

# Wind direction sensor

4123.0000 BG

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6	11.06		Lo
5	07.06		Lo
7	03.08		
Issue.	Date		Name



## Description

This sensor is designed for the acquisition and electronic transmission of wind direction data. It is suitable for applications in the field of meteorology and environmental monitoring, e. g. for automatic weather stations, at airports, on research vessels, at industrial sites, for mobile measuring systems etc.. The instrument's rugged construction and its dust- and water repellent surface, as well as the optional high performance heating enable heavy duty applications like wind energy measurement or operation under severe climatic conditions.

Thanks to various simultaneously usable outputs and further options there is a wide range of measuring tasks (refer to "ordering code").

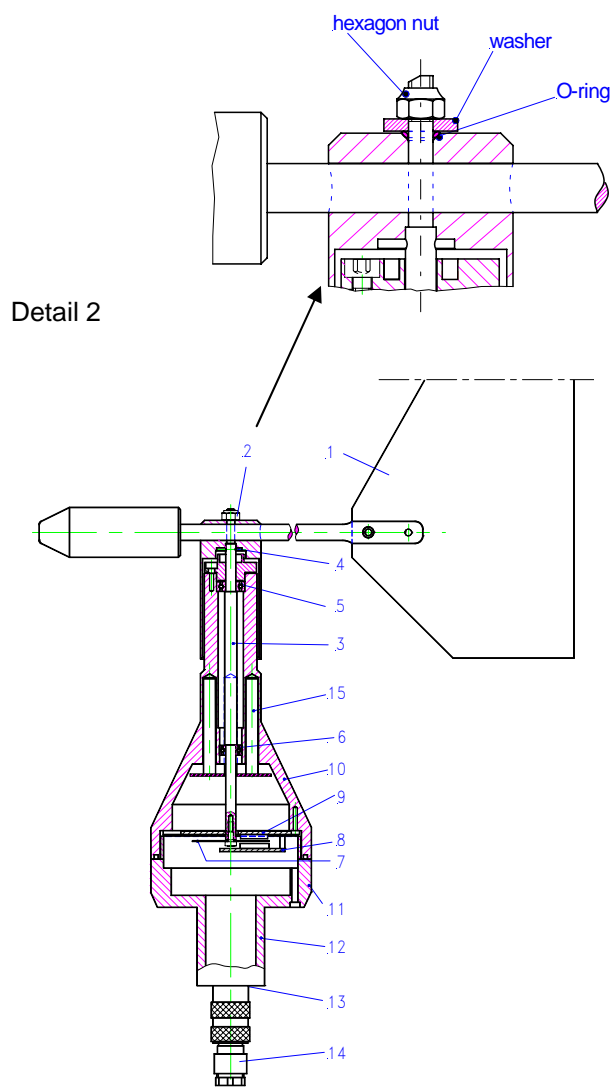
## Mechanical design and principle of operation

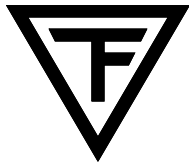
The sensor comprises a wind vane system which is continuously kept parallel to the local wind direction through the occurring wind pressure. The vane position is transmitted by the shaft to the angular encoder unit. The mechanical design can be noted on fig. 1:

The fin (1) is made of anodized aluminium sheet metal. The supporting arm and the counter balance are made of stainless steel. The rotary head, made anodized aluminium, is fastened to the vertical shaft (3) by a hexagon nut with washer and O-ring sealing (2). In order to maintain the correct position after replacement there is a pin (4) in the shaft, engaging a groove when lowering the rotary head. The shaft is made of stainless steel and is guided by two precision ball bearings (5, 6). The code wheel (7) is fastened to the lower end of shaft and is placed between the two print boards (8, 9), carrying the 8-line light barrier.

