USER MANUAL

Mini Master clock HN 60, HN 61

INHALT

1   DESCRIPTION

The „mini" master clock is a device used to control small-scale systems of unified time, with up to 20 pieces of slave clocks and up to 8 pieces of school bell (signaling devices). The clock is mounted to the DIN rail and is finding its use mostly in schools and plants of reduced size. One or two slave lines 24 V / 150 mA, one or two programmable relay contacts, switching program with a weekly cycle up to 399 programable lines. Integrated GPS receiver on HN 61 / 61m / 61i / 61a. Audio output on HN 60a / 61a.

1.1   Technical Description

1.1.1 Basic properties

- LCD display with 2x16 characters
- easy operation using 6 keys located on the front panel
- well-arranged user menu
- multi language support
- monitoring quality of DCF 77, WWVB, MSF or GPS signal
- possibility of configuration for any time zone
- USB for connection of flash memory drive with saved switch programs
- powered by mains 115 or 230VAC or by DC power 12 or 24 VDC

1.1.2 Switching channels

1 or 2 programmable relay contacts freely configurable

for switching based on:

- weekly program cycle with up to 399 programmable lines
- astronomical calendar with sunrise and sunset time calculation based on entry of geographical coordinates
- manual switching with various modes (ON/OFF, push-button, timer)

1.1.3   Time-base

- The clock is controlled by a microprocessor and locked to its own precise crystal time base.

Local time calculation with automatic DST:

- entry of desired zone from standard timezone table

1.1.4 Slave line

Freely adjustable for the transmission of:

- MOBALine (except HN 60i / 61i)
- polarized minute impulses
- polarized half-minute impulses
- polarized second impulses

The impulse length, gap length and cycle type can be set for all types of impulse lines.

1.1.5 Other I / O

- input for the connection of DCF, WWVB, MSF receiver or GPS receiver (with DCF output)
- SMA connector for external GPS antenna and synthetic passive DCF output on HN 61 / 61m / 61i / 61a
- output 24 VDC with adjustable current limit to 200 mA
  (for powering of bells or other devices), can serve as 24VDC power input alternatively
- terminal for connection of external backup battery with adjustable current limit
- mono audio output (HN 60a / 61a only)
- GPIO with striking (up to two tones) and carillon (up to four tones, on request) functions (HN 60m / 61m only)

1.1.6 Operation reserve

passive

- internal backup battery for RTC in case of power loss
- as soon as the power becomes resumed the slave clocks adjust automatically and in an accelerated mode to the proper time, the channel state corresponds to the actual time

active

- internal circuit for charging the accumulators
- optional external maintenance-free lead-acid batteries
- energy saving mode to save the backup battery

1.1.7 Daylight saving time processing

- via DCF receiver or by setting the time zone when synchronizing from GPS
- respecting timezone settings

1.1.8 Design

conventional type

- plastic box of IP 20, for mounting on a DIN rail - 6M or 9M width

for indoor use

- mounting to a wall, IP 40

for outdoor use

- mounting to a wall, IP 65

1.2   Accessories

- AD 650, DCF 77.5 kHz radio receiver, for indoor and outdoor placement, standard cable length 10 m (max. 200 m), for HN 60
- GPS antenna for HN 61, cable length 5 m (max 30 m)
- battery pack with maintenance free Pb accumulator 12 V / 0.8 Ah,
  provides for continuous operation of the MASTER clock, including the connected slave clocks in case of a power outage, for a period
  of approx. 24 hours.
- striking module HN..SSR2

2 INSTALLATION

2.1 Installation environment

The following installation places should be avoided:
- within the reach of high-voltage operated equipment
- places exposed to direct impact of solar radiation

2.2 Installation procedure

- Snap the clock box onto the DIN rail
- Terminate all supply cables on the terminal box at the top of the clock box.
- The wall mounting case has holes for supply cables in the top and rear of the case.
- Connect the DCF receiver (GPS antenna), slave clock line cables, switching circuit, power cable.
- Switch-on the mains power. The current time is displayed on the Master clock

2.3 Terminal board connection

2.3.1 DIN rail variant HN 60/61/60i//61i
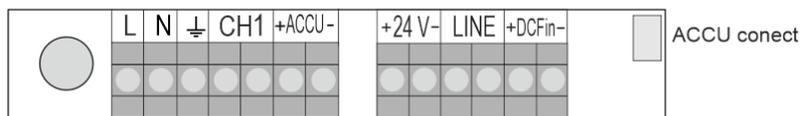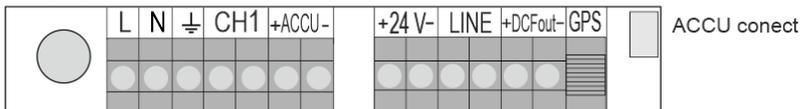
2.3.2 DIN rail variant HN 60m/61m

HN 60m

| L | N | ⏚ | CH1 | +ACCU– | | +24 V– | LINE | +DCFin– | | ACCU conect |

bottom terminal block

USB

GND | I2 | I1 | O4 | O3 | O2 | O1 | + 14 V

HN 61m

| L | N | ⏚ | CH1 | +ACCU– | | +24 V– | LINE | +DCFout– | GPS | | ACCU conect |

bottom terminal block

USB

GND | I2 | I1 | O4 | O3 | O2 | O1 | + 14 V
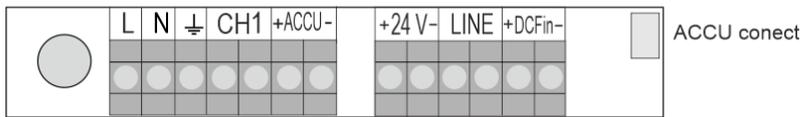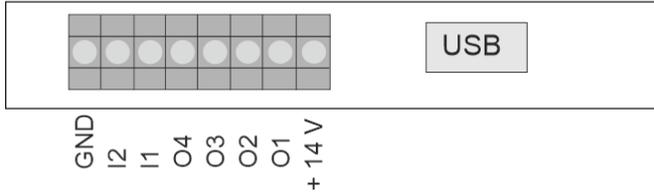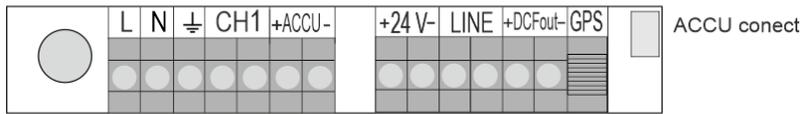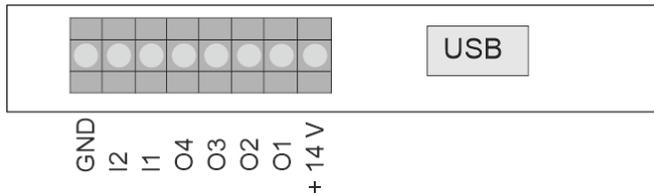
2.3.3 DIN rail variant HN 60a/61a

HN 60a — ACCU conect

| L | N | ⏚ | CH1 | +ACCU– | | +24 V– | LINE | +DCFin– | DCF | | NC COM NO | CH2 |

USB   AUDIO

HN 61a — ACCU conect

| L | N | ⏚ | CH1 | +ACCU– | | +24 V– | LINE | +DCFout– | GPS | | NC COM NO | CH2 |

USB   AUDIO
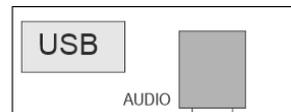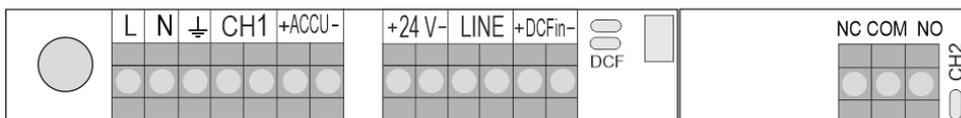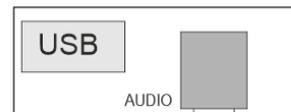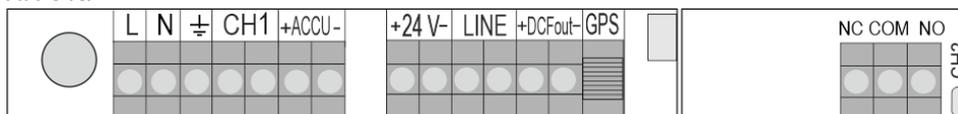
2.3.4 Terminal description

