Installation and Operating

TBU 190(t) S 230
Movement for *IRIG-B, AFNOR NFS 87500* or *DCF-FSK* audio frequency time code

Please read this instructions carefully before installation.

Content

References to the User's Manual

1. The information in this User's Manual can be changed at any time without previous notice.
   The current version is available for download on www.mobatime.com – Downloads.
2. This User's Manual has been composed with utmost care, in order to explain all details in respect of the operation of the product. Should you, nevertheless, have questions or discover errors in this Manual, please contact us.
3. We do not answer for direct or indirect damages, which could occur, when using this Manual.
4. Please read the instructions carefully and start the setting-up of the product, only once you have correctly understood all information for the installation and of the operation.
5. The installation must only be carried out by skilled staff.
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Guidelines for installation and handling

1. This movement has no incorporated disconnect device from the mains supply power. An appropriate disconnect device must be provided external to the movement, concerning to the national installation regulations.
2. The movement has to be transported or stocked only in the original packing and in a dry environment.

1. Dimensions, Definitions

Diameter	Type	Art.-No.
30 - 80 cm	Movement: TBU 190t S 230	200859

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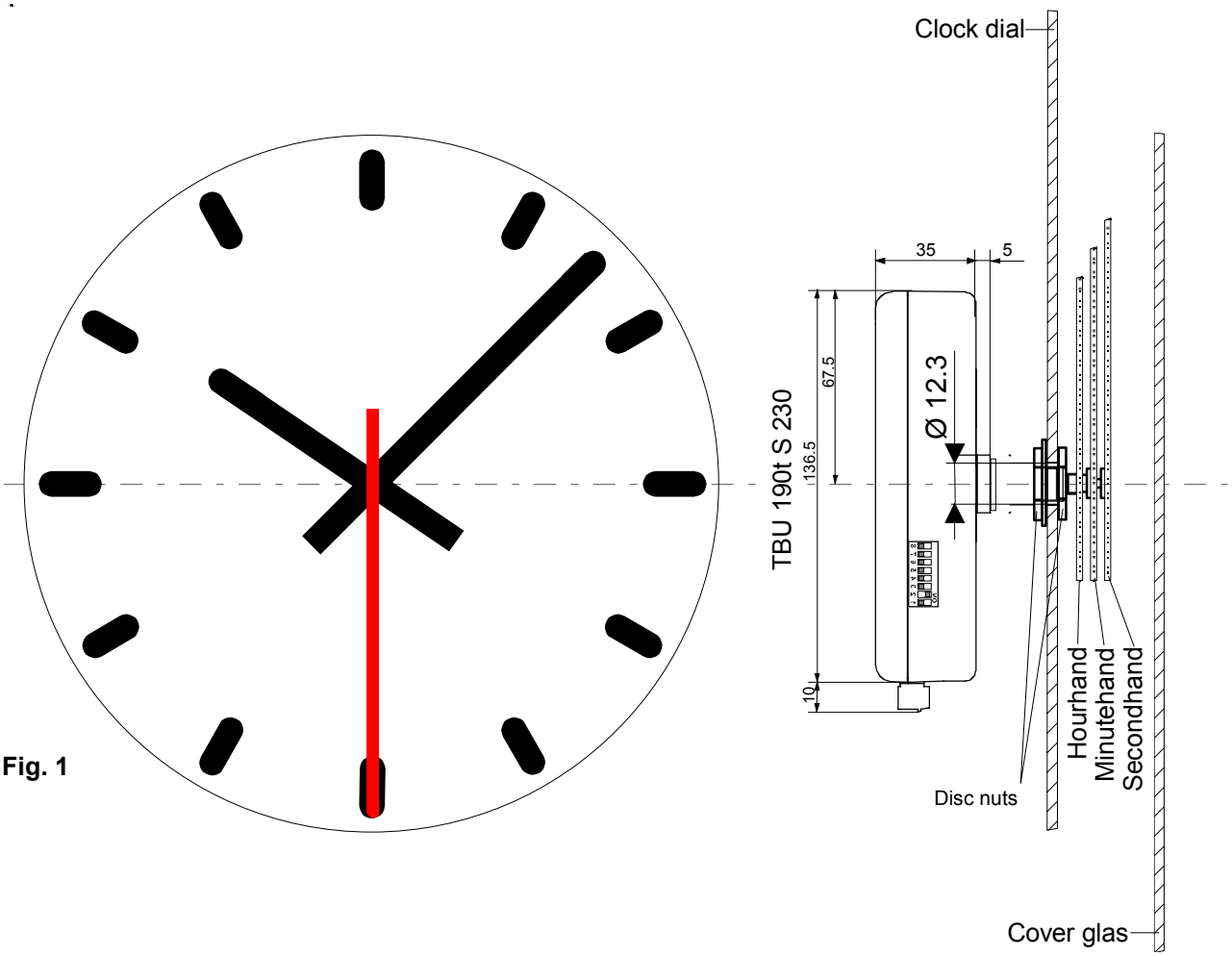


