The equipment should be handled only by people having the necessary knowledge and training for the work. It is the responsibility of the supervisor to ensure that this is the case.

To prevent injury from moving parts all covers should be in place during normal operation of the instrument.

Always read the instructions carefully before operating the equipment. Pay special attention to the warnings and directions relating to personal safety. These instructions include the following types of warnings:

<table>
<thead>
<tr>
<th>Degree of potential injury or damage</th>
<th>Likelihood of occurrence</th>
<th>Signal word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe</td>
<td>Can occur if warning is ignored</td>
<td>WARNING</td>
</tr>
<tr>
<td>None</td>
<td>This label is used for special instructions which are important but not related to hazards</td>
<td></td>
</tr>
</tbody>
</table>

To ensure that the equipment functions properly and that accurate readings are obtained, all adjustments, settings and calibration routines described in these instructions should be carried out only by specially trained personnel.

---

**WARNING**

When service work is being done with the cover and gate frame on the profile measuring station raised, there is a danger of fingers etc. being trapped. Always secure the hood in open position if the compressed air is turned off. Failure to observe this can result in the cover closing suddenly, causing injury. Most of the built-in instruments have moving parts that are operated pneumatically and/or electrically, and some incorporate knives that are capable of causing serious injury. All service work should be carried out only by specially trained personnel. A large part of the service work needs to be done with the compressed-air supply connected. It is therefore essential that only one person at a time should work on the profile measuring station when the cover and guard are raised. This reduces the risk of instruments being activated unexpectedly.

---

**WARNING**

The system is delivered with a service key which bypasses the built-in safety functions. The service key should only be used by ABB personnel, or service specialist with equal knowledge and training. Putting hands or fingers inside modules when the service key is inserted result in extreme danger.
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1 Introduction

1.1 System overview

L&W Autoline Profiler measuring station is a complete system for automatic measurement of profile strips or sheets. It consists of the following components:

- Measuring bench with equipment for feeding the sample strip in and out, and for supplying electric power and compressed air to the measuring modules included in the station and other equipment. A description of the measuring table is given in the operating instructions for L&W Autoline 400 profile measuring station.

- The MSU system unit, for communication between the profile measuring bench computer and the respective modules. The system unit incorporates a control board for each module.

- A PC running L&W Autoline Profiler Software, which controls the feed mechanism for the sample, the various modules, and collects and processes the measurement results. The PC program is described in a separate users' manual.

- Modules for measuring various properties. Several properties are measured in certain modules, whereas two instruments can be integrated into other modules. Each L&W Autoline module, measuring either one or multiple properties, has its own code number and operating instructions.

Also included in the delivery is an L&W Profile Sample Cutter (code 148) or an L&W Sample Trimmer (code 149).

L&W Autoline 400 Profiler may also be equipped with an L&W Sample Loading System (code 525) for automatic loading of sample strips and sheets.

1.2 Delivery list

In addition to the permanently fitted equipment and the separate parts belonging to the profile measuring bench instrumentation (specified in the operating instructions for each instrument), the following are included in the delivery.

<table>
<thead>
<tr>
<th>Supplied separately</th>
<th>Supplied in special accessories case</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Blank plates for covering openings left by removal of measuring modules</td>
</tr>
<tr>
<td>1 set</td>
<td>Allen keys</td>
</tr>
<tr>
<td>1</td>
<td>PROM extractor</td>
</tr>
<tr>
<td>1</td>
<td>Spanner (17 mm) for adjustment of measuring bench feet</td>
</tr>
<tr>
<td>1</td>
<td>Phillips screwdriver (#2) for measuring-bench inspection panels</td>
</tr>
<tr>
<td>1</td>
<td>Pozidrive screwdriver (#1) for other cross-head screws</td>
</tr>
<tr>
<td>2</td>
<td>Screwdrivers (for fine-tuning of potentiometers)</td>
</tr>
<tr>
<td>1 set</td>
<td>Spare screws for measuring-bench inspection panels</td>
</tr>
<tr>
<td>1 set</td>
<td>MSU fuses</td>
</tr>
<tr>
<td>1</td>
<td>Ratchet handle with 3/8&quot; hexagon bit for adjusting height of castors</td>
</tr>
<tr>
<td>2</td>
<td>Plugs for air hoses (10-mm dia.)</td>
</tr>
<tr>
<td>4</td>
<td>Plugs for air hoses (6-mm dia.)</td>
</tr>
<tr>
<td>4</td>
<td>Reduction fittings for 10/6-mm dia. air hose</td>
</tr>
<tr>
<td>1</td>
<td>Service key for compressed-air safety lock</td>
</tr>
</tbody>
</table>
2 Measurement method

