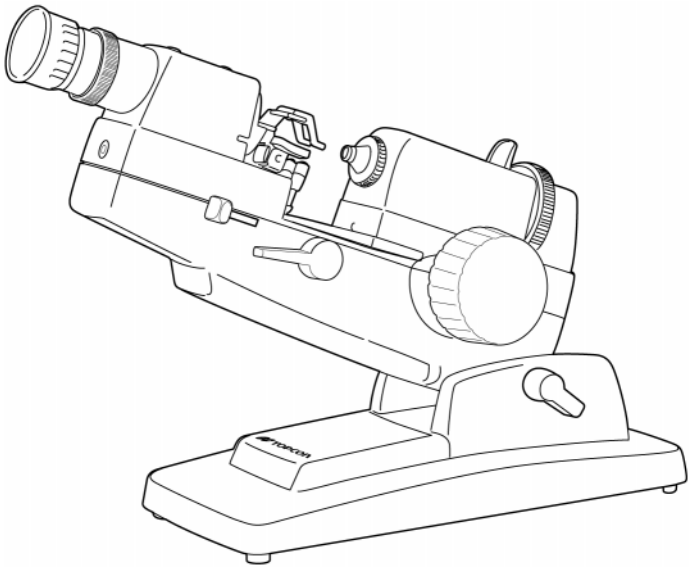
TOPCON

ENGLISH

INSTRUCTION MANUAL



LENSMETER

LM-8

INTRODUCTION

Thank you very much for purchasing the TOPCON *LM-8 Lensmeter*.

This Instruction Manual gives a description of the TOPCON *LM-8*. This includes its main features and basic operation, troubleshooting and the checking, maintenance and cleaning of this instrument.

Please read the section *Displays for safe use* on page *v* and the section *Safety precautions* on page *vi* carefully before the instrument is put into operation.

To get the best use from this instrument, read these instructions carefully and place this manual in a convenient location for future reference.

Precautions

- This *Lensmeter* is a piece of precision equipment, which needs to be used and kept in places under normal conditions regarding temperature and humidity. Do not expose the instrument to direct sunlight.
- To ensure best use, install the instrument on a level floor, free from any vibration.
- Always check that all cables are plugged in correctly before use.

  WARNING: For your own safety always make sure the instrument is correctly grounded for compatibility with high currents. Never disable the grounding plug of the power cord.
- Use a power supply within the range of ±10% of the rated voltage of AC 100V ±10% (50/60 Hz).
- Make sure that no fingerprints or foreign matter remain on the objective lens.
- TOPCON is not responsible for any modification caused by disassembly or adjustments made by unauthorized dealers or persons.
- If any trouble occurs with your instrument or its accessories, first refer to the troubleshooting guide in this manual and carry out the checks listed there. If nothing is found during your check, then contact your authorised dealer or TOPCON to service it.
- Always turn the power source off and place the dust cover on the instrument when it is not in operation.

Selecting externally connected equipment

The TOPCON *LM-8* complies with the CE marking.

Before connecting a personal computer, image recorder, image printer, TV camera, or monitor to the TOPCON product, make sure that such external equipment is in compliance with the CE marking.

Displays for safe use

Important warnings are placed on the products and inserted in the instruction manuals, in order to encourage the safe use of products and prevent any danger to the operator and others or damage to existing facilities.

We advise that everyone understands the meaning of the following displays and icons before reading the "Safety precautions" and text.

Meaning of displays

Display	Meaning
 **WARNING**	Ignoring or disregarding this display may result in serious injury or lead to life-threatening situations.
 **PRECAUTIONS**	Ignoring or disregarding this display may lead to personal injury or severe damage to the instrument or facilities.

- Potential injury includes wounds, burns, electric shocks, etc.
- Damage to facilities refers to extensive damage to buildings, equipment and furniture.

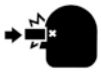
Meaning of icons

Icons	Meaning
	This indicates Mandatory Action. Specific content is expressed with words or an image, located close to the icon.
	This icon indicates a Hazard Alert (Warning). Specific content is expressed with words or an image, located close to the icon.
	This indicates Prohibition. Specific content is expressed with words or an image, located close to the icon.

Safety precautions

This instruction manual specifies safety precautions necessary to prevent accidents.

Always observe these precautions and use the instrument correctly.

	CAUTION ⚠	
Icons	**Prevention item**	**Page**
	● To prevent your fingers getting caught, be particularly careful when changing the tilt angle of the machine.	*17*
	● To prevent the machine/component parts from falling over operate the machine with care when changing the tilt angle.	*17*

Operation and maintenance

Purpose

This *Lensmeter* is a piece of precision electrical equipment for medical use, which must be used according to a doctor's instructions.

User maintenance

To ensure the safety and performance of the instrument, unless otherwise specified in this manual, the maintenance should only be carried out by a trained service technician. The following maintenance tasks, however, can be performed by the user. We refer you to the applicable text in this manual, with regard to the maintenance method.

Target position adjustment

For details, we refer you to the applicable text in this manual (page *29*).

