Translation of the original operating instructions

DRELLOSCOP 1020

CE

DRELLO

Article no. of this documentation: **1.1020.2B001e**
As of: 12.11.2012

DRELLO is used in these operating instructions as abbreviation for DRELLO Ing. Paul Drewell GmbH & Co. KG.

Andreas-Bornes-Strasse 46

D-41179 Mönchengladbach

Telephone: +49 - (0)2161 - 909 - 6
Telefax: +49 - (0)2161 - 909 - 700

Email: info@drello.de
Internet: www.drello.de

Table of Contents

1 General

1.1 Information on these operating instructions

These operating instructions contain important instructions on handling the DRELLOSCOP 1020 LED hand-held stroboscope, hereinafter referred to as the device, during installation, operation, maintenance and care as well as disposal.

The requirement for safe, proper and economic work on and with the device is compliance with all specified safety and handling instructions.

Compliance helps to avoid danger, minimise repair costs and downtimes and increase the reliability and the service life of the device.

In addition, local accident prevention regulations and general safety rules for the location of the device must be complied with.

Read the operating instructions carefully before beginning any work! They are part of the product and must be kept in the immediate vicinity of the device and be accessible to operating staff at all times.

1.2 Explanation of symbols

All warnings in these operating instructions are also indicated by a warning symbol.

The following warning symbols are used throughout these operating instructions:

Symbol	Meaning
	General warning
	Danger of electric current
	General instructions and useful suggestions on handling
	Note on observing environmental regulations for disposal

1.3 Warnings

The warnings used in these operation instructions are indicated by signal words that are intended to indicate the extent of the danger. The warning symbol also indicates the type of danger.

The following warning symbols are used throughout these operating instructions:

⚠WARNING

Risk of injury!

Consequences of failure to observe...

► Instructions for avoiding

A warning of this category indicates a potentially dangerous situation. If the dangerous situation is not avoided, it may lead to serious injury or even death.

Follow the instructions in this warning to avoid possible danger of serious injury or even death.

CAUTION

Damage to property by...

Consequences of failure to observe...

► Instructions for avoiding

This warning level indicates potential damage to property. If the situation is not avoided, it may lead to damage to property.

Follow the instructions in this warning to avoid material damage.

NOTE

Descriptive text…

A descriptive text contains additional information that is important for further processing or for simplifying the procedure step explained.

1.4 Limitation of liability

The manufacturer assumes no liability for damage and operational faults resulting from:

- failure to observe these operating instructions,
- use for other than the intended purpose,
- deployment of non-trained or insufficiently-trained staff,
- use of non-approved equipment,
- faulty connection,
- previous work that is not part of the scope of supply,
- failure to use original replacement and accessory parts,
- technical modifications and changes not approved by DRELLO,
- failure to perform prescribed maintenance work.

With the exception of further claims, DRELLO is liable for any errors or omissions within the framework of the warranty obligations stated in the contract.

Claims for damage are excluded irrespective of the legal basis.

1.5 Spare parts

⚠WARNING

Danger of injury due to wrong or faulty spare parts!

Incorrect or faulty replacement parts can lead to damage, malfunction or total breakdown of the equipment as well endangering the safety.

► Use only the original spare parts of the manufacturer.

2 Safety

2.1 General

This section provides important instructions on all safety aspects for optimum protection of staff as well as safe and smooth operation.

⚠WARNING

Danger from failure to observe the safety instructions!

Failure to observe the safety and handling instructions listed in these operating instructions can lead to considerable danger.

► Always pay attention to all warnings and instructions specified here.

2.2 Responsibility of the operator

Since this device is used in the commercial sector, the operator is subject to the legal requirements for occupational safety.

In addition to the occupational safety instructions in these operating instructions, the current safety, accident prevention and environmental protection regulations relevant for operation of the device must be complied with.

The operator must

- be informed on the current industrial safety regulations and conduct risk assessment to determine additional hazards specific to the device that result from the special work conditions at its location. These must be implemented in the form of instructions for the operation of the device.
- continually check during the entire period of service that all operating instructions created by him comply with current regulations and to modify them if necessary.
- clearly regulate and determine the responsibilities of the staff for installation, operation, maintenance and cleaning

- ensure that all persons handling the device have read and understood these operating instructions. In addition, he must ensure that persons are regularly trained and informed on all hazards when using the device.
- check that staff observes the operating instructions and is aware of safety and danger while working with the device.
- ensure that these operating instructions and all additional regulations can be accessed by operating and maintenance staff.
- determine a person responsible for the device and allow him to reject instructions from third parties that are prejudicial to safety!
- make the necessary protective equipment available to staff.

