DESCRIPTION:

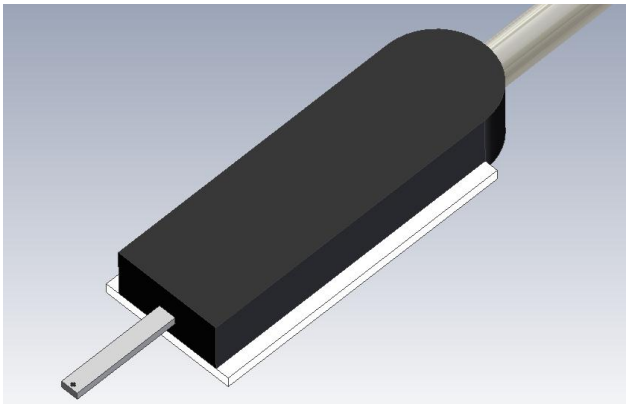
Hall Probe E for F3A Magnetic is a single-chip fully integrated 3-axis Hall-Probe.
The E Hall probe was designed with the goal to enable measurements where the probe's Magnetic Field Sensitive Point (MFSP) needs to be placed very close to the target, or where the geometry of the environment allows only a limited access. For these applications, the E Hall probe was devised in the way that the MFSP can be placed as closely as 150 µm to the target area.

The Hall Probe E for F3A Magnetic Transducers contains a CMOS integrated circuit, which incorporates three groups of mutually orthogonal Hall elements, biasing circuits, amplifiers, and a temperature sensor. The integrated Hall elements occupy very small area (150µm x 150µm), which provides very high spatial resolution of the probe. The CMOS IC technology enables very high precision in the fabrication of the vertical and horizontal Hall elements, which gives high angular accuracy (orthogonality error < 0.1°) of the three measurement axis of the probe. The on-chip application of the spinning-current technique in the biasing of the Hall elements suppresses the planar Hall effect. The on-chip signal pre-processing enables a very high frequency bandwidth (DC to 25 kHz) of the probe; and on-chip signal amplification provides high output signals of the Hall probe.

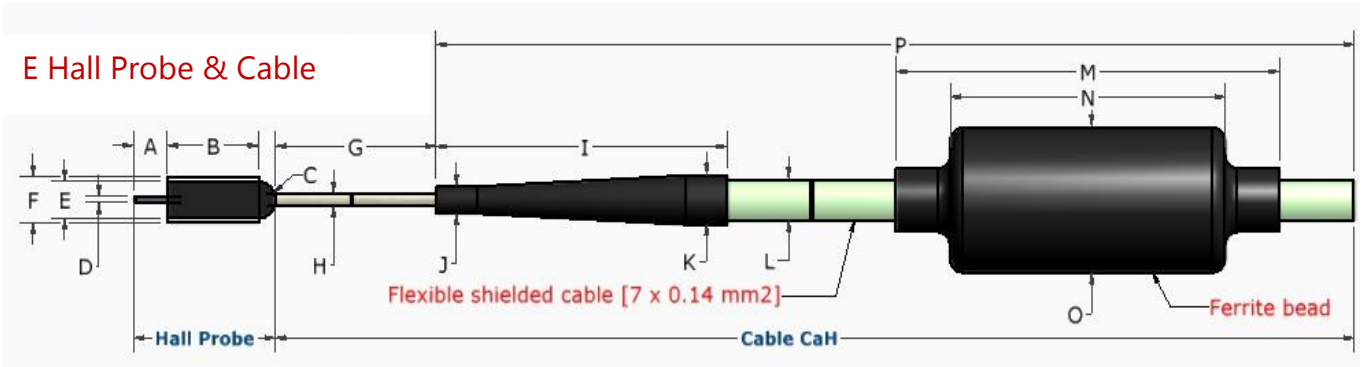
The output of the Hall Probe are high-level analog voltages proportional with each of the measured components of a magnetic flux density and a voltage proportional with the probe temperature.

KEY FEATURES:

- **The E Hall probe was devised in the way that the Magnetic Field Sensitive Point (MFSP) can be placed as closely as 150µm to the target area**
- **Fully integrated CMOS 3-axis (Bx, By, Bz) Hall Probe, of which one, two, or three channels are used**
- **Very high spatial resolution (By: 0.03 x 0.005 x 0.03mm^3; Bx and Bz: 0.15 x 0.01 x 0.15 mm^3)**
- **High angular accuracy (orthogonality error less than 0.1°)**
- **High frequency bandwidth (from DC up to 25kHz)**
- **Virtually no planar Hall Effect**
- **Negligible inductive loops on the Probe**
- **Integrated temperature sensor on the probe for temperature compensation**
- **The Hall Probe E for F3A Magnetic Transducers is consisting part (Module H) of the F3A Magnetic Field Transducer and Digital Teslameter**
- **Suitable for as 3-axis (03, XYZ), 2-axis (XY, XZ, YZ) and as 1-axis (0X, 0Y, 0Z) Hall Probe**
- **Available as a separate unit for OEM customers**



