

Datasheet:**Hall probe type C for SENIS 3MH3 Digital Teslameters and F3A/F3B analog magnetic field transducers****DESCRIPTION:**

The Hall probe type C for SENIS 3MH3 digital teslameters and F3A / F3B analog magnetic field transducers is a miniature 3-axis magnetic field probe that gives simultaneous analogue voltage outputs for all three components (Bx, By, Bz) of the measured magnetic flux density and for the probe temperature.

The probe contains a CMOS integrated circuit, which incorporates three groups of mutually orthogonal Hall elements, biasing circuits, amplifiers, and a temperature sensor.

Hall elements occupy very small area ($150 \times 150 \mu\text{m}^2$), 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 of the three measurement axes of the probe (mutual orthogonality error $< \pm 1^\circ$).

The 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 - 25 kHz) of the probe, and on-chip signal amplification provides high output signals of the Hall probe, which makes the transducer immune to electromagnetic disturbances.

The sensor chip is embedded in the probe package made fully of alumina-ceramics (Al_2O_3) and connected to the CaH cable, which makes the C probe both mechanically and electrically robust. The device is glued onto a reference ceramic plate suitable for an appropriate fixing of the probe.

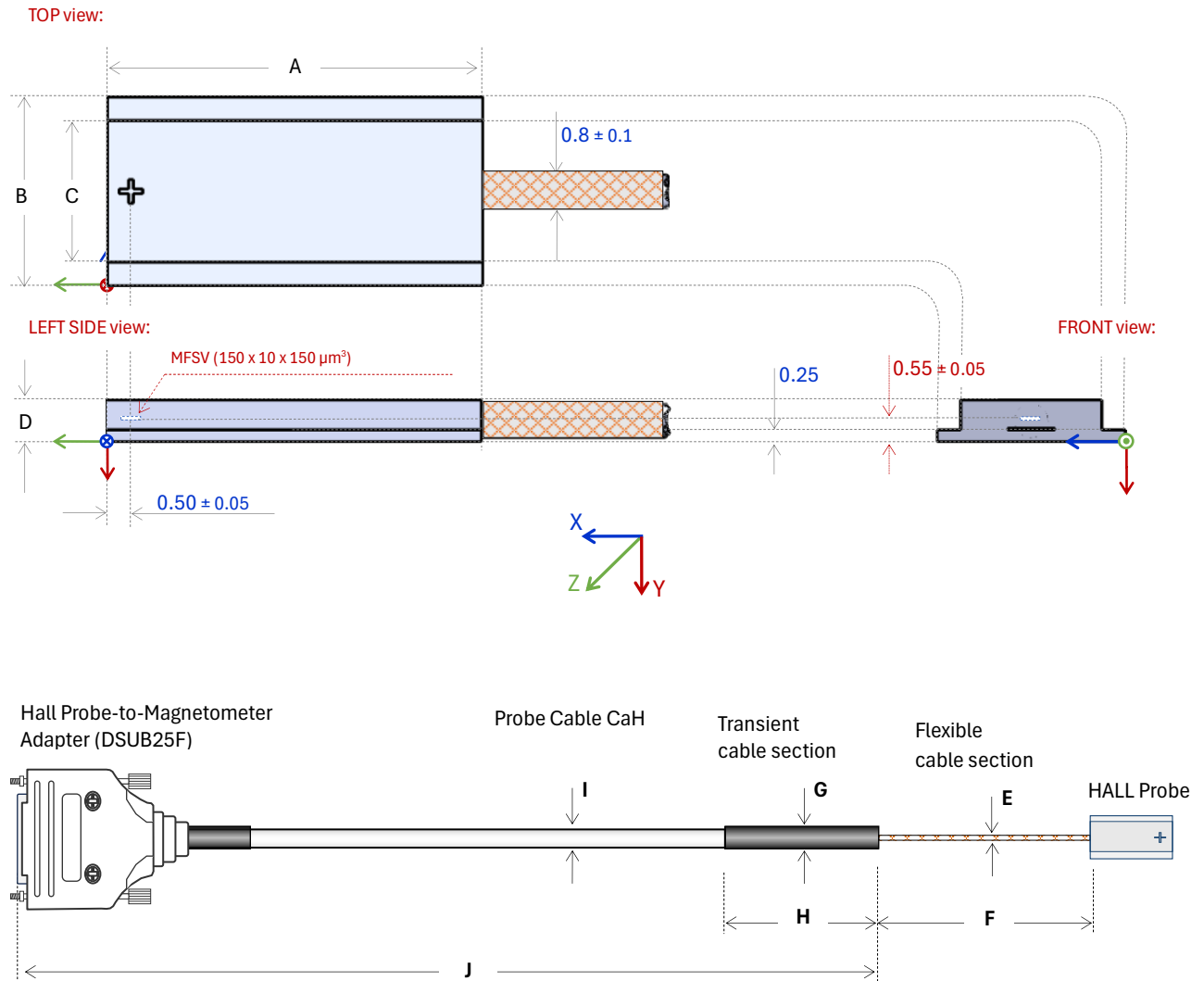


Figure 1: Hall probe type C

Key features of the C Hall probe:

- Hall probe type C is a robust probe respectively to its small size. The chip is glued onto a reference ceramic plate suitable for an appropriate fixing of the probe.
- Fully integrated CMOS 3-axis (Bx, By, Bz) Hall Probe, of which one, two, or three channels are used
- Very high spatial resolution: By: $30 \times 5 \times 30 \mu\text{m}^3$; Bx & Bz: $150 \times 10 \times 150 \mu\text{m}^3$
- High angular accuracy of the measurement axes: mutual orthogonality error between the three measurement axes is less than $\pm 1^\circ$, determined with accuracy of better than 0.1° by application of an improved method
- High operating temperature range: (a) standard: (+5, +45) °C; (b) extended: (-40, +155) °C.
- Very high linearity
- Very high frequency bandwidth: DC - 25 kHz (-3 dB)
- Virtually no planar Hall effect
- Negligible inductive loops on the Probe
- Integrated temperature sensor on the probe for temperature compensation, etc.

Hall probe & Cable) - Mechanical specifications:



Part	Dimension (mm)
A	8.00 ± 0.05
B	4.00 ± 0.05
C	3.00 ± 0.05
D	$0.90 + 0.05 / - 0.00$
E	$\varnothing 0.8 \pm 0.1$
F	50 ± 1
G	$\varnothing 2.2 \pm 0.2$
H	25 ± 2
I	$\varnothing 1.7 \pm 0.1$
J	Standard lengths of the probe Cable are: 2, 5 and 10 m. Different lengths are available on a demand.

Figure 2: Dimensions of the H-module F3A-03C0XC (where X denotes length of the probe cable in m - meters)

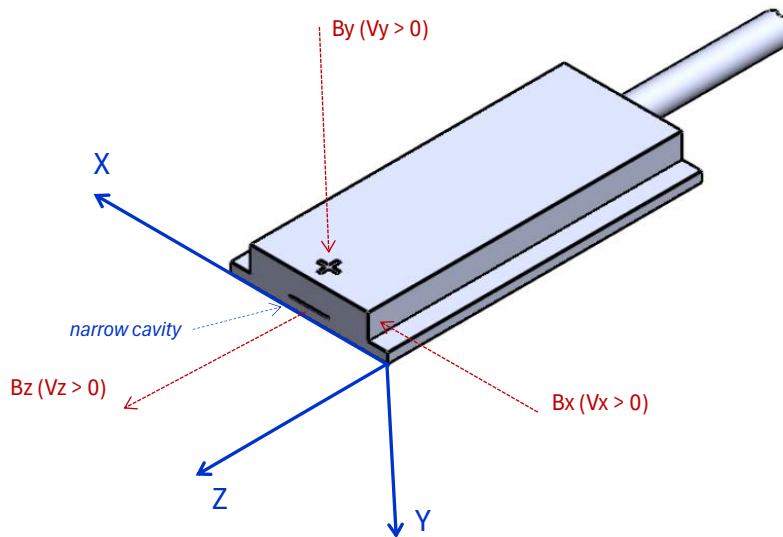


Figure 3: Reference Cartesian coordinate system (X, Y, Z) of the 3-axis Hall probe type C