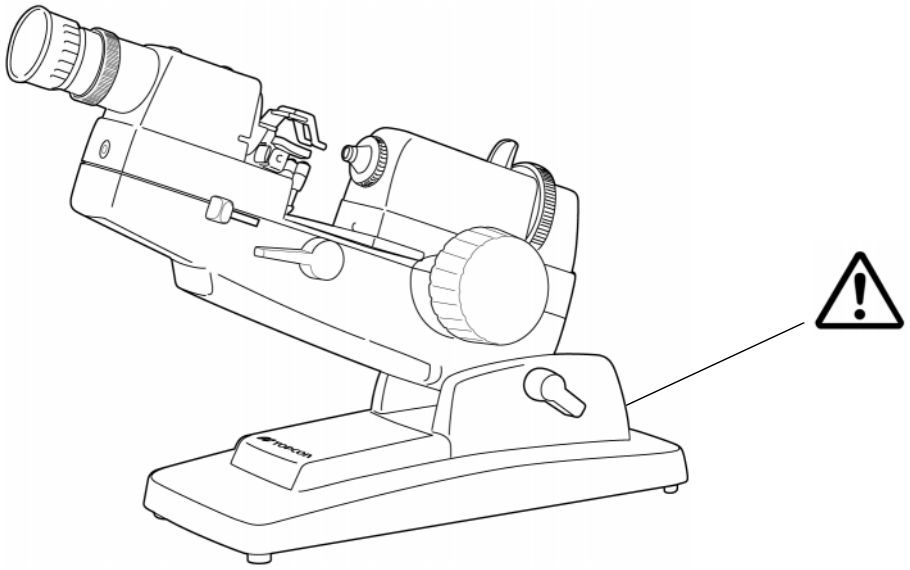
TOPCON instruments general statements

- TOPCON shall not take any responsibility for damage due to fire, earthquakes, actions by third persons and other accidents, or the negligence and misuse by the user or use under unusual conditions.
- TOPCON shall not take any responsibility for damage resulting from the inability to use this equipment, such as a loss of business profit and suspension of business.
- TOPCON shall not take any responsibility for damage caused by operations other than those described in this Instruction Manual.
- The diagnoses that are made are the responsibility of relevant doctors, and TOPCON shall not take any responsibility for the results of such diagnoses.

Warning indications and positions

To ensure safe operation of this equipment, warning indications are provided.

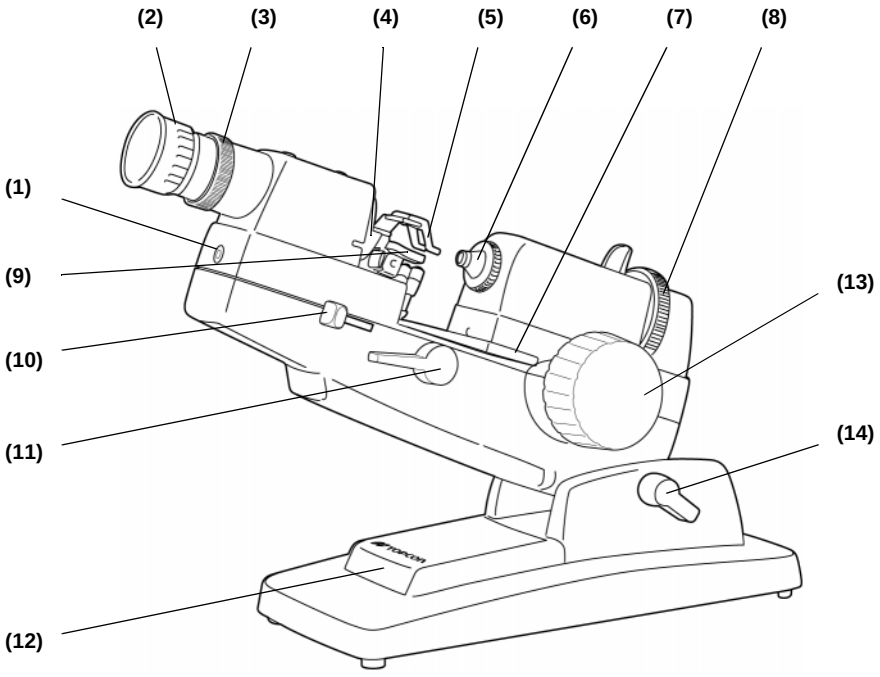
Adhere to the following warning instructions.



