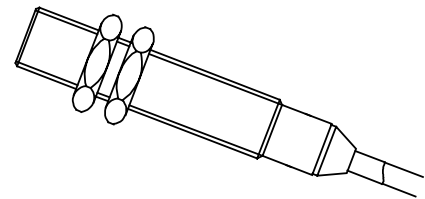


# Ferrostat Speed Sensor Series DSF Explosion Proof Versions EEx

DSF ..10.\*\* .HV  
Ex  
ATEX



## Operating Instructions

**374E-64368**

Valid from lot nr. 0103

### General

<b>Function</b>	The <b>DSF</b> series Ferrostat speed sensors are suitable for use with a <b>pole wheel</b> to generate speed proportional frequency signals. They exhibit dynamic behaviour, whereby pulse generation down to 0.05 Hz is guaranteed. The sensing element is a magnetically biased Hall device, followed by an amplifier having a trigger characteristic and short circuit proof output stage.
<b>Use in potentially explosive environment EEx</b>	<b>For operation in hazardous areas the restrictions given in the EC Type Examination Certificate must be adhered to.</b>  <b>DSF xx10.00 xHV Ex</b> series sensors are certified <b>intrinsically safe II 2 G EEx ia IIC T6-T1</b> for use in flammable gas atmospheres, and as <b>II 2 D T147°C IP65</b> for use in flammable dust atmospheres. EC Type Examination Certificate no. ZELM 03 ATEX 0124X.  A copy of the EC Type Examination Certificate forms a constituent part of these operating instructions.

### Technical Data

<b>Supply voltage *</b>	8 ... 28 VDC, max. superimposed AC ripple of 25mVpp. The voltage drop as a result of the cable impedance and Zener barrier series resistance must be allowed for! <b>Protected against reverse polarity.</b>
<b>Current consumption</b>	max. 15mA ( <b>without load</b> )
<b>Signal output *</b>	Square wave from push-pull output stage, DC coupled to the supply (0V = reference voltage), Load current max. 25mA, Output voltage HI: > Supply voltage - 4 Volt at I <sub>source</sub> = 25mA Output voltage LO: < 2 Volt at I <sub>sink</sub> = 25mA The voltage drop as a result of the cable impedance and Zener barrier series resistance must be allowed for! <b>Short circuit proof and protected against reverse polarity.</b>
<b>Frequency range</b>	0,05Hz...20 kHz
<b>Noise immunity</b>	In accordance with 89/336/EG / EN 50081-2 / EN 50082-2
<b>Isolation</b>	Housing, cable screen and electronics galvanically separated (500 V/50 Hz/ 1 Min.)
<b>Operating temperature *</b>	See tables on following pages. <b>The restrictions given in the EC Type Examination Certificate must be adhered to.</b>
<b>Housing *</b>	Stainless steel X12CrNiS188, material number 1.4305, front side hermetically sealed, electronic components potted in a chemical and age proof ceramic. Dimensions according to table and drawings. Maximum permissible tightening torque: <b>12 Nm</b> for M12x1 <b>25 Nm</b> for M14x1 <b>35 Nm</b> for M16x1 <b>50 Nm</b> for M18x1 <b>75 Nm</b> for M22x1
<b>Protection class</b>	IP68 (Head), IP67 (cable connection), IP 54 (where connector used)
<b>Ex protection *</b>	II 2 G EEx ia IIC T6-T1 (explosive gas) II 2 D 147°C IP 65 (explosive dust) <b>The restrictions given in the EC Type Examination Certificate must be adhered to.</b>
<b>Vibration immunity</b>	5 g <sub>n</sub> in the range 5...2000Hz.