Fuse	MST fuse T200 mA / 250 V or T315 mA / 250 V (for power supply 115 VAC / 60 Hz)
L N PE	mains power input 230 VAC / 50 Hz or 115 VAC / 60Hz respectively
CH1	connection switched circuits, max. 250 V, 6 A, 1500 VA, ith possibility of programming or manual switching
O1 – O4	universal switching outputs type OC (HN 60m / 61m only)
I1 - I2	universal switching inputs (HN 60m / 61m only)
+ 24 -	DC output for powering other external devices (eg school bells), can also be used as a 24 VDC power supply; this terminals can also be used to power the HN 6x with 24 VDC
+ ACCU -	14 V output for powering external devices or charging of external battery; this terminals can also be used to power the HN 6x with 12 VDC
L1	slave line connection terminals
+ DCF IN -	DCF input for HN 60/ HN 60i / HN 60a / HN 60m
+ DCF OUT -	synthetic DCF output for HN 61 / HN 61i / HN 61a / HN 61m
GPS SMA connector	for GPS antenna, for HN 61/ HN 61i / HN 61a / HN 61m
USB	USB for connecting flash memory with switching programs
LED CH1	channel status indication
LED DCF	DCF reception indication
RS485 TRE	activation of RS485 bus terminating resistor (optional)
RS485	communication bus RS485 (optional)
AUDIO	line audio output, 3.5 mm jack connector (HN 60a / 61a)

Note:	If the masterclock is powered through +ACCU- connector from a permanent 12-14 VDC power supply, the "Accu connect" jumper needs to be installed.
	Do not install the jumper if the masterclock is powered by mains 230 VAC (115 VAC) and equipped with an active battery backup (12 V accumulator connected to +ACCU-).
	In case of no mains power is available and masterclock should be switched on, the "Accu connect" jumper can be set temporarily and when an external 12 V accumulator is connected to +ACCU- the masterclock will start up. Once the masterclock is started, the jumper should be removed again.

2.4   Slave line connection

Connect the slave clock to terminal the L1 (LINE1). Set the type of slave line depending on the type of clock
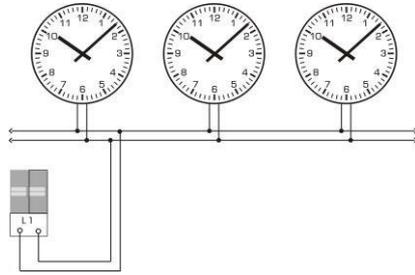
Fig.: Connection of clock to unified pulse line
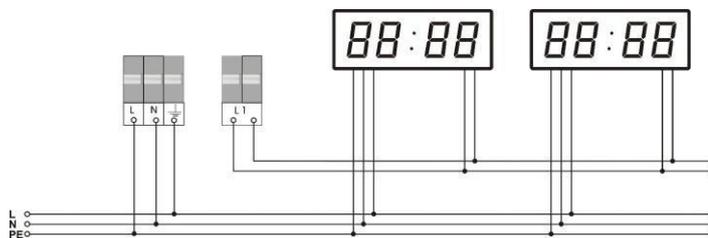
Fig.: Connection of digital clock to system of unified time

2.5   DCF connection

The DCF receiver serves for fully automatic adjustment and synchronization of time using the DCF radio signal with a coverage within the diameter of 1500 km around the Germany city Frankfurt am Main. Comprehensive information about time and date is then transmitted into the DCF transmitter located in Mainflingen near to Frankfurt. The transmitter transmits long-wave signals at 77.5 kHz frequency. The DCF receiver guarantees absolutely precise time data with automatic transition to the summer time.

Generally the DCF receiver is supplied with 10 m long cable, but it can be located also at a longer distance, in which case it is advisable to connect it via a twisted pair of up to 200 m. Do not install the receiver close to buildings consisting of metallic steel structures, near to PCs, TV and radio receivers or in places surrounded with thick walls or into underground or cellar areas.
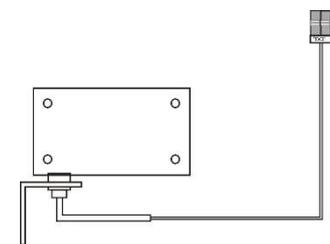
Fig.: DCF conection

2.6   GPS Antenna connecting

2.6.1 Integrated GPS receiver

The magnetic GPS antenna can be connected to the HN 61 variant
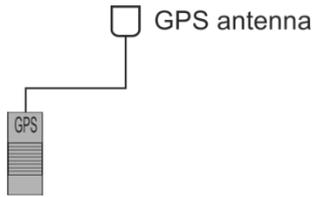
2.6.2 External GPS receiver

An external GPS receiver with DCF code output, eg GPS 4500, can be connected to
the HN 61m as a source of synchronization signal
(eg if a sufficiently long extension of the coaxial cable of the magnetic GPS antenna
is not available).
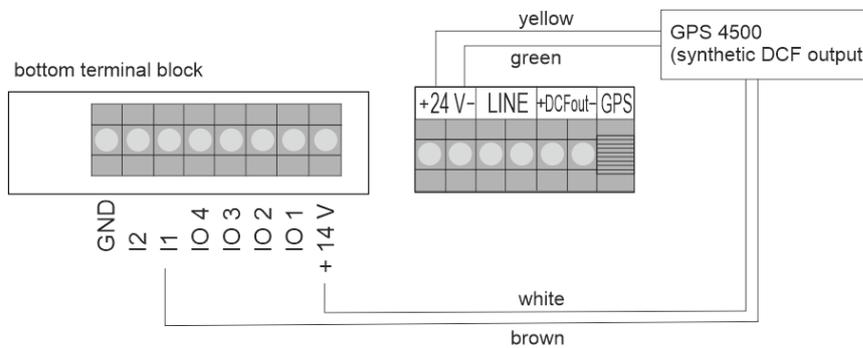
2.7   Switching channel

The CH1 terminal (or RELAY 1) serves to control the externally connected equipment. School
bells or external equipment can be powered with 24 V DC.
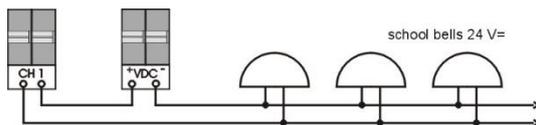
Fig .: Connection of school bells
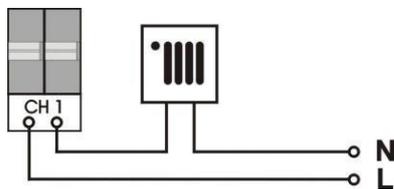
Fig .: Connection of external devices with 230 VAC power supply

2.8   Connecting the striking module

HN..SSR2

HN 6x

L N ⏚

OUT1 OUT2

Magnetic Bell Strikers

SSR1 SSR2 +14 V

Terminal board

GND IO 6 IO 5 IO 4 IO 3 IO 2 IO 1 +14 V
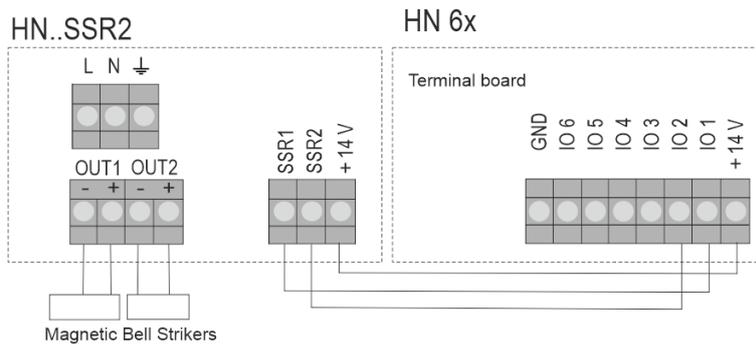
Note: Only for HN 60m / 61m

