

Watch Movement Specification and Drawing

SOLAR SERIES

Cal. VS54A

Movement Size

13 1/2'''

Casing Diameter

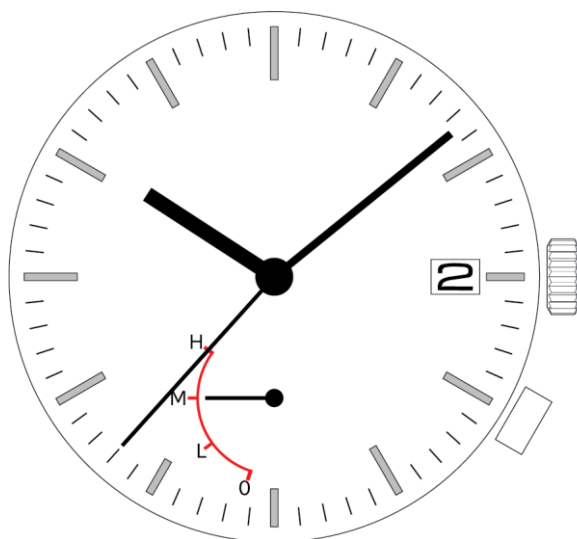
Ø 30.6mm

Height

4.52mm

Running Time

Approx. 5 months



Date: 4/Aug./'23

Cal. VS54A

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1. Solar-powered watch

This watch is a solar-powered watch containing a solar cell underneath the dial to convert any form of light into " electrical energy" and store the power in a secondary battery.

2. Eliminating the need for battery replacement

Unlike conventional quartz watches, this watch does not use a silver oxide battery, thus eliminating the need for battery replacement.

3. You can use the dial which light transmittance is more than 20%

It is possible to assemble the dial which transmits light on the solar cell.

It enabled to cover the solar cell color, and you can design variety colors of dials.

4. Running time

Expected running time from full charge to stoppage will be around 5 months.

5. Battery indicator

Always display the power storage level.

Improve the convenience of solar watch.

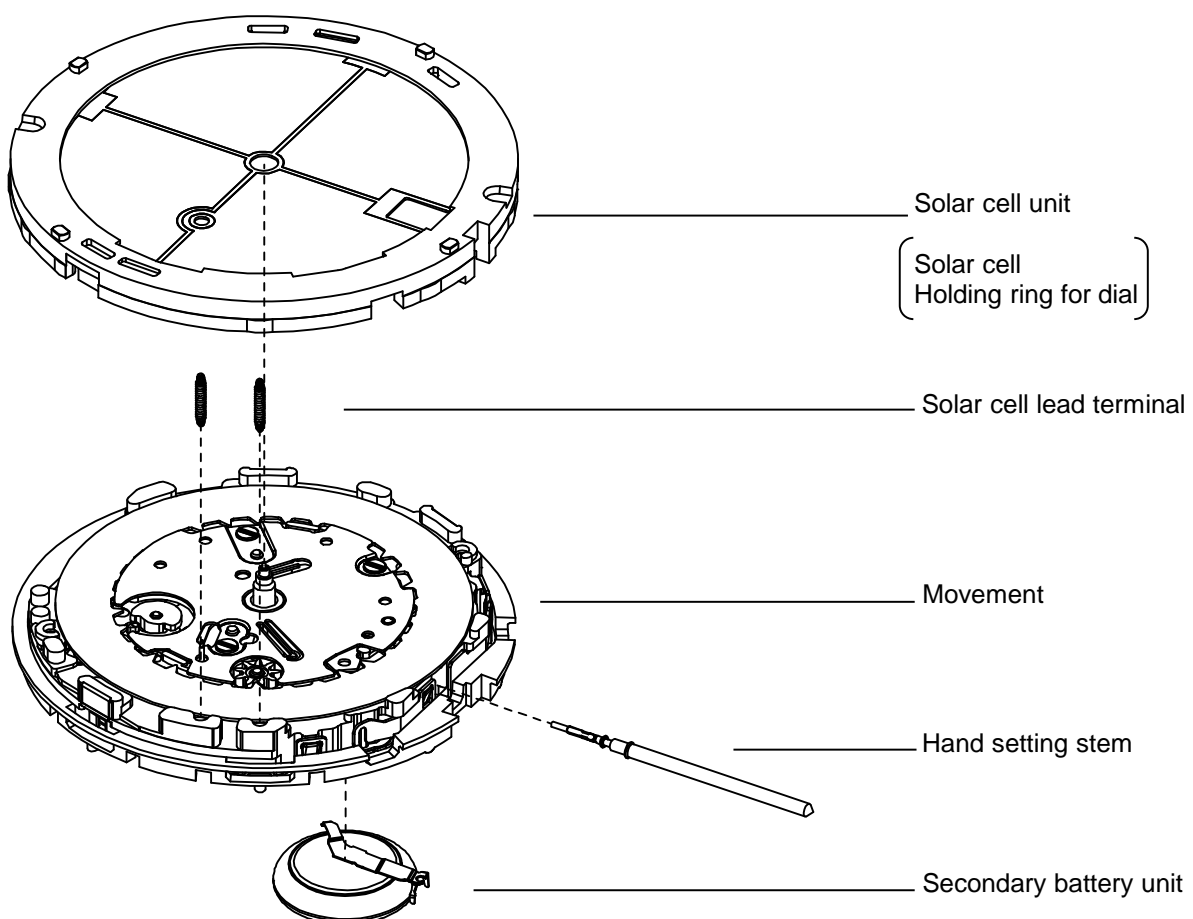
6. Power depletion warning function

The two-second intervals movement of the second hand is a signal of energy depletion.

The watch continuous running time after two-second intervals movement is approximately 10 days.