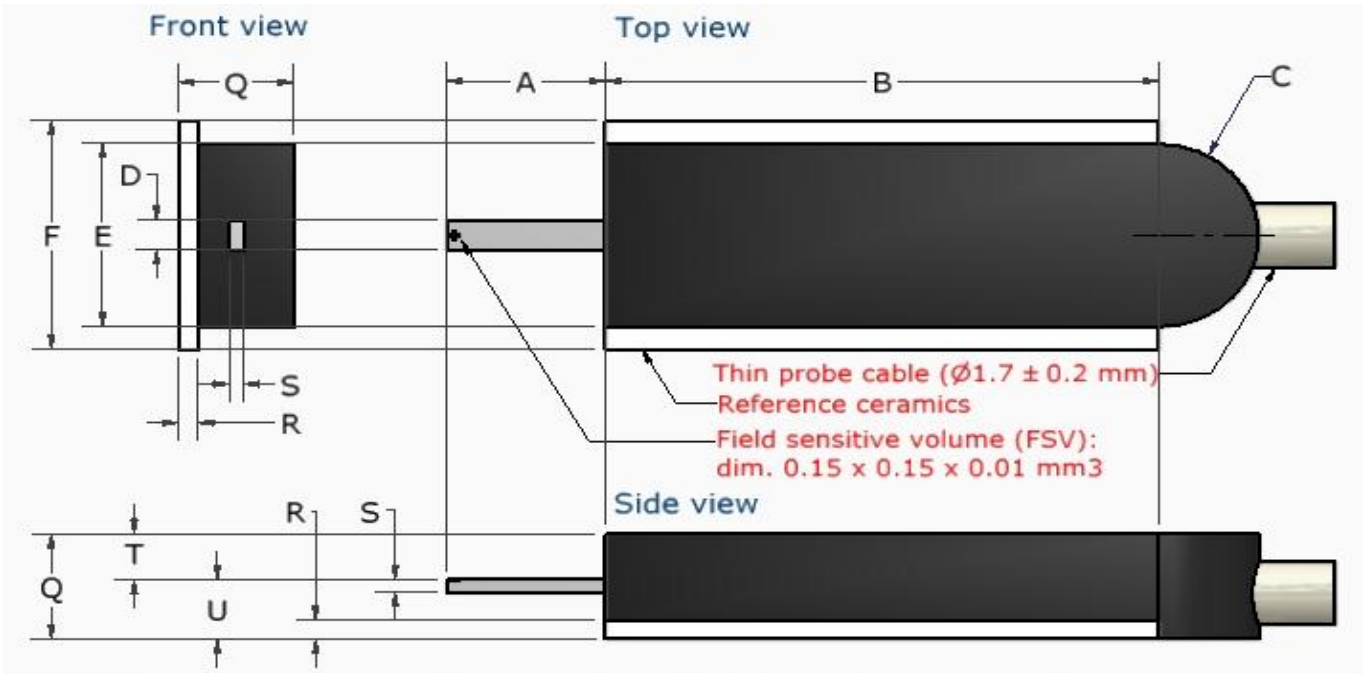
PROBE DIMENSIONS AND CHARACTERISTICS:



E Hall Probe & Cable CaH: Dimensions & Tolerances

Dimension	[mm]	Dimension	[mm]	Dimension	[mm]	Dimension	[mm]
A	3.0 +/- 0.1	E	4.0 +/- 0.1	I	35 +/- 3	M	50 +/- 2
B	11.0 +/- 0.1	F	5.0	J	4.0 +/- 0.2	N	30 +/- 1
C	R2.0 +/- 0.1	G	50 +/- 1	K	6.0 +/-0.2	O	16 +/- 1
D	0.64	H	1.7 +/- 0.2	L	4.9 +/- 0.1	P	XX +/- 1% [1)]

Figure 1: **Dimensions of E Hall probe and cable (Module H)**



E Hall Probe: Detailed Specifications

Dimension	[mm]	Dimension	[mm]	Dimension	[mm]
A	3.0 +/- 0.1	E	4.0 +/- 0.1	R	0.4
B	11.0 +/- 0.1	F	5.0	S	0.28
C	R2.0 +/- 0.1	…	…	T	1.0 +/- 0.1
D	0.64	Q	2.2 +/- 0.1	U	1.2 +/- 0.1

Figure 2: **The orthogonal projections of E Hall probe (with appropriate Probe dimensions and tolerances)**

CLOSE-UP OF THE PROBE TIP

The E Hall probe was designed with the goal to enable measurements where the probe's Magnetic Field Sensitive Point (MFSP) needs to be placed very close to the target, or where the geometry of the environment allows only a limited access. For these applications, the E Hall probe was devised in the way that the MFSP can be placed as closely as 150 µm to the target area (see Fig.3).