Fig. 1

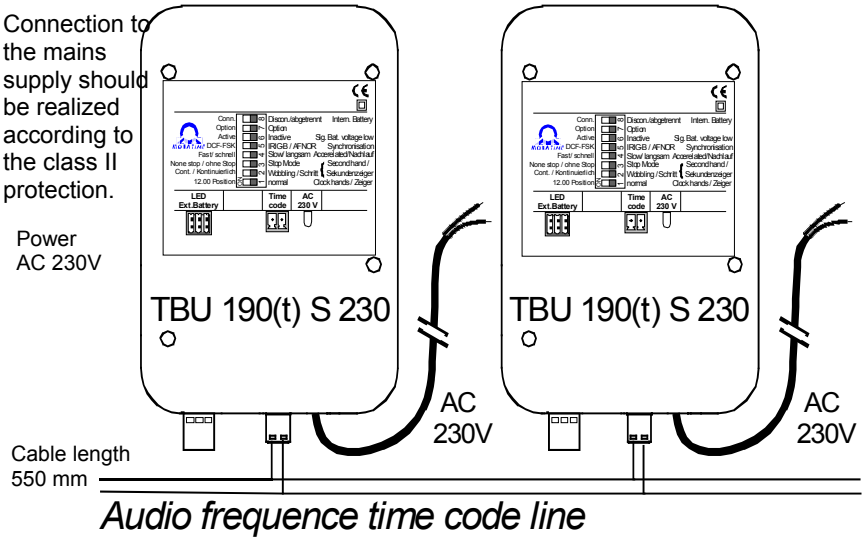


Fig. 2

2. Function description

Self-setting movement with hour, minute and second display. For self-setting slave clocks for indoor or outdoor use with dial diameters up to 80 cm, with or without illumination.

- ***IRIG-B, AFNOR NFS 87500*** or ***DCF-FSK*** audio frequency time code controlled with automatic time take-over and daylight saving time change-over by means of the connected master clock. Time code selectable by means of a DIP-switch.
- Signalization of missing audio frequency time code reception after 1 hour.
- Signalization of missing audio frequency time code reception on LED output after 10 seconds (IRIG-B, AFNOR), resp after 2 minutes (DCF-FSK)
- Internal quartz clock for precise time display even during a failure of the *IRIG-B, AFNOR* or *DCF-FSK* signal.
- Upon mains power failure, hour, minute and second hands will keep on running, powered by an internal battery (NiMH) for one hour. After this time, the hands move to 12.00 o'clock position.
- Automatic battery management (load / test).
- Connector for external NiMH battery available.
- Signalization of low battery voltage by setting the hands to 12 o'clock position. (Signalization can be activated / deactivated by means of a DIP-switch).
- Different running modes of the second hand, selectable by means of a DIP-switch.
- Catching up speed selectable by means of DIP-switch (< 3 minutes resp < 6 minutes for 12 hours rotation.

3. Mounting guidelines

3.1 Mounting of movement series 190t S

The dial must be sufficiently stable. The fixing hole must have a diameter of 12.3 mm.
The movement must be fixed in vertical position.

Vide Fig. 3 for the position of mounting parts.
The disc nut (2*) M12 x 1 has to be tightened with a special wrench tool (Art. No. 201998) and a torque wrench with a torque of 4.5 Nm +/- 0.2 Nm.

Attention:
The ring nut (5), the compensation ring (6) and the spring washer (7) must not be removed.
After tightening of the disc nut (2*), the movement must not be wrenched!

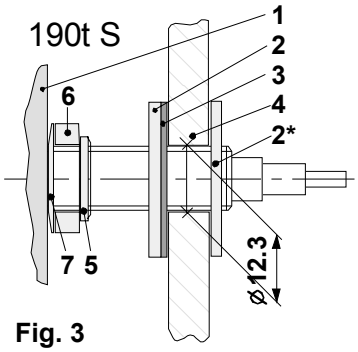


Fig. 3

1 Movement
2 Disc nut
3 Rubber washer
4 Dial
5 Ring nut
6 Compensation ring
7 Spring washer

3.2 Mounting of hands and Starting-up

3.2.1 Mounting of hands

The shafts of the hour, minute and second hands are positioned ex-work on the reference position (12 o'clock). The hands shall be carefully fixed and tightened on the shafts. Enough space must be provided between the hands. See Fig. 4.