Contents

1 COMPONENTS

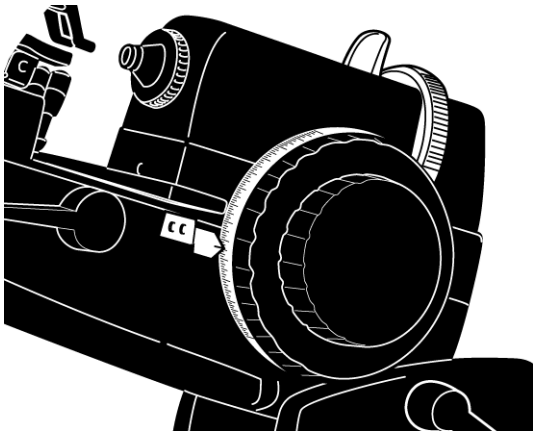
1.1 Main Body



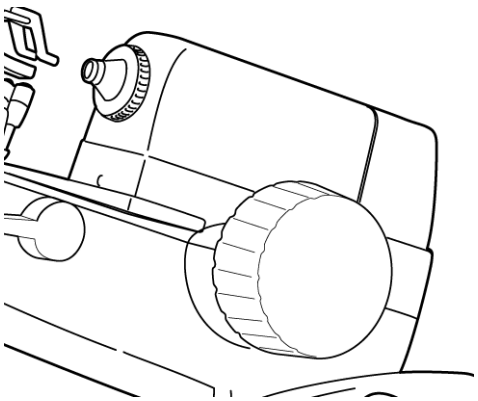
(1) Power switch
(2) Eyepiece adjustment ring
(3) Protractor ring

(4) Prism holder
(5) Lens holder
(6) Lens stop
(7) Lens table
(8) Axis wheel
(9) Lens-holder lever
(10) Axis marker lever
(11) Lens table adjustment lever
(12) Cell box
(13) Diopter power knob
(14) Tilt locking-lever

LM-8E (diopter power knob with scale)

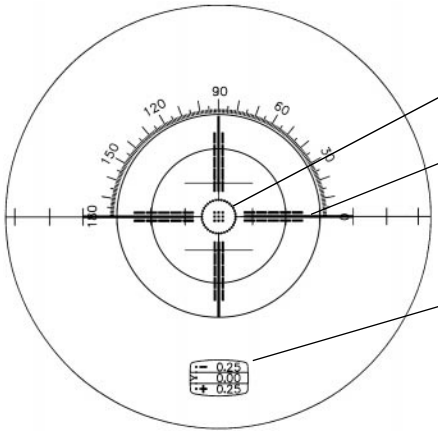


LM-8C (without axis wheel)



1.2 Target image

Cross-line Pinhole Corona

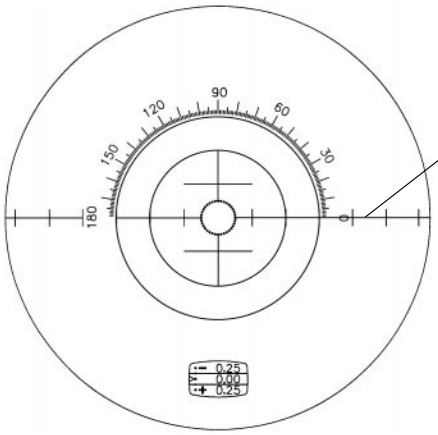


Pinhole corona

Cross-line

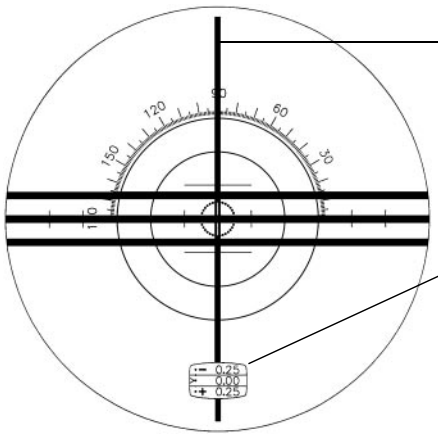
Diopter scale-reading window

Pinhole Corona (LM-8C)



Scale

Cross-line Pinhole Corona

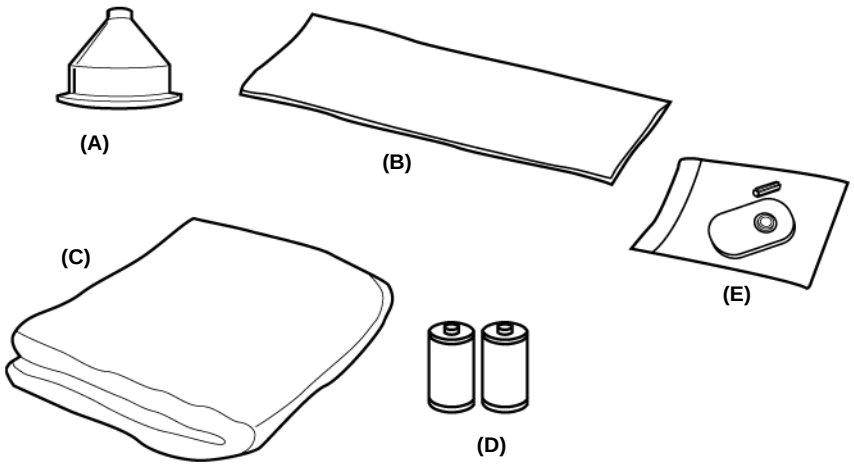


Cross-line

LM-8E Diopter power is indicated on the scale of the Diopter Power knob.

