MOUNTING AND INSTRUCTION MANUAL

TREND NTP

NTP analog clock

Certification of the Producer

STANDARDS

The NTP clock TREND was developed and produced in accordance with the EU Guidelines:
2006 / 95 / EG
2004 / 108 / EG
96 / 48 / EG

CE

References to the Instruction Manual

1. The information in this Instruction Manual can be changed at any time without notice.
    The current version is available for download on www.mobatime.com.
2. This Instruction Manual has been composed with the 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 only start setting-up the product, after you have correctly understood all the information for the installation and operation.
5. The installation must only be carried out by skilled staff.
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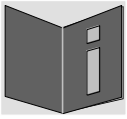
Installation and Handling Notice

This clock may only be transported in its original packaging and must be kept dry.

Table of contents

1 Safety

1.1 Safety instructions

Read this chapter and the entire instruction manual carefully and follow all instructions listed. This is your assurance for dependable operations and a long life of the device.

Keep this instruction manual in a safe place to have it handy every time you need it.

1.2 Symbols and Signal Words used in this Instruction Manual

	Danger! Please observe this safety message to avoid electrical shock! There is danger to life!
	Caution! Please observe this safety message to avoid damages to property and devices!

1.3 Observe operating safety!

Caution!

- Never open the housing of the device! This could cause an electric short or even a fire, which would damage your device. Do not modify your device!

- The device is not intended for use by persons (including children) with limited physical, sensory, or mental capacities or a lack of experience and/or knowledge.

- Keep packaging such as plastic films away from children. There is the risk of suffocation if misused.

1.4 Consider the installation site!

Caution!

- To avoid any operating problems, keep the device away from moisture and avoid dust, heat, and direct sunlight. Do not use the device outdoors.

Danger! Make sure
that you wait before using the device after any transport until the device has reached the ambient air temperature. Great fluctuations in temperature or humidity may lead to moisture within the device caused by condensation, which can cause a short.

1.5 Please observe the electromagnetic compatibility!

Caution!

- This device complies with the requirements of the EMC and the Low-voltage Directive.

2 Maintenance

2.1 Troubleshooting: Repairs

If you cannot rectify the problems, contact your supplier from whom you have purchased the device.

Any repairs must be carried out at the manufacturer's plant.

Disconnect the power supply immediately and contact your supplier, if …

- liquid has entered your device

- the device does not properly work and you cannot rectify this problem yourself.

2.2 Cleaning

- Please make sure that the device remains clean especially in the area of the connections, the control elements, and the display elements.

- Clean your device with a damp cloth only.

- Do not use solvents, caustic, or gaseous cleaning substances.

2.3 Disposing

Device
At the end of its lifecycle, do not dispose of your device in the regular household rubbish. Return your device to your supplier who will dispose of it correctly.
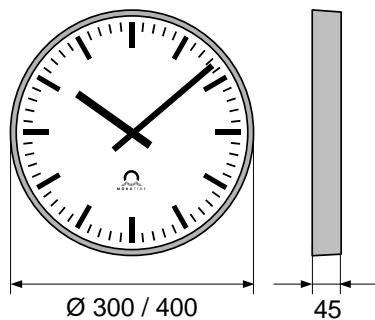
Packaging
Your device is packaged to protect it from damages during transport.
Packaging is made of materials that can be disposed of in an environmentally friendly manner and properly recycled.

3   General Information: Introduction

3.1   Measurements

Ø 300 / 400   45

All specifications in mm.

3.2   Function description

The **TREND** is a self-setting clock with hour, minute and second hand. It is network-compatible and can be synchronized using NTP (Network Time Protocol). It is available in the diameters 30 cm and 40 cm.

Features:

- 10/100 MBit/s Ethernet LAN connection.

- PoE (Power over Ethernet) power supply.

- Synchronization using an NTP server in the network.

- Push-button for reset to factory configuration.

- Automatic takeover of the network configuration:

  IPv4:   from a DHCP server in the network: IP address, gateway address, subnet mask, up to 4 NTP server addresses, time zone server address, SNMP manager address.

