Installation and Operation Manual

Flashlight Stroboscope

DRELLOSCOP® 3009

Read and adhere to this manual before you install, operate, store or handle the unit.

Mains supply version

DRELLO

This installation and operation manual
Edition 1.3009.2B002e is only valid for the
Flashlight Stroboscope DRELLOSCOP 3009

List of contents

Introduction

The manual for the installation of the DRELLOSCOP 3009 has been prepared for persons (electrical engineers and service engineers) who have to make the installation and the maintenance of the unit. These persons have to be familiar with all regulations concerning electrical engineering and have to adhere to these in any case.

The operation manual for this unit has been prepared for persons who use the unit for the inspection and who have to make adjustments on it.

Carefully read this manual in order to become familiar with it and to operate it correctly.

Correct use

The DRELLOSCOP 3009 is exceptionally destined for the professional application for the visual inspection of periodic motions. Any other use is regarded as incorrect use, and all risks are solely on the part of the user.

The main application of this unit is the contactless measurement of revolutions and oscillations as well as the inspection of fast periodic and quasi-periodic motions at an apparent stand still.

One example for the correct use is the application during the observation of mechanical motions, for the improvement of machine settings, e.g. uniform running of gear drives, folding apparatus of form printing machines and folding/bending processes on packaging machines.

The maintenance of this unit must only be made by electrical specialists.

Any questions concerning the operation of the unit or special applications which are not answered in this manual should be directed to:

DRELLO GmbH & Co. KG
Max-Reger-Str. 35a
D-41179 Mönchengladbach

Phone: +49-(0)2161-909-6
Fax: +49-(0)2161-909-700
E-mail: info@drello.de

Name plate

For the identification of the unit you find its serial number on the name plate on the backside of the DRELLOSCOP 3009. Note down this serial number in the figure on the right in the line "SN" to have this available in the case of questions or orders for spare parts.

Electromagnetic compatibility

The DRELLOSCOP 3009 meets the protective requirements of the European Direction 89/336.

Safety measures

Danger through electric current

- Make sure that only qualified personnel (electrical engineers) are instructed with the maintenance of the unit.
- Separate the DRELLOSCOP 3009 from mains supply and all other peripherals when there is an indication for a defect by smoke or a sharp smell.
- There may be residual voltages on the capacitors inside the unit! Opening of the housing must only be made by qualified personnel (electrical engineers) for replacing fuses, the back up battery and the flashtube. There are no other parts in the unit which you can repair or replace.
- Make sure that no liquids are allowed to enter into the unit (e.g. by cleaning). Never continue using the unit when liquids have entered into the stroboscope!
- If you do not intend to use the unit for a longer period, store the DRELLOSCOP 3009 only in dry rooms which are protected against weather.
- Make sure that the connected cables will not be bent, squeezed or damaged otherwise. Replace damaged cables immediately.
- If a safe operation is no more assured separate the battery from the stroboscope and against unintended switching on.
- A safe operation is no more possible in the following cases:
  - When the unit or the connection cable shows visible damages.
  - When the unit does not work correctly.
  - When the unit was exposed to moisture or rain
  - In the case of formation of condensing water.
  - When objects have entered into the unit.
  - When the permissible storage/operation temperature has been exceeded or fell below a permissible value.

Danger through stroboscopic light flashes

Stroboscopes, when operated with a frequency of approx. 10 ... 20 Hz can in exceptional cases cause epileptic fits. This risk is the higher the bigger the contrast is between flash and ambient light. Also persons who until now had never such an epileptic fit can be affected by this. Consequential injuries, e.g. through a fall cannot be excluded.

- If possible operate the stroboscope at normal ambient light.
- Start the adjustment of the flash sequence from the expected top frequency value.
- Make sure that persons which may be affected by epilepsy do not stand closely to the stroboscope while in use.

Operation

With a correctly adjusted DRELLOSCOP rotating machine parts will appear at a stand still. For persons who are not informed about this phenomenon there is the risk to touch the running machine or to be caught by it. The result is severe or fatal injuries.

- Inform all persons close to the illuminated area about the function principal of the DRELLOSCOP 3009 and remind them about the dangers which may result from the optical illusion.

- Make sure that the illuminated area is not accessible by other persons.

Repair

Do not repair the DRELLOSCOP yourself. Always refer to the service department of company DRELLO GmbH & Co. KG. Incorrectly executed work on the unit may lead to personnel injury, material damage or damages on the unit itself.

