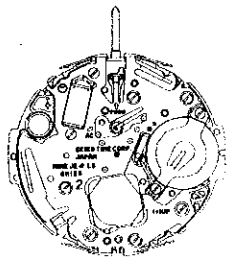
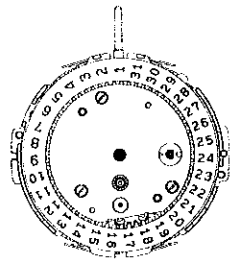
PARTS CATALOGUE / TECHNICAL GUIDE

Cal. 6M15A
Cal. 6M91A

[SPECIFICATIONS]

Item \ Cal. No.		6M15A	6M91A
Movement		  The illustrations refer to Cal. 6M15A. (x 1.0)	
Movement size	Outside diameter	28.5 mm between 6 o'clock and 12 o'clock sides ø27.0 mm between 3 o'clock and 9 o'clock sides	
	Casing diameter	ø26.4 mm	
	Height	3.7 mm (3.9 mm including the battery portion)	
Time indication		3 hands, 24-hour hand and mode indicator	2 hands, 24-hour hand and mode indicator
Driving system		Step motor (4 pcs.)	Step motor (3 pcs.)
Additional mechanism		• World time function (Standard time/daylight saving time) • Alarm (24-hour indication system) • Stopwatch function (Up to 24 hours) • It measures in 1/10 second increments for the first 60 minutes. • Automatic calendar (Year, month and date up to the year 2099) • Hands 0-reset adjustment function (including the date position adjustment) • Alarm test system • Confirmation sound for watch operation • Electronic circuit reset switch • Battery life indicator	• Dual time function • Dual time alarm (Main time ± 23 hours) • Main time alarm (24-hour indication system) • Automatic calendar (Year, month and date up to the year 2099) • Hands 0-reset adjustment function (including the date position adjustment) • Alarm test system • Demonstration movement of the hands and date • Confirmation sound for watch operation • Electronic circuit reset switch
Loss/gain		Monthly rate at normal temperature range: less than 15 seconds	
Regulation system		Nil	
Measuring gate by quartz tester		Use 10-second gate (in "Ø CHRONO." mode).	Use 10-second gate (in "Ø MATCH" mode).
Battery		SEIKO SR927W, Maxell SR927W, SONY SR927W, EVEREADY 399 Battery life is approximately 2 years. Voltage: 1.55V	SEIKO SR927W, Maxell SR927W, SONY SR927W, EVEREADY 399 Battery life is approximately 3 years. Voltage: 1.55V
Jewels		9 jewels	6 jewels

PARTS CATALOGUE

Cal. 6M15A, 6M91A

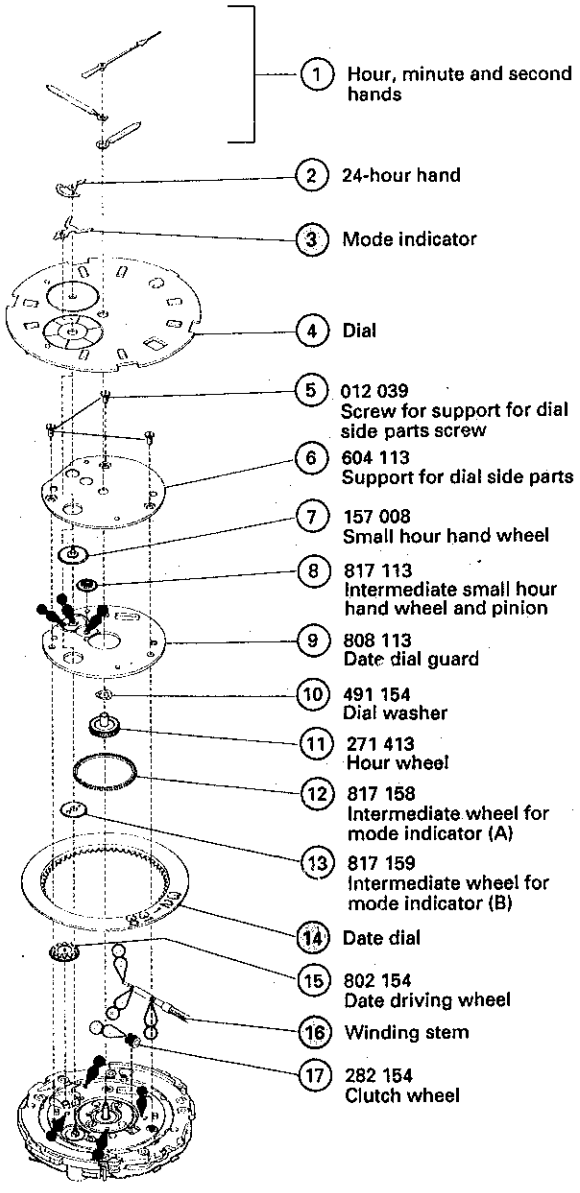
Disassembling procedures Figs. : (1) → (61)