  IPv6:   -SLAAC: IP address
  -DHCPv6 server in the network: IP address, up to 4 NTP server addresses, time zone server address, SNMP manager address

  Alternatively: the network configuration can be set manually using the PC tool MOBA-NMS.

- Automatic daylight saving time change according to a predefined rule. The rules can be programmed using the PC tool MOBA-NMS.

  Alternatively: daylight saving time change according to a rule of a MOBATime time zone server in the network.

- Integration into a monitoring system (SNMP-Manager) possible. The clocks can send SNMP V2 alarm notifications (traps) and periodical alive notifications.

- Signalization of a missing NTP synchronization after 24 hours by setting the hands to the 12 o'clock position.

- Two motors for minute / hour hand and second hand.

- Operation mode of the minute hand selectable over MOBA-NMS.

4   Mounting guidelines

4.1   Single-sided clock

4.1.1   Connections

LAN - PoE

push-button

yellow LED: data activity

green LED: connection

4.1.2   Mounting

24

250

5

Ø 11

Ø 7-10

Ø ≤ 4.5

LAN connection (flex cable) with PoE
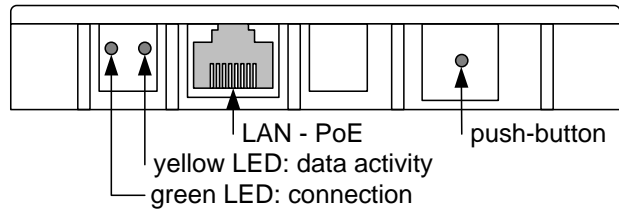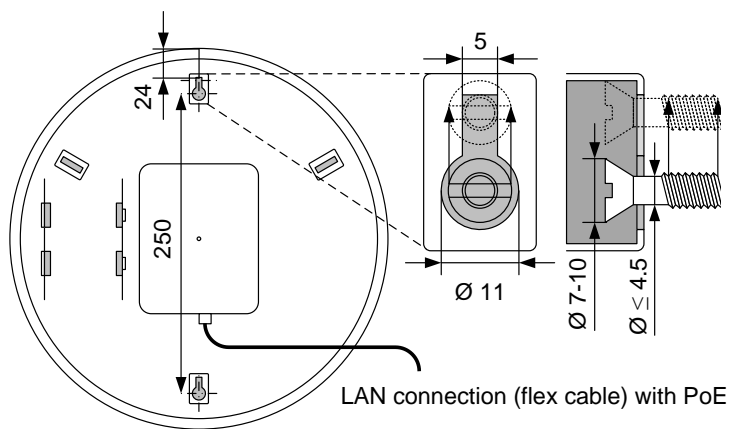
4.2 Double-sided clock

4.2.1 Connections

MOBALine

push-button
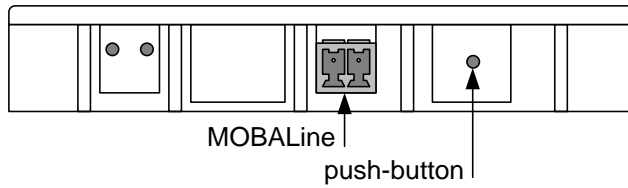
4.2.2 Mounting

All specifications in mm.