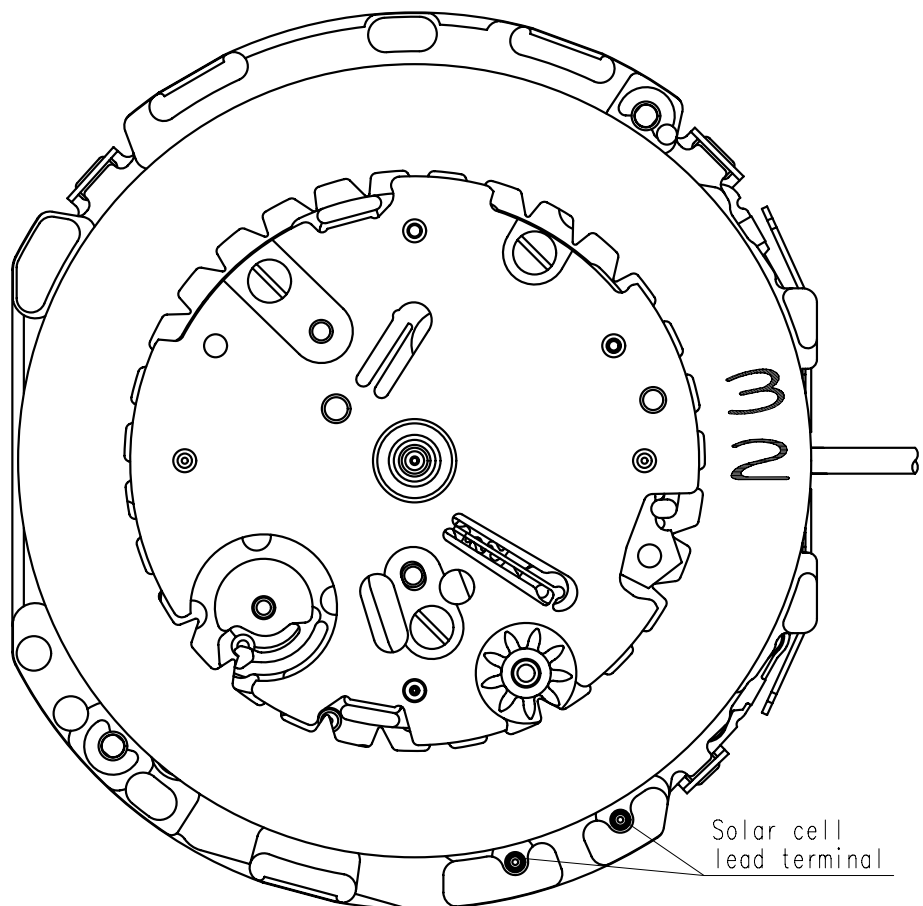
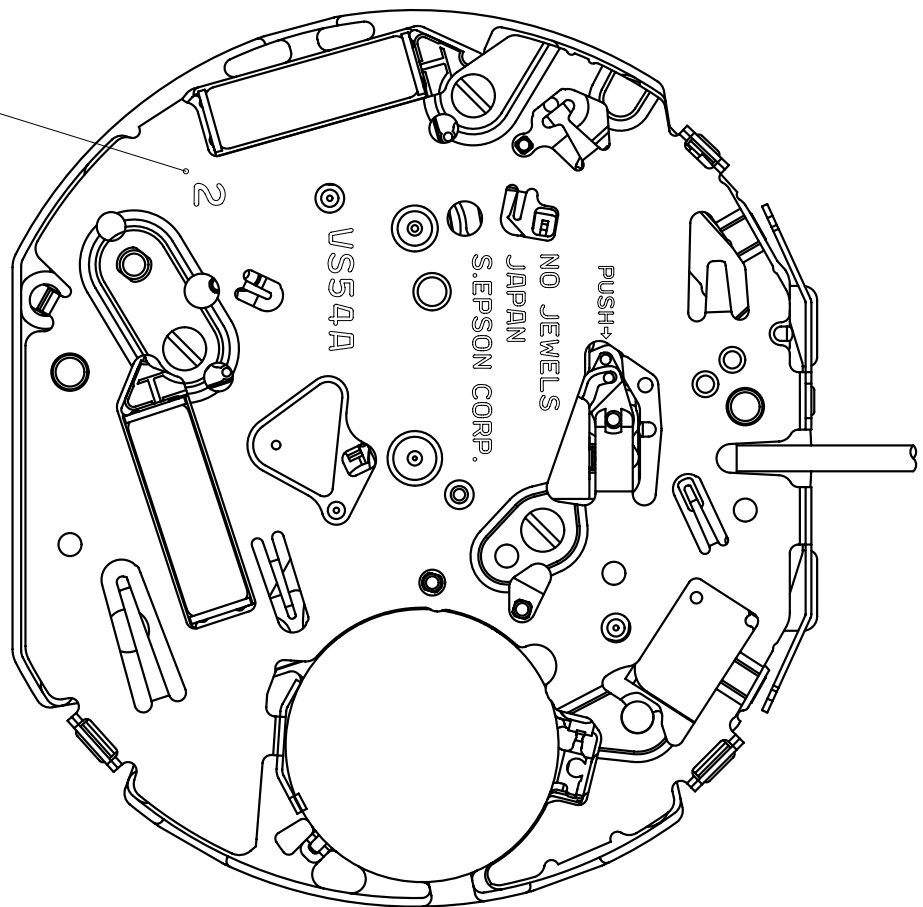
7. Over charge prevent function is equipped

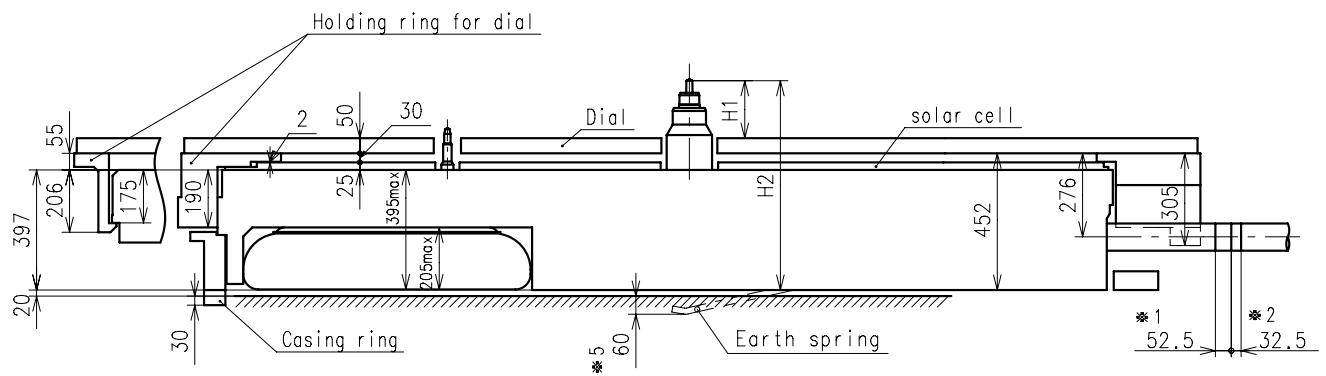
If the secondary battery is charged more than predetermined voltage, over charge prevent function is operated to prevent the secondary battery deterioration and breakage.

