493K
Taking Control of Rotational Moulding

K-METRON *(FW 2.3.4)*

493K THICKNESS MEASUREMENT GAUGE

WITH RADIO LINK UP AND SOFTWARE RECORDING

USER INSTRUCTIONS (Doc v3.0.0)

RELATING TO FIRMWARE VERSION (FW 2.3.4)

(as displayed on boot-up of the K-METRON)

IMPORTANT

Read all instructions before use

Observe safety precautions

CE

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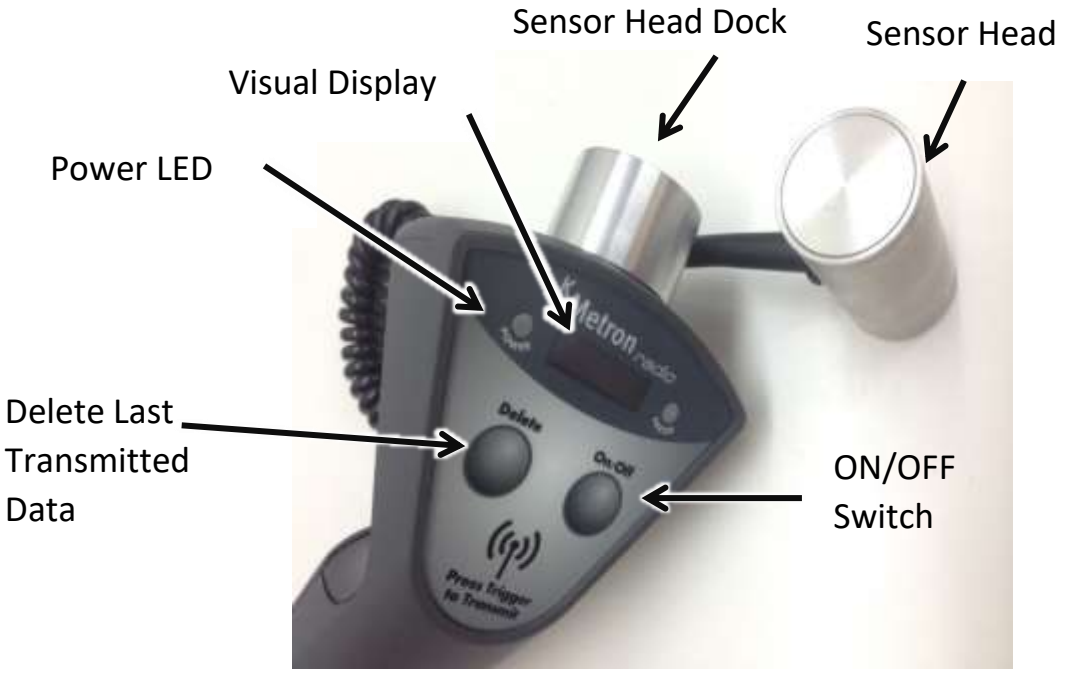
1 OPERATING THE K-METRON

1.1 Turning the unit ON & OFF

To turn the unit ON momentarily press the ON/OFF switch on the face of the K-METRON until the left-hand POWER LED illuminates. Battery level will be checked each time the unit is turned on, and if a low battery voltage is detected then a warning will be displayed on start up.

To turn the unit OFF press the ON/OFF switch on the face of the K-METRON unit the POWER LED goes off.



The unit will auto power off after 3 minutes of inactivity. A warning “PWR OFF” is displayed after 1 minute of inactivity. The unit can be interrupted from auto power off by pressing either the orange trigger or the DELETE button; pressing either will only interrupt the auto power off and will neither ‘transmit’ or ‘delete’ any data.

1.2 Entering the Configuration Menu

To enter the configuration menu, with the K-METRON turned off, hold down the DELETE button and switch the unit on. While continuing to hold down the DELETE button, the display will read “Wait … Setup mode”. Once the display reads “M1: Cal Object” release the DELETE button. The unit is now in the Configuration Menu. To scroll through each menu use the DELETE button; to select use the Orange Trigger Button.

1.3 Coupling the Sensor Head with the Calibrated Magnet.

Place the Sensor Head on one face of the product that is to be measured. Hold or place the magnet on the opposite side of the product wall until it couples to the sensor head.

Hollow objects can be measured by inserting the calibrated magnet through a small opening in the product. The magnet should immediately be coupled with the sensor head positioned on the outside of the product and adjacent to the aperture. The sensor head can then be slid over the surface of the product to the desired place of measurement. Movement should be slow and steady. Care should be taken when moving the sensor head to avoid de-coupling.

