BBE Bamberg+Bormann Electronic GmbH

Instruction Manual

Digital MOVISTROB

MS - 1000

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Brief Description:

1. Introduction

With stroboscopes you can observe the motion of rapid periodic or semiperiodic processes (such as rotating or oscillating objects).

If an object (such as a rotating shaft) is illuminated with short flashes of light at exactly the same point, it will appear to stand still, because the human eye is too slow to detect the individual images.

A stroboscope also lends itself to hands-off measurement of revolutions.

All functions of the MS 1000 stroboscope are controlled and monitored by a microprocessor, allowing features not possible in more traditional units.

The operator's console is menu-supported for optimal information and visibility. All readouts, displays, messages and input commands are displayed on an LCD screen (2 x 20 characters).

On internal control the flash frequency is generated digitally, i. e. it is quartz-accurate and temperature-stable.

On external trigger: precise, frequency-independent digital phase-shifter with 1/10 degree resolution. Slow motion with adjustable period.

Automatic adjustment of the flash output to the frequency in both internal and external operation.

Impulse output for synchronous control of other Movistrob• stroboscopes with external control, e. g. MS 350.00, MS 400.00, MS 600.00, MS 2150.

We recommend you read this instruction manual through carefully. It includes all operating instructions for the stroboscope. The manual explains the display and operating elements of the device and describes the various menus and functions.

Caution!

Persons with limited physical, sensorial or mental abilities are not allowed to use the unit, unless they are supervised for their safety by a qualified person or are briefed by the responsible person how to use the unit.
Use of this product may induce an epileptic seizure in those prone to this type of attack.

Objects viewed with this product may appear to be stationary when in fact they are moving at high speeds.
Always keep a safe distance from and do not touch the target.

There are high voltages present inside this product. Refer to the section on lamp replacement before attempting to open this product.

Do not allow liquids or metallic objects to enter the ventilation holes on the stroboscope as this may cause permanent damage.

The instrument may be operated by trained personnel only.
Maintenance and repairs may also be carried out by qualified personnel or by the manufacturers only.

2. Operating the stroboscope

2.1 Operating and display elements on the front board

Keys and display are located on the front board (see illustration 2.1, Operating and Display Elements).

2.2 Switch and ports on rear of the unit

The following are located on the rear of the unit:

Main switch
AC cable socket
Handlamp port
Input port for external trigger: 7-pin diode bayonet socket
Impulse output: 3-pin diode bayonet socket

2.3 Menu layout

All stroboscope functions are contained in several main and submenus (internal, external and line).

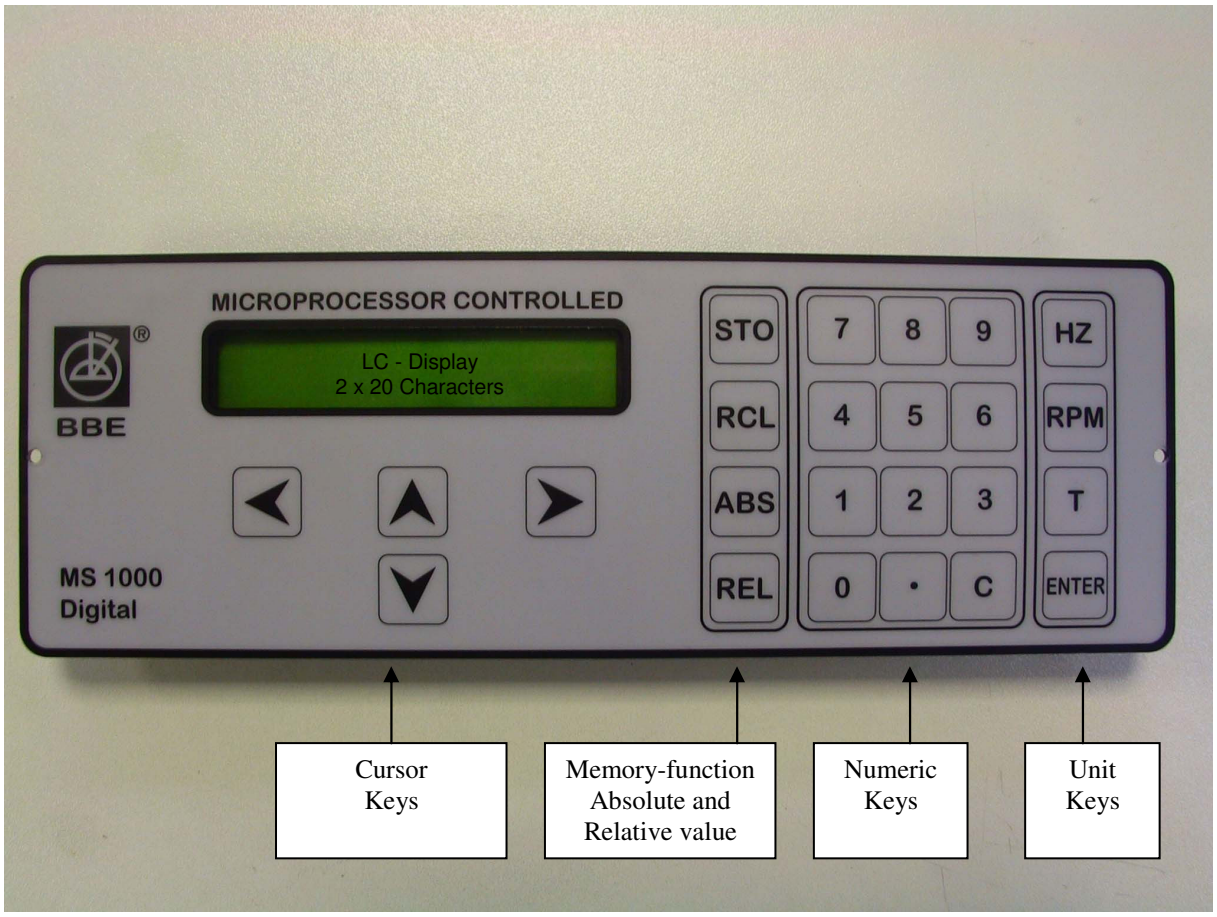
Main menu:	Submenu:
1. Internal Trigger	1.1 Internal Oscillator
	1.2 Internal Burst
2. External Trigger	2.1 Readout RPM/Hz/T
	2.2 Phase Shifter
	2.3 Slow Motion
	2.4 Prescaler
3. Line Synchron	3.1 Readout RPM/Hz/T
	3.2 Phase Shifter
	3.3 Slow Motion
	3.4 Prescaler
4. Memory	4.1 Recall Memory
	4.2 Clear Memory

