Vector Instruments

ROTOR CALIBRATION

TEST CERTIFICATE

Rotor serial number: E1F2

Rotor calibration, R: 45.8 rpm per m/s

Inspector: 3

Date: 06.12.10

Type (R30 unless specified):

Re-calibration: ☐ Repair: ☐

Copy of previous calibr.: ☐

Speed band (M, K, K2 or S): M

METHOD

The above rotor has been calibrated in a wind tunnel by comparison with a standard rotor held by V.I. which in turn is periodically calibrated by BMT Teddington (formerly a part of the NPL), the A100 series anemometer being mounted on a 1" (25.4mm) diameter unguyed pole using a type 405 top fitting. The above calibration figure has been obtained by comparison at one airspeed (9m/s) to an accuracy of 1%. A figure for 'R' at other speeds can be deduced from the characteristic curve for this design of rotor tabulated overleaf, it being unnecessary for many practical purposes to calibrate the anemometer over a range of speeds.

SPEED BANDS

All rotors are mechanically interchangeable between the different types of anemometer, but because different units of windspeed are used, and spread of tolerances in production, it is necessary to assign each anemometer its dedicated rotor. The four speed bands, M, K, K2 or S, signify the type of use, or units of windspeed.

Band	Units	Anemometer Type	Range of R
M	m/s	A100M, A101M, A100H	45.7 - 46.6
K	knots	A100K, A100	46.2 - 47.0
K2	knots	A100L2	46.4 - 46.8
S	wind run	A100S, A100R	47.6 - 48.4

OPERATION

Rotors are fitted with a unique gravity fastening device in which positive locking to the spindle is obtained by pressing the hub with a force of approximately 1.5KgF while the anemometer is held upright.
Removal is achieved only by first inverting the instrument, again pressing the hub, and releasing.

SPECIFICATION

Rotor type:	3-cup, clockwise rotation viewed from above
Duty:	All-weather, continuous exposure.
Temperature range:	-50 to +70 degrees C
Max. wind speed:	75 m/s
Materials:	Cups: Weather-resisting plastics Hub, arms: Anodized aluminium alloys.
Response:	2.3m +/- 10% (distance constant)
Dimensions:	Diameter: 150mm. Height: 50mm
Weight:	31g

TABULATED DATA

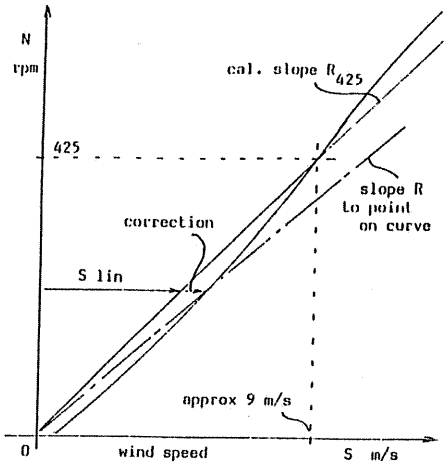
The calibration slope 'R' at 425 rpm is given above for the accompanying rotor. Using this figure, the windspeed can be accurately determined at 425 rpm, e.g. for the cal. figure R_{425} of 47.0 rpm per m/s, the windspeed is:

S = 425 / 47.0 = 9.043 m/s (see column 3 of the table overleaf)

To obtain the corresponding windspeed for the accompanying rotor, use the figure for R given at the head of this page.
As a first approximation, windspeeds may be determined for other r.p.m.'s by assuming a linear relationship as has been done in col. 4 of the table. However, as the rotor response is not quite linear, a slightly different slope is applied at each rotor speed, and the ratio of slopes 'F' is listed in col. 2 of the table. The true windspeeds 'S' have then been calculated for our typical 47.0 rpm rotor.
The differences between the true speeds and the assumed linear speeds are listed in col. 5, and these may be applied as a correction to the assumed linear response to obtain true windspeed for any rotational rate of the rotor.
Strictly, the correction should be re-calculated for each rotor, but in practice the error resulting from use of the figures in col. 5 of the table, will be less than 0.1% for the available range of rotor speeds (45.7 - 48.4 rpm)
The complete table, or a part of it as necessary for the required accuracy, may be entered into a computer, and linear interpolation used to calculate the corrected windspeed.

