Manual
Ex ia Sensors Series A5S1 (intrinsically safe)
(Original operating manual)

valid for versions
A5S1DD0 (1x speed, signal range 0 Hz…25 kHz)
A5S1DD3 (1x speed / 1x direction, signal range 0 Hz…25 kHz)
A5S1DD4 (2x speed, phase shifted, signal range 0 Hz…25 kHz)
A5S1DS0 (1x speed, signal range 0 Hz…12 kHz)
A5S1DS3 (1x speed / 1x direction, signal range 0 Hz…12 kHz)
A5S1DS4 (2x speed, phase shifted, signal range 0 Hz…12 kHz)

also valid for sensors with previous order code:
A5S10 to A5S13 (1x speed, signal range 0 Hz…12 kHz)
A5S14 to A5S17 (1x speed / 1x direction, signal range 0 Hz…12 kHz)
(valid from Serial-No. 1602050001)

Speed Sensors
for Hazardous Areas zone 0 resp. 1
based on Differential-Hall-Effect Principle

TÜV certified for IEC 61508:2010; SIL 3
DIN EN ISO 13849-1:2016; PL e; Kat. 3
DIN EN ISO 13849-2:2012; PL e; Kat. 3
IEC 62061:2015; SIL-CL 3
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<th>Meaning</th>
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<tr>
<td>altern.</td>
<td>alternative</td>
</tr>
<tr>
<td>API</td>
<td>Technical standards of the &quot;American Petroleum Institute&quot;</td>
</tr>
<tr>
<td>A5S</td>
<td>BRAUN GmbH Sensor series</td>
</tr>
<tr>
<td>ATEX</td>
<td>stands for ATmosphère Explosibles (meaning the ATEX EU directives for explosion protection)</td>
</tr>
<tr>
<td>DIN</td>
<td>German Institute for Standardisation (Deutsches Institut für Normung)</td>
</tr>
<tr>
<td>EMC</td>
<td>Electro magnetic compatibility</td>
</tr>
<tr>
<td>EN</td>
<td>European Norm</td>
</tr>
<tr>
<td>Ex ia</td>
<td>Type of protection &quot;Intrinsically Safe&quot;, approval for hazardous areas zone 0 resp. 1</td>
</tr>
<tr>
<td>F/R</td>
<td>Forward/Reverse (Forward/Backward)</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>incl.</td>
<td>inclusive</td>
</tr>
<tr>
<td>IPxx</td>
<td>Ingress Protection Number xx according to DIN EN 60529</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>max.</td>
<td>maximum</td>
</tr>
<tr>
<td>min.</td>
<td>minimum</td>
</tr>
<tr>
<td>MTTFd</td>
<td>Mean Time To Failure dangerous</td>
</tr>
<tr>
<td>n</td>
<td>Short term for Speed</td>
</tr>
<tr>
<td>NEMAx</td>
<td>National Electrical Manufacturers Association Number x</td>
</tr>
<tr>
<td>nm</td>
<td>nanometer</td>
</tr>
<tr>
<td>PELV</td>
<td>Protective Extra Low Voltage</td>
</tr>
<tr>
<td>PFDbavg</td>
<td>Probability of Failure on Demand average</td>
</tr>
<tr>
<td>RPM</td>
<td>Revolutions Per Minute</td>
</tr>
<tr>
<td>sec</td>
<td>second</td>
</tr>
<tr>
<td>SELV</td>
<td>Safety Extra Low Voltage</td>
</tr>
<tr>
<td>SILx</td>
<td>Safety Integrity Level x</td>
</tr>
<tr>
<td>TMR</td>
<td>Triple Modular Redundant</td>
</tr>
<tr>
<td>Ub</td>
<td>+ supply voltage</td>
</tr>
<tr>
<td>UL</td>
<td>Underwriter Laboratories</td>
</tr>
<tr>
<td>Vdc or V dc</td>
<td>Volt direct current</td>
</tr>
</tbody>
</table>
### 1.3 Application characteristics

Speed sensors for applications such as turbines, compressors, expanders, etc. in hazardous areas of zones 0 resp. 1. The sensors are approved as intrinsically safe equipment with protection class Ex ia IIC, temperature class T4 (at Ta = -40 °C to +125 °C) or temperature class T6 (at Ta = -20 °C to +40 °C). The power supply must comply with the regulations for this (see chapter 4.2 "Power supply" or Chapter 3 "Safety instructions"). Safety classification up to SIL 3 / IEC 61508:2010 resp. DIN EN ISO 13849-1:2016 PL e Kat. 3, DIN EN ISO 13849-2:2012 PL e Kat. 3 and IEC 62061:2015; usable in applications up to SIL cl. 3 as speed sensors. Their low end of 0 Hz allows monitoring the machine down to zero speed. They are contact-free, wear-free, maintenance-free and unsusceptible versus external magnetic stray fields and machine vibration.

**Sensors A5S1DD0 and A5S1DS0 and A5S10…13 for detection of rotational speed**

Single Channel, the output provides the rotational speed as a single-track frequency signal.

**Sensors A5S1DD3 and A5S1DS3 and A5S14…17 for detection of rotational speed and direction of rotation**

Dual Channel, 1 track = rotational speed as frequency, 1 track = F/R status as binary signal.

**Sensors A5S1DD4 and A5S1DS4 for detection of rotational speed and direction of rotation with two phase-shifted speed signals**

Dual Channel, the output provides the rotational speed as a twin-track frequency signal (phase shifted). Suitable for external direction detection with enhanced safety.

### 1.4 Mounting of the Sensor

The sensor should be mounted in radial direction so that it points to the axis of rotation of the rotating profile. An arrangement parallel to the axis of rotation for frontal scanning is also possible. Then, a possible axial displacement in the machine must be considered. All our information applies to radial scanning.

For mounting, it is best to have the same thread in the fixed part. The sensor is then fixed in the correct position with the supplied nut.

The mounting may be made flush in any material; several sensors can also be placed close to each other.

**Adjustment to the profile edges**

Mounting preferably in radial direction and in alignment with the profile

![Diagram of profile edge and rotation of target](image)

wrench planes at rear or front end of sensor

![Slots for positioning with NPT at rear end](image)

Figure 1: Adjustment to the profile edges
1.4.1 Notes on Pole Wheel

The pole wheel must be made of ferromagnetic steel. Non-ferrous material, stainless steel or plastics do not work.
The grooves / bolts of the pole wheel must be equidistant; otherwise the speed signal will be unsteady.
The pole wheel should have no damage or burrs; otherwise the speed signal can become unsteady. If there is any damage, increasing the gap in the air can eliminate a possible fault (double pulses).

1.4.2 Positioning of Sensor

1.4.2.1 Alignment of Sensor

The sensor must be aligned with the flanks of the profile to be scanned. It is correctly installed if the two planes at the end of the sensor (which also serve as wrench planes for screwing in) point in the direction of the profile or perpendicular to the profile edges (for example the tooth flanks of a gear).
A deviation of up to ± 20 ° is permitted.

