

**OVERVIEW**

A SENIS Magnetic Field Transducer (a magnetic flux density-to-analog voltage transducer, hereinafter MFT) consists of two modules:

1. The Hall probe module H (including the cable CaH) and
2. The Electronic module E.

The two modules may be firmly connected via the cable CaH:

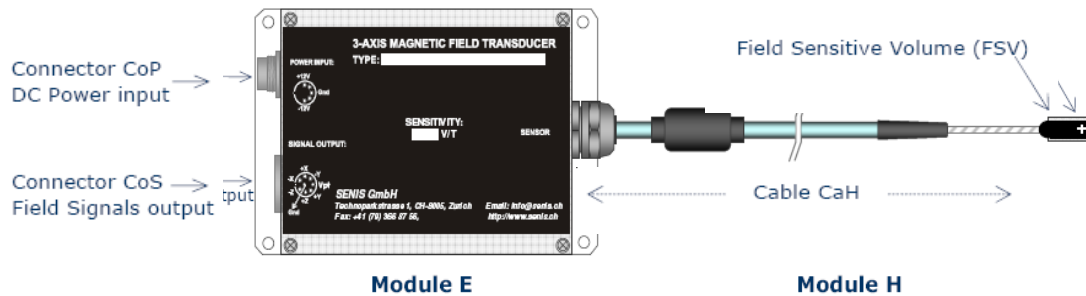


Figure 1. Structure of a SENIS Magnetic Field Hall Transducer with a fixed Hall Probe

The firm connection of the modules H and E is recommended for achieving high accuracy of a transducer (e.g. 0.1% or better).

Alternatively, the modules H and E can be made detachable at the connector, as shown in Fig.2:

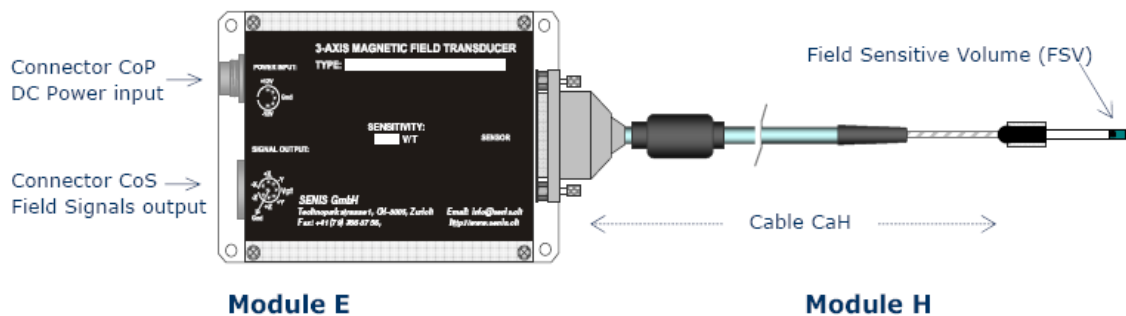


Figure 2. Structure of a SENIS Magnetic Field Hall Transducer with a detachable Hall Probe

Detachable probes and E-modules are available as separate units.

There are two basic types of SENIS Hall probes:

1. The Hall sensor chip is *closed*, and therefore the probe is robust and stable.
2. The magnetic sensitive part is *thin*, the Hall sensor chip is not completely closed; therefore the probe is fragile and less stable, and the standard realization is detachable (but fixed connection is also available).

For OEM-customers a non-calibrated version of H-module consisting of only Hall probe and the cable CaH is available. Such customers may purchase from SENIS the know-how on how to make and calibrate their own module E.

**1. Magnetic Transducer Type Identifier:**

Each SENIS Magnetic Field Transducer type is designated with an alphanumeric model number consisting of 3 characters:

<b>T1</b>	<b>T2</b>	<b>T3</b>
Type identifier (2 char.)		Product Release (1 char.)

