

Stroboscope

SCHMIDT
control instruments



Edition DT 03.3.E

DT Series

Model DT-311N
DT-315N
DT-315A

Operating Instructions

Valid as of: 01.07.2011 • Please keep the manual for future reference!



DT-315N



DT-311N



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Content

1	Warranty and Liability	3
1.1	Notices within the Operating Instructions	3
1.2	Responsibilities of the Operating Company	3
1.3	Responsibilities of the Personnel	3
1.4	Informal Safety Measures	4
1.5	Training of the Personnel	4
1.6	Intended Use	4
1.7	Dangers in Handling the Device.....	4
1.8	Copyright.....	4
1.9	EU Declaration of Conformity and WEEE Registration.....	4
2	Available Models.....	5
2.1	Specifications	5
2.2	Delivery Includes.....	6
2.3	Unpacking	6
3	Initial Setup and Operating Procedure	6
3.1	Notes Before Starting Measurement.....	6
3.2	Connecting the Power Cord (DT-311N only)	7
3.2.1	Connecting the AC Adapter/Charger (DT-315N and DT-315A only).....	7
3.2.2	Battery Charge (DT-315N and DT-315A only)	7
3.2.3	Battery Change (DT-315N and DT-315A only).....	7
3.3	Operating Elements	8
3.3.1	True RPM Measurement	9
3.4	Measuring with the Stroboscope.....	10
3.4.1	Internal Signal Mode Normal operation	10
3.4.2	External Signal Mode	10
3.4.2.1	Delay Mode	11
3.4.2.2	RPM Display Mode	11
3.4.2.3	Deg/msec Display Mode	11
3.4.2.4	Synchronous Output Signal	12
3.5	Memory	12
3.6	Troubleshooting	13
4	Service and Maintenance.....	14
4.1	Flash Tube Replacement	14
5	Cleaning.....	15
6	Correspondence	15
7	Repairs.....	15

1 Warranty and Liability

In principle, the supply of the device is subject to our "General Conditions of Sale and Delivery." These have been provided to the operating company on conclusion of the contract, at the latest.

Warranty:

- Stroboscopes are warranted for 12 months.

Parts subject to wear, electronic components and measuring springs are not covered by the warranty. No warranty or liability will be accepted for bodily injury or property damage resulting from one or several of the following causes:

- Misuse or abuse of the device.
- Improper mounting, commissioning, operation and maintenance of the device (e.g. verification interval).
- Operation of the device if any safeguards are defective or if any safety and protection precautions are not properly installed or not operative.
- Failure to comply with the notices in the Operating Instructions regarding transport, storage, mounting, commissioning, operation, maintenance and setup of the device.
- Any unauthorized structural alteration of the device.
- Insufficient inspection of device components that are subject to wear.
- Opening the device or improper repair work.
- Disasters caused by the effects of foreign objects or by force majeure.

1.1 Notices within the Operating Instructions

The fundamental prerequisite for the safe handling of this device and its troublefree operation is the knowledge of the basic safety notices and safety instructions.

These Operating Instructions contain the most important notices for the safe operation of the device.

These Operating Instructions, in particular the safety notices, must be observed by any person who works with the device. In addition, the local valid rules and regulations for the prevention of accidents must be complied with.

The representations within the Operating Instructions are not true to scale.

The dimensions given are not binding.

General indications of direction, such as FRONT, REAR, RIGHT, LEFT apply when viewing the front of the device.

1.2 Responsibilities of the Operating Company

In compliance with the EC Directive 89/655/EEC, the operating company agrees to only permit persons to work with the device who:

- are familiar with the basic regulations on industrial safety and accident prevention and who have been trained in handling the device.
- have read and understood the chapter on safety and the warning notices in these Operating Instructions and have confirmed this with their signatures.
- are examined regularly on their safe and conscientious working method.

1.3 Responsibilities of the Personnel

All persons who work with the device agree to perform the following duties before starting work:

- to observe the basic regulations on industrial safety and accident prevention.
- to read the chapter on safety and the warning notices in these Operating Instructions and to confirm with their signatures that they have understood them.

1.4 Informal Safety Measures

The Operating Instructions must always be kept on hand where the device is operated. Apart from the Operating Instructions, the generally and locally valid regulations on accident prevention and environmental protection must be provided and complied with.