Maintenance

Maintenance work as described in this manual must only be made by qualified personnel. The relevant regulations for the electrical engineering have to be observed and maintained thereby.

Carry out only the maintenance work described in this manual. All other work on this unit may lead to personnel injury, material damage and damage on the unit itself.

Symbols used in this manual

The security advice in this manual is classified in two stages:

DANGER!
Safety advice which non-observance may lead to danger for persons are marked with this symbol. This symbol is used in cases of imminent danger. The possible consequences of non-observance can be death or serious injuries.

In some chapters you find the following advice symbol:

ATTENTION!
This symbol is used in front of warnings concerning damages on the unit or other materials.

Advice
This symbol refers to special advice for the use of the unit

Product description

Function

The DRELLOSCOP 3009 is a flashlight stroboscope with separate handlamp. It delivers pulses to an installed quartz flashtube with which you can illuminate rotating or oscillating objects by light flashes. When the frequency of the light flashes coincides with the motion of the object and the light flashes are very short there appears for the eye the impression to see a "frozen" object. This optical illusion is a less tiring possibility for the observer to inspect periodic motions visually and to measure rotations or oscillations in a contactless way.

Storing of adjustments

When you switch off the DRELLOSCOP 3009 all actual adjustments will be stored. When switching the unit on again all these adjustments become active, however the flashtube first remains switched off.

The DRELLOSCOP 3009 has two possibilities for the flash control: the manual control and the control through external pulses.

Depending on the selected control mode different functions are available.

Manual control of the flash sequence

In the manual control mode the flash sequence is adjusted by hand in the control field via rotary knob on the front panel.

Control of the flash sequence through external pulses

In the external control mode difference pulse generators, inductive or photoelectric pulse generators supply the pulses for the flash sequence. In this control mode a frozen image is even then obtained when the speed changes.

Image shifting

The installed control allows for shifting the object to be inspected to an optimum position for the observation.

Slow motion

The installed control allows slow motion of the object by means of the rotary knob on the front panel.

Scope of supply

1	Flashlight stroboscope DRELLOSCOP 3009 connection 230V AC	Product no. 1.3009.60001
	or	
1	Flashlight stroboscope DRELLOSCOP 3009 Connection 115V AC	Product no. 1.3009.60002
1	Handlamp HL 4090	Product no. 1.4090.2
1	Quartz-flashtube 300-2	Product no. 1.B300.20002
1	Cable plug for external control	Product no. 17.03.015
1	Manual	Product no. 1.3009.2B002e

Available accessories:

1	Transport case TK 3009 for DRELLOSCOP 3009 and standard accessories	Product no. 1.3009.2TK
1	Proximity switch NJ2/8-L 10 K for external control	Product no. 0.0NJ2.20008
	alternatively:	
1	Photoelectric pick-up KT5-3000 with 5 m cable and plug	Product no. 0.0KT5.00003
1	Tripod for handlamp	Product no. 28.02.001
1	Flood-lighting lamp LE 4052/10	Product no. 1.4052.60002
1	Quartz-flashtube 104-1 for LE 4052/10	Product no. 1.B104.20001
1	Ex-protected lamp LE 4072/10	Product no. 1.4072.60001
1	Quartz-flashtube 300-2 for LE 4072/10	Product no. 1.B300.20002

Connection

Preparations

The DRELLOSCOP 3009 is a portable stroboscope. It can be powered by mains supply.

ATTENTION:
Make sure that the unit is not exposed to extreme temperatures or extreme humidity. The ambient temperature should be between 0 and +50°C.

Do not use the unit close to radiators. Avoid direct sun radiation.

Avoid strong room illumination to obtain best contrast for the illumination with the DRELLOSCOP 3009.

DO NOT EXPOSE THE UNIT TO VIBRATIONS OR SHOCKS.

Application

The compact flashlight stroboscope DRELLOSCOP 3009 with high light intensity serves for contactless measurements of rotations or oscillations as well as for the observation of fast periodic and quasi-periodic motions at an apparent stand still.

The handy design makes it universally applicable especially in the service range.
Major fields of application:

Electrical engineering
- Speed measurement on motors and blowers
- Collector inspection on generators
- Slip measurement on asynchronous machines

Chemical industry
- Visual inspection on stirring operators and centrifuges
- Inspection on driving engines, vibrating and oscillating screens
- Speed control on pumps
- Observation of atomization processes

Machine construction
- Observation of the amplitude and measurement of the frequency of oscillations
- Inspection of drilling and milling tools during the production
- Slip measurement on clutches and belt drives
- Inspection of the backlash on gear units

Textile industry
- Inspection of the speed of spindles, rotors and spindles on spinning and winding machines
- Observation of the warp thread on weaving machines
- Representation of the motion of sewing threads on mechanical elements on sewing machines

Graphics industry
- Observation and control of the reference marks with label, form, flexo and intaglio printing
- Inspection of longitudinal and transverse perforation as well as of marginal perforation during form continuous printing
- Motion analysis on the folding apparatus during form printing
- Synchronism inspection on machine drives and machine gear drives

Packaging industry
- Motion analysis of mechanical processes on packaging machines, e.g. folding and bending processes
- Inspection of the application of cold setting adhesives

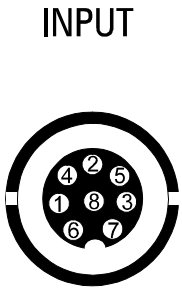
Steel industry
- Visual inspection of surface defects in the cold rolling area as well as with galvanised and coated sheets.

Connection for external control

Pin allocation of input socket

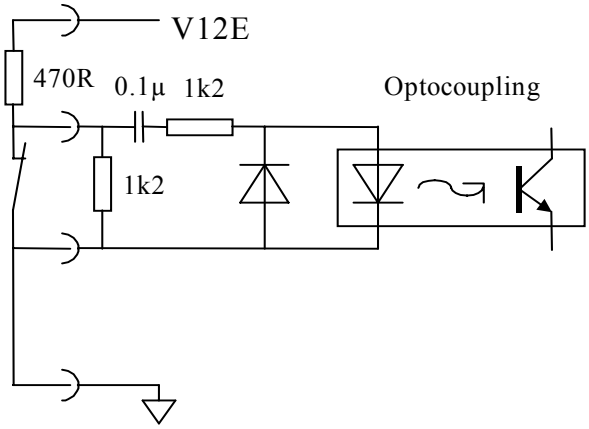
Cable plug DIN 45326, product no. 17.03.015

Connection	Connection	Direction	Value
1	Supply voltage	Output	+12 V – max. 20 mA
2	NC		
3	Pulse input	Input	0,5...30 V_p
4	Reference potential		0 V
5	NC		
6	Free for options		
7	Opt coupling Anode	Input	4...12 V
8	Opt coupling Cathode	Input	Reference potential

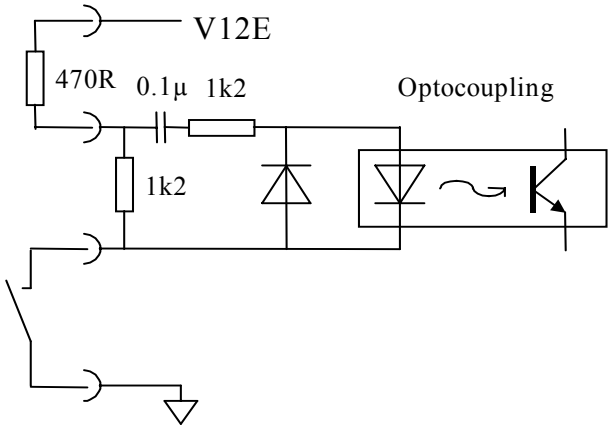


Circuit diagram of the input for the connection of a contact via the opto coupling

Break contact



Make contact



Connection for signal "OUTPUT“

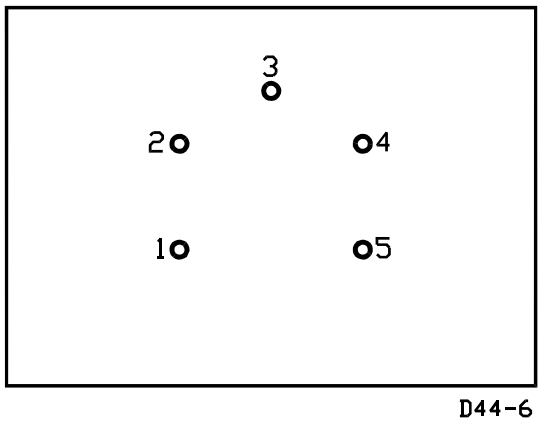
To the "Output“ socket you can connect further stroboscopes, especially units with high flash frequencies which then will be controlled in the cycle of the flashes of DRELLOSCOP 3009. It is also possible to connect writing frequency measuring units.

