

F.W.BELL

PRECALIBRATED GAUSSMETERS

620/640

FEATURES

- 1000X Scale Expansion* (with zero center readout)
- 2 parts in 10^5 Resolution*
- Precalibrated Probes (probe interchangeable without recalibration)
- 0.3% built-in Calibration Accuracy
- Temperature Stable Probes
- Direct ac & dc Field Readout
- 5 volt dc Auxiliary Output**
- 100 kG Probe Capability

GENERAL DESCRIPTION

The Model 620 and 640 Gaussmeters are precision instruments utilizing high-performance Bell Hall generators. They provide features not formerly available, including a precalibration technique which permits direct interchangeability of probes without recalibration. With built-in calibration accuracy of $\pm 0.3\%$, instrument accuracy is $\pm 0.8\%$ to 30 kG (3 tesla) and $\pm 0.4\%$ to 10 kG (1 tesla) when used with the new probes. All probes are calibrated at the factory by referencing to a laboratory standard magnet. Controlled feedback permits incremental operation up to 30 kG.* 1000X scale expansion with zero center meter readout permits direct measurement of small incremental variations in both a positive and negative direction.* The instruments offer twelve ranges, over-

lapping from 0.1 gauss (10^{-5} tesla) FS to 30 kG (3 tesla) FS. With appropriate Probe, 100 kG measurements possible. Both dc and ac fields are indicated directly on the panel meter. AC fields up to 400 Hz are read out as an RMS value for sine wave fields. A calibrated output voltage of 1 V FS is available at the output jacks located on the front panel allowing connection to higher accuracy instrumentation such as DVM. An auxiliary output, located on the rear panel, is adjustable from 1 V to 5 V FS to provide increased output voltage and power to drive external equipment.** The Gaussmeters offer automatic change-over to battery operation in case of a power failure, making them ideal for fixed installations where constant, non-interrupted service is required. Simplified operation plus a variety of high stability probes makes the 620 and 640 ideal instruments for laboratory, field and production applications.



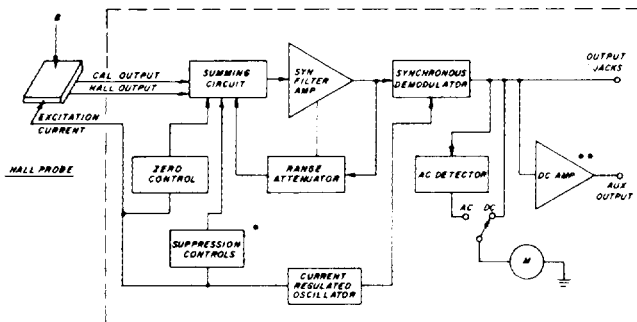
Model 640 Gaussmeter

*Offered with 640 only **Optional with 620

THEORY OF OPERATION:

The basic principle of magnetic field measurement used in the Model 620/640 Gaussmeters can be described as a field-modulated carrier-amplifier system. The Hall element is fed by a locally generated current regulated excitation signal which causes input chopping action. When the Hall element is placed in the field, a field modulated ac carrier output voltage is produced.

620/640 Gaussmeter



Each probe provides the Hall output voltage and the calibration output. These outputs are applied to the summing circuit along with the zero control output, suppression controls output and feedback range attenuator. The zeroing voltage removes the Hall elements residual output to zero the instrument under the conditions of zero field. The suppression controls buck out the absolute field output of the Hall element so that scale expansion can be applied for incremental operation.* High stability amplification is supplied by the synchronous filter amplifier and feedback attenuator combination. The amplified carrier is then restored to a field proportional voltage by the synchronous demodulator, without loss of polarity (field direction) information. This output feeds the output jacks and meter for dc fields. If the field is time varying, the demodulated output will be instantaneously proportional to the field waveform up to 400 Hz. A separate detector converts the ac portion of the output to dc for meter readout providing separation and independent readout for ac and dc fields.



Model 620 Gaussmeter

* Offered with 640 only
 ** Optional with 620

SPECIFICATIONS:

Field Range: 12 range non-overlapping from 0.1 G (10⁵ tesla) full scale to 30 kG (3 tesla) full scale.

