temperature

JOFRA® calibration

Marine Temperature Calibrator
MTC series

» Wide temperature range
MTC-140 A -17 to 140°C / -1 to 284°F
MTC-320 A 33 to 320°C / 91 to 608°F
MTC-650 A 33 to 650°C / 91 to 1202°F

» Fast calibration is timesaving
The specially designed heating block profile heats up to 320°C / 608°F in just 4 minutes and to 650°C / 1202°F in only 10 minutes

» High flexibility
Not limitations by fixed holes. Interchangeable insertion tubes are used to match the diameter of the sensor-under-test

» Enhanced stability
MVI circuitry ensures stability despite mains supply variations in the engine room environment

» Timesaving features
Fast one-key-one-function access to the automatic switch test and auto-stepping

» Documentation made easy
RS232 communication interface and JOFRACAL calibration software package are part of the standard delivery

» DNV approval
All JF Instruments calibrators are marine type approved by Det Norske Veritas

» Complete marine program
Part of a complete program of marine approved temperature, pressure and signal calibrators; including temperature sensors

The MTC series of portable temperature calibrators facilitates correct readings on all of your temperature monitoring devices. The MTC dry-block design does not use any hazardous hot liquid and heats up and cools down much faster than traditional ways of calibrating temperature sensors on a vessel. You can reach 320°C (608°F) in just 4 minutes and do it safely.

Maintain and calibrate monitoring devices for:

- Turbo-charger lubrication
- Fuel oil inlet
- Exhaust gas
- Crankcase protection
- Turbine and gear bearings
- Steam
- Servo oil propeller pitch
- Purifiers
- Starting air
- Hydraulic systems
- Oil burner
- Generators
- Safety valves
- Cylinder/piston/fuel valve cooling media
- Thrust/shaft plane/stern tube bearings
- Lubricating oil systems
- Scavenge air
- Sea water cooling
- Charge air
- Uptake gas
- Feed water
- Cooling water outlet
- Refrigeration systems
- Gland steam
- Condensing system
- Main steam
- Condensers

ISO 9001 Manufacturer

Specification Sheet
SS-MTC

AMETEK®
TEST & CALIBRATION INSTRUMENTS

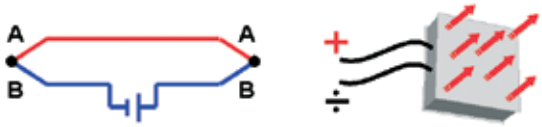
The MTC series features a large backlit display that is easy to read even in well-lit areas. Units feature an informative display that provides icons and information regarding the status of the MTC and the calibration in-progress. The MTC series also features an auto-step function. Using this function you may stay in the control room or on the bridge and monitor the temperature reading while the calibrator, located in the engine room by the sensor, automatically steps through a number of pre-programmed temperatures.

Fast heating and cooling

The MTC-320 A and the MTC-650 A contain an innovative heating block profile. This design heats up the MTC-320 A to maximum temperature in just 4 minutes and the MTC-650 A in only 10 minutes. The fast performance of the heating block is due to the special profile that minimizes mass and yet, still accepts an insertion tube with a 1 in (26 mm) outer diameter. This design is a balanced compromise between temperature stability, homogeneity, and rapid heating and cooling.

MTC-140 A heating/cooling block

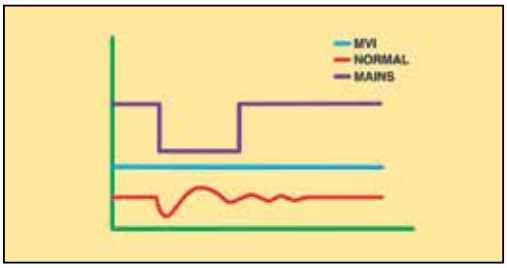
The model MTC-140 A features Peltier elements. In 1834, Jean Peltier, a French physicist found that an ''opposite thermocouple effect'' could be observed when an electric current was connected to a thermocouple. Heat would be absorbed at one of the junctions and discharged at the other junction. This effect is called the ''PELTIER EFFECT''.



The practical Peltier element (electronic heating pump) consists of many elements of semiconductor material that are connected electrically in series and thermally in parallel. These thermoelectric elements and their electrical interconnections are mounted between two ceramic plates. The plates serve to mechanically hold the overall structure together and to electrically insulate the individual elements from one another.

