametek

US, Canada, Latin America
Europe, Africa, Middle East
Asia

AMETEK TCI at **1-800-527-9999**
AMETEK Denmark A/S at + 45 4816 8000
AMETEK Singapore Pte. Ltd. at
+ 65 (64) 842 388

1.2 Standard Equipment

Inspect the unit carefully upon receipt. Save packing carton in case re-shipment is necessary. If there appears to be any damage, equipment missing or if there are any questions about the unit, contact AMETEK.















Check to see if your calibrator is complete. It should include:

- CSC200 Calibrator
- Instruction Manual
- Test Leads
- Carrying Case

1.3 Safety information

Symbols Used

The following table lists the International Electrical Symbols. Some or all of these symbols may be used on the instrument or in this manual.

Symbol	Description
	AC (Alternating Current)
	AC-DC
	Battery
	CE Complies with European Union Directives
	DC
	Double Insulated
	Electric Shock
	Fuse
	PE Ground
	Hot Surface (Burn Hazard)
	Read the User's Manual (Important Information)
	Off
	On
	Canadian Standards Association



This calibrator must be recycled or disposed of properly (2002/95/EC).

The following definitions apply to the terms “Warning” and “Caution”.

- “Warning” identifies conditions and actions that may pose hazards to the user.
- “Caution” identifies conditions and actions that may damage the instrument being used.

Use the calibrator only as specified in this manual, otherwise injury and damage to the calibrator may occur.

Warning

To avoid possible electric shock or personal injury:

- Do not apply more than the rated voltage. See specifications for supported ranges.
- Follow all equipment safety procedures.
- Do not use the calibrator if it is damaged. Before you use the calibrator, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Select the proper function and range for your measurement.
- Make sure the battery cover is closed and latched before you operate the calibrator.
- Remove test leads from the calibrator before you open the battery door.
- Inspect the test leads for damaged insulation or exposed metal. Check test leads continuity. Replace damaged test leads before you use the calibrator.
- When using the probes, keep your fingers away from the probe contacts. Keep your fingers behind the finger guards on the probes.
- Do not use the calibrator if it operates abnormally. Protection may be impaired. When in doubt, have the calibrator serviced.
- Do not operate the calibrator around explosive gas, vapor, or dust.
- Disconnect test leads before changing to another measure or source function.
- To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator appears.
- To avoid personal injury or damage to the calibrator, use only the specified replacement parts and do not allow water into the case.



To avoid possible damage to calibrator or to equipment under test:

- Disconnect the power and discharge all high-voltage capacitors before testing resistance or continuity.
- Use the proper jacks, function, and range for your measurement or sourcing application.
- To avoid damaging the plastic lens and case, do not use solvents or abrasive cleansers.

Clean the calibrator with a soft cloth dampened with water or water and mild soap.

2. Calibrator Interface

2.1 Display and Inputs

The CSC200 has a large LCD area that displays the function selected and the input/output value. Input terminals on the top of the calibrator are used for all TC and RTD connections Figure 1 illustrates many of these features.

2.2 Key Functions

Figure 1 shows the layout of the calibrator keypad while Table 1 lists the calibrator keys and their functions.

Table 1: Key Functions

Key	Function
1	Turns the unit on and off
2	Selects between thermocouple or RTD functions Note: Also selects °F/°C units as a power-up function
3	Displays and selects TC or RTD type used in conjunction with knob.
4	Selects input (measure) or output (source) mode
5	Recalls stored setpoints for the function selected
6	Press to store setpoints
7	Left/Right arrow keys move the decade adjust cursor to the desired decade
8	Digital adjustment of output and RTD/TC type selection