By interrupting this light barrier, the angular position is detected by means of an 8 bit Gray Code. The housing consists of an upper (10) and a lower part (11). These parts, as well as the hub, are made of a special coated aluminium alloy, featuring water repellence and corrosion protection. Sealing between upper and lower part is achieved by means of an O-ring. The pivot (12) at the lower part has a size 34 x 40 mm and may be fastened to a crossarm or similar mounting device. At the lower end of the pivot there is a connector socket (13) and plug (14). At the top section a white mark is located. If the corresponding mark which is engraved in the rotary head is brought exactly to the same position, the sensor supplies a signal corresponding North direction. When installing the sensor an adequate geographic alignment must be carried out (refer to section "Installation"). A built-in heating features operation in cold climate.

Fig. 1: Mechanical design





## Electrical design and principle of operation

When moving the wind vane, the wheel of the angular encoder is turned so that, depending on the wind direction, a corresponding digital signal is supplied. The subsequent electronic circuitry converts this signal to a serial output, resp. to additional analog signals (refer to "Technical Data").

The serial data output (TTL) corresponds an RS 232 structure, with 600 Bd, 8 bit, 1 start bit, 2 stop bit, no parity bit.

## Construction of the heating

The heating consists of a power transistor, controlled by a separate circuitry with temperature sensor.

The high performance heating versions are equipped with 4 cylindrical heaters (15) with 60 W max. heating power.

For further data processing (averaging etc.), refer to datalogger COMBILOG, type 1020; catalog group 1.

## Technical Data

Measuring range:	360°
Max. load:	100 m/s
Threshold at 90° initial deflection:	< 0.2 m/s
Damping ratio at $v = 3$ m/s and initial deflection = 15°:	< 0.3
Compliances:	WMO Guide No. 8/7th ed. VDI 8786, T.2, 12/2000 MEASNET
Power supply:	Electronics: Type 4123.0000: 10...30 VDC; < 5 mA at 12 V Type 4123.1000: 10...30 VDC; 35...75 mA at 12 V heating: 10...30 VDC; approx. 7 W high performance heating: 24 VDC; approx. 60 W
Output:	digital: serial 8 bit Gray code, RS 232 compatible, 600Bd, 8 data bit, 1 startbit, 2 stopbit, no parity, TTL level
additional, with version 4123.1---: analog:	0...20 mA 4...20 mA 3 phase signal for direct con- nection of analog instruments.

Admissible load:	approx. 400 $\Omega$
Heating system:	Thermostat controlled, max. 7 W
High perf. heating:	max. 60 W
Operating temperature:	-25...+80 °C -40...+80 °C with high per- formance heating
Protection class:	IP 65, when operated upright
Housing material:	Aluminium alloy
Connection:	12 p. connector, water- and dust proof acc. to IP 67
Dimensions:	
Total height:	approx. 370 mm
Max. turning radius:	350 mm
Max. housing $\varnothing$ :	80 mm
Pivot:	$\varnothing$ 34 x 40 mm
Weight:	approx. 1.015 kg
Measuring cable:	LiY(C)Y 0.25 mm <sup>2</sup> (not included)

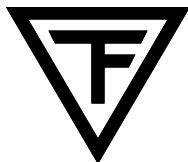
## Ordering Code

Wind direction sensor, 8 bit Gray Code with serial output, TTL level; with built-in heating.	<b>4123.0000</b>
Wind direction sensor, 8 bit Gray Code with serial output, TTL level; analog outputs 0...20 mA, 4...20 mA as well as 3 phase signal for direct connection of analog instruments, with built-in heating.	<b>4123.1000</b>
As 4123.0000, but with high performance heating.	<b>4123.0100</b>
As 4123.1000, but with high performance heating.	<b>4123.1100</b>

## Operating instruction

### Installation:

The wind direction sensor has to be placed at a suitable height (for example 10 m for meteorological measurement of the ground wind). There is a number of tilting masts of different heights from 5 to 15 m available for this purpose. Lattice masts up to 80 m height and various telescopic masts can also be supplied (refer to product group 9). In any case it has to be taken care to avoid zones of lee or turbulences!



Before mounting the sensor, the wind vane is placed onto the shaft and turned until its groove matches the pin. After that the hexagonal nut is screwed on and tightened. The correct position of the vane on the shaft may also be checked after completing installation by controlling if the notch at the end of the shaft points to the same direction as the white mark on the side of the rotary head.

