

## Technical Data

### Measurement Principle

The movement of a balance wheel is followed with a high speed camera up to object speeds of 0.9m/s. The surface roughness of the balance wheel's rim generates the contrast followed by the optical system in real time.

### Measurement Modes and User Interface Display Settings

#### Driven mode

- Instantaneous rate, amplitude, knocking detection (*rebat*).
- Acquisition time limit: None, indefinite recording.

#### Free mode

- Instantaneous rate, amplitude, quality factor, isochronisms.
- Acquisition time limit: 10min (factory setting – can be modified on customer request).

### Frequency Determination

Frequency measuring range: 0.1-500Hz  
 Frequency accuracy:  $<10^{-6}$ Hz<sup>(a)</sup>

### Rate Accuracy

Rate measuring range:  $\pm 9999$ s/d<sup>(\*)</sup>  
 Rate accuracy: 0.1s/d<sup>(a)</sup>

### Amplitude Determination

Amplitude measuring range: 0.1°-400°<sup>(\*)</sup>  
 Amplitude accuracy: 0.1°

### Measurement Options

- Standard balance wheel mode. Interruption of signal of up to 40% of amplitude sweep.
- Interrupted balance wheel mode. Interruption of signal of up to 75% of amplitude sweep.
- Rotating cage mode (e.g. *Tourbillon* coaxial).

The modes "Interrupted balance wheel" and "Rotating cage" can be simultaneously applied.

### Software Data Base Integration Options

- Caliber and Operator ID databases.

### Software Export Options

- Standard report template.
- User customizable reports.
- Raw data export as csv files.

### Gyroscopic Frame

- $\pm 0.45^\circ$  angular accuracy.

### Technical Details

Time base: Quartz, voltage controlled, VCOCXO  
 Stability:  $\pm 20$ ppb between 0° and 70°C  
 Ageing: daily  $\pm 10$ ppb; 1<sup>st</sup> year  $\pm 300$ ppb  
 Freq. tolerance: 20yrs  $\pm 4.6$ ppm  
 Warm up time: 60s (25°C)

Casing: Aluminum, black anodized  
 Dimensions: 60 x 71 x 66 cm<sup>3</sup> (w x h x d)  
 Weight: 30kg  
 Interface: 1 micro USB (for non-motorized version) or 2 USB Type B (for motorized version)  
 Mains connection: Universal adapter 100-240V AC / 50-60Hz with 24V DC output

### Operation conditions

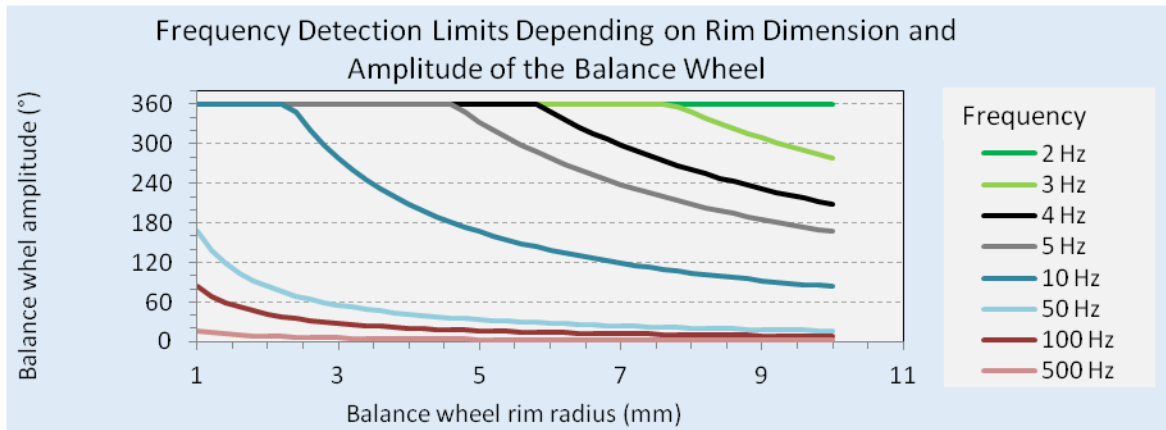
Temperature: 0°-55°C  
 Humidity: Above dew point for chosen temperature

(a) The correlation between rim dimension and amplitude of the balance wheel and the maximum frequency for the stated frequency and rate accuracies is visualized in the annexed table.

(\*) The upper limits are display limits only and can be augmented on customer request.

Correlation between rim dimension (radius), amplitude of the balance wheel and the corresponding frequency limit for a rate accuracy of  $10^{-6}$ Hz. Amplitudes above  $400^\circ$  are given as  $400^\circ$ .