<b>Shock immunity</b>	50 g <sub>n</sub> during 20 ms, half sine wave impact.						
<b>Weight</b>	According to table						
<b>Pole wheel</b>	Ferromagnetic toothed wheel, material e.g.. USt37-2, involute gear wheels preferred, Module ≥1, tooth width min. 6 mm, sidewise movement at min. tooth width < 0,2 mm, eccentricity < 0,2 mm. <ul style="list-style-type: none"> <li>• Pole wheel – sensor gap with <table style="margin-left: 200px;"> <tr> <td>Module 1:</td> <td>0,2...1,0 mm</td> </tr> <tr> <td>Module 2:</td> <td>0,2...2,5 mm</td> </tr> <tr> <td>≥Module 4:</td> <td>0,2...4,5 mm</td> </tr> </table> </li> </ul>	Module 1:	0,2...1,0 mm	Module 2:	0,2...2,5 mm	≥Module 4:	0,2...4,5 mm
Module 1:	0,2...1,0 mm						
Module 2:	0,2...2,5 mm						
≥Module 4:	0,2...4,5 mm						
<b>Version AH</b>	Connector per table.						
<b>Version SH</b>	<b>Teflon cable</b> , Art.-Nr. 824L-35053, 4-pole, 4 x 0,24 mm <sup>2</sup> (AWG 24), screened wires (mesh screen, isolated from housing), white outer shell Ø max. 4,0 mm, bending radius min. 60 mm, weight 32 g/m. <b>The brown wire is not used.</b>						
<b>Version S2H</b>	<b>Silicone cable</b> , Art.-Nr. 824L-36622, 6-pole, 6*0.6mm <sup>2</sup> (AWG 20), screened wires (mesh screen, isolated from housing), black outer shell Ø max. 13,0 mm, bending radius min. 30 mm, weight 200 g/m. <b>The brown, blue and orange wires are not used.</b>						

\* The maximum permissible operating temperature depends upon the following parameters, as shown in the table below:

- Sensor housing size
- Maximum available electrical power from the intrinsically safe sensor power supply and from the intrinsically safe input circuit of the attached instrumentation and any Zener barriers.
- Ex Temperature class (T1-T6)

**Operating temperature for II 2 D T 147°C IP65** : -20 / + 100°C

Where dust clouds are present, the surface temperature of the sensor must not exceed 2/3 of the ignition temperature of the corresponding dust / air mixture.

In the event of dust coatings being present, the surface temperature of the sensor must not exceed the limits defined in EN 50281-1-2.

**Operating temperature for II 2 G EEx ia T6-T1** : per table :

Sensor Type or Housing size	maximum available electrical power [mW]	maximum permissible operating Temperature [°C]						Example Zener Barriers from STAHL (PTB 01 ATEX 2053) (Connection diagrams page 4)
		Ex hazardous areas: Temperature class						
		T1	T2	T3	T4	T5	T6	Power supply & Signal path
DSF 1210.**	900	125	125	125	83	48	33	1 x 9001/011-280-075-10 & 1 x 9001/01-280-050-101
	630	125	125	125	96	61	46	2 x 9001/01-168-075-101
	525	125	125	125	102	67	52	1 x 9001/01-168-075-101 & 1 x 9001/01-168-050-101
	490	125	125	125	104	69	54	1 x 9001/01-280-050-101 & 1 x 9001/01-280-020-101
	399	125	125	125	108	73	58	1 x 9001/01-168-075-101 & 1 x 9001/01-168-020-101
	300	125	125	125	113	78	63	-
	200	125	125	125	117	82	67	-
	100	125	125	125	120	89	74	-
DSF 1810.**	900	125	125	125	90	55	40	1 x 9001/01-280-075-101 & 1 x 9001/01-280-050-101
	630	125	125	125	102	67	52	2 x 9001/01-168-075-101
	525	125	125	125	106	71	56	1 x 9001/01-168-075-101 & 1 x 9001/01-168-050-101
	490	125	125	125	107	72	57	1 x 9001/01-280-050-101 & 1 x 9001/01-280-020-101
	399	125	125	125	111	76	61	1 x 9001/01-168-075-101 & 1 x 9001/01-168-020-101
	300	125	125	125	115	80	65	-
	200	125	125	125	120	85	70	-
	100	125	125	125	120	89	74	-
DSF 2210.**	900	125	125	125	98	63	48	1 x 9001/01-280-075-101 & 1 x 9001/01-280-050-101
	630	125	125	125	107	72	57	2 x 9001/01-168-075-101
	525	125	125	125	110	75	60	1 x 9001/01-168-075-101 & 1 x 9001/01-168-050-101
	490	125	125	125	111	76	61	1 x 9001/01-280-050-101 & 1 x 9001/01-280-020-101
	399	125	125	125	114	79	64	1 x 9001/01-168-075-101 & 1 x 9001/01-168-020-101
	300	125	125	125	118	83	68	-
	200	125	125	125	120	86	71	-
	100	125	125	125	120	90	75	-
	50	125	125	125	120	91	76	-