L&W Autoline 400 profile measuring station is intended for measuring various properties of a profile test strip taken across the machine direction. The sample strip should be 295–307 mm in width and should be cut out using an L&W Profile Sample Cutter (code 148) or an L&W Sample Trimmer (code 149). To guide the measurement, profile measuring programs are set up in the station computer. The properties that are to be measured, the distance between measurement points, etc. are specified in the measuring programs. The grade definitions are also entered in the computer.

A measurement series must be defined before measurement. This involves entering the source of the test piece, the grade involved and the profile program which is to be used.

The sample strip is placed in a container, and its end is fed into the profile measuring station. When a measurement series is started, the strip is fed automatically up to the first measurement position. Measurement and feeding of the test strip in accordance with the selected profile program are then carried out automatically.

Measurement with automatic feed can also be carried out on sheets which are at least 400 mm long.

The Profiler may also be equipped with an L&W Sample Loading System for automatic loading of samples.

Sheet measurement can also be carried out by the sheet being placed manually in an instrument.
3 Description of the equipment

The measurement bench consists of a frame in which the following units are mounted:

- Profile measuring station computer with monitor, keyboard and trackball.
- MSU system unit.
- Measuring modules in accordance with the order.

The measurement bench also contains the following:

- Feed mechanism that feeds the test strip into the profile measuring station.
- Equipment for supplying power to the various components of the profile measuring bench.
- Equipment for supplying compressed air to the various parts of the profile measuring bench.
- Two fans for evacuation of air to prevent temperature rise in the profile measuring station.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Opening for feeding the sample strip</td>
</tr>
<tr>
<td>2</td>
<td>Monitor screen mounted on adjustable arm</td>
</tr>
<tr>
<td>3</td>
<td>Hinged hood</td>
</tr>
<tr>
<td>4</td>
<td>Figure marking the centre of module space</td>
</tr>
<tr>
<td>5</td>
<td>Adjustable foot (total of six)</td>
</tr>
<tr>
<td>6</td>
<td>Emergency stop</td>
</tr>
<tr>
<td>7</td>
<td>Cover for replacing the backgrounds of the colour meter</td>
</tr>
<tr>
<td>8</td>
<td>Door (total of six)</td>
</tr>
<tr>
<td>9</td>
<td>Skirting plate</td>
</tr>
<tr>
<td>10</td>
<td>Container for sample strip</td>
</tr>
<tr>
<td>11</td>
<td>Control buttons for opening/closing the hood</td>
</tr>
<tr>
<td>12</td>
<td>Keyboard and trackball on sliding holder</td>
</tr>
</tbody>
</table>
3.1 Emergency stop

The Emergency Stop shuts off the power supply to the measuring station and sample loader (if fitted), together with the compressed-air supply to some of the instruments. The Emergency Stop should only be used to prevent injury. To reset, turn the knob in the direction of the arrow. The PC program must now be restarted.

The Emergency Stop on the sample loader control panel operates in the same way.
3.2 Feed mechanism

The sample strip is fed by an endless drive belt located so that it drives one long side of the sample strip. Nine pneumatically actuated pressure rollers are located above the drive belt. When the end of the sample strip is fed into the profile measuring station, it will be detected optically and the first pressure roller will be lowered to press the strip down onto the belt. When measurement is started, the belt starts and feeds the strip to the first measurement position.

When the end of the strip has passed the next pressure roller, this roller will be lowered and the first roller will be lifted. The end of the strip is drawn in this manner through the profile measuring station by one of the pressure rollers pressing it down onto the drive belt. A drive roller and a pressure roller at the centre of the strip are located after the last measuring module. The drive roller with pressure roller feed the sample strip when the end has been fed through the profile measuring station. When all measurements on the sample strip have been completed, the strip is discharged from the profile measuring station. It is advisable to place a collecting container at the right-hand end wall of the bench in order to collect the tested sample strips.

A finger protection gate is provided in front of the pressure rollers, and this gate is at the bottom of its travel when the sample strip is being fed and measurements are in progress. The gate also serves as a guide for the sample strip during measurement. When carrying out measurements such as on a sheet which is not fed automatically, the gate can be lifted by pressing the Open Gate button in the basic image of the PC program.