The position 12 o'clock must be checked on each movement after the mounting (Chap.4).

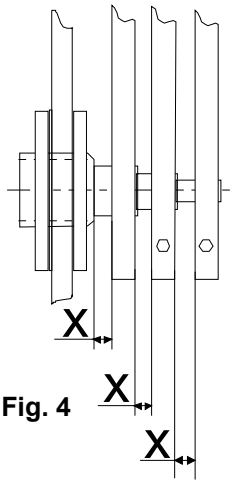


Fig. 4

3.2.2 Starting-up and check of the hand position

- Set DIP switch **1** to **ON** position (12:00 Position, Fig. 5)
- Install the AC 230V power supply by using the white two wire cable from the movement. The clock runs to 12 o'clock position
  ➔ Position of hands OK?
- If the hand position is wrong, carefully loosen the hand, adjust and tighten.
- Reset DIP Switch **1** to **OFF** position
  ➔ If necessary, check the 12 o'clock position again
- If the hands position is OK, continue with chapter 4 for further setting up.

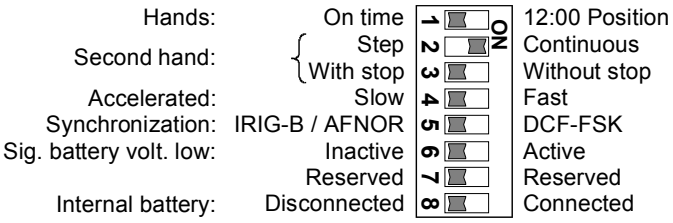


Fig. 5

4. Setting up / Connections

- After checking the 12 o'clock position, reset DIP-Switch **1** to **OFF** position (Fig. 5).
- Wire line signal (IRIG-B, AFNOR or DCF-FSK) to plug "Time code" (see Fig. 6 and 8).
- The hands remain a short time (about 3 minutes using DCF-FSK) in 12 o'clock position, until 2 complete telegrams are received.

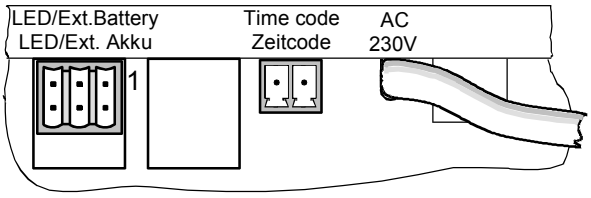


Fig. 6

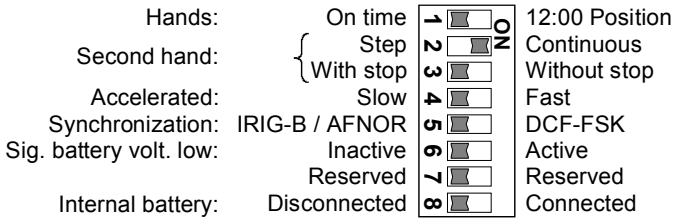
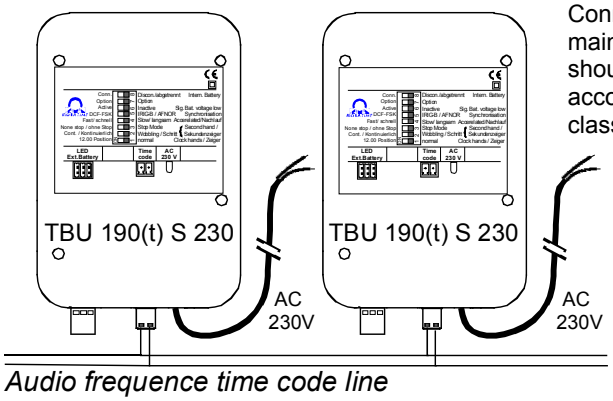


Fig. 7

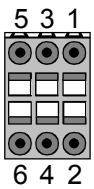
Example:



Connection to the mains supply should be realized according to the class II protection.

Fig. 8

Connector LED / BAT



1 Battery + (max. 5.6 V DC)
2 Battery -
3 nc
4 nc
5 LED + (no resist. needed)
6 LED -

Attention:
Max. 15 movements per line connected to a master clock with an output impedance of 600 Ω (MTS, IF 488).

5. Additional Information for TBU 190 Movements

5.1 Active running reserve

The movements of the TBU 190 series are equipped with an internal rechargeable battery (4.8 V, 140 mAh). Powered from this battery the movements continue running (hour, minute and second hands) during maximum 1 hour when mains power fails. The battery is connected to the movement only if DIP switch 8 is closed (ON position).