8. Structure of the separated parts

Cal.	VS54A	Specifications	Date : 4/Aug./'23
			Rev. : 01
Solar Quartz 13 1/2''' Movement / Three hands(H/M/S) with Battery indicator			
1. MOVEMENT DIMENSIONS			
Outside diameter	φ 31.20mm × 28.00mm(3-9H)		
Casing diameter	φ 30.6mm		
Total height	3.97mm (Including solar cell : 4.52mm)		
2. TIME STANDARD			
Type of quartz oscillator	Tuning fork		
Frequency of quartz oscillator	32,768 Hz		
Accuracy	±20 seconds per month (on wrist)		
Operating temperature range	—5°C to +50°C		
Regulation device	Nil (Pre-adjusted)		
3. INDICATOR / FUNCTIONS			
3 Hands	Hour / Minute / Second		
Small hands	Battery indicator(6H)		
Calendar	Instant setting device for date calendar		
Reset switch			
Power depletion warning function			
(Second hand moves at 2-second intervals when voltage is 1.2V)			
Running time	Approx. 5 months (After fully charged)		
Setting mechanism	Crown at normal position : Free		
	Crown pulled out 1st click : Instant date change		
	Crown pulled out 2nd click : Time setting / Reset		
Battery indicator	4 level display		
4. FEATURES			
Jewels	0 Jewels		
Anti-magnetism	Over 1600A/m (Direct current magnetic field)		
Driving current consumption	Approx. 1.45 μ A (1.4V)		
Operation stopping voltage	1.0V		
Solar cell type	Amorphous silicon solar cell		
Maximum unbalance of hands	Hour hand	: 0.6 μ N•m	
	Minute hand	: 0.9 μ N•m	
	Second hand	: 0.09 μ N•m	
	Battery indicator hand	: 0.05μN•m	
Moment of inertia	Second hand	: less than 0.25 μ g•m ²	
	Battery indicator hand	: less than 0.05 μ g•m ²	
5. SECONDARY BATTERY			
Type	Lithium metal batteries		
Size	φ 9.5mm × t 2.05mm		
Nominal voltage	1.5 V		
Capacity	5.5 mAh		
6. SEPARATED PARTS (Parts code)			
Hand setting stem	0351578 or 0351177		
Secondary battery unit	302334R		
Solar cell unit	4020560		
Solar cell lead terminal (2pcs)	4281516		
7. TEST OF ACCURACY			
Equipment to be used	SEIKO quartz tester QT-99, Greiner quartz timer-C , Witschi Q-tester 4000		
Duration of measurement	10 seconds		
Microphone to be used	Electromagnetic detection type		
All specifications are subject to change without notice.			

	Hands type
Type M	Mark 2





Center post		Type M (2) VS54A**
Maximum height from dial	H1	190
Total height including movement	H2	692

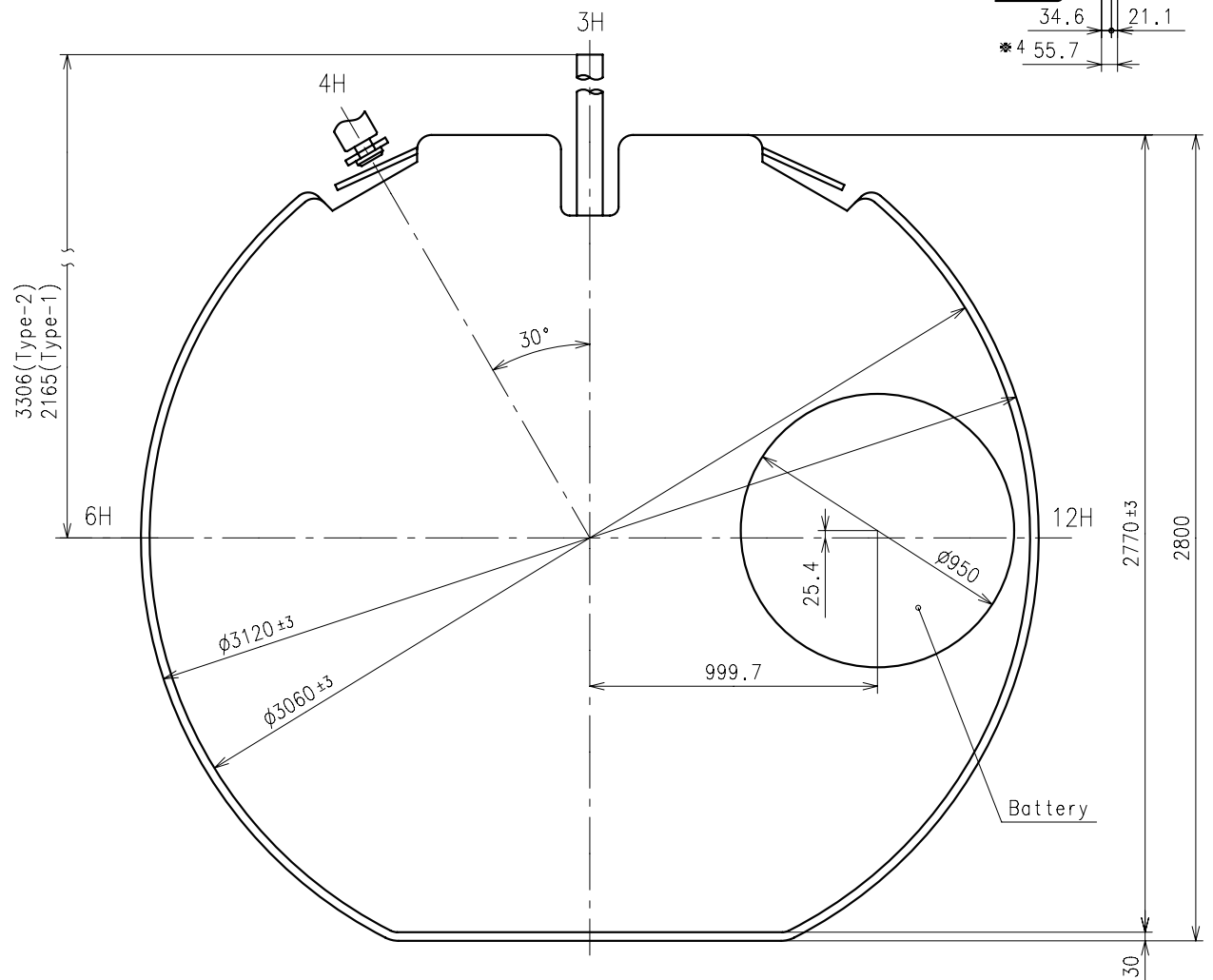
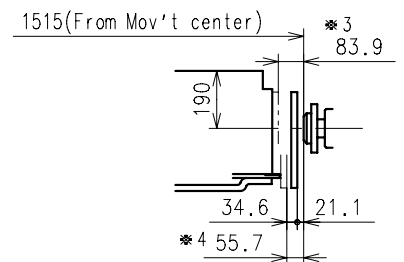
*1: First pullout stroke

*2: Second pullout stroke

*3: Button stroke

*4: Switching stroke

*5: The earth spring is absolutely placed in contact with the case back.