**Attention:** This unit must only be operated after the wind vane has been installed and the hexagonal nut has been tightened well; otherwise (during rain) water could penetrate into the housing! Installation is carried out according to fig. 2. The sensor can be mounted on a pipe stud  $\varnothing 35$  mm, or alternatively on an adapter type 9023.

For crossarm installation a clamp type 9022 can be used. For operation in connection with a speed sensor, the use of a U-shaped crossarm, type 9040, is recommended. The installation of a lightning rod is recommended for measuring sites in regions accordingly threatened. Power- and measuring lines shall be protected by suitable over voltage protection devices! North adjustment is performed by using a compass or exactly determined true bearings of targets in the field. Hereby the two white marks on the housing and the rotary head should be opposite to each other when the vane is pointing to true North.

Installation on top of wind turbines, ship masts or similar structures with tilt motion, vibration or other dynamic force requires a rugged, eventually shock absorbing, suspension construction. In this case, please contact us for further consultation.

### Connection:

Connection has to be carried out according to fig. 3.

### Maintenance:

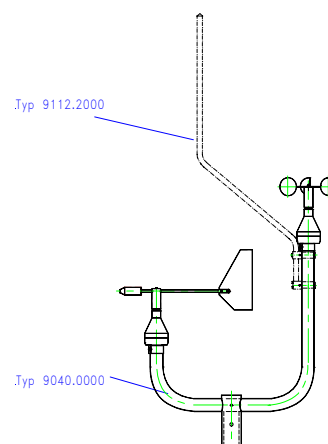
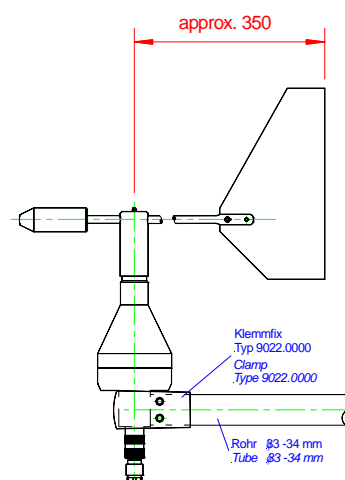
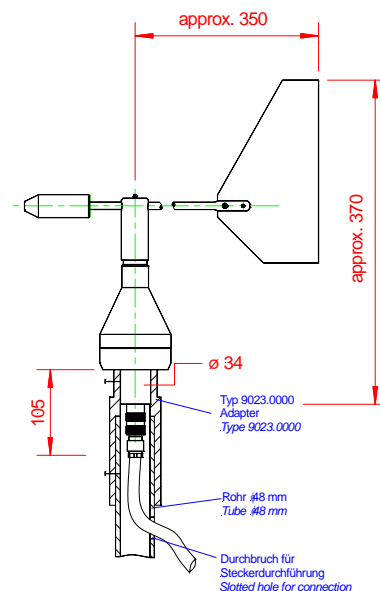
The wind direction sensor type 4123 operates maintenance-free!

Ball bearings, however, are subject to attrition. Their live time strongly depends on the ambient conditions, such as: average wind speed, pollution, vibration etc.. Therefore an occasional check for plausibility (during low wind speed) is recommended: If a decrease of sensitivity is detected, the shaft / ball bearing assembly will have to be replaced.

In case of remote sites with difficult access conditions, for example high measuring towers or wind turbines, an individual service schedule should be issued, including preventive replacement of the bearings, for example every 2 years.