.1	1	10	100	1,000	10,000
.3	3	30	300	3,000	30,000

Field measurements can be extended to 100 kG with appropriate probes.

Absolute Measurement Accuracy: Using internal calibration feature $\pm 0.8\%$ FS to 30 kG (3 tesla) and $\pm 0.4\%$ FS to 10 kG (1 tesla) with high performance probes.

Incremental Measurement Accuracy: Using internal calibration feature $\pm 1.0\%$ FS to $\pm 3.0\%$ FS depending on probe type and absolute field magnitude.*

Scale Expansion: 1000X with automatic and true zero center meter incremental readout.*

Meter Scale Resolution: For absolute measurements, one minor scale division is 1.0% of full scale reading. On 0.1 gauss (10⁻⁵ tesla) range, this represents 0.001 gauss (10⁻⁷ tesla) resolution. For incremental measurements, one minor scale division is 0.002% of full scale absolute range setting. On 100 gauss range, this represents 0.002 gauss or 2 parts in 10⁵ resolution.

Zero Suppression: Up to 30 kG fields may be suppressed to Zero.*

Stability: Temperature stable probes offer temperature dependence of $\pm 0.005\%$ of reading per degree C mean value from -20°C to 60°C .

Meter Readouts: Direct and independent reading of dc static flux density and RMS value of ac fields (sine wave 10 to 400 Hz). See instruction manual for field rejection capability.

Calibration: Internal calibration technique allows changing probes without recalibration. Internal calibration error does not exceed $\pm 0.3\%$. Can be calibrated to higher precision with suitable external standard field.

Output: Calibrated dc voltage of 1.0 volt FS is available at output jacks on front panel. Output impedance is approximately 1 k Ω . An auxiliary output, adjustable to 5 V dc, appears at the auxiliary output jacks located in the rear of the instrument.** Fields dc up to 400 Hz can be measured at the output jacks using an oscilloscope or external indicator.

Power Supply: AC line operation 115/230 V, 50/60 Hz; Internal battery (12 V dry battery, Neda 923 — Eveready 2780N or equivalent) furnished as optional accessory. External battery input 9 to 18 V dc available at rear of the instrument. When batteries are used, automatic takeover feature is available in case of the line power failure.

Accessories: 12 V dry battery, Neda 923 — Eveready 2780N or equivalent allows internal battery operation and can be used for external battery operation.

Dimension: 5 $\frac{3}{4}$ " high, 15" wide, 10 $\frac{3}{8}$ " deep.

Weight: Shipping 18 lbs., net, 12 lbs.

GAUSSMETER OPTIONS:

The Model 620 and 640 Gaussmeters offer a number of options to meet a variety of applications. These options are denoted by a letter suffix to the model number (example: 620R-Rack mount 620). The options are:

- D — 5 volt dc auxiliary Output
- N — Narrow Banding (dc to 10 Hz)
- R — Rack Mount
- Z — Zero Center Meter

Option D and Z are standard with the Model 640 Gaussmeter. The following configuration options are available:

Model number and options included.

640N:	Narrow banding
640R:	Rack mount
640NR:	Narrow banding, rack mount
620D:	5 vdc. auxiliary output
620N:	Narrow banding
620R:	Rack mount
620Z:	Zero center meter
620DN:	5 vdc. aux. output, narrow banding
620DR:	5 vdc. aux. output, rack mount
620DZ:	5 vdc. aux. output, zero center meter
620NR:	Narrow banding, rack mount
620NZ:	Narrow banding, zero cntr. mtr.
620RZ:	Rack mount, zero cntr. mtr.
620DNR:	5 vdc. aux. output, narrow banding, rack mount
620DNZ:	5 vdc. aux. output, narrow banding, zero cntr. mtr.
620DRZ:	5 vdc. aux. output, rack mtg., zero cntr. mtr.
620NRZ:	Narrow banding, rack mtg., zero cntr. mtr.
620DNRZ:	5 vdc. aux. output, narrow banding, rack mount, zero center meter.

The factory should be contacted for assistance if an application requires a configuration other than that defined above.

