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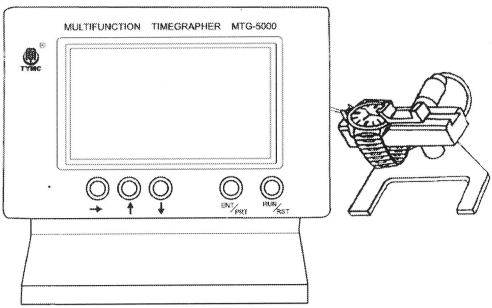

MULTIFUNCTION TIMEGRAPHER

OPERATION MANUAL

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I.Performances and Technical Specifications

The timegraphers MTG-5000 is used to test the performances of mechanical watches. It is an advanced model in the MTG series which has higher test accuracy and more powerful functions.

Its functions are as follows:

— There are 5 testing modes, specially it is served the function of long-term monitoring of rate and amplitude.

— 960 dots extraordinary long diagram of beat noise can be displayed on the LCD.

— Test with ±0.2s/d high degree of accuracy can be carried out.

— There are the displays of diagrams of beat noise, the numerical values of rate, amplitudes and beats errors, adding the maximum differences of rates and amplitudes among various positions when executing programmed testing and isochronism diagram display when executing rate/amplitude monitoring testing.

—There is perfect print function, the diagram and values mentioned above all can be printed by heat sensitive printer.

— It is served the functions of multi-rate display, time and calendar display , acoustic stimulation of beat noise and function of testing pause.

— Automatic microphone can be equipped.

The timegrapher is equipped with large size colored LCD screen . The design of casing and panel is simple and clear. It is convenient to operate.

Technical Specifications:

Beat numbers of watches can be tested:

18000, 19800, 21600, 25200, 28800 and 36000,can be selected manually or automatically.

Ranges of displayed numerical results and their accuracy:

Rate:Normal Accuracy:-300 s/d ~ +300 s/d,Accuracy: ± 1 s/d

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Super Accuracy:-99.9 s/d~+99.9 s/d, Accuracy: ± 0.2 s/d
Amplitude: 100°~345°, Accuracy: ± 3°
Beat error: 0 ~ 4.0 ms , Accuracy: ± 0.1 ms

Length of diagram displayed: 480 dots or 960 dots

Data stored: 1920 beats

Position tested: 1~ 6 positions

Lift angle: 30°~ 60°, default value: 52°

Power: single phase, AC 90 V ~ 250 V, two wires,

Power consumption: about 15 W.

Weight of mainframe: 1.0Kg

Dimension: 245 × 130 × 200 mm

Operating environment:

Temperature: 0°~50° C
Humidity: 0~90 % RH

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II. Components and Functions of Keys

The timegrapher consists of two components: mainframe(DC power supply included) and microphone. The heat sensitive printer and/or the automatic microphone as the options are available.

There are five keys on the mainframe panel. Their functions are as follows:

"→": to move the cursor to right,used to select setting items when testing.

" ↑","↓ ": to move the cursor upward and downward or to increase and decrease values.

"ENT/PRT": used for confirmation key during setting and for printing key during testing.

"RUN/RST": generally used as a restart key to return back to starting window at any time, also for starting key before-testing and followed by operating prompt

The"→","↑ " and"↓ " keys also have others functions,used according to prompts.

III. Testing:

The starting window appears on the screen after power on. The first thing is to select testing mode by " ↑ " and " ↓ ",then push" RUN/RST" to enter testing directly.

1. NORMAL TESTING ——PUSHING MODE:

In this testing mode the diagram displaying is "pushing" mode,namely, accompanying by the progress of test the diagram scroll from left to right and the new dot of diagram always appears on utmost left end of diagram. This mode is similar to that in the paper tape recording timegrapher. The displayed diagram are continuous and integrated, easy to observe. So we recommend to use this mode.

When testing is proceeding you can use the " → " key to move the cursor to select the item you want to set, use " ↑ " and " ↓ " to change setting or to increase and decrease values. The changeable settings have: beats number, lift angle,resolution of rate, on or off of sound.

The high resolution testing is only used for testing watches with very high precision, otherwise the diagram may be disorder.

Because this timegrapher has perfect function of automatic gain control , so it is unnecessary to adjust signal intensity.

The lift angle can be selected between 30~60 degrees. Press " ↑ "key or " ↓ "key once the lift angle will be increased or decreased at step 0.1° ,and if you press them continuously it will be changed at step 1°.

The normal testing of watches refers to test the watches as the traditional tester does. You just put the watch on the microphone, the timegrapher will continuously test the watches with the set-up parameters. and display the diagram and values of the rate, amplitude and beat error with the LED indicator flickering and making a sound.