2.9   Synchronization of sub-master clok using DCF current loop

HN 61

L N ⏚ CH1 +ACCU-

+24 V- LINE +DCFout- GPS

ACCU conect

HN 60

L N ⏚ CH1 +ACCU-

+24 V- LINE +DCFin-

ACCU conect
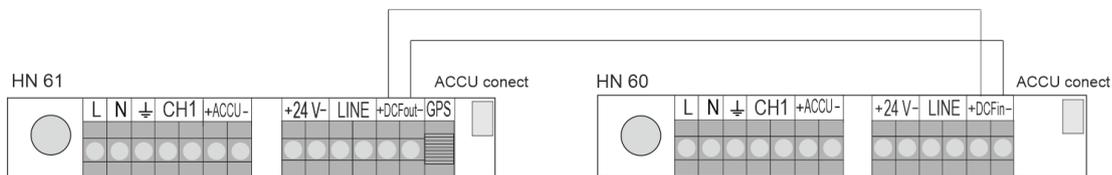
2.10   Output blocking

This function is used to block the output function (striking) while the bells (eg death bell) are moving at the same time, so as not to damage the striking hammers or destroy the bell.

bottom terminal block

USB

GND I2 I1 Q4 Q3 Q2 Q1 +14 V

10 kOhm

senzor
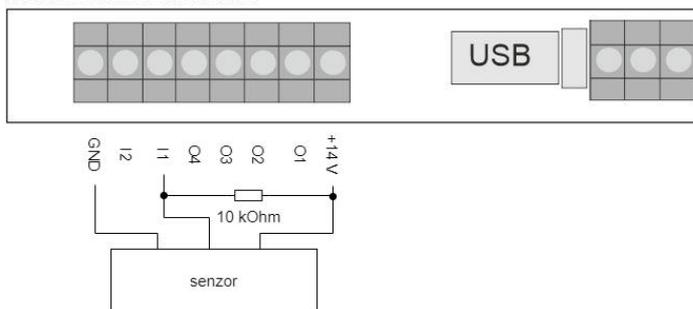
Sensor used: inductive sensor with NO output (eg BES M18MI-NSC80B-BV03)

The function is activated by a sensor connected to the main clock. If the sensor detects the movement of the bell, its output closes and the main clock blocks the striking. Blocking takes place during sensor activation and set timeout (chapter 12). After this time, the output is activated again

3 LCD DISPLAY - INFORMATION SCREENS

Fig .: DIN rail variant front panel

There is a slot for the uSD card, a line audio output for a 3.5 mm jack connector and a USB connector for connecting a flash drive.

In the basic mode, you can scroll through the information screens on the LCD display:

MASTER	time and date information, manual time and date adjustment
LINE	information about the state of slave line; time adjustment for the slave line
CHANNEL	information about the state of channel
STRIKING	status and striking settings - displayed only if the striking is enabled
SYNCHRONIZATION QUALITY	information about the receipt and the quality of the DCF or GPS synchronisation signal
VERSION	information about Master clock model and SW version

Button function:

◀ ▶	switching between information screens
✗	return to MASTER screen

Note: The button function is different in each screen.
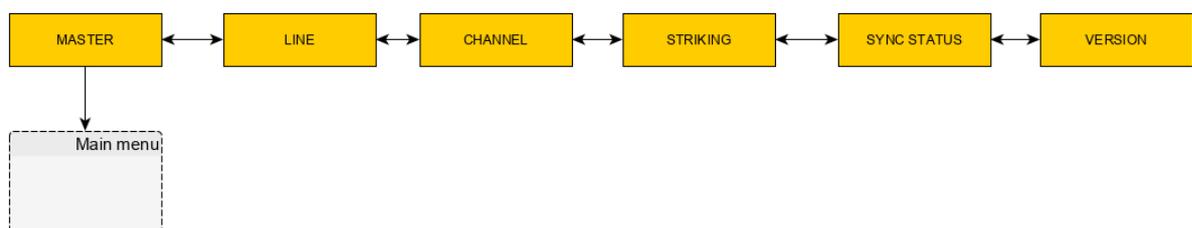
3.1 The MASTER screen

Basic screen. From all the „screens" you can jump back into the MASTER screen by operating the ✗ button.

some channels lock indication

channel status indication one or more are active

time   day of week

```
1 0 : 3 2 : 0 5   S t      I    #
2 9 . 0 4 . 2 0 1 9 s      U S B
```

date   indication DTS
                   indikation USB
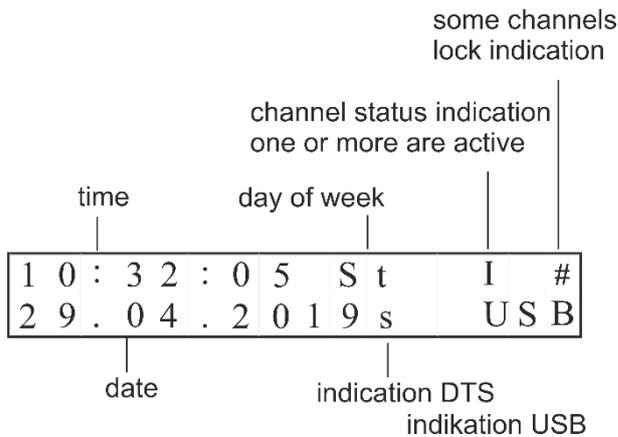
Button function:

—	correction of seconds: ± 30 secs.
+	input to manual time and date setting
✓	input to MAIN menu
hold ✗ and press ✓	manual channel switching

3.1.1 Manually setting the time and date

Set the time and date manually when operating without a DCF or GPS receiver.

time

```
0 0 : 0 0 : 0 0
0 1 . 0 1 . 2 0 1 9
```

date
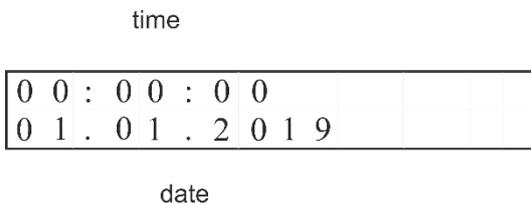
Button function:

◄ ►	move around the items
+ —	change the blinking item (automatic change when pressed down and held)
✓	storage of values entered and return to the MASTER screen
✗	return without storing the values entered

Press the + button. The cursor flashes now on the position of the hours. Enter the time value in the hh ➤ mm ➤ form using the + and — buttons. The cursor is now blinking on the date position. Enter the date in the dd ➤ mm ➤ yy form.

Confirm the values set up by pushing the ✓ button.

Day of the week and DST status are set automatically according to the selected time zone.

3.2 The LINE screen

This screen shows the operation state of the slave line. This is displayed when push gradually the ➤ button from the MASTER screen.

line state

| L | 1 | | | | | r | u | n | n | i | n | g |
| 1 | 2 | : | 0 | 0 | | | | | m | i | n | |

line time   slave line type
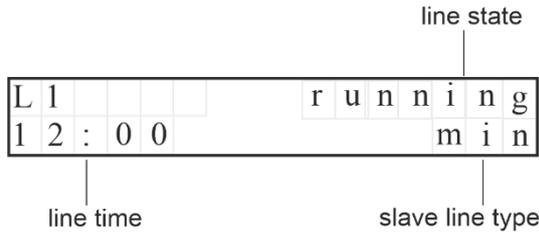
Button function in Line screen mode:

━	start / stop the slave line
✚	slave line time setting (pulse lines only)
✓	enter the slave line menu (the adjustment is described in chap. 7)

slave line status can be:

stop	line is stopped, it is possible to set the line time
running	line normal operation
fast fwd	accelerated catch up cycle
waiting	line in waiting mode; time necessary to correct the time of slave clocks is shorter than the time necessary for accelerated catch-up cycle
overload	line is overloaded or short circuit on line
12pos + stop	accelerated catch-up cycle with automatic stop on 12:00

Note:

MOBALine	time on the line is displayed only, can't be set; only the mode of minute hand of analog clock movement mode can be set

3.2.1 Setting the time of slave line

Set the slave pulse line time in stop mode. Set the same time on all slave clocks before starting the line. Enter this time as the slave time. To setting, press the button ✚ from the LINE screen. (Line type settings are described in Chap.7.1.)