Wall / ceiling set 10 cm

Ceiling set 50 / 100 cm

LAN

Bridge cable
Art. no. 205132
Included in delivery

PCB

MOBALine

Reset push-button

DCF
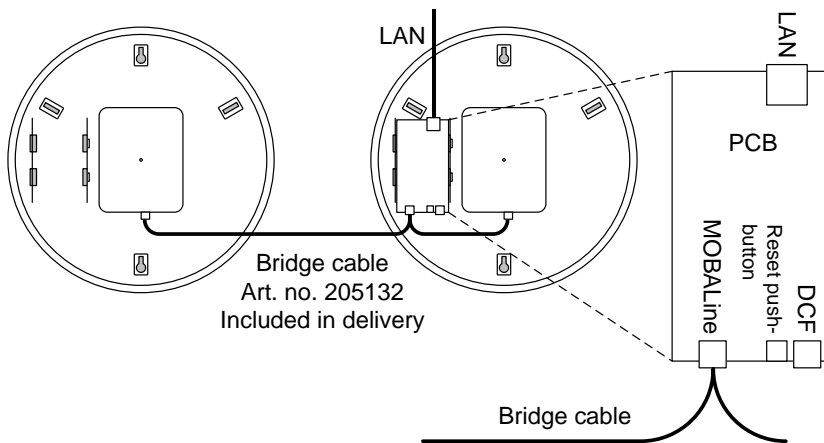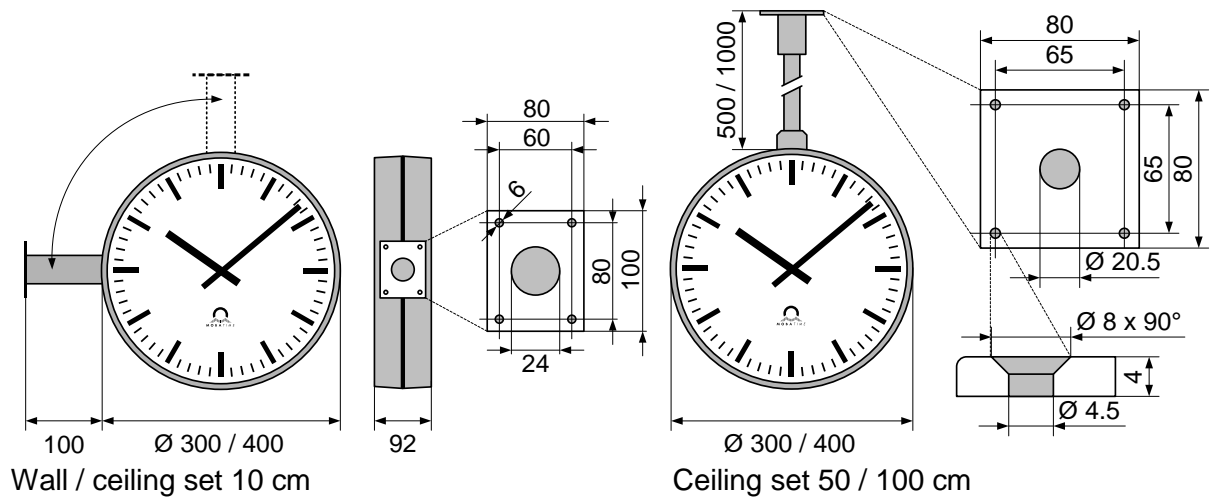
Bridge cable

Connection bridge cable

red

2

movement

brown

1

red

brown

red

PCB

MOBALine
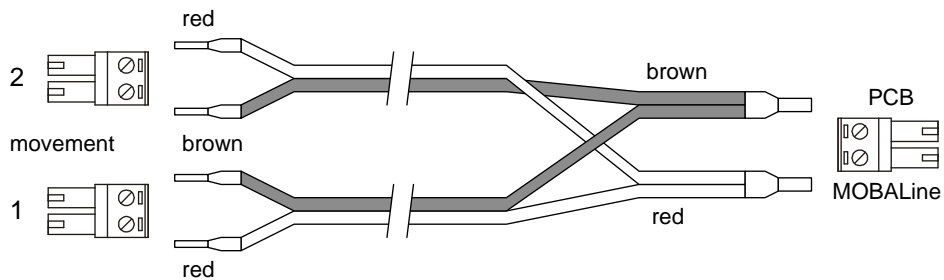
Notice: The cabling must correspond to the above drawing!

5   Configuration

5.1   Overview

The NTP clock TREND can be operated in two different modes:

- **Unicast**

  The clock works as an NTP client. It possesses its own IP address (see chapter 4.3.1)

- **Multicast**

  The clock works as an NTP client. It is addressed over a group address (multicast IP) (see chapter 4.3.2).