The diagram on the LCD screen is similar to that in the paper tape recording timegrapher ,the slope of the lines of diagram represents the rate deviation of tested watch and the distance between two lines represents the beat error. The value of rate is positive deviation when the lines goes upward from left to right and it is negative deviation when the lines goes downward. A horizontal diagram represents that the rate of the watch

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is thoroughly exact. The above mentioned slope and distance of lines are related to the beat number. They may be different for two watches with the same rate and beat error but with different beat number. So attention should be paid to the digital display.

The value of the rate is the average of 48 beats while the values for the beat error and amplitude is the averages of 8 beats and 16 beats respectively. The three values first appearing on the screen are at the different time and will be updated every 12 beats. If the results are out of the limits, or the diagram is disorder, it is impossible to get the average values and there will be blank in the displayed places.

During the change of testing positions, the displayed values sometimes are incorrect.

In addition to the display of the current value of the rate, at the same time, the rate for a certain section of the diagram is displayed in small digits, which is called "multi-rate display". With the diagram pushing to the right, the rate display is shifting also. It is easy to see the change of the rate.

During the testing, press the "ENT/PRT" key and then press corresponding key to choose printing mode: printing diagram along with numerical results of rate and amplitude every 96 beats or printing the diagram only.1920 beat data and corresponding values of rate and amplitude will be stored in the machine during testing and which can be printed.

The diagram will be printing from the latest displayed section to the previous one. The printing will stop automatically when all the stored data have been printed out. Press the "ENT/PRT" key, the printing operation will be interrupted and resume to test.

2. NORMAL TESTING ——EXTENDING MODE:

In this testing mode the diagram displaying is 'EXTENDING" mode, others are the same as mode 1. So called "EXTENDING" mode is that the diagram of beat noise simply extended when testing is in progress. The new dot always appears on the utmost front end of the diagram. After the

line extended to the utmost right of the screen, the display will come back to starting point and the former adjacent displayed diagram will be cleared out. The diagram may be not continuous and the current observation point is movable, but the displaying has the advantage of stability.

3. TWO WINDOWS DISPLAY TESTING:

This mode has two windows, upper and lower, to display the diagram, so the displayed diagram length is doubled to 960 dots. It corresponds 120 seconds for the watch whose beat number is 28800 and 160 seconds for 21600 . Usually, the diagram in 5~6 positions can be displayed at the same time, it is very convenient to observe.

The diagram displaying is assigned as "PUSHING" mode and there is no “multi-rate display”

4.PROGRAMMED TESTING:

Programmed testing is referred that before testing, which positions to be tested and the testing time of each position are programmed. The watches are tested according to program ompletely.

The operations are as follows:

1) Selecting of testing parameters:

The parameters include beat number, testing position, testing time and lift angle. The operation can be performed step by step according to prompts on the screen. The testing time on every position is 10~30 seconds, usually set to 15~20 seconds.

2). Testing:

Testing will start automatically after above selections of parameters. In each position, the testing is the same as that in “TWO WINDOWS DISPLAY TESTING” testing mode but there is only normal precision testing. During the testing,only the key “RUN/RST” can be used to return to starting window. The sound is off. When the testing for one position is finished, the values for the rate, amplitude and beat error related to that

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position would be displayed. Then the symbol of next position is displayed. If your tester is equipped with the automatic microphone, it will turn to the next position automatically. Otherwise, it is necessary to turn it to the next position by hand. When testing for all positions is finished the diagrams for each position are displayed on the screen ,you can press “INT/PRT” KEY to print it. This is the same as in normal testing, but in this mode only the diagram itself is printed without additional numerical information. If you press “→”key ,then the values of rate, amplitude and beat error for each position will be displayed. At the same time, the maximum difference of rate and amplitude among all positions are calculated and displayed. If you press “INT/PRT” KEY all the displayed numerical results will be printed. In addition, the name of the customer and some compliment terms can also be printed. But this function must be required when place the order

5.Rate/amplitude Monitoring:

The instrument can test the rate and amplitude of watch continuously and figure out the average in a period of time(so called “monitoring period”), display on the screen in form of a curve so that obtain a variation curve of rate and amplitude of the watch in a relative long time (max. 13 days). The curve is a highly valuable reference data for analyzing performances of the watch,finely adjusting the watch and provides the foundation of improving design for development section

The operating procedure is as follows:

Select the rate/amplitude monitoring test mode and push on “ ↑ ”key, after selecting beat number and lift angle the screen will display the program list programmed last time (for first use it is factory default program), then you can select former program or re- programming.