**Fig. 2: Mounting options**

(standard from – stock solutions)



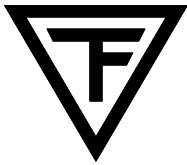
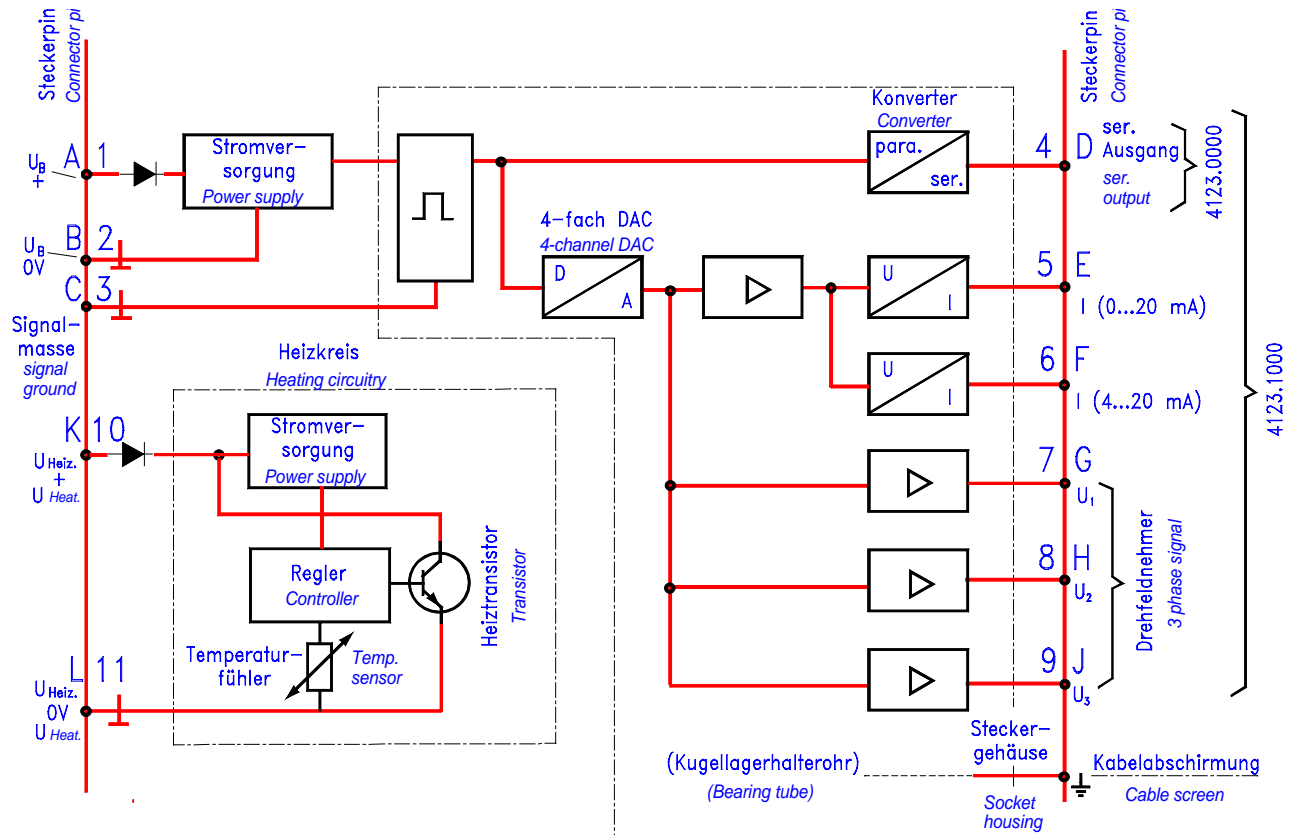
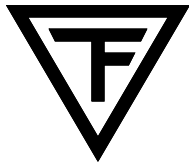


Fig. 3: Block diagram / Connection plan





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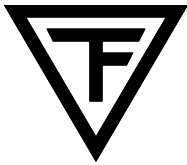
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## Graycodetabelle

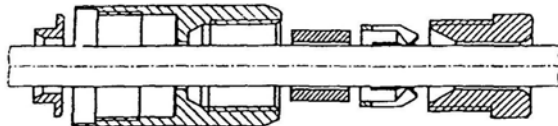
Winkel	Graycode
2,5	127
5,0	126
7,5	124
10,0	125
12,5	121
15,0	120
17,5	122
20,0	123
22,5	115
25,0	114
27,5	112
30,0	113
32,5	117
35,0	116
37,5	118
40,0	119
42,5	103
45,0	102
47,5	100
50,0	101
52,5	97
55,0	96
57,5	98
60,0	99
62,5	107
65,0	106
67,5	104
70,0	105
72,5	109
75,0	108
77,5	110
80,0	111
82,5	79
85,0	78
87,5	76
90,0	77
92,5	73
95,0	72
97,5	74
100,0	75
102,5	67
105,0	66
107,5	64
110,0	65
112,5	69
115,0	68
117,5	70
120,0	71