1.5 Training of the Personnel

Only trained and instructed personnel is permitted to work with the device. The responsibilities of the personnel must be clearly defined for mounting, commissioning, operation, setup, maintenance, and repair. Trainees may only work with the device under the supervision of experienced personnel.

1.6 Intended Use

The device is intended exclusively to be used as a Stroboscope. Any other use or any use exceeding this intention will be regarded as misuse. Under no circumstances shall HANS SCHMIDT & Co GmbH be held liable for damage resulting from misuse.

The intended use also includes:

- Complying with all notices included in the Operating Instructions and observing all inspection and maintenance works.

1.7 Dangers in Handling the Device

The device was designed according to the state of the art and the approved safety standards. Nevertheless, its use may cause serious or fatal injury to the user or third persons, and/or an impairment of the device or of other material assets.

The device may only be applied:

- For its intended use in a faultless condition with regard to the safety requirements.
- Malfunctions that could impair safety must be remedied immediately.
- Personal protective equipment must be used according to the EC Directive 89/686/EEC.



The device must not be operated in potentially explosive areas and must not come into contact with aggressive substances.

1.8 Copyright

The copyright on these Operating Instructions remains with the company HANS SCHMIDT & Co GmbH.

These Operating Instructions are intended for the operating company and its personnel only. They contain instructions and notices that may only be reproduced on the prior written permission of

HANS SCHMIDT & Co GmbH

and under indication of the complete reference data.

Violations will be prosecuted.

1.9 EU Declaration of Conformity and WEEE Registration

In compliance with the EU Directive 2004/108/EG



HANS SCHMIDT & CO GmbH is registered in compliance with the German Electrical and Electronic Equipment Act (ElektroG).

2 Available Models



These Operating Instructions refer to the DT-311N, DT-315N and DT-315A Models.

2.1 Specifications

Model DT-311N, DT-315N and DT-315A

INTERNAL Signal Mode (normal operation)

Flash Range: 0.7 - 585 Hz = 40.0 - 35000 rpm or FPM (flashes/min)
with automatic range control

Accuracy: $\pm 0.1\%$ of reading, ± 1 digit

Resolution: With automatic range control
40.0 - 4999 rpm: ± 0.1 rpm
5000 - 7999 rpm: ± 0.2 rpm
8000 - 9999 rpm: ± 0.5 rpm
10000 - 35000 rpm: ± 1 rpm

Phase Shift: Use + / - push buttons (360° in 6 sec.)

Display: 5 digit LED, 10 mm high

Output Signal: Synchronous, 400 μ s pulse width amplitude, 0 to +12 V DC
4.7 k Ω output impedance

Rate Multiplier/Divider: Multiply by 2 / divide by 2 the current flash rate

EXTERNAL (Trigger) Signal Mode

Flash Range: 40.0 - 35000 rpm

Accuracy: $\pm 0.01\%$, ± 1 digit

Phase Shift: 0 - 359° (with 1° resolution)

Delay Time: 0 - 2000 μ s from 40 - 10000 rpm

Input Trigger Signal: Hi level: 2.5 - 12 V DC,
Lo level: 0 - 0.8 V DC
Pulse width: 50 μ s min.

Input impedance: Hi level: 4.7 k Ω at 12 V,
Lo level: 6.8 k Ω at 0 V
Triggering selectable from Lo to Hi edge or Hi to Lo edge

General

Light Intensity: Approx. 300 lux (frequency-dependent)

Display: 5 digit LED, 10 mm high,

Display Update: 0.2 sec.

Flash Tube Power/Life: Xenon, 10 W max. (100 million flashes)

Flash Duration: 10 - 40 μ s

Output Signal Sensor: 12 V $\pm$ 0.6 V DC, 40 mA

Auto Power Off: Continuous or 1 - 120 min (user selectable)

Power Requirement: 230 V AC, 30 VA (DT-311N only)

Temperature Range: 5 - 45°C

Housing Material: Aluminium/ABS

Weight net (gross): 1200 g (1800 g)

Dimensions: 185 mm x 120 mm x 120 mm (L x W x H)