2.4 Keypad Operations

The entire operation of the MS 1000 is carried out with the keys on the front board.

They are arranged in several logical pads (see *Illustration 2.1*, *Operating* and *Display Elements*).

Illustration 2.1 Operation and Display Elements on Front Board



2.4.1 Cursor Keys: ◄ ► / ▲ ▼

With the keys on the cursor pad you can move up and down in a menu or raise and lower a numerical value on the LCD display.

▲ Raising a value at the cursor position
▼ Lowering a value at the cursor position
◄ Moving the cursor to the left
► Moving the cursor to the right

2.4.2 Numeric Keys: 0 – 9 / • / C

The keys on the numeric keypad allow you the input of a numerical value directly.

0 – 9 Input figures from 0 – 9
• Input a comma
C Clear: end function or exit submenu

2.4.3 Unit Keys: Hz / RPM / T / ENTER

The unit keys assign a numerical value to a corresponding unit.

Hz	-	Frequency	F in 1/sec
RPM	-	Revolutions	N in 1/min
T	-	Period	T in ms

ENTER for all units other than Hz, RPM or T, such as angle input in the phase shifter.

In addition, you can switch from one unit, such as RPM, to another, such as Hz or T, at any time.

2.4.4 Memory functions: Absolute and Relative Value Display: STO / RCL / ABS / REL

Memory Functions:

The **STO** and **RCL** keys allow you to store or recall readouts in the **Readout RPM / Hz / T** and **Memory** functions.

STO Stores a readout
RCL Recalls a stored readout

Absolute and Relative Value Display

The absolute and/or relative (percentage) deviation from a reference value of a readout can be displayed by using the **ABS** and **REL** keys.

ABS Displays absolute deviation from reference value
REL Displays relative deviation from reference value

2.5 Recalling a submenu or a function

Use the cursor keys ⮝ / ⮟ to make your selections from the menu.

In the Main menu:

- Internal Trigger
- External Trigger
- Line Synchron
- Memory
- Serial I / O

In the Intern submenu:

- Internal Oscillator
- Internal Burst

In the Extern and Line menu:

- Readout RPM / Hz / T
- Phase Shifter
- Slow Motion
- Prescaler

In the Memory submenu:

- Recall Memory
- Clear Memory

Always use the **ENTER** key to recall the selected point on the menu (submenu or function).

Exit a submenu or function with the **C** (Clear) key.

◎ Example: Recall **Phase Shifter** function from **Line Synchron** submenu.

Switch on the stroboscope. The BBE copyright notice will appear for approx. 2 seconds.

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BBE V5.0S *MS1000*

The stroboscope then goes to main menu:

Main: ⮟ = Down ⮝ = Up
Internal Trigger

Line Synchron is the third line on the Main menu. You must therefore press the ⮟ key twice.

Key: ⮟

Main: ⮟ = Down ⮝= Up
External Trigger

Key: ⩛

Main: ⩛ = Down ⩓ = Up
Line Synchron

Press the **ENTER** key to recall the **Line Synchron** submenu.

Key: **ENTER**

Line: ⩛ = Down ⩓ = Up
Readout RPM/Hz/T

Now you are in the **Line Synchron** submenu on the first line of the menu.