Configuration takes place via the PC tool MOBA-NMS. The network configuration is automatically done by:
-IPv4:   DHCP server (see chapter 6.2)
-IPv6:   SLAAC or DHCPv6 Server (see chapter 6.3 and 6.5)
-manually using the PC tool MOBA-NMS (see chapter 6.10)

5.2   Reset

5.2.1   Default values

Name (20 Zeichen)	TREND NTP
IP mode	IPv4 and IPv6 on
DHCP IPv4	on
IPv4 IP address	1.255.255.253
IPv4 subnet mask	255.255.255.0
IPv4 gateway address	1.255.255.252
IPv6 fix address/prefix	0::0/64
IPv6 link local address	see calculation in chapter 6.3
DHCPv6	on
IPv6 autoconfiguration (RA, SLAAC)	on
Host name	MOBATIMExxxxxx, with the last 6 digits corresponding to the last 6 digits of the MAC address. e.g. MAC 00:16:91:12:34:56 → MOBATIME123456
NTP server address 1	0.0.0.0
NTP server address 2	0.0.0.0
NTP server address 3	0.0.0.0
NTP server address 4	0.0.0.0
Request interval NTP [s] (10...999s)	10
Time zone entry 1	London
Time zone entry 2	Brüssel
Time zone entry 3	Athen
Time zone entry 4	Bukarest
Time zone entry 5	Kairo
Time zone entry 6	Amman
Time zone entry 7	UTC
Port number for configuration	65532
Port number for time zone client	65534
SNMP manager address 1	0.0.0.0 / 0::0
SNMP manager address 2	0.0.0.0 / 0::0
Interval SNMP Alive-Traps [min] (1…1440)	30

5.2.2   Reset with push-button (single-sided version only)

The TREND clock features a push-button on the rear side (see chapter 4.1.1 Connections). It can be pushed using a pointy object (e.g. a paper clip). For the double-sided mounting (see chapter 4.2.2), the push-button on the control electronics is used. To carry out a software reset on the clock, the push-button must be held down for min. 2 seconds.

If the push-button is held down for more than 10 seconds, the factory settings are loaded.

5.2.3   Reset with MOBA-NMS

The clock can also be reset using the PC tool MOBA-NMS.

5.3   Operating modes

5.3.1   Unicast

The clock possesses a network connection and is synchronized to UTC (coordinated world time) from an NTP server.

This operating mode supports the monitoring and configuration of the clock through the network connection. The configuration can be carried out automatically by a DHCP server or manually using the software MOBA-NMS.

For monitoring and configuration with MOBA-NMS, one of the group addresses (multicast IP) 239.192.54.0 or 239.251.34.0 for IPv4 resp. FF38::EFC0:3600 or FF38::EFFB:2200 for IPv6 or the IP address is used.

The operating mode unicast with DHCP is configured per default:

In this operating mode, the clock will try to obtain the following network parameters from a DHCP server (see also chapter 5.2):

- IP address
- Gateway address
- Subnet mask
- NTP server address(es) / time zone server address
- SNMP manager address

In this operating mode, the clock will try to obtain the following network parameters in an IPv6 network from a DHCPv6 server (see also chapter 7.4):

- IP address
- NTP server address(es) / time zone server address
- SNMP manager address

The NTP server addresses must be configured as DHCP option on the server by the network administrator. If an address is sent to the clock, it will request NTP and time zone packages from it. The request interval can also be configured using MOBA-NMS.

5.3.2   Multicast

The clock features a network connection and is synchronized to UTC (coordinated world time) by a network administrator.

The configuration can be carried out with MOBA-NMS. Further, this operating mode supports the monitoring of the clock through the network connection. Using MOBA-NMS, single configuration parameters can also be modified through the network connection.