2.1 Specifications (Forts.)

Model DT-315N and DT-315A

Low Battery Indicator:	Display shows all L's
Power Requirement:	Internal NiCd battery pack, Capacity: ¾ hour continuous use Charging voltage: 230 V AC, 30 VA
External Power Supply:	10.5 to 15 V, 2.3 A, stabilized 0.3 Vp-p
Weight, net (gross):	2000 g (3200 g)
Dimensions:	250 mm x 120 mm x 120 mm (L x W x H)

2.2 Delivery Includes

Model DT-311N:

- 1 Instrument
- 1 Connector plug for trigger signal
- 1 Operating Instructions

Model DT-315N and DT-315A:

- 1 Instrument
- 1 AC adapter/charger
- 1 Connector plug for trigger signal
- 1 Operating Instructions

2.3 Unpacking

Unpack the tension meter and inspect it for any shipping damage.

Notices of defect must be filed immediately, at the latest within 10 days on receipt of the goods.

3 Initial Setup and Operating Procedure

3.1 Notes Before Starting Measurement



Have you read and understood the Operating Instructions, in particular Chapter 1 “Basic Safety Notices” ?

You are not permitted to operate the tension meter before doing so.

Before working with the instrument you must put on your personal protective clothing, if necessary. For example, eye protectors, gloves, etc.

To avoid damage, do not move the center roller by hand.

Do not operate or store instrument in the following places:

Explosive areas; Near water, oil, dust, or chemicals; Areas where temperature is above 40°C.

Do not look at the emitted light for long periods of time; it can be harmful to the eyes.

Use 1/4-20 UNC tripod knuckle screws of up to 8 mm length for the thread at the bottom of the housing.

Charge the battery pack before first use (DT-315N and DT-315A only).

Do not disassemble or repair unit while in operation.

3.2 Connecting the Power Cord (DT-311N only)



Before connecting the power cord 16, ensure proper supply voltage (230 V).

Connection:

- Connect the power cord **16** to the power line.

3.2.1 Connecting the AC Adapter/Charger (DT-315N and DT-315A only)

The instrument is provided with a battery pack, allowing either battery-or line-operation. For line-operation, use the AC adapter/charger as a power supply to power the strobe continuously.

.1.1



fig. 3.2.1a



Before connecting the AC adapter/charger, ensure proper supply voltage (230 V).

No warranty or liability will be accepted for AC adapters/chargers from other manufacturers.

Connection:

- Connect the AC adapter cord to the AC adapter connector **16**.

3.2.2 Battery Charge (DT-315N and DT-315A only)

Before first use or if the display **1** shows  the battery needs to be recharged.

To charge the battery:

1. Turn the power switch **17** OFF.
2. Connect the AC charger to the instrument and to the power line.

Charge the unit only with the provided AC adapter/charger.

3. The B-CH LED **4** will be lit during battery charge; within 2 hours the battery should be charged completely and the LED **4** should go out.



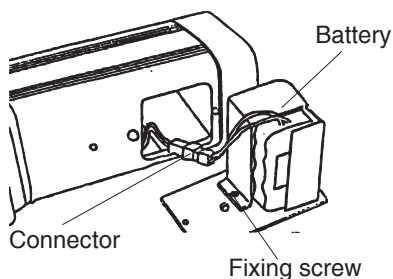
The built-in battery will only be charged when the stroboscope is off.

Charging the empty built-in battery will take about 2 hours.

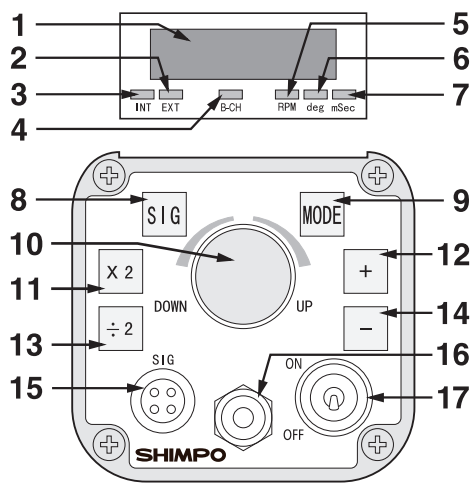
The battery charge control of the AC adapter/charger will stop the charging process as soon as the battery has been recharged completely.

3.2.3 Battery Change (DT-315N and DT-315A only)

The life of the built-in battery should last for approximately 300 charges. If the time period between recharges becomes increasingly shorter, then replace battery with a new one.