Press the ⩛ key to recall the **Phase Shifter** . Now the stroboscope is in the desired **Phase Shifter** function.

Key: ⩛

Line: ⩛ = Down ⩓ = Up
Phase Shifter

With the **ENTER** key recall the **Phase Shifter** . Now the stroboscope is in the desired **Phase Shifter** function.

Key: **ENTER**

Phase: N= 3000 RPM
Ph: 0.0

The stroboscope flashes at a 50 Hz frequency, corresponding to 3000 RPM. The present phase shift is 0.0 degrees.

Exit the **Phase Shifter** function with the **C** key.

Key: **C**

Line: ⩛ = Down ⩓ = Up
Phase Shifter

You are now in the **Line Synchron** submenu at the **Phase Shifter** menu line.

Pressing the **C** key again will return you to the **Main** menu at the **Line Synchron** submenu line.

Key: **C**

Main: ⩛ = Down ⩓ = Up
Line Synchron

Using the above mentioned method you can recall all the submenus and functions on the stroboscope.

The ⩛ and ⩓ allow you to select any menu line.
The **ENTER** key allows you to recall the selected menu line.
The **C** key allows you to exit a function or submenu.

3. Detailed description of functions

3.1. Internal Oscillator

This function produces internally-triggered flashes in the 30 - 18.000 RPM or 0.5 -300 Hz range. When the function is first recalled it is set for a frequency of 1 Hz, corresponding to 60 RPM.

Other frequencies (RPMs) can be fed in directly with the numeric keys or changed with the cursor keys.

◎ Example 1: setting a turning frequency of 2000 RPM with the numeric keys

Keys: **2 0 0 0 RPM**

Interal Oscillator
N= 2000.00 RPM

◎ Example 2: setting 50 Hz with the numeric keys.

Keys: **5 0 Hz**

Internal Oscillator
F= 50.00 Hz

You can switch between the **RPM / Hz / T** units simply by pushing the appropriate unit key.

Now you want to display the number of revolutions. Press the **RPM** key to change the stroboscope over to the **RPM** display mode.

Key: **RPM**

Internal Oscillator
N= 3000.000 RPM

Now you wish to raise the display from 3000 to 6000 RPM with the cursor keys.

Move the cursor to the 100s position. Press the ◄ key twice for this.

Keys: ◄ ◄

Internal Oscillator
N= 3000.00 RPM

The cursor is now at the 100s line. Pressing the ▲ key will raise the RPMs at the cursor position. If the ▲ key is held longer than 1 second an automatic key repeat will occur (autorepeat function).

The autorepeat function in conjunction with the ▲ and the ▼ cursor keys allows you to set the flash frequency manually to the turning frequency of a rotating object, such as a lathe head.

Please note that even with whole number multiplication and fractions a stationary image appears, if for example a flash occurs after every second revolution.

To take readings, begin with the flash frequency high and reduce it until a mark on the object is no longer seen as a single, rather than multiple, image.

In addition there is a dual-flash function that is accessed with the **ENTER** key. For approx. 2 seconds the flash frequency is doubled. This function allows a quick check of the flash frequency set. If the flash frequency is properly set you will see a double image when the double-flash function is accessed.

If the flash frequency deviates slightly from the turning frequency the object to be measured will appear to be turning slowly (see also **Slow-Motion** function).

Ranges:	Turning frequency	N =	30	-	18.000	RPM	and/or
		F =	0.5	-	300	Hz	and/or
		T =	3.33	-	2.000	ms	

Summary:

1. Recall **Internal Trigger** submenu
2. Recall **Internal Oscillator** on the **Internal Trigger** submenu
3. Keys:
   - ↑ Raises the value at the cursor position
   - ↓ Lowers the value at the cursor position
   - ← Moves cursor one space to the left
   - → Moves cursor one space to the right

   Hz display in Hz
   RPM display in RPM
   T display in ms

   Numeric Keys direct input of the turning frequency in RPM, Hz or T

   ENTER dual-flash function

4. Exit the Internal Oscillator function by pressing **C** key.

3.2 Internal Burst

This function produces a series of flashes in which the flash number and intervals can be selected at will in the following ranges:

Number of flashes:	1	-	256 (flashes)
Intervals:	3.33	-	2.000 ms / or
	30	-	18.000 RPM and / or
	0.5	-	300 Hz

When the **Internal Burst** function is recalled the following display appears:

Int. Burst n=10
T= 100.00 ms

n is the number of flashes and **T** is the interval between the flashes.

Press **ENTER** to start the burst. The stroboscope generates 10 flashes at an interval of 100 ms. The burst can be repeated at any time by pressing **ENTER**.

The interval between flashes is input with the numeric keys followed by the corresponding (**RPM, Hz** or **T**).
The number of flashes is also input with the numeric keys and **ENTER.**

Example: Produce a flash series of **n = 5** flashes at an interval of **T = 500 ms**.