1.4 Loss of Magnetic Coupling.

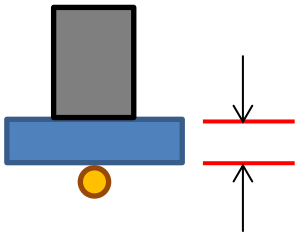
When magnetic couple of the cube magnet is lost it can be retrieved by retaining the end of the attached cord and fishing the magnet out of the opening. If the spherical magnet loses coupling then it must be retrieved by turning the moulding upside down and allowing the magnet to fall out or by using a telescopic metal pointer to grab it.

1.5 Tracking the Sensor Head to the Point of Measurement.

The calibrated magnet will automatically couple, orientate and centre itself over the Sensor Head. Once coupled track the Sensor Head to the point on the part which you wish to measure, taking care not to remove the sensor head from the face of the work piece. This may result in the loss of the magnetic coupling. The calibrated magnet will follow the Sensor Head to the desired point of measurement.

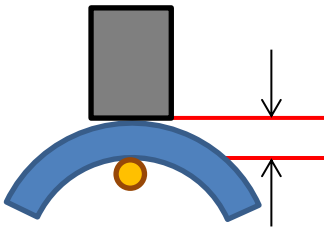
1.6 Ensure Correct Sensor Head Orientation

When measuring flat parts ensure that the sensor head is perpendicular to the surface.



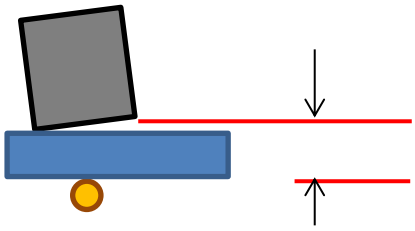
Thickness displayed on the meter will be the thickness of the measured part.

When measuring external radii it is important to ensure that the sensor head is perpendicular to the surface of the part being measured.



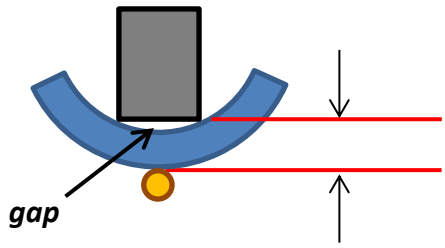
Thickness displayed on the meter will be the thickness of the measured part.

Incorrect Sensor Head Orientation: a non-perpendicular orientation will result in an erroneous measurement.



Thickness displayed on the meter will be the thickness of the measured part plus the gap between the sensor head and the part.

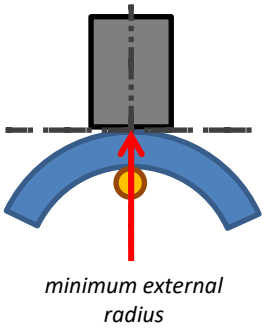
An internal radii will return a value for which compensation must be made.



Thickness displayed on the meter will be the thickness of the measured part plus the gap between the sensor head and the

1.7 Measuring an External Radius with K-METRON.

It is straight forward to measure external radii down to 5mm. Place the sensor head on the surface of the part located at external radius to be measured. Ensure that the sensor head is perpendicular to the tangent of the radius to make an accurate reading.

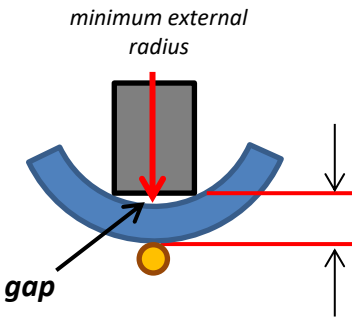


A minimum external radius of 5mm (3/16") can be measured using the supplied 10mm diameter magnetic sphere.

A minimum external radius of 3.3mm (0.1229") can be measured using a 6.6mm diameter magnetic sphere (contact for

1.8 Measuring an Internal Radius with K-METRON.

It is straight forward to measure external radius down to 5mm. At radii less than this the main difficulty is with access to the surface. When measuring thickness of internal radii, the correct measurement often requires compensation for the gap distance as shown below.



A minimum internal radius of 25mm (1") can be measured before it becomes impractical and difficult to compensate for gap distances. Radii less than 25mm also tend to allow the magnetic force to pull the magnet to the side of the part.

1.9 The Sensor Head Dimensions.

The sensor head is a cylinder of size 27mm diameter x 55mm length.