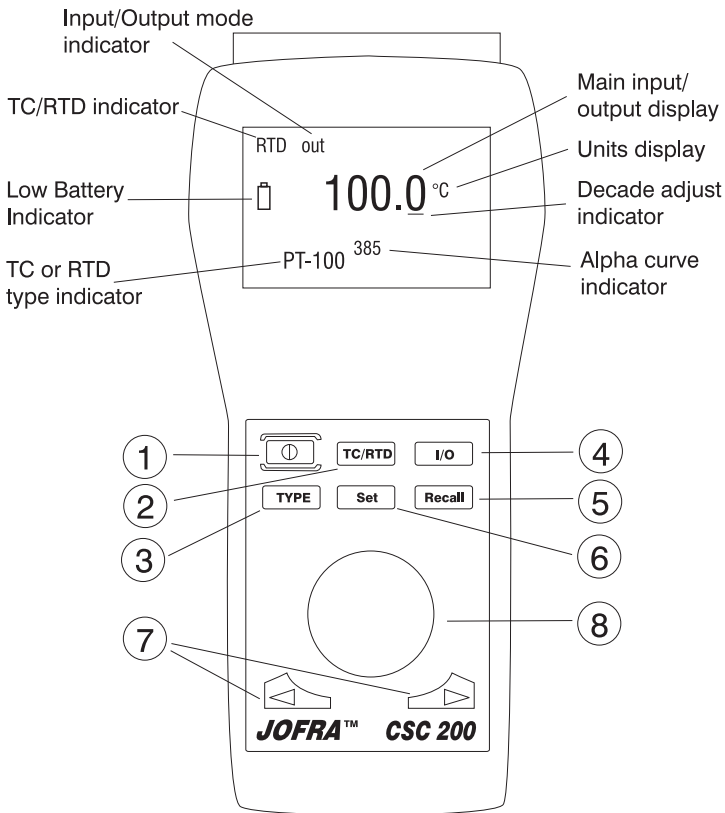


Figure 1

2.3 Power Saver

The calibrator has an adjustable power saver option that allows it to shut down after being dormant for a period of 1 to 30 minutes. To set the shutoff time, perform the following:

1. With the CSC200 turned off, hold down the left arrow key and turn on the power. Continue to hold down the left arrow key until the power-up sequence is complete (about 5 seconds) then release.
2. Using the knob, adjust the time from 1 to 30 minutes or disable completely.
3. Press the left arrow again to return to normal operation. The new auto-shutoff setting will be saved in non-volatile memory.

2.4 Default Temperature Unit Selection

The CSC200 can display all temperatures in either °F or °C. Once the desired units are selected the setting will be stored in non-volatile memory until changed by the user.

The unit ships from the factory with the temperature units set in the °C mode. To change to °F do the following steps:

- 1) With the CSC200 turned off hold down the TC/RTD key.
- 2) Turn on the CSC200 and continue to hold down the TC/RTD key until the display indicates °F (takes about 5 seconds)
- 3) Repeat the process to switch back to °C

3. *Operation in the Thermocouple Mode*

The CSC200 can input or output any one of the 14 different thermocouple types. To operate in the TC mode refer to Figure 2 and proceed as follows:

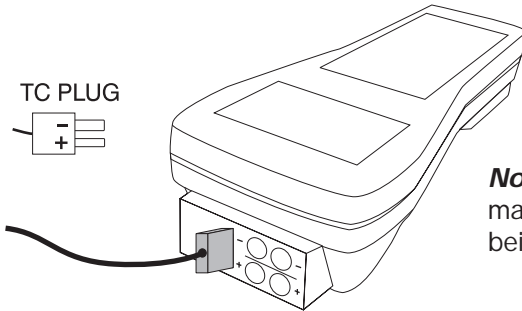
- 1) Select the TC mode by pressing the "TC/RTD" key.
- 2) Select the TC type by holding the "Type" key and turning the knob.
- 3) Press the "I/O" key to select either input or output
- 4) Insert the proper TC wire into the mini-connector (See Figure 2)
- 5) When operating in the output mode use the digital knob and cursor controls to select the desired output. For advanced output options refer to Section 5 Setpoint Mode Operation.

3.1 CJC Control

To disable the CJC proceed with the following steps:

- 1) With the unit turned off press and hold the I/O key.
- 2) Turn on the unit while still holding down the I/O key.
- 3) Approximately 5 seconds after power up release the I/O key. The CJC off annunciator will be displayed on the LCD when operated in the TC mode.
- 4) Turning the CSC200 off then back on will return the unit to normal operation (CJC on).

NOTE: When operating in the direct millivolt mode the CJC is not used.



Note: The TC wire used must match the thermocouple type being calibrated.