Reassembling procedures Figs. : (61) → (1)

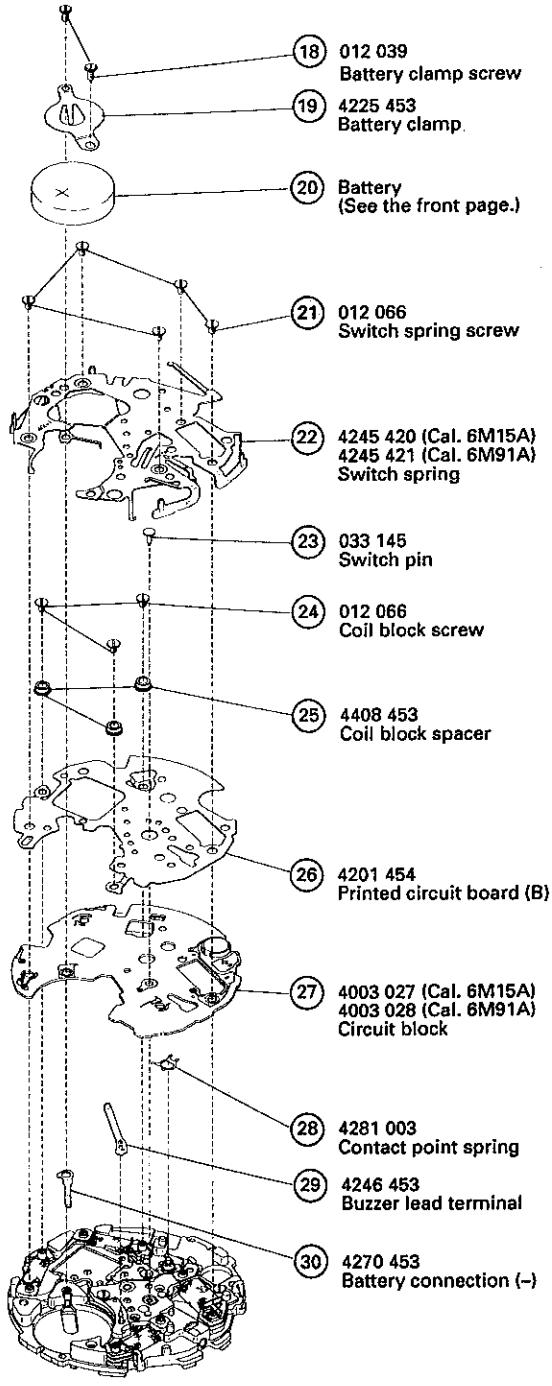
Lubricating: **Types of oil** — Moebius A; SEIKO Watch Oil S-6

Oil quantity — Normal quantity

Ex. Cal. 6M15A



1. Hour, minute and second hands
2. 24-hour hand
3. Mode indicator
4. Dial
5. 012 039 Screw for support for dial side parts screw
6. 604 113 Support for dial side parts
7. 157 008 Small hour hand wheel
8. 817 113 Intermediate small hour hand wheel and pinion
9. 808 113 Date dial guard
10. 491 154 Dial washer
11. 271 413 Hour wheel
12. 817 158 Intermediate wheel for mode indicator (A)
13. 817 159 Intermediate wheel for mode indicator (B)
14. Date dial
15. 802 154 Date driving wheel
16. Winding stem
17. 282 154 Clutch wheel