5.1.1 Signalization of mains power break

After one hour without mains power returns, the movements run to 12:00 o'clock position to signalize a mains power failure.

5.1.2 External running reserve battery

Instead of the internal an external battery can be connected to the movement (nominal voltage 4.8 V, terminals 1 (+) and 2 (-) of the LED/BAT connecters). In this case, DIP switch 8 should be opened.

5.1.3 Battery management

The battery management (recharge and load test) is done from the movements automatically. The test- and charge process is designed for batteries with a capacity of 140 mAh. When DIP switch 6 is closed (ON position), a deep battery voltage is signalized by positioning the clock hands to 12:00 o'clock. In this case the battery unit has to be exchanged (refer to next section) or set DIP switch 6 to OFF position (operation without battery management).

5.1.4 Replacement of the internal batteries

If the internal running reserve battery should be exhausted (e.g. because of aging), it can be accessed by removing the case back cover of the movement (remove the four screws on backside of the movement). The battery unit may be exchanged only by a same type of battery (battery unit for TBU 190: art. no.: 202 524).

5.1.5 Restrictions for running reserve battery

Rechargeable batteries exposed to extremely whether situations (direct solar irradiation, temperatures below zero) are subject to an accelerated aging process. Movements, installed outdoors, should therefore be used without running reserve battery, if possible. (Recommendation: DIP switches 6 and 8 opened).

5.2 Selection of time code format

The TBU 190 movements can be synchronized with the sound frequency time code IRIG-B / AFNOR NFS 87500 or DCF-FSK. The selection of the time code format shall be made by means of DIP switch 5 (position ON = DCF-FSK).

5.2.1 Signalization of the time code with LED

The availability of a valid time code can be displayed with a LED. This can be connected to the terminals 5 (+) and 6 (-) of the LED/BA plug without pre-resistance (I_F = 6 mA).

The LED will be switched off after 10 seconds without reception of a valid IRIG-B / AFNOR NFS 87500 telegram, resp. after 2 minutes without the reception of a valid DCF-FSK telegram. When operating from a standby accumulator (in case of a mains failure) the movements will also switch off the LED output.

5.2.2 Signalization of synchronization failure

After a running time of 1 hour without synchronization, the movements will display the failure of the time code by putting the hands on 12:00 o'clock.

5.3 Selection of catching up speed

With the DIP switch 4 the catching up speed of the TBU 190 movements will be determined. With the rapid catching up speed (switch on position ON) the catching up time for 12 hours will be less than 3 minutes, with the slow catching up speed less than 6 minutes. In order to avoid a loss of hand steps caused by a too high mechanical charge of the motors at rapid catching up speed, clocks with dial diameter > 40 cm should be running with slower catching up speed. (Recommendation: DIP switch 4 open).

5.4 System reset of the clock

The operation of the DIP switches 4 and 5 causes a restart of the software of the clock movement electronic. In case of disturbances these switches can be used as reset switches. In case of a reset the movement will reset all internal settings into the initial position and loose the time information (will then need a new synchronization by means of a valid time code format).

6. Technical specification

	TBU 190 S 230	TBU 190t S 230
Synchronization	IRIG-B, AFNOR or DCF-FSK audio frequency time code	
Setting times: Running time to reference pos. Read in of time Running time for new adjustment Changes of daylight saving time	(depending on switch position) 3 min., 6 min. resp 10 – 20 sec. (IRIG), 3 – 4 min. (DCF-FSK) resp 10 seconds – 3 min., 6 minutes resp Maximum 2.75 min., 5.5 min. resp	
Operation mode second shaft	- Continuously **or** secondly pace shift (wobbling) - 1 revolution in 60 s **or** 1 revolution in 58 s with stop at 12.00 and start with the minute change	
Operation mode minute shaft	1 step every 60 s	
Operation mode hour shaft	continuous	
Operation voltage	230 VAC ±10% 50 – 60Hz	
Power consumption from 230 VAC	< 3 VA	
Time signal input: Impedance for 1 kHz signal Voltage range (0 dB corr. to 0.775 Veff)	 1.5 kΩ +10 dB … -30 dB (2 Vpp … 25 mVpp) (pp = peak-peak)	
Stand-by reserve during power failure	1 hour (hour, minute and seconds)	
Number of motors	2 (hour / min. + sec.)	
Dial diameter	25 – 80 cm	
Max. dial thickness	4 mm	14.5 mm
Temperature range	-30 ... +70°C	
Weight	360 g	400 g
Standards	EN 50121-4, EN 61000-6-3	
Savety	EN 60950-1, Protection class II	

Subject to change without notice

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