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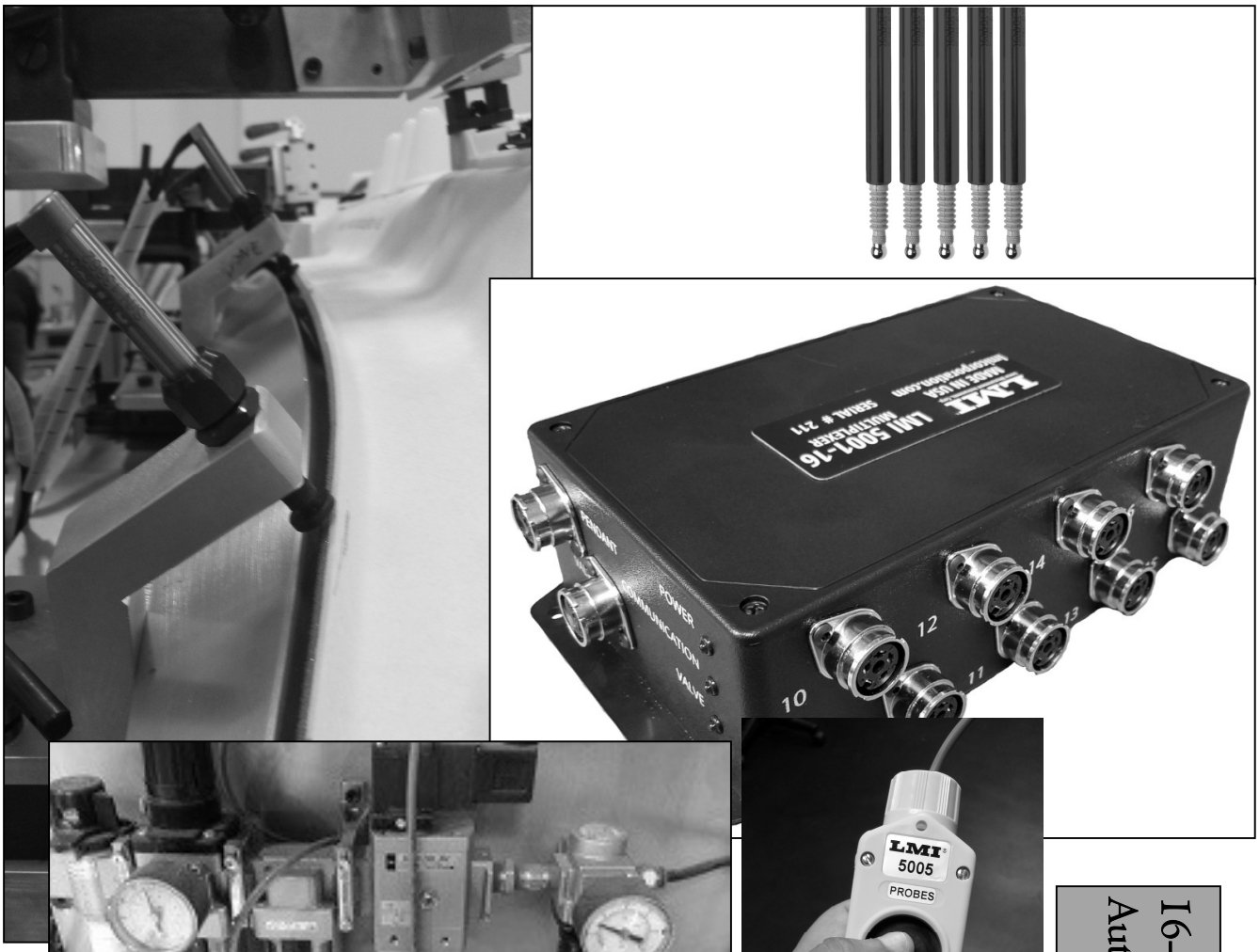
Research, Development and Manufacturing of Precision Measuring Systems