Keys: **5 ENTER**

Int. Burst n = 5
T = 100.00 ms

Keys: **5 0 0 T**

Int. Burst n = 5
T = 500.00 ms

Press **ENTER** and the stroboscope now generates 5 flashes at an interval of 500 ms = ½ second.

Exit the Internal Burst function with the **C** key.

Ranges:	Flash number:	1	-	256 flashes
	Flash interval:	3.33	-	2,000 ms and / or
		30	-	18.000 rpm and / or
		0.5	-	300 Hz

Summary:

1. Recall **Internal Trigger** submenu.
2. Recall **Internal Burst** function on **Internal Trigger** submenu.
3. Keys: Numeric keys - direct input of flash interval **T** or flash number **n**, followed by corresponding or **ENTER .**

4 Exit **Internal Burst** function with the **C** key.

3.3 External Trigger and Line Synchron submenus

All of the following examples are from the **Line Synchron** submenus, where a trigger signal is already located (power frequency F = 50 Hz, corresponding to 3000 RPM).

Functions from the **External Trigger** submenu always require an external emitter (such as a reflection photoelectric barrier, inductive emitter).

External triggering always results in a completely stopped image of the object, even when the frequency of the periodic movement process is subjected to certain fluctuations.

3.4 The readout RPM/Hz/T Function from the External Trigger or Line Synchron submenu

This function allows the exact RPM measurement of an external and / or line synchronous trigger signal. The resolution is $10E^{-5}$ (0.001% quartz timebase), i. e. 5 places from the left of the readout are accurate.

The readout can be displayed in RPM, Hz or period.

In addition the absolute or relative deviation from a reference value can be displayed.

All readouts can be stored and are not lost even if the stroboscope is disconnected from the mains, as long as it is fitted with a backup battery.

Now recall the readout RPM / Hz function from the **Line Synchron** submenu.

The following display will appear:

Read. P:1 ----------
N = 3000.00 RPM C

(for a power frequency of F = 50 Hz)

The stroboscope is now in rev. counter mode. The external frequency is displayed in RPM.

With the **Hz / RPM / T** keys you can change the display mode at any time. Press **Hz.**

Key: **Hz**

Read. P:1 ----------
F = 50.000 Hz C

(for a power frequency of F= 50 Hz)

The stroboscope is now in frequency display mode. The external frequency is shown in **Hz.** Press the **T** key and the stroboscope will change to timer display mode. The external frequency will be shown in **ms.**

Key: **T**

Read. P:1 ----------
T = 20.000 ms C

(for a power frequency of F = 50 Hz)

Absolute and Relative Deviation

In addition you can also display the absolute and relative deviation of the readout from a reference value.

Example 1: Absolute deviation of the readout to a reference value.

Since the power frequency constantly fluctuates around the F = 50 Hz value, you wish to display the absolute deviation from the F = 50 Hz reference value.

For this enter the following:

Keys: **ABS 5 0 Hz**

Read. P:1 ---------
δF = -0.050 Hz C

(for a power frequency of F = 49.950 Hz)

Now the absolute deviation of the power frequency of F = 49.950 from an F = 50 Hz reference value is displayed.

With the keys **HZ / RPM / T** you can change to another of the display modes at any time.

Press the **T** key.

Key: **T**

Read. 0:1 ---------
δT = 0.020 ms C

(for a power frequency of F=49.950)

Press the **RPM** key.

Key: **RPM**

Read. P:1 ---------
δN = - 3.00 RPM C

(for a power frequency of F=49.950 Hz)

With the **C** key you can delete the absolute value display again and the stroboscope returns to the rev counter display mode again.

Key: **C**

Read. P:1 ---------
N = 29997.00 RPM C

(for a power frequency of F=49.950 Hz)

Example 2: Relative (percentage) deviation of a readout from a reference value.

Since the power frequency constantly fluctuates around the F = 50 Hz value, you wish to display the relative deviation of the power frequency F = 49.50 Hz from an F = 50 Hz reference value.

To do this enter the following:

Keys: **REL 5 0 Hz**

Read. P:1 ---------
ar = -0.1000 % C

(for a power frequency of F = 49.950)

The relative deviation from a reference value of F = 50 Hz is now displayed.

With the **C** key you can erase the relative value display and the stroboscope returns to rev counter display.

Key: **C**

Read. P:1 ---------
N = 2997.00 RPM C

(for a power frequency of F = 49.950 Hz)

Readout Memory

Each displayed readout can be stored and later recalled.

To store a readout press the **STO** key and a figure between 00 - 24. The file number must always be entered as a 2-digit number.

Example: Store the displayed readout of **N = 3003.20 RPM** in file 10.

Key: **STO**

Read. P:1 STO-----
N = 3003.20 RPM C

Key: **1**

Read. P:1 STO 1_
N = 3003.20 RPM C

Key: **0**

Read. P:1 STO 10
N = 3003.20 RPM C

The displayed readout is now stored in file 10. The stroboscope returns to normal measuring mode.

