Group3 Magnetic Field Measurement Products

Group3 Teslameters offer:

- ➔ outstanding accuracy
- ➔ extremely high resolution
- ➔ small probe size
- ➔ single probe covers all fields up to full scale.
- ➔ noise immunity
- ➔ interchangeable probes

Group3 teslameters are the highest precision Hall effect instruments available - no other instrument can offer comparable specifications in the same price range. Group3's unique linearization and temperature correction techniques have overcome the inherent problems of standard Hall effect devices. Every Group3 probe is individually characterized at many field values, each at a range of temperatures. All this data is analyzed by the calibration computers and the resulting correction coefficients are stored in the probe itself. Advanced software algorithms in a Group3 teslameter use the data to produce corrected field readings.

No other instrument available approaches the thermal stability of the DTM-151 and LPT-141 combination - conservatively rated at 10ppm/°C maximum, but typically less than half of that.

The small active area of a Hall probe is ideal for field mapping. It offers particular advantages in regions of non-uniform field, for making measurements "on-the-fly" (when moving the probe through a field region), and also for measuring AC magnetic fields. These are applications where NMR based teslameters do not operate well. High precision Group3 teslameters offer near equal resolution, can operate in all these difficult areas, and cost far less than an NMR system.

Because the characterization data for each probe is permanently stored within the probe plug housing itself, any Group3 probe can be used with any Group3 instrument. Probes and instruments can be swapped around while still maintaining the full accuracy of the system. A single probe covers a wide range of field values - there is no requirement to change probes. A selection of probes is available, of differing areas, sensitivities, and temperature dependence.

The Group3 instruments are robustly housed in an all-metal case, which also gives added protection against RFI problems. The small sized unit takes up little space on a bench top, and if the panel mount version is used, three teslameters can be mounted across a standard 19" panel.

The field reading is on a 7 digit red LED display, highly visible in the normal laboratory environment, whether it is dimly or brightly lit.

The front panel is kept simple, with just two buttons needed to select and change settings. Group3 has adopted this elegant approach, rather than providing a button for everything, whether it's required or not.

The sophisticated drive methods employed, and the very special cable used for the probes permit large separations of probe head and instrument. Probe cables can be manufactured up to 30 metres in length.

Group3 offers three distinct families of teslameters

- the high precision **DTM-151** series - the premium Hall effect teslameter.
  outstanding accuracy, very high resolution (1 in 600,000)
  for use with temperature compensated probes.
  choose either serial (fiber optic + RS-232) or IEEE-488 GPIB communications.

- the high resolution **DTM-150** series
  the same high resolution as the DTM-151,
  for use with non-temperature compensated probes.
  same accuracy as DTM-151 at room temperature (25°C)
  intended for use where the probe will be held at a constant temperature,
  or where the full accuracy over temperature is not required.
  choose either serial (fiber optic + RS-232) or IEEE-488 GPIB communications.

- the economy **DTM-133** series.
  lower resolution, (1 in 12,000)
  for use with non temperature compensated probes
  choose either serial (fiber optic + RS-232) or IEEE-488 GPIB communications,
  or the no communications option for lowest cost.

All the above instruments can be supplied in either bench top style or with the panel mounting option.

Be careful when making comparisons based on other manufacturers' specification sheets. Group3 has always quoted an overall accuracy specification, for the full system - instrument plus probe, over the quoted field and temperature range. After all, it is the system accuracy that is of interest to someone doing the measurement - a probe or an instrument alone is of little use.