1.3 Accessories

Accessories



Description	Quantity
Contact lens stop **(A)**	1
Silicon cloth **(B)**	1
Dust cover **(C)**	1
UM1 dry cell **(D)**	2
Lens protection pad **(E)**	1 set
Steel needle marking set (3 steel needles, refill ink, ink pad, holder) (optional accessory)	1 set

2 BASIC OPERATION

2.1 Preparations

1 Check component parts of the machine.

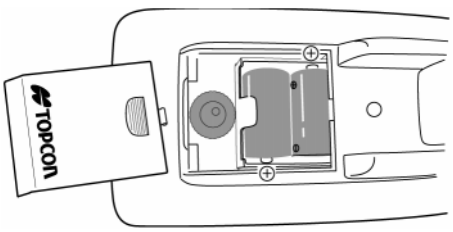
Remove the adhesive tape from the lens stop.

Remove the adhesive tape from the marking ink cartridge.

2 Put dry cells in the cell box.

Turn on the power switch; the lamp will come on.

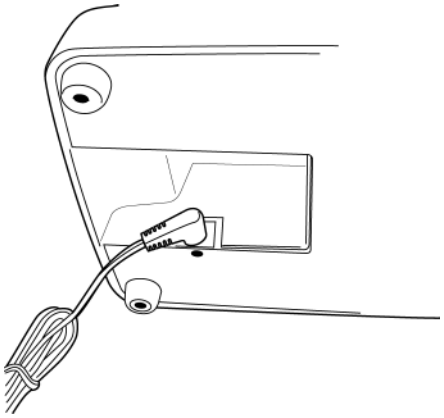
The lamp will go off automatically after 5 minutes to save cell power.



Note: *When removing dry cells, remove the (+) side first. If the spring on the (-) side jumps out, push it back into position.*

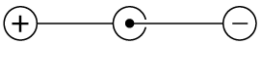
When using an AC adapter (sold on the market), insert power connector as illustrated below, and then turn on the power switch. In this case, the light stays on (even after 5 minutes).

With regard to the AC adapter, either purchase one yourself or ask your dealer to get one for you.

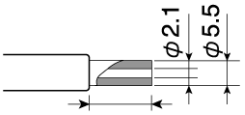


AC adapter specification

For Europe, products are designed to comply with the CE standard.



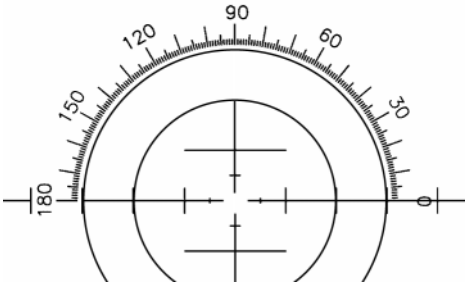
Output: 6V, 100mA and higher



3 To enable measurements in a comfortable position, adjust the tilt angle of the machine by operating the tilt locking lever.

4 Before starting measurement, correctly focus the target (otherwise an incorrect measurement result will occur).

Before setting the lens, rotate the eyepiece adjustment ring and stop it at the point where the scale is clearly visible. Placing a white paper at the lens stop makes it easier to read the scale.



Note: *To avoid visual error in adjustment, rotate clockwise.*

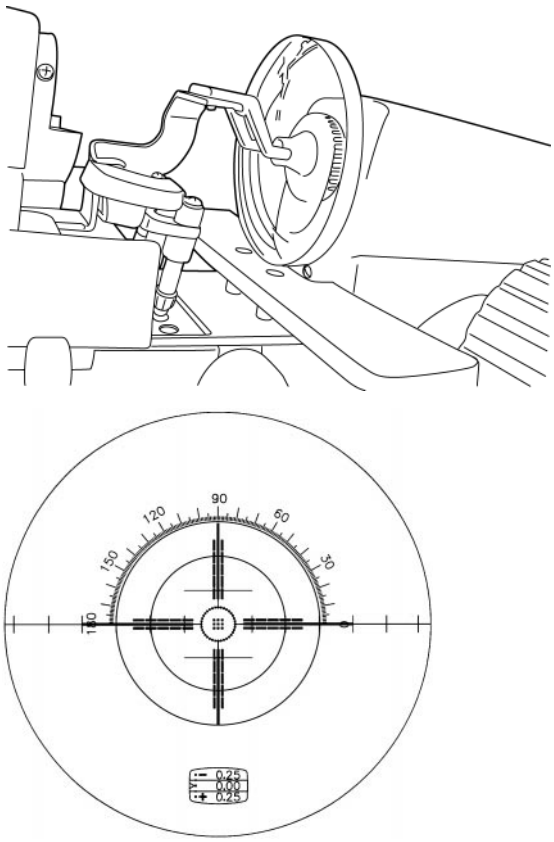
2.2 Measurement

2.2.1 Measurement of spherical lens

1 Place the concave surface of the lens on the lens stop and fix it firmly with the lens holder.

2 Focus the target correctly by rotating the diopter power knob.

Note: *To avoid visual error during adjustment, adjust in the (+) -> (-) direction.*