PROBE CONFIGURATIONS:

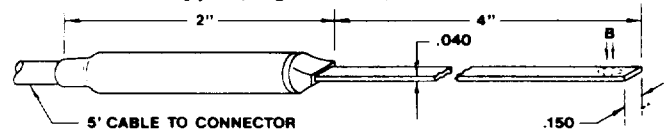
The Bell new standard line probes are designed to fill a large variety of customer applications and requirement. The probes provide stable and repeatable magnetic field measurements by being carefully matched to electrical input characteristics of the 620 and 640 Gaussmeters. There are five (5) classes of probes offered. They are:

- | | |
|------------|-----------------|
| Standard | Cryogenic |
| Heavy Duty | Special Purpose |
| Flexible | |

The classes offer a wide variety of Hall sensors mounted in graduated stem types and lengths to provide the mechanical and electrical characteristics required for most magnetic field measurements.

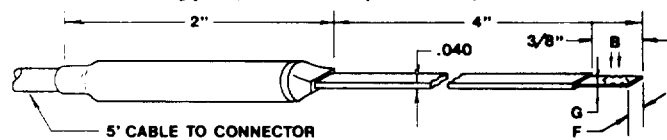
STANDARD PROBES (S Class)

Transverse Type (Rigid Stem)



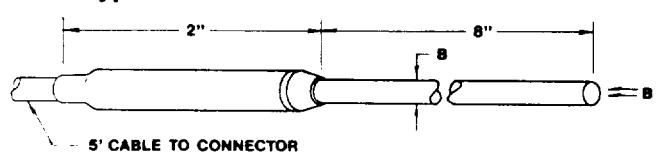
Model No.	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
STB4-0404	1.0% to 10 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
STG4-0404	2.0% to 30 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
STJ4-0404	0.1% to 10 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C
STL4-0404	0.25% to 30 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C
STR4-0404	1.0% to 100 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C

Transverse Type (Half Encapsulated)



Model No.	Dimension		Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
	F	G					
STB4-0204	.130" ± .003	.020" ± .003	1.0% to 10 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
STG4-0204	.130" ± .003	.020" ± .003	2.0% to 30 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
STE4-0104	.080" ± .003	.015" ± .003	2.0% to 10 kG	1X	.040" Dia.	0°C to +75°C	-0.08 % /°C
STI4-0004	.135" ± .003	.010" ± .003	3.0% to 10 kG	1X	.030" Dia.	0°C to +75°C	-0.10 % /°C

Axial Type



Model No.	Dem. B	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
SAE4-0808	.080" ± .003"	2.0% to 10 kG	1X	.020" Dia.	0°C to +75°C	-0.08 % /°C
SAB4-1208	.120" ± .003"	1.0% to 10 kG	1X	.030" Dia.	0°C to +75°C	-0.08 % /°C
SAB4-1808	.180" ± .003"	1.0% to 10 kG	1X	.030" Dia.	0°C to +75°C	-0.04 % /°C
SAG4-1808	.180" ± .003"	2.0% to 30 kG	1X	.030" Dia.	0°C to +75°C	-0.04 % /°C
SAK4-1808	.180" ± .003"	0.25% to 10 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C
SAN4-1808	.180" ± .003"	0.5% to 30 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C
SAR4-1808	.180" ± .003"	1.0% to 100 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C

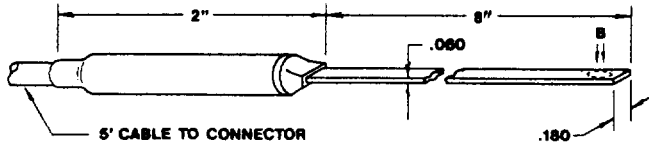
620/640

PRECALIBRATED GAUSSMETERS

SEE SALES BROCHURE #60700 FOR COMPLETE SPECIFICATIONS FOR THE MORE THAN 110 PROBES AVAILABLE FOR THE 620 OR 640

HEAVY DUTY PROBES (H Class)