1.10 Measuring the Thickness.

When the sensor head is at the desired measuring point **pull and hold the orange trigger** and make small **figure of eight** movements of the Sensor Head to ensure that Transducer Magnet is centrally located on the Sensor Head. Centring of the calibrated magnet will easily occur on materials up to 20mm (0.78”) thick but will also depend on the surface finish of the material being measured.

On releasing the trigger the unit will display and transmit the **minimum value** measured to the receiver**.** The data that are sent to the PC are the Date, Time, Mould Identification Number, the Mould Position Number and the Thickness Reading.

If the receiver is not connected to the PC, a ‘TX Error’ will be displayed after holding down and releasing the trigger. The unit is still operational and can be used to display on-screen readings without the receiver being connected to the PC, however users should be aware that a 'TX Error' indicates that the reading is not saved on the PC.

1.11 Deleting a Thickness Measurement.

If an erroneous thickness measurement has been made and transmitted to the PC then it can be remotely deleted from the PC. To do this press the delete button; the display signals confirmation. The Position Number on the PC will then be reduced by ‘1’.

1.12 Indexing Mould ID.

After the thickness measurements on a particular mould are completed the user has the option to increment the Mould Identification number. This number is used as a guide to indicate which moulds are being measured and recorded.

To increment the Mould Index number complete the following two steps:

Step 1. Move the magnet away from the sensor head so that O/R (‘out of range’) is displayed on-screen;
Step 2: Hold the trigger down for 7 seconds.

The on-screen indication will now show that the Mould Index number has been incremented.

1.13 Out of Measurable Range Thicknesses

During the calibration of a spherical or cube magnet the unit will determine at which maximum thickness the sensor magnets become out of range and then will display O/R for 'out of range' when appropriate. The O/R limit is reached whenever the effect of the magnet on the sensor head is too small to provide a useful measurement also seen when no magnet is present, such as would happen when the magnet becomes de-coupled. For a limit where the thickness decreases to zero and the measurement is out of range, "LOW" will be displayed.

1.14 Choosing which Magnet Type to use.

The unit comes with two different types of magnet, a cube and a sphere. The desired range of measurement will be the major factor which determined whether to use the cube or spherical magnet. The 10mm x 10mm x 10mm cube magnet is best for thick walled parts. The 10mm spherical magnet is best for thinner parts when tight radii are to be measured. The measurement specifications for each of the magnets are shown in the Table below.

MEASUREMENT SPECIFICATIONS FOR CUBE AND SPHERICAL MAGNETS

METRIC	Part thickness	Accuracy	
10mm cube magnet	4mm – 20mm	4mm-17mm: +/- 0.2mm of reading 17mm +: +/- 1.0mm of reading	Factory Set
10mm sphere magnet	2mm-20mm	2mm-13mm: +/- 0.2mm of reading 13mm: +/- 1.0mm of reading	

IMPERIAL	Part thickness	Accuracy	
0.39" cube magnet	0.157" – 0.787"	0.157" -0.669": +/- 0.008" of reading 0.669": +/- 0.039" of reading	Factory Set
0.39" sphere magnet	0.079" – 0.787"	0.079-0.512": +/- 0.008" of reading 0.512": +/- 0.039" of reading	

1.15 Units of Measurement

The measurement can be made in IMPERIAL or METRIC units. To do this hold down the DELETE button while the K-METRON is off and continue to hold it while switching the unit on. While continuing to hold down the DELETE button, after a short delay (with Wait … Setup mode being displayed) the K-METRON will enter the "Configuration menu" and display "M1: Cal Object". Release the DELETE button at this point. Pressing the DELETE button will scroll through the menu. Pressing the DELETE button twice will display "M3: Units". To Select or Enter a menu the Orange Trigger button is pulled. Use the DELETE button to scroll through METRIC/IMPERIAL/EXIT and select the desired Units by pulling the Orange Trigger Button. The unit will now exit the configuration menu and return to operational status.

2 THE K-METRON SOFTWARE

2.1 Connecting the K-METRON to the PC & Installing the Communications Driver.

Connect the K-METRON receiver unit to the PC using the attached USB flying lead. Allow Windows to automatically connect to the internet for the latest communication driver. It will do this automatically upon plugging in the USB flying lead.

2.2 Downloading the K-METRON Software.

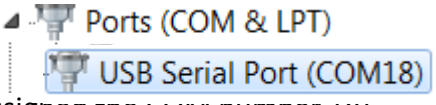
Download and install the K-METRON software from the link supplied by 493K. If you do not have this link it can be found at www.493k.com under the Software heading.