R30 ROTOR CALIBRATION DATA

N rpm	F ratio	S m/s	S lin.	Correction m/s
1	0.211	0.101	0.021	0.080
2	0.346	0.123	0.043	0.080
5	0.569	0.187	0.106	0.081
10	0.719	0.296	0.213	0.083
20	0.829	0.513	0.426	0.087
40	0.901	0.945	0.851	0.094
50	0.916	1.161	1.064	0.097
60	0.927	1.377	1.277	0.100
80	0.942	1.807	1.702	0.105
100	0.9515	2.236	2.128	0.108
120	0.9588	2.663	2.553	0.110
150	0.9667	3.301	3.191	0.110
200	0.9764	4.358	4.255	0.103
250	0.9834	5.409	5.319	0.090
300	0.9892	6.453	6.383	0.070
350	0.9940	7.492	7.447	0.045
400	0.9982	8.526	8.511	0.015
425	1.0000	9.043	9.043	0
450	1.0017	9.558	9.574	-0.016
500	1.0047	10.589	10.638	-0.049
550	1.0072	11.618	11.702	-0.084
600	1.0095	12.646	12.766	-0.120
650	1.0116	13.671	13.830	-0.159
700	1.0134	14.697	14.894	-0.197
750	1.0150	15.722	15.957	-0.235
800	1.0164	16.747	17.021	-0.274
850	1.0176	17.772	18.085	-0.313
900	1.0188	18.796	19.149	-0.353
950	1.0198	19.820	20.213	-0.393
1000	1.0209	20.841	21.277	-0.436
1100	1.0228	22.883	23.404	-0.521
1200	1.0243	24.926	25.532	-0.606
1300	1.0256	26.969	27.660	-0.691
1400	1.0267	29.013	29.787	-0.774
1500	1.0276	31.058	31.915	-0.857
1600	1.0279§	33.119§	34.043	-0.924§
1750	1.0277§	36.230§	37.234	-1.004§
1900	1.0272§	39.355§	40.426	-1.071§
2200	1.0257§	45.636§	46.809	-1.173§
2600	1.0232§	54.065§	55.319	-1.254§
2750	1.0222§	57.240§	58.511	-1.271§
3100¶	1.0198	64.677	65.957	-1.280
3300¶	1.0184	68.944	70.213	-1.269
3500¶	1.0170	73.223	74.468	-1.245
3700¶	1.0156	77.514	78.723	-1.209



AMBIENT CONDITIONS

P: 760mm Hg
T: 15°C

For other conditions use:

$$Re_1 = Re_s \left(\frac{\mu s \cdot rho\,1}{\mu_1 \cdot rho_s} \right)$$

$Re_s = 37.0\,N$

(Re based on cup speed and effective diameter)

1 refers to new conditions
s refers to standard conds.
μ is static viscosity of air
rho is air density
(F in table depends only on Re)

¶ extrapolated. § amended 14.10.94

$$\text{Ratio } F = \frac{R}{R_{425}}$$

where R is slope from origin to point on curve.
R425 is slope to point at calibration rpm.

$$\text{Wind speed } S = \frac{N}{F \times R_{425}}$$

R425 is given a value of 47rpm per m/s in col. 3 of the above table.

$$Slin = \frac{N}{R_{425}}$$

Wind speed obtained assuming constant linear relationship.

The correction (m/s) in the above table shows the amount to be added to S lin. to obtain true wind speed, again in the case of a rotor having a calibration slope of 47.0 rpm per m/s.

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A100 Series Anemometers
- Calibration Data & Operating Instructions

QA By Date 6/12/10 (3)

Type/Options..... :

Anemometer Serial Number ..... : 5187
Ratemeter Module (PL5) S/N..... : 1302
Ratemeter Calibration (S)..... : 100·07 Hz/V
Type of disc fitted (K or M)..... : M. (K = 25 slot, M = 13 slot)

Rotor Serial Number..... : E1F2 (matching rotor initially supplied) (refer to rotor cal sheet for full information)
Rotor Calibration (R)..... : 45·8 rpm/ metre per second

Pulse output frequency (f): = 13R/60 Hz per m/s for disc M, or = 25R/60 Hz per m/s for disc K

With standard connection for d.c. output,
Output Voltage (V_o) = f/S Volts/metre-per-second, or = f/1.9426 S Volts/Knot

i.e. **Output Voltage (V_o) ..... : 99·2 mV / metre per second**

30 Second Averaged Output? ..... : no

Operating Instructions

1. To fit the rotor, remove the white protector tube and, with the anemometer approximately vertical, lightly push the rotor onto spindle .