Read. P:1 ----------
N=3000.00 RPM C

To recall a stored readout press the **RCL** key and a number between 00 - 24. The file number must always be entered as a 2-digit number.

Key: **RCL**

Read. P:1 RCL------
N = 3000.00 RPM C

Key: **1**

Read. P:1 RCL 1___
N=3000.00 RPM C

Key: **0**

Read. P:1 RCL 10
N = 3000.00 RPM C

The readout stored in file 10 is now displayed. Press the **C** key to return to normal measuring mode.

Key: **C**

Read. P:1 ---------
N = 3000.00 RPM C

Ranges: Measurement range - 60 – 18000 RPM and / or
1 – 300 Hz and / or
3.33 – 1000 ms
Accuracy - 0.001 % (quartz timebase)
Files - 25 (00 - 24)

Summary:

1. Select **External Trigger** or **Line Synchron** submenu.
2. Recall readout **RPM / Hz / T** function.
3. Keys: **Hz** - Display in Hz (1/sec)
RPM - Display in RPM (1/min)
T - Display of period (msec)
Numeric keys - Input file number
- Input reference value for the ABS- and REL-function

REL - Inputs reference value for the relative value display
ABS - Inputs reference value for the absolute value display
STO - Stores readout
C - Exits from absolute or relative value display
- Exits from memory functions

4. Exit the readout **RPM / Hz / T** function with the **C** key.

3.5 The Phase Shifter function from the External Trigger or Line Synchron submenu.

The **Phase Shifter** function produces a phase shift of a trigger signal in the 0 - 359 degree range with a resolution of 1/10th degree, independent of the frequency.

By this means a marker on a rotating object can be moved as desired.

A new zero point can be set at any angular position.

When you recall the **Phase Shifter** function from the **Line Synchron** submenu the following display will appear on the LCD screen:

Phase: N = 3000 RPM
Ph= 0.0

(For a power frequency of F = 50.00 Hz or N = 3000 RPM)

The first line of the LCD screen displays the turning frequency of the external trigger signal (in this case the power frequency).

The second line displays the present phase shift of **0.0** degrees.

The value of the phase shift can be changed with either the numeric or cursor keys.

Example: Enter a phase shift of 180 degrees with the numeric keys.

Keys: **1 8 0 ENTER**

Phase: N = 3000 RPM
Ph= 180.0

(For a power frequency of F = 50.00 Hz or N=3000 RPM)

With the cursor keys you can also change the value of the phase shift as you would with a rotary knob.

- ▲ - Raise the value at the cursor position.
- ▼ - Lower the value at the cursor position.
- ◀ - Move the cursor one position to the left.
- ▶ - Move the cursor one position to the right.

Press the **ENTER** key, without inputting figure beforehand, for a new angular zero point at any time. All new angle inputs will now be calculated from the new zero point.

Ranges:	Angles	-	0.0 – 359.0 degrees
	Resolution	-	1/10th degree
	Readout ranges	-	60 – 18000 RPM and / or 1 – 300 Hz and / or 3.33 – 1000 ms

Summary:

1. Select **External Trigger** or **Line Synchronous** submenu.
2. Recall **Phase Shifter** Function.
3. Keys: **Hz** - Display in Hz (1/sec)
   RPM - Display in RPM (1/min)
   T - Display of period (msec)

Numeric keys - Directly inputs and angle in degrees.

ENTER - Enters input angle.
- Otherwise sets a new angular zero point.

- ⮝ - Raise the value at the cursor position.
- ⮟ - Lower the value at the cursor position.
- ⮜ - Move the cursor one position to the left.
- ⮞ - Move the cursor one position to the right.

4. Exit the readout **RPM / Hz / T** function with the **C** key.

3.6 The Slow Motion function from the External Trigger or Line Synchronous submenu.

This function produces slow motion effects with a defined period in the 0.5 – 30 second range from an external adjacent turning frequency.

Rotation can be clockwise or counterclockwise and be stopped.

Example: The external adjacent trigger frequency is 3000 RPM. When the **Slow Motion** function is recalled from the **Line Synchronous** submenu the following display appears on the LCD display.

SlowMot. N= 3000 RPM
→ T= 20.0 sec

You are now in the **Slow Motion** function. The time for one rotation is 20 seconds. The direction of rotation is clockwise.

The direction of rotation can be changed at any time with the ⮜ and ⮞ keys. The current direction of rotation is shown by the → and ← symbols on the LCD display. Press a cursor key twice to stop the motion. This will be displayed with the word **Stop**.

Press the ⮜ key.

Key: ⮜

SlowMot. N= 3000 RPM
← T= 20.0 sec

The direction of rotation is now counterclockwise. Press the ⮞ key again to stop the motion.

Key: ➢

SlowMot. N= 3000 RPM
Stop T= 20.0 sec

The period **T** can be entered directly with the numeric keypad and **ENTER** , or raised and lowered with the ➢ and ➢ cursor keys.