**Ex-Sensor type table:**

Type	Art.-Nr.	Housing	Connection			Weight complete [g]	Operating temperature [°C] (1)
		Thread (1)	„LEMO“ Connector	Mating connector supplied (2)	Cable length (4)		
DSF 1210.00 SHV Ex atex	374Z-05066	M12x1			2m		Class T6-T1
DSF 1810.00 SHV Ex atex	374Z-05067	M18x1			2m		Class T6-T1
DSF 1810.00 S2HV atex	374Z-05068	M18x1			5m		Class T6-T1
DSF 2210.00 SHV Ex atex	374Z-05069	M22x1			2 m		Class T6-T1
DSF 2210.00 S2HV Ex atex	374Z-05071	M22x1			5m		Class T6-T1
DSF 2210.00 AHV Ex atex	374Z-05072	M22x1	ERA 2S-304 CLL	(3)	-		Class T6-T1
DSF 2210.87 SHV Ex atex	374Z-05070	M22x1			2 m		Class T6-T1

- (1) The temperature and atmosphere limitations for each sensor housing size, as shown in the table, must be observed and the restrictions given in the EC Type Examination Certificate must be adhered to.
- (2) Mating connector for cable diameter 3.1...4.1mm, other diameters on request.
- (3) Type FFA 2S 304 CLA C42 : Art.-Nr. 820A-35732
- (4) The limitations relating to permissible cable capacitance and inductance detailed in the EC Type Examination Certificate under Ex power supply and instrumentation Ex input must be adhered to!

**Connection**

The sensor wires are sensitive to electrical interference. The following 2 points should therefore be noted:

- A screened 3 core cable must always be used for sensor connections. The screen must be taken all the way to the terminal provided on the instrumentation and not earthed.
- The sensor cables should be laid as far as possible from large electrical machines and on no account laid parallel to high voltage/current power lines.

The maximum permissible cable length is a function of the sensor voltage, cable routing, the capacitance and inductance characteristics of the cable and the max. signal frequency. In general however, it is advisable to keep the distance between sensor and instrumentation as short as possible. The sensor cables can be extended using junction boxes having IP20 rated terminals. (corresponding to DIN 40050 or IEC 529) We recommend the use of JAQUET extension cable Art.-Nr. 824L-31081.

**Installation**

The sensor should be mounted with the middle of the front face over the middle of the tooth. With radial sensor mounting around gear or slotted wheels, the sensor is normally mounted over the centre of the wheel. Dependent upon gear width, a degree of axial movement is then permissible. The middle of the sensor must however be a minimum of 3 mm from either edge of the pole wheel under all operating conditions.

**Solid and vibration free mounting of the sensor is important.**

The sensors are insensitive to oil, grease etc and can be installed in arduous conditions. Should the cable be subjected to aggressive materials, then Teflon cable should be specified. During installation the smallest allowable pole wheel to sensor air gap should be set. The gap should however be set so as to prevent the face of the sensor ever touching the pole wheel. The overall system calibration is not influenced by the air gap.

**Maintenance**

Sensors are maintenance free.

The sensors are fully potted and sealed and cannot be repaired.