Hall probe:			
Dimensions	X (mm)	Y (mm)	Z (mm)
Magnetic field sensitive volume (MFSV)	0.15	0.01	0.15
Position of the MFSV centre (Fig. 2 and 3)	2.00 ± 0.05	$-0.55 -0.05/+0.00$	-0.50 ± 0.05
External dimensions of the probe	4.00 ± 0.05	$0.90 +0.05/-0.00$	8.00 ± 0.05
Positioning accuracy:			
Angular accuracy of the measurement axes	<ul style="list-style-type: none"> $< \pm 1^\circ$ with respect to the reference surface Mutual orthogonality between the meas. axes: $< \pm 1^\circ$ (determined with an accuracy of better than 0.1° by the application of a well-improved measurement method) 		
Cable properties:			
Flexible shielded cable, with a flexible braided part (OD ~ 0.8 mm, length 50 mm) near the probe			
External diameter:	(1.7 ± 0.1) mm		
Conductor:	Silver plated soft copper core, 7 x 44 AWG		
Insulation:	PFA (Perfluoro Alkoxy), diameter 0.30 mm		
Twisting:	Minimum: 10 x OD (static) / 15 x OD (dynamic)		
Shield:	Silver plated soft copper braid		
Jacket:	PFA (Perfluoroalkoxy)		
Service temperature:	$-196 / +200$ °C		
Linear resistance:	1.4 Ω /m		
Rated voltage:	150 Vac		
RoHS compliance:	Yes		

Installation Manual for the Hall probe type C:



NOTE: The C probe is fragile! Please handle it with a special care.

Hall probe type C is made of the two thin ceramic plates and can be easily broken. Therefore, avoid any mechanical contact of the probe tip with other objects! Moreover, avoid the immersion of the probe in any liquid, as well its exposure to moisture and aggressive gasses.

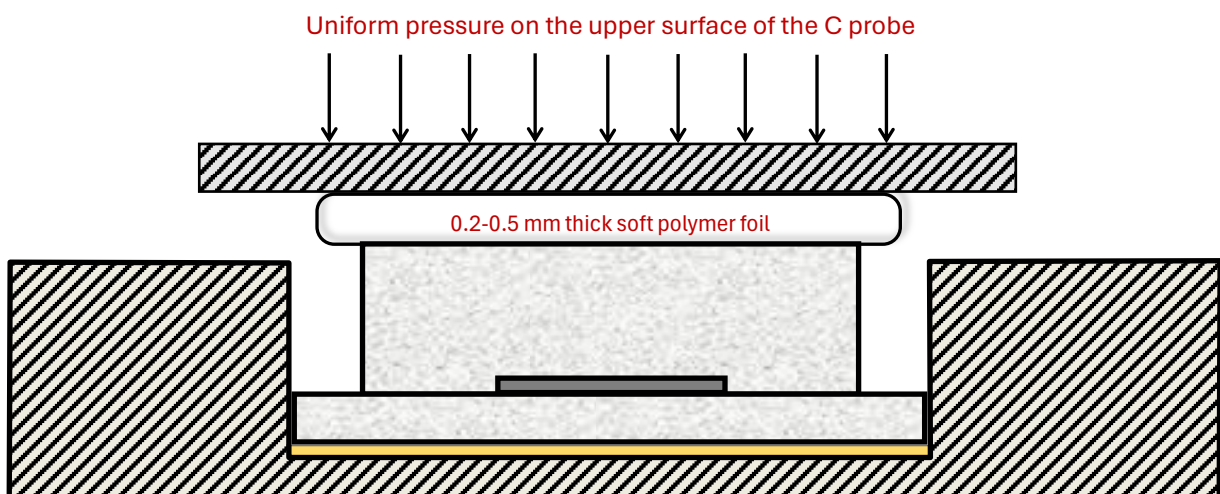
Considering that we deal with a high-precision device of very small dimensions, following precautions should help to avoid damage to the probe during installation and handling, and ensure that the accurate calibration of the device remains preserved:

- Always disconnect powering of the instrument before plugging/unplugging the Hall probe!