Figure 2

4. Operation in the RTD (ohms) Mode

The CSC200 can input or output any one of 17 different RTD types including ohms. Operation in the input mode includes 2, 3 and 4 wire RTD's and YSI Series 400 Thermistors. When operating in the output mode the CSC200 can simulate a RTD output into virtually all transmitters and RTD input devices including pulsed excitation current instruments.

4.1 RTD Input (measure) Mode Operation

To operate the CSC200 in the input mode refer to Figure 3 for the proper input connections and proceed as follows:

- 1) Select the RTD mode by pressing the "TC/RTD" key.
- 2) Select the RTD type by holding the "Type" key and turning the knob.

Note: The PT-100 (platinum 100 ohm) has several Alpha curve choices (385, 392, JIS, etc.), take care to select the proper one for your application.

- 3) Press the "I/O" key to select the input mode.
- 4) Rotate the knob to select the 2, 3, or 4 wire mode. Be sure the connections made match the input mode selected. Annunciators on the LCD will indicate which wire mode is selected.

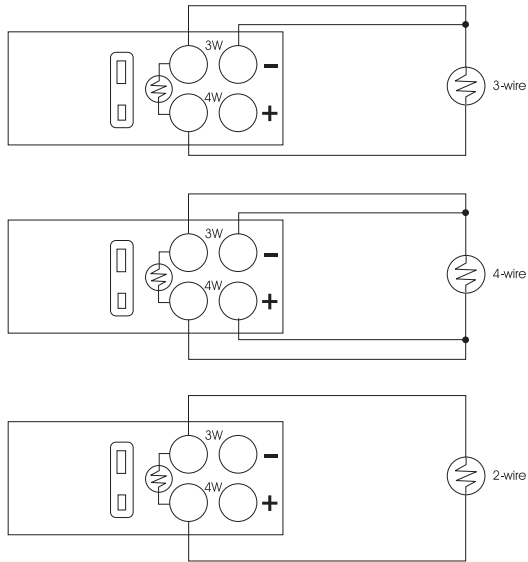


Figure 3

4.2 RTD Output (simulate) Operation

To operate the CSC200 in the output mode refer to Figure 4 for proper output connections and proceed as follows:

- 1) Select the RTD mode by pressing the "TC/RTD" key.
- 2) Select the RTD type by holding the "Type" key and turning the knob.
Note: The PT-100 (platinum 100 ohm) has several Alpha curve choices (385, 392, JIS, etc.), take care to select the proper one for your application.
- 3) Press the "I/O" key to select the output mode.
- 4) Using the digital knob and cursor control adjust the output to the desired output.