**Ex**

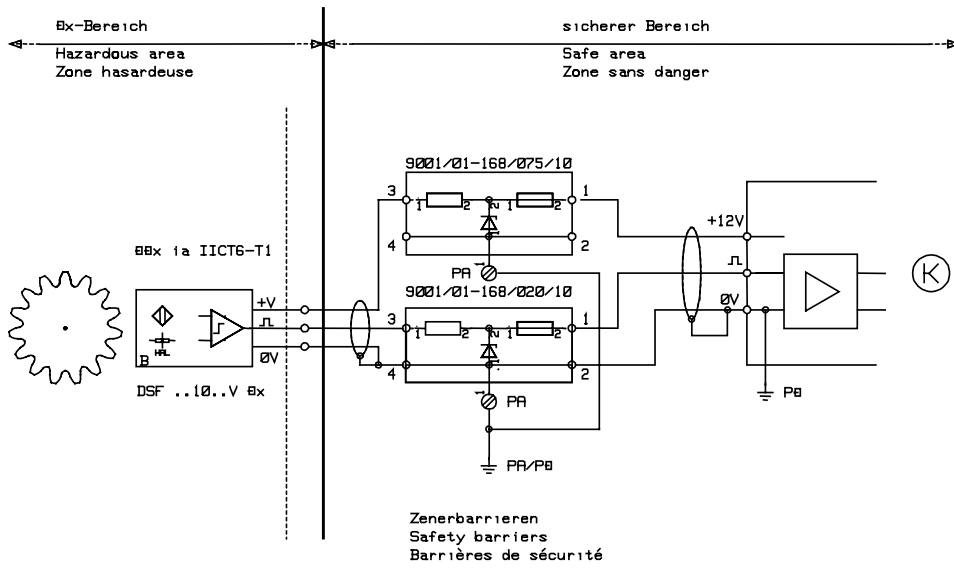
A connection diagram for use with Zener barriers is provided on page 4.

Protection class : II 2 G EEx ia IIC T6-T1

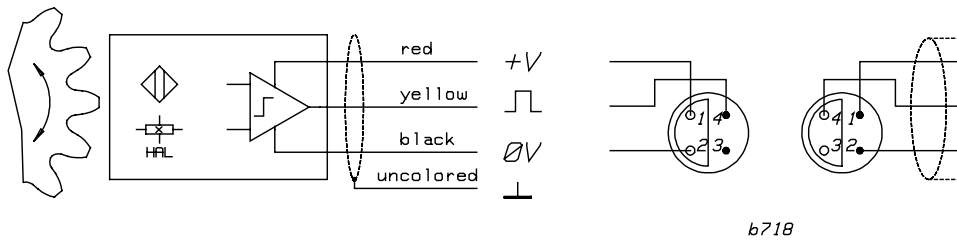
II 2 D 147°C IP 65 (Power level of 900mW, at Ta =100°C)

**The restrictions given in the EC Type Examination Certificate and appropriate standards (e.g. IEC 79-14 or DIN VDE 0165) must be adhered to.**

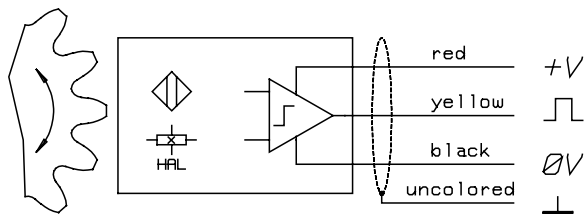
**Connection using Zener barriers:**



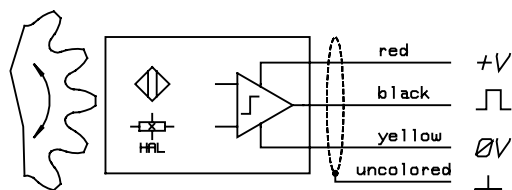
**Connection diagram sensor type DSF xx10.00 AHV Ex-atex:**