2.3 Setting the Correct Communications Port.

Ensure that the K-METRON software is set to look at the correct communications port that has been assigned by Windows for the receiver hardward (when the radio receiver was connected and the driver installed, Windows will have auto-assigned this number).

To determine the communication port number that Windows has assigned go to:

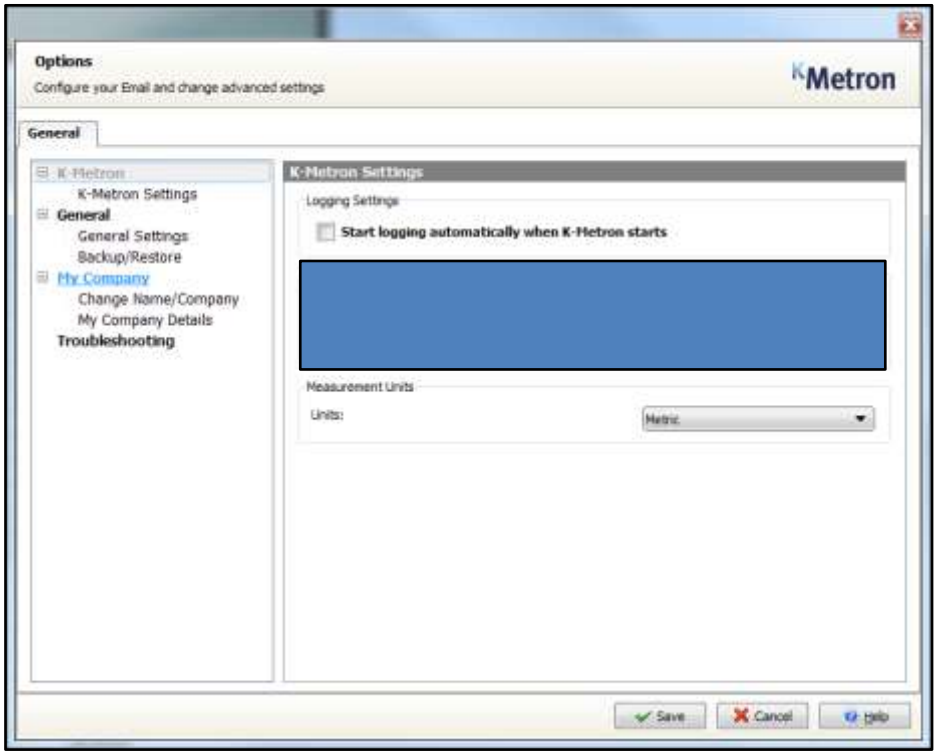
- Windows Control Panel
- Device Manager
- Under Ports (COM & LPT) the USB Serial Port will show the COM number that has been allocated by Windows e.g.



(in this case Windows has assigned the COM number 18)

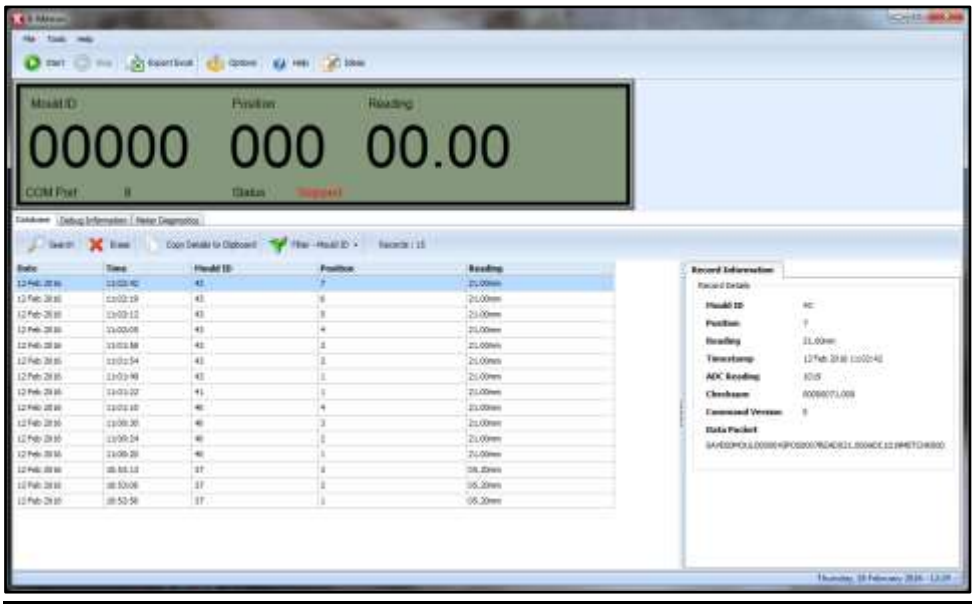
To assign the COM number withing the K-METRON software:

- Run K-METRON Software
- Go to options and assign the correct COM Port.