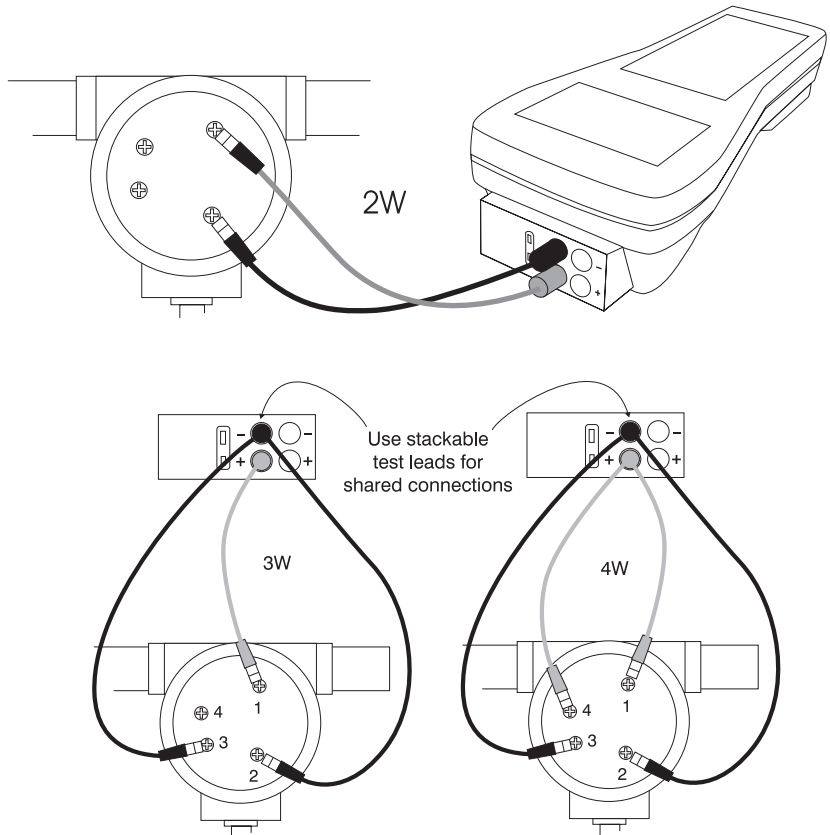


Figure 4

5. User Defined Setpoints

One of the unique and time saving features of the CSC200 is the ability to store user defined setpoints for all output functions. Up to 3 setpoints can be stored for each of the 14 TC and 17 RTD functions. Stored setpoints will remain in non-volatile memory until changed by the operator. To store and recall setpoints proceed as follows:

5.1 Storing Setpoints

- 1) Select an output function (TC or RTD) refer to section 3 and 4.
- 2) Using the digital adjustment knob and cursor control, set the output to the value to be stored.
- 3) Press the "Set" key once. The lower right hand side of the LCD will display "Setpoint 1"

- 4) Setpoint 1 is the starting default location. You can turn the knob to change the location (i.e. Setpoint 1, 2, 3).
- 5) Once a setpoint location has been chosen, press the "Set" key again to store the output value into that location.
- 6) Repeat this process for more setpoints (up to three)
- 7) To recall setpoints simply press the "Recall" key. Each press of the "Recall" key will retrieve a stored setpoint in sequential order.

6. Specifications

General

Operating Temperature	-10°C to 50°C / 14 to 122°F
Storage Temperature	-20°C to 60°C / -4 to 140°F
Stability	± 0.005% of reading / °C outside of 23 ± 5°C
Power	1 x 9V Alkaline
Low Battery Indicator	7V (approximate)
Size (Approx.)	188mm x 84mm x 52mm / 7.37in x 3.31 in x 2.05in
Weight (Approx.)	400g / 14oz
Note: All accuracies stated are for operation at 23°C ± 5°C. For operation below 18°C or above 28°C add ±0.005% of reading/°C (below 64.4°F or above 82.4°F add ±0.003%/°F)	

RTD / Resistance

Resistance Measurement

	Range	Accuracy (% of reading ± floor)
Ohms low	0.00Ω - 400.0Ω	0.025% ± 0.05Ω
Ohms high	401.0Ω - 4000.0Ω	0.025% ± 0.5Ω

Resistance Source

	Range	Excitation Current	Accuracy (% of reading ± floor)
Ohms low	5.0Ω - 400.0Ω	0.1mA - 0.5mA	0.025% ± 0.02/ I excitation
	5.0Ω - 400.0Ω	0.5mA - 3mA	0.025% ± 0.05Ω
Ohms high	400Ω - 1500Ω	0.05mA - 0.8mA	0.025% ± 0.5Ω
	1500Ω - 4000Ω	0.05mA - 0.4mA	0.025% ± 0.5Ω

Note: Unit is compatible with smart transmitters and PLCs.
Frequency response is ≤ 5ms.