For monitoring and configuration with MOBA-NMS, one of the multicast group addresses (multicast IP) is used. The group address is an IP address in the multicast range (224.0.0.0 to 239.255.255.255), addresses selected by Moser-Baer AG from a freely available range:

-IPv4:   239.192.54.x and 239.251.34.x, whereat x = 1..15

With IPv6, the ranges mentioned above are implemented as follows:

-IPv6:   FF3y::EFC0:360x and FF3y::EFFB:220x, whereat x = 0x1..0xF and y=scope

E.g.:   239.192.54.5 → FF38::EFC0:3605 or 239.251.34.10 → FF38::EFFB:220A
            For scope, the following values are possible: ~~2 = Link Local Scope~~
                                                             ~~5 = Site Local Scope~~
                                                             8 = Organization Local Scope
                                                             ~~14 = Global Scope~~

Unlike the unicast mode, the clock receives multicast addressed NTP and time zone packages from an NTP server on a fixed group address (multicast IP). The standard port numbers are 123 (NTP) and 65534 (time zone). The operating mode multicast means the least configuration effort for a network administrator.

6 Operating behavior

6.1 Power supply

The clock can be supplied through PoE (Power over Ethernet) from a switch. As an alternative to the PoE switch, a PoE injector can be used.

6.2 DHCP

In the unicast operating mode, the clock tries to obtain the network configuration from a DHCP server in the network. The DHCP options are evaluated automatically.

The exact description can be found in the manual BE-800793 Description MOBATime network clocks.

It is the task of the network administrator to configure the DHCP options accordingly.

6.3 IPv6

IPv6 allows for up to 4 parallel IP addresses, prioritized in decreasing order:
-address given by DHCPv6
-fix address
-address calculated with auto-config (SLAAC / RA)
-link local address

It is possible to deactivate DHCPv6 and / or auto-configuration.

Calculation of the link local address from the MAC address:
fe80::2[2nd part MAC]:[3rd part MAC]ff:fe[4th part MAC]:[5th part MAC][6th part MAC]

Example: MAC: 00:16:91:12:34:56

IPV6: fe80::216:91ff:fe12:3456

6.4 DHCPv6

In the unicast operating mode, the NPR tries to get the network configuration from a DHCPv6 server in the IPv6 network. The DHCP options are automatically evaluated.

A detailed description can be found in the manual BE-800793 Description MOBATIME network clocks.

The network administrator is responsible for configuring the DHCP options accordingly.

6.5 Autoconfiguration / SLAAC

In the unicast operating mode, the NPR tries to calculate the network configuration from the information of a router (RA) in the IPv6 network: IPv6 address.

A detailed description can be found in the manual BE-800793 Description MOBATIME network clocks.

6.6 SNMP

For the integration into a monitoring system, the TREND supports SNMP notifications (traps) (SNMP version 2c). As an SNMP agent, the TREND can send alarm traps and alive traps to an SNMP manager (e.g. network management tool HP OpenView or similar) in the network. For that purpose, the IP address of the SNMP manager must be configured (with DHCP or PC tool MOBA-NMS). The trap structures are defined in an

MIB file (for details, see document BE-800793). Alarm traps are used to inform the SNMP manager about errors. Alive traps are sent periodically and signal the availability and the status of the clock to the SNMP managers. The interval of the alive traps can be set with the PC tool MOBA-NMS.

6.7 Local time calculation

NTP clocks are synchronized to UTC (coordinated world time). In order to calculate and display the local time, the clocks require additional information in the shape of a time zone entry. The TREND features a predefined table with 7 entries which can be edited through the network using MOBA-NMS

Alternatively, the TREND supports the calculation of the local time based on the time zone entry of a time zone server. In the unicast mode, it requests the entry from the configured NTP server. In the multicast mode, it receives the corresponding entry on the configured group address.

6.8 Accuracy / Loss of synchronization

The deviation in the synchronized state is usually smaller +/-50 ms.

The clock signals a loss of synchronization after 24 hours through putting out the 12 o'clock command. The deviation after 24 h without synchronization is typically smaller +/-2 s (quartz accuracy: 20 ppm at room temperature).

Notice: The mentioned deviations depend on the accuracy and performance of the time source (NTP server). The NTP reception can be influenced by the network load and devices (hub, switch, router, firewall, etc.).

6.9 Redundant time source

The availability of NTP servers as time source can be improved through a redundant operation in the network. Depending on the operation mode of the TREND, the following strategy is provided (also works for time zone servers):

6.9.1 NTP client unicast

As a DHCP/DHCPv6 option or through manual configuration (MOBA-NMS), up to four different NTP server addresses can be announced to the clock. If three time requests in a row are not answered by the current server, the clock switches to the next server (if available). The duration until the change is dictated by the set request interval (default: 3 x 10 seconds). After a restart of the clock, the request begins at the first server.