3.3 Operating Elements



- 1 LED display

Displays function and value
- 2 LED EXT

External mode indicator
- 3 LED INT

Internal mode indicator
- 4 LED B-CH

Battery charge indicator (DT-315N and DT-315A only)
- 5 LED RPM

Flashes per minute indicator
- 6 LED deg

Phase shift indicator
- 7 LED mSec

Millisecond indicator
- 8 Signal switch

Switches the unit from the external mode to the internal mode (and vice-versa).
- 9 Display mode switch

When unit is set to the external mode, the strobe will switch to one of the three options each time “MODE” is pressed:
rpm (FPM) Displays flashes per minute External input 0 - 30000 rpm
deg Displays flash delay in degrees
msec Displays flash delay in msec
- 10 Setter

Changes the flashing rate, delayed angle and delayed time.
- 11 x2 Switch

In the internal mode, pressing “x2” doubles the flashing rate.
- 12 + Switch

In the internal mode, when object appears to be standing still, pressing “+” will give the illusion that the object is moving towards the rotating direction at a speed of 1 rotation in 6 seconds.
- 13 ÷2 Switch

In the internal mode, pressing “÷2” divides the flashing rate by two
- 14 - Switch

In the internal mode, when object appears to be standing still, pressing “-” will give the illusion that the object is moving in reverse at a speed of 1 rotation in 6 seconds.
- 15 Input and Output Connector

PIN #1: +12 V (for powering sensor)
PIN #2: Sync output signal
PIN #3: External input signal
PIN #4: 0V (common)
- 16 Power cord (DT-311N)
AC Adapter (DT-315N)
- 17 Power switch

3.3.1 True RPM Measurement

General:

Stroboscopes are highly stable industrial quality instruments for non-contact RPM measurement as well as for inspection and observation of moving parts.

They give the operator the illusion of “stopped motion” where in actuality the equipment under observation is in a moving state. By adjusting the flash rate, equipment in motion appears to be standing still. With a slight adjustment, movement can be viewed in apparent slow motion, which enables the operator or observer to study the process in action.

All stroboscopes can measure rotational (rpm) or reciprocating (strokes per minute) speeds with the same high precision as with an electronic digital tachometer.

To measure true revolutions per minute (rpm):

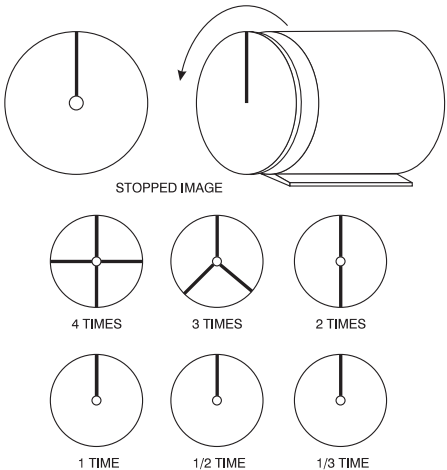
1. “Mark” the object to be measured by either visually noting an inherent distinguishing characteristic (such as a label, scratch, etc.) or physically marking the object with a small piece of tape, pencil mark, etc.
2. Firmly plug in power cord.
3. Turn power switch on.
4. Turn setter from highest rpm downward.
5. The true rpm can be noted once the action appears frozen **and** the first **single** image of the “mark” appears (see chart below and accompanying diagram for further explanation).
6. To verify this, double the flash rate by pressing $\boxed{\times 2}$; you then should see 2 images.
7. To verify rpm reading, press $\boxed{\div 2}$; a single image should appear again.

Measuring higher RPM than the stroboscopes’ range using harmonics:

All instruments can be used also to measure higher RPM by using the images effect.

- For example:
- Range up to 20,000 rpm
 - Rotating object 60,000 rpm
 - Images 3 times seen

Shaft Rotation (rpm)	Flashes (rpm)	Flashes/ rpm Shaft	Stopped Images
At 1500 rpm	6000	4 times	4
	4500	3 times	3
	300	2 times	2
	1500	1 times	1
	750	1/2 times	1
	500	1/3 times	1



3.4 Measuring with the Stroboscope

3.4.1 Internal Signal Mode Normal operation

Operation without the trigger signal:

1. Firmly plug in the power cord.
2. Turn the power switch **17** ON.
3. If the INT indicator is not on, press **SIG**; the INT light will then turn on.
4. Aim light beam at object under observation. The optimal distance between strobe and moving object is approximately 60 cm.
5. Measure rpm by turning the setter **10** to adjust the flashing rate to the rotational speed of the object.