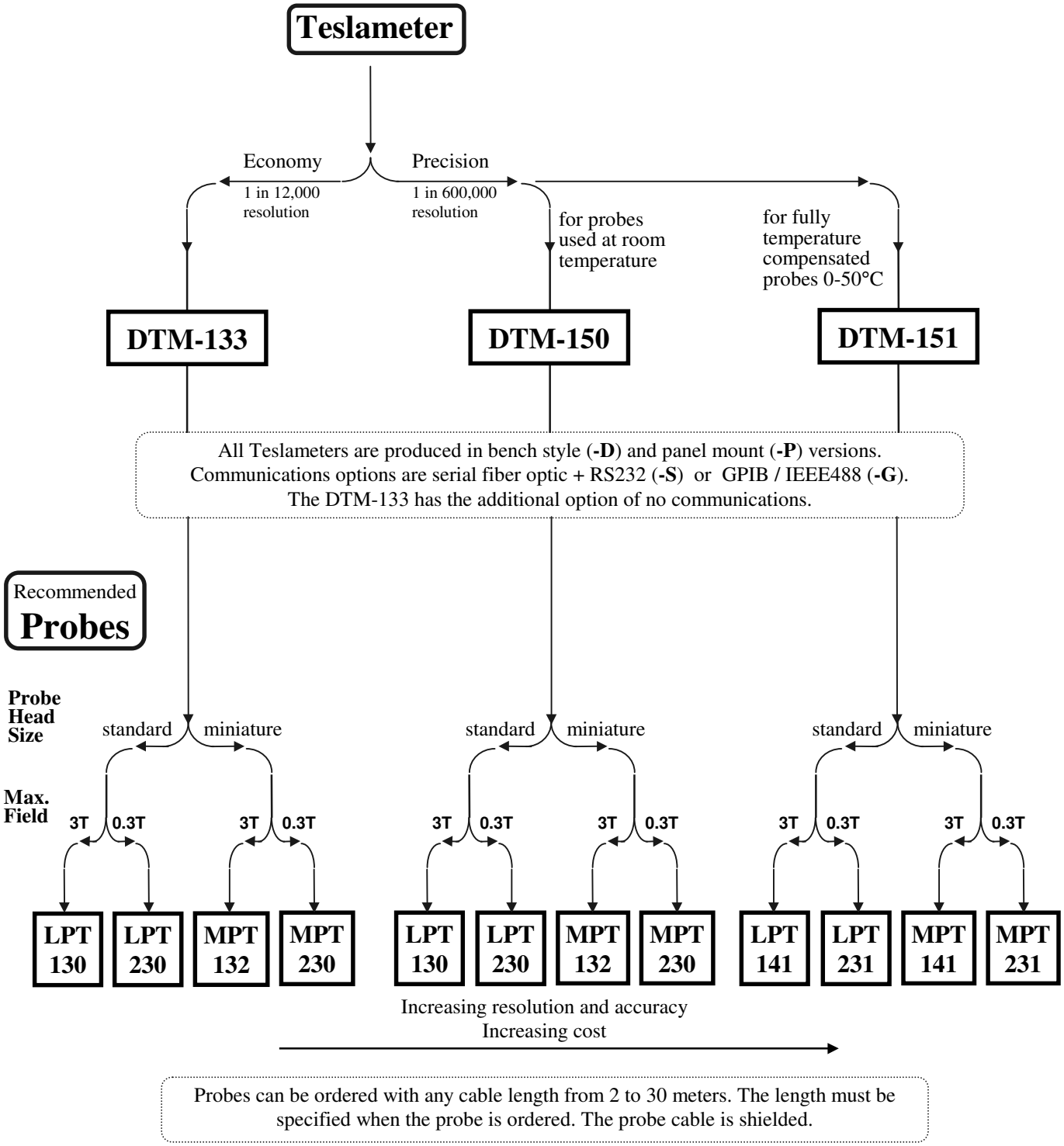
Frequently other manufacturers will quote a spec. for the instrument, another for the probe, and another for the temperature dependence of the probe. While all these individual numbers may look small, to get the system performance, you need to add all the inaccuracies together. Remember that a probe quoted with a number like 0.02% / °C may initially look good, but when you multiply it by the 50°C operation range that is standard of a Group3 probe, suddenly the competing probe is actually a 1% device.

Another ploy of some other manufacturers is to claim that "absolute accuracy" is a difficult specification to give, and prefer instead to quote "precision" or "repeatability". First of all, absolute accuracy is easy to quote for a teslameter system - all you have to do is ask "how accurate is the reading, when compared to a known standard?" An NMR probe is generally accepted as the best reference standard, and Group3 probes are checked for absolute accuracy against an NMR meter. The Group3 DTM-151 teslameter systems can be reliably quoted at an accuracy of 0.01%, considerably better than other teslameters.

Secondly, precision or repeatability are meaningless terms unless obtained under absolutely defined conditions, which don't really occur in real measurement situations.

The two prime specifications should be **absolute accuracy** (when compared to a known standard), and **resolution** ("what is the smallest change in field that the instrument will detect?").

Group3 Teslameter Selection Guide



Please note: while the top range of Group3 teslameters is 3 tesla, in fact the probes are calibrated to a maximum field of ±2.2 tesla. The instrument will read above 2.2 tesla, but with unspecified accuracy.