6.9.2 NTP client multicast

Two servers which send NTP packages from the same group address (multicast IP) are to be installed. The sending intervals of the two servers have to be set so that the primary server is the synchronization source in normal operation. The synchronization from the secondary server only occurs if the primary server shows an error. The ratio of the number of sent packages between primary and secondary server should be at least 4:1:

• sending interval primary server: 1 package / 1 minute
• sending interval secondary server: 1 package / 4 minutes

The choice of server thus depends on the dominance of the server which sends out more NTP packages per time unit. Consequently, if the primary server falls out, the secondary server dominates.

6.10 MOBA-NMS (MOBATime Network Management System)

MOBA-NMS is a Java-based PC program used for configuration and status requests of NTP clocks. This software allows for all configurations for one or several devices to be carried out centrally.

Further information, manuals and the software itself can be found on our website http://www.mobatime.com. If desired, it can also be sent out on a USB stick (must be ordered separately).

7   Update

The firmware resp. the bootloader of a clock can be updated using MOBA-NMS. However, depending on the reason for change the settings on the clock are lost. The protocol TFTP UDP Port 69 is used.
In the multicast operating mode, an update is carried out sequentially on multiple clocks. In the unicast operating mode, this is done parallel.

Attention: For the update, a DHCP server in the network is required.

The update window is opened by right-clicking on the device ➔ Commands ➔ Firmware Update…:

Firmware update

Bootloader update
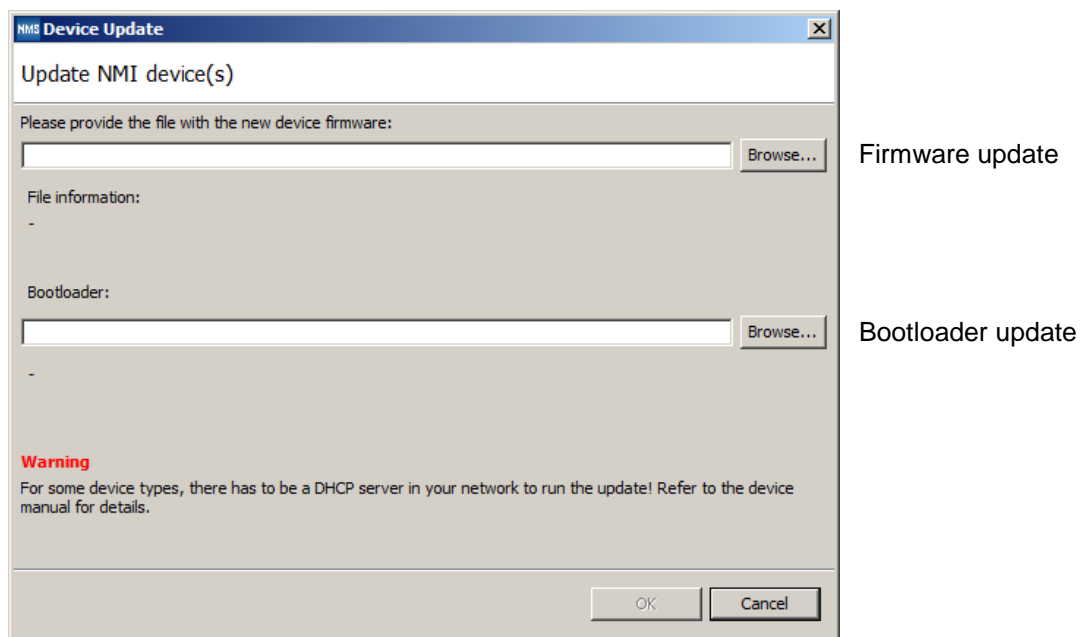
Attention: The newest versions of the firmware and bootloader are available at *www.mobatime.com* ➔ *Customer Area* ➔ *Product Resources* in the respective product folder. If the delivered device contains newer software than displayed in this manual, please check the settings.