3 Read the indicator value on the diopter power scale.

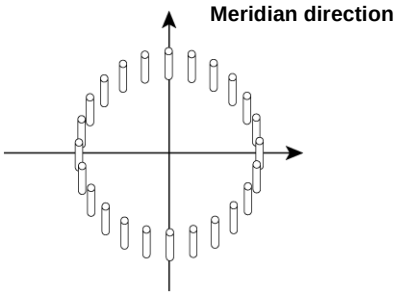
Note: *If the scale center does not align with the target image center, this means that optical center of the lens is not in proper alignment with the optical axis of the lens-meter. Vertical displacement can be adjusted by pushing the lens towards the lens table by operating the lens table adjustment lever, and horizontal displacement can be adjusted by manually moving the lens laterally.*

2.2.2 Measurement of astigmatic lens

1 Focus the pinhole corona section of the target by rotating the diopter power knob.

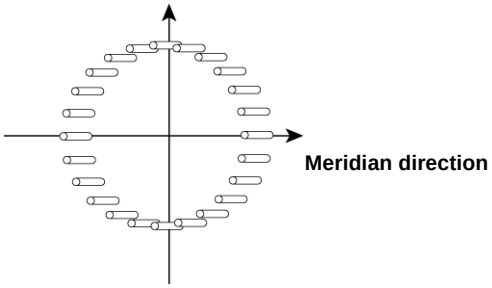
2 Align the cross-line with the stronger meridian by rotating the axis wheel (not applicable to LM-8C).

Note: *LM-8C Align the scale with the stronger meridian by rotating the protractor ring.*



3 Read the diopter power scale and the angle for the meridian direction.

4 Focus the target for the other meridian by rotating the diopter power knob.



5 Read both the diopter power scale and the angle.

Of these 2 measurement values, take the absolute value of the smaller one as being the S (spherical) power, and the difference between these two as the C (cylindrical) power. For the axial angle, take the angle of the measurement value, the absolute value of which will be the larger value.

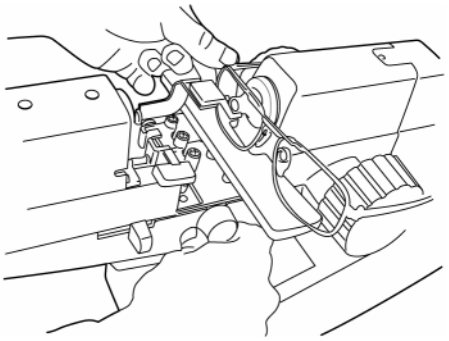
2.2.3 Measurement of framed astigmatic lens

1 Place the glasses on the lens table.

2 Press the frame toward the lens table and align the lens with the optical axis.

The refractive power can be determined in the same way, however you must set the focus to the stronger refractive power for the direction of the astigmatic axis.

Focus the target along the stronger meridian. Align the cross-line with the stronger meridian by rotating the axis wheel. The angle of the indicator Δ is the astigmatic axis.



Note: *LM-8C Align the scale with the stronger meridian by rotating the protractor ring.*

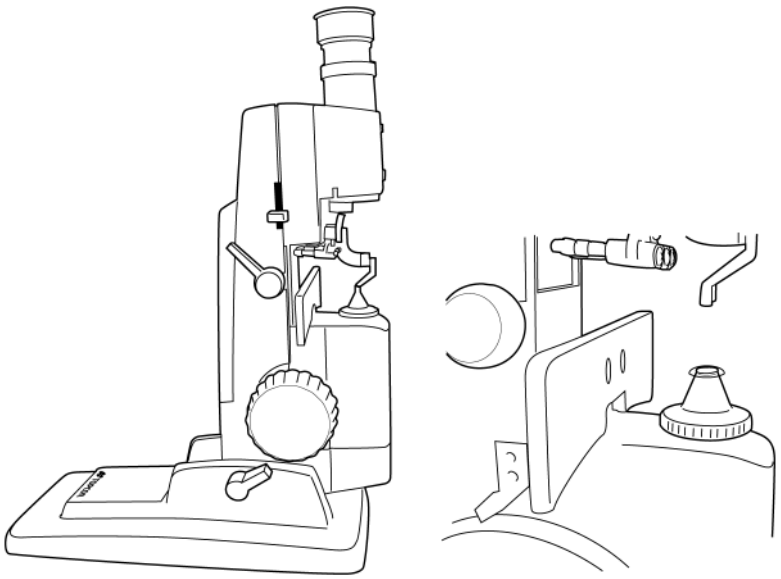
2.2.4 Measurement of contact lens

⚠ **PRECAUTIONS**	● To prevent your fingers getting caught, be particularly careful when changing the tilt angle of the machine.

⚠ **PRECAUTIONS**	● To prevent the machine/component parts from falling over operate the machine with care when changing the tilt angle.

1 Remove the lens stop and tilt the lens-meter so that it is in the upright position.

2 Replace the contact lens stop and put the contact lens on it.



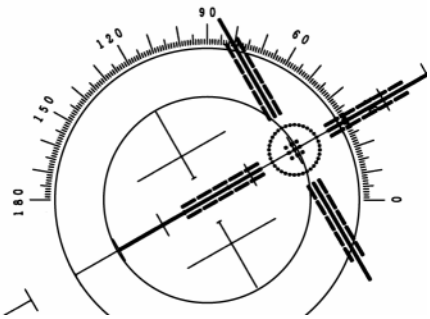
Note: *The contact lens stop can be stored in the dry cell box.*

2.2.5 Measurement of prismatic lens

Non-astigmatic lens

1 Place the prismatic lens against the lens stop and set the diopter power scale to zero.

The target image is moved from the scale center.