2.4 Recording the Thickness measurements.

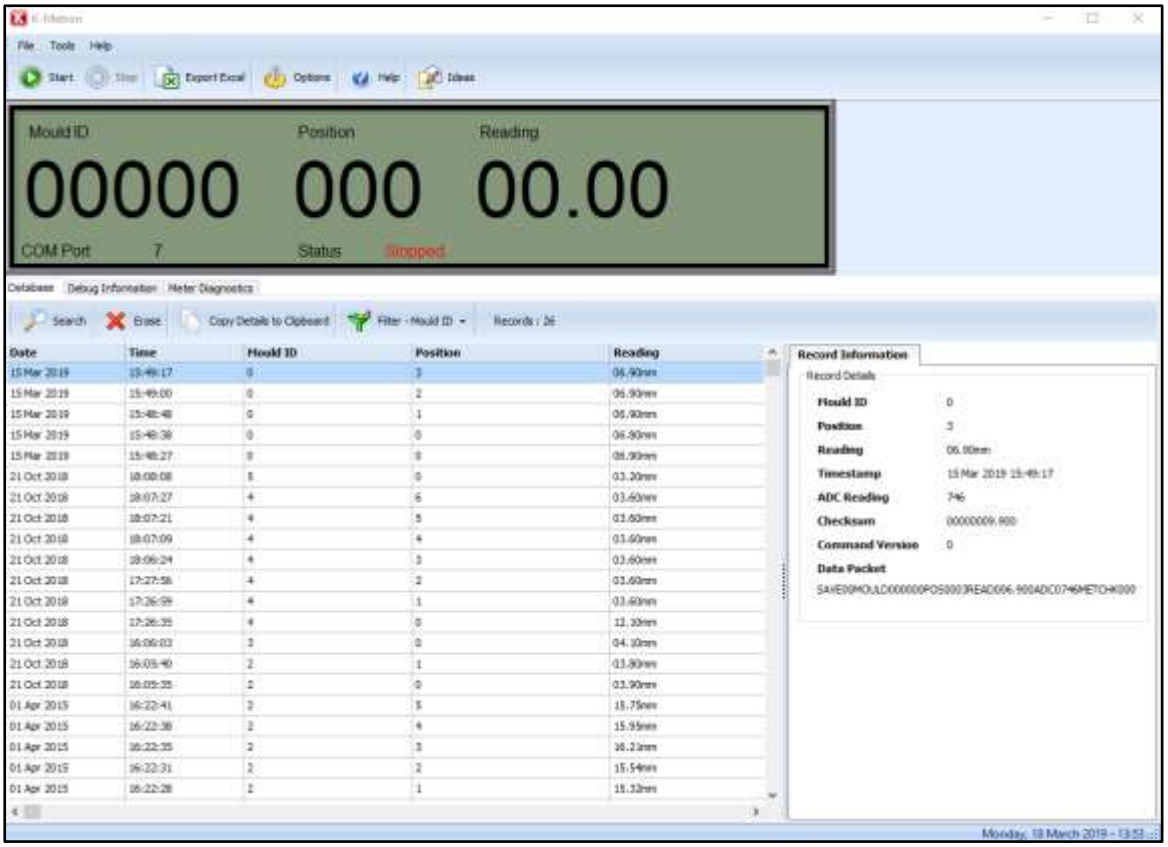
Hit the start button to begin receiving and recording data transmitted from the handheld K-METRON. Received data will be presented on a line per line basis and will record Date, Time, Mould ID, Position number and Reading.