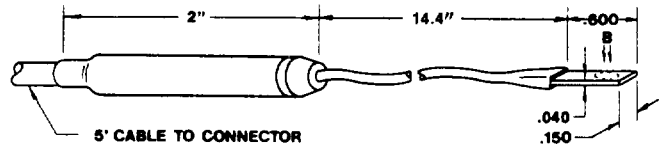
Transverse Type



Model No.	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
HTB4-0608	1.0% to 10 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
HTG4-0608	2.0% to 30 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
HTJ4-0608	0.1% to 10 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C
HTL4-0608	0.25% to 30 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C
HTR4-0608	1.0% to 100 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C

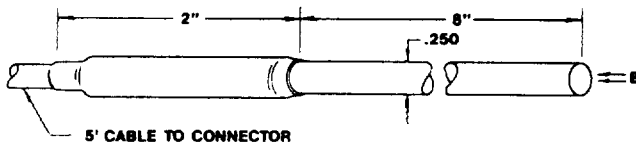
FLEXIBLE PROBES (F Class)

Transverse Type



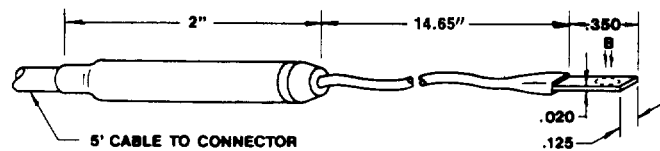
Model No.	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
FTB4-0415	1.0% to 10 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
FTG4-0415	2.0% to 10 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
FTJ4-0415	0.1% to 10 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C
FTL4-0415	0.25% to 10 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C
FTR4-0415	1.0% to 100 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C

Axial Type



Model No.	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
HAB4-2508	1.0% to 10 kG	1X	.030" Dia.	0°C to +75°C	-0.04 % /°C
HAG4-2508	2.0% to 30 kG	1X	.030" Dia.	0°C to +75°C	-0.04 % /°C
HAK4-2508	0.25% to 10 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C
HAN4-2508	0.5% to 30 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C
HAR4-2508	1.0% to 100 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C

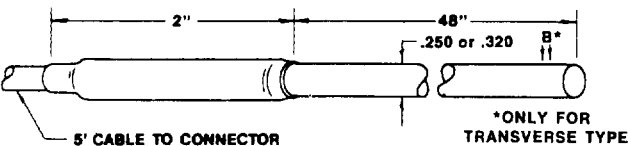
Transverse Type



Model No.	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
FTB4-0215	1% to 10 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
FTG4-0215	2% to 30 kG	1X	.070" Dia.	0°C to +75°C	-0.04 % /°C
FTJ4-0215	.1% to 10 kG	10X	.040" Dia.	0°C to +75°C	-0.005 % /°C

CRYOGENIC PROBES (C Class)

Transverse Type

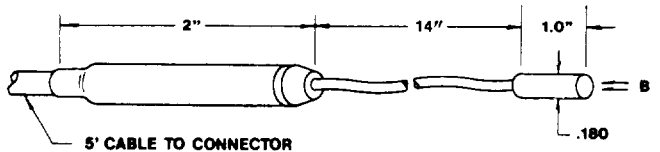


Model No.	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
CTP4-3248	1.0% to 30 kG	10X	.040" Dia.	-269°C to +75°C	-0.005 % /°C
CTU4-3248	2.0% to 100 kG	10X	.040" Dia.	-269°C to +75°C	-0.005 % /°C

Axial Type

Model No.	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
CAP4-2560	1.0% to 30 kG	10X	.030" Dia.	-269°C to +75°C	-0.005 % /°C
CAU4-2560	2.0% to 100 kG	10X	.030" Dia.	-269°C to +75°C	-0.005 % /°C

Axial Type



Model No.	Linearity	Range Mult.	Active Area	Op. Temp. Range	Temp. Stab.
FAB4-1815	1.0% to 10 kG	1X	.030" Dia.	0°C to +75°C	-0.04 % /°C
FAG4-1815	2.0% to 30 kG	1X	.030" Dia.	0°C to +75°C	-0.04 % /°C
FAK4-1815	0.25% to 10 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C
FAN4-1815	0.5% to 30 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C
FAR4-1815	1.0% to 100 kG	10X	.030" Dia.	0°C to +75°C	-0.005 % /°C

Specifications subject to change without notice.