Winkel	Graycode
122,5	87
125,0	86
127,5	84
130,0	85
132,5	81
135,0	80
137,5	82
140,0	83
142,5	91
145,0	90
147,5	88
150,0	89
152,5	93
155,0	92
157,5	94
160,0	95
162,5	31
165,0	30
167,5	28
170,0	29
172,5	25
175,0	24
177,5	26
180,0	27
182,5	155
185,0	154
187,5	152
190,0	153
192,5	157
195,0	156
197,5	158
200,0	159
202,5	223
205,0	222
207,5	220
210,0	221
212,5	217
215,0	216
217,5	218
220,0	219
222,5	211
225,0	210
227,5	208
230,0	209
232,5	213
235,0	212
237,5	214
240,0	215

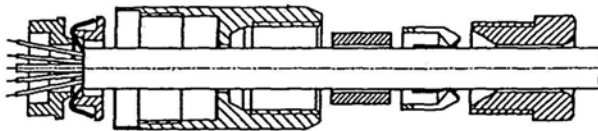
Winkel	Graycode
242,5	199
245,0	198
247,5	196
250,0	197
252,5	193
255,0	192
257,5	194
260,0	195
262,5	203
265,0	202
267,5	200
270,0	201
272,5	205
275,0	204
277,5	206
280,0	207
282,5	239
285,0	238
287,5	236
290,0	237
292,5	233
295,0	232
297,5	234
300,0	235
302,5	227
305,0	226
307,5	224
310,0	225
312,5	229
315,0	228
317,5	230
320,0	231
322,5	247
325,0	246
327,5	244
330,0	245
332,5	241
335,0	240
337,5	242
340,0	243
342,5	251
345,0	250
347,5	248
350,0	249
352,5	253
355,0	252
357,5	254
360,0	255



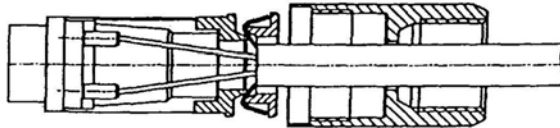
## Montageanleitung, Gegenstecker Handling instruction, Connector



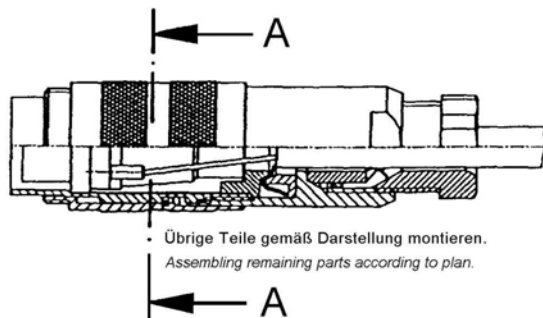
Teile auffädeln  
*stringing parts*



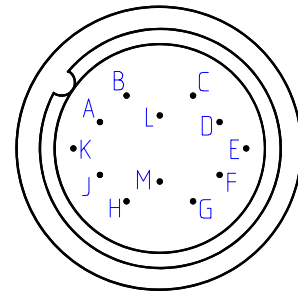
Abisolieren Schirm aufweiten,  
Schirmklemmring montieren.  
*Stripping, widening of shield,  
assembling shield clamping ring.*



Litze anlöten, Distanzhülse überschnappen,  
überstehenden Schirm abschneiden.  
*Soldering wire, tripping distance bush,  
cutting off projecting shield.*



• Übrige Teile gemäß Darstellung montieren.  
*Assembling remaining parts according to plan.*



Section A-A, magnified

Technical data are subject to change!