3 SAVING THE DATA

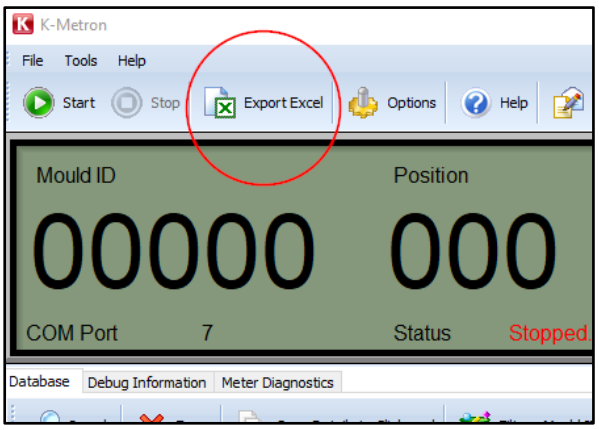
3.1 Continuous Internal Database Recording

The thickness data is stored in the K-METRON's core database. Unless deleted, all thickness measurements, even over several days, are saved in a single database. This data can can be viewed in the database tab in data and time order. A further feature to filter the Mould ID is available to allow the user to select only the values of a particular mould.



3.2 Exporting to Excel

For more advanced analysis or for report writing the data can be exported to Excel by clicking on the "Export Excel" button at the top of the screen:



The entire database will be saved out to an Excel file in the following column format:

<Date>, <Time>, <Mould ID>, <Position>, <Reading>

Example:

	A	B	C	D	E
1	Date	Time	Mould ID	Position	Reading
2	15 Mar 2019	15:49:17	0	3	06.90mm
3	15 Mar 2019	15:49:00	0	2	06.90mm
4	15 Mar 2019	15:48:48	0	1	06.90mm
5	15 Mar 2019	15:48:38	0	0	06.80mm
6	15 Mar 2019	15:48:27	0	0	06.90mm
7	21 Oct 2018	18:08:08	5	0	03.20mm
8	21 Oct 2018	18:07:27	4	6	03.60mm
9	21 Oct 2018	18:07:21	4	5	03.60mm
10	21 Oct 2018	18:07:09	4	4	03.60mm
11	21 Oct 2018	18:06:24	4	3	03.60mm
12	21 Oct 2018	17:27:56	4	2	03.60mm
13	21 Oct 2018	17:26:59	4	1	03.60mm
14	21 Oct 2018	17:26:35	4	0	12.10mm
15	21 Oct 2018	16:06:03	3	0	04.10mm
16	21 Oct 2018	16:05:40	2	1	03.80mm
17	21 Oct 2018	16:05:35	2	0	03.90mm
18	01 Apr 2015	16:22:41	2	5	15.75mm
19	01 Apr 2015	16:22:38	2	4	15.95mm
20	01 Apr 2015	16:22:35	2	3	16.21mm
21	01 Apr 2015	16:22:31	2	2	15.54mm
22	01 Apr 2015	16:22:28	2	1	15.32mm
23	01 Apr 2015	16:22:04	1	5	15.75mm
24	01 Apr 2015	16:21:39	1	4	15.95mm
25	01 Apr 2015	16:21:21	1	3	16.21mm
26	01 Apr 2015	16:20:52	1	2	15.54mm
27	01 Apr 2015	16:20:19	1	1	15.32mm
28					
29					

Since the user may not want the entire database to be exported to Excel it may be preferable to delete all data from the database after it has been exported and saved in Excel, thus leaving a clear database for next use.

The data can also be copied & pasted into other programs using the “Copy Details to Clipboard” button and then by pasting accordingly. To paste into Excel, use the Text Import Wizard and the Comma delimited import setting. Only the data that has been selected and copied will be exported in this case and not the entire database.

3.3 Erasing Unwanted Data.

To erase a single line of unwanted data first select that line with the mouse or by scrolling up and down with the arrow keys, and then clicking on the “Erase” button.

To erase a block of unwanted data select the first line and then while holding down the shift key select the last line of the data (using either the mouse or the arrow keys). The click on the Erase button to delete the entire block of data.