The unit can also be used as a pulse generator via this connector (from 0.5 to 417 Hz already). When using the output pulses the lamp may be switched off.

Socket	Denomination
1	+ 12 V
2	Output (Option)
3	Output voltages approx. + 10V in synchronism with the flash frequency
4	0V (reference potential Gnd)
5	As 3, but via coupling capacitor 0.1 µF

Mating plug DRELLO product no. 17.03.016

View on the socket:



Operation

Manual control and measurement of the flash frequency

When you switch the stroboscope on that function key used during the last test will light. To select the internal control the key "extern" must not light. The display now shows the selected flash frequency in flashes/min. when key "min^{-1}“ was pushed, and in flashes/sec. when key "sec^{-1}“ was pushed. The flash frequency can be changed with the rotary knob on the front panel from 30/min (0.5/sec) to 25.000/min (417/s.)

If a periodically moving object, e.g. a rotating disk shall be observed at an apparent stand still it is illuminated by the hand lamp, which is switched on by the built-in switch, and the flash frequency is adjusted so much until the object appears to stand still. If the object frequency (speed) is absolutely unknown set the flash frequency first to a level which is surely above the object speed, possibly to the highest value. Then reduce the frequency until a single still standing image of the object is visible. Its frequency can now be read from the display. When measuring the speed of rotationally symmetrical parts, e.g. spoke wheels, incorrect measurements may be possible. In these cases it is recommended to stick a mark on the object which serves as a reference point.

If the flash frequency is adjusted by the rotary knob little against the motion frequency of the object you obtain a slow motion effect and this in the object’s sense of rotation when the flash frequency is set to a lower value than the motion frequency of the object is.

The intensity of the light flashes is controlled by the microprocessor. With normal ambient light the brightness of the light flashes is normally sufficient for the observation. In very bright rooms it is recommended to screen the ambient light at the inspection place. Screening is always important in those cases where the object shall appear in its true colours which is allowed by the white xenon light of the flash lamp if it is not superimposed by foreign light.

Switch the lamp off during observation breaks which is in the interest of the flashtube's live. The stroboscope itself can remain switched on as long as you like.

Determination of the true motion frequency of an object

In stroboscopic speed measurement it is essential to know that the object under study appears "frozen", not only when its speed agrees with the flashing rate but also when its speed is an integral multiple of the flashing rate, so that it is illuminated by a flash every second, third, etc. revolution only. Generally, such ambiguity of the result will not occur since the speed of the part being examined is approx. known and the stroboscope is adjusted accordingly.

However, where this is not the case, the following method of control can be employed: double the flashing rate at which the part appeared standing still. If the flashing rate used in the first place corresponded to the true speed of the part, this will now be "frozen" in two positions 180° offset since the flashes occur every half-turn of the part. If, on the contrary, the object under study appears again standing still in a single position, repeat the test with doubled frequency.

If the frequency of the object is higher than the max. strobe frequency (25.000/min or 415/sec) the following method will help to solve the problem:

Starting from the highest value the flashing rate is gradually reduced until a single "frozen" image is obtained. The corresponding flashing rate is noted down as f_1. Then continue reducing the flash frequency until again a "frozen" image is obtained at f_2. The true frequency of the object being studied is obtained from the equation given below:

$$f = \frac{f_1 \times f_2}{f_1 - f_2}$$

If the object frequency is outside the measuring limits of the stroboscope (30/min or 0.5/sec) the measurement can be made as follows:

Starting from the lowest value the flash frequency is increased until a still standing image with the lowest numbers of positions of the object is obtained. This flash frequency is divided by the number of the positions in order to obtain the object frequency. However, with such slow objects it is in most cases much easier to count the motion periods during a fixed time, e.g. 60 sec.

External control

The DRELLOSCOP 3009 can also be controlled from an externally fed AC voltage or pulse series. To select this mode press key "EXTERN“. The display now shows the frequency of the entered AC voltage respectively of the pulse series. The internal control is switched off in this mode and the rotary knob is without function.

If the input frequency drops below a value of 30/min respectively 0.5/sec the measurement is stopped after approx. 2 seconds and the display shows "0.0". If the input frequency exceeds the maximum value of 25.000/min or 417/sec it is no more possible to carry out any measurement. The flash control is switched off and the display shows "--".

The external control is useful in all those cases where an object with fluctuating frequencies (speeds) shall be observed continuously at a standstill.

Examples:

On an Otto-motor the valve position shall be checked when increasing the speed.
On a printing machine the reference mark shall not only be checked during the normal press speed but also when starting the machine.

For the production of the control pulses different pulse generators are available. The pulse voltage shall be between +0.5 and 30 V with a rise time as low as possible. The light flashes will be triggered with a delay of approx. 20 µs after the pulse (respectively the positive half wave of the AC voltage) has reached a voltage of 0.5 V.

On Page 9 we have listed some pulse generators which can be connected to the socket "INPUT". When using closing contacts pay attention to that these are chatter free because chatters may lead to incorrect triggering of the light flashes.

For the use of pulse generators which zero potential is not applied to ground an opto coupling is installed in the strobe. The zero potential of the pulse generator may be up to ± 300 V against ground. With an input resistance of 470 Ohm the pulse voltage can be 3.5 to 24 V. You can also put in pulses with negative voltage via the opto coupling where the reference potential of the pulse generator has to be applied at the anode.

For the frequency measurement observe the following:

The frequency measurement with DELLOSCOP 3009 is made in an indirect way where first the duration of the period of the entered AC voltage respectively the time between the pulses of the entered pulse series is measured, and this time is converted into a frequency (1/min respectively 1/sec). With external synchronization the control voltage must be free from superimpositions caused by interference pulses as otherwise - with constant frequency - the duration of the period may differ. These fluctuations will then also appear in the frequency display.

Phase shifting of the stroboscopic image

If in addition to key "EXTERN“ also key "PHASE“ is pressed the rotary knob allows for shifting the phase position of the light flashes against the control pulse from 0 ... 360°. The adjusted phase angle is shown in the display. This feature allows for example to observe on an Otto-motor the position of the valve in each phase of the motor rotation. Speed fluctuations thereby have no influence on the adjusted phase angle.

Key "SLOW MOTION“

When this key is pushed (LED lights) it allows in the external control mode for a slow motion by means of the rotary knob on the front panel. You can now rotate the picture slowly around its axis to view it from any side. The slow motion frequency can be set from ± 0.002 Hz to ± 5 Hz. It is indicated in the display. With low frequencies you have to pay attention to that the original frequency should be very constant to avoid fluctuation of the slow motion effect.

Key "FINE Adj.“

After pressing this key (LED lights) the rotary knob allows for a fine adjustment of the flash frequency. When the key is not pressed the rotary button will make a coarse adjustment of the flash frequency.

Maintenance

The maintenance of the stroboscope is bounded to the inspection of the connection cable which must show no damages, and to the replacement of the flashtube.

Exchange of flashtube
Pay attention to separate manual of handlamp

Initializing of the stroboscope

When the strobe is in an undefined switch status, i.e. it does not respond upon pressing any key, you have to proceed for the initialization as follows:

- switch strobe off
- depress key min^{-1} and switch the strobe on at the same time.

Annexe

Repair

Irregular flash triggering
In the external control mode check the pulse generator (frequency display must not jump), if necessary replace flashtube.

No flash release:
1. Check safety fuse
2. Switch on internal control, the display must now show the frequency.
3. Change over to external control. If there is no frequency display with switched on pulse generator
   check pulse generator and its correct connection.
4. Switch on the handlamp. If no function replace flashtube.
5. If no function with new flashtube return unit with lamp to manufacturer for repair.

During the first two years after shipment (guarantee period) the repair is made free of charge in the manufacturer's facilities. The guarantee is void when the unit is opened by other persons during this period. Flashtubes are excluded from the guarantee.

Also after the guarantee period we recommend to have any repairs made by the manufacturer because then it is guaranteed that the unit will be brought to a correct statuts.

If repairs shall be made by third parties the following **safety measures** have to be observed

Before starting working on the unit separate it from the supply voltage. As the installed capacitors need a certain time for discharging to a non dangerous voltage the unit must only be opened after approx. 5 minutes waiting time after switching off. Switching on the open unit must only be made by qualified electricians. The repair must only be made by qualified electronic technicians to which we will send circuit diagrams upon request.

For any repair on the DRELLOSCOP 3009 refer to

DRELLO GmbH & Co. KG
Max-Reger-Str. 35 a
D-41179 Mönchengladbach

Phone +49-(0)2161-909-6
Fax +49-(0)2161-909-700
E-mail service@drello.de

Technical Data

Control of the flash frequency:	internal through micro computer, coarse and fine adjustment via rotary knob; external selectively through positive pulses from 0.5...30 Vp, pulse interval ratio < 1:1 through sine voltage from 1 V ... 60 Vpp, through reflection light screen, inductive pulse generator, proximity switch, closing contact, additional control via Opt coupling with potential free pulses 3.5 - 24V.
Phase shifter:	Electronic phase shifter for image shifting from 0...360°.
Range of the flash frequency:	with internal control 30...25,000 min^{-1} or 0.5...416 s^{-1} with external control 30...25,000 min^{-1} or 0.5...416 s^{-1}
Slow Motion:	Slow motion effect and Fine Adjustment via separate function keys.
Display:	5 decades, 7 segment LED, 12 mm high, red, floating point, Display with internal and external control selectively in min^{-1}, sec^{-1}, or degrees.
Resolution:	5 digits, angle display better 0.1°
Accuracy of the time base:	0.001 % (quartz time base)
Lamp:	refer to annexure
Flash energy: adjusted range	max. 0.35 Ws Joule/flash, depending on the of the flash frequency
Half width of the flash:	approx. 10 µs
Supply voltage:	230V AC, alternatively 115V AC
Power consumption:	max. 40 W
Fuses:	safety fuse 0,5 A slow (230V AC) safety fuse 1A slow (115V AC)
Permissible ambient temperature: (operation)	0°C ... +50°C
Permissible storage temperature:	-20°C ... +70°C
Housing:	light metal service friendly half shell design, ½ 19“ standard housing.

We reserve the right for technical changes in the course of development.

- Industrial Stroboscopes
- Video Inspection Systems
- Measuring Equipment for Ballistics
- Seed Counting Equipment

DRELLO
Ing. Paul Drewell GmbH & Co. KG

Declaration of conformity

according to ISO/IEC Guide 22 and EN 45014

Manufacturer:	DRELLO GmbH & Co.KG
Address:	Max Reger Straße 35a D- 41179 Mönchengladbach

We declare that the products

Product name:	Flashlight - Stroboscope
Modell:	DRELLOSCOP 3009
Accessories:	Handlamp with quartz-flashtube.
Possible accessories:	Transport case, trigger unit

correspond to the following product spezifications:

Safety:	VDE 0110b, VDE 0411, IEC 348
EMV:	EN 500082-2, EN 55011B, EN 55140, EN 55141, EN 61000-4-2, EN 61000-4-4
Additional Information:	The product corresponds to the EMC regulations 89/336/EEC and is consequently labeled with the CE mark. This product has been tested with calibrated test units which can be traced back to PTB standards.

Date: January 1st, 2007

Signature/Stamp:

ppa.

DRELLO Ing. Paul Drewell GmbH & Co. KG
41171 Mönchengladbach • Postfach 500126
41179 Mönchengladbach • Max-Reger-Str. 35a
Tel.: 0 21 61 / 909-6 Fax: 0 21 61 / 909-700

Drello Ing. Paul Drewell GmbH & Co.
Mailing address
Postfach 500126
D-41171 Mönchengladbach
Factory address
Max-Reger-Strasse 35a
D-41179 Mönchengladbach (Rheindahlen)

Phone
++49-(0)2161/909-6
Telefax
++49-(0)2161/909-700
e-Mail
info@drello.de
internet
www.drello.de

Dresdner Bank Mönchengladbach
Account 904928900 BankCode 310 800 15
IBAN: DE97 3108 0015 0904 9289 00
SWIFT-BIC: DRES DE FF 310
Stadtsparkasse Mönchengladbach
Account 92365 BankCode 31 0 500 00
IBAN: DE41 3105 0000 0000 0923 95
SWIFT-BIC: MGLSDE33

VAT-No.: DE120434605
Kommanditgesellschaft, Mönchengladbach
Amtsgericht Mönchengladbach, HRA 411
p.h.G. Drewell-Verwaltungs-GmbH, Mönchengladbach
Amtsgericht Mönchengladbach, HRB 253
Managing Directors
Hans-Günter Sebbt-Drewell