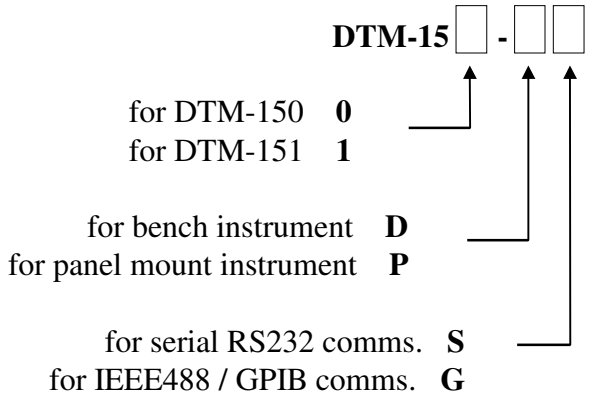
Resolution figures shown are relative to the full bipolar span of the instrument.

Ordering Information

DTM-151 and DTM-150

Available as standard with either serial communications or IEEE-488 bus communications.
Available as free standing bench instrument, or with a panel mount bezel.

Model numbering as follows:-

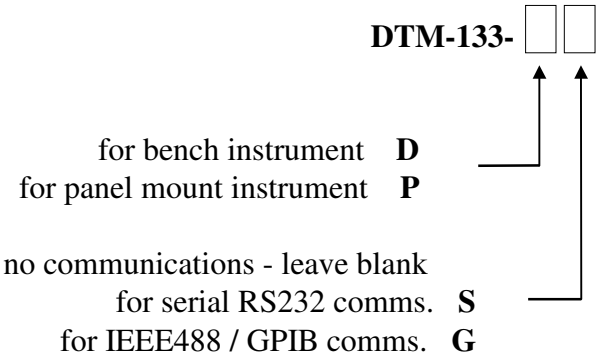


Example: **DTM-151-DS**
for bench style instrument with fiber optic +RS232 comms.

DTM-133

Available without communications -
if required, specify either serial communications or IEEE-488 bus communications.
Available as free standing bench style instrument, or with a panel mount bezel.

Model numbering as follows:-



DTM-151

DIGITAL HALL EFFECT TESLAMETER

The DTM-151 Digital Teslameter offers extremely accurate, high resolution measurement of magnetic flux densities.

Features:

- High accuracy - fully temperature compensated.
- Resolution of 1 part in 600,000
- 4 ranges
- Maximum field 3 Tesla
- 7 digit display
- either RS232 or IEEE488/GPIB communications.

Accuracy is **0.01%** of reading + 0.006% of full scale when used with the LPT-141 or MPT-141 probe.

Temperature range for instrument and probe 0 to 50°C

Because the probe characterization information is stored in the probe assembly itself, any Group3 probe can be used with any Group3 DTM. However for full accuracy the DTM-151 should be used with a probe that has temperature compensation circuitry.

Two buttons on the front panel are used to select the operation of the teslameter. The following modes can be selected for the display - magnetic field, peak hold of magnetic field, AC component of field, probe temperature.

Digital filtering (time averaging) can be enabled to suppress short term fluctuations.

Several teslameters (up to 31) with serial communications can be formed into a local communications loop, all of them talked to by one serial port on the control computer. The system can be operated in a trigger mode, where the timing of the measurements by several teslameters can be synchronized.

Internal switches select serial data format, baud rate, device address, string terminators, filtering, gauss or tesla units, data format, service request action, EOI action, and reset system to defaults.

Two analog outputs are available. These are derived from the raw probe signal, and are not corrected for linearity or temperature. One gives an instantaneous field value from dc to 3kHz (-3dB), the other a rectified value of the field's ac component from 8Hz to 3kHz (-3dB).

All models are available without display or front buttons, for true "Black box" requirements.

Panel mount versions are available, as are panels with correct cut-outs and mounting hardware.

DTM-151 Specifications

DTM-151 performance summary when combined with the listed probe.							
probe	**active area** (mm)	**resolution of display**	**max field**	**finest resolution**	**accuracy at** 25°C	**tempco** ppm/°C	**zero drift** µT/°C
LPT-141	4 x 1.6	1 in 600,000	3T	1µT	±0.01%	±10	±1
LPT-231	4 x 1.6	1 in 600,000	0.3T	0.1µT	±0.03%	±25	±1
MPT-141	1 x 0.5	1 in 600,000	3T	1µT	±0.01%	±10	±1
MPT-231	1 x 0.5	1 in 600,000	0.3T	0.1µT	±0.03%	±25	±1

The following specifications refer to DTM-151 with LPT-141 probe (standard size probe)
DTM-151 with MPT-141 probe (miniature probe)

Ranges 4 ranges, selectable from front panel
0.3, 0.6, 1.2, 3.0 tesla full scale

Resolution depends on the range selected, and whether the digital filtering is enabled.
Resolution available at the serial/GPIB port is greater than that of the display.