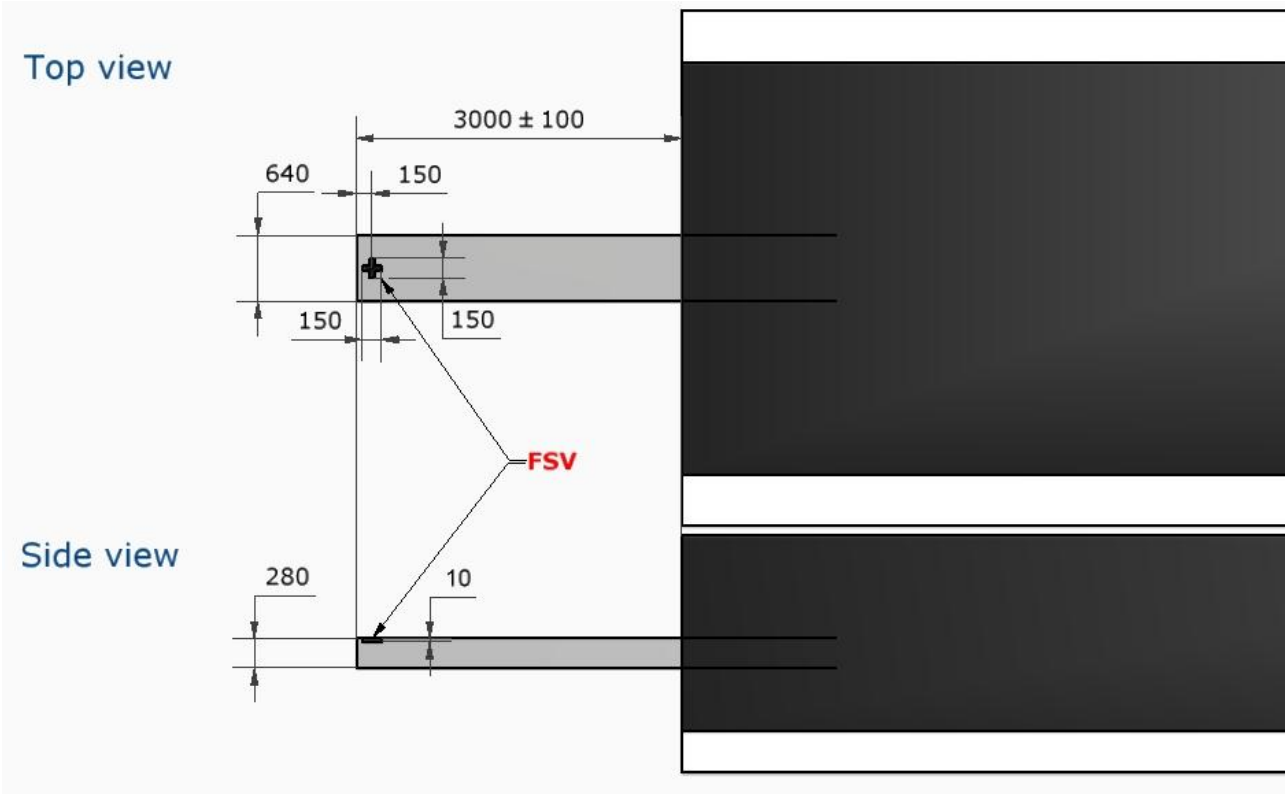


Figure 3: **Close-up of the probe tip of E Hall probe. All dimensions are expressed in micrometer [µm]**