Exit the function with the **C** key.

Ranges: Period T = 0.5 – 30 seconds
Turning frequency N = 60 – 18000 RPM
F = 1 – 300 Hz
T = 3.33 – 1000 ms

Summary:

1. Recall **External Trigger** or **Line Synchronous** submenu.
2. Recall **Slow Motion** Function from the current submenu.
3. Keys: ➢ - Counterclockwise rotation
   ➢ - Clockwise rotation

   Press cursor key twice to stop the function.

   Numeric keys - Direct input of period **T** in the 0.5 – 30 second range.
   ENTER - Enters input value.

   ➢ - Raises the period at the cursor position.
   ➢ - Lowers the period at the cursor position.

4. Exit the **Slow Motion** function with the **C** key.

3.7 The Prescaler function from the External Trigger or Line Synchronous submenu.

With this function you can prescale an external adjacent trigger frequency or the power frequency with a whole number value in the 1 - 256 range.

Example: On a gearwheel with 100 teeth the trigger impulses at each tooth are detected with a photoelectric barrier. Without a corresponding prescaling of the trigger frequency the flash frequency would be too high by a factor of 100. Dividing the external trigger frequency by the factor of 100 results in a flash frequency that corresponds to one turn of the gearwheel.

When you recall the **Prescaler** function the following display appears on the LCD display:

Set Prescaler: 1 - 256
last: 1 new: ____

The current value of **1** is displayed. Now you can input a value in the 1 - 256 range and execute it with **ENTER** . Thereafter the prescaler is set at the entered value and the stroboscope returns to the **External Trigger** or **Line Synchronous** submenu.

Range: Prescaler - 1 – 256

Summary:

1. Recall **External Trigger** or **Line Synchronous** submenu.
2. Recall **Prescaler** function from the current submenu.
3. Keys: Numeric keys - Direct input to **Prescaler** in the 1 – 256 range.
   ENTER - Enters the input value.
   C - Exits the function, returns to submenu.

3.8 The Memory Submenu

The **Memory** submenu has two options.

1. Recall Memory
2. Clear Memory

3.9 The Recall Memory Function

With the **Recall Memory** you can retrieve stored readouts from the Readout **RPM / Hz / T** function memory.

When you call up the **Recall Memory** function you will see the following display on the LCD screen:

Recall Mem. RCL __
0 - 24

To recall a stored readout enter a number between 00 - 24. The file number must always be entered as two digits.

Example: Recall the stored readout in file 10.

Key: **1**

Recall Mem. RCL 1_
0 - 24

Key: **0**

Recall Mem. RCL 10
N=3003.20 RPM C

Now the readout in file 10 will be displayed. To recall another file press the **RCL** key again. Press the **C** key to return to **Memory** submenu.

Key: **C**

Memory: ↓ = Down ↑ = Up
Recall Memory

Summary:

1. **Recall Memory** submenu.
2. **Recall Memory** function in the **Memory** submenu.
3. Keys: **Numeric keys**- Direct input of the file numbers 00 – 24
   C - Exits the function, returns to submenu.

3.10 Clear Memory Function

Delete the entire memory with the **Clear Memory** function.

Recall the **Clear Memory** function from the **Memory** submenu.

Clear Memory
← Press Keys →

Press the ⮜ and ⮞ keys together to erase the readout memory. Press the **C** key to exit the **Clear Memory** function without erasing readout memory.

Summary:

1. Recall **Memory** submenu.
2. Recall **Clear Memory** function from the **Memory** submenu.
3. Keys: ⮜ and ⮞ - Erases readout memory.
   C - Exits function, returns to submenu.

4. RS 232 serial interface

4.1 Introduction

Provided at the stroboscope are a serial input and output channel. The output data can be further processed by computer. It is also possible to control the stroboscope by computer. This enables the stroboscope to be integrated, e.g. into automated measuring apparatus. The serial transmission format of the channels can be adjusted via the stroboscope.

4.2 Data at serial output

At the serial output, all numerical values which appear on the LC display are output with the unit of measure as a character string in ASCII code. The output can be viewed with any terminal program. The unit of measure is separated by a blank character transmitted after the numerical value and replaced by the following abbreviations:

Hz	H
RPM	R
ms	M
0	G

The character string is initiated with a CR (Carriage Return, Decimal 13)

Example: String at serial output: (CR) 19.996M - 19.996 ms

4.3 Control instructions

The stroboscope can be operated via control instructions at the serial input channel. The instructions are transmitted as an ASCII character string, consisting of a symbol and a possibly following decimal number with or without decimal point. The instructions must be concluded with a CR. (carriage return, decimal 13). A numerical value is included in the currently selected unit.