The operator is also responsible that the device is always in perfect condition and the following therefore applies:

- The operator must ensure that the cleaning and maintenance intervals stated in these operating instructions are adhered to.

2.3 Staff requirements

2.3.1 Staff qualifications

⚠WARNING

Risk of injury due to insufficient qualification!

Improper use can result in considerable damage to persons or property.

► All activities shall only be performed by qualified staff.

The following qualifications are stated in these operating instructions for various different fields of activities.

- **Instructed person**

  was instructed by the operator on their assigned responsibilities and the possible dangers resulting from improper behaviour.

- **Specialist staff**

  is able to carry out assigned work tasks as well as recognise and prevent possible dangers based on his/her technical training, knowledge and experience, including knowledge of applicable regulations.

Only those staff members are permitted who can be expected to reliably perform their task. Those staff members whose responsiveness is affected by substances such as medication shall not be permitted.

Allow staff to be trained or instructed and/or persons undergoing general training to work on the device only under the constant supervision of an experienced person!

NOTE

Observe age and occupational-specific regulations at the location of the device when selecting staff.

2.3.2 Unauthorised persons

⚠WARNING

Danger for and resulting from unauthorised persons!

Unauthorised persons who do not fulfil the requirements are not familiar with the dangers at the work location.

- ► Do not permit unauthorised persons to be in the vicinity of the work area.
- ► In case of doubt, approach the persons and instruct them to leave the work area.
- ► Do not continue with work while the unauthorised person is in the vicinity of the work area.

2.3.3 Instruction

Staff must be regularly instructed by the operator.

NOTE

In order to keep track and protocol all instruction sessions, participating members of staff are required to acknowledge with their signature.

2.4 Intended use

The device is portable and intended for visual checking of moving work sequences. It is possible to connect an external controller via machine impulse for example.

Any use other than previously stated is considered as improper use.

⚠WARNING

Danger from use for other than the intended purpose!

Any use other than and/or going beyond the intended use of the device can lead to dangerous situations.

- ► Only use the device for its intended purpose.
- ► Pay attention to all specifications in these operating instructions.

No claims of any kind will be accepted for damage resulting from use of the appliance for other than its intended purpose. The risk must be borne solely by the user.

2.5 Device protection

The DRELLOSCOP 1020 is protected during battery operation by an internal self-restoring fuse, which is not replaceable. If the DRELLOSCOP 1020 is operated via the NG-1020 mains supply, the device is protected by the fuse of the mains supply.

2.6 Particular hazards

2.6.1 Danger from stroboscopic light flashes

⚠WARNING

Danger from stroboscopic light flashes

In rare cases, stroboscopes can cause epileptic fits when operated at a frequency of approx. 10 – 20 Hz. The risk increases if the contrast between the flash and the ambient lighting is high. Even persons who have never experienced an epileptic fit can be affected. Consequent injury such as falling over can therefore not be ruled out.

- ► If possible, always work in normal ambient light conditions.
- ► When setting the flash sequence, begin with the highest frequency.
- ► Make sure that persons suffering from epilepsy are not in the vicinity of the device during operation.

⚠WARNING

Danger from optical illusions!

A rotating machine part appears to be stationary at certain settings of the device. Persons who are not informed of this effect may reach into or be caught by the running machine, which could lead to serious or even fatal injuries.

- ► Inform all persons who stand in the vicinity of the illuminated area on the functionality of the device and make them aware of the danger that can result from the optical illusion.

3 Technical specifications

Dimensions	
Length / width	200 - 85 mm
Height / with rotary adjuster	40 - 55 mm
Weight	approx. 0.5 kg
Controller	
Manual controller (internal)	via rotary adjuster, 120...25000 min^{-1} or 2...416.6 sec^{-1} fast finder function by multiplication/division of the set flash sequence
External controller	via rectangular pulse 10...24 V 60…199999 min^{-1} or 1…3333 sec^{-1} display up to 99999 min^{-1} (1666.6 Hz) or 3333.3 sec^{-1} smooth real-time image shifting 0...360° and slow-motion function, automatic input frequency division from 416.66 sec^{-1}
Flash length control	automatic, depending on the flash sequence or manual by rotary adjuster, setting range 1...250 µs
Maximum flash sequence	416.66 sec^{-1} or 25000 min^{-1}
Measured value display	5-digit 7-segment display, number height 7.6 mm
Electrics	
Mains supply	3 x 1.2 V NiMH rechargeable batteries (AA), fast charging capability Plug-in mains supply 5 V_{DC}
Power consumption	400 mA @ 5 V_{DC}
Reverse polarity protection	yes
Operating time (battery)	approx. 4 hours at full load (depending on battery type, 2850 mAh)
Operating time (plug-in mains supply)	Continuous operation