7.1 Bootloader update

A bootloader update is only necessary if the respective alarm is displayed:

In case of a bootloader alarm, the selection field for the firmware (application) is deactivated and only made available after a successful bootloader update:

Important: The bootloader file must be a .zip file.

8   Time zone table

Time zone entries standard season table (version 10.1).

Time zone	City / State	UTC Offset	DST Change	Standard → DST	DST → Standard
00	UTC (GMT), Monrovia, Casablanca	0	No		
01	London, Dublin, Edinburgh, Lisbon	0	Yes	Last Sun. Mar. (01:00)	Last Sun. Oct. (02:00)
02	Brussels, Amsterdam, Berlin, Bern, Copenhagen, Madrid, Oslo, Paris, Rome, Stockholm, Vienna, Belgrade, Bratislava, Budapest, Ljubljana, Prague, Sarajevo, Warsaw, Zagreb	+1	Yes	Last Sun. Mar. (02:00)	Last Sun. Oct. (03:00)
03	Athens, Istanbul, Helsinki, Riga, Tallinn, Sofia, Vilnius	+2	Yes	Last Sun. Mar. (03:00)	Last Sun. Oct. (04:00)
04	Bucharest, Romania	+2	Yes	Last Sun. Mar. (03:00)	Last Sun. Oct. (04:00)
05	Pretoria, Harare, Kaliningrad	+2	No		
06	Amman	+2	Yes	Last Thu. Mar. (23:59)	Last Fri. Oct. (01:00)
07	UTC (GMT)	0	No		
08	Kuwait City, Minsk, Moscow, St. Petersburg, Volgograd	+3	No		
09	Praia, Cape Verde	-1	No		
10	UTC (GMT)	0	No		
11	Abu Dhabi, Muscat, Tbilisi, Samara	+4	No		
12	Kabul	+4.5	No		
13	Adamstown (Pitcairn Is.)	-8	No		
14	Tashkent, Islamabad, Karachi, Yekaterinburg	+5	No		
15	Mumbai, Calcutta, Madras, New Delhi, Colombo	+5.5	No		
16	Astana, Thimphu, Dhaka, Novosibirsk	+6	No		
17	Bangkok, Hanoi, Jakarta, Krasnoyarsk	+7	No		
18	Beijing, Chongqing, Hong kong, Singapore, Taipei, Urumqi, Irkutsk	+8	No		
19	Tokyo, Osaka, Sapporo, Seoul, Yakutsk	+9	No		
20	Gambier Island	-9	No		
21	South Australia: Adelaide	+9.5	Yes	1st Sun. Oct (02:00)	1st Sun. Apr. (03:00)
22	Northern Territory: Darwin	+9.5	No		
23	Brisbane, Guam, Port Moresby, Magadan, Vladivostok	+10	No		
24	Sydney, Canberra, Melbourne, Tasmania: Hobart	+10	Yes	1st Sun. Oct. (02.00)	1st Sun. Apr. (03:00)
25	UTC (GMT)	0	No		
26	UTC (GMT)	0	No		