The gate and pressure rollers are mounted on a gate frame which is raised together with the hood for inspecting and servicing the instruments.

3.3 Connections

The drawing below shows the connection panel that is located at the left-hand end of the station. Connections for mains power and compressed air supply are situated below this panel. For further information, see under Power supply, Compressed air supply and Alarm later in this section.

---

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>External alarm</td>
</tr>
<tr>
<td>2</td>
<td>Power-supply for sample loader</td>
</tr>
<tr>
<td>3</td>
<td>Sample-loader interface</td>
</tr>
<tr>
<td>4</td>
<td>Network port</td>
</tr>
<tr>
<td>5</td>
<td>Dummy plug shown mounted on drawing</td>
</tr>
</tbody>
</table>
3.4 Power supply

The profile measuring station is connected to the mains power supply at a central socket. Connect the bench to a well stabilized and transient-free supply with protective earth. Check that the power supply voltage is in accordance with the rating plate on the equipment.

- **The power supply should fitted with a mains switch and be protected by a 10 A fuse.**

  Make sure that the power supply cable is sufficiently long to enable the profile measuring station to be rolled out at least one metre away from the nearest wall.

- **A dummy plug must be fitted in the power-supply port for the sample loader if no sample loader is connected.**

3.5 Compressed air supply

Connect the profile measuring station to a supply of filtered and dry compressed air at a pressure of 0.6–1.0 MPa. Regulators with pressure gauges, filter and compressed air main valve are located on the inside of the door, at the extreme left of the bench. Make sure that the supply hose is sufficiently long to enable the profile measuring station to be rolled out to a distance of at least one metre from the nearest wall.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regulator for incoming compressed air (preset to approx. 0.6 MPa)</td>
</tr>
<tr>
<td>2</td>
<td>Pressure gauge for incoming compressed air</td>
</tr>
<tr>
<td>3</td>
<td>Filter for the incoming compressed air (normally concealed by a panel). The filter mesh is 5 µm.</td>
</tr>
<tr>
<td>4</td>
<td>Regulator for the compressed air supply to the pressure rollers (preset to a minimum of 110 kPa)</td>
</tr>
<tr>
<td>5</td>
<td>Pressure gauge for the compressed air to the pressure rollers</td>
</tr>
<tr>
<td>6</td>
<td>Filter for measuring air and cleaning air nozzle (normally concealed by a panel). The filter mesh is 0.01 µm.</td>
</tr>
<tr>
<td>7</td>
<td>Main valve for the compressed air supply to the profile measuring station</td>
</tr>
</tbody>
</table>

The compressed air supply can be shut off by means of the main valve. When the valve is closed (AIR OFF) the air system in the profile measuring bench is not pressurized. From the main valve, the compressed air flows to a regulator with filter and water collector. The regulator should be preset to around 0.6 MPa. To adjust the regulator setting, withdraw the regulator knob and set the pressure to the required value. Then press the knob back in again to lock the setting.

The air that actuates the paper feed pressure rollers is controlled by a special regulator. For thin paper grades, set the pressure to a minimum of 110 kPa. For thicker grades,
increase the pressure until reliable feed is obtained. To reset the regulator, withdraw the regulator knob, set the pressure to the required value, and then press the knob back in to lock the setting.

When adjusting the pressure, always start from a lower pressure and increase to desired level.

The compressed air used as measurement air in the instrument for measuring the roughness and air permeance is filtered in an additional fine filter.

For particulars of filter care, see the section under Inspection and maintenance.

3.6 Cleaning air nozzle

A cleaning air nozzle is connected on the inside of the second inspection door from the left. The nozzle is provided for cleaning the optical sensors of the bench, PPS measuring heads, reference films, etc.

To open the nozzle, bend the tip down, and to close it, release the tip.

3.7 Alarm

The profile measuring bench has a port for the connection of an external alarm, which can be either an acoustic alarm or a visual alarm (warning light). The alarm is triggered under the following conditions:

- When the wire basket in the grammage tester is full. When the system is ready to feed in the next sample, the profiler pauses, whereupon the alarm is activated and a message is displayed on the screen. When this occurs, acknowledge the message on the screen, empty the basket and press Continue on the screen.