To achieve a particular rate quickly, use the **X 2** or **÷ 2** switches and then the setter for fine tuning. When the object appears to be standing still, the measured value is shown on the display **1**.

Phase Shift:

When the object appears to be standing still, pressing **+** or **-** will give the illusion that the object is moving towards or reverse the rotating direction at a speed of 1 rotation in 6 seconds or in 1 degree steps.

- **1** If the Auto Power Off timer is used:
Once the internal timer has expired, the strobe will stop flashing and the display will flash rapidly. To restart the strobe, turn power switch off, then on, and the cycle will repeat. (see chapter 3.5).

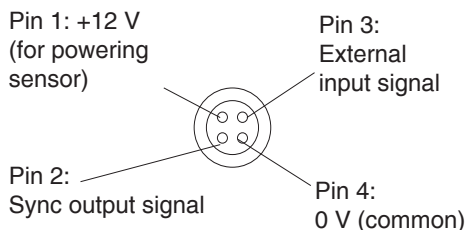
Memory:

If the unit is powered off the last used frequency will be stored. When switched on again, the stroboscope will start with the same frequency as powered off.

3.4.2 External Signal Mode

Operation with the trigger signal:

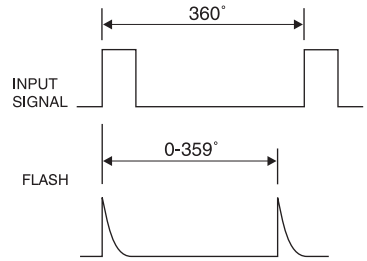
1. Solder the external trigger or sensor wires to the supplied plug according to the connector pin designation below and insert the plug into the strobe receptacle:
2. Firmly plug in the power cord.
3. Turn the power switch **17** ON.



4. If the EXT indicator is not on, press **SIG**; the EXT light will then turn on.
5. Press **MODE** to select the proper mode.

3.4.2.1 Delay Mode

- rpm:** Light will flash in correspondence with input signal; the input signal will be calculated into rpm and displayed.
- deg:** One cycle of input signal is 360°. A delayed angle will be displayed from 0 up to 359°. (The delayed angle can be changed by turning the setter as previously described).
- msec:** The above delayed angle will be displayed in msec.



i If the input signal frequency exceeds upper or lower limits, the alarm dashes () will be displayed and the strobe will stop flashing (see chapters 3.4.2.3 and 3.4.2.4).

i If the Auto Power Off timer is used: Once the internal timer has expired, the strobe will stop flashing and the display will flash rapidly. To restart the strobe, turn power switch off, then on, and the cycle will repeat. (see chapter 3.5)

3.4.2.2 RPM Display Mode

If the input signal exceeds 585 Hz, the upper dashes on the digital display will be flashing:  upper dashes

If the input signal is lower than 0.65 Hz, the lower dashes on the digital display  will be flashing:  lower dashes



3.4.2.3 Deg/msec Display Mode

If the input signal exceeds 167 Hz, the upper dashes on the digital display will be flashing:

deg upper dashes msec

If the input signal is lower than 0.67 Hz, the lower dashes on the digital display

 will be flashing:

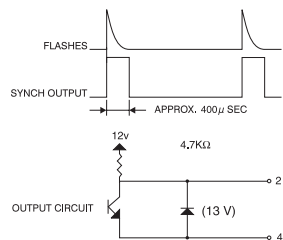
deg lower dashes msec



3.4.2.4 Synchronous Output Signal

For triggering and controlling additional stroboscopes, the synchronous output signal is applied at pin #2 (see below).



3.5 Memory

The following parameters are set at the factory:

- Decimal point: autorange
- Internal timer: continuous
- External trigger edge: L-H (Lo to Hi)

These parameters can be changed in the field to facilitate different situations.