MVI - Improved temperature stability

MVI stands for ''Mains power Variance Immunity''. Unstable mains power supplies are a major contributor to on-site calibration inaccuracies. Traditional temperature calibrators often become unstable in shipboard environments where large electrical motors, heating elements, and other devices are periodically cycled on and off. The cycling of supply power can cause the temperature regulator to perform inconsistently leading to both inaccurate readings and un-stable temperatures.



The MTC series calibrators MTC-320 A and MTC-650 A employ the MVI, thus avoiding such stability problems. The MVI circuitry continuously monitors the supply voltage and ensures a constant energy flow to the heating elements.

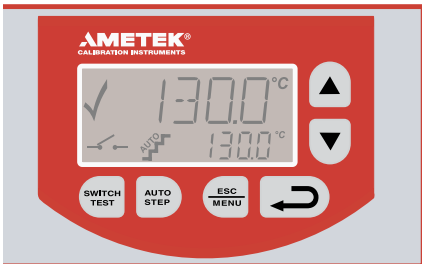
The MTC-140 A does not require the MVI circuitry because the Peltier elements are energized with a stabilised DC voltage.

Easy-to-use, intuitive operation

All instrument controls may be performed from the front panel. The heat source is positioned away from the panel. This design helps to protect the operator.

The main functions on the MTC series are designed with one-key-one-function logic. This means that there are no sub-menus or difficult to remember multiple keystrokes necessary to access primary functions.

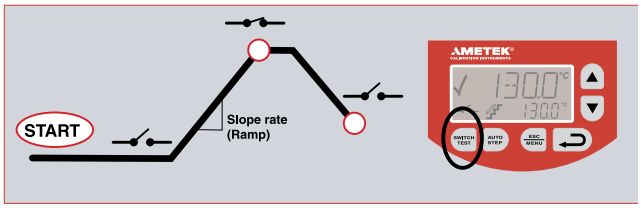
The easy-to-read, backlit display features dedicated icons, which help in identifying instrument conditions and operational steps.



Set temperature
The ''Up'' and ''Down'' arrow keys allow the user to set the exact temperature desired with a resolution of 0.1°C or °F.

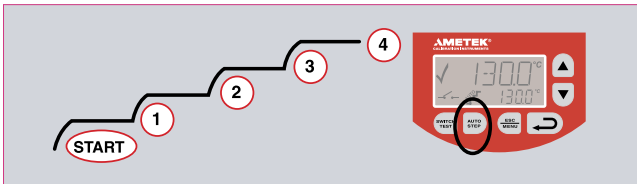
Instrument setups
The MTC series stores the complete instrument setup, including: engineering units, stability criteria, resolution, display contrast, slope (ramp) rate, auto-step settings, and maximum temperature.

Stability indicator
The bold checkmark (√) on the display indicates that the calibrator has reached the desired set temperature and is stable. The operator may change the stability criteria and establish a greater sense of security in the calibration results. A convenient countdown timer is activated five minutes before the unit reaches stability.



Automatic switch test
Operators can save a lot of time using the automatic thermoswitch test function to find values for the ''Open'' and ''Close'' temperatures. Additionally, this feature displays the hysteresis (deadband) between the two points. The feature ensures a very high repeatability when testing thermo-switches. Simply press the SWITCH TEST key to activate the function.

Auto-stepping
This feature saves manpower. The operator may stay in the control room, or on the bridge, monitoring the output from the sensor-under-test while the MTC series calibrator is placed in the engine room and automatically changes the temperature using a programmed step value and rate. Up to 9 different temperature steps may be programmed, including the hold time for each step.



This feature is also ideal for burning-in new sensors prior to installation; this minimizes initial drift and allows for initial testing.

Maximum temperature
From the setup menu, the user can select the maximum temperature limit for the calibrator. This function prevents damage to the sensor-under-test caused by the application of excessive temperatures. The feature also aids in reducing drift resulting from extended periods of exposures to high temperatures. This feature can be locked with an access code.

Re-calibration/adjustments
The MTC series has a very easy and straightforward procedure for re-calibration/adjustment. There is no need for a screwdriver or PC software. The only thing you need is a reliable reference thermometer.

Place the probe in the calibrator and follow the instructions on the display. Third-party labs and calibration facilities will be able to perform this function if a certificate from an independent source is necessary. Of course, AMETEK can provide you with a traceable calibration certificate from our labs when you require a higher level of confidence.