- If the leading edge of a sample fails to pass through the profiler, the test cycle will be aborted, the alarm activated and a message will be displayed on the screen. When this occurs, acknowledge the message on the screen, remove the sample by hand and restart the test.

Connecting an alarm: warning light and/or acoustic alarm
The power supply for the alarm can be taken either from the measuring station or from an external source (see below).

External-alarm port on measuring station (viewed from the front). 5-pin Tuchel C91A

Alarm connected to power supply from measuring station

Alarm connected to external power supply
3.8 Installation

The profile measuring station should normally be installed in an air conditioned laboratory and should be connected to compressed air and electric power supplies. The profile measuring station can also be connected to an external network for transmission of measurement data and downloading of grade and measurement series definitions.
4 Operation

Please refer to separate instructions for loading samples using the L&W Sample Loading System.

4.1 Measurement on a sample strip

Place the rolled-up strip (295–307 mm wide) in the container in the left-hand end of the bench, so that the top side of the strip faces upwards when the end is fed into the profile tester. Pull the end of the strip up towards the entry and feed it in under the two guide strips. N.B. The right-hand edge of the sample strip must be guided by the guide edge of the bench. Feed the end in further.

When the strip has been fed in around 100 mm, the first pressure roller will be lowered and will hold the strip against the stationary drive belt.

Sample strips of heavier grades must not have excessive curl.

When the sample strip is in position, profile measuring will be started by the computer program. The drive belt starts and feeds the sample strip to the first measurement to be carried out in accordance with the selected profile measuring program.

4.2 Measurement on sheet

Measurement on sheet can be carried out in one of the following ways:

- If the sheet is 295–307 mm wide and at least 400 mm long, it can be handled by the automatic feed mechanism. Measurement with automatic feed on a sheet presupposes that a special profile measuring program is set up for this measurement. The sheet is fed in as described above for measurement on a profile sample strip.

- To carry out individual measurements on a sheet, the sample can be placed manually in the required instrument. Touch Open Gate in the basic image to lift the finger gate. Place the sample centrally in the required instrument. The centre of every measuring module is marked with a figure at the front of the hood. Measurement is then carried out as a manual measurement from the PC program.
5 Inspection and maintenance

![WARNING]

When service work is being done with the hood on the profile measuring station raised, there is a danger of fingers etc. being trapped. Always secure the hood in open position if the compressed air will be turned off. Most of the built-in instruments have moving parts that are operated pneumatically and/or electrically, and some incorporate knives that are capable of causing serious injury. All service work should be carried out only by specially trained personnel.

A large part of the service work needs to be done with the compressed-air supply connected. It is therefore essential that only one person at a time should work on the profile measuring station when the hood and gate are raised. This reduces the risk of instruments being activated unexpectedly.

The hood over the measuring modules is pneumatically operated. Control buttons for opening and closing the hood are placed on the far left end of the profiler. The gate frame is linked to the hood, i.e. it is lifted and lowered with the hood.

During inspection and service, when the compressed air is shut off, the hood must be supported by a strut.

- Press the button to open the hood.
- Lift the hood further by one hand and move the lower end of the strut backwards to lock it in its support. Lower the hood and check that it rests on the strut.
- Slide the latch backwards and secure it by tightening the securing screw.
- The compressed air can now be shut off.

Follow instruction below to lower the hood again.

- Check that the compressed air is on. Press the lift button to pressurize the lifting cylinders.
- Move the monitor so that it will not interfere the hood movement.
- Undo the securing screw and slide the latch forward.
- Lift the hood by one hand and move the lower end of the strut forward to release it from the support.
- Lower the hood and close it by pressing the closing button.
To prevent personnel injuries, the profile measuring bench is equipped with a safety lock. **When the hood is raised, the compressed air supply to modules that could cause injuries is interrupted.** For service work that must be done with the hood raised and the measuring instruments operative, a separate service key for the safety lock is delivered with the profile measuring bench.

*Before closing the hood, remove the service key from the lock and move the monitor so that it will not prevent the hood from closing.*

### 5.1 To move the profile measuring station

**On casters**

The profile measuring station is equipped with four casters. The casters are normally retracted, and the bench rests on its six adjustable feet. To gain access to the rear of the profile measuring station, for instance, lower the casters and the profile measuring station can then be moved a short distance.

*The casters may be used only for short distances on a smooth surface.*

The screws for lowering the casters are fitted in the base plate of the profile measuring bench, on the inside of the doors. Use the tool supplied to turn the screws clockwise. Turn the screws alternately until the profile measuring station rests with the load distributed uniformly onto the four casters.