Correct alignment of the sensor

Incorrect alignment of the sensor

Figure 2: Alignment of sensor
### 1.4.2.2 Recommended Air Gap

The recommended air gap between the sensor front surface and the rotating part must be observed. It increases with the size of the profile: For cams or milled grooves with their width, distance and depth, for a gear with its module (= diameter / number of teeth). The field between grooves or cams must be at least as large as the specified width (W), the depth D = at least 3 mm. Thickness of a gear or length (T) of a milled recess of at least 5 mm (plus a possible axial displacement).

The guideline values given below for the profile size (D / W / T) of a rotor are the minimum dimensions, they may be exceeded in any direction. However, the maximum permissible air gap between the sensor and the pole wheel will not increase.

![Profile size of a grooved wheel](image)

\[D = \text{min. } 3 \text{ mm} \]
\[W = \text{min. } 3 \text{ mm} \]
\[T = \text{min. } 5 \text{ mm} \]

Figure 3: Information on profile size

<table>
<thead>
<tr>
<th>Module of a gear wheel</th>
<th>Diametrical Pitch approx.</th>
<th>min. width W of a groove wheel</th>
<th>Recommended air gap</th>
<th>Recommended air gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>m1</td>
<td>25.40 mm</td>
<td>3 mm</td>
<td>0.5 – 0.8 mm</td>
<td>--</td>
</tr>
<tr>
<td>m1.5</td>
<td>16.93 mm</td>
<td>3 mm</td>
<td>0.5 – 1.0 mm</td>
<td>--</td>
</tr>
<tr>
<td>m2</td>
<td>12.70 mm</td>
<td>3 mm</td>
<td>0.8 – 1.5 mm</td>
<td>0.3 – 0.8 mm</td>
</tr>
<tr>
<td>m3</td>
<td>8.47 mm</td>
<td>3 mm</td>
<td>0.8 – 2.0 mm</td>
<td>0.3 – 1.2 mm</td>
</tr>
<tr>
<td>m4</td>
<td>6.35 mm</td>
<td>3 mm</td>
<td>1.0 – 2.5 mm</td>
<td>0.5 – 1.5 mm</td>
</tr>
</tbody>
</table>

### 1.4.3 Maximum fastening torques / wrench sizes / thickness of BRAUN nuts

<table>
<thead>
<tr>
<th>Nut</th>
<th>Maximum fastening torque</th>
<th>Wrench size</th>
<th>Thickness (+/- 0.5 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12 x 1</td>
<td>12 Nm</td>
<td>WS 19</td>
<td>6 mm</td>
</tr>
<tr>
<td>M14 x 1</td>
<td>25 Nm</td>
<td>WS 22</td>
<td>4 mm</td>
</tr>
<tr>
<td>M14 x 1.5</td>
<td>25 Nm</td>
<td>WS 22</td>
<td>7 mm</td>
</tr>
<tr>
<td>3/4&quot;-16</td>
<td>25 Nm</td>
<td>WS 28</td>
<td>10 mm</td>
</tr>
<tr>
<td>M16 x 1</td>
<td>35 Nm</td>
<td>WS 24</td>
<td>8 mm</td>
</tr>
<tr>
<td>M18 x 1</td>
<td>50 Nm</td>
<td>WS 27</td>
<td>4 mm</td>
</tr>
<tr>
<td>3/4&quot;-20</td>
<td>50 Nm</td>
<td>WS 24</td>
<td>6 mm</td>
</tr>
<tr>
<td>M18 x 1.5</td>
<td>50 Nm</td>
<td>WS 26</td>
<td>9 mm</td>
</tr>
<tr>
<td>5/8&quot;-18</td>
<td>50 Nm</td>
<td>WS 24</td>
<td>10 mm</td>
</tr>
<tr>
<td>M22 x 1</td>
<td>75 Nm</td>
<td>WS 30</td>
<td>6 mm</td>
</tr>
</tbody>
</table>
1.5 Connection (pin assignment resp. wire assignment)

All sensors described here can have different dimensions and different connection types.

For the connections applies to the different types:

<table>
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<th>Assignment</th>
<th>with plug pin no.</th>
<th>with open cable ends of BRAUN cables wire color</th>
</tr>
</thead>
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<tr>
<td>Signal output 1: (speed signal f1)</td>
<td>4</td>
<td>white</td>
</tr>
<tr>
<td>Common zero</td>
<td>3</td>
<td>green</td>
</tr>
<tr>
<td>+ sensor supply Ub</td>
<td>1</td>
<td>brown</td>
</tr>
<tr>
<td>Signal output 2: (speed signal f2 resp. rotation direction signal)</td>
<td>2</td>
<td>red (at Teflon® cable) resp. yellow (at PVC cable)</td>
</tr>
<tr>
<td>Screen (not connected to sensor housing)</td>
<td></td>
<td>black</td>
</tr>
</tbody>
</table>

1.6 Arrangement of Pins in Sensor Plug

![Diagram of sensor plug pin arrangement]
1.7 Signal Transmission

The possible transmission distance is essentially determined by the highest occurring signal frequency, the properties of the transmission line and the input of the connected receiving device.

When connected to our Isolating Barrier D461R1…, a signal frequency of 25000 Hz can be safely transmitted over a distance of up to 500 m. If the signal frequency is lower, a correspondingly longer transmission distance applies. The cable is based on a 3-core or 4-core shielded version LiYCY or LiTCT with 3x0.5 mm² or 4x0.5 mm², as supplied by us (R <36 Ohm / km, C <150 pF / m).

The signal frequency in Hz is calculated with a uniformly divided profile by:
Number of poles x speed / 60.

For narrow poles, the effective frequency must be set higher in accordance with the relationship between pole and gap.

Important in the transmission:
A continuous good shielding must be provided. The shield must be connected directly to a shield rail on the receiving side. Never transmit multiple signals under one common screen!
Lay transmission line separately from sources of interference.
1.8 Direction of rotation signal for sensor series A5S1DD3 / A5S1DS3 / A5S14 / A5S15 / A5S16

The sensor indicates the direction of rotation by a constant signal, which is either high or low depending on the direction (see below for level values). The change is instantaneous as soon as a pole pitch (e.g., 1 tooth) has passed the sensor. At standstill, the last reported direction is retained. A hysteresis in the direction change or the combination with a speed lower limit must be implemented in the connected evaluation unit.

The assignment between the signal level and the direction of rotation results from the installation position of the sensor. For the purpose of predetermination, a mark o is placed on the type strip of the sensor. If the profile wheel rotates clockwise in the viewing direction to this mark, the output has high level, otherwise low level.