16 Port Multiplexor - AutoGage Hardware Overview



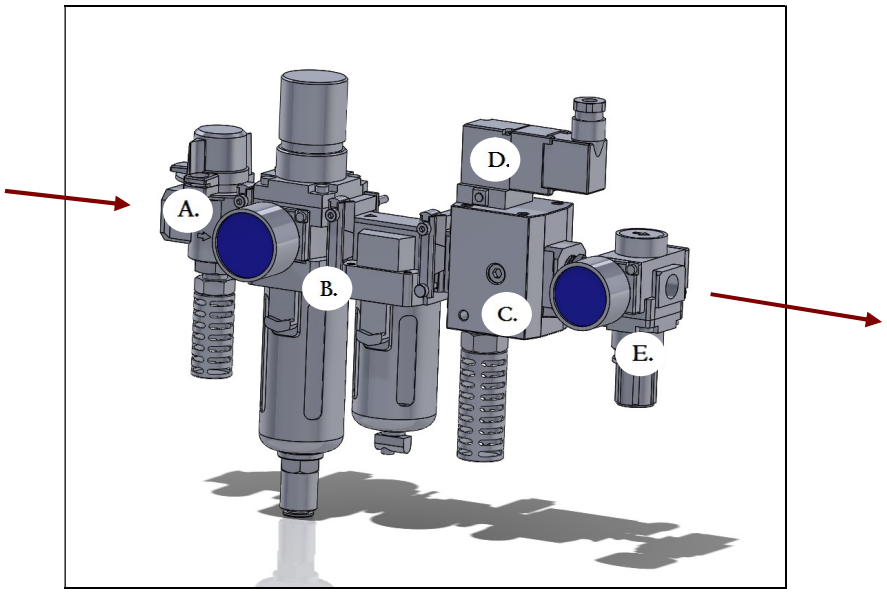
16-Port AutoGage Systems

LMI 5300 AutoGage System

System Overview and Designation of Parts

The LMI 5300 AutoGage System is a pneumatically driven gaging system that works in conjunction with LMI's Universal Gage Interface (UGI) software to provide a fast, accurate, and easy way to collect multiple points of data at once. Users view live readings on a PC running UGI and can record those readings to any desired output format (Excel, TXT, CSV, etc.) by a simply pushing a button.

The system consists of air-line plumbing, a 24-volt power supply, LMI Mini-Mux and up to 16 LMI 5300 air-driven probes.



Air Supply System

A. **Lockout Valve** – Prevents/allows shop air into the system. Shop air must be 100 psi or greater.
B. **Filter/Regulator Combo** – Regulates the pressure of shop air coming into the system. This should be set between 80 and 90 psi.
C. **Muffler** – Helps reduce the noise level of air coming through the system.
D. **24V Soft Start Valve** – Valve controlled by the LMI multiplexor. This can also be manually triggered by pushing the small pin button on the face of the valve.
E. **Low Pressure Regulator** – Regulates the pressure of air coming out of the Filter/Regulator Combo. This should be set between 8 and 10 psi.
F. **4 Port Manifold (not pictured)** – Manifold with ¼ inch fittings that feeds the 8 port manifold(s).
G. **8 Port Manifold (not pictured)** – These manifolds may or may not be mounted directly on the plate. Each port of the manifold provides air to one probe in the system via $^{5}/_{32}$ inch air hose. An adjustable flow control adjusts the amount of air the manifold receives.
H. **5005 Pendant Switch (not pictured)** – Two-button controller which plugs into the LMI multiplexor that can be used to extend/retract the probes and sample the data.

While LMI utilizes a two stage, five-micron filtering system for pneumatic AutoGage systems, **clean and dry air is still a requirement for the system and probes to function properly**. The incoming shop air should be set to 100 psi or greater. The first LMI regulator should be set to bring this down to 80 – 90 psi. The second regulator should be set to output air to the manifolds at 8-10 psi. Setting the output airflow higher could result in blown bellows and damage to the probes.

LMI 16 Port Multiplexor

The LMI 16 Port Multiplexor comes equipped with an On/Off Switch and a 9-pin serial input that connects to the PC and can support up to 16 probes (8 on each side).

> **NOTE:** If more than 16 probes are needed, the LMI 5001 G2 32-Port Primary Mux must be used instead of the LMI 16 Port Multiplexor**.**

Additionally, the LMI 16 Port Mux has a pendant switch input, a 24V valve output, and three indicator lights:

- **POWER** – Indicates the unit is receiving power from the Power Supply.
- **COMM** – Indicates communication between the Mux and PC via UGI software. This LED will flash when communicating with the Universal Gage Interface software.
- **VALVE** – Indicates the valves are active and are allowing air to pass through the system to the probes.

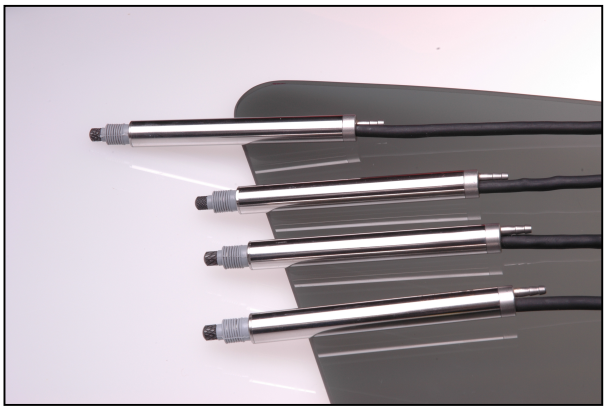
Power Specification:

Input Voltage: 85-264 VAC (120-370VDC)

Input Current: ECL15: 0.3 A rms

The LMI 16-Port Mux must be grounded to the plate or fixture. Contact LMI Corporation at (810) 714-5811 with any questions or concerns.