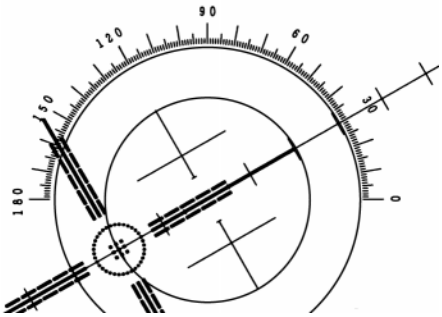


With regard to cross-line pinhole corona

2 Rotate the protractor ring and adjust the longer target center line so that it passes through the scale center (not applicable to LM-8C).

In this case, the reading indicates the direction of the base. When the reading is 2Δ, the direction is 30°.

3 If the target is below the horizontal line, 180° must be added to the angle read.



With regard to cross-line pinhole corona

Astigmatic Lens

For an astigmatic lens, follow the measurement method of the preceding section.

Measure the astigmatic axis using the axis wheel and read the prism base on the protractor ring.

2.2.6 Axis marking (Cartridge specification/Steel needle specification)

Using the cartridge, one light touch to the lens ensures a clear ink mark.

Non-astigmatic Lens

1 Set the lens so that the target is on the scale center.

2 Operate the axis marker lever, raise the three-needles and print marks on the lens by moving the marker forward.

Astigmatic Lens

1 Align the cross-line to 180°. (not applicable to LM-8C)

2 Rotate the diopter power knob to get the S+C value of the prescription.

3 Rotate the lens and focus the cross-line in the 180° direction (not applicable to LM-8C).

Note: *LM-8C Rotate the lens so that the stronger meridian of the pinhole corona is at the 180° direction.*

4 Mark the lens by operating the axis marker lever.

3 OPTIONAL ACCESSORIES

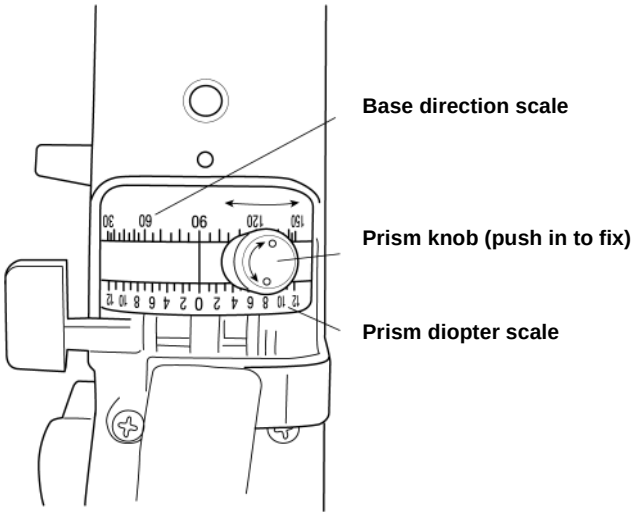
3.1 Prism compensator

It is not possible to measure lenses corrected for phoria using 6 prism diopters, this also applies to segments in spherical lenses of extreme strength, because the corona target will, in this case, be completely displaced and be out of the field of view of the eyepiece. For these types of lenses, the prism compensator must be used.

Note: *Rotating the prism knob on its vertical axis produces changes in the prism diopter power while rotating the prism knob on the optical axis of the instrument produces changes in the base direction. The prism diopter scale is on the side of the lens stop while the protractor scale is on the side of the eyepiece, and includes the former scale, color-coded, in minus strength and in white for the plus strength.*

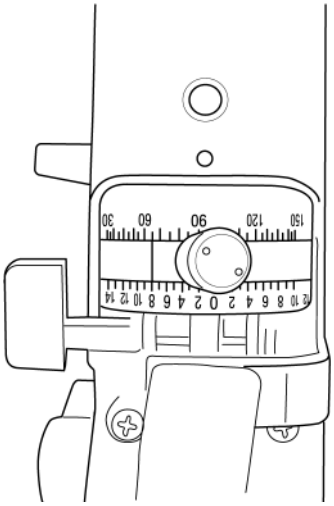
1. Place the lens against the lens stop with the geometric center of the lens aligned with the optical axis of the instrument.
2. Next, rotate the power knob and set the estimated vertex power to the vertex power scale superimposed on the field of view.

3 Finally, adjust the field of view. Then, adjust the prism knob of the prism compensator so that it coincides with the centers of the corona target image and the reticle cross-hairs.



4 Next, rotate the power knob once more to focus the corona target image and then use the prism compensator once more to align the centers of the corona image and the cross-hairs.

