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Introduction.

Our company, Photometric Solutions International (PSI), is a manufacturer of quality photometric and colorimetric equipment. Including our former incarnation as Optical & Photometric Technology (OPT), we have been servicing the lighting industries for over 20 years. During this time we have earned an outstanding reputation for our attention to detail in our customer service, and our *Flexibility*, *Reliability* and *Affordability*.

- In recent years we have been one of the largest suppliers of automotive photometric laboratory systems and goniophotometers throughout Asia.
- We have close associations with National and International Test Agencies for laboratory accreditation.
- Our staff stay at the forefront of photometric technology through our involvement in international organisations such as the CIE. Our company CEO Dr Steve Jenkins is Chairman of CIE Australia and our Technical Director Tony Bergen is also on the CIE Australia Committee. Both also serve on various international CIE Technical Committees.
- We have dedicated service teams based throughout Asia who can service our equipment and provide calibration services with traceability.

Option 1. Reflectometer for Total Reflectance of Flat and Curved Mirrors

A reflectometer that can measure the total reflectance of flat and curved mirrors is shown in Figure 1 below.

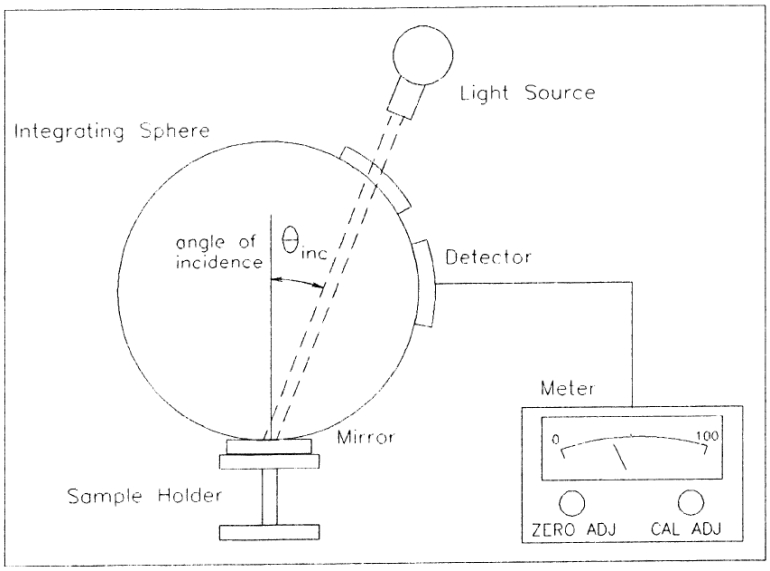

Figure 1: Reflector for Total Reflectance of Flat and Curved Mirrors

The system comprises:

- A collimator source with stabilised and regulated DC power supply. The source is calibrated to achieve a CIE Source A. The beam diameter will be between 13 and 25 millimetres.
- An integrating sphere of diameter 300mm with a matt diffuse coating of barium sulphate. The sphere has three ports, one for the entry of the incident light from the projector source, one for the mounting of the photocell and one for the mounting of the test sample. The arrangement of the entry port and the sample port is such that the incident light strikes the sample mirror at an angle of 25° to the normal of the sample port. The arrangement of the photocell port is such that no direct light from the projector source or from the mirror strikes the photocell.
- The system is mounted on a bench approximately 2m x 1m with a system of baffles between the projector source and the integrating sphere so as to ensure that the collimated light beam strikes the test mirror and no stray light enters the integrating sphere.
- A test sample holder for the mirrors.
- A reference reflectance standard is supplied for calibrating the system, calibrated either by a national standards laboratory or by an ISO-17025 accredited laboratory.
- A photocell, thermostatically stabilised at 35°C with an f_1' <1.5% and linearity better than 0.1%. The photocell signal is fed into a multi-ranging photocurrent preamplifier, with built-in A/D conversion. This has an LCD display to show the measured result, and adjustments to change the scale when calibrating the system with the reference standard so that then the LCD display will directly show the total reflectance.

- A User Manual (in English) to describe the test procedure and operation of the reflectometer.

The Test Sample Holder is fixed to the bench so that its normal is orientated along a radius of the integrating sphere. The mirror front surface will then be held against the integrating sphere.

There is an additional software interface option where the photometer can be interfaced to a PC and the measurements recorded by Windows-based software (see Option 4).

Figure 2: Mirror Reflectometer Set-up

Figure 3: Back of Collimated Source and Baffles Leading to Sphere

Option 2. Reflectometer for Total Reflectance of Flat and Curved Mirrors and the Diffuse Reflectance of Flat Mirrors

A reflectometer that can measure the total reflectance of flat and curved mirrors and also the diffuse reflectance of flat mirrors is shown in Figure 4 below.