Relationship between mark and direction signal

![Diagram of a gear indicating direction of rotation]

- o mark visible and rotation in clockwise direction = direction output high
- o mark visible and rotation in counterclockwise direction = direction output low
- o mark not visible: output inverse to above

1.9 Speed signal f2 (phase shifted) for sensor series A5S1DD4 / A5S1DS4

The sensor provides two phase shifted frequency signals f1 and f2:

Relationship between mark and phase position

![Diagram of a gear indicating phase position]

- o mark visible and rotation in clockwise direction: f1 is ahead
- o mark visible and rotation in counterclockwise direction: f2 is ahead
- o mark not visible: phase position inverse to above
1.10 Level and shape of the output signal

Rectangular pulses at low frequencies and with short lines. At higher frequencies and with long lines, the signal at the receiver becomes a saw tooth tread profile. Pulse pitch depends on the profile shape, when sampling a gear wheel profile, it is about 1:1. The level is the same over the entire speed range. The built-in output stage can pull loads to zero and to operating voltage equally strong.

The signal level during no-load running is almost equal to the supply voltage. The diagrams show how it gets smaller when the current load increases (the high-level decreases, the low level becomes higher). If the permissible maximum load of 25 mA is exceeded, the level drops sharply. The sensor is not damaged, the output is short-circuit proof.

![Diagram of output level with load against zero](image1)

Output level with load against zero

![Diagram of output level with load against Ub (+ supply)](image2)

Output level with load against Ub (+ supply)
### 1.11 Ordering Key for Sensors of A5S1... Series

| Signal frequency | b = DD : 0 Hz...25 kHz  
| Signal output   | c = 0 : 1x frequency  
|                 | c = 3 : 1x frequency / 1x direction*  
|                 | c = 4 : 2x frequency, phase shifted*  
| *minimum nominal thread length 74 mm |

<table>
<thead>
<tr>
<th>Unit of shaft diameter</th>
</tr>
</thead>
</table>
| d = M : metric  
| d = N : inch and ½-NPT at end of sensor  
| d = U : inch |

<table>
<thead>
<tr>
<th>Thread of shaft diameter</th>
</tr>
</thead>
</table>
| Standard thread:  
| e = 1210 : M12x1 (metric)  
| e = 1410 : M14x1 (metric)  
| e = 1415 : M14x1.5 (metric)  
| e = 1610 : M16x1 (metric)  
| e = 1615 : M16x1.5 (metric)  
| e = 1810 : M18x1 (metric)  
| e = 1815 : M18x1.5 (metric)  
| e = 2210 : M22x1 (metric)  
| e = 3416 : 3/4"-16 (inch)  
| e = 3420 : 3/4"-20 (inch)  
| e = 5818 : 5/8"-18 (inch)  
| other threads or flat shafts on request |

<table>
<thead>
<tr>
<th>Cable length in meters</th>
</tr>
</thead>
</table>
| i = 1m to 99m*  
| *only with versions with fixed cable |

<table>
<thead>
<tr>
<th>Nominal thread length in mm</th>
</tr>
</thead>
</table>
| Standard length for thread:  
| g = 50, 80, 120 : M12x1 (1210)  
| g = 50, 90, 154 : M14x1 (1410)  
| g = 50, 90, 154 : M14x1.5 (1415)  
| g = 48 : M16x1 (1610)  
| g = 80, 154 : M16x1.5 (1615)  
| g = 48, 94 : M18x1 (1810)  
| g = 50, 74, 94 : M18x1.5 (1815)  
| g = 48, 94 : M22x1 (2210)  
| g = 90 : 3/4"-16 (3416)  
| g = 90 : 3/4"-20 (3420)  
| g = 48, 100, 165 : 5/8"-18 (5818)  
| other lengths on request |

<table>
<thead>
<tr>
<th>Connection type</th>
</tr>
</thead>
</table>
| f = B : screw-plug-in connection  
| f = C : fixed PVC cable  
| f = T : fixed Teflon® cable |

Examples:

- **A5S1DD0M1210B80** = Signal frequency up to 25 kHz, signal output 1x frequency, thread M12x1, screw-plug-in connection, nominal length 80 mm
- **A5S1DS0M1415B90** = Signal frequency up to 12 kHz, signal output 1x frequency, thread M14x1.5, screw-plug-in connection, nominal length 90 mm
- **A5S1DD3M1615T80-5m** = Signal frequency up to 25 kHz, signal output 1x frequency / 1x direction, thread M16x1.5, Teflon® cable with 5m length, nominal length 80 mm
- **A5S1DS3M2210C94-5m** = Signal frequency up to 12 kHz, signal output 1x frequency / 1x direction, thread M22x1, PVC cable with 5m length, nominal length 94 mm
- **A5S1DD4U5818B100** = Signal frequency up to 25 kHz, signal output 2x frequency (phase shifted), thread UNF5/8-18, screw-plug-in connection, nominal length 100 mm
- **A5S1DS4M1815T94-2m** = Signal frequency up to 12 kHz, signal output 2x frequency (phase shifted), thread M18x1.5, Teflon® cable with 2m length, nominal length 94 mm
1.11.1 Ordering Key old / current

The following table is used to better allocate the old and current ordering keys.

<table>
<thead>
<tr>
<th>Old standard ordering keys</th>
<th>Corresponding current ordering keys</th>
</tr>
</thead>
<tbody>
<tr>
<td>A5S10…</td>
<td>A5S1DS0M1810…</td>
</tr>
<tr>
<td>A5S10…A</td>
<td>A5S1DS0U5818…</td>
</tr>
<tr>
<td>A5S10…C</td>
<td>A5S1DS0N5818…</td>
</tr>
<tr>
<td>A5S11…</td>
<td>A5S1DSOM2210…</td>
</tr>
<tr>
<td>A5S12…</td>
<td>A5S1DSOM1210…</td>
</tr>
<tr>
<td>A5S13…</td>
<td>A5S1DSOM1415…</td>
</tr>
<tr>
<td>A5S14…</td>
<td>A5S1DS3M1210…</td>
</tr>
<tr>
<td>A5S15…</td>
<td>A5S1DS3M1810…</td>
</tr>
<tr>
<td>A5S16…</td>
<td>A5S1DS3M1415…</td>
</tr>
<tr>
<td>A5S17…</td>
<td>A5S1DS3M2210…</td>
</tr>
</tbody>
</table>
1.12 Safety Data

See A5S-SIL-Datasheet.

1.13 General Certificates / Approvals

1.13.1 Certification IEC 61508:2010; SIL 3

The A5S... series differential hall effect sensors are TÜV certified according to IEC 61508:2010; suitable up to SIL3 as stand-alone speed sensors for the functions:
- speed monitoring in connection with BRAUN E16 machine protection systems
- output of a correct speed signal (frequency) with an accuracy of +/- 1Hz

1.13.2 Certification DIN EN ISO 13849-1:2016; PLe; Kat. 3

The A5S... series differential hall effect sensors are TÜV certified according to DIN EN ISO 13849-1:2016; suitable up to PLe; Kat. 3 as stand-alone speed sensors for the functions:
- speed monitoring in connection with BRAUN E16 machine protection systems
- output of a correct speed signal (frequency) with an accuracy of +/- 1Hz

1.13.3 Certification DIN EN ISO 13849-2:2012; PLe; Kat. 3

The A5S... series differential hall effect sensors are TÜV certified according to DIN EN ISO 13849-2:2012; suitable up to PLe; Kat. 3 as stand-alone speed sensors for the functions:
- speed monitoring in connection with BRAUN E16 machine protection systems
- output of a correct speed signal (frequency) with an accuracy of +/- 1Hz

1.13.4 Certification IEC 62061:2015; SIL-CL 3

The A5S... series differential hall effect sensors are TÜV certified according to IEC 62061:2015; suitable in applications up to SIL-CL 3 as stand-alone speed sensors for the functions:
- speed monitoring in connection with BRAUN E16 machine protection systems
- output of a correct speed signal (frequency) with an accuracy of +/- 1Hz
Certificate
No. SEBS-A.095133/15, V1.1

TÜV NORD Systems GmbH & Co. KG hereby certifies to

Braun GmbH
Esslinger Straße 26
71334 Waiblingen-Hegnach

that the differential hall effect sensor

Series A5S

meets the requirements
listed in the below mentioned standards by external diagnostic

- IEC 61508:2010 (capable up to SIL 3)
- DIN EN ISO 13849-1:2016 (capable up to PL e; Cat. 3)
- DIN EN ISO 13849-2:2012 (capable up to PL e; Cat. 3)
- IEC 62061:2005 (capable for applications up to SIL Cl. 3)

Base of certification is the report
SEBS-A.095133/15TB1 V1.1 and the tracking list in the annex.
This certificate entitles the holder to use the pictured safety approved mark.

Valid until: 07-11-2021
File reference: 8112819545

Hamburg, 07-11-2016

Tobias Nelke

Certification body SEECCERT
TÜV NORD Systems GmbH & Co. KG
Grolle Bahnstraße 31, 22526 Hamburg, Germany

Figure 4: SIL 3 Certificate
EU-Konformitätserklärung  

EU Declaration of Conformity

BRAUN GmbH Industrie-Elektronik, Esslinger Str. 26, 71334 Waiblingen, Germany erklärt in alleiniger Verantwortung, declares in its sole responsibility,

dass das Produkt:  
that the product:  

Hall-Effekt Drehzahl-Sensor  
Hall-Effect Speed Sensor  

Typ(en), types:  
A5S1…  

den genannten Europäischen Richtlinien und harmonisierten Normen entspricht, is in conformity with the listed European Directives and harmonized standards.

<table>
<thead>
<tr>
<th>EU-Richtlinie(n) / EU-Directive(s)</th>
<th>Norm(en), Standard(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014/34/EU</td>
<td>EN 60079-11:2012</td>
</tr>
<tr>
<td></td>
<td>EN 60079-26:2015</td>
</tr>
<tr>
<td>2014/30/EU</td>
<td>EN 61326-1:2013</td>
</tr>
<tr>
<td>2014/30/EU</td>
<td>EN 61326-3:2:2008</td>
</tr>
<tr>
<td>2014/35/EU</td>
<td>EN 61010-1:2010</td>
</tr>
<tr>
<td>2014/35/EU</td>
<td>EN 50581:2012</td>
</tr>
<tr>
<td>2011/65/EU</td>
<td>EN 61010-1:2010</td>
</tr>
<tr>
<td>2011/65/EU</td>
<td>EN 50581:2012</td>
</tr>
</tbody>
</table>

Kennzeichnung, marking:  

II 1 G Ex ia IIC T* Ga  
(T* = T4 or T6)  

EU-Baumusterprüfbescheinigung Nr.:  
EU Type Examination Certificate No:  
CML 14ATEX2075X  
Certification Management Limited B.V. (CML)  
Hoogoorddreef 15  
Amsterdam, 1101 BA  
The Netherlands  
2776

Benannte Stelle Nr., notified Body No:  

EU-Richtlinie(n) / EU-Directive(s)  
Norm(en), Standard(s)  

Diese Erklärung gilt für alle Sensoren der Baureihe A5S1…, die mit Typenschildern der oben genannten Typen versehen sind. Zusatzbezeichnungen an Stelle von ... stehen für die spezifische Ausführung.  
This declaration is valid for all sensors of series A5S1…, which are provided with type labels of the types mentioned above. Suffixes instead of ... are dummy variables for the specific model.

Unbedingt Beachtung aller Punkte der mitgelieferten Betriebsanleitung ist hierbei Voraussetzung.  
Strict observance of the operation manual is an indispensable precondition, hereto.

Unterzeichnet für und im Namen der BRAUN GmbH / Signed for and on behalf of BRAUN GmbH  

Waiblingen, 2019-01-23  

_____________________________  
_____________________________  
Ort und Datum  
Place and date  

Albrecht Braun  
Geschäftsführer  
Managing Director  

Figure 5:  
EU Declaration of Conformity
2 Hazardous protection

The safety requirements as determined by EN 1127-1, as well as the corresponding national regulations, are to be complied with regarding primary explosion protection, i.e. measures which prevent or restrict the formation of a hazardous explosive atmosphere.

In the case of secondary hazardous protection, i.e. measures that prevent the ignition of an explosive atmosphere surrounding electrical equipment, the series of standards applicable to EN 60079 and the relevant national regulations must be observed.

2.1 Relevant technical Data for Hazardous Area

See the following certificates from chapter 2.3.1

2.2 ATEX Certification of the Input Circuit

II 1 G Ex ia IIC T4/T6 Ga

Marking of notified Body: CE0123
EU Type Examination Certificate: CML 14ATEX2075X

2.3 Explosive relevant Certificates / Approvals

2.3.1 ATEX

The series A5S1... Differential Hall Effect Ex sensors are certified according to ATEX EU Type Examination Certificate No. CML 14ATEX2075X and are compliant according to ATEX Product Directive 2014/34/EU.
Marking see ATEX EU Type Examination Certificate chapter 2.3.5.

2.3.2 IECEx

The series A5S1... Differential Hall Effect Ex sensors are certified according to IECEx Certificate of Conformity No. CML 14.0030X.
Marking see IECEx Certificate of Conformity chapter 2.3.6.

2.3.3 USA (NEC) and Canada (CEC)

The series A5S1... Differential Hall Effect Ex sensors are certified for the USA and Canada according to QPS Certificate of Conformity No. LR 1323-1.
Marking see NEC/CEC Certificate of Conformity chapter 2.3.7.

2.3.4 EAC Ex

The series A5S1... Differential Hall Effect Ex sensors are certified for EAC (Russia, Kazakhstan and Belarus Customs Union) according to TR-Certificate No. RU C-DE.O601.B.00175 and TR CU 012/2011.
Marking see EAC Ex TR CU Certificate chapter 2.3.8.
2.3.5 ATEX EU Type Examination Certificate

EU Type Examination Certificate   CML 14ATEX2075X   Issue 1

2 Equipment  ASS1 Series Hall-effect Sensor
3 Manufacturer  Braun GmbH Industrie-Elektronik
4 Address  Esslinger Straße 26, DE 71334, Waiblingen, Germany

5 The equipment is specified in the description of this certificate and the documents to which it refers.
6 CML B.V., Chamber of Commerce No 6738671, Hoogoorddreef 15, Amsterdam, 1101 BA, The Netherlands, Notified Body Number 2776, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential reports listed in Section 12.

7 If an ‘X’ suffix appears after the certificate number, it indicates that the equipment is subject to conditions of safe use (affecting correct installation or safe use). These are specified in Section 14.
8 This EU Type Examination certificate relates only to the design and construction of the specified equipment or component. Further requirements of Directive 2014/34/EU Article 13 apply to the manufacture of the equipment or component and are separately certified.
9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the confidential report, has been demonstrated through compliance with the following documents:
10 The equipment shall be marked with the following:
   Ex IIC T* Ga
   (T* = T4 or T6 depending on supply power and ambient temperature, see Conditions of Safe Use)
   Ta= Up to -40 °C ≤ Ta ≤ 125 °C

Figure 6: ATEX EU Type Examination Certificate part 1
11 Description

The A5S1 Series Hall-effect Sensors are non-contact measuring head sensors used to detect the movement of rotating ferromagnetic parts with profiling, e.g., rotating cog wheels. The measuring head contains a hall-effect sensor, magnet and amplifier circuit encapsulated in a cylindrical stainless steel enclosure with end cap. The power supply and signal output connections are made using either an attached cable or plug and socket connector depending on the model.

The A5S1 Series sensor has a number of options defined by the full model number,

A5S1 Db c d eee e f ggg h iii jj k

- Db = static/dynamic and speed/frequency range (up to 25kHz)
- c = frequency and output type
- d = mechanical configuration
- eee = mechanical thread
- e = cable/connector
- ggg = sensor length
- h = cable termination
- iii = cable length
- jj = protection type (ia or nA)
- k = encapsulant type

Alternative model coding may be used in line with specific customer orders.

The A5S1 Series sensors are supplied from an intrinsically safe power source and connect to monitoring equipment located outside the hazardous area. The 1S versions have the following safety description,

\[
\begin{align*}
Ui & = 17V \\
Ii & = 100mA \\
Pi & = 125mW or 250mW or 500mW \\
Ci & = 0.131\mu F \text{ (including cable capacitance for up to 100m of attached cable)} \\
Li & = 0
\end{align*}
\]

12 Certificate history and evaluation reports

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Associated report</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>13 Nov 2014</td>
<td>R217B/00</td>
<td>Issue of the prime certificate</td>
</tr>
<tr>
<td>1</td>
<td>21/01/2019</td>
<td>R12231A/00</td>
<td>To transfer certificate to CML B.V</td>
</tr>
</tbody>
</table>

Note: Drawings that describe the equipment or component are listed in the Annex.

13 Conditions of manufacture

The following conditions are required of the manufacturing process for compliance with the certification.

13.1 The sensors shall be subjected to an electric strength test using a test voltage of 500 Vac or a 40% higher d.c. voltage may be applied between the circuit and earth for 60 s. Alternatively, a voltage of 20% higher may be applied for 1 s. There shall be no evidence of flashover or breakdown and the maximum current flowing shall not exceed 5 mA.

This certificate shall only be copied in its entirety and without change.

www.CMLEx.com

Version 2.0 Approval Approved

Figure 7: ATEX EU Type Examination Certificate part 2
13.2 When alternative model coding is used in line with specific customer orders, details of the specific construction shall be provided.

14 Specific Conditions of Use (Special Conditions)

The following conditions relate to safe installation and/or use of the equipment.

14.1 The following ambient temperature and supply input limits are to be applied to the sensor arrangement as applicable:

<table>
<thead>
<tr>
<th>Connection / Type</th>
<th>Temperature Class</th>
<th>Minimum Ambient Temperature</th>
<th>Maximum Ambient Temperature</th>
<th>Maximum Temperature at End Cap</th>
<th>Pi</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTFE cable</td>
<td>T4</td>
<td>-40 °C</td>
<td>125 °C</td>
<td>250mW</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>115 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTFE cable with plug/socket</td>
<td>T4</td>
<td>-40 °C</td>
<td>85 °C</td>
<td>500mW</td>
<td></td>
</tr>
<tr>
<td>PVC cable</td>
<td>T4</td>
<td>-5 °C if cable flexed</td>
<td>70 °C if cable flexed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-30 °C if cable fixed</td>
<td>80 °C if cable fixed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All IS types</td>
<td>T6</td>
<td>≥-5 °C</td>
<td>60 °C</td>
<td>500mW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T6</td>
<td>≥-5 °C</td>
<td>70 °C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The worst-case limitation of power and ambient shall always apply if more than one limiting factor is present in the sensor arrangement.

14.2 If a charge-generating mechanism is present, the exposed unearthed/ungrounded metallic enclosure is capable of storing a level of charge that could become incendiary for IIC gases. Therefore, the user/installer shall implement precautions to prevent the build-up of electrostatic charge, e.g. earthing the metallic part. This is particularly important if the equipment is installed in a zone 0 location.

Figure 8: ATEX EU Type Examination Certificate part 3
2.3.6 IECEx Certificate of Conformity

Figure 9: IECEx Certificate of Conformity part 1
IECEx Certificate of Conformity

Certificate No: IECEx CML 14.0030X
Issue No: 0
Date of Issue: 2014-11-13
Page 2 of 3

Manufacturer: Braun GmbH Industrie-Elektronik
Esklinger Straße 26
DE 71334
Wiblingen
Germany

Additional Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:
The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Explosive atmospheres - Part 0: General requirements
Edition 6.0
Edition 6.0
IEC 60079-15 : 2010 Explosive atmospheres - Part 15: Equipment protection by type of protection “n”
Edition 4
IEC 60079-28 : 2006 Explosive atmospheres - Part 26: Equipment with equipment protection level (EPL) Ga
Edition 2

This Certificate does not indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.

TEST & ASSESSMENT REPORTS:
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:
GB/CML/ExTR14.0019/00
Quality Assessment Report:
DE/TPS/QR12.0006/01

Figure 10: IECEx Certificate of Conformity part 2
Figure 11: IECEx Certificate of Conformity part 3

IECEx Certificate of Conformity

Certificate No: IECEx CML 14.0030X
Date of Issue: 2014-11-13

Schedule

EQUIPMENT:
Equipment and systems covered by this certificate are as follows:

The A5S1 Series Hall-effect Sensors are non-contact measuring head sensors used to detect the movement of rotating ferromagnetic parts with profiling, e.g. rotating cog wheels.

See Annex for full description and Conditions of Manufacture

CONDITIONS OF CERTIFICATION: YES as shown below:
See Annex for Conditions of Certification

Annex:
Certificate Annex IECEx CML 14.0030X Iss 0.pdf
Annexe to: IECEx CML 14.0030X Issue 0
Applicant: Braun GmbH Industrie-Elektronik
Apparatus: A5S1 Series Hall-effect Sensor

Description

The A5S1 Series Hall-effect Sensors are non-contact measuring head sensors used to detect the movement of rotating ferromagnetic parts with profiling, e.g., rotating cog wheels. The measuring head contains a hall-effect sensor, magnet and amplifier circuit encapsulated in a cylindrical stainless steel enclosure with end cap. The power supply and signal output connections are made using either an attached cable or plug and socket connector depending on the model. The measuring head is supplied either as an intrinsically safe version (Ex ia) or a non-sparking version (Ex nA). The design and construction of both versions are identical.

The A5S1 Series sensor has a number of options defined by the full model number,

A5S1 Db c d eeee f ggg h iii jj k

- Db = static/dynamic and speed/frequency range (up to 25kHz)
- c = frequency and output type
- d = mechanical configuration
- eeee = mechanical thread
- f = cable/connector
- ggg = sensor length
- h = cable termination
- iii = cable length
- jj = protection type (ia or nA)
- k = encapsulant type

Alternative model coding may be used in line with specific customer orders

I.S Versions (Ex ia):

The I.S versions are supplied from an intrinsically safe power source and connect to monitoring equipment located outside the hazardous area. The I.S versions have the following safety description,

\[ U_i = 17V \]
\[ I_i = 100mA \]
\[ P_i = 125mW/250mW/500mW \]
\[ C_i = 0.131 \mu F \text{ (including cable capacitance for up to 100m of attached cable)} \]
\[ L_i = 0 \]

Non-sparking Versions (Ex nA):

The Ex nA versions have the following ratings,

- Rated voltage = 32Vdc
- Rated current = 40mA/60mA/120mA

Figure 12: IECEx Certificate of Conformity part 4
Conditions of Manufacture

1. The equipment shall be subjected to an electric strength test using a test voltage of 500 Vac or a 40% higher d.c. voltage may be applied between the circuit and earth for 60 s. Alternatively, a voltage of 20% higher may be applied for 1 s. There shall be no evidence of flashover or breakdown and the maximum current flowing shall not exceed 5 mA.

2. When alternative model coding is used in line with specific customer orders, details of the specific construction shall be provided.

Conditions of Safe Use

1. The following ambient temperature and supply input limits are to be applied to the sensor arrangement as applicable:

   a. Intrinsically safe modules:

<table>
<thead>
<tr>
<th>Connection /Type</th>
<th>Temperature class</th>
<th>Minimum ambient temperature</th>
<th>Maximum ambient temperature</th>
<th>Maximum temperature at end cap</th>
<th>Pi</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTFE cable</td>
<td>T4</td>
<td>-40 °C</td>
<td>125 °C</td>
<td>125 °C</td>
<td>125mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>115 °C</td>
<td></td>
<td>250mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100 °C</td>
<td></td>
<td>500mW</td>
</tr>
<tr>
<td>PTFE cable with plug/socket</td>
<td>T4</td>
<td>-40 °C</td>
<td>85 °C</td>
<td>125 °C</td>
<td>500mW</td>
</tr>
<tr>
<td>PVC cable</td>
<td>T4</td>
<td>-5 °C if cable flexed -30 °C if cable fixed</td>
<td>70 °C if cable flexed 80 °C if cable fixed</td>
<td>125 °C</td>
<td>500mW</td>
</tr>
<tr>
<td>All I.S types</td>
<td>T6</td>
<td>≥5 °C</td>
<td>60 °C</td>
<td>80 °C</td>
<td>500mW</td>
</tr>
<tr>
<td></td>
<td>T6</td>
<td>≥5 °C</td>
<td>70 °C</td>
<td>80 °C</td>
<td>250mW</td>
</tr>
</tbody>
</table>

   Note: The worst-case limitation of power and ambient shall always apply if more than one limiting factor is present in the sensor arrangement

   b. Ex nA modules:

<table>
<thead>
<tr>
<th>Connection /Type</th>
<th>Temperature class</th>
<th>Minimum ambient temperature</th>
<th>Maximum ambient temperature</th>
<th>Maximum temperature at end cap</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTFE cable</td>
<td>T4</td>
<td>-40 °C</td>
<td>125 °C</td>
<td>125 °C</td>
<td>32Vdc 40mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>115 °C</td>
<td></td>
<td>32Vdc 80mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100 °C</td>
<td></td>
<td>32Vdc 120mA</td>
</tr>
</tbody>
</table>

Figure 13: IECEx Certificate of Conformity part 5
<table>
<thead>
<tr>
<th>Connection /Type</th>
<th>Temperature class</th>
<th>Minimum ambient temperature</th>
<th>Maximum ambient temperature</th>
<th>Maximum temperature at end cap</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTFE cable with plug/socket</td>
<td>T4</td>
<td>-40 °C</td>
<td>85 °C</td>
<td>125 °C</td>
<td>32Vdc 120mA</td>
</tr>
<tr>
<td>PVC cable</td>
<td>T4</td>
<td>-5 °C if cable flexed</td>
<td>70 °C if cable flexed</td>
<td>125 °C</td>
<td>32Vdc 60mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-30 °C if cable fixed</td>
<td>80 °C if cable fixed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Ex nA types</td>
<td>T6</td>
<td>≥-5 °C</td>
<td>70 °C</td>
<td>80 °C</td>
<td>32Vdc 60mA</td>
</tr>
<tr>
<td></td>
<td>T6</td>
<td>≥-5 °C</td>
<td>60 °C</td>
<td></td>
<td>32Vdc 120mA</td>
</tr>
</tbody>
</table>

Note: The worst case input limitation and ambient shall always apply if more than one limiting factor present in the sensor arrangement

3. If a charge-generating mechanism is present, the exposed unearthed/ungrounded metallic enclosure is capable of storing a level of charge that could become incendive for IIC gases. Therefore, the user/installer shall implement precautions to prevent the build-up of electrostatic charge, e.g. earthing the metallic part. This is particularly important if the equipment is installed in a zone 0 location.
## 2.3.7 NEC/CEC Certificate of Conformity

### QPS Evaluation Services Inc.
Testing, Certification and Field Evaluation Body
Accredited in Canada, the USA, and Internationally

<table>
<thead>
<tr>
<th>File</th>
<th>LR 1323</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page 1 of 2</td>
<td></td>
</tr>
</tbody>
</table>

---

### CERTIFICATE OF COMPLIANCE
(ISO TYPE 3 CERTIFICATION SYSTEM)

**Issued to**: Braun GmbH Industrie-Elektronik  
**Address**: Esslinger Straße 26, DE 71334 Waiblingen  
**Germany**  
**Project Number**: LR 1323-1  
**Product**: Sensor  
**Model Number**: Type ASS1************ **  
Type ASS1************, **

*Note: The ASS1 Series sensor has a number of options defined by the full Type coding (see report)*

**Ratings**  
**Canada**:  
Sensor type ASS1************ **  
Class I, Div 1, Groups A, B, C, D, Temperature code T6/T4, 'Intrinsically safe'  
Ex ia IIC T6/T4 Ga

Sensor type ASS1************, **  
Class I, Div 2, Groups A, B, C, D, Temperature code T6/T4, 'Non-incendive'  
Class I, Zone 2, Ex nA IIC T6/T4 Gc