Range selected	Filtering	**Resolution** (µT) display	serial/GPIB
0.3 tesla	filtering ON	1	0.1
	OFF	5	0.1
0.6 tesla	filtering ON	2	1
	OFF	10	1
1.2 tesla	filtering ON	4	1
	OFF	20	1
3 tesla	filtering ON	10	1
	OFF	50	1

Absolute Accuracy ±0.01% of reading ± 0.006% of range at 25°C

Temperature Stability scale factor: ±5 ppm of reading / °C typical, ±10 ppm of reading / °C max.
zero drift: ± (1µT + 0.0003% of full scale) / °C max.
effect of probe cable: add -3ppm / °C for each metre of probe cable

Frequency DC, or in AC mode 8 to 3,000 Hz

Update rate 10 fully corrected measurements per second

Display 7 digit, red LED. 8 additional indicators for range, units, peak hold and filter

Enclosure All metal, with tilt stand on bench models, bezel mount on rack models

Dimensions 217 x 125 x 50mm , weight 1.2 kg

DTM-150

DIGITAL HALL EFFECT TESLAMETER

The DTM-150 Digital Teslameter offers accurate, high resolution measurement of magnetic flux densities.

Features:

- Resolution of 1 part in 600,000
- 4 ranges
- Maximum field 3 Tesla
- 7 digit display
- either RS232 or IEEE488/GPIB communications.

Accuracy is 0.03% of reading + 0.006% of full scale at 25°C when used with LPT-130 or MPT-132 probe.

Because the probe characterization information is stored in the probe assembly itself, any Group3 probe can be used with any Group3 DTM. However, for best performance the DTM-150 should be used with a non-temperature-corrected probe.

Two buttons on the front panel are used to select the operation of the teslameter. The following modes can be selected for the display - magnetic field, peak hold of magnetic field, AC component of field.

Digital filtering (time averaging) can be enabled to suppress short term fluctuations.

Several teslameters with the serial communications option (up to 31) can be formed into a local communications loop, all of them talked to by the one serial port on the control computer. The system can be operated in a trigger mode, where the timing of the measurements by several teslameters can be synchronized.

Internal switches select serial data format, baud rate, device address, string terminators, filtering, gauss or tesla units, data format, service request action, EOI action, and reset system to defaults.

Two analog outputs are available. These are derived from the raw probe signal, and are not corrected for linearity. One gives an instantaneous field value from dc to 3kHz (-3dB), the other a rectified value of the field's ac component from 8Hz to 3kHz (-3dB).

All models are available without display or front buttons, for true "Black box" requirements.

Panel mount versions are available, as are panels with correct cut-outs and mounting hardware.

The operating temperature range of the probe and instrument is 0 to 50 °C

DTM-150 Specifications

DTM-150 performance summary when combined with the listed probe.							
probe	**active area** (mm)	**resolution of display**	**max field**	**finest resolution**	**accuracy at** 25°C	**tempco** ppm/°C	**zero drift** µT/°C
LPT-130	4 x 1.6	1 in 600,000	3T	1µT	±0.03%	-80	±12
LPT-230	4 x 1.6	1 in 600,000	0.3T	0.1µT	±0.03%	-620	±12
MPT-132	1 x 0.5	1 in 600,000	3T	1µT	±0.03%	-140	±40
MPT-230	1 x 0.5	1 in 600,000	0.3T	0.1µT	±0.03%	-800	±12

The following specifications refer to DTM-150 with LPT-130 probe (standard size probe)
DTM-150 with MPT-132 probe (miniature probe)

Ranges 4 ranges, selectable from front panel
0.3, 0.6, 1.2, 3.0 tesla full scale

Resolution depends on the range selected, and whether the digital filtering is enabled.
Resolution available at the serial/GPIB port is greater than that of the display.