JOFRACAL CALIBRATION SOFTWARE

JOFRACAL calibration software ensures easy calibration of RTD´s, thermocouples, transmitters, thermoswithes, pressure gauges and pressure switches.

JOFRACAL can be used with JOFRA DPC-500, HPC and IPI pressure calibrators, all JOFRA temperature calibrators, as well as JOFRA AMC900, ASC300 multi signal calibrator and ASM-800 signal multi scanner. When used with JOFRA ASM-800, JOFRACAL can perform a simultaneous semi automatic calibration on up to 24 pressure and/or temperature devices under test in any combination.

JOFRACAL software controls the complete calibration procedure, stores the results and provides a calibration audit trail through hard-copy certificates. All calibration data are stored for each sensor to monitor drift and optimise recalibration intervals. A scheduler feature allows planning of future calibrations.

JOFRA calibration

FUNCTIONAL SPECIFICATIONS

Mains specifications

Voltage MTC-140/320/650 A115V(90-127) / 230V(180-254)
Frequency, non US deliveries .....50 Hz ±5, 60 Hz ±5
Frequency, US deliveries .....60 Hz ±5
Power consumption (max.) MTC-140 A .....150 VA
Power consumption (max.) MTC-320 A / 650 A ..... 1150 VA

Temperature range

MTC-140 A
Maximum .....140°C / 284°F
Minimum @ ambient temp. 0°C /32°F .....-30°C / -22°F
Minimum @ ambient temp. 23°C / 73°F .....-17°C / -1°F
Minimum @ ambient temp. 40°C / 104°F..... -2°C / 28°F
MTC-320 A.....33 to 320°C / 91 to 608°F
MTC-650 A.....33 to 650°C / 91 to 1202°F

Resolution (user-selectable)

Selectable .....
1° or 0.1°C/°F

Stability

MTC-140 A .....±0.05°C / ±0.09°F
MTC-320 A / 650 A .....±0.1°C / ±0.18°F

Measured after the stability indicator has been on for 10 minutes. Measuring time is 30 minutes.

Time to stability (approximate)

MTC-140 A ..... 5 min.
MTC-320 A / 650 A ..... 8 min.

Accuracy

MTC-140 A .....±0.4°C /±0.7°F
MTC-320 A.....±0.5°C / ±0.9°F
MTC-650 A..... ±0.9°C / ±1.6°F

Specification when using the internal reference. (Load 4 mm OD reference probe in the center of the insert).

Immersion depth

MTC-140 A (insulation included)..... 115 mm / 4.5 in
MTC-320 A / 650A..... 110 mm / 4.3 in

Heating time

MTC-140 A	-17 to 23°C / 1 to 73°F	3 minutes
MTC-140 A	23 to 140°C / 73 to 284°F	15 minutes
MTC-320 A	33 to 320°C / 91 to 608°F	4 minutes
MTC-650 A	33 to 650°C / 91 to 1202°F	10 minutes

Cooling time

MTC-140 A	100 to 0°C / 212 to 32°F	10 minutes
MTC-140 A	0 to -15°C / 32 to 5°F	13 minutes
MTC-140 A	140 to 100°C / 284 to 212°F	2 minutes
MTC-320 A	320 to 100°C / 608 to 212°F	16 minutes
MTC-650 A	650 to 100°C / 1202 to 212°F	28 minutes

Switch input (dry contact)

Test voltage .....Maximum 5 VDC
Test current .....Maximum 2.5 mA

Engine rooms - testing the temperature in exhaust gas

Savings

The exhaust gas temperature is a very important factor. If the temperature is too low, too little fuel is let into the cylinder, and if the temperature is too high, too much fuel is let into the cylinder.
Often a range of ±10°C (50°F) is allowed, before an alarm is activated. However, if calibration is performed more often, this range could be reduced and a more economical combustion could be achieved.

Engine rooms - testing the temperature in exhaust gas

Application

On each cylinder, a thermometer has been placed close to the exhaust gas outlet to measure the temperature of the exhaust gas. This thermometer breaks very often due to the impact from the exhaust gas. As a consequence the temperature indication is often inaccurate. The thermometers most frequently have a scale from 350 to 450°C (662 to 842°F).