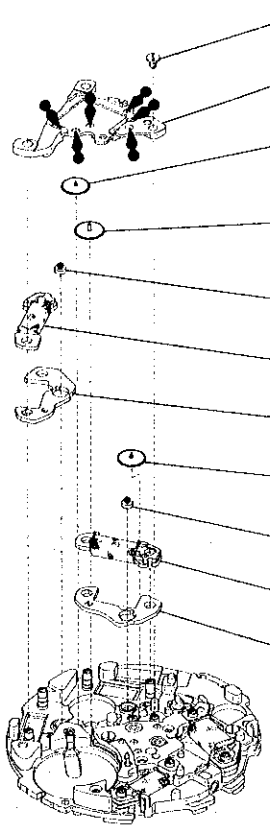


18. 012 039 Battery clamp screw
19. 4225 453 Battery clamp
20. Battery (See the front page.)
21. 012 066 Switch spring screw
22. 4245 420 (Cal. 6M15A) 4245 421 (Cal. 6M91A) Switch spring
23. 033 145 Switch pin
24. 012 066 Coil block screw
25. 4408 453 Coil block spacer
26. 4201 454 Printed circuit board (B)
27. 4003 027 (Cal. 6M15A) 4003 028 (Cal. 6M91A) Circuit block
28. 4281 003 Contact point spring
29. 4246 453 Buzzer lead terminal
30. 4270 453 Battery connection (–)

Please see the remarks on the following pages.

PARTS CATALOGUE

Cal. 6M15A, 6M91A



(31) 012 066
Screw for train wheel bridge (A)

(32) 125 300
Train wheel bridge (A)

(33) 817 153
Intermediate date wheel and pinion (B)

(34) 817 157
Intermediate date wheel and pinion (A)

(35) 4146 154
Step rotor

(36) 4002 455
Coil block (C)

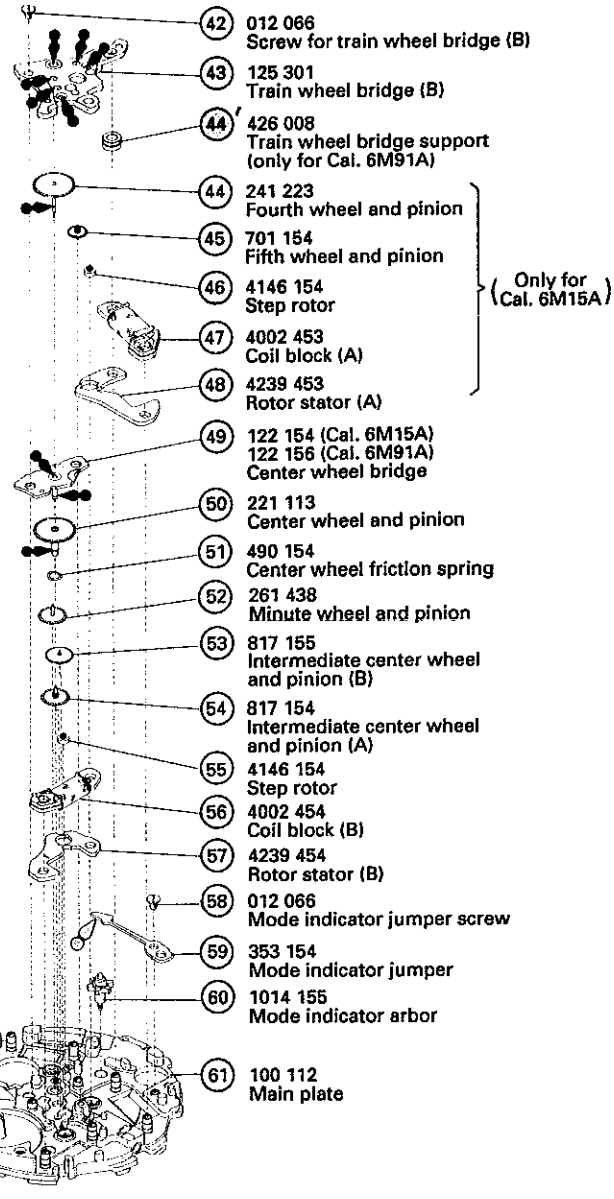
(37) 4239 456
Rotor stator (D)

(38) 817 156
Intermediate minute wheel and pinion

(39) 4146 154
Step rotor

(40) 4002 454
Coil block (B)

(41) 4239 455
Rotor stator (C)



(42) 012 066
Screw for train wheel bridge (B)

(43) 125 301
Train wheel bridge (B)

(44)′ 426 008
Train wheel bridge support (only for Cal. 6M91A)

(44) 241 223
Fourth wheel and pinion

(45) 701 154
Fifth wheel and pinion

(46) 4146 154
Step rotor

(47) 4002 453
Coil block (A)