When measurements are being taken, the profile measuring station must always stand on its six feet. Raise the casters by turning the screws anti-clockwise. After the measuring bench has been moved, check that it is level and that it rests on all six feet. If necessary, adjust the feet.
Using a pallet transporter or forklift truck

If the profile measuring station is to be transported a longer distance, it can be lifted by means of a pallet transporter or forklift truck. Before lifting, remove the two front skirting plates and possibly also the skirting plates on the ends of the bench.

Option 1

Using pallet transporter or forklift truck

Make certain that the sturdy square beams of the frame are being used for lifting.

5.2 To remove/fit a measuring module

Every measuring module can easily be removed from the frame, e.g. for major service work or replacement. The module is mounted on the frame of the bench and is secured to the frame tubes by means of clamps. To remove a module, proceed as follows:

• Open the door in front of the module and release all connections from the front panel of the module.
• Lower the casters of the profile measuring bench and pull the bench forward so that its rear will be accessible. Remove the cover panel in question at the rear. Undo the screws at the top, pull out the top of the panel and disconnect the power supply to the fan. (The power supply can alternatively be disconnected from the frontside.) Lift off the panel.
• Release the clamps that secure the module to the frame (usually one socket head screw in each square tube that can be released from the underside).
• Carefully lift the module out towards the rear. The modules with bursting strength testers can be withdrawn a few centimetres towards the rear, and the rear can then be lowered. Then slope the module towards the rear so that it can be lifted out between the square tubes of the frame.
• Proceed in the reverse order to fit a module and re-assemble the profile measuring station.

If the profile measuring bench is to be used with one module removed, one of the blank plates supplied must be fitted in place of the module that has been removed.

WARNING

When removing or fitting an Elrepho module (code 539), extra care must be taken. Contact your Lorentzen & Wettre service and support organization for guidance.
5.3 To clean the drive belt

Some paper grades can result in deposits accumulating on the belt, causing the samples to slip. If this happens, clean the belt using only pure alcohol. The use of any other cleaning fluid can damage the belt.

5.4 To clean and adjust the sensors for the sample strip

Twelve optical sensors sense the beginning and end of the sample strip. The sensors are mounted on the inside of the drive belt. Blow the sensors clean every day. Use the cleaning air nozzle supplied with the Profiler, situated inside the second door.

Six amplifiers, with which the sensitivity of the sensors can be adjusted, are located behind the first door from the left. The optical paper sensors are connected two by two to the amplifiers. Proceed as follows to normalize and adjust the threshold level of the amplifiers.

- Clean the sensors and make sure that there is no paper or the like on them.
- Open the plastic cover over the first (left) amplifier control-panel. Set the channel selector to 1. This amplifier handles sensor one and two, next amplifier handles sensor three and four and so on.
- Bend a strip of paper or paperboard, about 15 mm wide, as shown in the drawing below and place it centrally over the first sensor at the extreme left.
• Check that the mode selector is in RUN position.
• Press and hold the MODE button for approx. three seconds (until the progress bar appears in the display).
• When the display is back to normal, the normalization is ready.
• Switch the mode selector to position SET.
• Check that the template still covers the sensor to be adjusted.
• Press the UP or DOWN button for one second.
• Remove the template from over the sensor.
• Press the UP or DOWN button for one second.
• Now the threshold value will flash twice. The value should be 1000 ± 100 units.
• Switch the mode selector back to position RUN.
• The adjustment of the first sensor is now finished.
• Repeat this procedure for all the remaining sensors.

5.5 Compressed air system

Draining the filter
Condensate is collected in the air-filter bowls. The bowls are drained automatically. The condensate level can be checked through windows on the filter bowls.

To check and replace the filter elements
The filter elements should be replaced if they have become clogged. Dismantle the filters as follows.
• Shut off the compressed air supply by turning the main valve to AIR OFF.
• Remove the cover plate over the filters. First back off the lower screws about one turn and then remove the upper screws. Remove the cover plate.
• Unscrew the filter bowl by turning it anti-clockwise by hand and remove it. Clean the bowl, e.g. using soapy water, but never use any solvent.
• Unscrew the filter element from the top part of the unit, either by hand or by using a wrench. Fit a new element.
• Refit the filter bowls and refit the cover plate.