RTD Read and Source

RTD Type	Range (°C / °F)	Accuracy (±°C / °F)
P10(90)385	-200.0 - 100.0 / -328 - 212	1.4 / 2.52
	100.0 - 300.0 / 212 - 572	1.6 / 2.88
	300.0 - 600.0 / 572 - 1112	1.8 / 3.24
	600.0 - 800.0 / 1112 - 1472	2.0 / 3.60
P50(90)385	-200.0 - 100.0 / -328 - 212	0.4 / 0.72
	100.0 - 300.0 / 212 - 572	0.5 / 0.90
	300.0 - 600.0 / 572 - 1112	0.6 / 1.08
	600.0 - 800.0 / 1112 - 1472	0.7 / 1.26
P100(90)385	-200.0 - 100.0 / -328 - 212	0.2 / 0.36
	100.0 - 300.0 / 212 - 572	0.3 / 0.54
	300.0 - 600.0 / 572 - 1112	0.4 / 0.72
	600.0 - 800.0 / 1112 - 1472	0.5 / 0.90
P200(90)385	-200.0 - 100.0 / -328 - 212	0.8 / 1.44
	100.0 - 300.0 / 212 - 572	0.9 / 1.62
	300.0 - 630.0 / 572 - 1166	1.0 / 1.80
P400(90)385	-200.0 - 100.0 / -328 - 212	0.4 / 0.72
	100.0 - 300.0 / 212 - 572	0.5 / 0.90
	300.0 - 630.0 / 572 - 1166	0.6 / 1.08
P500(90)385	-200.0 - 100.0 / -328 - 212	0.4 / 0.72
	100.0 - 300.0 / 212 - 572	0.5 / 0.90
	300.0 - 630.0 / 572 - 1166	0.6 / 1.08
P1K(90)385	-200.0 - 100.0 / -328 - 212	0.2 / 0.36
	100.0 - 300.0 / 212 - 572	0.3 / 0.54
	300.0 - 630.0 / 572 - 1166	0.4 / 0.72
P50(90)391	-200.0 - 100.0 / -328 - 212	0.4 / 0.72
	100.0 - 300.0 / 212 - 572	0.5 / 0.90
	300.0 - 600.0 / 572 - 1112	0.6 / 1.08
	600.0 - 800.0 / 1112 - 1472	0.7 / 1.26
P100(90)391	-200.0 - 100.0 / -328 - 212	0.2 / 0.36
	100.0 - 300.0 / 212 - 572	0.3 / 0.54
	300.0 - 600.0 / 572 - 1112	0.4 / 0.72
	600.0 - 800.0 / 1112 - 1472	0.5 / 0.90

RTD Type	Range (°C / °F)	Accuracy (±°C / °F)
P100(90)392	-200.0 - 100.0 / -328 - 212	0.2 / 0.36
	100.0 - 300.0 / 212 - 572	0.3 / 0.54
	300.0 - 630.0 / 572 - 1166	0.4 / 0.72
M10(90)427	-100.0 - 260.0 / -148 - 500	1.4 / 2.52
M50(90)428	-180.0 - 200.0 / -292 - 392	0.4 / 0.72
M100(90)428	-180.0 - 200.0 / -292 - 392	0.3 / 0.54
H120(90)672	-80.0 - 260.0 / -112 - 500	0.2 / 0.36
P100(90)JIS	-200.0 - 100.0 / -328 - 212	0.2 / 0.36
	100.0 - 300.0 / 212 - 572	0.3 / 0.54
	300.0 - 630.0 / 572 - 1166	0.4 / 0.72
YSI(90)400	15.00 - 50.00 / 59 - 122	0.1 / 0.18
Read Accuracy is based on 4-wire input. For 3-wire input add ± 0.05Ω assuming all three RTD leads are matched.		

Thermocouple Measurement/Source

	Range	Accuracy (% of reading ± floor)
Read (mV)	-10.000mV - 75.000mV	0.02% ± 10μV
Source (mV)	-10.000mV - 75.000mV	0.02% ± 10μV
Maximum current output in voltage ranges is 1mA with an output impedance of <= 1Ω		

Thermocouple Read and Source (errors in °C / °F)

