

Operation Manual for
TLMS-O100 Open-End Magnetic Shield
TLMS-C100 Capped-End Magnetic Shield

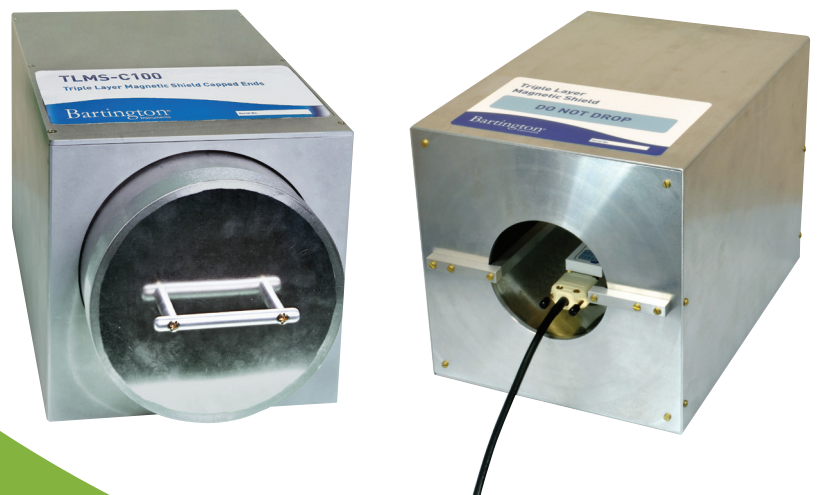


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1. About this Manual

This document describes the installation, operation and maintenance of the TLMS-0100 Open-End Magnetic Shield and TLMS-C100 Capped-End Magnetic Shield. It should be read in conjunction with [product brochure](#) DS0014, which can be found on the Magnetic Shields [product page](#) of the Bartington Instruments website at www.bartington.com.

1.1. Symbols Glossary

The following symbols used within this manual call your attention to specific types of information:



WARNING: Indicates a situation in which serious bodily injury or death could result if the warning is ignored.



Caution: Indicates a situation in which bodily injury or damage to your instrument, or both, could result if the caution is ignored.



Identifies items that must be disposed of safely to prevent unnecessary damage to the environment.

Note: Provides useful supporting information on how to make better use of your purchase.

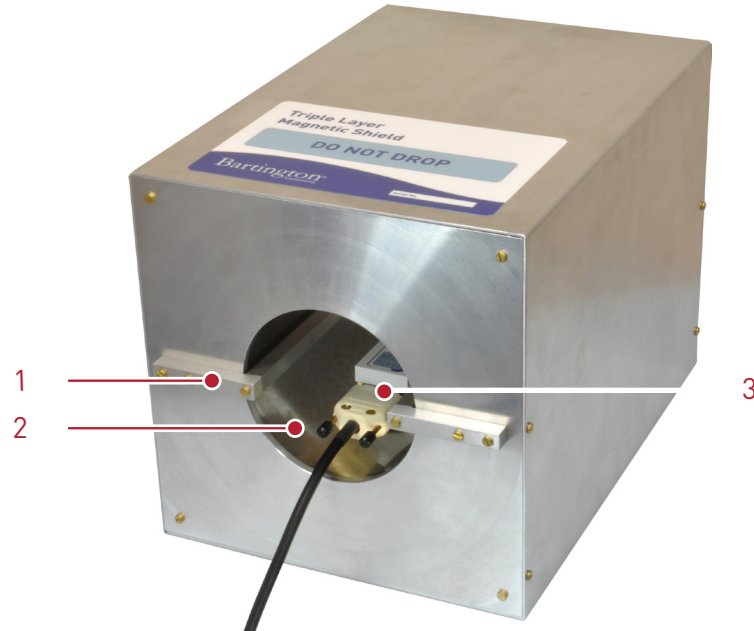
2. Safe Use



WARNING: These products are not qualified for use in explosive atmospheres or life support systems. Consult Bartington Instruments for advice.

3. Introduction to the Magnetic Shields

3.1. TLMS-0100 Open-End Magnetic Shield



Key

1. Guide rails
2. Cylinder
3. Test sensor

The Open-End Magnetic Shield include guide rails to support a test probe inside the cylinder if required.