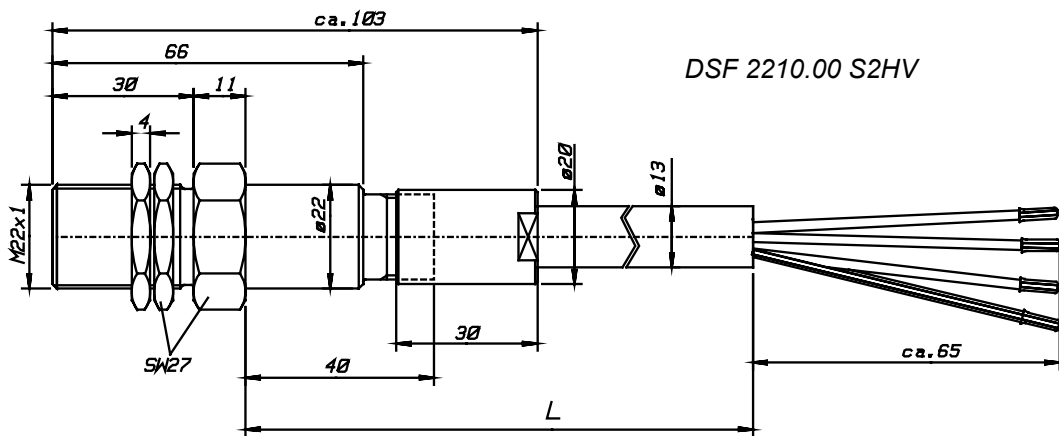
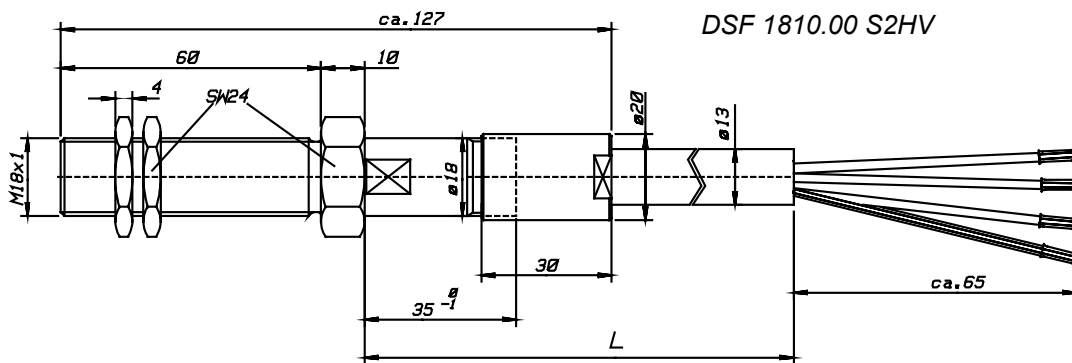
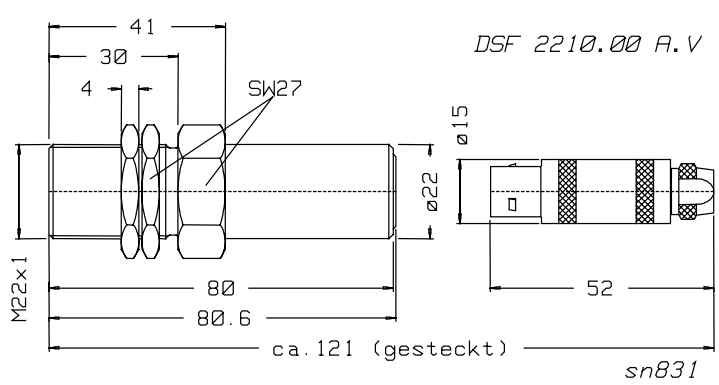
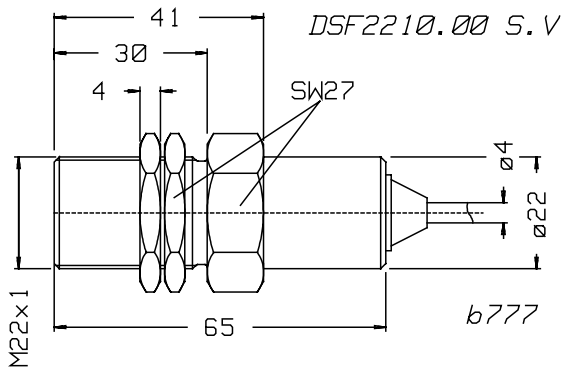
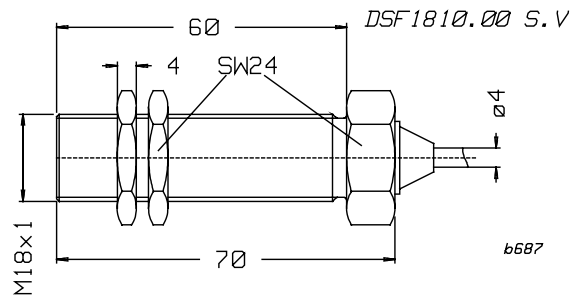
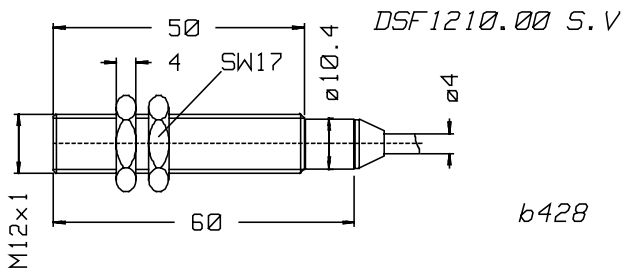
**Connection diagram sensor types DSF xx10.00 SHV Ex-atex und DSF xx10.00 S2HV Ex-atex :**