**(T1) (T2): Type Identifier (2 characters):**

<b>F3A</b>	<b>F1A</b>	<b>I3A</b>	<b>D3A</b>	<b>I1A</b>	<b>H3A</b>	<b>CPA</b>	<b>MPA</b>
<b>Fully integrated (amplifier) 1-, 2-, 3-axis Hall Probe</b>	<b>Fully integrated (amplifier) 1-axis (Y) Hall Probe</b>	<b>Integrated 1-, 2-, 3-axis Hall Probe</b>	<b>Dual integrated 1-, 2-, 3-axis Hall Probe</b>	<b>Integrated 1-axis (Y) Hall Probe</b>	<b>Hybrid 1-, 2-, 3-axis Hall Probe sensors</b>	Magnetic Transducers with <b>Custom made Probes</b> , incorporating combination of any of SENIS Hall sensors and a temp. sensor, coil, optical sensor, etc.	<b>Multi-Probe</b> , with any of SENIS Probe types
<b>Very high spatial resolution</b>	<b>Very high frequency bandwidth</b>	<b>Very high spatial resolution</b>	<b>Very high spatial resolution</b>	<b>Very low noise &amp; offset fluctuations</b>	<b>Ultra low noise &amp; offset fluctuations</b>		
<b>Very high angular accuracy</b>	High disturbance immunity	Very high angular accuracy	Very high angular accuracy,	Very high Linearity	Very high Linearity		
High frequency bandwidth		<b>Low noise &amp; offset fluctuations</b>	<b>Very low noise &amp; offset fluctuations</b>				
High disturbance immunity		Very high Linearity	Very high Linearity				

Figure 3. Magnetic Transducer Comparison Table (for type selection please see also Selection Chart at [www.senis.ch](http://www.senis.ch))

Attribute Type	Probe Technology	Number of Axes	Spatial Resolution	Angular accuracy	Noise & Offset Fluctuations	Linearity	Frequency Bandwidth	Disturbance Immunity (induct., el. Static & cable pickup)
<b>F3A</b>	Fully Integrated	1, 2, 3	● ● ●	● ● ●		● ●	● ●	● ● ●
<b>F1A</b>	Fully Integrated	1				● ●	● ● ●	● ● ●
<b>I3A</b>	Integrated	1, 2, 3	● ● ●	● ● ●	●	● ● ●		●
<b>D3A</b>	Dual Integrated	1, 2, 3	● ● ●	● ● ●	● ●	● ● ●		● ●
<b>I1A</b>	Integrated	1			● ●	● ● ●		
<b>H3A</b>	Hybrid	1, 2, 3			● ● ●			● ●

**Performance: ● Good ●● Very Good ●●● The Best**

Figure 4. Magnetic Transducer Comparison Chart (for type selection see also Selection Chart at [www.senis.ch](http://www.senis.ch))

**(T3): Product release (1 character):**

This parameter is designated with an upper case letter starting with A, which denotes the current product release.

**2. Notation of the H-Module:**

Each SENIS Hall probe model is designated with an alphanumeric model number consisting of 6 characters:

H1	H2	H3	H4	H5	H6
Measurement axes (2 characters)		Type identifier (1 char.)	Cable Length [m] (2 characters)		Connection type (1 char.)

**(H1) (H2): Measurement axes (2 characters):**

Single-axis Hall Probes:	<b>0X, 0Y, 0Z</b>
Two-axis Hall Probes:	<b>XY, YZ, XZ</b>
Three-axis Hall Probes:	<b>03</b>

**(H3): Hall Probe type identifier (1 character):**

This parameter is designated with an upper case letter relative to the Probe's mechanical package (A, B, C, etc., except the letters X, Y and Z, in order to differentiate from the previous notation of the measurement axes).




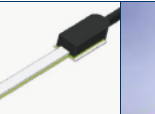
1. Magnetic field Probes based on the **FULLY INTEGRATED 3-AXIS Hall sensor WITH PRE-AMPLIFIER** (field sensitive volume (FSV) **0.15 x 0.01 x 0.15 mm**):

FIGURE							
Probe type (H3)	<b>A</b> <sup>1)</sup>	<b>B</b> <sup>2)</sup>	<b>D</b> <sup>3)</sup>	<b>E</b> <sup>4)</sup>	<b>G</b> <sup>5)</sup>	<b>H</b> <sup>6)</sup>	<b>K</b> <sup>5)</sup>
Probe dimensions (mm)	16.5x5.0x2.3	16.5x4.0x2.3	16.5x5.0x2.3	14.5x5.0x2.0	42.0x2.0x0.5	42.0x2.0x1.1	47.0x2.0x0.5
OLD Probe notation	C-H3A	C-H3B	C-H3D	T-H3A	3H05x2x42	3H1.1x2x42	---