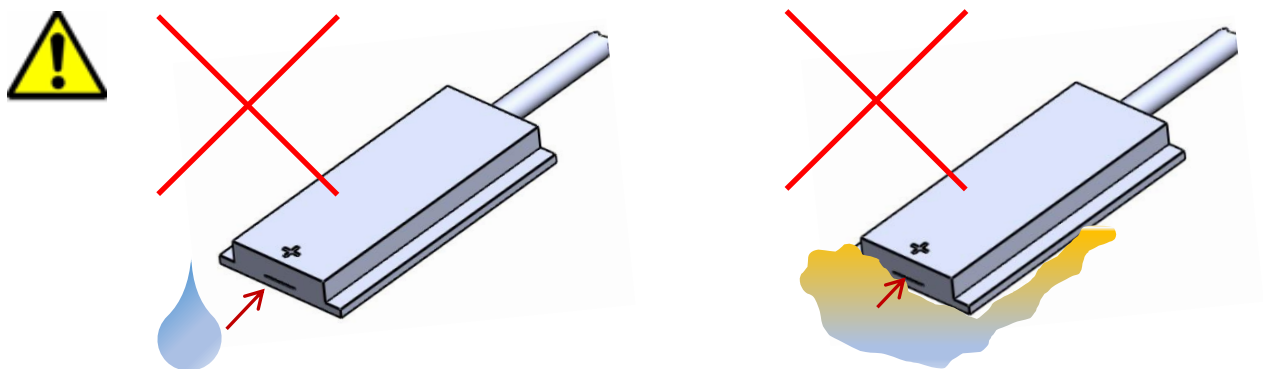
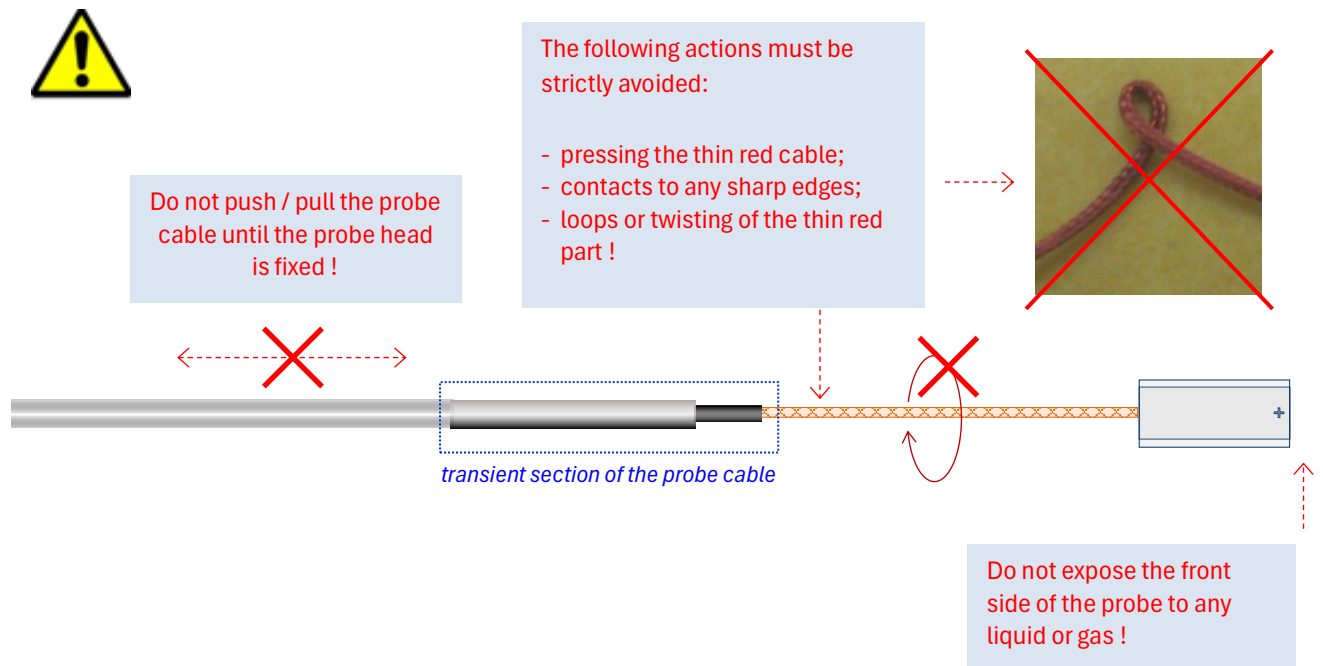