**Connection diagram sensor type DSF 2210.87 SHV Ex-atex:**



**Dimensional drawings for sensor types DSF xx10.xx xHV Ex-atex :**



# CE-Declaration of Conformity

According to the CE guidelines

- Electromagnetic compatibility 89/336/EEG
- Apparatus used in explosive environment 94/4/EG

## The apparatus

Type name : DSF xx10.xx xHV atex

Have been developed, and are constructed and produced in accordance with the guidelines 89/336/EG and 94/4/EG solely by :

Company : JAQUET AG, Thannerstrasse 15, CH-4009 Schweiz.

The following harmonised standards are applicable :

- EN 50081-2, EN 50011, CISPR 16
- EN 50082-2, EN 61000-4-2/3/4/5/6/8/11
  
- EN 50014
- EN 50020
- EN 50284
- EN 1127
  
- EN ISO 9001:2000

The following national standards are applicable :

- IEC 60068-2-1/2/30/6
- VDE 0165

Full technical documentation is available.

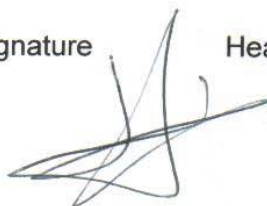
The associated instruction manuals are available under following numbers :

- 374D-64368 for DSF xx10.xx Ex Atex in original language.
- 343E-64368 for DSF xx10.xx Ex Atex in english.

Basel, the 01.09.03

Signature

Head of engineering





Prüf- und Zertifizierungsstelle

ZELM Ex



(1) **EC-TYPE-EXAMINATION CERTIFICATE**

- (2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**
- (3) EC-TYPE-EXAMINATION CERTIFICATE Number:

**ZELM 03 ATEX 0124X**

- (4) Equipment: **Rotation speed sensor type DSF ..10.\*\*.HV Ex**
- (5) Manufacturer: **JAQUET AG**
- (6) Address: **Thannerstrasse 15, CH-4009 Basel**
- (7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.
- (8) The Prüf- und Zertifizierungsstelle ZELM Ex, notified body No. 0820 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report ZELM Ex 0370215173.

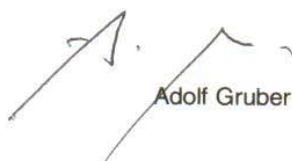
- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
- EN 50 014: 1997+A1+A2                      EN 50020: 1994                      EN 50 281-1-1: 1998**
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this Certificate.
- (12) The marking of the equipment shall include the following:



**II 2 G EEx ia IIC T6 and II 2 D T 147°C IP 65**

Zertifizierungsstelle **ZELM Ex**

Braunschweig, June 18, 2003

  
Adolf Gruber



Sheet 1/4

EC-type-examination Certificates without signature and stamp are not valid. The certificates may only be circulated without alteration. Extracts or alterations are subject to approval by the Prüf- und Zertifizierungsstelle ZELM Ex. This English version is based on the German text. In the case of dispute, the German text shall prevail.