Change mode:

MME	MODE	MEASURE	EXTERN
MML			LINE
MPE		PHASE	EXTERN
MPL			LINE
MSE		SLOW MOTION	EXTERN
MSL			LINE
MG		GENERATE	
MB		BURST	

In the respective mode:

Vxxxxx.xxx	Value	Send numerical value

UH	UNIT	Unit	Hz
UR			RPM
UM			ms
UG			Degree
D	DOUBLE	Double flashing function	

Zxxxxx.xxx	ZERO	Zero angle	absolute
Z		relative	

Pxxxxx.xxx	PRESCALER	SET Prescaler

R	SLOW MOTION	right
L		left
S		Stop

4.4 Setting transmission parameters in SERIAL mode

In order to configure the serial interface, the item **SERIAL** must be selected in the menue. The current transmission speed and data format setting are displayed. The cursor can be positioned below the baudrate field or the format field (⮝/ ⮟). The fields can subsequently be edited (.....). Available are standard baudrates from 110 to 9600 Bd. The format structure is as follows:

Data bits	Parity	Stop bits
7 / 8	N - None	1 / 1.5 / 2
	O - Odd	
	E - Even	

In order to ensure faultless data transmission at high transmission speeds, the length of the data lines at the serial socket should not be too long. The usable line length also depends on the line capacity. (the RS 232 standard recommends less than 2500pF). In addition, a shielded cable should be used. In the event of transmission problems, it may be usefull to reduce the baudrate.

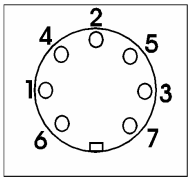
You can choice the following baud rates: 600Bd, 1200Bd, 2400Bd, 4800Bd or 9600 Bd.
On the printed circuit board you will find 5 Jumper positions and 1 Jumper in the edge of the print.
On delivery the baud rate of the stroboscope is preset on 9600 Bd.

5. Description of Inputs and Outputs

Input port for external emitter

The connection of an external transmitter takes place via a seven pole diode plug with bayonet lock. The socket pin assignment for **external triggering** and **synchronous output** is as follows:

- 1 / 2 +6V DC / max. 315 mA
- 3 +12V DC across 150 KΩ for switching contact
- 4 Signal Input (0.5 - 50V, R = 270 KΩ)
- 5 Signal ground
- 6 Signal output
- 7 not connected (n.c.)



When the device is externally triggered through a switching contact (3 and 4)the resistance of the control circuit should not exceed 100 Kohms when contacts are closed. The short circuit current is less than 50 uA.

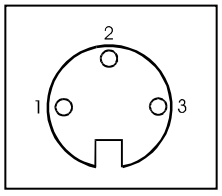
When the device is externally triggered with outside current do not exceed a peak of 50 V.

Control output port for other **MOVISTROB®** devices or external meters, etc.

Connect other devices with external triggering (such as the MOVISTROB 400.00, 500.00, 600.00, 2150) to the 3-pin diode bayonet socket. A suitable cable is available as an extra.

Output port contacts:

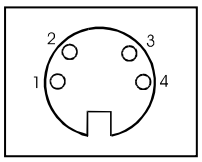
Pin 1 - signal output
Pin 2 - ground



Output impulse: 12 Vss positive
Output resistance: 600 Ohms

Pin connection of data cable for serial interface:

1. Signal ground
2. serial input
3. serial output
4. n.c.



serial data cable (9pin / Sub.D)

Computer		Stroboscope
3	→	2
2	→	3
5	→	1
7-8	→	housing / diode plug
1-4-6		short circuit

In correspondence concerning the instrument, please quote the type number and serial number as given on the type plate at the back side of the housing.

6. Technical Data

Control of flash sequence:

1. Internal
   by quartz oscillator, key adjustment
2. External
   by periodic signals (right angle, sinus)
   input signals of 300 mV to 50 Vss
   input and output potential-free
3. line synchronous

Phase shift:

Independent of frequency for image shift n x 360 degrees,
resolution: $1/10^{th}$ degree

Slow Motion Operation:

Object movement can be selected with internal or external control as apparently stopped or continuously running in slow motion with adjustable period.

Frequency Range:

Internal control	30	-	18000 RPM and / or
	0.5	-	300 Hz
External control	60	-	18000 RPM and / or
	1	-	300 Hz

Readout display:

Internal, external and line-synchronous selectable in RPM, Hz and ms

Readout memory:

25 files to store readouts; memory unaffected if device is disconnected from mains

Accuracy timebase:

$10E^{-5}$ (0.001% - quartz timebase)

Display:

Alphanumeric backlit LCD display (2 x 20 characters)

Operation:

Menu-supported for optimal information and clarity

Impulse output:

12V positive, internal resistance 600 Ohms approx. for controlling other **MOVISTROB®** devices, external meters, etc.

Handlamp:

Verious models with plug, extension 2,5 meters (8 ft approx.), focusable, flash tubes plug-in type.

Light intensity:

Standard model 700 LUX, automatic output conversion over entire frequency range

Flash period:
2 - 6 µs approx.