(48) 4239 453
Rotor stator (A)

(Only for Cal. 6M15A)

(49) 122 154 (Cal. 6M15A)
122 156 (Cal. 6M91A)
Center wheel bridge

(50) 221 113
Center wheel and pinion

(51) 490 154
Center wheel friction spring

(52) 261 438
Minute wheel and pinion

(53) 817 155
Intermediate center wheel and pinion (B)

(54) 817 154
Intermediate center wheel and pinion (A)

(55) 4146 154
Step rotor

(56) 4002 454
Coil block (B)

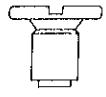
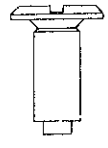
(57) 4239 454
Rotor stator (B)

(58) 012 066
Mode indicator jumper screw

(59) 353 154
Mode indicator jumper

(60) 1014 155
Mode indicator arbor

(61) 100 112
Main plate

	012 066 • Switch spring screw (5 pcs. with Cal. 6M15A) (4 pcs. with Cal. 6M91A) • Coil block screw (3 pcs.) • Screw for train wheel bridge (A) (1 pc.) • Screw for train wheel bridge (B) (1 pc.) • Mode indicator jumper screw (1 pc.)
	012 039 • Screw for support for dial side parts (3 pcs.) • Battery clamp screw (2 pcs.)

Note:
Parts (44) ~ (48) are not used in Cal. 6M91A, and the train wheel bridge support ((44)′) is added instead.

⊙ ⇨ Please see the remarks on the following pages.

PARTS CATALOGUE

Cal. 6M15A, 6M91A

Remarks:

(14) Date dial

Part code	Position of crown and calendar	Color of figure	Color of background
801 455	3 o'clock	Black	White

The type of date dial is determined based on the design of cases.
Check the case number and refer to "SEIKO CASING PARTS CATALOGUE" to choose a corresponding date dial.

(16) Winding stem 351 169

The type of winding stem is determined based on the design of cases.
Check the case number and refer to "SEIKO CASING PARTS CATALOGUE" to choose a corresponding winding stem.

- Piezoelectric element

  4589 650

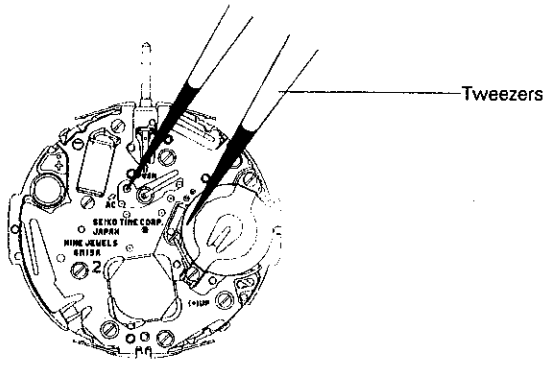
TECHNICAL GUIDE

Cal. 6M15A, 6M91A

- Cal. 6M15A and 6M91A have almost the same structure as Cal. 6M13A. For the information other than explained here, refer to "PARTS CATALOGUE/TECHNICAL GUIDE Cal. 6M13A".
- For the repairing, checking and measuring procedures, refer to the "TECHNICAL GUIDE, GENERAL INSTRUCTIONS".

I. REMARKS ON INSTALLING THE BATTERY

- After the battery is replaced with a new one, or after the battery is re-installed following the repairing procedures, be sure to short-circuit the AC terminal of the circuit block and the battery connection (+) with conductive tweezers to reset the circuit as shown in the illustration below.
  (When checking the current consumption, short-circuit with the power supplied from external source.)



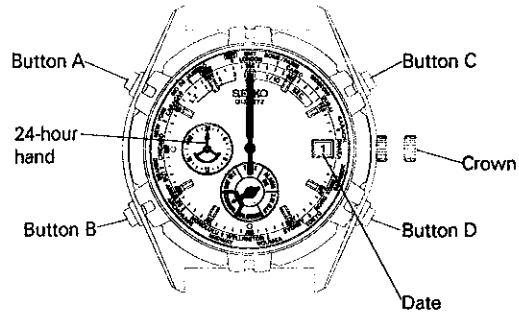
• To reset the circuit of the complete watch, follow the procedure below.

[Cal. 6M15A]

(1) Turn the crown to set the mode indicator to "Ø CHRONO.".