TC Type	Range (°C / °F)	Accuracy (°C / °F)
J	-210.0 - 0.0 / -346 - 32	0.6 / 1.08
	0.0 - 800.0 / 32 - 1472	0.4 / 0.72
	800.0 - 1200.0 / 1472 - 2192	0.5 / 0.90
K	-200.0 - 0.0 / -346 - 32	0.8 / 1.44
	0.0 - 1000.0 / 32 - 1832	0.5 / 0.90
	1000.0 - 1372.0 / 1832 - 2501.6	0.7 / 1.26
T	-250.0 - 0.0 / -418 - 32	0.8 / 1.44
	0.0 - 400.0 / 32 - 752	0.4 / 0.72
E	-250.0 - -100.0 / -418 - -148	0.8 / 1.44
	-100.0 - 1000.0 / -148 - 1832	0.4 / 0.72
R	0.0 - 1767.0 / 32 - 3212.6	1.4 / 2.52
S	0.0 - 1767.0 / 32 - 3212.6	1.4 / 2.52
B	600.0 - 800.0 / 1112 / 1472	1.4 / 2.52
	800.0 - 1000.0 / 1112 - 1832	1.5 / 2.70
	1000.0 - 1820.0 / 1832 - 3308	1.7 / 3.06
C	0.0 - 1000.0 / 32 - 1832	0.8 / 1.44
	1000.0 - 2316.0 / 1832 - 4200.8	2.5 / 4.50
XK	-200.0 - 800.0 / -328 - 1472	0.4 / 0.72
BP	0.0 - 800.0 / 32 - 1472	1.1 / 1.98
	800.0 - 2500.0 / 1472 - 4532	2.5 / 4.50
L	-200.0 - 0.0 / -328 - 32	0.45 / 0.81
	0.0 - 900.0 / 32 - 1652	0.4 / 0.72
U	-200.0 - 0.0 / -328 - 32	0.7 / 1.26
	0.0 - 600.0 / 32 - 1112	0.45 / 0.81
N	-200.0 - 0.0 / -328 - 32	1.0 / 1.80
	0.0 - 1300.0 / 32 - 2372	0.6 / 1.08
All TC errors include CJC errors		
CJC error outside of $23 \pm 5^{\circ}\text{C}$ is $0.05^{\circ}\text{C}/^{\circ}\text{C}$ ($73.4 \pm 9^{\circ}\text{F}$ is $0.09^{\circ}\text{F}/^{\circ}\text{F}$)		
Note: All accuracies stated are for operation at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($73.4 \pm 9^{\circ}\text{F}$).		
For operation below 18°C or above 28°C add $\pm 0.005\%$ of reading/ $^{\circ}\text{C}$ (below 64.4°F or above 82.4°F add $\pm 0.003\%/^{\circ}\text{F}$).		

7. Maintenance

7.1 Replacing Batteries

Replace batteries as soon as the battery indicator turns on to avoid false measurements.

Note: Use only 9 Volt alkaline battery.

7.2 Cleaning the Unit



To avoid personal injury or damage to the calibrator, use only the specified replacement parts and do not allow water into the case.



To avoid damaging the plastic lens and case, do not use solvents or abrasive cleansers.

Clean the calibrator with a soft cloth dampened with water or water and mild soap.

7.3 Service Center Calibration or Repair

Only qualified service personnel should perform calibration, repairs, or servicing not covered in this manual. If the calibrator fails, check the batteries first, and replace them if needed.

Verify that the calibrator is being operated as explained in this manual. If the calibrator is faulty, send a description of the failure with the calibrator. Be sure to pack the calibrator securely, using the original shipping container if it is available.

7.4 Replacement Parts & Accessories

<u>Order Number</u>	<u>Description</u>
SPK-CSC-002	Operating Manual
SPK-HHC-002	Soft carrying case
104203	Test Lead Set
124004	Shoulder strap
2206011	Wire adapter kit - Type K thermocouple
2206012	Wire adapter kit - Type T thermocouple
121985	Extension Cable for Pt 100 Sensor - 5 m
121983	Extension Cable for Type K - 5 m
122523	Extension Cable for Type N - 5 m
120519	Thermocouple Male Plug - Type Cu-Cu - White
120518	Thermocouple Male Plug - Type R / S - Green
120517	Thermocouple Male Plug - Type K - Yellow
120516	Thermocouple Male Plug - Type J - Black
120515	Thermocouple Male Plug - Type T - Blue
120514	Thermocouple Male Plug - Type N - Orange



*..because calibration is
a matter of confidence*

AMETEK

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AMETEK is a leading global manufacturer of electrical and electromechanical products for niche markets. Listed on the New York Stock Exchange (AME) since 1930. AMETEK's annual sales exceed \$1 billion. Operations are in North America, Europe, and Asia, with about one third of sales to markets outside the United States.

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www.ametekcalibration.com
www.jofra.com

AMETEK Test & Calibration Instruments • Florida, USA (*Western Hemisphere*)
Tel: +1 727-536-7831 • Tel: +1 800-527-9999 • calinfo.us@ametek.com

AMETEK Denmark A/S • Denmark (*Europe and the Middle East*)
Tel: +45 4816 8000 • ametek@ametek.dk

AMETEK Precision Instruments Europe GmbH • Germany (*Germany only*)
Tel: +49 2159 91360 • info@ametek.de

AMETEK Singapore Pte. Ltd. • Singapore (*Asia*)
Tel: +65 6 484 2388 • aspl@ametek.com.sg

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