Ambient conditions	
Ambient temperature range	0 … +45 °C
Storage temperature range	-20 … +60 °C
Degree of protection	IP50
Illumination	
LED	High-performance LED, white radiating combined with highly-efficient optics
Colour temperature	6500 K
Illumination Ø	150 mm @ 300 mm object gap
Illumination strength	3500 lx @ 200mm object gap; measured at 50 Hz and 50 µs flash length
CE declaration of conformity	printed version on request

NOTE

Battery operation

Following detection of undervoltage during battery operation (display flashes), the device can be operated for approx. 15 minutes.

4 Description

4.1 Description of functions

The DRELLOSCOP 1020 is a portable LED hand-held stroboscope for use in a harsh industrial environment.

Switching the appliance ON/OFF

The device is switched on or off by pressing the ON/OFF button. A display test is performed after switching on. All display elements light up for approx. 4-5 seconds and subsequently switch to the basic setting (LED sec^{-1} lights up, display value is 50,000). Pressing the "ON/OFF" button again, switches off the device.

Internal controller (hereinafter referred to as manual controller)

Flash sequence 2.00 sec^{-1} ...416.67 sec^{-1} / 120 min^{-1}....25000 min^{-1}.

Setting takes place via the rotary adjuster.

Turn clockwise	→	flash sequence increases
Turn anticlockwise	→	flash sequence decreases

Fast finder function

Pressing the "Double" button multiplies the current flash sequence by a factor of 2. Pressing the "Halving" button divides the current flash sequence by two. Exceeding the lower or higher flash sequence limit (2Hz / 416.67Hz) is not possible and in this case, multiplication or division by 2 is not performed. This function allows convenient detection of the true flash sequence with respect to the object motion sequence.

Explanation

If an intermittent moving object seems to be standing still, the flash sequence corresponds to the motion sequence or the ratio is an integer number. However, the highest flash sequence possible should be set in order to produce a simple stationary image. When this has been achieved, the flash sequence is multiplied by a factor of 2 by pressing the "Double" button. If a doubled stationary image is then produced, the previously set flash sequence is correct. If however, a single stationary image is produced, the set flash sequence was too low. Repeated doubling of the flash sequence helps to determine the correct motion sequence. If this is higher than the flash sequence range of the stroboscope allows, the true motion sequence can be determined using a following method:

Starting with the highest flash sequence, the first two values are determined by reducing them, which then produces simple stationary images of the object. This then results in the true motion sequence

$$\text{True motion sequence } f_x\,[\text{Hz}] = n \cdot f_1\,[\text{Hz}]$$

$$\text{with } n = \frac{f_2[\text{Hz}]}{f_1[\text{Hz}] - f_2[\text{Hz}]}$$

Example:

Beginning with the highest flash sequence (416.66Hz), the flash sequence is reduced until a simple stationary image results. The flash sequence is named f_1.

The flash sequence is then reduced further until another simple stationary image can be seen. The motion sequence is named f_2.

To determine the "n" factor, the determined values f_1 and f_2 are inserted into the corresponding formula. The true motion sequence f_x cannot be determined using the formula ($f_x = n \cdot f_1$). If rotating objects are being examined, rotation-symmetrical structures such as spoke wheels must be marked to rule out ambiguity due to symmetry.

External controller

Pressing the "External" button (cogwheel symbol) otherwise named Extended External Control activates the "external control" function. The frequency of the impulse sequence supplied then appears in the display. The flash sequence is synchronised to the incoming control impulses and therefore creates the impression that the object is stationary even with heavily fluctuating movement for example. If no control signal is supplied to the "external input", the value 0.0 appears in the display after approx. 2 seconds.

If the input frequency is greater than 416.67 sec^{-1}, the flash sequence is automatically split to a permissible flash sequence value. The displayed value corresponds to the original input frequency. Note that a frequency input greater than 1.6666 KHz (99999 min^{-1}) cannot be displayed in min^{-1}. Input frequencies greater than 3.33 kHz are not permitted, the error code (Err 1) is displayed.

Flash sequences that are smaller than 1 Hz are not permissible and are indicated by an error code (Err 2). However, flash triggering still takes place irrespective of this error message.

Menu control

Additional function expansions or display values can be set via the menu control.

Menu functions for manual control:

- Display value in sec^{-1}
- Display value in min^{-1}
- Flash duration display or setting

Also with extended control

- Setting of the image position and display of the phase angle in degrees
- Setting of the slow-motion function und display of the slow-motion angle in degrees

For further information, refer to the "Menu structure" section

	NOTE
	The menu level "Display value selection or functions" is closed after pressing the "Menu" button directly afterwards. The original setting remains unchanged. For all other levels, the selected menu functions are accepted. Generally, all settings in the menu can be confirmed by pressing the rotary adjuster.

Sleep function

If no settings to the device are made by the user, it is switched to sleep mode after approx. 16 minutes. This reduces the intensity of the display field and the keyboard considerably and the flash function is switched off. Pressing a button or the rotary adjuster switches the device back to the operating mode and the flash function on.

4.2 Device overview

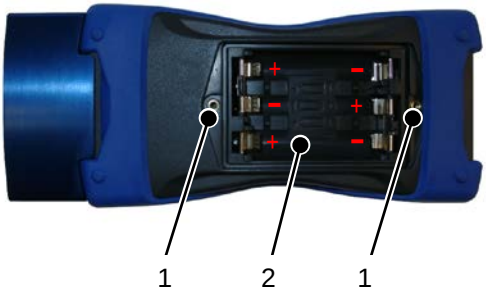
1	Display	Displays the current value of the selected function.
2	Display for min^{-1}	Display of flashes per minute. The LED lights up when the function is selected.
3	"Menu" button	Menu control selection. The LED lights up when the function is selected.

4	Rotary adjuster	The rotary adjuster is used to switch the flash mode on and off and for confirming the menu functions. Turning clockwise or anticlockwise, settings are made for the flash sequence during manual control, image position, slow-motion angle, flash duration, menu selection and the "sec^{-1}" or "min^{-1}" display.
5	Double button	The current flash sequence is multiplied by a factor of 2. This is for fast retrieval of the true object frequency.
6	ON/OFF button	Switches the device ON/OFF.
7	9-pole device plug	Connection for the NG-1020 mains adapter and supply of the control signals for the "external control" mode
8	Halving button	The current flash sequence is divided by a factor of 2. This is for fast retrieval of the true object frequency if the stationary image is displayed repeatedly.
9	External button	Selection of external control. The LED lights up when the function is selected.
10	Display for sec^{-1}	Displays number of flashes per second. The LED lights up when the function is selected.

4.2.1 Front view

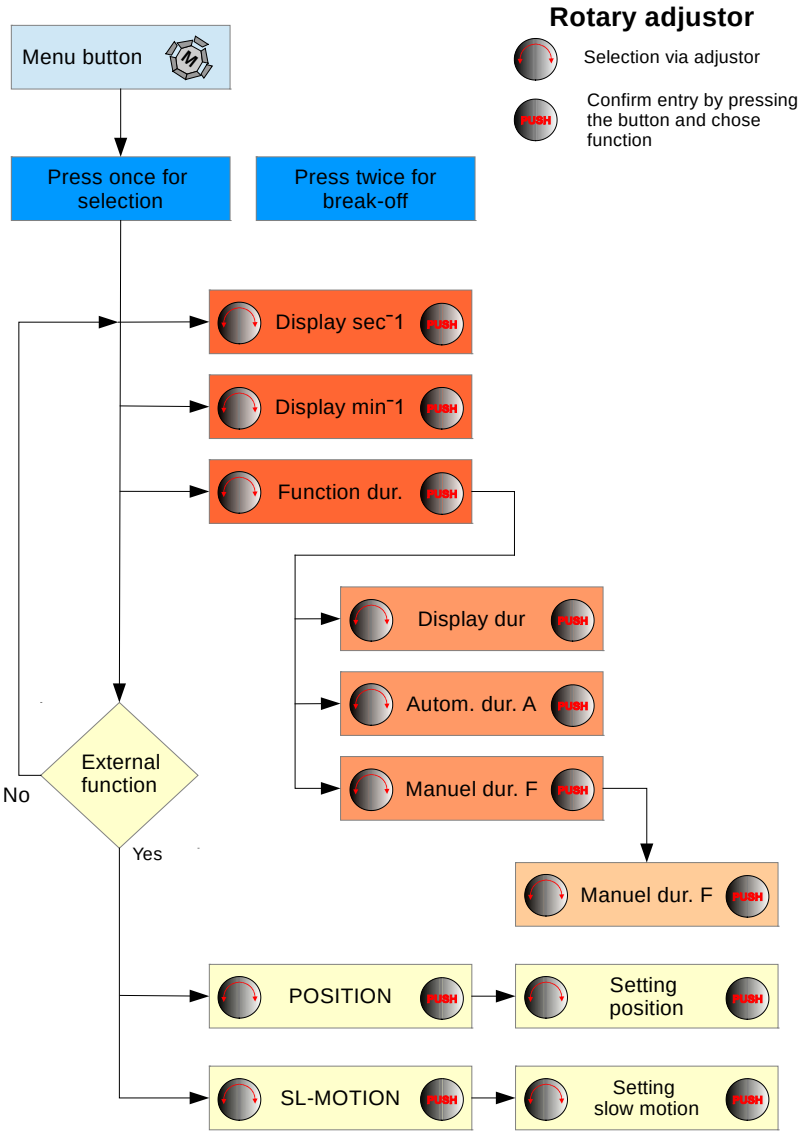
1	LED with lens	High-performance LED with integrated lens.

4.2.2 View from underneath



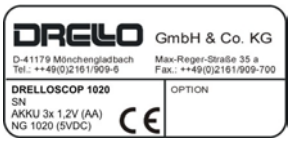
1	Lid fixing	Thread for removing the fixing screws of the battery compartment lid.
2	Battery compartment	Battery compartment for accommodating 3 rechargeable 1.2V AA /HR6-size batteries (see scope of delivery)

4.3 Menu structure



4.4 Type plate

The type plate is located on the underneath of the device. It includes the following information:



- Device designation
- Serial number
- Connection values
- Options

5 Transport, assembly and connection

5.1 Scope of supply

The DRELLOSCOP 1020 system is supplied with the following components depending on the system number:

DRELLOSCOP 1020 system number: 1.1020.00001

No.	Designation	Article number
1	DRELLOSCOP 1020	**1.1020.60001**
1	NG-1020 plug-in mains supply	**1.1020.20001**
3	NiMH 1.2V / 2100mAh HR6 (AA) rechargeable battery	**23.02.022**
1	TK-1020-01 plastic transport case	**39.1020.001**
	DRELLOSCOP 1020 operating manual, English	**1.1020.2B001e**

DRELLOSCOP 1020 system number: 1.1020.00002

No.	Designation	Article number
1	DRELLOSCOP 1020	**1.1020.60001**
1	LA 1020B charging device (Basic 4 plus)	**59.1020.20001**
6	NiMH 1.2V / 2100mAh HR6 (AA) rechargeable battery	**23.02.022**
1	TK-1020-02 plastic transport case	**39.1020.002**
	DRELLOSCOP 1020 operating manual, English	**1.1020.2B001e**

DRELLOSCOP 1020 system number: 1.1020.00003

No.	Designation	Article number
1	DRELLOSCOP 1020	**1.1020.60001**
1	LA 1020B charging device (Basic 4 plus)	**59.1020.20001**
3	NiMH 1.2V / 2100mAh HR6 (AA) rechargeable battery	**23.02.022**
1	NG-1020 plug-in mains supply	**1.1020.20001**
1	TK-1020-02 plastic transport case	**39.1020.002**
	DRELLOSCOP 1020 operating manual, English	**1.1020.2B001e**

DRELLOSCOP 1020 system number: 1.1020.00004

No.	Designation	Article number
1	DRELLOSCOP 1020	**1.1020.60001**
1	LA 1020US charging device (Ultra Fast)	**59.1020.20003**
6	NiMH 1.2V / 2850mAh HR6 (AA) rechargeable battery	**23.02.022**
1	TK-1020-02 plastic transport case	**39.1020.002**
	DRELLOSCOP 1020 operating manual, English	**1.1020.2B001e**

DRELLOSCOP 1020 system number: 1.1020.00005

No.	Designation	Article number
1	DRELLOSCOP 1020	**1.1020.60001**
1	LA 1020US charging device (Ultra Fast)	**59.1020.20003**
3	NiMH 1.2V / 2850mAh HR6 (AA) rechargeable battery	**23.02.023**
1	NG-1020 plug-in mains supply	**1.1020.20001**
1	TK-1020-02 plastic transport case	**39.1020.002**
	DRELLOSCOP 1020 operating manual, English	**1.1020.2B001e**

NOTE

Check the entire delivery according to the delivery note for completeness. We also refer you to our sales and delivery conditions.

Measures in the event of transport damage

Report damage due to defective packaging or damage incurred during transit to the haulage contractor, insurer and factory immediately after delivery.

Take steps to reduce existing damage and prevent any further damage.

5.2 Available accessories

The following accessories are available for the device:

No.	Designation	Article number
1	Sensors for the external controller	**on request**

5.3 Unpacking

Remove all packaging materials and protective foils from the product and the accessories before using it for the first time.

NOTE

- ► Do not remove the rating plate or any warning signs on the appliance.
- ► If possible, keep the original packaging during the guarantee period in order to be able to pack the appliance properly in the event of a guarantee claim. Transport damage will invalidate the guarantee.

NOTE

The packaging materials used can be recycled. When no longer required, dispose of the packaging materials according to local environmental regulations.

5.4 Storage

The following regulations apply for storage:

- Store at a dry place. Maximum relative humidity: 80%, non-condensing
- Protect from direct sunlight. Keep storage temperature between -20 … +60 °C.
- Store at a dust-free location.
- Avoid mechanical vibration and damages.

NOTE

After use, store the device in the transport case supplied and also in the original packaging if possible.

CAUTION

Risk of damage to the device due to leaking batteries!

When storing for longer periods of time, ´the rechargeable batteries can leak and damage the device.

► Before storing for longer periods of time, remove the batteries and store them in the battery compartments proved in the transport case.

5.5 Requirements for the place of use

- At the place of use, the device may not be subject to extreme temperatures or humidity. Comply with the specifications for ambient conditions specified in the technical data.
- Avoid setting up at locations with direct sunlight.
- Avoid strong ambient lighting at the place of use in order to achieve a good contrast.
- Do not subject the device to vibration or knocks.

5.6 Mains operation

When using the NG-1020 plug-in mains supply (depending on the scope of supply), battery operation is switched off automatically.

Carry out the electrical connection of the device as follows:

- Insert the 9-pole cable socket of the connecting cable for the NG-1020 plug-in mains supply into the 9-pole device connection plug of the DRELLOSCOP 1020 and secure it against loosening by means of the locking screws.
- Insert the plug of the NG-1020 plug-in mains supply into the mains socket.

CAUTION

Risk of damage to the device due to incorrect pin assignment!

Incorrect pin assignment of the connecting cable can lead to destruction of the electrical components in the device.

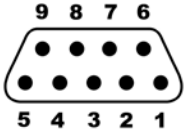
► Only use the NG-1020 plug-in mains supply from the manufacturer.

5.7 Connecting an external controller

If the device is to be connected to an external controller, the connections on the 9-pole plug must be undertaken by a qualified specialist electrician.

Pin assignment

The pin assignment of the connecting plug is depicted as follows:



Numbering of the device connection plug (top view)

Pin	Signal	Direction	Level
1	not assigned		
2	not assigned		
3	Supply voltage (+)	Input	5 V_{DC}
4	not assigned		
5	Trigger impulse (0 V)	Input	0 V trigger
6	Trigger impulse (+)___----___		10...24 V_S
7	not assigned		
8	Supply voltage (-)	Input	0 V
9	Supply voltage (-)	Input	0 V

6 Operation

6.1 Switching the device ON/OFF

The device is switched on or off by pressing the ON/OFF button.

After switching on, a display test is performed. All display elements light up for approx. 4-5 seconds and subsequently switch to the basic setting (LED sec^{-1} lights up, display value 50,000). The device is subsequently ready for operation.

The device is switched off by pressing the button again.

6.2 Operating

6.2.1 Selecting the operating mode

The device can be operated in two modes:

Manual controller

This function is active when the LED of the "EXTERN" button is **not** lit up. If the LED of the "EXTERN" button lights up, press the "EXTERN" button to activate manual control.

In manual control, the flash sequence is set with the rotary adjuster.

- The object to be controlled should speed up to its target speed in order to adjust the flash sequence.
- Press the rotary adjuster to switch on the flash trigger.
- Set the flash sequence via the rotary adjuster so that a stationary image is seen by the observer.
  The flash sequence speed is increased by turning the rotary adjuster clockwise and decreased by turning anticlockwise.
- If multiple images the object are seen, press the "Halving" button. Repeat this procedure until a single stationary image of the object is achieved.

External controller

This function is available when the device is connected to a pulse generator, from which it obtains control impulses. This type of flash sequence control also generates the desired stationary image even if the machine speed changes.

- Press the "EXTERNAL" button. The external controller is activated when the LED of the button lights up.
  The frequency of the supplied pulse sequence appears in the display. If no control signal is supplied to the "external input", the value 0.0 appears in the display after approx. 2 seconds.

NOTE

- If the input frequency is greater than 416.67 sec^{-1}, the flash sequence is split down to a permissible flash sequence value automatically. The value displayed corresponds to the original input frequency.
- An input frequency greater than 1.666 KHz cannot be displayed in min^{-1}.
- Input frequencies greater than 3.333 kHz are not permissible and are indicated by an error code "Err 1".
- Flash sequences that are smaller than 1 Hz are not permissible and are indicated by an error code "Err 2". However, flash triggering still takes place irrespective of this error message.

NOTE

If the menu button is pressed, the measured value can be depicted also for input signals smaller than 1Hz or greater than 3.333Khz in sec^{-1} or up to 1.666KHz in min^{-1} respectively.

6.3 Further setting options for flash operation (manual control)

6.3.1 Setting the flash sequence display

- Press the "Menu" button. The LED lights up when the function is selected.
- Turn the rotary adjuster until the lights up with "Display min^{-1}" or "Display sec^{-1}".
- If the desired display (min^{-1} or sec^{-1}) was selected, press the rotary adjuster to confirm selection.

NOTE

The menu is closed automatically and all settings are stored.

6.3.2 Displaying the current flash duration

- Press the "Menu" button. The LED lights up when the function is selected.
- Turn the rotary adjuster until the "dur." function is displayed.
- Press the rotary indicator.
- The current flash duration is displayed in [µs]. Either "dA" for Duration-Automatic-Mode or "dF" for Duration-Fix-Mode is in front of the number.
- If the setting is to be changed, select the corresponding function (refer to following section).
- Press the rotary adjuster to either set the flash duration (Fix-Mode) or to exit the function. The changed setting is saved.

NOTE

To exit the function, press the Menu button again. The menu is closed.

6.3.3 Setting the "Duration-Auto-Modus" variable flash duration

The flash duration is adjusted automatically to the flash sequence with this function. Automatic adjustment gives the impression of a constant brightness irrespective of the flash sequence.

NOTE

Use this function if a continual impression of brightness is desired irrespective of the flash sequence used.

- Press the "Menu" button. The LED lights up when the function is selected.
- Turn the rotary adjuster until "dur." is displayed.
- Press the rotary indicator.
- The current flash duration is displayed in [µs]. Either "dA" for Duration-Automatic-Mode or "dF" for Duration-Fix-Mode is in front of the number.
- Turn the rotary adjuster until "dA" is displayed.
- Press the rotary indicator. The device is in automatic mode and the current flash duration is displayed in [µs].
- Press the "Menu" or rotary adjuster button. The menu control is closed and the settings saved.

6.3.4 Setting the flash duration "Duration-Fix-Modus"

This function allows the flash duration to be set to a fixed value irrespective of the flash sequence. Adjustment of the flash sequence makes it possible to eliminate possible motion blur while depicting the moving object.

NOTE

Use this function if significant motion blur is detected or the brightness needs to be reduced.

- Press the "Menu" button. The LED lights up when the function is selected.
- Turn the rotary adjuster until "dur." is displayed.
- Press the rotary indicator.
- The current flash duration is displayed in [µs]. Either "dA" for Duration-Automatic-Mode or "dF" for Duration-Fix-Mode is in front of the number.
- Turn the rotary adjuster until "dur F" is displayed.
- Press the rotary indicator. The device is in fix mode.
- Set the flash duration by turning the rotary adjuster.
- Press the "Menu" or rotary adjuster button. The menu control is closed and the settings saved.

NOTE

Manual setting of the flash duration may not exceed the maximum permissible flash duration for the respective flash sequence.

An additional protective function (overload protection) reduces the manually set flash duration automatically when this reaches a non-permissible value as a result of a change in the flash sequence.

6.4 Further setting options for flash operation (external control)

6.4.1 Image shift (PHASE)

The object to be controlled can be "shifted" into the optimum position. The flash moment is changed electronically that another image position of the object can be viewed.

	NOTE
	This function is useful when the object does not need to be completely illuminated.

	NOTE
	The "image shift" function is deactivated in the "external controller" mode after switching on the device. The "PHASE" function must called first to enable it. Switching off the function is only possible if either the "slow-motion" function is selected or the device is briefly switched off and on again.