**US**:  
Sensor type ASS1************ **  
Class I, Div 1, Groups A, B, C, D, Temperature code T6/T4, 'Intrinsically safe'  
Class I, Zone 1, AEx ia IIC T6/T4

Sensor type ASS1************, **  
Class I, Div 2, Groups A, B, C, D, Temperature code T6/T4, 'Non-incendive'  
Class I, Zone 2, AEx nA IIC T6/T4

*Note: complete electrical ratings ("See instruction manual" – detailed in the instructions and can be identified from model number)*

**Applicable Standards**  
**Canadian standards**:  
Canadian Electrical Code (CEC) dated 2012  
CSA C22.2 No. 60079-0:11  
CSA C22.2 No. 60079-11:11  
CSA C22.2 No. 60079-15:12  
CSA C22.2 No. 157-92, (R2012)  
CSA C22.2 No. 213-1987 (R2013)  
CSA-C22.2 No.61010-1-12, edition 3

**US standards**:  
National Electrical Code (NEC) dated 2014  
UL 60079-0 (12.00.01) -2013  
UL 60079-11 (12.02.01) -2013  
UL 60079-15 (12.12.02) -2012  
UL 913 – 8th edition  
ISA 12.12.01 – 2013  
UL-61010-1 (82.02.01), edition 3

---

**Figure 15**: NEC/CEC Certificate of Conformity part 1
Figure 16: NEC/CEC Certificate of Conformity part 2
2.3.8 EAC Ex TR CU Certificate

Figure 17: EAC Ex TR CU Certificate part 1
Сведения о национальных стандартах (сводах правил), применяемых на добровольной основе для соблюдения требований технических регламентов

<table>
<thead>
<tr>
<th>Обозначение национального стандарта или свода правил</th>
<th>Наименование национального стандарта или свода правил</th>
</tr>
</thead>
<tbody>
<tr>
<td>ГОСТ 31610.0-2014 (IEC 60079-0:2011)</td>
<td>Взрывоопасные среды. Часть 0. Оборудование. Общие требования</td>
</tr>
<tr>
<td>ГОСТ 31610.11-2014 (IEC 60079-11:2011)</td>
<td>Взрывоопасные среды. Часть 11. Оборудование с видом взрывозащиты &quot;искробезопасная электрическая цепь &quot;i&quot;</td>
</tr>
<tr>
<td>ГОСТ 31610.15-2014/IEC 60079-15:2010</td>
<td>Взрывоопасные среды. Часть 15. Оборудование с видом взрывозащиты &quot;n&quot;</td>
</tr>
</tbody>
</table>

Figure 18: EAC Ex TR CU Certificate part 2
**Figure 19: EAC Ex TR CU Certificate part 3**
### Сведения по сертификату соответствия - Ex-приложение

3.2 Специальные условия безопасного применения «X».

Знак «X» в маркировке взрывозащиты датчика серии ASS1 указывает на специальные условия безопасного применения, заключающиеся в следующем:

- допускаются следующие сочетания нежизненного параметра:

<table>
<thead>
<tr>
<th>Тип подключения</th>
<th>Температурный класс</th>
<th>Минимальная температура окружающей среды, °C</th>
<th>Максимальная температура окружающей среды, °C</th>
<th>Максимальная температура на стене с кабелем, °C</th>
<th>Номинальное значение (Вид взрывозащиты на стене)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Кабель РТФЭ</td>
<td>T4</td>
<td>минус 60</td>
<td>125</td>
<td>125</td>
<td>32 В 40 мА</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>250</td>
<td>32 В 60 мА</td>
</tr>
<tr>
<td>Кабель РТФЭ с резьбовым оплетением</td>
<td>T4</td>
<td>минус 60</td>
<td>85</td>
<td>125</td>
<td>32 В 120 мА</td>
</tr>
<tr>
<td>Кабель PVC</td>
<td>T4</td>
<td>минус 5/минус 30 (незащищенный/ защищенный кабель)</td>
<td>70/80</td>
<td>125</td>
<td>32 В 60 мА</td>
</tr>
<tr>
<td>«на» и «пA»</td>
<td>T6</td>
<td>&gt; минус 5</td>
<td>60</td>
<td>500</td>
<td>32 В 60 мА</td>
</tr>
<tr>
<td>подключения</td>
<td>T6</td>
<td>≥ минус 5</td>
<td>70</td>
<td>500</td>
<td>32 В 120 мА</td>
</tr>
</tbody>
</table>

- при эксплуатации датчика серии ASS1 с взрывозащитой вида взрывозащита электрическая шель «i» должна быть исключена возможность образования заряда статического электричества на поверхности металлических оболочек. Изготовитель должен обеспечить передачу потребителю требований по специальным условиям безопасного применения вместе с другой необходимой информацией.


Внесение изменений в конструкцию и техническую документацию согласно ТР ТС 012/2011. Изготовитель должен информировать ОС "ОБОРОНТЕСТ" обо всех изменениях, внесенных в конструкцию, которые могут повлиять на взрывозащищенность конечного изделия.

3.4 Маркировка, наносимая на оборудование, должна включать следующие данные:
- наименование изготовителя или его зарегистрированный товарный знак;
- наименование изделия;
- маркировку взрывозащиты, предупредительные надписи;
- единый знак обращения продукции;
- специальный знак Ex взрывобезопасности (Приложение 2 к ТР ТС 012/2011);
- дату выпуска и порядковый номер изделия по системе нумерации предприятия-изготовителя;
- номер сертификата соответствия;
- другие данные, которые должен отразить изготовитель, если это требуется технической документацией.

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**Figure 20: EAC Ex TR CU Certificate part 4**
3 Safety Notes for Installation and Operation

3.1 General Instructions

The sensors of series A5S1… are built and tested according to standards DIN EN 61010-1 (VDE 0411-1) and have left the factory in a perfectly safe condition. To maintain this condition and to ensure safe operation, the user must follow the instructions contained in this manual. Connection and maintenance work may only be performed by adequately qualified personnel and only when the power supply is switched off.

Important:
If the safety instructions are not followed, it is possible that the sensor will not deliver a speed signal !!!

3.2 EMI

The sensor complies with all relevant regulations, as determined by the Policy of the European Committee for Electrotechnical Standardization (CENELEC), for the Electromagnetic Compatibility (2014/30/EU). Testing and inspection have been performed according to Standards EN 61326-1 and EN 61326-3-2. Thereby, the product meets all requirements to be marked by the CE sign.
For space reasons, the sensor is marked by its model No. but does not carry the CE-mark.

3.3 Safety note about metallic abrasion in the machine

Metallic (ferromagnetic) abrasion may adhere to the front of the sensors when the machine is at standstill. It must be ensured by appropriate measures (oil filter, if the sensors are mounted in oil or mounting the sensors on the top of the machine) that this does not happen. Otherwise it is possible that the sensor will not provide a speed signal when the machine restarts.
In general, the circulation of the oil or the air draft when starting the machine removes the metal abrasion from the sensor. Subsequently, the sensor must be recalibrated by switching off and on its power supply.