Amplitude ( $^\circ$ )	Maximum Frequency (Hz) to maintain stated accuracy																					
	2	3	4	5	6	7	8	9	10	20	30	40	50	60	70	80	90	100	200	300	400	500
1,00	400	400	400	400	400	400	400	400	400	400	278	208	167	139	119	104	93	83	42	28	21	17
1,20	400	400	400	400	400	400	400	400	400	347	232	174	139	116	99	87	77	69	35	23	17	14
1,40	400	400	400	400	400	400	400	400	400	298	199	149	119	99	85	74	66	60	30	20	15	12
1,60	400	400	400	400	400	400	400	400	400	261	174	130	104	87	74	65	58	52	26	17	13	10
1,80	400	400	400	400	400	400	400	400	400	232	154	116	93	77	66	58	51	46	23	15	12	9
2,00	400	400	400	400	400	400	400	400	400	208	139	104	83	69	60	52	46	42	21	14	10	8
2,20	400	400	400	400	400	400	400	400	379	190	126	95	76	63	54	47	42	38	19	13	9	8
2,40	400	400	400	400	400	400	400	386	347	174	116	87	69	58	50	43	39	35	17	12	9	7
2,60	400	400	400	400	400	400	400	356	321	160	107	80	64	53	46	40	36	32	16	11	8	6
2,80	400	400	400	400	400	400	372	331	298	149	99	74	60	50	43	37	33	30	15	10	7	6
3,00	400	400	400	400	400	397	347	309	278	139	93	69	56	46	40	35	31	28	14	9	7	6
3,20	400	400	400	400	400	372	326	290	261	130	87	65	52	43	37	33	29	26	13	9	7	5
3,40	400	400	400	400	400	350	307	272	245	123	82	61	49	41	35	31	27	25	12	8	6	5
3,60	400	400	400	400	386	331	290	257	232	116	77	58	46	39	33	29	26	23	12	8	6	5
3,80	400	400	400	400	366	313	274	244	219	110	73	55	44	37	31	27	24	22	11	7	5	4
4,00	400	400	400	400	347	298	261	232	208	104	69	52	42	35	30	26	23	21	10	7	5	4
4,20	400	400	400	397	331	284	248	221	199	99	66	50	40	33	28	25	22	20	10	7	5	4
4,40	400	400	400	379	316	271	237	211	190	95	63	47	38	32	27	24	21	19	9	6	5	4
4,60	400	400	400	363	302	259	227	201	181	91	60	45	36	30	26	23	20	18	9	6	5	4
4,80	400	400	400	347	290	248	217	193	174	87	58	43	35	29	25	22	19	17	9	6	4	3
5,00	400	400	400	334	278	238	208	185	167	83	56	42	33	28	24	21	19	17	8	6	4	3
5,20	400	400	400	321	267	229	200	178	160	80	53	40	32	27	23	20	18	16	8	5	4	3
5,40	400	400	386	309	257	221	193	172	154	77	51	39	31	26	22	19	17	15	8	5	4	3
5,60	400	400	372	298	248	213	186	165	149	74	50	37	30	25	21	19	17	15	7	5	4	3
5,80	400	400	359	288	240	205	180	160	144	72	48	36	29	24	21	18	16	14	7	5	4	3
6,00	400	400	347	278	232	199	174	154	139	69	46	35	28	23	20	17	15	14	7	5	3	3
6,20	400	400	336	269	224	192	168	149	134	67	45	34	27	22	19	17	15	13	7	4	3	3
6,40	400	400	326	261	217	186	163	145	130	65	43	33	26	22	19	16	14	13	7	4	3	3
6,60	400	400	316	253	211	180	158	140	126	63	42	32	25	21	18	16	14	13	6	4	3	3
6,80	400	400	307	245	204	175	153	136	123	61	41	31	25	20	18	15	14	12	6	4	3	2
7,00	400	397	298	238	199	170	149	132	119	60	40	30	24	20	17	15	13	12	6	4	3	2
7,20	400	386	290	232	193	165	145	129	116	58	39	29	23	19	17	14	13	12	6	4	3	2
7,40	400	376	282	225	188	161	141	125	113	56	38	28	23	19	16	14	13	11	6	4	3	2
7,60	400	366	274	219	183	157	137	122	110	55	37	27	22	18	16	14	12	11	5	4	3	2
7,80	400	356	267	214	178	153	134	119	107	53	36	27	21	18	15	13	12	11	5	4	3	2
8,00	400	347	261	208	174	149	130	116	104	52	35	26	21	17	15	13	12	10	5	3	3	2
8,20	400	339	254	203	169	145	127	113	102	51	34	25	20	17	15	13	11	10	5	3	3	2
8,40	400	331	248	199	165	142	124	110	99	50	33	25	20	17	14	12	11	10	5	3	2	2
8,60	400	323	242	194	162	139	121	108	97	48	32	24	19	16	14	12	11	10	5	3	2	2
8,80	400	316	237	190	158	135	118	105	95	47	32	24	19	16	14	12	11	9	5	3	2	2
9,00	400	309	232	185	154	132	116	103	93	46	31	23	19	15	13	12	10	9	5	3	2	2
9,20	400	302	227	181	151	129	113	101	91	45	30	23	18	15	13	11	10	9	5	3	2	2
9,40	400	296	222	177	148	127	111	99	89	44	30	22	18	15	13	11	10	9	4	3	2	2
9,60	400	290	217	174	145	124	109	97	87	43	29	22	17	14	12	11	10	9	4	3	2	2
9,80	400	284	213	170	142	122	106	95	85	43	28	21	17	14	12	11	9	9	4	3	2	2
10,00	400	278	208	167	139	119	104	93	83	42	28	21	17	14	12	10	9	8	4	3	2	2



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