KEY FEATURES

Automatic switch test

Finds switching temp. .....Open, close, hysteresis
Slope rate, programable .....0.1 to 9.9 °C/°F

Auto stepping

Programmable.....Up to 9 steps
Dwell time on each step..... Programmable

Enhanced stability

Unstable mains protection ..... MVI Circuitry
Stability indication ..... Yes, in display

Multi-information display

Stability indicator..... Bold checkmark
Countdown timer before stable .....4 minutes
Temperature .....SET and READ simultaneously
Alphanumeric messages..... Yes
Calibration status icons..... Yes

Training mode (heating/cooling block disabled)

Simulation of all functions ..... Yes
Simulating heating and cooling..... Approx. 100° per minute

Service facilities

Adjustment of the unit from the keypad ..... Yes
Self explanatory guide in display ..... Yes

Other information: Displays serial number, software revision level, and last calibration date

Setup facilities

Stability criteria..... Extra time before ”stable indication” ..... is shown
Display resolution..... 0.1° or 1°C/°F
Temperature units ..... °C and °F
Slope rate..... 0.1 to 9.9°/minute
Maximum temperature .....Any value within range

Type approval certifcate

All JF Instruments calibrators are type approved by Det Norske Veritas. Find the certificate at our web-page www.jofra.com
DNV Marine Approval, Certificate no.:.....A-10549

PHYSICAL SPECIFICATIONS

Instrument dimensions

L x W x H:.....241 x 139 x 325 mm / 9.5 x 5.5 x 12.8 in

Instrument weight

MTC-140 A .....6.5 kg / 14.3 lb
MTC-320 A.....5 kg / 11 lb
MTC-650 A..... 6.4 kg / 14.1 lb

Insert dimensions

MTC-140 A
Diameter x length..... 19 mm x 100 mm / 0.75 x 3.9 in
MTC-320 A, MTC-650 A
Diameter x length.....26 mm x 120 mm / 1 x 4.7 in

Weight of non-drilled insert (approximate)

MTC-140 A .....2.6 oz / 75 g
MTC-320 A.....5.8 oz / 170 g
MTC-650 A..... 17.8 oz / 510 g

Use of other inserts may reduce performance of the calibrator. To get the best results out of the calibrator, the insert dimensions, tolerance and material is critical. We highly advise using JOFRA inserts, as they guarantee trouble free operation.

Shipping (with std. accessories + carrying case)

Weight: MTC-140 A..... 12.5 kg / 27.6 lb
Weight: MTC-320 A..... 11 kg / 24 lb
Weight: MTC-650 A .....12 kg / 27 lb
Size: L x W x H..... 507 x 232 x 415 mm /19.9 x 9.1 x 16.3 in

Shipping (with std. accessories but no carrying case)

Weight: MTC-140 A .....10 kg / 22 lb
Weight: MTC-320 A..... 8 kg / 17.5 lb
Weight: MTC-650 A .....9.5 kg / 21 lb
Size: L x W x H....465 x 255 x 470 mm / 16.4 x 9.8 x 14.6 in

Shipping (carrying case only)

Weight: ..... 5.0 kg / 11 lb
Size: L x W x H.... 507 x 232 x 415 mm / 19.9 x 9.1 x 16.3 in

Miscellaneous

Serial data interface ..... RS232 (9-pin Male)
Operating temperature.....0 to 40°C / 32 to 104°F
Storage temperature .....-20 to 50°C / -4 to 122°F
Humidity .....0 to 90% RH
Protection class IP-10
CE Conformity.....EN61326 : 1997/A1:1998 / corr. (2000)
..... EN61010-1 : 1993/A2:1995

STANDARD DELIVERY

- MTC dry-block calibrator (user specified)
- Mains power cable (user specified)
- Traceable certificate - temperature performance
- Insert (user specified)
- Tool for insertion tubes
- User manual
- Test cables (1 x red, 1 x black)
- 3 pcs. insulation plugs for:
- 1/4, 3/8, 1/2 in (6, 10, 13 mm) sensors (MTC-140 A only)
- RS232 cable
- JOFRACAL calibration software