27	Honiara (Solomon Is.), Noumea (New Caledonia),	+11	No		
28	Auckland, Wellington	+12	Yes	Last Sun. Sep. (02:00)	1st Sun. Apr. (03:00)
29	Majuro (Marshall Is.), , Anadyr	+12	No		
30	Azores	-1	Yes	Last Sun. Mar. (00:00)	Last Sun. Oct. (01:00)
31	Middle Atlantic	-2	No		
32	Brasilia	-3	Yes	3rd Sun. Oct. (00:00)	3rd Sun. Feb. (00:00)
33	Buenos Aires, Santiago	-3	No		
34	Newfoundland, Labrador	-3.5	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
35	Atlantic Time (Canada)	-4	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
36	La Paz	-4	No		
37	Bogota, Lima, Quito, Easter Island, Chile	-5	No		
38	New York, Eastern Time (US & Canada)	-5	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
39	Chicago, Central Time (US & Canada)	-6	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
40	Tegucigalpa, Honduras	-6	No		
41	Phoenix, Arizona	-7	No		
42	Denver, Mountain Time	-7	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
43	Los Angeles, Pacific Time	-8	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
44	Anchorage, Alaska (US)	-9	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
45	Honolulu, Hawaii (US)	-10	No		
46	Midway Islands (US)	-11	No		
47	Mexico City, Mexico	-6	Yes	1st Sun. Apr. (02:00)	Last Sun. Oct. (02:00)
48	Adak (Aleutian Is.)	-10	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
49	UTC (GMT)	0	No		
50	UTC (GMT)	0	No		
51	UTC (GMT)	0	No		
52	UTC (GMT)	0	No		
53	UTC (GMT)	0	No		
54	Scoresbysund, Greenland	-1	Yes	Last Sun. Mar. (00:00)	Last Sun. Oct. (01:00)
55	Nuuk, Qaanaaq,Greenland	-3	Yes	Last Sat. Mar. (22:00)	Last Sat. Oct. (23:00)
56	Qaanaaq, Greenland (old)	-4	Yes	2nd Sun. Mar. (02:00)	1st Sun. Nov. (02:00)
57	Western Australia: Perth	+8	No		
58	Caracas	-4.5	No		
59	CET standard time	+1	No		
60	Santiago, Chile (old)	-4	Yes	2nd Sun. Oct. (00:00)	2nd Sun. Mar. (00:00)
61	Chile, Easter Island (old)	-6	Yes	2nd Sat. Oct. (22:00)	2nd Sat. Mar. (22:00)
62	Baku	+4	Yes	Last Sun. Mar. (04:00)	Last Sun. Oct. (05:00)
63	UTC (GMT)	0	No		
64	UTC (GMT)	0	No		

In countries where the DST switch date changes annually (e.g. Iran, Israel), the time zone has to be defined manually in the user time zone table (entries 80 – 99).

Legend:
UTC:	Universal Time Coordinate, equivalent to GMT
DST:	Daylight Saving Time
DST Change:	Daylight Saving Time changeover
Standard → DST:	Time change from Standard time (Winter time) to Summer time
DST → Standard:	Time change from Summer time to Standard time (Winter time)

Example:
2nd last Sun. Mar. (02:00)	Switch over on the penultimate Sunday in March at 02.00 hours local time.

Notice: As usual, the time table is adapted each year. You can download the newest time table from our homepage: *www.mobatime.com* ➔ *Downloads* ➔ *Moba-Software* ➔ *Time Zone Table*. If the delivered device contains a newer version as showed in this manual, it's recommended to check the time zone entries.

9 Accessories

- Wall / ceiling set (arm length 10 cm)
- Ceiling set 50 cm
- Ceiling set 100 cm

10 Technical data

Network interface	10/100 Mbit/s Ethernet controller, RJ45 plug Only shielded cable permitted
Network	IPv4 and / or IPv6 with: IPv4: static or DHCP IPv6: static, SLAAC and / or DHCPv6
Synchronization	Network Time Protocol (NTP), UTC
Monitoring	Status request of the clocks with PC software MOBA-NMS. SNMPv2c alarm and alive notifications (traps) for integration into a network management system.
Regulating time after restart	< 3 minutes 20 seconds daylight saving time change: < 15 seconds
Operation	DHCP, MOBA-NMS, SNMP V2c
Operating modes	second axis: step operation minute axis: continuous or step operation hour axis: continuous
Power supply	PoE, phantom or pins 4, 5 and 7, 8 (class 1)
Calculation of local time and daylight saving time change	automatic daylight saving time change, selectable from 7 predefined rules or daylight saving time change from external MOBATime time zone server, selectable from 7 entries
Accuracy	deviation typically <+/-50 ms in synchronized state
Loss of synchronization	hands on 12 o'clock position after 24 h deviation typically <+/-2 s after 24 h
Number of motors	without second hand: 1 (h / min.) with forward and backward motion with second hand: 2 (h / min. + sec.) with forward / backward motion
Temperature area	-10 … +55 °C
Weight	without second hand: 170 g with second hand: 185 g