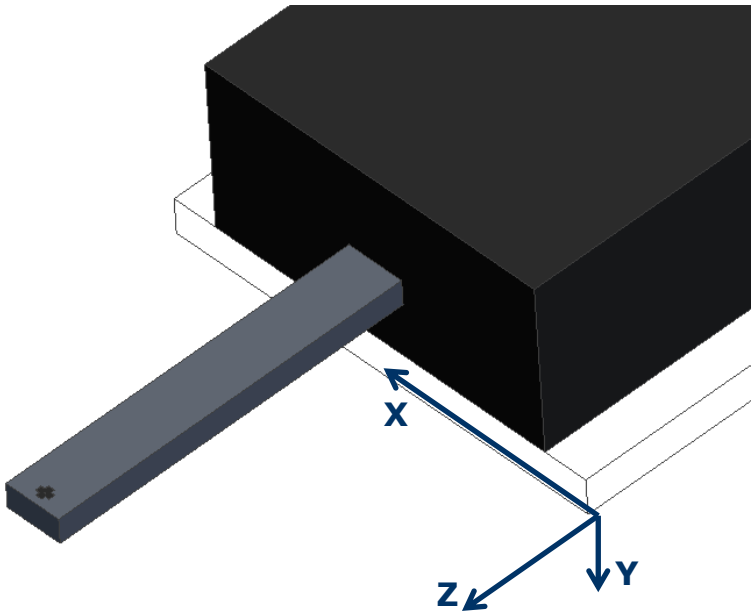


Figure 4: **The reference Cartesian coordinate system of E probe**

Dimension	X [mm]	Y [mm]	Z [mm]
Magnetic field sensitive volume (MFSV)	0.15	0.01	0.15
Position of the center of MFSV (corresponding to MFSP, see Fig. 2, 3 & 4.)	2.5 ± 0.1	-1.2 ± 0.1	2.85 ± 0.1
Total Probe external dimensions	• 0.64 - Probe tip (thinner part)	• 0.28 - Probe tip (thinner part)	• 3.0 ± 0.1 - Probe tip (thinner part)
	• 4.0 ± 0.1 / 5.0 - Longer, thicker part of the probe / ref. ceramics	• 2.2 ± 0.1 - Longer, thicker part of the probe	• 13.0 ± 0.2 - Longer, thicker part of the probe
Angular accuracy of the axes	± 0.5° with respect to the reference surface		
CaH Cable	Shielded, with a flexible thin part near the probe and a ferrite bead on the thicker part (see Fig. 1)		
[1)] Total length of the CaH cable:	• Standard: **2** m (Probe notation: **03E02**) • Optional: XX m (Probe notation: **03Exx**) Note: Different lengths are available upon request.		

INSTALLATION MANUAL FOR E HALL PROBE

Warning: the Probe Tip is Fragile!

In order to achieve the small thickness of the probe, a part of the sensor chip is left non-encapsulated. The sensor chip is a ≈ 0.3mm thick bar of mono-crystalline silicon, and can be easily broken. Therefore, avoid any mechanical contact of the probe chip with other objects! Moreover, avoid the immersion of the probe of any liquid, and its exposure to moisture and aggressive gasses.

Considering that we deal with a high-precision device of very small dimensions, following precautions should help to avoid damage to the probe during installation and handling, and ensure that the device's accurate calibration remains preserved.

The mounting of the probe should be carried out by application of very low pressure to its back-end and thin wires. If the probe head is clamped, the user should make sure that the substrate surface in contact with the reference plane of the probe is flat and covers as much of the probe reference surface as possible (see Fig. 5). Do not apply more force than required to hold the probe in its place.

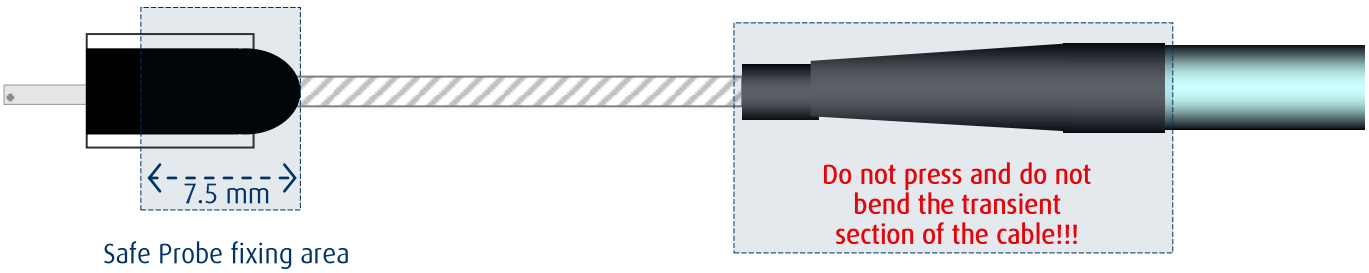


Figure 3. **Safe fixing area of the E Probe head**

In order to prevent rupture of the thin wires from the probe head, the user should fix and secure the probe cable in the proximity of the head. The thin wires of the flexible section of the probe need to be folded with care; repeated strong bending should be avoided.

Also, avoid any high pressure and bending of the transient section between the thin and the thick cables.