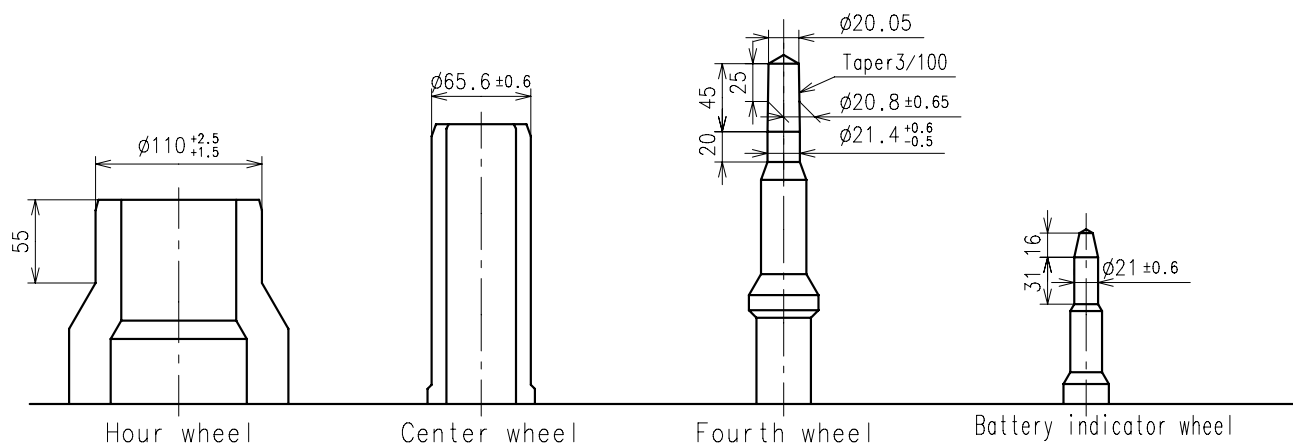


* Unbalance

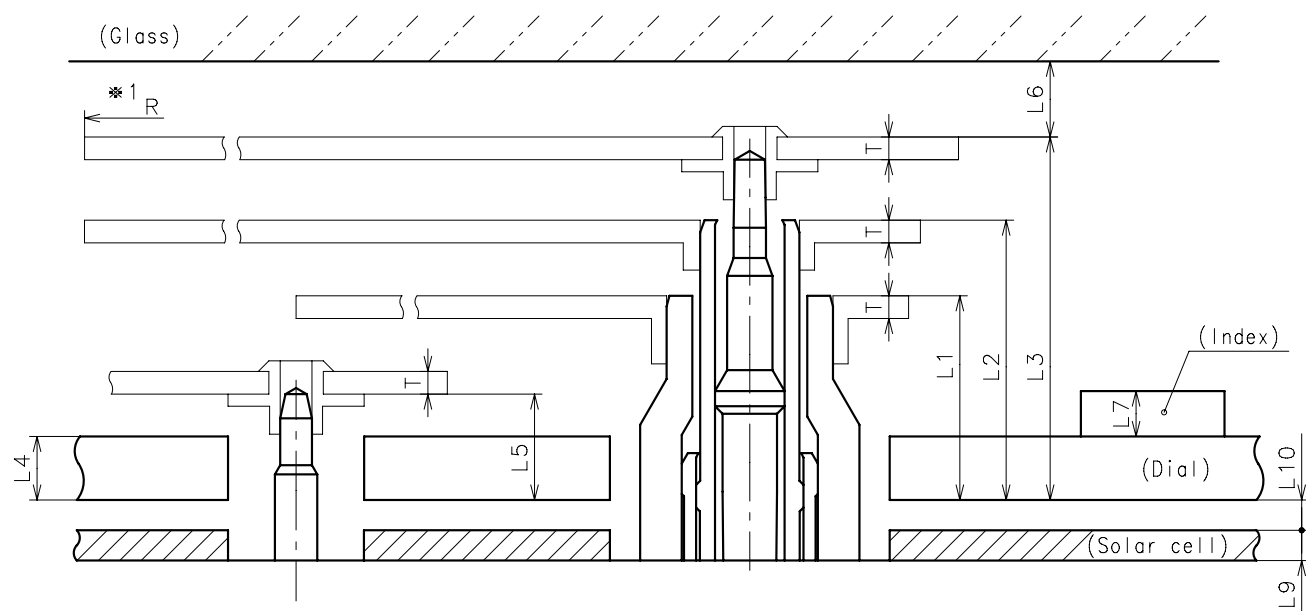
· Hour hand	$\leq 0.6\mu\text{ N}\cdot\text{m}$ ($60\mu\text{ g}\cdot\text{m}$)
· Minute hand	$\leq 0.9\mu\text{ N}\cdot\text{m}$ ($90\mu\text{ g}\cdot\text{m}$)
· Second hand	$\leq 0.09\mu\text{ N}\cdot\text{m}$ ($9\mu\text{ g}\cdot\text{m}$)
· Battery indicator hand	$\leq 0.05\mu\text{ N}\cdot\text{m}$ ($5\mu\text{ g}\cdot\text{m}$)

* Moment of inertia

· Second hand	$\leq 0.25\mu\text{ g}\cdot\text{m}^2$
· Battery indicator hand	$\leq 0.05\mu\text{ g}\cdot\text{m}^2$