5 Read the scales of the prism compensator for the prism diopter and the base direction. (In the figure on the next page the readings are 8Δ 65°)



6 Find the vertex power by looking at the vertex power scale superimposed on the field of view.

Note: *Cylinders with correction for phoria can be checked in the same manner as for simple cylinders, as explained previously.*

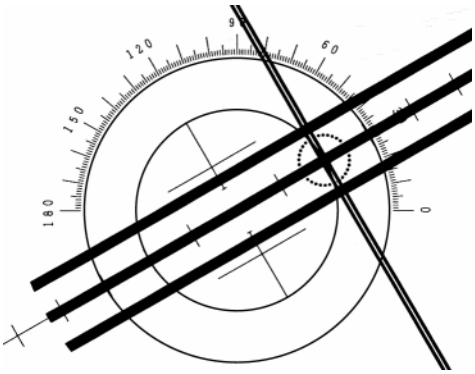
Note: *If the prism diopter power is indicated in orange-colored figures, the actual base direction will be the indicated direction plus 180°.*

For lenses which have more than 14 prism diopters

For lenses which have more than 14 prism diopters, set the prism compensator to 14Δ, by rotating the prism knob on its vertical axis, and then rotate the compensator, by revolving the prism knob on the optical axis. Rotating the prism compensator will make the target image exceed the outer edge of the field of view as in figure below. Stop rotation at the point where the center of the corona target image is nearest to the center of the reticule cross-hairs and read the prism diopter power from the scale in the field of view. The actual prism diopter power will be the prism diopter reading already obtained plus the prism diopters of the prism compensator. (In the figure below, the reading is 2Δ+14Δ=16Δ.)

However, the base direction will be the value obtained from the protractor scale of the prism compensator.

The prism diopter scale and protractor scale of the prism compensator must always be returned to zero after measurements have been completed.



Fitting of prism compensator (option)

1. Remove 2 screws from the prism holder and attach them instead to the prism compensator.
2. Bring the base angle scale to 0°, and if the target image moves between 0-180° by rotating the prism handle, fasten the 2 screws.

4 MAINTENANCE AND CHECKS

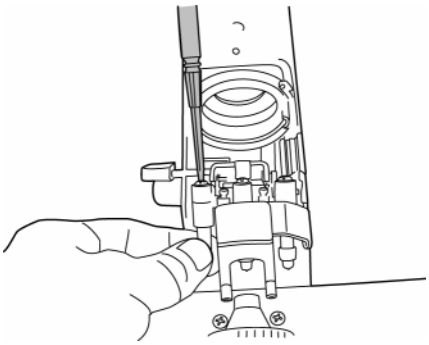
4.1 Daily care

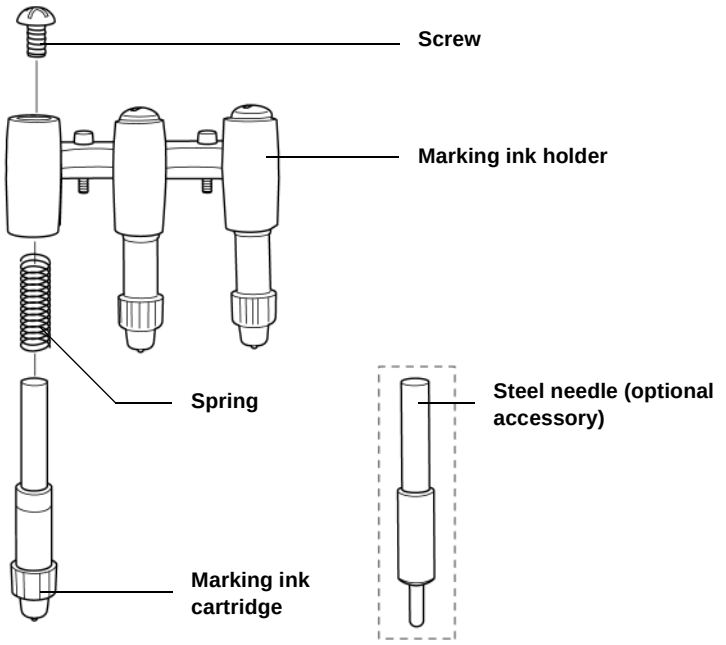
- Dust can affect the performance of this instrument.
  Always apply the lens cap and dust cover when not in use.
- Use a soft dry cloth to clean the main body, control unit, chin rest and forehead rest.
  The plastic body of this instrument can be cleaned with a neutral detergent if necessary to remove dirt.
  Do not use chemicals or solvents because they may deform or discolour the equipment.
- Turn the power switch OFF when the instrument is not in use.

4.2 Replacement of Marking Ink Cartridge

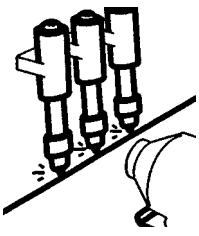
1 To replace the marking ink cartridge, remove the top screw. Hold the cartridge when removing so that the spring does not jump out.

Carry out this operation with the lens holder lowered.





Note: *Ensure the ink cartridges do not interfere with the lens table*



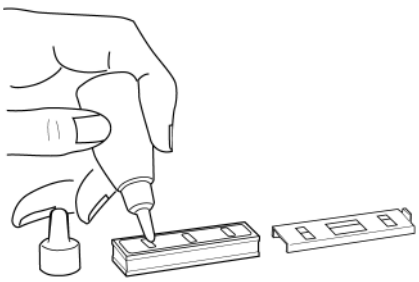
4.3 Refilling of ink for steel needle (optional)

When ink becomes blurred, refill ink.

