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X = mean value rate

Calculation of the mean value - Rate

	Rate	Beat error	Amplitude
HH - CH	9.1		
HB - CB	10		
VB - 9H	8.3		
VG - 6H	3.2		
VH - 3H	7.2		
VD - 12H	11.2		
X	8.2		
D	8		
DVH	-2.1		
Di	-5.9		
Im		N	

	Rate
HH - CH	9.1
HB - CB	10
VB - 9H	8.3
VG - 6H	3.2
VH - 3H	7.2
VD - 12H	11.2
X =	Sum divided by the number of test positions
X =	(HH + HB + VB + VG +VH + VD) : 6
X =	(9,1 + 10 + 8,3 + 3,2 + 7,2 + 11,2) : 6
X =	49 / 6 test positions
X =	8.2

Calculation of the mean value - Beat error

	Rate	Beat error	Amplitude
HH - CH		0	
HB - CB		0	
VB - 9H		0.1	
VG - 6H		0.1	
VH - 3H		0.1	
VD - 12H		0.1	
X		0.1	
D		0.1	
DVH			
Di			
Im		N	

	Beat error
HH - CH	0
HB - CB	0
VB - 9H	0.1
VG - 6H	0.1
VH - 3H	0.1
VD - 12H	0.1
X =	Sum divided by the number of test position
X =	(HH + HB + VB + VG +VH + VD) : 6
X =	(0 + 0 + 0,1 + 0,1 + 0,1 + 0,1) : 6
X =	0.4 / 6 test positions
X =	0.1

Calculation of the mean value - Amplitude

	Rate	Beat error	Amplitude
HH - CH			298
HB - CB			294
VB - 9H			287
VG - 6H			283
VH - 3H			287
VD - 12H			278
X			288
D			20
DVH			-12
Di			
Im		N	

	Amplitude
HH - CH	298
HB - CB	294
VB - 9H	287
VG - 6H	283
VH - 3H	287
VD - 12H	278
X =	Sum divided by the number of test position
X =	(HH + HB + VB + VG +VH + VD) : 6
X =	(298 + 294 + 287 + 283 + 287 + 278) : 6
X =	1727 / 6 test positions
X =	288

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D = max. difference between the test positions

Calculation of difference DELTA - Rate

	Rate	Beat error	Amplitude
HH - CH	9.1		
HB - CB	10		
VB - 9H	8.3		
VG - 6H	3.2		
VH - 3H	7.2		
VD - 12H	11.2		
X	8.2		
D	8		
DVH	-2.1		
Di	-5.9		
Im		N	

	Rate
HH - CH	9.1
HB - CB	10
VB - 9H	8.3
VG - 6H	**3.2**
VH - 3H	7.2
VD - 12H	**11.2**
D =	**Difference between the largest and the smallest value**
D =	11.2 (VD) - 3.2 (VG)
D =	**8.0**

Calculation of difference DELTA - Beat error

	Rate	Beat error	Amplitude
HH - CH		0	
HB - CB		0	
VB - 9H		0.1	
VG - 6H		0.1	
VH - 3H		0.1	
VD - 12H		0.1	
X		0.1	
D		0.1	
DVH			
Di			
Im		N	

	Beat error
HH - CH	**0**
HB - CB	0
VB - 9H	**0.1**
VG - 6H	0.1
VH - 3H	0.1
VD - 12H	0.1
D =	**Difference between the largest and the smallest value**
D =	0.1 (VB) - 0 (CH)
D =	**0.1**

Calculation of difference DELTA - Amplitude

	Rate	Beat error	Amplitude
HH - CH			298
HB - CB			294
VB - 9H			287
VG - 6H			283
VH - 3H			287
VD - 12H			278
X			288
D			20
DVH			-12
Di			
Im		N	

	Amplitude
HH - CH	**298**
HB - CB	294
VB - 9H	287
VG - 6H	283
VH - 3H	287
VD - 12H	**278**
D =	**Difference between the largest and the smallest value**
D =	298 (HH) - 278 (VD)
D =	**20.0**

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DVH = Difference between the mean values of vertical an horizontal test positions

Calculation of the difference DVH - Rate

	Rate	Beat error	Amplitude
HH - CH	9.1		
HB - CB	10		
VB - 9H	8.3		
VG - 6H	3.2		
VH - 3H	7.2		
VD - 12H	11.2		
X	8.2		
D	8		
DVH	-2.1		
Di	-5.9		
Im		N	

	Rate
HH - CH	9.1
HB - CB	10
VB - 9H	8.3
VG - 6H	3.2
VH - 3H	7.2
VD - 12H	11.2	
DVH =	Difference between the mean values of vertical and horizontal test positions
DVH =	((VB+VG+VH+VD)/4) - ((HH+HB)/2)
DVH =	((8,3 + 3,2 + 7.2 + 11,2) / 4) - ((9,1 + 10) / 2)
DVH =	7,5 - 9,6
DVH =	-2.1

Calculation of the difference DVH - A

Beat error

	Rate	Beat error	Amplitude
HH - CH			298
HB - CB			294
VB - 9H			287
VG - 6H			283
VH - 3H			287
VD - 12H			278
X			288
D			20
DVH			-12
Di			
		N	

	Amplitude
HH - CH	298
HB - CB	294
VB - 9H	287
VG - 6H	283
VH - 3H	287
VD - 12H	278
DVH =	Difference between the mean values of vertical and horizontal test positions
DVH =	((VB+VG+VH+VD)/4) - ((HH+HB)/2)
DVH =	((287 + 283 + 287 + 278) / 4) - ((298 + 294) / 2)
DVH =	284 - 296
DVH =	-12