ACCESSORIES

122832	Cleaning Brushes - 4 mm - Package of 3 pcs
60F174	Cleaning Brushes - 6 mm - Package of 3 pcs
22822	Cleaning Brushes - 8 mm - Package of 3 pcs
65-F100	Insulation in Tube, 100 mm x Ø25 mm
65-F101	Insulation in Tube, 150 mm x Ø25 mm
65-F102	Insulation in Tube, 200 mm x Ø25 mm
65-F103	Insulation in Tube, 250 mm x Ø25 mm
65-F104	Insulation in Tube, 300 mm x Ø25 mm
65-F105	Insulation in Tube, 350 mm x Ø25 mm
65-F106	Insulation in Tube, 400 mm x Ø25 mm
65-F107	Insulation in Tube, 450 mm x Ø25 mm
123469	Set with 3 pcs of insulation plugs * 6, 10 and 13 mm / 1/4, 3/8 and 1/2 in. (MTC-140 only)
125068	Support rod set for sensors, 2 gribs, 2 fixtures * Support rod set can be mounted on all JOFRA dry-blocks
125066	Extra fixture for sensor grib
125067	Extra sensor grib
125002	Edgeport Converter with 4 pcs of RS232 ports
123408	Carrying Case for CTC/MTC A models
104216	Thermal Protection Shield

Marine approved temperature sensors

JF Instruments also has a series of temperature sensors which are type approved by classification societies for marine applications such as measuring exhaust gases, cooling water for diesel engines, and product or room temperatures in refrigeration stores. These sensors are specially designed with high enduance for vibration according to IEC 68-2-6. Approvals from Lloyds Register of Shipping and Det Norske Veritas. For further information please visit our web-page at www.jofra.com

Inserts, heat shield, and cleaning brushes

Always use the original inserts where material and physical dimensions have been optimized. A drilling guide is included if you buy undrilled inserts.
Use the cleaning brushes to clean the bores in your inserts when necessary.

Carrying case (Optional) - 123408

The protective carrying case ensures safe transportation and storage of the instrument and all associated equipment. The carrying case is included in the standard delivery.

Thermal Protection Shield (Optional) - 104216

An external heat shield is available and may be placed on top of the calibrator to reduce the hot air stream around the sensor-under-test. This is especially important for testing thermocouples having head-mounted transmitters with cold-junction compensation.

Support rod set for sensors (Optional) - 125068

It is possible to order a support rod for sensors, which can be mounted on the side of all JOFRA dry-block calibrators and holds the sensors under test in their position, while calibrating them.
The support rod set includes 2 pieces of sensors grips and 2 pieces of fixtures for sensor gribs.

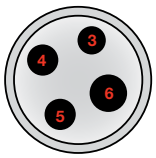
125066 Extra fixture for sensor grib
125067 Extra sensor grib

PREDRILLED INSERTS FOR MTC SERIES

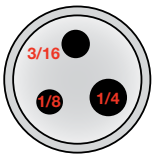
Inserts for MTC-140 A and MTC-320 A are made of aluminium. Inserts for MTC-650 A are made of brass.
All specifications on hole sizes refer to the outer diameter of the sensor-under-test.
The correct clearance size is applied in all predrilled inserts.

Spare part no. for predrilled inserts - metric (mm)				
		Instruments		
Probe diameter	Insert code [1]	MTC-140 A [2]	MTC-320 A	MTC-650 A
3 mm	003	123428	123436	123444
4 mm	004	60F451	100177	100196
5 mm	005	123429	123437	123445
6 mm	006	60F453	100179	100198
7 mm	007	123430	123438	122516
8 mm	008	105185	100182	100201
9 mm	009	105186	100183	100202
10 mm	010	105187	100185	105188
11 mm	011	123431	100188	100204
12 mm	012	123432	100186	100206
13 mm	013	123433	60F339	105189
14 mm	014	N/A	100190	100208
15 mm	015	N/A	100191	100209
16 mm	016	N/A	123439	123446
18 mm	018	N/A	123440	122517
20 mm	020	N/A	123441	122518
Package of the above inserts		124679	124681	124685
Multi-hole type 1	M01	123479 [2]	123475	123476

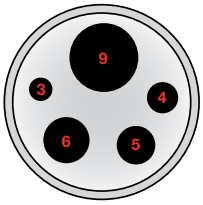
Spare part no. for predrilled inserts - imperial (inch)				
		Instruments		
Probe diameter	Insert code [1]	MTC-140 A [2]	MTC-320 A	MTC-650 A
1/8 in	125	60F450	100176	100195
3/16 in	187	60F452	100178	100197
1/4 in	250	60F454	100180	100199
5/16 i	312	60F456	100181	100200
3/8 in	375	60F458	100184	100203
7/16 in	437	60F460	100187	100205
1/2 in	500	60F462	100189	100207
9/16 in	562	60F464	60F344	60F408
5/8 in	625	60F466	100192	100210
11/16 in	688	N/A	60F348	60F412
3/4 in	750	N/A	100193	100211
3/16 in	813	N/A	60F352	60F416
7/8 in	875	N/A	60F354	60F418
Package of the above inserts		124680	124682	124686
Multi-hole type 2	M02	123480 [3]	123477	123478