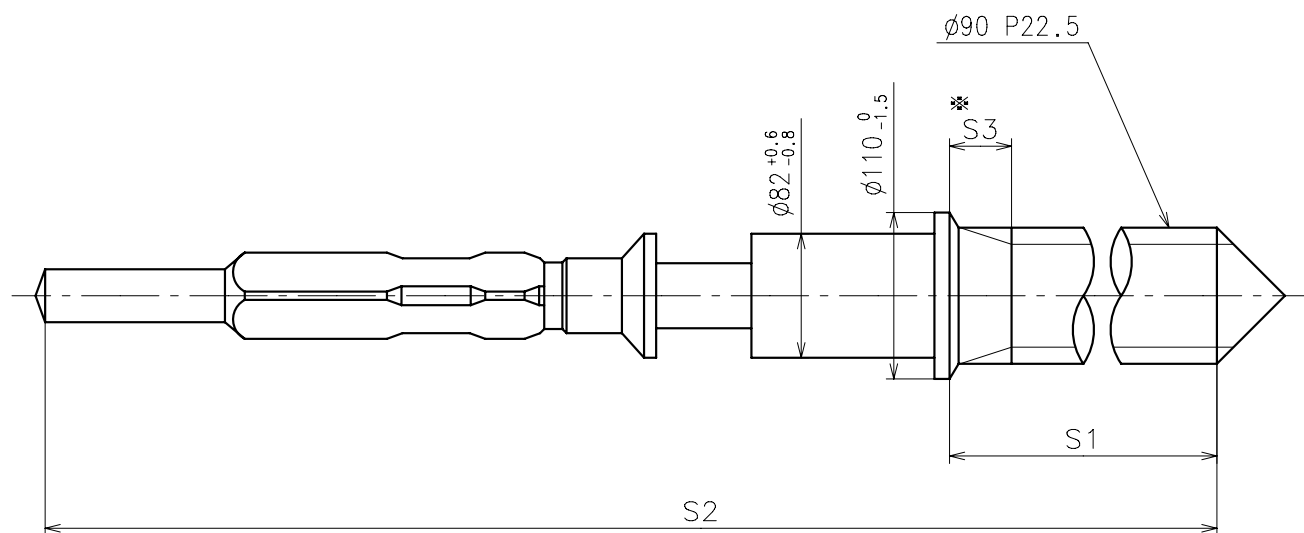
	Parts No.			
	Hour wheel	Center wheel	Fourth wheel	Battery indicator wheel
Type M (2) VS54A**	0271662	0221663	0241605	0888511



	L1	L2	L3	L4	L5	L6	L7	L9	L10	T	*1 R
Type M (2) VS54A**	150	200	255	50	80	MIN: 50	MAX: 50	25	30	15	MAX: 1500

* 1: It is the size taken into consideration for hands attachment.

Please observe some standard value specified in unbalance and moment of inertia when using long hands.

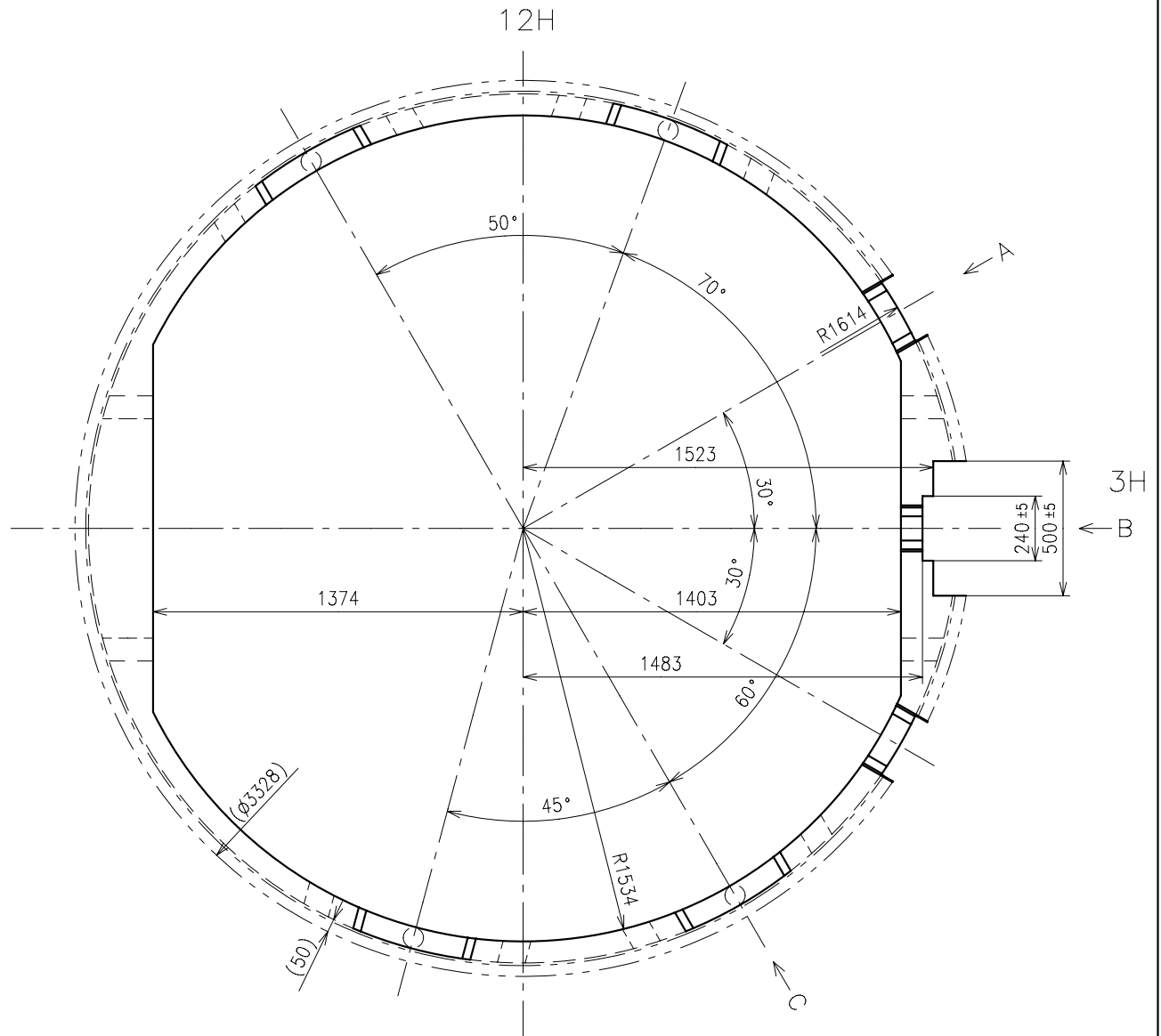


※ Not threaded

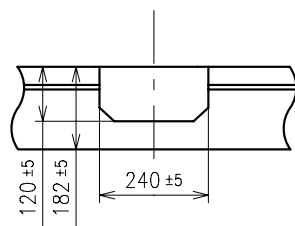
	Part No.	S1	S2	※ S3
Type-1	0351177	1366	1964	60
Type-2 (Standard)	0351578	2507	3105	650