1 Slide out the ink pad.

2 Remove the ink pad cover. Pull it lengthwise.

3 Refill with ink. Soak the felt pad well with ink.



4.4 Check and adjust

As this machine is a precision optical instrument, use with particular care and keep it free of shocks and vibrations.

Handling of lens stop (the same as for lens holder end)

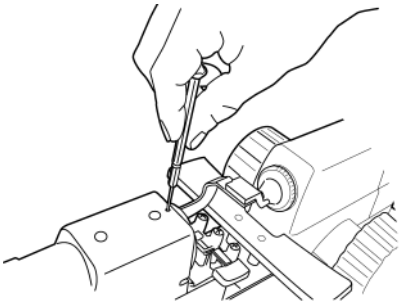
- To protect the lens surface, clean the lens stop end and lens holder end and remove any adhering dust thoroughly.
- Lens protection pad is also attached. However, for a highly spherical lens, the measurement value shifts a little.

Target Position Adjustment

When the target is focused without a lens and when the centers of the target and the scale agree, their positional relations are correct. If the target center rotates at the same position when rotating the axis wheel, adjust it as follows (not applicable to LM-8C).

1 Adjust the 3 screws using a screwdriver.

2 Tighten the screw that faces in the direction in which you want to move the target.



Before adjustment, loosen the screw in the opposite direction. Be sure to loosen the screw little by little when adjusting. (Finally, 3 screws must be fastened.)

If the target center is displaced and it moves when the target is moved, experience and skill is required. If this is the case ask your dealer for repairs.

Diopter power of lens (D)	Amount of shift
-20	+0.06
-10	+0.02
+10	+0.02
+20	+0.06

4.5 List of expendables and spare parts

When ordering expendables and spare parts, please specify the code number and the quantity required, in addition to the description.

	Description	Code Number
Expendables (standard accessory)	Marking ink cartridge (3 pc/set)	4203699500
	Lens protection pad	4203656000
	Prism compensator	4203450000
Expendables (optional accessory)	Prism compensator	4203450000
	Steel needle marking set	4203625100
	Supply ink	4203690060

4.6 Contacting TOPCON

When you contact us, please mention the following:

Model name: **LM-8**

Period of use: **Please inform us of the purchase date of this instrument.**

Type of problem: **Please give us a brief description of the problem.**

5 TROUBLESHOOTING

5.1 Before requesting service

If any problem should occur, first consult the following troubleshooting table, and follow the instructions suggested. Then, if the problem is not solved, or something is wrong with the instrument, contact your authorized dealer or TOPCON.

Be sure to disconnect the power input plug from the outlet before replacing a lamp or fuse.

5.2 Troubleshooting table

Trouble	Check points
Power switch is on but target image cannot be seen.	● Are the dry cells nearly used up? ● Is AC adapter connected properly (when using AC adapter)? ● The lamp will go off automatically after 5 minutes to save cell power (when using dry cells). ● Is the diopter power knob near 0D (without lens)? ● Is the diopter power knob too far away from the refractive power of lens. Is the optical center measured (with lens)? ● Prism compensator is 6 prism or higher (when using prism compensator).
Measurement value is incorrect	● Is visibility correction done correctly? ● Is the contact lens holder used for measuring glasses?
Ink is blurred	● Replace ink cartridge. ● For lens with steep surface curve, use steel needle (optional accessory).
Target and scale centers are displaced	● Is lens set? ● Make sure prism compensator is 0-prism. ● If target center does not move by rotating axis wheel, carry out target position adjustment (for details refer to page *29*).

6 SPECIFICATIONS

	Measuring range	Minimum reading
Peak refractive power	0 ~ ±25D	0.125D (within ±5D, LM-8E: ±3D)
	0 ~ ±20D (LM-8E)	0.25D (±5D and higher, LM-8E: ±3D)
Prism refractive power	0 ~ 6Δ	1Δ
Prism compensator	0 ~ 14Δ	1Δ (option)
Axial angle (target)	0 ~ 360°	1°
Visibility adjustment	+3 ~ -5D	
Eyepiece section	0 ~ 180°	1°
Lens diameter	Ø 20 ~ 90 mm	2 mm
Inclined angle	0 ~ 90°	
Power supply	3V (UM1 cell x2)	6-V AC adapter (on the market)
Cell life and power consumption	500h and longer by continuous 5-min. ON and 5-min. OFF 0.13VA or lower	
Dimensions	310 (H) x 160 (W) x 420 (D) mm	
Weight	approx. 4kg	

Environmental conditions	Indoor use, maximum altitude: 2,000m, degree of contamination: II, working temperature range: 5-40°C, Temperature less than 31°C (40°C): linear drop to max. relative humidity of 80% (50%)

Subject to changes in design and/or specifications, without prior notice.

CLASSIFICATION : IEC 601-1 CLASS I TYPE B

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