2. To remove the rotor, first invert the instrument, press the rotor hub to release the gravity sensitive catch, and allow the rotor to slide off. Excessive force should not be used.

3. Mount the instrument, screwing it securely to mast top using a ¼ inch BSW screw directly into the base of the anemometer (or use Mast Adaptor 405). The screw should not enter more than 0.38 inches; use of an excessively long screw may result in internal damage. Alternatively a Taper Spigot (128-1) and Taper Adaptor (405T) will allow rapid removal and replacement in portable applications. The anemometer also accepts a standard tripod fitting.

4. Wire to base station :

WIRE COLOUR	WIRE FUNCTION	MODULE PIN
RED	POSITIVE SUPPLY : 10V TO 30V DC*	VCC
BLUE	NEGATIVE SUPPLY (0V)	GND
GREEN	ANALOGUE VOLTAGE OUTPUT POSITIVE NOMINALLY 0-10V = 0-100KTS(A100) OR 0-7.5V = 0-75M/S(A100H)	VOUT
YELLOW	OUTPUT NEGATIVE (COMMON, CONNECTED TO BLUE INTERNALLY)	GND
WHITE	CAL/RD, CONNECT TO NEGATIVE SUPPLY FOR NORMAL OPERATION ('READ'), INJECT 2V RMS SINEWAVE VIA 1uF (NON-POLARISED) CAPACITOR TO CALIBRATE ('CAL').	CAL/RD
BLACK	CONNECTS TO BASEPLATE/BODY OF INSTRUMENT	N/A
SCREEN	CABLE SCREEN (INSULATED AT INSTRUMENT), CONNECT TO EARTH OR TO BLUE WIRE AT TERMINAL EQUIPMENT FOR MAXIMUM INTERFERENCE SCREENING.	N/A

* Note that the anemometer calibration remains valid for supplies down to 10V, however the maximum analog output voltage is limited to approx. 0.5V below the supply.

Note that the frequency signal proportional to windspeed is available on the ACOUT pin. This pin is normally not connected but this squarewave signal (0v low, 7½V high) can be used if required, in addition to or instead of the analog output.

Recommended service intervals for optimum instrument life and accuracy are:

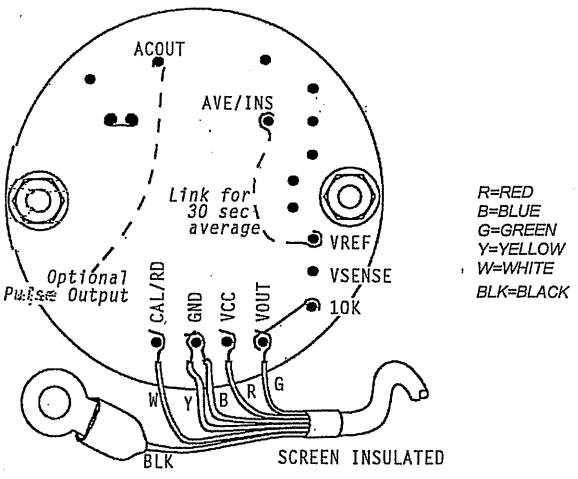
New bearings every ..... 2 or 3 years
Recalibration every ..... 5 or 6 years
Full refurbishment every ... 8 or 9 years

(...these figures are for a typical inland site, more regular servicing will be required for marine installations and sites with heavy atmospheric pollution).

If an extension cable, new instrument cable, overhaul, spares, repair or recalibration is required contact our sales desk. Suitable extension cable is DEF61-12 parts 4&5 7-2-6C collectively screened, typ. 90mΩ/m/core.

Additional application information is available on request from our sales desk, for example:

Ref. 020-001 ...Lightning protection advice.
Ref. 020-004 ...Instrument siting advice.
Ref. 014-105 ...Changing output range & fitting surge protection (PC3 circuit option).
Ref. 014-106 ...Alternative output connections.
Ref. 013-101 ...Regular user maintainance of anemometer.
Ref: 011-101 ...General Arrangement & Parts List



Conversion Factors:
1 metre/sec = 1.9426 Knots = 3.60 Km/Hr = 2.237 Miles Per Hour

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