Button function:

◄ ➤	move around items
✚ ━	change the blinking item (while holding auto load)
✓	save the entered values and return to the LINE screen
✗	return without saving

Set slave pulse line time in following format:

minute impulse line	hh : mm
half-minute impulse line	hh : mm: 00 or hh : mm : 30
seconds impulse line	hh : mm : ss

3.3 CHANNEL screen

This screen is displayed when push gradually the ➤ button from the MASTER screen.

3.3.1 Channel is controlled by active weekly program or manually

```
              lock channel
              indication
selected channel
         channel state      channel time
┌─────────────────────────────────────────┐
│ C H 1    I    #    0 7 : 4 4 : 1 6        │
│ p u s h    b t n            0 0 1   r     │
└─────────────────────────────────────────┘
         |                       |
  manual control mode    number of records
```
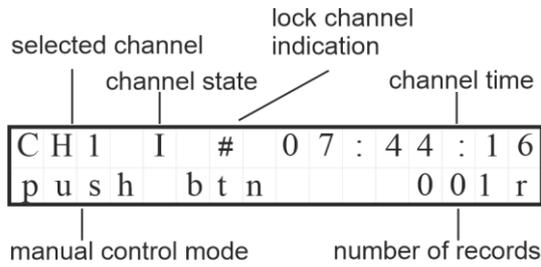
Button function:

✓	entry to the selection of week program for the purpose of editation (setting is described in chapter 9)
long press ▬	lock / unlock channel

3.3.2 Channel switches according to calculated of sunrise and sunset times

```
             lock channel
selected channel  indication
         channel state      time on illumin.
┌─────────────────────────────────────────┐
│ C H 1    0    #      o n 2 1 : 5 0        │
│ I l l u .            o f f 0 4 : 4 5      │
└─────────────────────────────────────────┘
                          |
                  time off illumin.
```
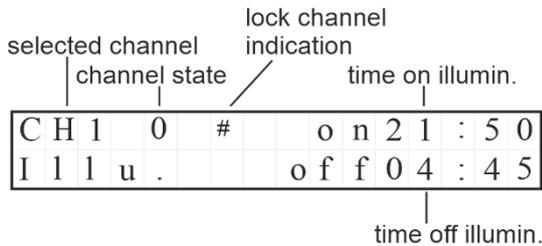
Button function:

✓	entry to coordinate settings and channel switching on / off correction (setting is described in chap. 8.2)
long press ▬	lock / unlock channel

3.3.3 MUTE screen - Advance / delay switching before / after audio output

```
selected channel
         channel state
┌─────────────────────────────────────────┐
│ C H 1    0        0 9 : 5 1 : 4 9         │
│ m u t e                                   │
└─────────────────────────────────────────┘
```
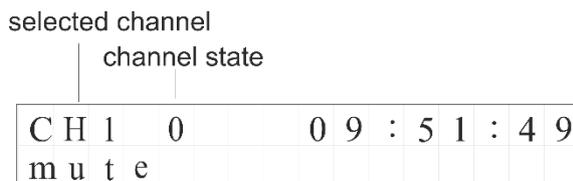
Button function:

✓	entry to advance / delay, before/after setting audio output (setting is described in chap. 8.3)
long press ▬	lock / unlock channel

3.4 STRIKING screen

Striking can only be set for clocks with the HN..SSR2 add-on module for classic bells or dulcimers; or on a clock with audio output for Audio striking. Only one type of striking can be activated. This is displayed when push gradually the ➤ button from the MASTER screen.

3.4.1 Striking bells or dulcimers

Functional only if striking is activated in the menu. Displays the time period when striking is off, the type of striking and that is currently being striking.
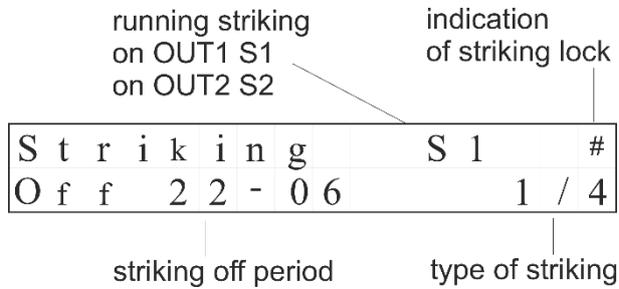
```
running striking              indication
on OUT1 S1                    of striking lock
on OUT2 S2
        ┌──────────────────────────────────────┐
        │ S  t  r  i  k  i  n g      S 1     #  │
        │ O f  f    2 2 - 0 6           1 / 4   │
        └──────────────────────────────────────┘
          striking off period    type of striking
```

Button function:

✓	entry to striking set up menu (setting is described in chap. 10)
long press ▬	block / unblock striking function

3.4.2 Audio striking

Functional only if striking is activated in the menu. Displays the time period when striking is off, the type of striking.

```
                    indication
                    of striking lock

        ┌──────────────────────────────────────┐
        │ A  u  d  i  o    S  t  r  i  k  i  n g   #  │
        │ O f  f    2 2 - 0 6              1 / 4  │
        └──────────────────────────────────────┘
          striking off period    type of striking
```
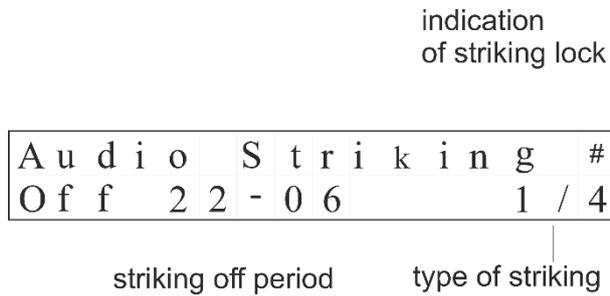
Button function

✓	entry to striking set up menu (setting is described in chap. 10)
long press ▬	block / unblock striking function

3.5 SYNCHRONIZATION QUALITY SCREEN

It will be displayed when push gradually the ➤ button from the MASTER screen.

The value in % indicates the reception quality of the last hour if the synchronization was successful at least once.