LMI 5300 Probes



LMI 5300 probes extend to meet the part when air is supplied to the probe. Each probe has a 10mm range of travel with an accuracy of +/- .03 mm. Each probe has five main components:

1. Removable Tip (part number LMI 037 spherical radius tip*)
2. Bellows (part number LMI 5304)
3. Barrel
4. Air hookup
5. Electrical cable

***Two notes about tips:**
(1.) Other tip designs are available; however, please consult your LMI representative when using non-LMI manufactured tips as adding additional mass may affect the functionality of the probe.
(2.) Optionally, a small amount of thread locker can be applied to the 4/48 thread to ensure the tip will not loosen. LMI recommends VC-3 Threadmate.

Installation of Probes

When designing fixtures utilizing LMI probes, consideration should be taken to protect the probes as much as possible from potential sideloading or bumping of the probe barrel and plunger when loading and unloading parts. Ideally, the tip of the probe should be flush or just below flush with the fixture rails when retracted. Probes must be able to fully extend and retract to calibrate a system.

LMI recommends securing LMI 5300 probes to the fixture using Starrett collets 25-SC 38 (LMI part number 2156). These collets provide a uniform amount of pressure to the probe's diameter, whereas other methods apply an uneven amount to one side of the probe.

Insert the LMI 5300 probe into the collet and align the retracted tip with the outside edge of the holding block. Hand-tighten the collet using the hexagonal nut. The internal fingers of the collet will grip the barrel of the probe with equal and dispersed pressure, preventing the probe from sliding closer to or further away from the part to be measured.

Hand-tightening should provide enough pressure to hold the probe in place; however, the hexagonal nut can be tightened using a torque wrench not to exceed 0.75 Nm. **Be aware that overtightening the collet could deform the probe barrel.**

Operation of Probes

Probes must be mastered in LMI's Universal Gauge Interface (UGI) software prior to taking any measurements. The mastering process consists of three steps:

1. Cal High – Probes are fully extended; readings are captured by UGI.
2. Cal Low – Probes are fully retracted; readings are captured by UGI.
3. Cal Master – Probes are extended to contact either a master part or a master cap; readings are captured by UGI.

The use of a **master part** allows the user to capture every point at once for each of the three steps listed above. If using a **master cap**, both the Cal High and Cal Low steps can be performed on all probes at once, but the Cal Master step must be performed on each individual probe, one at a time.

Once calibration is complete, a part can be measured using the steps below:

1. Verify probes are retracted before loading part onto fixture, then load part on the fixture.
2. Open UGI and click on Run a Partfile. Select the partfile from the list and click Run.
3. Extend the probes using the LMI 5005 pendent switch. The live readings on the screen will change.
4. Click the Sample button to capture the data.
5. Click the Write button to write the captured data to a chosen export location.
6. Retract the probes using the LMI 5005 pendent switch and unload the part.

For information about UGI and partfile creation for AutoGage systems, please reference the UGI 2nd Edition Manual at https://www.lmicorporation.com/AutogageSupport.html or contact LMI Corporation by phone at (810) 714-5811.

Proper Care and Handling of Probes

- It is important to retract probes before removing and loading parts on the fixture.
- The tip on the LMI 5300 probe can be replaced with a different profile tip if needed. It is important that the tips are properly screwed in all the way to avoid creating an inaccurate distance between the probe and the part.
- The LMI 5300's rubber bellows helps protect its inner electronics from dust and debris. Tears or holes in the bellows can result in the probe not fully extending. Bellows should be inspected on a regular basis to be sure they are not damaged as parts are loaded in and out of the fixture.

Troubleshooting

UGI says Calibration needed	- Calibrate the probes. - Check to see if the Frequency column in the Partfile Edits screen is set to 0 (if not, set it to 0).
Probes not extending	- Verify Power Supply is on. - Verify incoming shop air is clean and dry. - Verify Lockout Valve is open. - Verify 80-100 psi on Regulator/Filter indicator. - Verify 8-10 psi on Low Pressure indicator. - Open flow control on manifold
Points in UGI showing 4096	- Verify power switch is in the on position and that the mux is plugged into 110V AC power. - Verify COMM light is on. - Verify that the 9-pin cable is connected to the LMI 16 Port Mux.
Probe(s) not fully extending	- Check bellows for tears and proper seating - Replace and/or adjust bellows if necessary. - Adjust manifold flow control. - Verify 8-10 psi from the low-pressure regulator. - Is the barrel of the probe bent?

LMI 5200 AutoGage System

System Overview and Designation of Parts

The LMI 5200 AutoGage system is similar to the 5300 AutoGage system with exception of air supply plumbing. The 5200 probes are spring-loaded, so no air is needed. The probes remain extended until the mass of the part to be measured compresses the plunger. The power supply and mux box are the same in both 5300 and 5200 16-Port AutoGage systems.

Power Supply and Multiplexor(s) – Reference Page 3

LMI 5200 Probes

LMI 5200 probes retract when a part is placed on them. It is especially important to not side load the LMI 5200 probes. Each probe has a 10mm range of travel with an accuracy of +/- .03 mm.

Each probe has four main components:

1. Removable Tip
2. Bellows (part number LMI 5304)
3. Barrel
4. Electrical cable

Two notes about tips:
(1.) Other tip designs are available; however, please consult your LMI representative when using customer tips as adding additional mass may affect the functionality of the probe.
(2.) Optionally, a small amount of thread locker can be applied to the 4/48 thread to ensure the tip will not loosen. LMI recommends VC-3 Threadmate.

Installation of Probes

When designing fixtures utilizing LMI 5200 probes, consideration should be taken to protect the probes as much as possible from potential sideloading or bumping of the probe barrel and plunger when loading and unloading parts. Ideally, the tip of the probe should be flush or just below flush with the fixture rails when retracted. Probes must be able to fully extend and retract to calibrate a system.

LMI recommends securing 5200 probes to the fixture using Starrett collet 25-SC 38 (LMI part number 2156). These collets provide a uniform amount of pressure to the probe's diameter, whereas other methods apply an uneven amount to one side of the probe.

Insert the LMI 5200 probe into the collet and align the retracted tip with the outside edge of the holding block. Hand-tighten the collet using the hexagonal nut. The internal fingers of the collet will grip the barrel of the probe with equal and dispersed pressure preventing the probe from sliding closer to or further away from the part to be measured.

Hand-tightening should provide enough pressure to hold the probe in place; however, the hexagonal nut can be tightened using a torque wrench not to exceed 0.75 Nm. **Be aware that overtightening the collect could deform the probe barrel.**

LMI also recommends that the probes be orientated on the fixture in a manner to avoid any instances of side loading, which can damage the probe.

Operation of Probes

Probes must be mastered in LMI's Universal Gauge Interface (UGI) software prior to taking any measurements. The mastering process consists of three steps:

1. Cal High – Probes are fully extended; readings are captured by UGI.
2. Cal Low – Probes are fully retracted (press and hold down the plunger); readings are captured by UGI.
3. Cal Master – Probes are extended to contact either a master part or a master cap; readings are captured by UGI.

The use of a **master part** allows users to capture every point at once for the Cal High and Cal Master steps listed above. However, the Cal Low step must be done individually for each probe. If using a **master cap**, Cal High can be performed on all probes at once. However, Cal Low and Cal Master must be performed on each individual probe one at a time.

Once calibration is complete, a part can be measured using the steps below:

1. Carefully load the part on the fixture.
2. Open UGI and click on Run a Partfile. Select the partfile from the list and click Run.
3. Click the Sample button to capture the data.
4. Click the Write button to write the captured data to a chosen export location.
5. Carefully unload the part.

For information about UGI and partfile creation for AutoGage systems, please reference the UGI 2nd Edition Manual at https://www.lmicorporation.com/AutogageSupport.html or contact LMI Corporation at (810) 714-5811.

Proper Care and Handling of Probes

- If probes swing or clamp into a measurement position, it is important to retract the swing arms or clamps before removing and loading parts on the fixture.
- The LMI 5200 probe's tip can be replaced with a different profile tip if needed. It is important that tips are properly screwed in all the way to avoid creating an inaccurate distance between probe and part.
- The LMI 5200's rubber bellows helps protect its inner electronics from dust and debris. Tears or holes in the bellows can result in the probe not fully extending. Bellows should be inspected on a regular basis to be sure they are not damaged as parts are loaded in and out of the fixture.

Troubleshooting

UGI says Calibration needed	- Calibrate the probes. - Check to see if the Frequency column in the Partfile Edits screen is set to 0 (if not, set it to 0).
Points in UGI showing 4096	- Verify Power Supply is on. - Verify that the 9-pin cable is connected to the LMI 16 Port Mux.