(2) Pull out the crown.

(3) Keep buttons "A" "B" "C" and "D" pressed at the same time for approximately 2 seconds. When the buttons are released, a beep sounds and the hands turn a full circle once or twice.



(4) Reset the hands to the "12" o'clock position.
- With each press of button "C" the second hand advances one second.
- With each press of button "A" the minute hand advances one minute.
- With each press of button "B", the hour hand advances one hour. When setting the hour hand, check that the 24-hour hand is set to the "24" position.

* The hands move quickly if the respective buttons are kept pressed.

(5) Press button "D" to put the date numeral "1" to the center of the calendar frame.
* With each press of the button, the date moves slightly. It moves quickly if the button is kept pressed.
* The date dial turns clockwise only.

(6) Push the crown back in to the normal position.

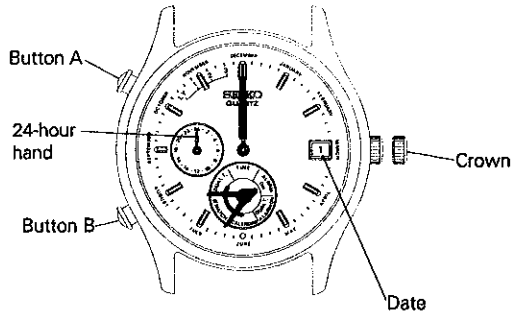
(7) Turn the crown to set the mode indicator to "TIME" to set the desired time and turn it to "CALENDAR" to set the desired year, month and date.

[Cal. 6M91A]

(1) Turn the crown to set the mode indicator to "Ø MATCH".

(2) Pull out the crown.

(3) Keep buttons "A" and "B" pressed at the same time for approximately 2 seconds. When the buttons are released, a beep sounds and the hour and minute hands start moving counterclockwise and clockwise, respectively. The date advances one day and returns to the current date.



(4) Press button "A" or "B" once to stop the hands and date.

(5) Press button "A" to select the hand or date to be adjusted in the following order.

Minute hand → Hour hand → Date

* The hands selected to be adjusted will move back and forth and return to where they were. The date will advance one day and return to the current date if selected.

(6) Press button "B" to reset the selected hand to the 12 o'clock position and set the date to "1".
* When setting the hour hand, check that the 24-hour hand is set to the "24" position.
* The hands and date move quickly if button "B" is kept pressed.

(7) Push the crown back in to the normal position.

(8) Turn the crown to set the mode indicator to "TIME" to set the desired time and turn it to "CALENDAR" to set the desired year, month and date.

II. REMARKS ON DISASSEMBLING AND REASSEMBLING

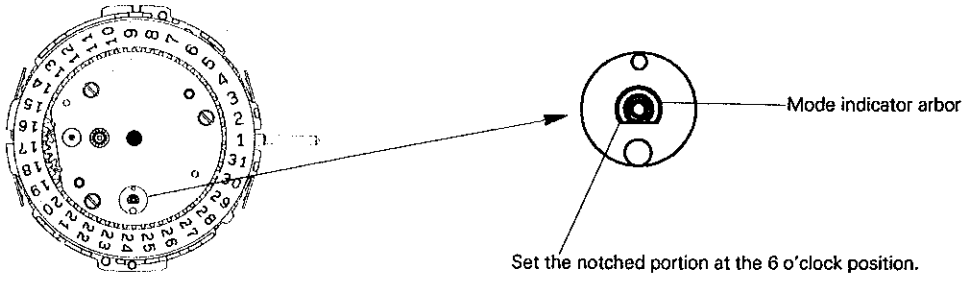
Use the universal movement holder for disassembling and reassembling.

③ Mode indicator

• **How to install**

Place the movement on a flat metal plate or the like as you do when installing the hands, and then set the mode indicator and the mode indicator arbor in proper position following the procedure below.

(1) Turn the crown to set the notched portion of the mode indicator arbor at the 6 o'clock position.



(2) Install the mode indicator so that it points to "TIME".

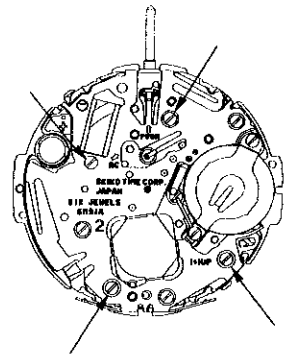
[Cal. 6M15A]

[Cal. 6M91A]

(21) Switch spring screw

Tighten the four switch spring screws.