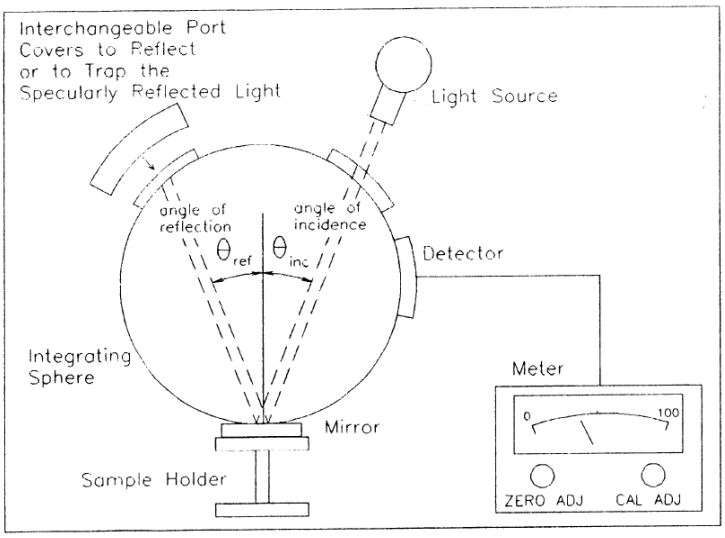

Figure 4: Reflectometer for Total Reflectance of Flat and Curved Mirrors and the Diffuse Reflectance of Flat Mirrors

This system is identical to the system in Option 1, with the exception that an additional port is added to the sphere with attachments for either reflecting or trapping the specularly reflected light.

In this case, the system will be able to measure:

- Total reflectance;
- Diffuse reflectance;
- Specular reflectance; and
- Reflected haze.

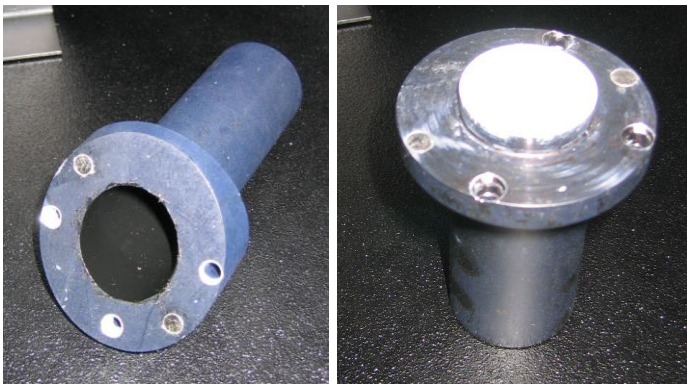

Figure 5: Gloss Trap and Diffuse Reflecting Plug for Measurement of Specular and Diffuse Reflectance

Option 3. Reflectometer for Absolute Measurement of Specular Reflectance

A reflectometer that can measure the specular reflectance of the first and second surfaces of flat mirrors is shown in Figure 6 below.