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Di = Delta Isochronism

Calculation of the difference Di - Rate

	Rate	Beat error	Amplitude
HH - CH	9.1		
HB - CB	10		
VB - 9H	8.3		
VG - 6H	3.2		
VH - 3H	7.2		
VD - 12H	11.2		
X	8.2		
D	8		
DVH	-2.1		
Di	-5.9		
Im		**N**	

	Rate
HH - CH	**9.1**
HB - CB	10
VB - 9H	8.3
VG - 6H	**3.2**
VH - 3H	7.2
VD - 12H	11.2
Di	**Rate difference between the best positions VG and HH**
	3.2 (VG) - 9.1 (HH)
Di =	**-5.9**

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Imax = Calculation of the isochronism

measurement 0h

	Rate	Beat error	Amplitude
HH - CH	9.1		
HB - CB	10		
VB - 9H	8.3		
VG - 6H	3.2		
VH - 3H	7.2		
VD - 12H	11.2		
X			
D			
DVH			
Di			
Im		**N**	

measurement 24h

	Rate	Beat error	Amplitude
HH - CH	8.6		
HB - CB	11.7		
VB - 9H	11.2		
VG - 6H	2.6		
VH - 3H	6.7		
VD - 12H	11.1		
X			
D			
DVH			
Di			
Im	-2.9	**N**	

The isochronism is the difference between the current measured rate value and the rate value after 24h

Imax is the parent value of all test positions

	Rate 0h	Rate 24h		Amplitude	
HH - CH	9.1	8.6	Iso = 9,1 - 8,6 =	0.5	
HB - CB	10	11.7	Iso = 10 - 11,7 =	-1.7	
VB - 9H	8.3	11.2	Iso = 8,3 - 11,2 =	**-2.9**	**= Imax**
VG - 6H	3.2	2.6	Iso = 3,2 - 2,6 =	0.6	
VH - 3H	7.2	6.7	Iso = 7,2 - 6,7 =	0.5	
VD - 12H	11.2	11.1	Iso = 11,2 - 11,1 =	0.1	
X					
D					
Di					
Im		**-2.9**			

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Calculation of the quality factor N

Fonction index FM (according to NIHS 93-10)

As lower the quality factor N is, as better the watch movement

measurement 0h

	Rate	Beat error	Amplitude
HH - CH	9.1	0	298
HB - CB	10	0	294
VB - 9H	8.3	0.1	287
VG - 6H	3.2	0.1	283
VH - 3H	7.2	0.1	287
VD - 12H	11.2	0.1	278
X	8.2	0.1	288
D	**8**	0.1	20
DVH	-2.1		-12
Di	-5.9		
Im		**N**	

measurement 24h

	Rate	Beat error	Amplitude
HH - CH	8.6	0	298
HB - CB	11.7	0	286
VB - 9H	11.2	0.1	264
VG - 6H	2.6	0.1	268
	6.7	0.1	275
VD - 12H	11.1	0.1	279
X	8.7	0.1	278
D	9.1	0.1	34
DVH	-2.3		-20
Di	-6		
Im	**-2.9**	**N**	1.8

The quality factor N is calculated according to the criteria listed below:

1) Iscochronism error (Im)
2) Delta value of rate measurement (Pmax)
3) Thermal coefficient (C)
4) mean value of daily rate

Values of the first three criteria marked with a coefficient are added together, the quality factor.

As rare a thermal cabinet is available, it is generally not possible to determine the thermal coefficient. We recommend inserting the maximum thermal coefficient which is guaranteed from the hair spriing manufacturer, i.e. for quality 1: C = 0.6

$$N = 0{,}15 * [Imax] + 0.1 * Pmax + C$$

Imax	=	Absolut value of the maximum isochronism
Pmax	=	is the absolute maximum value of the rate difference of all measured test positions 0h (Delta à 0h)
C	=	thermal coefficient

$$N = 0{,}15 * 2.9 + 0.1 * 8 + 0{,}6$$

$$N = 1.8$$

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Quality Factor N (CTM)

Fm Function index (NIHS 93-10)

N = 0.15 * Imax + 0.1 * Pmax + C

N = Quality factor (Fm function index)
Imax = Largest isochronism error (absolute value)
Pmax = Test position error
C = Thermal coefficient

As lower the quality factor N is, as better the watch movement

Beispiel:

Test position	$M0_{T1}$ 0h, 23° C [s/d]	$M24_{T1}$ 24h, 23° C [s/d]	$M0_{T2}$ 0h, 38° C [s/d]	I	Coefficient	CTM Index
ZO	9.1	8.6		0.5		
VB - 9H	8.3	11.2		-2.9		
VG - 6H	3.2	2.6	12.2	0.6		Beat error
VH - 3H	7.2	6.7		0.5		
Imax (Abs)				2.9	0.15	0.4
Pmax	5.9				0.1	0.6
C						0.6
N						**1.6**

$C = M0_{T2} - M0_{T1} / T2 - T1$

For the pieces tested with the device CM10, CM20 or PC10 occur a 0h and 24h measurement at current room temperature (~23°C).

As rare a thermal cabinet is available, it is generally not possible to determine the thermal coefficient. We recommend inserting the maximum thermal coefficient which is guaranteed from the hair spriing manufacturer, i.e. for quality 1: C = 0.6