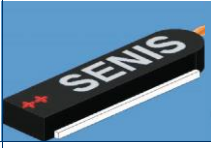
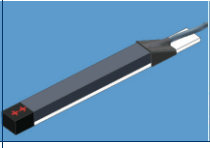
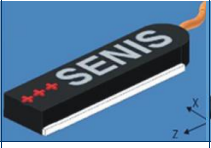
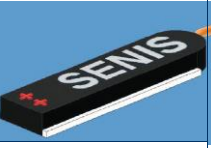
**REMARKS:**

- 1) Very robust standard package;
- 2) The package includes two gutters allowing the fixing of the Probe in the corresponding Probe Holder;
- 3) The mechanical package includes a transparent window (diam. 1.5 mm) over the Hall elements integrated on the Hall probe IC die;
- 4) The Probe has a thin sensitive part, which is a naked silicon chip (dim. 3 mm x 0.64 mm x 0.3 mm). Caution: the naked silicon die is fragile.
- 5) Very thin and long Probes with naked silicon chip. Caution: the naked silicon die is fragile.
- 6) Very thin and long Probes with protected silicon chip. Caution: the naked silicon die is fragile.

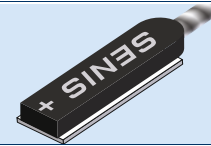
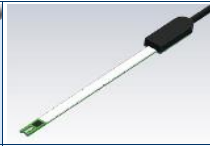
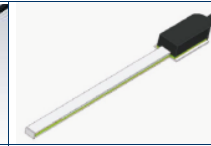
2. Magnetic field Probes based on the **FULLY INTEGRATED SINGLE-AXIS (transverse) Hall sensor WITH PRE-AMPLIFIER** (field sensitive volume (FSV) **0.40 x 0.01 x 0.04 mm**):

FIGURE				
Probe type (H3)	<b>A</b>	<b>G</b>	<b>H</b>	<b>K</b>
Probe dimensions (mm)	16.5 x 5.0 x 2.3	42.0 x 2.0 x 0.5	42.0 x 2.0 x 1.1	47.0 x 2.0 x 0.5
OLD Probe notation	C-HYA	HY05x2x42	HY1.1x2x42	HY05x2x47

3. High-resolution low-noise Magnetic field Probes based on the **DISCRETE HALL SENSORS** (field sensitive volume **(FSV) 0.3 mm (diam.)**):

<b>FIGURE</b>				
<b>Probe type (H3)</b>	<b>I</b>	<b>J</b>	<b>N</b>	<b>P</b>
<b>Probe dimensions (mm)</b>	<b>16.5x5.0x1.5</b>	<b>31.0x3.0x1.5</b>	<b>16.5x4.0x2.0</b>	<b>16.5x5.0x2.0</b>
<b>OLD Probe notation</b>	<b>J-xxb</b>	<b>J-xxa</b>	---	---

4. **NEW:** Magnetic field Probes based on the **INTEGRATED HALL SENSORS WITH NO PRE-AMPLIFIERS** (field sensitive volume **(FSV) 0.15 x 0.01 x 0.15 mm**):

<b>FIGURE</b>			
<b>Probe type (H3)</b>	<b>A</b>	<b>G</b>	<b>H</b>
<b>Probe dimensions (mm)</b>	<b>16.5x5.0x2.3</b>	<b>42.0x2.0x0.5</b>	<b>42.0x2.0x1.1</b>
<b>OLD Probe notation</b>	---	---	---

**(H4) (H5): Cable Length (2 characters):**

<b>Cable length</b>	<b>H4</b>	<b>H5</b>
lengths less than 1m are noted as:	.	An integer (1, 2, 3, ...or 9), expressing the length in dm
lengths within 1m and 9m are noted as:	0	An integer (1, 2, ...or 9), expressing the length in m
lengths of 10+ meters are noted as:	A 2-digit number, showing the length in meters	

For example:

Standard Hall Probe-to-Electronics Cable lengths are:

The corresponding cable length notation are:

<b>0.6 m</b>	<b>2 m</b>	<b>5 m</b>	<b>10 m</b>
<b>.6</b>	<b>02</b>	<b>05</b>	<b>10</b>

*NOTE: The max. standard cable length is 10m.*

**(H6): Connection Type (1 character):**

*Fixed* Hall Probe  
(nickel plated brass Cable Gland)

*Detachable* Hall Probe  
(standard D-SUB 25 pins Connector):

*Detachable* low-noise Hall probe  
(LEMO - EGG.2B.314.CLL - socket, panel, 14 way)