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Prüf- und Zertifizierungsstelle

ZELM Ex



(13)

## SCHEDULE

(14)

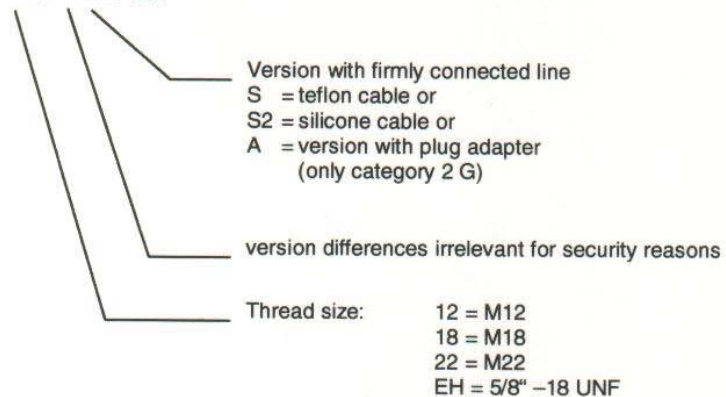
### EC-TYPE-EXAMINATION CERTIFICATE ZELM 03 ATEX 0124X

(15) Description of equipment

The rotation speed sensors are used for the recording of the rotation speed for the touchless scanning of rotating ferromagnetic rotating magnetic poles, gears, camshafts and the like.

#### Model key:

Rotation speed sensor type DSF ..10.\*\* .HV Ex



#### Electrical data

Supply- and signal circuit type of protection Intrinsic Safety EEx ia IIC resp. IIB or iaD for use according to category 2D

only for the connection to certified intrinsically safe circuits

maximum values:  $U_i = 28 \text{ V}$   
 $I_i = 150 \text{ mA}$   
 $P_i = 900 \text{ mW}$  (at category 2D) and/or  
 $P_i \leq 900 \text{ mW}$  (in accordance with table 1 at category 2 G)

Maximum effective inner capacity  $C_i = 36 \text{ nF}$

The maximum effective inner inductance is negligibly small

For use according to category 2D the maximum permissible ambient temperature conducts to 100°C.

The lower temperature boundary is for all versions and applications - 20 °C.

The temperature class, the maximum permissible ambient temperature and the maximum permissible power of the connected, certified, intrinsically safe circuit ( $P_i$ ) for the different versions are for the usage according to category 2G are to be determined with the following table.

Sheet 2/4

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Schedule to EC-TYPE-EXAMINATION CERTIFICATE ZELM 03 ATEX 0124X

Table 1

type	P <sub>i</sub> [mW]	maximum ambient temperature for the temperature classes					
		T1	T2	T3	T4	T5	T6
DSF 1210...	900	125	125	125	83	48	33
DSF 1410...	630	125	125	125	96	61	46
DSF 1610...	525	125	125	125	102	67	52
DSF EH10...	490	125	125	125	104	69	54
	399	125	125	125	108	73	56
	300	125	125	125	113	78	63
	200	125	125	125	117	82	67
	100	125	125	125	120	89	74
	50	125	125	125	120	91	76
	DSF 1810...	900	125	125	125	90	55
DSF 2010...	630	125	125	125	102	67	52
	525	125	125	125	106	71	56
	490	125	125	125	107	72	57
	399	125	125	125	111	76	61
	300	125	125	125	115	80	65
	200	125	125	125	120	85	70
	100	125	125	125	120	89	74
50	125	125	125	120	91	76	
DSF 2210...	900	125	125	125	98	63	48
	630	125	125	125	107	72	57
	525	125	125	125	110	75	60
	490	125	125	125	111	76	61
	399	125	125	125	114	79	64
	300	125	125	125	118	83	68
	200	125	125	125	120	86	71
	100	125	125	125	120	90	75
50	125	125	125	120	91	76	

(16) Report No.

ZELM Ex 0370215173

(17) Special conditions for safe use

1. The Rotation Speed Sensors may be used only in intrinsically safe circuits in accordance with the information in this EC-Type-Examination Certificate.
2. The permissible ambient temperature range is to be determined according to the determination of this EC-Type-Examination Certificate.
3. The versions with plug adapter are only intended for use in areas, in which explosive atmospheres caused by gases or vapours in accordance with the category 2 G might occur.
4. The instruction manual has to be considered.

Sheet 3/4

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Prüf- und Zertifizierungsstelle

ZELM Ex



**Schedule to EC-TYPE-EXAMINATION CERTIFICATE ZELM 03 ATEX 0124X**

- (18) Essential Health and Safety Requirements  
met by standards

Zertifizierungsstelle ZELM Ex

  
Adolf Gruber



Braunschweig, June 18, 2003

Sheet 4/4

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