Material : Steel

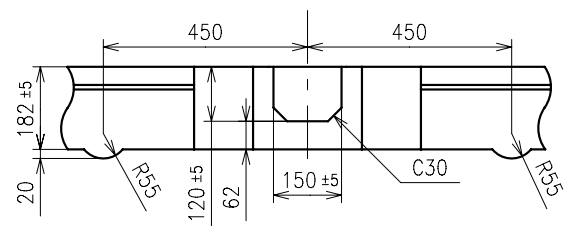
Hardness : Vickers 600±50



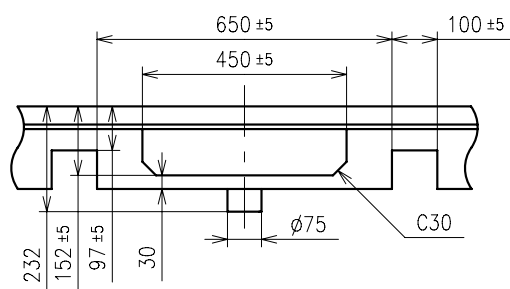
A view

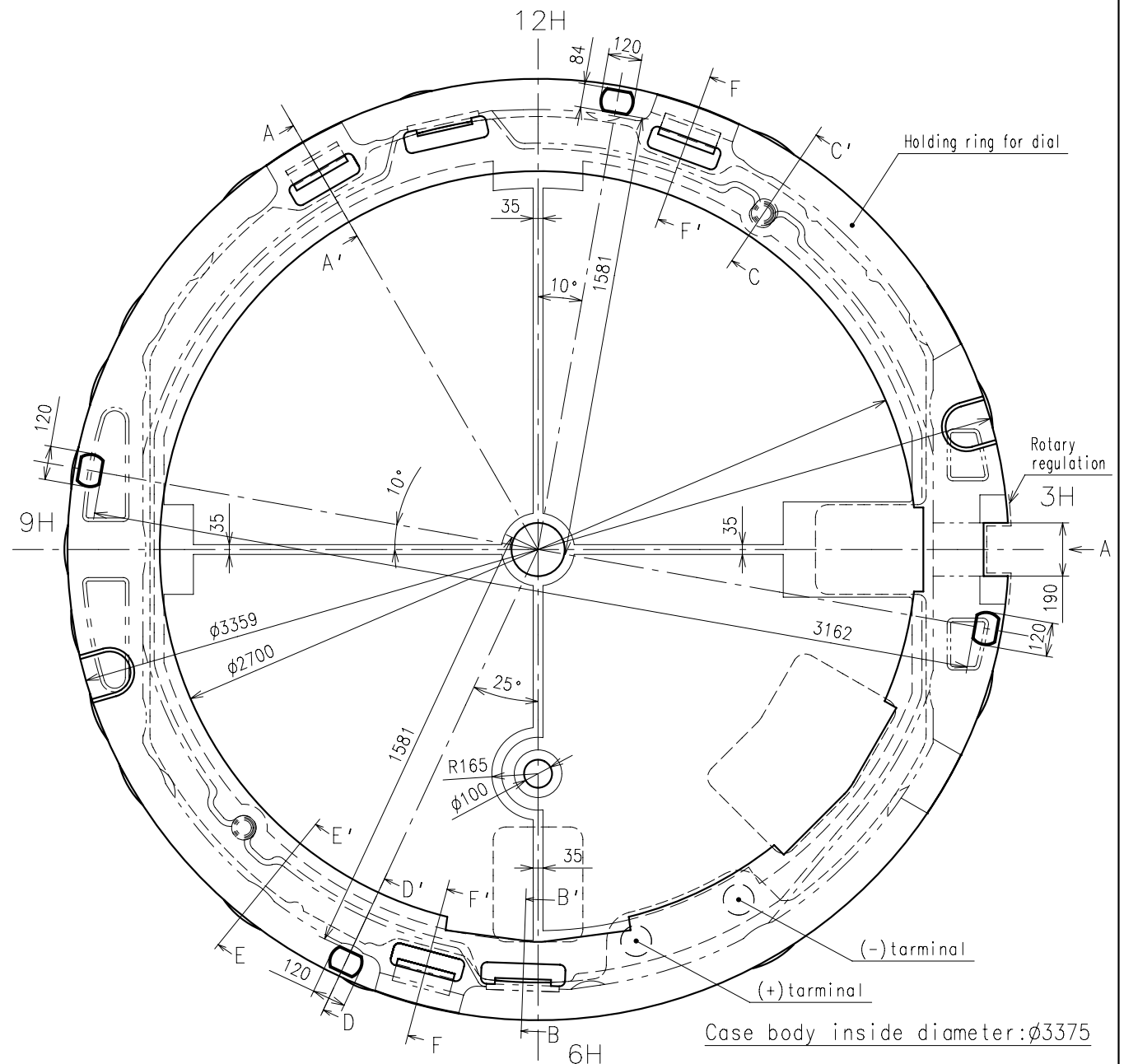


B view



C view

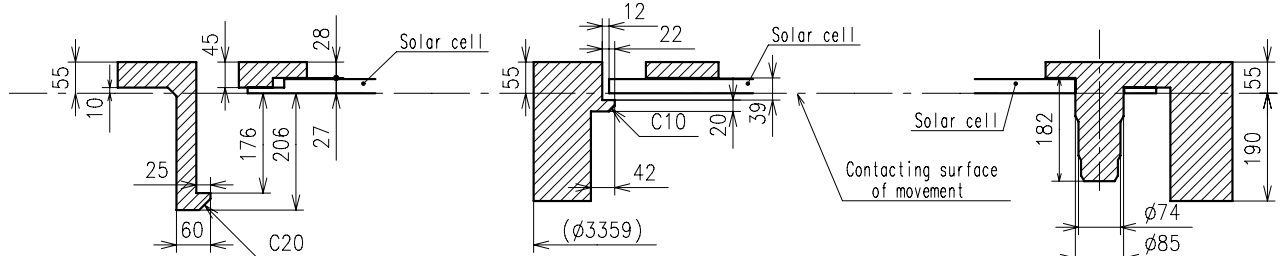




A-A' section

B-B' section

C-C' section

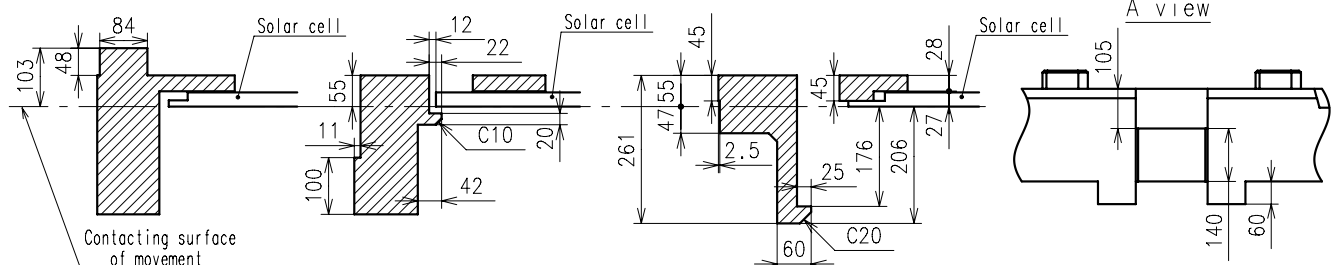


D-D' section

E-E' section

F-F' section

A view



1. Attention for solar cell unit

Pay attention not to touch and scratch the surface of the solar cell.

2. Dial transparency rate

Keep the transparency rate of the dial more than 20%.

(Effective aperture is $\phi 27\text{mm}$)

Each elements of solar cell must be kept the transparency rate.

3. The guideline of charging time is as in below

Illumination (Lx)	Source of light	Environment	Dial transparency rate = 20%			Dial transparency rate = 30%		
			A (Approx. . Hours)	B (Approx. . Hours)	C (Approx. Minutes)	A (Approx. . Hours)	B (Approx. . Hours)	C (Approx. Minutes)
700	A fluorescent lamp	Inside the office	—	26	110	—	18	69
3,000		30W 20cm	77	6	25	52	4	15
10,000	Sun light	Cloudy	24	2.0	7	16	1.5	5
100,000		Fine weather	8	0.7	3	5.3	0.5	2

Condition A : Time required for full charge

Condition B : Time required for steady operation

Condition C : Time to charge 1 day of power

4. How to set the secondary battery unit

Please set the exclusive secondary battery unit.

(The secondary battery is Lithium metal batteries without any environmentally harmful substances.)

Please install the minus part of the secondary battery towards inside of the watch.

If the silver oxide battery is accidentally set and charged, there is a possibility of battery explosion.

To prevent from the battery explosion, it is adopted safety structure not to charge the silver oxide battery even if it is accidentally set.