To change any of the above parameters, follow these steps:

1. Turn the power switch on.

2. Make sure that the INT lamp is on. If not, press **SIG** until it turns on.

3. Change the desired memory parameter:

a. **To change the decimal point:**

Press **÷ 2** and **-** at the same time for approximately 2 seconds until the display alternates between —1— and 0.0.

Press **+**. The display will freeze and show 0.0.

Change the decimal point by pressing **+**.

If 0.0 is selected the decimal point is in the autorange mode.

If 0 is selected the decimal point is eliminated throughout the entire range.

b. **To change the internal timer (Auto Power Off):**

Press **MODE**. The display will alternate between —2— and 0;

Press **+**. The display will freeze to 0.

Use the setter to set timer for power off anywhere between 1 and 120 minutes.

c. **To change the trigger edge or the external signal mode:**

Press **MODE**. The display will alternate between —3— and L-H.

The external trigger edge is factory-set to occur during the positive transition of the incoming pulse.

To change it to the negative transition:

Press **+**. The display will change from L-H to H-L.

3.5 Memory (Cont.)

4. Press  to go back to normal operation.

The above settings can be checked quickly by performing steps A to C as described above and then pressing .

3.6 Troubleshooting

RPM reading is displayed but unit is not flashing:

- Flash tube may need to be replaced (see „Flash Tube Replacement“ section)

Stroboscope is in external signal mode, no flash:

- Check flash tube. Replace if necessary
- Check for damaged wiring and/or loose pin connections

Stroboscope is in internal signal mode, no flash:

- Check flash tube. Replace if necessary
- Check for damaged wiring and/or loose pin connections

4 Service and Maintenance

Stroboscope is easy to maintain.

4.1 Flash Tube Replacement

When rpm reading is displayed but unit is not flashing, flash tube may need to be replaced:

1. Unplug line cord from power line.
2. Turn power switch off (wait a few minutes until stroboscope is cool before proceeding).
3. Remove protective window by removing the 4 screws (fig. 4.1a).
4. Use tube removing tool provided with the pare tube:
Insert tool all the way and turn clock-wise until tool unlocks (fig. 4.1b).
Pull out tube (fig. 4.1c and fig. 4.1d).
5. Install new flash tube using the removing tool (in the opposite direction fig. 4.1d) and turn counter-clockwise until tool locks (fig.4.1b).
6. Replace window (fig. 4.1a).
7. Mount reflector in the center so that the reflector will not interfere with the screw spacer on the corners.

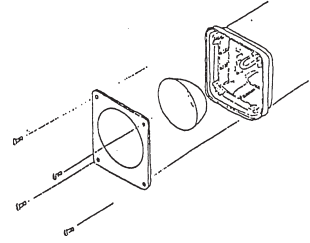


fig. 4.1a

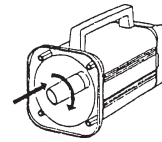


fig. 4.1b

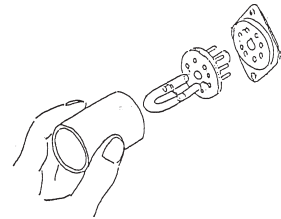


fig. 4.1c

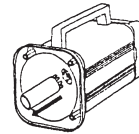


fig. 4.1d

5 Cleaning

For cleaning the unit, do not use any



AGGRESSIVE SOLVENTS

such as trichloroethylene or similar chemicals.



NO WARRANTY OR LIABILITY

shall be accepted for damage resulting from improper cleaning.

6 Correspondence

Should you have any questions regarding the instrument or Operating Instructions, or their use, please indicate above all the following details which are given on the ID plate:

- 1) Model
- 2) Serial number

7 Repairs

Shipping instructions:

We kindly ask for return free of charge for us, if possible by airmail parcel. All occurring charges, if any (such as freight, customs clearance, duty etc.), will be billed to customer. For return from foreign countries, we ask you to include a proforma invoice with a low value for customs clearance only, e.g. 50 Euro, each and to advise the shipment in advance by fax or eMail.



To avoid unnecessary follow-up questions, and the resulting loss of time or possible misunderstandings, please return the instrument with a detailed fault description to our service department. Please indicate in your order whether you require an calibration certificate with calibration report.

**Service address: HANS SCHMIDT & Co GmbH
Schichtstr. 16
D-84478 Waldkraiburg
Germany**

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