- Applied CMOS Hall sensor can be damaged by ESD. We strongly recommend that the probe be handled with appropriate ESD preventive precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure.
- Mounting of the Probe should be carried out by application of very low pressure to its head and the thin red cable.
- Do not apply more force than required to hold the probe in its place. Damage to either the ceramics package of the Hall sensor or thin wiring could destroy the Probe.
- If the probe head is clamped, the user needs to make sure that the environment surface in contact with the reference plane of the probe is flat and covers as much of the probe reference surface as possible.
- Do not apply more force than required to hold the probe in its mounting. Also, do not press the probe just in a single spot. Pressure on the probe should be uniformly distributed over its upper surface.

To relax a stress while mounting or gluing the probe in a groove, it is recommended to press the probe by application of a flat 0.2 - 0.5 mm thick soft polymer or a rubber foil over the upper surface of the probe:



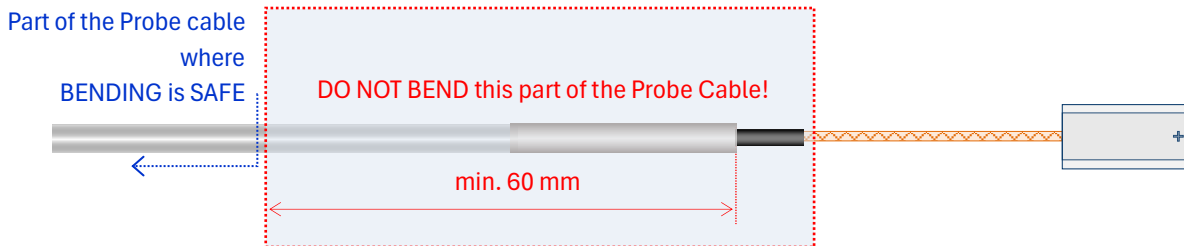
- In order to prevent rupture of the thin probe wiring, the user should fix and secure the probe cable in the proximity of the head. The thin red wire from the probe can be folded only with a special care. Strongly avoid loops or twisting of this section.



Strongly avoid contact of the FRONT side of the probe (with the cavity) with any liquid or a grain mass (such as a glue). Due to capillary effect, such matter could enter through the cavity into the interior of the probe and destroy or deteriorate the characteristics of the CMOS Hall sensor!

- Do not expose the thin red cable to the external sharp edges.
- Do not expose the probe to moisture and aggressive gasses.
- Avoid immersion of the probe in any liquid.
- Strongly avoid any high pressure, tightening and/or bending of the rigid (non-flexible) **transient section** between the thin (red) and thick (white) probe cables.

- Safe area for bending the thick (white) probe cable is specified on the following drawing:



- Keep the cable out of the way of foot traffic. Do not pinch the cable, or drop sharp or heavy objects on it. Severed cable cannot be re-joined without altering the probe performance, and requires factory repair and full re-calibration of the device.
- Example / proposal for a safe fixation of the C probe on a probe holder:

