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ISQ-TS120K
DIGITAL LED TACHOMETER/STROBOSCOPE OPERATION MANUAL

V0

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4.6.3 LCD back light off

The LED backlight will automatically shut off after 2 minutes of no keypad or dial operation when using the LCD backlight will light again with keypad or dial operation.

4.7 Connector of External input/output

4.7.1 Charging round socket:

4.7.2 External synchronous USB port

1. +12V output
2. OUT external pulse input
3. -12V output

4.7.3 External Pulse input

The unit can be operated and controlled by an external signal, from either a sensor or machine signal.

This will allow the stroboscope to flash in sync with the target object's rotational speed.

The input signal will have the following characteristics.

Input frequency: 60-120,000fpm(1-2000Hz)
Input pulse width: over 50us
Delay angle: 0-359°(every 1°)
Delay time: 0-999ms(every 1ms)

Note: when the external sensor is used, please use the AC adapter otherwise, there is no voltage on the sensor port.

Warning

◆ Please closely follow all safety precaution.

Be sure to read the entire instruction manual thoroughly before initial set-up, operation and maintenance. The instruction manual provides two grades of safety warnings: "Danger" and "Caution". The precautions described here with concern the safety of the operator are to be read carefully. Follow these precautions.

⚠ Danger

◆ "Danger" marking indicates possible death, severe injury or fire if the user disregards the instruction.)

⚠ Caution

◆ "Caution" marking indicates the possibility of minor injury or object damage if the user operates the equipment improperly. Disregard to this message may cause severe injury. Be sure to follow the following types of content, and distinguish between description.

⃠ This warning indicates a prohibited operation.

❗ This warning indicates constraint of content.

⚠ Danger

⃠ Use in flammable environments is prohibited.
Use in this manner may result in fire or explosive.
⃠ Don't look directly into the LED light source.
This may result in eye injury.

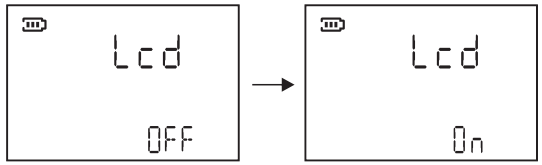
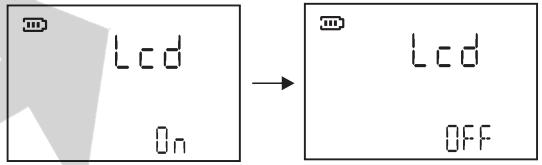
⚠ Caution

⃠ Do not drop. Damage or injury may result.
⃠ Don't use or restore in the following environments. Direct sunshine, condensation, dust or caustic.

⃠ Do not alter, modify or dispose of improperly. Such action may cause damage accidents and void warranty.
◐ Operate with 0-35℃(32-95℉), 35-38%RH Use outside of this range may alter operation of the unit.
⃠ To clean, gently wipe with a soft cloth.
⃠ This unit may become excessively hot when used continuously for more than 2 hours.

Summary

This LED stroboscope is our latest new technology product, which use America CREE high power LED lamps and have the characteristics of wide measurement range, high brightness, long life time, they can be used any time, any place. With convenient operation, the build in lithium rechargeable batteries, single use time is more than 12 hours. This stroboscope is used to measure the motions of objects, when the strobe flash speed and highspeed moving objects are in synchronous fast moving objects and working status of all kinds of gears and rotors during working. This stroboscope can be widely used in paper, packaging, printing industries to inspect the high speed printing process, ink color matching, die cutting, hole punching and and folding quality. For textile industry, it can be used to detect the spindle and thread speed on spindle machine and coiling machine and inspect the working condition and status of the mechanical knitting, weaving machine and sewing machine. When used in mechanical manufacturing, industries, it can be used for the non contact rpm speed measurement and other measurement. Beside, it can also be used in aircraft manufacturing, automotive manufacturing, cable and wire manufacturing, mining, ship building, steel, chemical, pharmaceutical, optional, electronic, food-processing and other industries.

Operation	Expression
PHASE+ Press and release OR	 LCD backlight OFF → LCD backlight ON
PHASE- Press and release OR	 LCD backlight ON → LCD backlight OFF

4.6 Power-saving settings

4.6.1 LED flashing auto off

The LED flashing will automatically turn off after 2 minutes of no keypad or dial operation when using battery power. Flashing will resume with either a dial (rotation) movement or a keypad operation.

The LED auto shutoff will not occur in External trigger mode, while a signal is being received by the unit. The LED flashing will automatically turn off after 2 minutes of no external pulse input.

4.6.2 Auto off Power off

The unit will automatically power off after 5 minutes of no keypad or dial operation when using battery power. To resume operation, press “POWER” key.

The auto power shutoff will not occur in External trigger mode, while signal is being received by the unit. The power will automatically turn off after 2 minutes of no external pulse input.

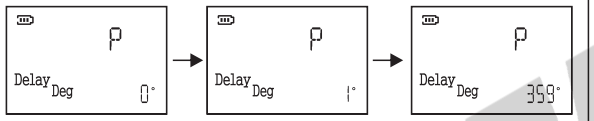
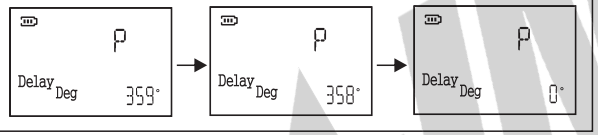
4.5.2.2 Delay angle setting

As period of external input is 360°, the delay angle can be set form 0° to 360° by every 1°. Delay angle setting increases as the dial turns right, and decrease as it turns left.

Delay angle will go to 0° as its settings increase from 359°, and it goes to 359° as the angle decrease from 0°.

