



## 5 Specification

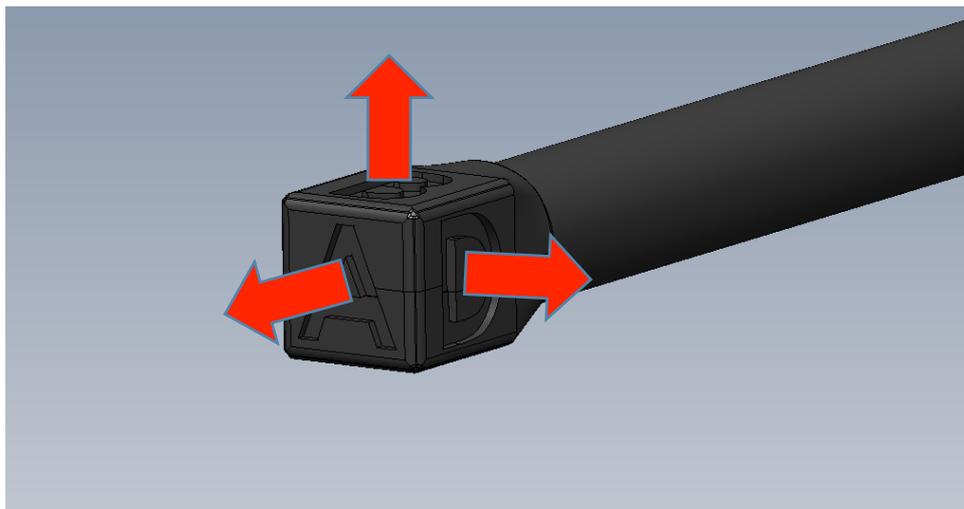
|                            | <b>MagnaCheck 3D</b>  | <b>MagnaCheck 1D</b>                             |
|----------------------------|---|--|
| Measurement range          | G: 0 to 2,000<br>kA/m: 0 to 159<br>mT: 0 to 200   | G: 0 to ±1,000<br>kA/m: 0 to ±79<br>mT: 0 to 200 |
| Resolution                 | G: 0.01<br>kA/m: 0.01<br>mT: 0.01   | G: 0.08<br>kA/m: 0.01<br>mT: 0.01                |
| Units                      | Gauss, milliTesla, kiloAmps/metre   |  |
| Measurement modes          | DC, AC peak, true RMS   | DC, AC peak, true RMS                            |
| MPI bench features         | True RMS for thyristor switched fields  | True RMS and shot time measurement               |
| Reading maximum hold times | Off, 1, 2, 5 and 10 seconds   |  |
| Measurement sample rate    | 70 measurements/sec   | 500 measurements/sec                             |
| Sensor calibration         | Stored digitally in probe   |  |
| Measurement accuracy       | ±5%   | ±5%  |
| Applicable Standards       | ASTM E1444/1444M-16 and EN ISO 9934-3 2005  |  |
| Zeroing                    | Manual zero with null pot supplied  |  |
| Display type               | 2.8" (70mm) 320 x 240 pixels colour backlit LCD   |  |
| Power                      | 2 x 1.5V AA batteries, 6 hours continuous operation   |  |
| Instrument dimensions      | 168mm L x 85mm W x 30mm D   |  |
| Instrument weight          | 350g (0.77 lb) including batteries  |  |
| Environmental:             | Altitude up to: 2,000m<br>Temperature: 0°C to 40°C<br>Maximum relative humidity: 5% to 95% non-condensing<br>IP Rating: Designed to meet IP54 |  |

## 6 Principles of 3D magnetic field strength probe operation

Traditional magnetic field strength measurements are performed with a single Hall Effect sensor, which provides an output voltage proportional to the instantaneous magnetic field strength perpendicular to the sensor.

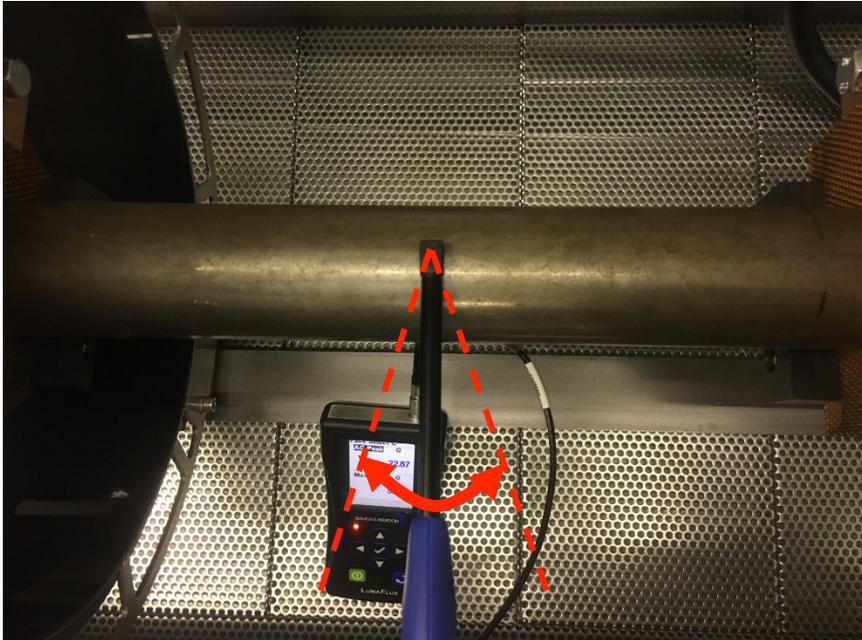
This results in considerable measurement variation dependent on the respective orientations of the sensor and the magnetic field. Careful, precise positioning and orientation of the sensor is required to ensure that the maximum field strength is accurately measured. This introduces practical difficulties for the operator, and the potential for significant measurement error.