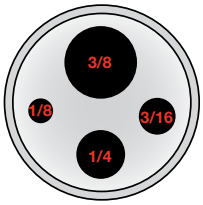
Multi-hole M01 (MTC-140 A)



Multi-hole M02 (MTC-140 A)



Multi-hole M01 (MTC-320 / 650 A)



Multi-hole M02 (MTC-320 / 650 A)

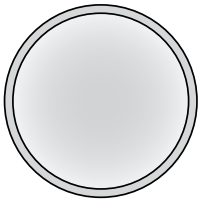
Note 1: Use the insert code, when ordered as the standard insert together with a new calibrator.

Note 2: MTC-140 A only: Remember to use matching insulation plugs.

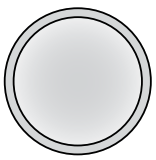
Note 3: MTC-140 A only: All multi-hole inserts are delivered with a matching insulation plug.

UNDRILLED INSERTS FOR MTC SERIES

Inserts, undrilled			
	Instruments		
Inserts	MTC-140 A [1]	MTC-320 A	MTC-650 A
5-pack, undrilled inserts	60F448	100175	100194
Undrilled insulation plug	123937	N/A	N/A



(MTC-320 / 650 A)



(MTC-140 A)

ORDERING INFORMATION

Order number	Description
	Base model number
MTC140A	MTC-140 A, -17 to 140°C (-1 to 284°F)
MTC320A	MTC-320 A, 50 to 320°C (122 to 608°F)
MTC650A	MTC-650 A, 50 to 650°C (122 to 1202°F)
	Power supply (US deliveries 60 Hz only)
115	115VAC
230	230VAC
	Mains power cable type
A	European, 230V,
B	USA/CANADA, 115V
C	UK, 240V
D	South Africa, 220V
E	Italy, 220V
F	Australia, 240V
G	Denmark, 230V
H	Switzerland, 220V
I	Israel, 230V
	Insert type and size
XXX	1x Insert for dry-block configuration (Please see insert section for correct code)
	Calibration certificate
F	NPL Traceable Calibration Certificate (standard for Europe, Asia, Australia and Africa)
G	NIST Traceable Temperature Certificate (standard for Americas)
H	DANAK Accredited Calibration Certificate (Optional)
	Options
C	Carrying case
MTC650A230AM01FC	**Sample order number** JOFRA MTC-650 A with standard accessories, 230VAC, European powercord, multi-hole type M01, NPL traceable certificate and carrying case.

AMETEK Test & Calibration Instruments
A business unit of AMETEK Measurement & Calibration Technologies Division offering the following industry leading brands for test and calibration instrumentation.

JOFRA Calibration Instruments
Temperature Calibrators
Portable dry-block calibrators, precision thermometers and liquid baths. Temperature ranges from -90°C(-130°F) to 1205°C(2200°F). Temperature sensors for industrial and marine use.
Pressure Calibrators
Convenient electronic systems ranging from -25 mbar to 1000 bar - fully temperature-compensated for problem-free and accurate field use.
Signal Instruments
Process signal measurement and simulation for easy control loop calibration and measurement tasks.

M&G Pressure Testers & Pumps
Pneumatic floating-ball or hydraulic piston dead weight testers with accuracies to 0.015% of reading. Pressure generators delivering up to 1,000 bar.

Lloyd Instruments
Materials testing machines and software from Lloyd Instruments guarantees expert materials testing solutions. The comprehensive program also covers Texture Analysers to perform rapid, general food testing and detailed texture analysis on a diverse range of foods and cosmetics.

Davenport Polymer Test Equipment
Allows measurement and characterization of moisture-sensitive PET polymers and polymer density.

Chatillon Force Measurement
The hand held force gauges and motorized testers have earned their reputation for quality, reliability and accuracy and they represent the de facto standard for force measurement.

Newage Testing Instruments
Hardness testers, durometers, optical systems and software for data acquisition and analysis.

AMETEK®
TEST & CALIBRATION INSTRUMENTS

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