- Press the "Menu" button. The LED lights up when the function is selected.
- Turn the rotary adjuster until "PHASE" is displayed.
- Press the rotary adjuster to activate the image shift setting and to read the current "phase angle" (image position) with respect to the input signal.
- Turn the rotary adjuster to set the desired image position.
- Press the "Menu" or rotary adjuster button. The menu control is closed and the settings saved.

	NOTE
	After closing the "PHASE" menu function, the set image position remains and can be further modified with the rotary adjuster. However, the phase angle is no longer displayed.

6.4.2 Setting the slow-motion function

With external control of the flash sequence a continual, apparent image shift can be set. The eye perceives this as a sequence in slow motion.

NOTE

The "scrolling" is deactivated after switching on the device in "external control" operating mode. The "SLO" function must be called first to enable it. Switching the function on/off is only possible when either the "PHASE" function (image shift) is selected or the device is switched off briefly and then switched on again.

- Press the "Menu" button. The LED lights up when the function is selected.
- Turn the rotary adjuster until "SLO" is displayed.
- Press the rotary adjuster to activate the slow-motion function and to read the current "slow-motion angle" with respect to the input signal.
- Set the slow-motion speed by turning the rotary adjuster
- Press the "Menu" or rotary adjuster button. The menu control is closed and the settings saved.

NOTE

The apparent slow-motion effect (scrolling) remains after switching off this function and can be further modified with the rotary adjuster. However, the "slow-motion angle" is no longer displayed.

NOTE

The "slow-motion angle" serves as a setting aid. Once set, it is adjusts itself automatically to the changing object speed. This automatic adjustment keeps the apparent circulation speed constant irrespective of the object speed.

7 Maintenance and repair

7.1 Maintenance

No maintenance work on the device is necessary. Only the rechargeable batteries used must be charged as required with the charging station supplied.

	NOTE
	If the DRELLOSCOP 1020 is not to be used for a longer period of time, remove the batteries from the device and insert them into the battery compartment provided in the transport case.

7.2 Changing the batteries

- Switch off the device.
- Unscrew both screws of the battery lid and remove it.
- Remove any batteries.
- Insert the loaded batteries according to polarity into the battery compartment, replace the lid and the screws.
- Charging the batteries

	NOTE
	When the battery voltage is too low, the indicator in the display starts flashing. If the voltage sinks further, flash operation switches off automatically and "dc Lo" appears in the display. The batteries must be replaced. The device switches off automatically within 30 seconds.

	NOTE
	If the DRELLOSCOP 1020 is not to be used for a longer period of time, remove the batteries from the device and insert them into the battery compartment provided in the transport case.

7.3 Cleaning

Clean the lens (light emitting surface) with a damp cloth as required.

If dirty, clean the housing of the device with a slightly damp, lint-free cloth. Do not use cleaners containing solvents.

7.4 Troubleshooting

Fault	Cause	Remedy
No display	Batteries discharged.	Recharge batteries
	No voltage supply.	Check connecting cable.
	Stroboscope not switched on.	Switch on stroboscope.
Display is flashing	Battery voltage in lower permitted range.	Change the batteries immediately.
Display is flashing, "dc Lo" is displayed and operation not possible.	Battery voltage too low.	Replace batteries immediately.
The device does not flash with manual controller.	"External controller" operating mode is activated without a trigger impulse.	Switch over to "manual controller" operating mode.
The device does not flash with external controller.	There is no trigger impulse.	Check external impulse generator
"Err 1" display	Input frequency above 3.33 kHz.	Reduce input frequency.
"Err 2" display	Input frequency below 1.00 Hz.	Increase input frequency.

7.5 Repairs

Do not perform repairs on the device yourself. Contact customer service at DRELLO. Improper work can result in personal injuries, damage to property or damage to the device itself.

If repairs must be performed, please contact:

DRELLO Ing. Paul Drewell GmbH & Co. KG

Customer service

Andreas-Bornes-Strasse 46

D-41179 Mönchengladbach

Telephone: +49 - (0)2161 - 909 - 6

Telefax: +49 - (0)2161 - 909 - 700

Email: service@drello.de

Internet: www.drello.de

7.6 Disposal

This product may not be disposed of in the domestic refuse within the European Union.

Dispose of the device in accordance with the EC Directive Waste Electrical and Electronic Equipment 2002/96/EC. Questions on disposal can be answered by the responsible local authority.