Programming can be carried out according to screen prompt. A program consists of 1~10 “step”s. For each step, test position、 monitoring period, monitoring duration can be set in. There are seven grades of monitoring period, that is, 4″ 、10″ 、20″ 、50″ 、2′ 、4′ and 10′ .Because the maximum

sample size are 192 spots,so only a maximum of 192 periods can be monitored in a step, then there is a maximum monitoring duration for a certain monitoring period. When "OVER THE MAXIMUM MONITORING DURATION"appears on the screen, you have to decrease the monitoring duration.

Starting monitoring test, the screen will display the instantaneous values of rate and amplitude and then the curve spots will be displayed which corresponding to the averages in a monitoring period, among them, white spot is the value of rate and the red spot is of amplitude. The four time values appeared on the lower part of the screen are monitoring period, amount of time for one scale spacing, hours and minutes of monitoring duration respectively. The test will go on continuously .When the monitoring duration of this step is up the automatic microphone will rotate automatically and the machine will enter the next step monitoring. Also you can push" ↓ "to stop present step and switch to next step.

When the monitoring of last step is finished, the test will be stopped and microphone will return to CH position. Then you may select the following operations:

Data storing: The machine provides three storage areas ,so monitoring results for three monitoring operations can be stored. On the storing window the information of date and time when the data had been stored is displayed for three areas respectly. You can select one to store present data and the former data will be covered.

Curve display and print: You can display measured curves on screen from the first step to arbitrary step. Pushing "ENT/PRTR" key then the corresponding curve will be printed. When printing starts, the first is the date, time and number of step, then the curve.

Data display and print : From the first step you can display the values of rates and amplitudes corresponding to various spots. If the monitoring spots are more than 96 the display should be in two pages. You can select to display the data of other steps or another page by pushing corresponding keys, or print this data by pushing "ENT/PRT" key. Also, the date, time and

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the number of step are printed at first. In the process of printing you can push "ENT/PRT" key to stop printing.

The stored curves and data can be display or printed at any time. Selecting the mode of rate/ amplitude monitoring and pushing" ↓ " key, first you select the storage area, then the display and printing can be carried out as the same as above-mentioned.

VI. Setting of date, time display and selecting of display colors:

On the starting window push "→" key to set date and time display according to prompt.

On the starting window just push"ENT/PRT"key to enter color selecting window, then according to the prompt, 3 kinds of colors can be selected on the color selecting window.

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V . Frequency Calibration

The reference frequency of this timegrpher is 36.000000 MHz and this frequency should be calibrated periodically. For calibrating the frequency, please plug the probe unit of the frequency meter into the corresponding socket on the back panel through a larger hole marked with "Frequency Calibration". After the tester starts and comes to stable state, the frequency is measured. The allowable error of the frequency is ±50 Hz. If the frequency is out of the limits, it should be calibrated by turning a built-in potentiometer using a small screwdriver through a smaller hole, which is located over the larger hole as mentioned above. The frequency should be within the limits and as close to the reference frequency as possible.

Ⅵ. Troubleshooting

1.After the tester is turned on, the screen is not bright:

If the LED indictor on the left of the panel is flickering when a running watch is mounted, then the driving board of backlight is damaged. You can replace it. If the LED indicator is not bright too, then the power supply is damaged. In this case ,please have it repaired.

2.The LCD is bright, but the display is blank or there are some stripes or disorder dots displayed:

The control board is damaged. Please replace it.

3. There is display of words , but no display of the diagram, or the display of the diagram in disorder. After the watch is wound and put it in its place, the testing cannot be carried out properly still.

Probably the plug of the microphone is not well inserted into the socket. Please plug it again. If it still does not work properly, the tester or the microphone has some trouble, but most possibly is some thing wrong with the microphone. If you have several testers, please exchange the microphones to see which one is wrong. The one with malfunction has to be repaired.

4. The display of signal and sound is normal, but the display of values or the gradient of slope is abnormal.

Probably, the beat number is incorrect. Please check it and correct it.

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Ⅶ. Options

1. Automatic Microphone

The tester can be equipped with automatic microphone. The microphone of this type has two plugs, insert the 4-pins plug into the socket marked with "Microphone" and another plug insert into a socket mark with "Control". After power is turned on, if the microphone is not in CH position (i.e. face -up), please press the "Reset" key, it will rotate to face-up position. The microphone can be controlled by the tester according to the program or controlled by buttons, and it can also be rotated to any position by hand.

2. Heat-sensitive Printer

The tester can be equipped with heat-sensitive printer On the printer, there are two small keys, marked with "SEL" and "LF" respectively. When the printer is working, the signal light on the "SEL" should be turned on. If not, please press the key "SEL". When you would feed the paper, the key "SEL" should be pressed first and the signal light will be turned off. Then press the key "LF" and the paper starts advancing, press the key again, the paper advancing will be stopped. Press the key "SEL"; the printer will restore its stand-by state.