Operating current:
230 V / 50-60 Hz, 115 V on request

Drain:
33 VA

Permissible ambient temperature:
0 – 50 degrees C (32 – 122 degrees F)

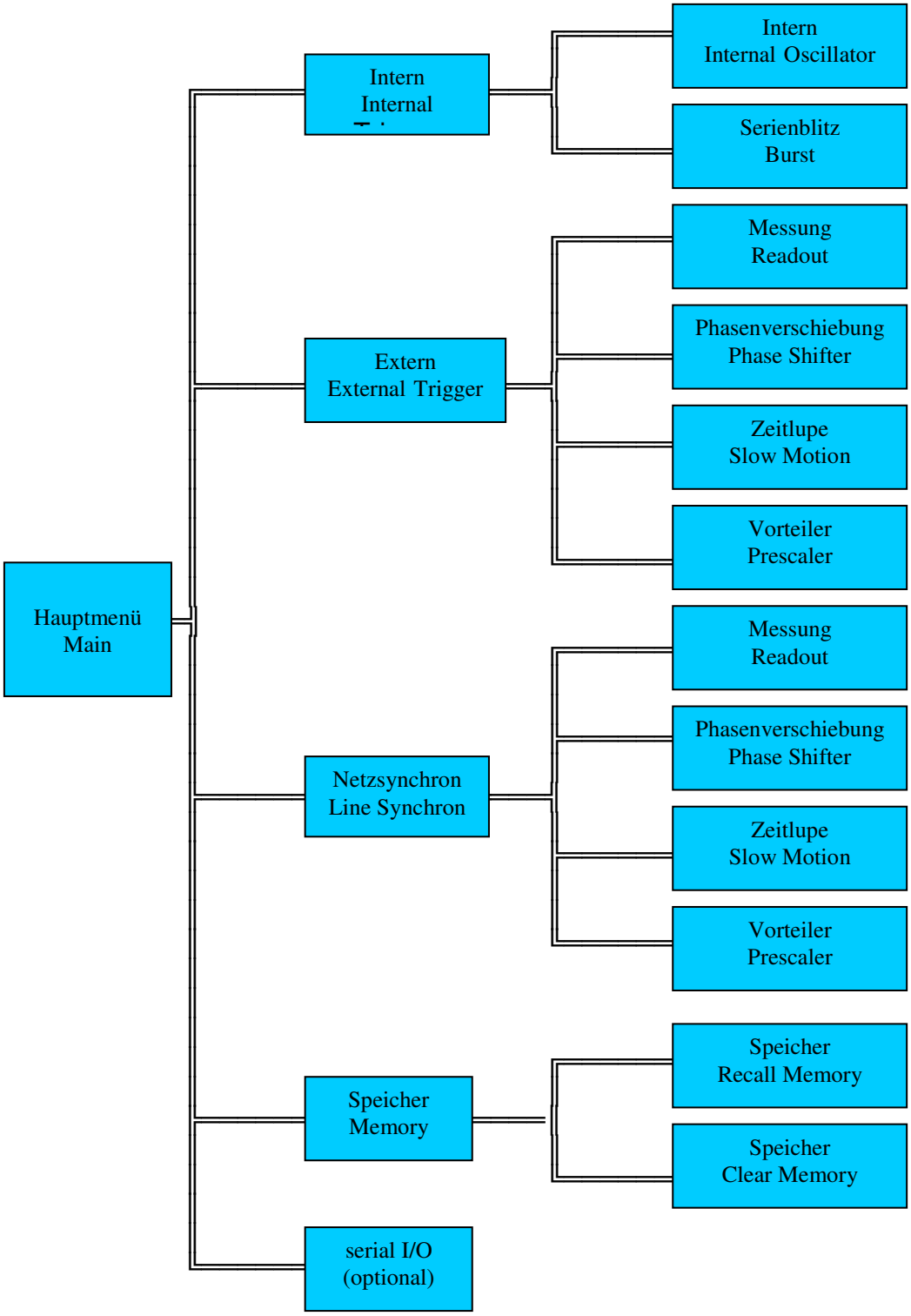
Permissible storage temperatures:
-20 – +70 degrees C (-4 – +158 degrees F)

Housing:
Light alu half-shell construction, easily-accessible for maintenance, hight adjustable with carrying handle

Dimensions:
W = 246 mm, H = 87 mm, T = 200 mm
(10" x 3 ½ " x 8" approx.)

Weight:
Control section, 3 kg (6 ½ lbs) approx.
Handlamp, dependent on model

We reserve the right to make technical changes and improvements to our devices, attachments, materials and software, which may incur deviations from earlier offers and prospectuses.



Meßwertanzeige bei Betriebsart INTERN, EXTERN, und Netzsynchron wahlweise in Hz, RPM and ms, absolut und relativ.

Memory-Funktion mit 25 Speicherplätzen standartmäßig. (auch bei Netztrennung)

Measurement display with INTERN, Extern and LINE SYNCHRON functions can be selected in Hz, rpm and ms, absolute or relative deviation.

MEMORY function with 25 storage locations standard. (also with supply disconnected)