Range selected	Filtering	**Resolution** (µT) display	serial/GPIB
0.3 tesla	filtering ON	1	0.1
	OFF	5	0.1
0.6 tesla	filtering ON	2	1
	OFF	10	1
1.2 tesla	filtering ON	4	1
	OFF	20	1
3 tesla	filtering ON	10	1
	OFF	50	1

Absolute Accuracy ±0.03% of reading ± 0.006% of range at 25°C

Temperature Stability with **LPT-130** probe
scale factor: -80 ppm of reading / °C max.
zero drift: ± (12µT + 0.0003% of full scale) / °C max.
effect of probe cable: add -3ppm / °C for each metre of probe cable

with **MPT-132** probe
scale factor: -140 ppm of reading / °C max. (100ppm/ °C typical)
zero drift: ± (40µT + 0.0003% of full scale) / °C max.
effect of probe cable: add -3ppm / °C for each metre of probe cable

Frequency DC, or in AC mode 8 to 3,000 Hz

Update rate 10 fully corrected measurements per second

Display 7 digit, red LED. 8 additional indicators for range, units, peak hold and filter

Enclosure All metal, with tilt stand on bench models, bezel mount on rack models

Dimensions 217 x 125 x 50mm , weight 1.2 kg

DTM-133

DIGITAL HALL EFFECT TESLAMETER

The DTM-133 Digital Teslameter offers accurate, medium resolution measurement of magnetic flux densities at an economic price.

Features:

- Resolution of 1 part in 12,000
- 4 ranges
- Maximum field 3 Tesla
- 6 digit display (5 digit, plus sign)
- optional RS232 or IEEE488/GPIB communications.

Accuracy is ± (0.03% of reading + 0.03% of full scale) with LPT-130 or MPT-132 probe.
Temperature coefficient is -80 ppm / °C max. when used with LPT-130, or
-140 ppm / °C max. when used with MPT-132 probe.
Accuracy and temperature specifications include performance of probe.

Because the probe characterisation information is stored in the probe assembly itself, any Group3 probe can be used with any Group3 DTM. However, for best performance the DTM-133 should be used with a non-temperature-corrected probe.

Two buttons on the front panel are used to select the operation of the teslameter. The following modes can be selected for the display - magnetic field, peak hold of magnetic field, AC component of field.

Digital filtering (time averaging) can be enabled to suppress short term fluctuations.

Several teslameters with the serial communications option (up to 31) can be formed into a local communications loop, all of them talked to by the one serial port on the control computer. The system can be operated in a trigger mode, where the timing of the measurements by several teslameters can be synchronised

Internal switches select serial data format, baud rate, device address, string terminators, filtering, gauss or tesla units, data format, service request action, EOI action, and reset system to defaults.

An analog output is available. This is derived from the raw probe signal, and is not corrected for linearity or temperature. It gives an instantaneous field value from dc to 9kHz (-3dB).

All models are available without display or front buttons, for true “Black Box” requirements.

Panel mount versions are available, as are panels with correct cut-outs and mounting hardware.

The operating temperature range of the probe and instrument is 0 to 50 °C

DTM-133 Specifications

DTM-133 performance summary when combined with the listed probe.							
probe	**active area** (mm)	**resolution of display**	**max field**	**finest resolution**	**accuracy at** 25°C	**tempco** ppm/°C	**zero drift** µT/°C
LPT-130	4 x 1.6	1 in 12,000	3T	50µT	±0.03%	-80	±12
LPT-230	4 x 1.6	1 in 12,000	0.3T	5µT	±0.03%	-620	±12
MPT-132	1 x 0.5	1 in 12,000	3T	50µT	±0.03%	-140	±40
MPT-230	1 x 0.5	1 in 12,000	0.3T	5µT	±0.03%	-800	±12

The following specifications refer to DTM-133 with LPT-130 probe (standard size probe)
DTM-133 with MPT-132 probe (miniature probe)

Ranges 4 ranges, selectable from front panel
0.3, 0.6, 1.2, 3.0 tesla full scale

Resolution depends on the range selected.

Range selected	**Resolution** (µT)
0.3 tesla	50
0.6 tesla	100
1.2 tesla	200
3 tesla	500

Absolute Accuracy ±0.03% of reading ± 0.03% of range at 25°C

Temperature Stability with **LPT-130** probe
scale factor: -80 ppm of reading / °C max.
zero drift: ± (12µT + 0.0015% of full scale) / °C max.
effect of probe cable: add -3ppm / °C for each metre of probe cable

with **MPT-132** probe
scale factor: -140 ppm of reading / °C max.
zero drift: ± (40µT + 0.0015% of full scale) / °C max.
effect of probe cable: add -3ppm / °C for each metre of probe cable

Frequency DC, or in AC mode 8 Hz to 9,000 Hz

Update rate 30 fully corrected measurements per second

Display 6 digit, red LED. 8 additional indicators for range, units, peak hold and filter

Enclosure All metal, with tilt stand on bench models, bezel mount on rack models

Dimensions 217 x 125 x 50mm , weight 1.2 kg

HALL PROBES

For Group3 Digital Teslameters

There are two main families of probes manufactured by Group3.