3.5.1 DCF

signal quality as a percentage
in the last hour

| D C F | | s | i | g | n | . | : | | 1 | 0 | 0 | % |
| B | i | t | : | 1 | | N | o | : | 5 | 7 | | O | k | : | 3 |

last received bit
(l, 0 or -)

number of seconds mark
(0 - 58)

counter of identical
telegrams (0 to 9)

3.5.2 GPS

number of satellites in sight of the receiver

| G | P | S | | s | i | g | n | a | l | | 1 | 3 | s | a | t |
| 1 | 0 | 0 | % | | q | u | a | l | i | t | y | | | | |

GPS signal quality in the last hour

3.5.3 MSF

signal quality as a percentage
in the last hour

| M | S | F | | s | i | g | n | . | : | | 1 | 0 | 0 | % |
| B | i | t | : | 1 | | N | o | : | 5 | 7 | | O | k | : | 3 |

last received bit
(l, 0 or -)

number of seconds mark
(0 - 58)

counter of identical
telegrams (0 to 9)

3.5.4 WWVB

signal quality as a percentage
in the last hour

| W | W | V | B | | s | i | g | n | . | : | | 1 | 0 | 0 | % |
| B | i | t | : | 1 | | N | o | : | 5 | 7 | | O | k | : | 3 |

last received bit
(l, 0 or -)

number of seconds mark
(0 - 58)

counter of identical
telegrams (0 to 9)

3.6   VERSION screen

This is displayed when push gradually the ➤ button from MASTER screen.

type of master clock

```
 H N 6 0 .  S 4
 v  0 . 4 9          0 x 0 0 0 1
```

software version   status code
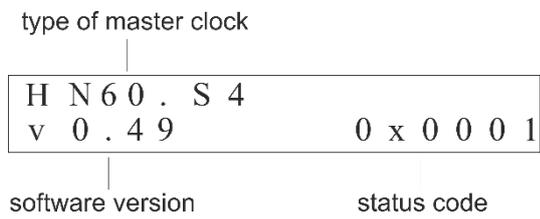
Button function:

    ✓   entry into service menu - only for service purposes

4 MAIN MENU

Press the ✓ to enter MAIN MENU.

```
Main  menu
Time  zone
```

Menu items:

Synchronization	set up synchronization source
Time zone	time zones configuration
Slave line 1	slave line parameters settings
Channel setup	setting the switching channel parameters
Week program	edit the weekly program
Striking	setting the striking parameters
Load channel	load pre-prepared switching programs per USB into the main clock.
Output blocking	striking output lockout setting

Button functions:

◀ or ▶	change item
✓	confirm selection and enter settings
✗	return to the MASTER screen

Main menu structure
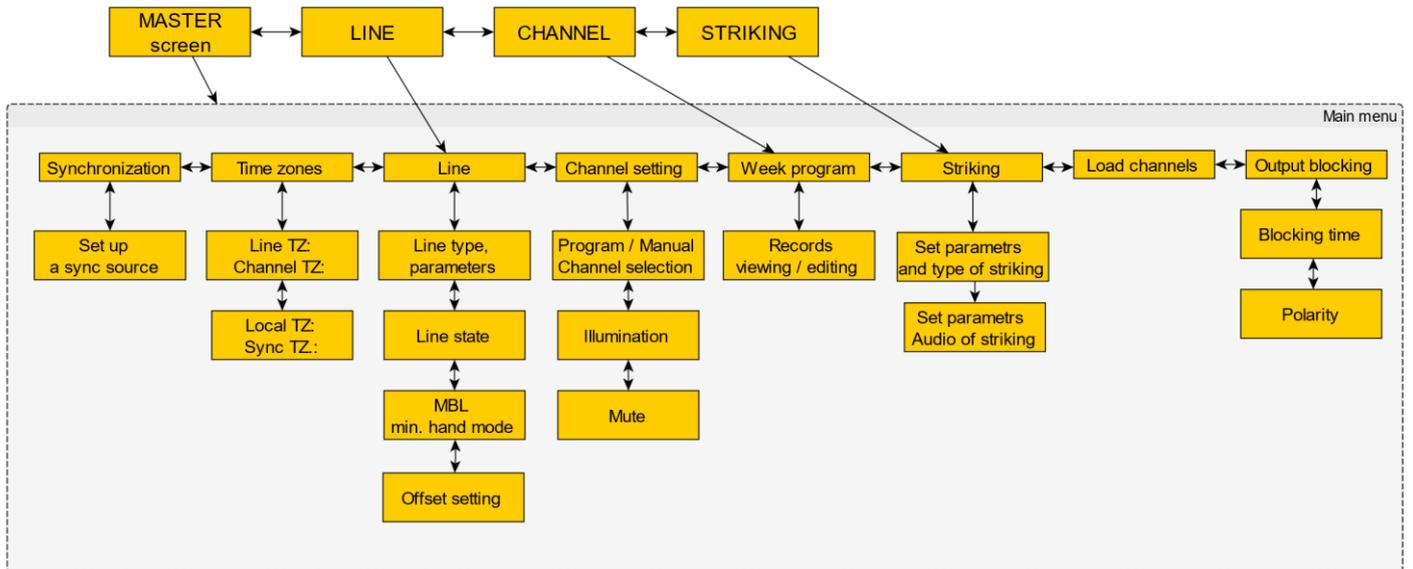
5   SYNCHRONIZATION

The DCF synchronization type is preset for the HN 60 / 60i / 60a clock variants, and the GPS synchronization type for the HN 61 / 61i / 61a clock variants. For HN 60m / 61m, the type of synchronization can be selected.

In the MAIN Menu press the ✓ button to select SYNCHRONIZATION.

```
                        synchronization source
                        (DCF or GPS)
                                         |
  ┌──────────────────────────────────────────┐
  │ T y p e :                        D C F    │
  │                                           │
  └──────────────────────────────────────────┘
```

Button functions:

+ ─	change the blinking item
✓	save the entered values and return to MAIN menu
✗	return to the MAIN menu without saving

Sync sources, options:

DCF   DCF receiver (integrated input) synchronization

GPS   integrated GPS receiver synchronization

MSF   MSF receiver (DCF input) synchronization

WWVB   WWVB receiver (DCF input) synchronization

IN1   synchronization by external synthetic DCF source

- eg for combination HN 61m
  with external GPS receiver

IN1 + DCF   synchronization by two DCF signals - signal redundancy

- primary signal source is IN1 (eg external GPS receiver)
- switching to a secondary signal source (eg DCF receiver) occurs when the primary signal is lost at IN1
- the switchback occurs after the primary signal is restored

6   SET TIME ZONES

This function is used to set time zones of slave line, channel, local time, and synchronization source. See the Mobatime Time zone table in chapter 12.
In the MAIN Menu press the ✓ button to select *Time Zones.*
The menu contains two pages:

```
L i n e   T Z :              2
C h a n n e l   T Z :        2
```

```
L o c a l   T Z :            2
S y n c   T Z :              2
```

Button functions:

◀ ❯	page switching
✓	enter the item settings on the current page
✗	return to MAIN menu

Button functions in item edit mode:

◀ ❯	moving between items;
✚ ━	change the blinking item (while holding auto load)
✓	save the entered values and return to page view
✗	return without saving

7   SLAVE LINE MENU

Set the L1 slave line parameters according to the type of connected slave clocks, enter the line type, pulse, gap length, and cycle type.

In the MAIN Menu press the ✓ button to select Slave line.
The menu contains four pages (fourth page accessible only when MOBALine is set):
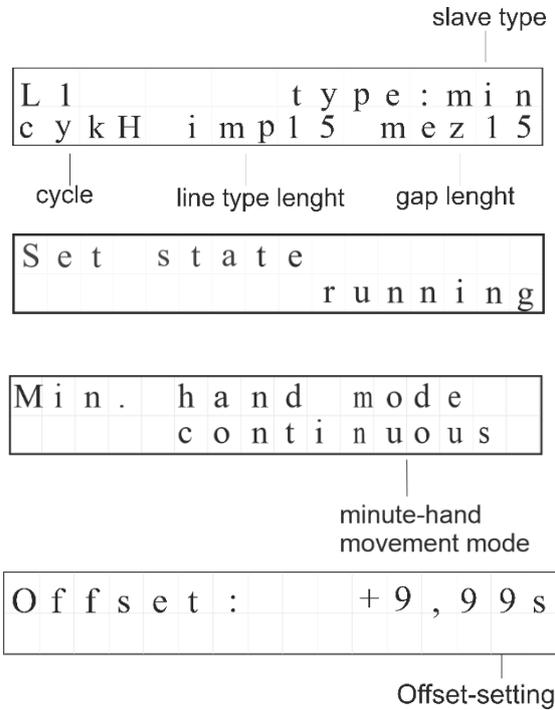
slave type

```
L 1              t y p e : m i n
c y k H   i m p l 5   m e z 1 5
```

cycle   line type lenght   gap lenght

```
S e t    s t a t e
                  r u n n i n g
```

```
M i n .   h a n d   m o d e
          c o n t i n u o u s
```

minute-hand
movement mode

```
O f f s e t :        + 9 , 9 9 s
```

Offset-setting

Button functions:

◄ ►	page switching
✓	enter the item settings on the current page
✗	return to MAIN menu

Button functions in item edit mode:

◄ ►	moving between items
+ −	change the blinking item (while holding auto load)
✓	save the entered values and return to page view
✗	return without saving

7.1   First Page Options

line type by type of slave clock:

min	for clocks controlled by minute pulses
1/2m	for clocks controlled by half minute pulses
sec	for clocks controlled by second pulses
MBL	for clocks controlled by MOBALine

for pulse lines set cycle, according to the mode in which the slave clock operates:

H	half day, 12 hours (analog clock)
D	daily, 24 hours (digital clock)

pulse parameters for slave lines:

pulse	enter the pulse duration in tenths of seconds (01 - 99)
gap	enter the length of the gap between pulses in accelerated mode in tenths of a seconds (01-99)

Default values for minute and half minute lines: pulse length 1.5 s, gap length 1.5 s

Default values for second line: pulse length 0.3 s, gap length 0.2 s

Note about setting a second line:

For a second line, Σ imp + gap can't be higher than 10, if = 10 no fast-forward mode is possible.

7.2   Setting the Line Status:

you can set the following line states:

run	the line starts
stop	the line stops
12pos-stop	the line runs to 12:00 in accelerated mode and then stop

If the MOBALine line type is set, stopping the line will set the analog slave clock to 12:00 position.

7.3   Setting minute hand movement mode

The following modes can be set for MOBALine:

continuous	fluent hand movement
minute	hand moves in steps of one minute
½ minute	hand moves in steps of 1/2 minute

7.4   Offset setting

In line can be set to time shift lines versus time on the master clock - offset.

By default, the offset is set to 0.

By setting a negative / positive offset value, the time on the line is delayed / overtaken by the value of the set offset,

eg at an offset value of -1.00 seconds, the time on the line is delayed by 1 second compared to the time on the main clock.

Shift range -9.99 sec to +9.99 sec.

Adjust step by step:

sign sign	+/-
units of seconds	0-9
tens of milliseconds	0-99

8 CHANNEL SETTING - CHANNEL PARAMETERS

Use this function to set the channel switching mode.
In the MAIN Menu press the ✓button to select Channel setup.
The menu contains three pages:

```
M a n                          C H 1
p u s h    b t n        0 : 0 0 m
```

```
I l l u .   - - -  C  + 0 0 m
5 0 a 0 0 ' N    1 5 a 0 0 ' E
```

```
M u t e   C H 1
p r e :   1 0   p o s t :    0 5
```

Button functions:

◄ ➤	page switching
✓	enter the item settings on the current page
✗	return to MAIN menu

Button functions in item edit mode:

◄ ➤	moving between items
➕ ➖	change the blinking item (while holding auto load)
✓	save the entered values and return to page view
✗	return without saving

Note: If channel is configured for manual switching, at the same time it can't be configured for illumination switching and vice versa.

8.1 Program / manually

The menu is used to set the manual switching mode of the channel.

Options:

timer	by pressing the button the channel will switch to predefined period of time 00:01-15:59 (mm:ss)
on / off	press to turn on, press to turn off
push button	the channel is switched on while the button held (default)

Selection of the channel:

CH1, ---
CH1, CH2, --- (for MHU 60a / 61a only)

Note: the channel cannot be selected if it is already set to switch the lighting or mute switching.

8.2 Switching illumination by calculated sunrise and sunset time

Calculated times apply to the specified geographic coordinates. For places with specific conditions, it is possible to adjust the time for switching off and switching off the channel. Adjusting the value to the positive value speeds up the evening switching-on and extends the switching-off time in the morning.
Example: no correction: switch on 19:20 – switch off 6:32; correction + 10 min: 19:10 - 6:42; correction -10 min: 19:30 - 6:22.

Use the button ✓ to select the illumination position.
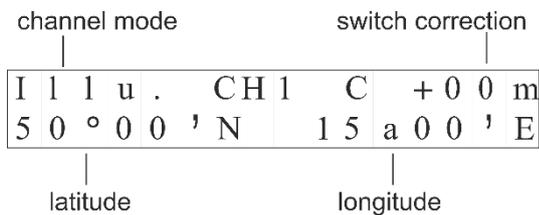
Lighting switch correction

range   -99 minutes to +99 minutes

Coordinates range

latitude   0 ° 00 'to 89 ° 59' N (S)

longitude   0 ° 00 'to 179 ° 59' E (W)

Selection of the channel:

CH1, ---
CH1, CH2, --- (for MHU 60a / 61a only)

Note: the channel cannot be selected if it is already set for manual or mute switching.

8.3 Switching MUTE signal

The menu is used to set the switching of the MUTE signal of the external amplifier and its advance before and after the audio output. This function is only available for HN 60a /61a. It can only be used with a clock with audio output.

Use the button ✓ to select the mute position

```
Mute    CH1
pre:    10   post:   05
```

Selection of the channel:

CH1, ---

CH1, CH2, --- (for MHU 60a / 61a only)

Note: the channel cannot be selected if it is already set for manual or lighting switching.

Range

pre	0-99 (0,0 - 9,9 s), advance before audio output (100 ms unit)
	e.g. 10 means that MUTE turns on a second earlier
post	0-99 (0.0 - 9.9 s), delay after audio output (100 ms unit)
	e.g. 05 means that MUTE switches off 500 ms later

9 WEEK PROGRAM

Allows you to edit switching program for the selected channel. Capacity of 399 program lines. Weekly program entries can be edited, added or deleted.
In the MAIN Menu press the ✓ button to select Weekly program.

```
┌─────────────────────────────────┐
│ W e e k    p r o g r a m        │
│ C H 1    0 0 5    r e c o r d s  │
└─────────────────────────────────┘
```

count of saved records
for selected channel

selection of channel

Button functions:

+ −	channel selection CH1/CH2/AUD; according to the master clock variant
✓	entry to view records
✗	return to the MAIN menu

9.1 View and edit program records for CH switch channel

time

switching mode
(On/Off/pulse)

```
┌─────────────────────────────────┐
│ X X : X X : 0 0        I        │
│ X X . X X .    * * * * * * *     │
└─────────────────────────────────┘
```

date

day of week
in order: Mo-Su

If there are no records in the switching program, "Blank list" is displayed.

Button functions:

◄ ►	move between records
+	add new record
−	delete of selected record
✓	edit of selected record
✗	return to channel selection

Record editing button functions:

◄ ►	move between items
+ −	change the blinking item
✓	save the edited record
✗	return to list of records without saving

Enter all the data step-by-step:

time:		**hh:mm:ss**
mode:	**I**	switch on
	0	switch off
	sxx	channel will be switched on for specified duration (01 to 99 s)
date		**dd.mm**
day of the week:		in the order **Mo**, **Tu**, **We**, **Th**, **Fri**, **Sa**, **Su**
		* day in which the program line will be executed
- the day when the program line not be executed

Note:

If you set value "xx" in the position of hh or mm", it means that the channel will execute the command every time unit.

For example:

1.   xx: 00: 00 means that the command will be executed every hour

2.   08: xx: 00 means that the command will be executed every minute of the eighth hour.

If you set value "xx" in the position of dd or mm", it means that the channel will execute the command every date unit.

For example:

1. xx. 02. 00 means that the command will be executed every day in February

2. 08. xx. 00 means that the command will be executed every eighth of the month.