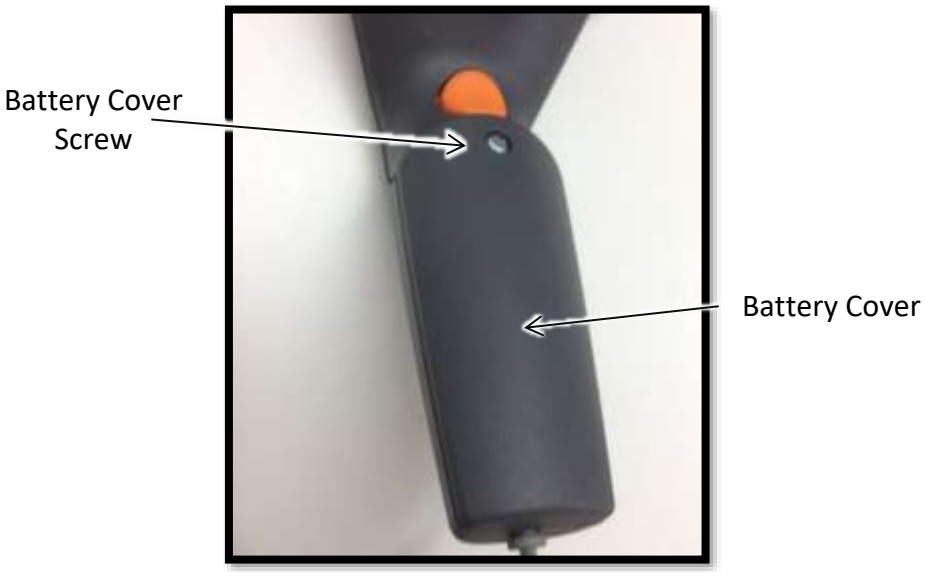
4 POWERING THE K-METRON

4.1 Battery Type

K-METRON is designed for use with a single Lithium PP3 9-volt battery. Using a non-lithium variant of a PP3 9-volt battery, such as an alkaline, will significantly reduce battery life. An equivalent rechargeable battery may also be used but this may require

4.2 Replacing the Battery in K-METRON

To replace the battery, remove the cover screw. Carefully unclip the spent battery from the battery cover lid and unclip the battery terminals from the flying power lead. Attach the terminals on the new battery and ensure they clip on securely. Insert the charged battery into the clip and remount the cover. Make sure the battery cable is not trapped by the cover.



4.3 Battery Life

It is recommended that a PP3 lithium battery is used to provide the longest battery life. When used continually without transmitting data the battery life is in the region of 50 hours based on transmission of data at a rate of 10 transmissions/hour the estimated battery life would be in the region of 40 hours.

5 CALIBRATING THE K-METRON

After the K-METRON is calibrated with each type of magnet the values are stored within the K-METRON memory. There re-calibration is not necessary when switching between magnets; instead the desired magnet is chosen in the configuration menu.

The K-METRON's accuracy improves with careful magnetic coupling between the sensor head and the part face. Measurement accuracy ranges from +/- 0.2mm at the lower end of the readings and +/- 1mm at the upper end of measurement. This will depend on whether the spherical magnet or the cube is used.

Although the units are calibrated before leaving 493K re-calibration may be necessary within your plant.

Select a location that is at least 1 metre away from any steel or ironwork which will affect accuracy of calibration.

Re-calibration is not required for use with differing materials.

5.1 Entering Calibration Mode.

With the unit turned OFF hold down the DELETE button. While still holding the DELETE button down (in one hand) turn the unit on (with the other hand). Therefore on switch on, when the display lights up, release the ON/OFF button but continue to hold down the DELETE button for a few seconds when "M1: Cal Object is displayed then immediately release the DELETE button while waiting the display will read "Wait … Setup mode". This is an instantaneous press holding for an extended period will result in the unit turning off!

The K-METRON is now in the configuration menu. Scroll through the menu using the DELETE button and select "M2: Calibrate" by pulling the orange trigger. The unit will prompt for re-confirmation and this is acknowledged with the orange trigger.

5.2 Calibrating the K-METRON.

The display should now read NM – no magnet. With no magnet near the sensor head, the trigger should be depressed and released.

After successfully acknowledging 'NM – no magnet' the unit will then request the 20mm position. The magnet should be placed on the 20mm step and the trigger pulled. Confirmation of step calibration will be provided and then the next step thickness requested, i.e. 19mm. Slide the magnet onto the next step ensuring that it does not snap down. The next position will be requested, i.e.18mm, and so on.

The magnet should be placed on each step so that it is in the centre of the step and is not interfering with the step edge. The sensor head should be centred on the magnet. Ensure that the magnet is not moving when calibrating as this will affect the calibration values.

The more accurately you can teach the K-METRON the thickness that it is measuring during calibration, the greater the accuracy of the part thickness measurement in the field.

Continue this step by step calibration down to the 'Zero' thickness with the magnet directly on the sensor surface.

If you make a mistake during the calibration sequence, press the DELETE button to go back to the previous position.