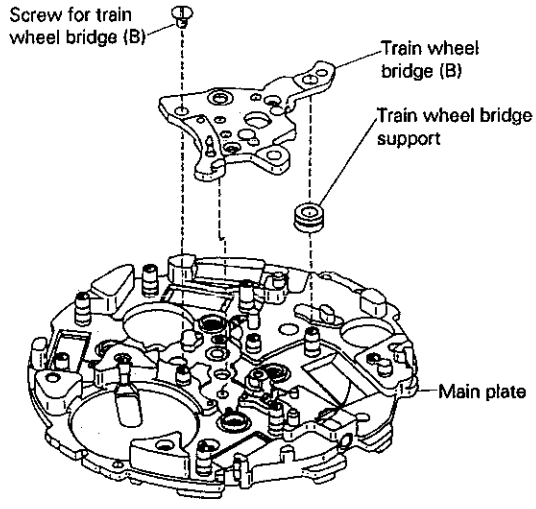
- **Setting position of the switch spring screws for Cal. 6M91A**



(44)′ Train wheel bridge support (only for Cal. 6M91A)

The train wheel bridge support is used in Cal. 6M91A only. It can be installed with either side up.

* Parts (49) ~ (60) are not shown in the illustration at right.



III. VALUE CHECKING

- **Coil block resistance**

Coil block for second motor (only for Cal. 6M15A)	:	1.5KΩ ~ 1.9KΩ	(Part code: 4002 453)
Coil block for hour and minute motors	:	1.2KΩ ~ 1.6KΩ	(Part code: 4002 454)
Coil block for date motor	:	0.8KΩ ~ 1.2KΩ	(Part code: 4002 455)

- **Upconverter coil resistance**

120Ω ~ 180Ω

- **Measuring time accuracy**

[Cal. 6M15A]

(1) Turn the crown to set the mode indicator to "Ø CHRONO.".
* When the stopwatch is counting, press button "A" to stop measurement and then press button "B" to reset the hands.

(2) Set the gate of the quartz tester to "10" and then put the watch on the microphone.

[Cal. 6M91A]

(1) Turn the crown to set the mode indicator to "Ø MATCH".

(2) Press button "A" and "B" at the same time for approximately 2 seconds.
* Only the minute hand moves slightly every second.

(3) Set the gate of the quartz tester to "10" and then put the watch on the microphone.

(4) After the measurement is over, press button "A" or "B". The hands return to the 12 o'clock position and stop.

- **Current consumption**

Cal. No.	6M15A	6M91A
For the whole movement	less than 3.0μA	less than 2.2μA
For the circuit block alone	less than 0.8μA	

[Cal. 6M91A]

Measure the current consumption following the procedure below.

(1) Set two battery clamp screws to the movement and tighten them temporarily. Then, install the dial, hands and mode indicator to the movement.
* Do not install the battery clamp.

(2) Turn the crown to set the mode indicator to "TIME".

(3) Supply power from the external source and short-circuit the AC terminal of the circuit block and (+) terminal of the battery.

(4) Press button "A" or "B". The hands return to the normal movement. Then, measure the current consumption.

Note:

In Cal. 6M91A, the motors move the hands and date calendar at the following intervals.

- Minute motor : 10-second intervals
- Hour motor : 2-minute intervals
- Date motor : 24-hour intervals

Calculate the current consumption following the formula below.

$$\text{Electric current in the IC} + \frac{\text{Current consumption of minute motor} - \text{Electric current in the IC}}{10\ *} = \text{Current consumption of movement}$$

(Ex.)

$$1.5\ (\mu A) + \frac{2.8\ (\mu A) - 1.5\ (\mu A)}{10} = 1.63\ (\mu A)$$

* The value of the numerator represents the current consumption of the minute motor, which moves at 10-second intervals. To obtain the current consumption to the second, it should be divided by "10".

- The current consumption of Cal. 6M91A is measured in the same manner as that of other 2-hand calibres whose minute hand moves at 10- or 20-second intervals.
- To obtain the current consumption of the movement, it is necessary to add up the measured values of all the motors by converting them to the values to the second. However, the hour and date motors' current consumption to the second is so small that it will not affect the aggregate of the current consumption. Therefore, it is safely assumed that the above formula represents the current consumption of the movement.