9.2   View and edit AUD program audio recordings

Playback of audio file is available for HN 60a/61a only. Playback is possible only from connected USB flash disk.
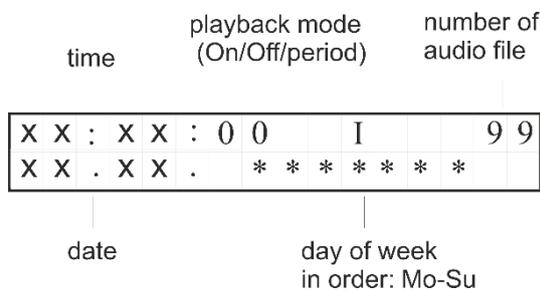
Button functions:

◄ ►	move between records
✚	add new record
▬	delete of selected record
✓	edit of selected record
✗	return to channel selection

Record editing button functions:

◄ ►	move between items
✚ ▬	change the blinking item
✓	save the entered record
✗	return to list of records without saving

Enter all the data step-by-step:

time: **hh:mm:ss**

type:	**I**	audio output is switched on playing selected file
	0	audio output is switched off
	sxx	audio output will be switched on playing selected file for specified time period (01 to 99 s)

number of audio file: **1** to **999**

date: **dd.mm.**

day of the week: in the order **Mo**, **Tu**, **We**, **Th**, **Fri**, **Sa**, **Su**

* the day in which the program row will be executed

- the day when the program row will not be executed

Note: Preparation of audio files.

In computer prepare audio files in format *.wav, with parameters:

- audio channels: 2
- resolution: 16bit
- sampling rate: 48 000 Hz
- name of file: number from 1 to 999 with suffix wav, e.g.: "25.wav"
- Place this prepared audio file to USB flash drive, to root directory.

10 STRIKING

This function is used to set up striking.
In the Main Menu, press ✓ button to select Striking.
The menu contains one page for setting the classic striking on the bells or dulcimers

```
S t r i k e   o f f 2 2 - 0 5 h
1 / 2   I 0 2   P 1 8   P h 2 0
```

or possibly for clocks with audio output also the second page for audio striking settings:

```
A u d i o   o f f   2 2 - 0 5 h
1 / 2   P h 1 0
```

Only one type of striking can be activated at a time. The active striking is then displayed in the information screens.

Button functions:

◄ ➤	switching pages
✓	enter the settings of the items on the current page
✗	return to the main menu

Button functions in item editing mode:

◄ ➤	move by items
− +	change the blinking item (while holding automatic loading)
✓	save the entered values and return to page display
✗	return without saving

10.1 Classic striking on the bells or dulcimers

This function is used to set the parameters and type of ringing on bells or dulcimers using electric bell strikers. Switching of electric hammers is realized by means of additional module HN..SSR2. By default, striking is disabled**.** (For HN 60m/61m only)

The display shows:

striking off period

```
S t r i k e   o f f 2 2 - 0 5 h
1 / 2   I 0 2   P 1 8   P h 1 0
```

striking type   gap lenght

pulse lenght   gap lenght between
                  1/4 and hour striking
                  at 1/4 type striking

Options:

22-05	setting of the beginning and end of the time period when the striking is switched off; e.g. at setting 22-06 the last hit is at 22:00 and the striking starts the next day at 6:00
1/2	set the type striking; the choice is 1/2, 1/4, 1/1 and off
I	enter the pulse length in tenths of a second (01-99)
P	enter the pulse gap length (01-99)
Ph	enter the length of the gap between the 1/4 and the hour striking (01-99)

Description of supported striking types

Type of striking	Time	15´	30´	45´	60´	Full hours x h
1/4	output / number of strokes	1/OUT 1	2/OUT 1	3/OUT 1	4/OUT 1	1-12 / OUT 2
1/2		-	1/OUT 1	-	-	1-12 / OUT 1
1/1		-	-	-	-	

Note: When striking every quarter of an hour, it usually rings a quarter of an hour on a bell with a higher tone and full hours on a bell with a lower tone.

10.2   Audio striking

This function is used to set the parameters and type of Audio striking on the audio output, it is only available for variants with audio output. During audio striking, the sound of bells (or dulcimers or other audio devices) from recordings stored on a connected USB flash drive is played on the audio output. (For HN 60a/61a only.)

When the function is activated, the weekly switching channel for audio output is locked. This channel cannot be unlocked while the audio striking function is activated. By default, audio striking is disabled.

The display shows:
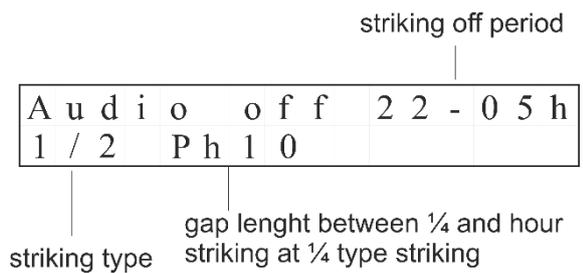
USB flash with default sounds for audio striking is available as a separate item - see accessories for Master clock HN 6x.

If necessary, it is possible to prepare your own set of audio files with sounds as described below.

Note: **Preparation of audio files.**

In computer prepare audio files in format *.wav, with parameters:

- audio channels: 2
- resolution: 16bit
- sampling rate: 48 000 Hz
- Required file names: with extension wav, eg: "bell15.wav", specifically:

for striking in the quarter of an hour	**bell15.wav**
for striking in half	**bell30.wav**
for striking in the three quarters of an hour	**bell45.wav**
for striking in an hour	**bell60.wav**
to strike whole hours	**bellxh.wav**,

where **x** is the hour when the file is run

i.e., files must be prepared for all-day striking

bell1h.wav - bell12h.wav

Place these prepared audio files in the root directory of the USB flash disk and connect the USB to the USB connector on the Master Clock.

Type of striking		Time				Full hours x h
		15´	30´	45´	60´	
every quarter of an hour - 1/4	audio file	bell15.wav	bell30.wav	bell45.wav	bell60.wav	bellxh.wav
every half hour - 1/2		-	bell30.wav	-	-	
hourly - 1/1		-	-	-	-	

22-05	setting of the beginning and end of the time period when the striking is switched off; e.g. at setting 22-05 the last hit is at 22:00 and the striking starts the next day at 5:00
1/2	set the type striking; the choice is 1/2, 1/4, 1/1 and off
Ph	enter the length of the gap between the 1/4 and the hour striking at 1/4 type striking (01-99)

11 LOAD CHANNELS

If USB flash drive is inserted into USB connector, you are able to load pre – prepared switching programs to Master clock. When loaded, the existing entries in the memory for all switching programs will be deleted

Switching programs are generated from Switch Editor Basic.

Place "**hn60.swprg**" file into root directory of USB flash drive. Insert USB flash drive into USB connector.

In MAIN Menu press the ✓ button to select Load channels.

```
┌───────────────────────────┐
│S a v e   p r o g r a m ?  │
│R e c o r d s :      0 0 5 │
└───────────────────────────┘
```

The display shows the number of records that were found in the hn60.swprg file.

Press the ✓ button. Then the switching channels will be loaded into the internal memory and the Master clock will be restarted. After rebooting, you can disconnect the USB flash drive.

If the required file is not available, "0" records will be displayed and after pressing ✓ button, "nothing to save" will be displayed.

Button function

✓	save channel records and reset Master clock
✗	return to MAIN menu without saving

12 OUTPUT BLOCKING

This function is used to block the striking output.

The function is used if both striking and ringing are connected to the same bells or dulcimers (eg death knell). If the master clock starts striking at the time of ringing (movement of the bells), striking hammers or bells could be damaged.

The disabling blocking function is provided by the master clock, which takes information about the movement of the bell from the connected external sensor. It must be positioned so that it can detect the movement of the bells (chapter 2.10). As long as the bells are moving, the striking is blocked, then the blocking is extended by the time set on the first page of the menu.

In the Main Menu, press ✓ button to select Blocking output.