3.4 Safety Notes on Installation

3.4.1 Initial Commissioning and Installation

After the sensor has been mounted and the air gap checked, the sensor must be recalibrated to the current air gap.
The sensor is recalibrated by switching off and on its power supply.

3.5 Safety Notes on Operation

Chapter 3.3 has to be observed, too.

3.5.1 Machine Maintenance or Overhaul

If the air gap has been changed or the air gap has been checked, e.g. with a feeler gauge, the sensor must be recalibrated to the current air gap.
The sensor is recalibrated by switching off and on its power supply.
4 Technical Specifications

4.1 Conformity to Standards

<table>
<thead>
<tr>
<th>EU-Directive(s)</th>
<th>Standard(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014/34/EU ATEX product directive</td>
<td>EN 60079-0, EN 60079-11, EN 60079-26</td>
</tr>
<tr>
<td>2014/30/EU EMC directive</td>
<td>EN 61326-1, EN 61326-3-2</td>
</tr>
<tr>
<td>2014/35/EU Low voltage directive</td>
<td>EN 61010-1</td>
</tr>
<tr>
<td>2011/65/EU RoHS directive</td>
<td>EN 50581</td>
</tr>
</tbody>
</table>

4.2 Power Supply

Supply voltage for use in zones 0 and 1: see approvals from chapter 2.3.
The sensors of the A5S1... series may only be operated in hazardous area zone 0 or 1 if they are supplied by an associated electrical equipment approved for Zone 0 / category 1. The signal wire must also be connected to an intrinsically safe circuit.
This requirement is best met with the BRAUN Isolating Barrier D461... series. These isolating barriers also provide the necessary supply voltage required for signal transmission over greater distances or under another load. The output of the isolating barriers is again a pulse signal with a strong level. This results in a powerful system for speed detection in the hazardous area and signal transmission to any measurement device.
The isolating barrier must be installed in a safe (non-hazardous) area.

4.3 Signal Output

Rectangular pulses with constant high level and low level over the entire speed range.
Push-Pull amplified output. Maximum load 20 mA.
The signal output is short circuit proof and protected against polarity error.

4.4 Speed (Frequency-) Range

Speeds with a maximum signal frequency of:
A5S1DS: 0 Hz…12 kHz
A5S1DD: 0 Hz…25 kHz

4.5 Signal Transmission

Cable in shielded version LiYCY with 3x0.5 mm², resp. 4x0.5 mm² with R < 36 Ohm/km and C < 150 pF/m).

4.6 Electrical Protective Measures

Protection class: no protection needed
IP code: IP67, pressure-tight stainless-steel housing (1.4305)

4.7 Connection

Connection with screw-plug-in connection (straight or angled) or with fixed PVC (up to 85°C) or Teflon® (up to 125°C) cable.

4.8 Permissible Ambient Temperature

See certificates from chapter 2.3.
4.9 **Installation Dimensions**

The sensors are available with different installation threads (D) metric, resp. inch, resp. inch with NPT, and each with a number of different nominal lengths (L). This is the length from the front surface of the sensor to the end of the mounting thread (see figures on chapter 7).

4.10 **Cable diameters of BRAUN Cables**

- PVC 3-wire (LiYCY 3x0.5 mm²): approx. 5.4 mm (+/- 0.5 mm)
- PVC 4-wire (LiYCY 4x0.5 mm²): approx. 5.8 mm (+/- 0.5 mm)
- Teflon® 3-wire (LiTCT 3x0.5 mm²): approx. 4.8 mm (+/- 0.5 mm)
- Teflon® 4-wire (LiTCT 4x0.5 mm²): approx. 4.8 mm (+/- 0.5 mm)

4.11 **Weight**

The weight depends on the length and shaft diameter of the sensor and the length of fixed cables.

5 **Accessories (optional)**

- **Cable with connector:**
  - L3A22BO-xm: PVC sensor connection cable (3-wire) with straight plastic connector
  - L3A23BO-xm: PVC sensor connection cable (3-wire) with angled plastic connector
  - L3T24MO-xm: Teflon® sensor connection cable (3-wire) with straight metal connector
  - L3T25MO-xm: Teflon® sensor connection cable (3-wire) with angled metal connector
  - L4A08BO-xm: PVC sensor connection cable (4-wire) with straight plastic connector
  - L4A06BO-xm: PVC sensor connection cable (4-wire) with angled plastic connector
  - L4T09MO-xm: Teflon® sensor connection cable (4-wire) with straight metal connector
  - L4T10MO-xm: Teflon® sensor connection cable (4-wire) with angled metal connector

  : x = cable length in meters

- **Only connector:**
  - Bi4F/01: straight connector (plastic body)
  - Bi4F/02: angled connector (plastic body)
  - Bi4F/05: straight connector (metal body)
  - Bi4F/04: angled connector (metal body)

6 **Useful Lifetime, Proof Test Interval and replacement of A5S sensors**

The Useful Life Time of A5S... sensors are 20 years.
The Proof Test Interval of A5S... sensors are 20 years.
The A5S... sensors are maintenance free in principle and only need replacement if a fault occurs.

The normal lifetime of A5S sensors (by design, but not guaranteed) at operation temperatures up to 60 °C is 20 years.
At higher operation temperatures or if the availability is crucial, we suggest a replacement of the sensors after 5 years of operation during a normal revision of the machine.
Dimensions at different Connection Types

Sensor with screwed on straight mating connector

Sensor with screwed on angled mating connector

Sensor with fix mounted connecting cable

Sensor (NPT version) with fixed Teflon® cable, only for 5/8"-18 (inch) thread

Also see chapter 1.11 (Ordering keys for available shaft diameters D and nominal lengths L)

Figure 21: Dimensions at different connection types
8 Revision Notes

Note:
At editorial changes only the release date is updated.
At technical changes the release date is updated and the revision index is increased.

<table>
<thead>
<tr>
<th>Date</th>
<th>Rev</th>
<th>Modification</th>
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<tr>
<td>13.08.2018</td>
<td>00</td>
<td><strong>First edition</strong></td>
</tr>
<tr>
<td>13.08.2018</td>
<td>01</td>
<td>Adjustment of revision no. to match German version.</td>
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| 07.12.2018 | 01  | **Editorial:**
|            |     | Chapter 7: Thread diameter for NPT-Version inserted. |
| 23.01.2019 | 01  | **Editorial:**
|            |     | New ATEX EU Type Examination Certificate in chapter 2.3.5 inserted and EU Declaration of Conformity in chapter 1.13.6 adapted. |
| 25.02.2019 | 01  | **Editorial:**
|            |     | New Chapter 1.11.1 inserted. |
| 18.03.2019 | 01  | **Editorial:**
|            |     | Chapter 1.11: additional standard threads and nominal lengths inserted. |
| 17.04.2019 | 01  | **Editorial:**
|            |     | Chapter 1.4.3: additional values for threads 3/4"-16 and 3/4"-20 inserted. |
| 28.06.2019 | 01  | **Editorial:**
|            |     | Chapter 2.3.3 (NEC/CEC) and 2.3.7 (NEC/CEC Certificate of Conformity inserted. |