*Detachable* Hall Probe  
(the standard DIN SFV81 8-pins connector (MALE, panel mounted) (mating plug KV81 Connector):

**F** applicable for F3A, F1A, I1A, and 1- and 2-axis H3A magnetic field transducers

**C** applicable for F3A and F1A magnetic field transducers

**L** applicable for H3A magnetic field transducers

**D** applicable for MPA magnetic field transducers and for magnetic field transducers applied in Magnetic Field Mapping System MMS



**F**

**C**



**L**






**D**





**3. Notation of the E-Module:**

Each SENIS E-Module is designated with an alphanumeric model number of up to 8 characters:

E1	E2	E3	E4	E5	E6	E7	E8
Type identifier (1 char.)	Measurement range (3 characters)			Frequency Bandwidth (3 characters)			Accuracy (1 char.)

**(E1): Electronic module type identifier (1 character):**

Electronics Module Type identifier (E1)	Description	OLD Notation	Photograph
<b>A</b>	<p>Standard 3-channel analogue electronic processing unit used as the electronic module (Module E) in SENIS 3-, 2- or 1-axis magnetic flux density to voltage transducers <b>based on fully integrated 3-Axis Hall sensor with preamplifiers.</b></p> <p>The complete electronics is mounted in High mechanical strength, electrically shielded aluminum case [95 W x 120 L x 37 H mm] with mounting provision.</p>	<p><b>3D:</b> <b>E3D</b></p> <p><b>1D:</b> <b>EYD</b> <b>EXD</b> <b>EZD</b></p>	
<b>M</b>	<p>3-channel analogue electronic processing unit used as the electronic module (Module E) in SENIS Multi-Probe System <b>based on fully integrated 3-Axis Hall sensor with preamplifiers.</b></p> <p>The complete electronics is mounted in a SCHROFF's 3U, 84HP Aluminum case (Cabinet Style: Desktop);</p> <p>The external dimensions: 447 W x 315 L x 132 H mm</p>	---	
<b>S</b> the version adjusted to the SENIS Mapping System MMS	<p>The 3-channel analog processing E-module is mounted in an aluminum SCHROFF's Card frame, <b>3U, 10HP</b> (detachable from the System's Control Unit integrated in a 19" enclosure), including an 8-pins DIN KJV81 connector (female) on the front panel (for the corresponding 3D Hall probe connection)</p> <p>Ext. Dimensions: H133.35 x W 50.8 x D167 mm</p>	---	

Electronics Module Type Identifier <b>(E1)</b>	Description	OLD Notation	Photograph
<b>B</b>	<p>Standard analogue electronic processing unit for the range of the SENIS 1- and 2-axis magnetic flux density-to-voltage transducers based on <i>on the discrete high-resolution Hall sensors</i>.</p> <p>The complete electronic is mounted in a high mechanical strength, electrically shielded Aluminum case [dim.: 110 W x 230 L x 56 H mm; weight &lt; 1 kg].</p>	<b>Eb</b>	
<b>C</b>	<p>Standard single-channel analogue electronic processing unit used as the electronic module (Module E) in SENIS single-axis magnetic flux density to voltage transducers <b>based on fully integrated Single-axis (transverse) Hall sensor with preamplifier</b>.</p> <p>The complete electronics is mounted in High mechanical strength, electrically shielded aluminum case [95 W x 120 L x 37 H mm] with mounting provision.</p>	<b>EYD</b>	
<b>G</b>	<p>The 3-channel analogue electronic processing unit which to be is used as the electronic module in SENIS 3-axis Ultra-low-noise magnetic flux density-to-voltage transducers based on <i>the discrete high-resolution Hall sensors</i>.</p> <p>The complete electronic is mounted in a high mechanical strength, EMC shielded 42HP Al-case [dim.: 240 W x 260 L x 135 H mm; weight &lt; 3 kg].</p>	---	
<b>J</b>	<p>Standard single-channel analogue electronic processing unit for the range of the SENIS single-axis magnetic flux density-to-voltage transducers based on <i>the integrated Single-Axis Hall sensor with NO preamplifier</i>.</p> <p>The complete electronic is mounted in a high mechanical strength, electrically shielded aluminum case [95 W x 120 L x 37 H mm] with mounting provision.</p>	---	

**(E2) (E3) (E4): Measurement Range (3 characters):**

The 3-digits alphanumerical representation of the measurement range in the further E-Module notation would be as the following:

Full Scale (fs)	E2	E3	E4
fs less than 100mT:	corresponding 2-digit number, expressing the full scale in <i>mT</i>		suffix M, refers to measuring unit <i>mT</i>
full scale up to 1T:	. (dec. point)	A digit (1, 2, ...or 9), expressing the integer multiple of 100mT	suffix T, refers to measuring unit <i>Tesla</i>
full scale up to 9T:	0	A digit (1, 2, ...or 9), expressing the integer multiple of 1T	suffix T, refers to measuring unit <i>Tesla</i>
full scale 10T to 20T:	corresponding 2-digit number, expressing the full scale in <i>Tesla</i>		suffix T, refers to measuring unit <i>Tesla</i>

For example:

Standard full scale meas. ranges are:

<b>20 mT</b>	<b>200 mT</b>	<b>2T</b>	<b>20T</b>
<b>20M</b>	<b>.2T</b>	<b>02T</b>	<b>20T</b>

The corresponding representations are:

**NOTE: Upon a customer's request other full scale options within 20mT and 20T are available.**

**(E5) (E6) (E7): Frequency Bandwidth (3 characters):**

The 3-digits alphanumerical representation of the frequency bandwidth (Bw) in the further E-Module notation would be as the following:

Freq. Bandwidth	E5	E6	E7
Bw less than 1kHz:	<b>0</b>	suffix <b>K</b> , refers to measuring unit <i>kHz</i>	A digit (1, 2, ...or 9), expressing the multiple of 0.1kHz
Bw within 1kHz and 10kHz:	A digit (1, 2, ...or 9), expressing the multiple of 1kHz	suffix <b>K</b> , refers to measuring unit <i>kHz</i>	A digit (1, 2, ...or 9), expressing the multiple of 0.1kHz
Bw higher than 10kHz:	corresponding 2-digit number, expressing the freq. bandwidth in <i>kHz</i>		suffix <b>K</b> , refers to measuring unit <i>kHz</i>

Examples:

Standard frequency bandwidths of the analogue SENIS MFT's are:

0.5kHz, 2.5kHz, 10kHz and 25kHz.

Corresponding 3-digits representations, according to the proposed Freq. Bandwidth notation, would be: 0K5, 2K5, 10K and 25K, respectively.

**NOTES: Upon a customer's request other frequency bandwidth options are available:**

- from DC up to 25 kHz for 3-Axis MFT type "A", and
- up to 75 kHz for single-axis MFT type "C" (see Notation 2.a).



**(E8): Linearization accuracy (1 character):**

The following 1-character notation could be used to mark the accuracy of the units:

Linearization Accuracy	Notation (E8)	Remarks
0.01%	H	Currently, SENIS does not offer analog Magnetic Field Transducers with the linearization accuracies better than 0.1%.
0.025%	I	
0.10%	J	
0.25%	K	For measurement ranges up to $\pm 2T$ , the standard linearity options are 0.1%, 0.25% and 1%.
0.50%	L	
1.0%	M	
not linearized	Q	The units are characterized only up to $\pm 2T$ .

**4. OPTION: Extended operating temperature range of the H-module**

**(O1): OPTIONAL: Operating Temperature of the H-Module:**

Standard operating temperature +5°C to +45°C  
 Extended operating temperature up to +100°C

<b>O1</b>
omitted
E

**The overview of the proposed SENIS MFT notation**

- The type notation of a magnetic transducer consists of the type identifier, an unique combination of notations of the Module H and the Module E, separated by a "-", and an indicator for the extended temperature range if ordered as an option. On this way the alphanumeric model number consists of 19 (max. 21) characters:

T1	T2	T3	-	H1	H2	H3	H4	H5	H6	-	E1	E2	E3	E4	E5	E6	E7	E8	-	O1
Type Identifier (3 chars)				Module H (6 characters)							Module E (8 characters)								option: ext. temp range	

- For example:

By the old notation the model number C-H3A-2m\_E3D-2.5kHz-1-2T represents a 3-axis magnetic field transducer based on the fully integrated 3D Hall sensor with pre-amplifiers, mounted into a Probe package type C-H3A, with 2m long cable; the modules H and E are firmly connected, the module E is type E3D, the magnetic field range is  $\pm 2T$ , the nominal accuracy (linearity) is 1%, and the frequency range is 2.5kHz.

Using the new notation, we denote the same unit as the following 19-char's model number:

**F3A-03A02F-A02T2K5M**