The menu contains two pages:

12.1 Setting the added output blocking time and activating the striking output function

The display shows:

blocking time [s]

```
Blocking  time:  10
chan:-   strike:    *
```

activation of the channel
blocking, not implemented

blocking activation
for striking on bells
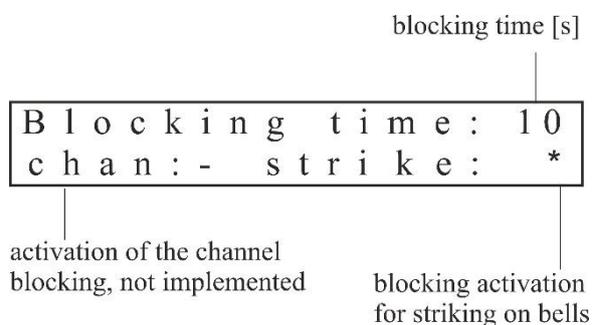
Options:

blocking time [s]	0-99 (default 10 s)
blocking activation	**-** blocking off (default **-**)
	* blocking on

12.2 Selection of control contact type

selection of the type of control contact NO / NC

```
┌─────────────────────────────────────┐
│ P o l a r i t y :    N O             │
│                                      │
└─────────────────────────────────────┘
```

polarity NC   sensor is closed when the bell is not moving (normally close)
polarity NO   sensor is closed when the bell is in motion (normally open)

Button functions:

◄ ►   switching pages
✓   enter the settings of the items on the current page
✗   return to the main menu

Button functions in item editing mode:

◄ ►   move by items
─ +   change the blinking item (while holding automatic loading)
✓   save the entered values and return to page display
✗   return without saving

13 TECHNICAL PARAMETERS

13.1 Technical specifications

Model			HN 60 / 60m	HN 61 / 61m	HN 60i	HN 61i	HN 60a	HN 61a
Mounting on a DIN rail			6 MD				9 MD	
Slave clock line	number		1					
	Typ	MOBALine	✓	✓	-	-	✓	✓
			polarized minute, half-minute or second impulses					
	electrical parameters		12 / 24 V, max. 150 mA					
Switching relay contact	number		1				2	
	weekly program		with up to 399 switching commands					
	astronomical calendar		with entry of geographical coordinates for sunrise/sunset calculation					
	manual switching		selection of different control modes					
	electrical parameters		max. 250 VAC, max. 6 A, 1500 VA					
Other I/O	input of DCF signal		✓	-	✓	-	✓	-
	output of DCF signal (synthetic passive)		-	✓	-	✓	-	✓
	GPS input for external antenna		-	✓	-	✓	-	✓
	USB		✓					
	mono audio output 3,5 jack		-				1 (2 outputs)	
	GPIO - 4 digital outputs OC (open collector) max.100 mA		For HN 60m / 61m	-				
	output 12 and 24 VDC,		max. 200 mA summary current					
Back-up at power failure	passive for RTC		about 5 years by lithium battery					
	active for full functionality		internal circuit for charging the external battery					
Power supply	AC (mains)		115 or 230 VAC ±5 %, 50-60 Hz					
	DC		24 VDC +/- 5 %; 13 VDC +/- 10 %					
Accuracy (at about 20 °C)	without synchronisation		+/- 0.1 s/day (after 24 h of synchronisation at constant temperature)					
	synchronised		± 10 ms					
Environment	operating temperature		from -30 to + 70°C					
	relative humidity		max. 95% without condensation					
Dimensions (mm) / Weight (kg)	IP 20		106 (6MD) x 90 x 58 mm / 0.6 kg				161 (9MD) x 90 x 58 mm / 0.6 kg	
	IP 40		146 x 180 x 82 mm / 0.9 kg				256 x 200 x 94 mm/ 1.6 kg	
	IP 65		146 x 240 x 111 mm / 1.3 kg				256x333x129 mm / 2.7 kg	

Option / Accessories									
DCF 77 radio Funkempfänger	AD 650		✓	-	✓	-	✓	-	✓
DCF 77 radio receiver	back-up battery pack Lead battery 0,8 Ah, 12 V	Dimensions [mm] / Weight [kg]	106 (6M) x 92 x 40 / 0.5						
BP 60/50 12V	striking module		53 (3M) x 90 x 62 / 0,.2 (HN 60m / 61m only)	-					53 (3M) x 90 x 62 / 0.2
HN..SSR2	for indoor wall mounting		✓						
HN 6x IP 40 case	for outdoor wall mounting		✓						

13.2 Power supply, parameters and options

Property	Values		
[3] power source	[1] 230 VAC +/- 10 %	24 VDC +/- 5 %	13 VDC +/- 10 %
power supply terminal	L N PE	VDC	ACCU
voltage at the ACCU terminal	14 VDC	14 VDC	-
[4] max possible current consumption from ACCU terminal	200 mA	200 mA	-
voltage at the VDC terminal	24 VDC	-	24 VDC
[4] max possible current consumption from VDC terminal	200 mA	-	200 mA
[2] impulse line voltage	12/24 V	12/24 V	12/24 V
active operaration reserve Pb accumulator	✓	-	-
[5] fitted jumper Accu connect	-	-	✓
voltage type	AC voltage, sine 50-60 Hz	DC voltage, stabilized and smoothed	

Note:

1) according to the type of clock - see the table in chapter 12.1 Technical data

2) default value - 24 V; 12 V can be selected in the Service menu

3) if the tolerance of the supplied supply voltage is not observed, or if another type of voltage is used, the correct operation of the main clock cannot be guaranteed

4) the total power supplied to the connected equipment consists of consumption of the secondary line, consumption at the ACCU and VDC terminals; the maximum values of the specified currents cannot be supplied to the load at the same time

5) If the masterclock is powered through +ACCU- connector from a permanent 12-14 VDC power supply, the "Accu connect" jumper needs to be installed

Do not install the jumper if the masterclock is powered by mains 230 VAC (115 VAC) and equipped with an active battery backup (12 V accumulator connected to +ACCU-).

In case of no mains power is available and masterclock should be switched on, the "Accu connect" jumper can be set temporarily and when an external 12 V accumulator is connected to +ACCU- the masterclock will start up. Once the masterclock is started, the jumper should be removed again.

14 TIME ZONE TABLE

Time zone entries in the standard season table (version 11).

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, Helsinki, Riga, Tallinn, Sofia, Vilnius	+2	Yes	Last Sun. Mar. (03:00)	Last Sun. Oct. (04:00)
04	Bucharest	+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	Istanbul, Kuwait City, Minsk, Moscow, Saint 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, Kolkata, Chennai, New Delhi, Colombo	+5.5	No		
16	Astana, Thimphu, Dhaka, Novosibirsk	+6	No		
17	Bangkok, Hanoi, Jakarta, Krasnoyarsk	+7	No		
18	Beijing, , Hong kong, Singapore, Taipei, , Irkutsk	+8	No		
19	Tokyo, 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, 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.), Madagan, 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,	-3	No		
34	Newfoundland	-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	-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	Ittoqqortoormiit, 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	Myanmar	+6,5	No		
57	Western Australia: Perth	+8	No		
58	Caracas	-4.5	No		
59	CET standard time	+1	No		
60	Not used				
61	Not used				
62	Baku	-4.0	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.

15 WARRANTY and REPAIRS

- The HN 60&HN 61master clock meets the requirements of the following standards:
- Electrical safety EN62368-1
  EMC - EN 55032, EN 55024, EN 50121 – 4
- CE Applied EU directives:
- 2014/35/EU (LVD), 2014/30/EU (EMC), 2011/65/EU (RoHS), 2012/19/EU (WEEE)
- The device is to be located outside of working radius of high voltage power sources. Also it can not be exposed to direct impact of solar radiation.
- The device is covered with a 24-month warranty starting from the date of product sale. The warranty does not refer to defects that have been caused by the following:
  - unprofessional handling or interference
  - chemical effects
  - mechanical damage
  - the external impact (such as natural disasters, etc.)
- Servicing during the warranty and post-warranty period is carried out by the manufacturer

MOBA TIME