LPT series - the standard probe,
sensitive area 1.6 x 4.0 mm,
housed in a probe head of 13 x 10.5 x 2.5 mm thick (LPT-130 and LPT-230)
14 x 14 x 2.5 mm thick (LPT-141 and LPT-231)

MPT series - miniature probe,
sensitive area 1.0 x 0.5 mm,
housed in a probe head of 14 x 5 x 2 mm thick

Within these families there are probes of differing full scale ranges
the standard maximum range is 3.0T
the high sensitivity probe has a maximum field of 0.3T

Every Group3 probe is individually characterized at many field values, each at a range of temperatures. All this data is analyzed by the calibration computers and the resulting correction coefficients are stored in the probe itself. Because the characterization data for each probe is permanently stored within the probe plug housing, any Group3 probe can be used with any Group3 instrument. Probes and instruments can be swapped around while still maintaining the full accuracy of the system.

For full accuracy over a range of temperatures the DTM-151 should be used with the following probes:

LPT-141 LPT-231 MPT-141 MPT-231

Probe cables can be ordered in any length from 2 to 30 meters. Specify the required cable length when ordering the probe. The cable cannot be extended later.

The probe cable is shielded and has a nominal diameter of 6.5mm.
At the probe head end there is a 300mm length of unshielded cable of 4.5mm diameter.
The probe head is attached to the cable by a short (13 to 50mm) length of flexible wiring.
This allows greater flexibility when mounting the probe head.

Various special configurations of probe head can be manufactured to special customer requirements - if one of the existing types of probe is not suitable for your application, please contact your Group3 representative.

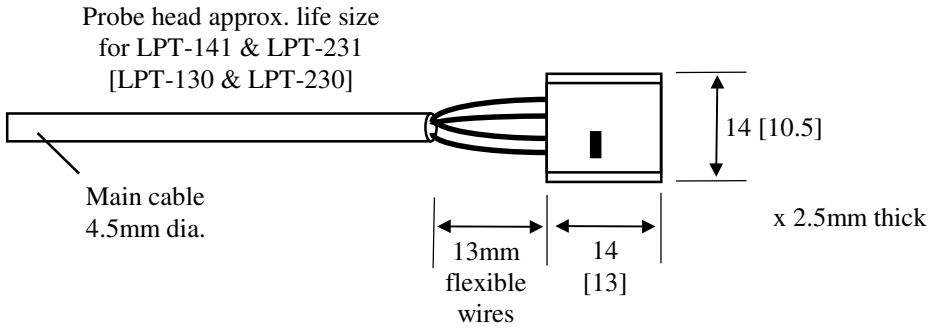
The operating temperature range of the probe and instrument is 0 to 50 °C

A range of probe holders is available for both series of probe heads. One, two and three axis probe holders have been manufactured in aluminum and non-metallic materials.

Detailed calibration tables are supplied with each probe to demonstrate that the probe has been properly calibrated and performs within the published tolerances over the temperature range.

Hall Probes

LPT series performance summary (probe only)						
probe	**Probe head size** (mm)	**active area** (mm)	**max field**	**accuracy at** 25°C	**tempco** ppm/°C	**zero drift** µT/°C
standard sensitivity						
LPT-141	14 x 14 x 2.5	4.0 x 1.6	3T	±0.01%	±5	±1
LPT-130	13 x 10.5 x 2.5	4.0 x 1.6	3T	±0.03%	-60	±12
high sensitivity						
LPT-231	14 x 14 x 2.5	4.0 x 1.6	0.3T	±0.03%	±20	±1
LPT-230	13 x 10.5 x 2.5	4.0 x 1.6	0.3T	±0.03%	-600	±12



MPT series performance summary (probe only)						
probe	**Probe head size** (mm)	**active area** (mm)	**max field**	**accuracy at** 25°C	**tempco** ppm/°C (max.)	**zero drift** µT/°C (max.)
standard sensitivity						
MPT-141	14 x 5 x 2	1.0 x 0.5	3T	±0.01%	±5	±1
MPT-132	14 x 5 x 2	1.0 x 0.5	3T	±0.03%	-120	±40
high sensitivity						
MPT-231	14 x 5 x 2	1.0 x 0.5	0.3T	±0.03%	±20	±1
MPT-230	14 x 5 x 2	1.0 x 0.5	0.3T	±0.03%	-800	±12