Install the secondary battery unit under the circuit block cover as illustrated below A and B.

Check whether the secondary battery lead plate is surely connected to minus terminal. (Refer to the Fig.[2])

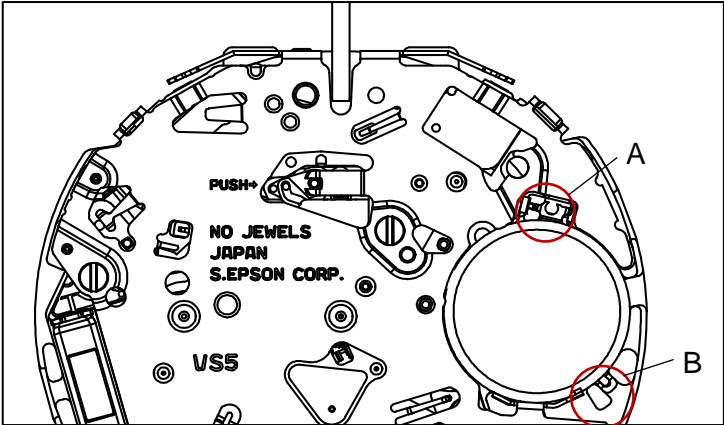


Fig.[1]

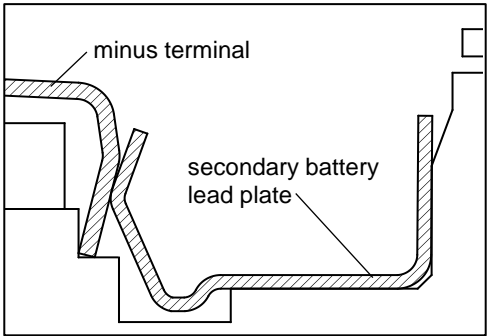


Fig.[2] (Detail of A)

5. How to remove the setting stem

When removing the setting stem, put the setting stem at normal position and push the "setting lever" by tweezers. (Refer to the Fig.[3].)

The "setting lever" can not be push if the setting stem is not at normal position.

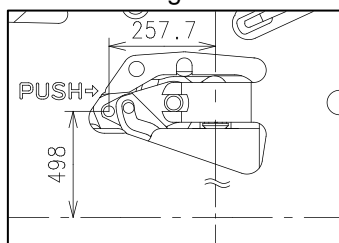


Fig.[3]

6. Attention of casing part structure

Use the specified holding ring for dial to prevent rotation of the movement inside of the case in order to stabilize the button operation.

Refer to the [Solar cell unit] page instruction as to the shape and tolerance.

Use the metal case to prevent from the movement malfunction by static electricity.

7. How to set the hands

Each hand moves at step interval. Set the each hand at correct position according to the scale on the dial in order not to make a mistake in reading time.

Do not turn the hand forcibly.

8. Attention of battery indicator hand setting

The shaft of battery indicator hand is indicating the running time from the beginning when the secondary battery is installed.

The indication position depends on the voltage of the secondary battery.

Therefore, be sure to do "0" position setting of battery indicator hand after setting the hand.

Alternatively, install the secondary battery after setting the hand at "0" position to guide the correct running time.

9. How to remove the hands

When removing the hands, use exclusive fork-shaped tools.

Do not remove the dial under the condition that any hands are set.