3.2. TLMS-C100 Capped-End Magnetic Shield



Key

1. Three-layer lid
2. Earth grounding stud
3. Cable slot
4. Cylinder

The Capped-End Magnetic Shield has a three-layer lid that covers the cylinder to provide additional shielding.

The cylinder and the lid contain a slot to accommodate the cable from the test sensor inserted into the cylinder.

4. Setting up the Magnetic Shields

4.1. TLMS-O100 Open-End Magnetic Shield

The major axis of the TLMS-O100 Open-End Magnetic Shield should be oriented east/west to minimise the internal field. In this orientation (in the Earth's field of ~50,000 nT), the field in the centre of the Magnetic Shield can be expected to be typically 1nT transverse to the axis of the shield, provided the instrument has been fully degaussed and is not subjected to mechanical stress.

Note: The Open-End Magnetic Shield should ideally be connected to system ground to reduce electrical noise.

4.2. TLMS-C100 Capped-End Magnetic Shield

When setting up the TLMS-C100 Capped-End Magnetic Shield, an east/west orientation of the major axis is preferable for a good signal, but not essential. The capped ends mean there is additional shielding at either end of the sample chamber so the shield is less reliant on orientation.

Note: The Capped-End Magnetic Shield has a grounding pin that should be connected to reduce electrical noise.

5. Using the Magnetic Shields

The Magnetic Shields have two main uses:

- investigating errors produced by a vector magnetic field sensor close to zero flux
- measuring remanent magnetisation of a specimen.

Examples shown are in nT.

5.1. Measuring Magnetic Errors

When measuring the errors of single or three-axis magnetometers, the residual errors of magnetometer and Magnetic Shield must be separated.

Place the sensor under investigation as close as possible to the centre of the cylinder. If using the Capped-end Magnetic Shield, put the lid on so that it fits snugly over the end of the cylinder. Record the zero field values (R₁).

Next, rotate the axis of the sensor in the plane of investigation by 180°. In this way the shield residual error is made to reverse but the sensor residual error is not. Record this second value (R₂).

Calculate the magnetometer error (E_M) as:

$$E_M = (R_1 + R_2) / 2$$

Be sure to observe operation of signs: e.g. if R₁ = -3 and R₂ = -10

then E_M = ((-3) + (-10)) / 2

$$= -6.5$$

This figure provides the offset for further readings made with the magnetometer under investigation.

5.2. Measuring Remanent Magnetisation of a Specimen

This procedure requires a vector sensing magnetometer. Bartington Instruments recommends a Mag-01H with a Mag Probe B, or D if a B is unavailable.

Place the magnetometer probe in, or near to, the centre of the cylinder, with the directional arrow pointing east. This is the sensing direction. Note the base reading of the sensor in the cylinder without the specimen: record this value as E_{M/s}.

Mark the specimen with the X, Y and Z directions in which it will be measured, then place it in front of the sensor at a known distance.

Keeping the specimen at the known distance from the sensor, rotate it 180° in the plane of X. Repeat for Y and Z.

Value R is the magnetometer reading minus E_{M/s}. For each plane record the pairs of values R parallel (R_P) and antiparallel (R_A) to the sensing direction, i.e. R_{PX}, R_{AX} etc.

Calculate the three directional components V_x, V_y and V_z, observing correct operation of the signs, where

$$V = (R_P - R_A) / 2$$

For example, if R_{PX} = -23 and R_{AX} = +17 then the component of the external field in the X direction has a value V_x of -20nT.

With these three values the total field can be calculated as the square root of V_x² + V_y² + V_z². The field direction can be calculated using direction cosines.

6. Troubleshooting, Care and Maintenance

The Magnetic Shields do not require servicing. Please contact Bartington Instruments in the event of any difficulty.

6.1. Cleaning

Periodic cleaning is not normally required.

If the system becomes soiled and cleaning is necessary, use a damp cloth to clean the outer surfaces.

7. Storage and Transport

Note: Avoid exposing this instrument to shocks or continuous vibration.

8. Disposal

This product should be disposed in accordance with local regulations for the disposal of metal products.

Notes



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