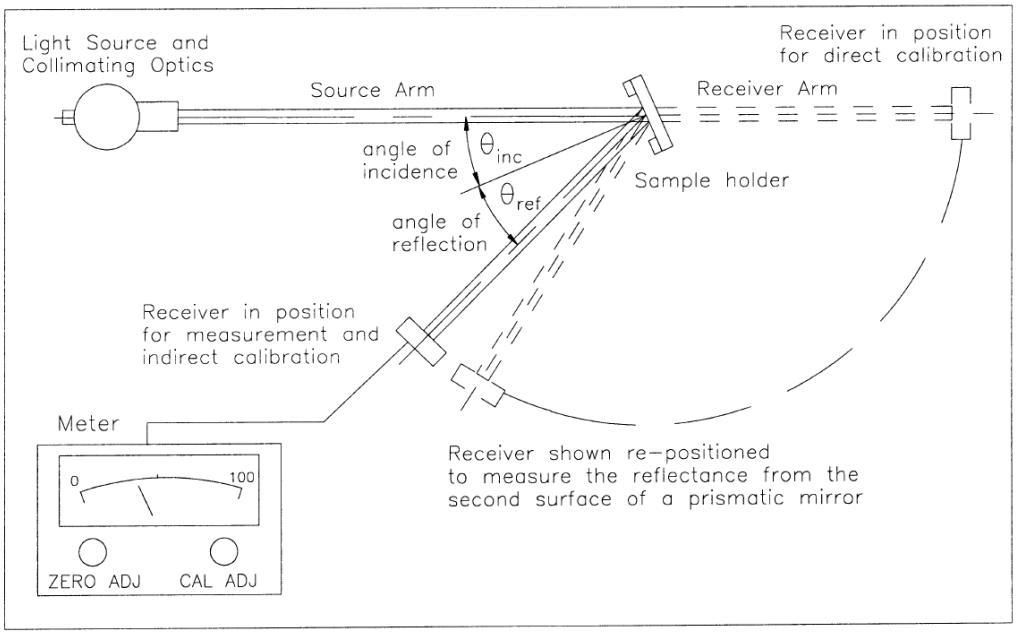

Figure 6: Reflectometer for Absolute Measurement of Specular Reflectance

For the absolute measurement of the specular reflectance of flat mirrors the system consists of a collimator, a sample holder and a photometer, all mounted in an articulated frame. The photometer consists of a photocell and amplifier with LCD readout. This and the collimator are as described in Option 1.

Initially, the photocell is placed directly in line with the collimated beam at the reference test distance and the reflectance scale adjusted at the 0% and 100% points. Then, the sample is put in place so that the collimated beam of light strikes the reflecting surface at 25° to the surface normal. The photocell is then re-positioned so that it receives the reflected light at the reference test distance and the reflectance of the sample is measured and shown on the readout.

There is a set of two baffles between each arm of the measurement system. The baffles ensure a collimated light beam and eliminate any stray light. The sets of baffles are placed identically in each of the arms of the system.

The whole system is precisely located and mounted on a sturdy bench approximately 2 metres by 1 metre. The distances between the photocell and collimator source are identical for the two photocell positions. The photocell can be positioned to measure the reflectances of both the first and second surfaces of the mirror.

The sample holder is mounted on the bench and angles so that its normal is at 25° to the axis of the collimated beam of light. It is able to be precisely adjusted along the optic axis of the collimator to ensure that the reflecting surface is always at the same point in space. The extent of the linear movement is approx 25mm and it is adjusted through a screw jack with very fine adjustment. The sample mirror is held so that there is no obstruction to the reflected light from its front or back surface.

The display of reflectance is shown on the LCD screen display. The values of reflectance with no light and with full (no mirrors) can be adjusted by simply setting the values on the amplifier at the two calibration modes (no light and full light).

A User Manual (in English) describes the test procedure and operation of the reflectometer.

There is an additional software interface option where the photometer can be interfaced to a PC and the measurements recorded by Windows-based software (see Option 4).

Option 4. Software Interface

With this option we will provide a communications cable and Windows-based software to coordinate the measurement. The software will automate the calibration and measurement process and save the data for later retrieval.

The operator will be able to enter in information about the test item at the time of performing the measurements. The software will automatically provide the scaling so that the amplifier itself does not need to be scaled, although the operator will at any time be able to operate the system manually without the software by just using the front panel display of the amplifier.

Other Information

Installation Requirements

The building arrangements are the responsibility of the client. This includes:

- Laboratory construction;
- Painting of wall, floor and ceiling surfaces a matt black colour;
- Construction of solid floor;
- Construction of stray light baffles and curtains;
- Dust-proofing and air conditioning.

The room should have an available space of at least 4 metres x 2 metres. The entire room should be light-tight and dust-proof. The equipment can work in lit environments, but a dark room is better for best results.

An air lock is preferable, however a partitioned area around the entrance where visitors can replace their shoes with slippers is acceptable. The room needs to be maintained at 25 degrees Celsius and preferably around 50-70% humidity.

Mains supply should be properly earthed, stabilised and filtered. The mains electrical supply for the entire system should be provided through an uninterruptible power supply (UPS) system, or at the vary least through a voltage stabiliser, and should include an isolation transformer and line filter. PSI can advise the client regarding the best locations of power outlets.

PSI will professionally pack the equipment in a solid wooden crate and deliver the crates to the airport or seaport in Melbourne. The cost of freight out of Melbourne is not included in this price. The client will be responsible for shipping the equipment from the port to their facility.

Warranty

PSI provides an unconditional warranty on all equipment supplied for 12 months from the date of installation. During the warranty period, PSI will repair any faulty equipment at no charge to the client if the repair can be carried out by our local staff or representatives. If the repair requires attendance by our staff in Australia, the Client will be responsible for any travel and accommodation expenses incurred by PSI to effect the faulty equipment.

This warranty does not cover misuse, abuse or accidental damage to the equipment. In such a case all repairs and travel and accommodation expenses will be born by the Client.

PC

If the software interface option is selected, the client is to provide a PC system according to PSI's specifications.