THE CUBE AND SPHERICAL MAGNETS ARE NOT INTERCHANGEABLE AND DOING SO WILL RESULT IN INACCURATE READINGS. THE MAGNET TYPE MUST BE SET IN THE CONFIGURATION MENU BEFORE USING THE K-METRON. IT IS ADVISABLE TO STORE ANY UNUSED MAGNETS IN THE K-METRON CASE TO AVOID MISTAKENLY LOSING OR USING THE WRONG MAGNET.

5.3 Validating Calibration.

After calibration is complete the measured data should be validated. To do this position the calibrated magnet once more on each step and ensure the K-METRON'S measured and displayed value is that of the actual step thickness (note the measurement tolerances as per the table above apply).

6 THE SENSOR HEAD

DO NOT ALLOW THE TRANSDUCER MAGNET TO 'SNAP' TO THE FACE OF THE SENSOR – SEVERE DAMAGE MAY OCCUR TO THE DEVICE SENSOR AND MAGNET.

Keep the Sensor Head and magnet away from computer displays or any product which is sensitive to strong magnetic fields. Permanent damage may occur to such devices.

The Sensor is highly sensitive to magnetic fields and temperature. High temperature environments may also affect the accuracy of readings.

The instrument has been factory calibrated to accuracies shown in the table above.

Regular checks should be made to ensure the instrument is operating within its capabilities and it is recommended that the unit is returned to 493K Limited for an annual recalibration to ensure its continued performance is maintained. 493K offer a return carriage paid service, calibration and inspection.

7 MEASURING DIFFERENT MATERIALS

No calibration is required for use with differing materials. This equipment will measure materials of a thickness between 2mm to 20mm where access can be achieved to both sides of the product being measured.

7.1 Materials that can be measured.

Non-ferrous materials of any density will return an accurate reading within the limits of the device. Materials that can be measured include all non-ferrous materials such as:

- *Plastics of any density or composition*
- *Foamed materials*
- *Laminates*
- *Fibreglass*
- *Carbon Composites*
- *Glass*
- *Aluminium*
- *Brass and copper*

7.2 Measuring Non-ferrous Metal Parts.

When measuring the thickness of non-ferrous metal parts ensure that there is ***no movement*** of the magnet during the measurement. ***The figure of 8 movement for these materials should be made to centre the magnet to the sensor head but should be stopped once centred and before the measurement is taken.***

7.3 Materials that Cannot be Measured.

The unit cannot be used to measure any kind of ferrous materials, e.g. steels & irons.

8 WHAT'S INCLUDED

The system comprises:

1. A portable display unit containing the measurement electronics;
2. A Lithium PP3 9volt battery;
3. Sensor Head with lead attached to the display unit;
4. 2 x spherical 10mm magnets;
5. 1 x 10mm cube magnet with retrieval cord;
6. Magnetic telescopic pick up tool;
7. 1mm - 20mm Calibration Steps;
8. Instruction Manual;
9. K-METRON Software (downloaded via link supplied);
10. 493K carry bag.

9 TECHNICAL SPECIFICATIONS

Range:	2 to 20mm (magnet dependent)
Resolution:	0.1mm
Accuracy:	+/- 0.2mm or +/- 1mm depending on calibration type
Range error:	Better than +/- 0.3mm
Temperature:	5°C to 35°C (41°F to 95°F)
Calibration:	@ 20°C (68°F)
Minimum radius measured:	(10mm Cube): 20mm
	(10mm Spherical): 5mm
Power Supply:	1 x Lithium PP3 9volt battery (recommended)
	1 x Alkaline PP3 9volt battery (although the K-METRON will work with Alkaline batteries there will be a significantly reduced battery life)

10 DISCLAIMER

Use of this instrument is at the operators' risk and 493K Limited will not be held liable for any claims for damage to other equipment occasioned by its use or any consequential claims related to the instrument's accuracy. See also limitations as to use.

11 DECLARATION OF CONFORMITY

We the manufacturer

493K Limited
23 Watch Hill Road
Ballyclare
Co. Antrim
BT39 9QW
United Kingdom

declare under our sole responsibility that the product :-

K-METRON, Model No. 2.0

to which this declaration relates is in conformity with the following standard(s) or other normative document(s) :-

EN55022 : 1988 Class B
EN50082-1
IEC 801-2 : 1991
IEC 801-3 : 1984
IEC 801-4 : 1988

following the provisions of :-

EC EMC 2004/108/EC.

Place of issue

493K Limited
23 Watch Hill Road
Ballyclare
Co. Antrim
BT39 9QW
United Kingdom

Date of issue **30 Nov 2016**

Signature

Name **Dr Gareth W. G. McDowell**
Position **Managing Director**