The 3D magnetic field strength probe incorporates 3 orthogonally arranged Hall Effect sensors in a rugged probe housing, which simultaneously measure the instantaneous magnetic field strength in 3 axes as shown in Figure 6.



*Figure 6 - 3D Magnetic field strength probe, illustrating orthogonal measurement axes.*

This allows for the maximum field strength to be determined irrespective of the relative alignment of the magnetic field with the probe by calculating the magnitude of the field from each vector. Figure 7 illustrates a measurement being taken, with annotation showing acceptable variation of probe orientation with respect to the field.



*Figure 7 - 3D Magnetic field strength probe orientation.*

The implementation of the 3D magnetic field strength probe in the MagnaCheck product allows for two methods of operation.

### **Free Field Mode**

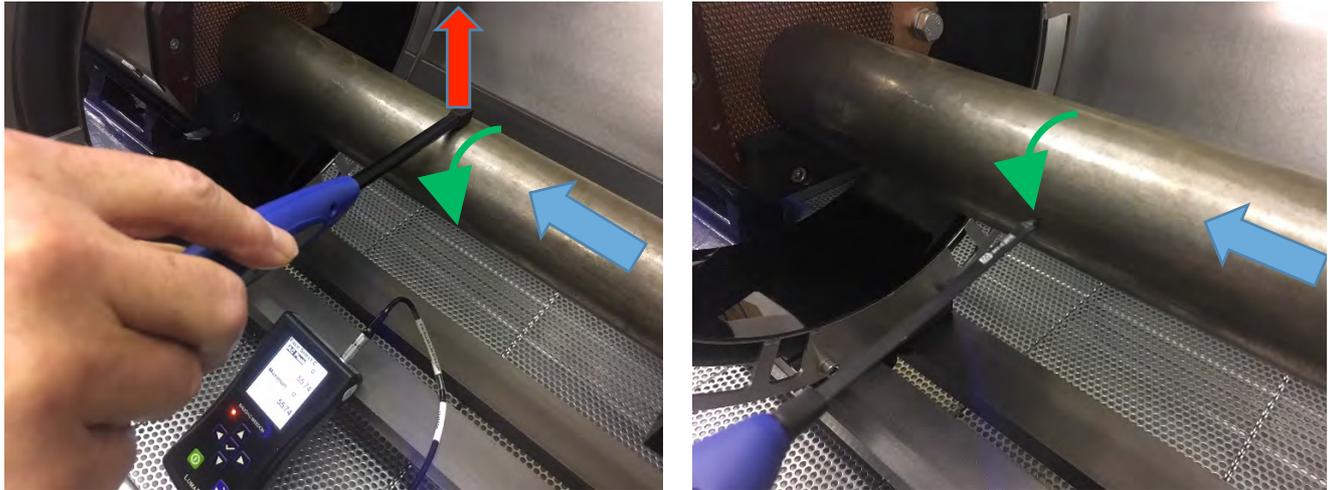
Free field mode uses the magnitude of the field strength from all three sensors, to calculate a single magnitude value, and is sensitive to the magnetic field in all vectors. It does not discriminate between wanted and unwanted components of the magnetic field.

When taking measurements of magnetic field strength at the surface of a part in a MPI bench, free field mode may not be appropriate, because the unwanted component of the field, perpendicular to the part will also be measured. This will result in an over-reading of the field strength in comparison with a 1D magnetic field strength probe placed at the part surface aligned with the field of interest. In this instance, Face Select mode should be used. Typical applications for Free Field Mode are:

- Measuring the magnitude of the field strength in Helmholtz coils.
- Measuring the magnitude of the field strength in a de-magnetisation coil.

### **Face Select Mode**

Face select mode allows the operator to place one of 5 designated probe faces onto the part surface, and the unwanted perpendicular element of the magnetic field is rejected from the magnetic field strength calculation as illustrated in Figure 8. The remaining 2 sensors are used in the magnitude calculation, permitting compensation for inaccurate probe orientation, resulting in better measurement repeatability compared with using a conventional 1D probe as shown in Figure 8.



*Figure 8 - Illustration of field strength measurement using an MPI bench. 3D measurement (left), 1D measurement (right). Direction of current (blue), field of interest (green), unwanted field (red).*

## 7 Calibration

A certificate of calibration is supplied with the MagnaCheck probes detailing the calibration equipment used, its calibration traceability, test conditions, measurement results, acceptance criteria and a certificate number.

The MagnaCheck Home Screen provides the due date of the next calibration in accordance with customer requirements. It is recommended that the MagnaCheck be recalibrated at least every twelve months.

For calibration of MagnaCheck please contact Baugh & Weedon or your local distributor.

## 8 Warranty, maintenance and battery replacement

### 8.1 Warranty

The MagnaCheck is provided with a one year warranty subject to fair wear and tear commencing from the date of dispatch, excluding batteries. Baugh & Weedon (the Company) undertakes to make good by providing a replacement or at its option repairing defects arising from faulty design, material or workmanship.

Defective goods must be promptly returned at the Purchaser's expense to the Company's factory in Hereford, UK. The goods must be accompanied by the purchaser's written order describing the defect and authorising the Company to invoice the Purchaser for any charges not covered by the warranty.