When set and remove the hour hand repeatedly, it may reduce the hand fixing torque because the hour wheel is made by plastic. To ensure the enough fixing torque, it isn't recommended to re-assemble the hour hand more than five times. (Type M only)

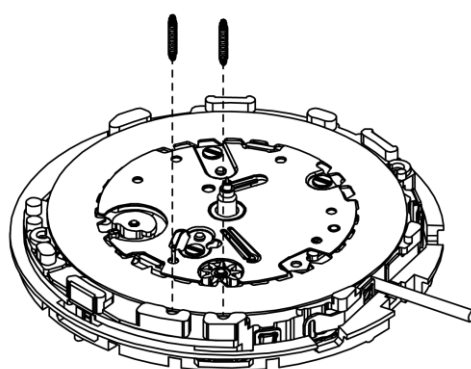
10. Caution

When charging the watch, do not place it too close to fluorescent lamp or other light sources as the watch temperature will become extremely high, causing damage to the parts inside the watch.

11. How to set the solar cell lead terminal

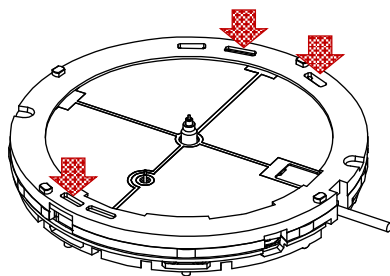
Please set 2pcs of solar cell lead terminals in accordance with this illustration.

As to the solar cell lead terminal shape, there is no distinction between upper and lower.

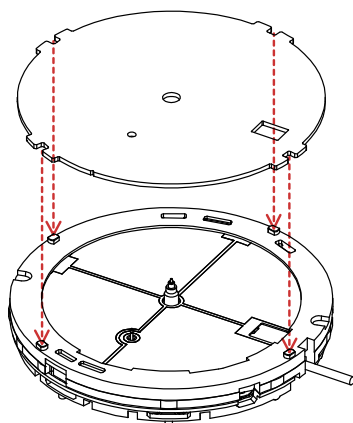


12. How to set the solar cell unit

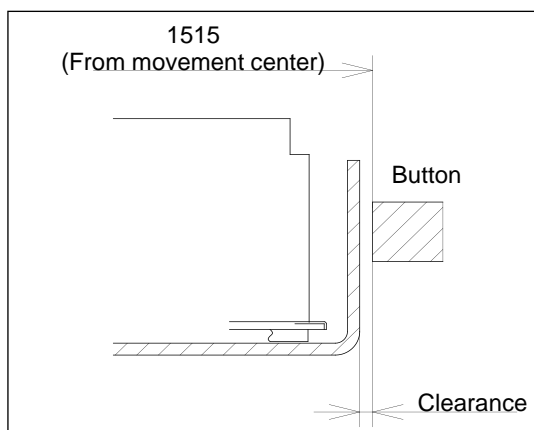
Push above part of each hook on the solar cell unit into main plate certainly.

**13. How to set the dial**

The dial is held by the four guide poles on the solar cell unit.

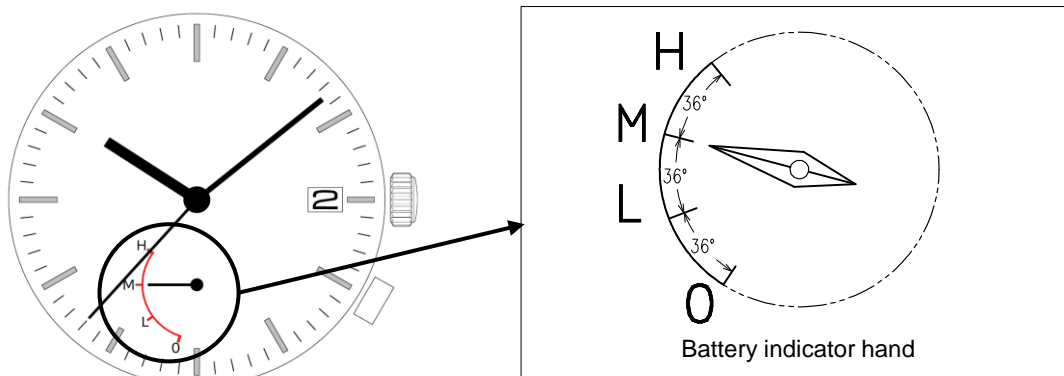
**14. Button position**

Please keep the clearance between the movement and the tip of button to prevent the interference in assembling and enable to be cased smoothly.



To keep the clearance, it is recommended to use button spring.

1. The index design instruction of Battery indicator hand



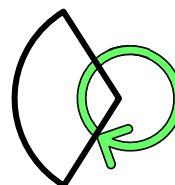
(1) Battery indicator function

Depending on the remaining running time, the battery indicator hand moves in the range of 108°.



(2) Set to "0" position

When the battery indicator hand is set to "0" position, this hand must be able to turn all round.

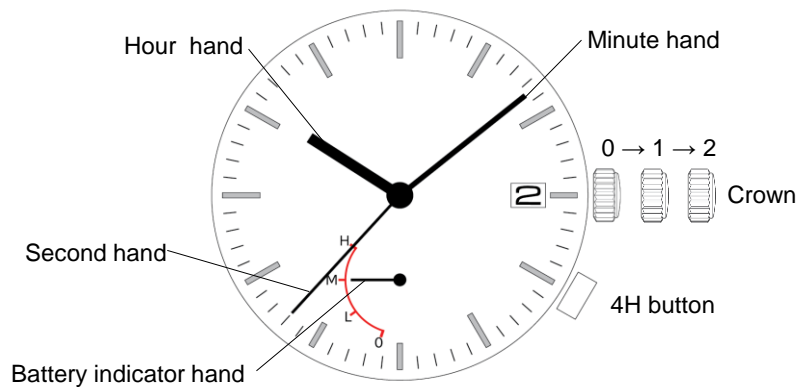


(3) Dial index design

The dial index must be designed on the assumption that the battery indicator hand turn a full round.

2. "0" position of Battery indicator hand

"0" position of battery indicator hand can be set on the arbitrary positions in the range of 360 degrees.



Crown position			
	0 click	1st click	2nd click
Crown	Free	Turn counterclockwise for date change	Time setting
4H button	Free (No effect)	Free (No effect)	Battery indicator hands 0-setting[*1]

[*1] How to set the "0" position

Pull crown out to the 2nd click position.
 ↓
 Press 4H button.
 Battery indicator hand move to "0" position.
 ↓
 Press 4H button repeatedly to set it to "0" position.
 ↓
 Push crown back to normal position.

Battery indicator and running time

Level	High	Middle	Low	0
Display				
Running time	90 days or more	30-90 days	30 days or less	Notice for charging