For details, please refers to: 4.4.3.2 delay angle setting.

Rotate the dial clockwise to increase delay angle setting or counter clockwise to decrease the delay angle.

Operation	Expression
PHASE+ To delay angle setting	
PHASE- To delay angle setting	

4.5.3 Back light setting

The LCD display of the stroboscope has a backlight that can be turned on or off in the parameter settings. Turning off the backlight will conserve battery power. For more information regarding the automatic setting of the backlight, see section 4.6.

To adjust the backlight setting, enter parameter mode and use the “SET” key to cycle to LCD settings.

Press “PHASE+” key to turn on the backlight. Press “PHASE-” key to turn off the backlight.

Setting accuracy(Vibration): ±0.01%
Set the resolution(Vibration):
60 ~ 120000FPM (Flash Per Minute) 0.1 FPM
1~200Hz 0.01Hz
LED Spec: USA CREE 10W LED light, life time is 3-5 years.
Battery: DC10.8V 200mA
Power: About 30W
Dimension: 208mmx70mmx60mm
Net weight: .380g

Main features:

1) Two units of measure-FPM(Flash Per Minute) and Hz
2) Wide flash range-60 to 120,000FPM
3) Multiply or divide by 2
4) Phase shift function “-” or “+” to “ +3° ”, “ +3° ”
5) Adjustable flash duration-(RATIO) Time can change for 0.1° each time as in the range if 0.1° -2.5° .
6) External input/output port-Synchronization of flash rate with external pulse, and output the pulse signal with flash rate.

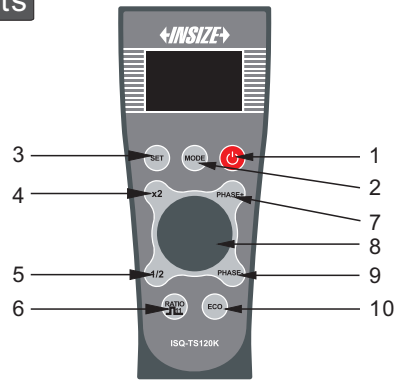
Production inspection and preparetion

2.1 Confirmation of product packaging

Confirmation the following four parts in your pachage;

1) One LED stroboscope
2) One AC/DC Adapter: 220V/DC16V/3A
3) One set of external input/output connector
4) Operation manual

Components



No.	Name	Function Instructions
1	POWER key	Power the unit on and off
2	MODE key	Select mode of operation: Internal/External/Parameter
3	SET key	Unit change, select parameter setting item, store setting value
4	x2 key	Multiplies the flash rate/frequency by a factor of 2.
5	½ key	Divides the flash rate/frequency by a factor of 2.
6	RATIO key	Adjust flash duration(Flash pulse width) in Internal/External mode
7	PHASE “+” key	Advance image forward 3degree at a time in internal mode. In parameter setting mode, change setting value.
8	PHASE “-” key	Retard image backwards 3 degree at a time in internal mode. In parameter setting mode, change setting value.
9	Dial	Set flash rate or frequency. CW; Increase flash rate/frequency. CCW; Decrease flash rate/frequency. (Turn dial quickly to drastically change value, Turn dial slowly to change value 1 dight.) In parameter setting mode, CW or CCW rotation changes the setting value.
10	ECO key	Reduce the brightness of LED, thereby saving battery power. Push again to return to original brightness setting.

4.5.2 Delay setting

Delay time angle setting will allow the flash to be delayed after an external pulse is transmitted to the stroboscope. It can be set in either external trigger mode, or in parameter setting mode. The following section details the parameter setting mode. Press MODE key to either external trigger mode, and press SET key 3 times to enter Delay setting. Through setting of delay time of flashing angle, the trigger flashing of external pulse input can be delayed.

Press “PHASE+” and “PHASE-” key, to select between delay time and delay angle.

4.5.2.1 Delay time setting

Selecting delay time angle form an external pulse input to LED flashing can be set in the range of 0-999ms, with a resolution or 1ms.

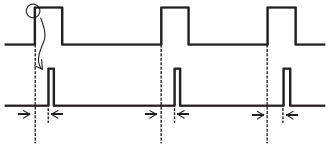
For details, please refers to: 4.4.3.1 delay time angle setting.

Rotate the dial clockwise to increase delay time angle setting or counter clockwise to decrease the delay time angle.

Operation	Expression
PHASE+ To delay angle setting	P Delay Time 0° → P Delay Time 1° → P Delay Time 359°
PHASE- To delay angle setting	P Delay Time 359° → P Delay Time 358° → P Delay Time 0°

Example: When trigger edge setting is set to “up edge”. The flash will occur on the leading edge of the input pulse(when delay setting is zero).

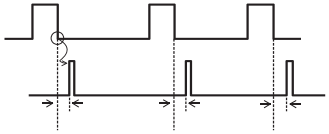
External pulse signal from machine/sensor stroboscope flash



Delay time(based on the delay settings of parameter)

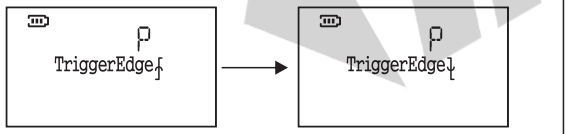
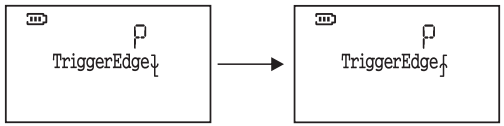
When trigger edge setting is set to “down edge”. The flash will occur on the trailing edge of the input pulse(when delay setting is zero).

External pulse signal from machine/sensor stroboscope flash



Delay time(based on the delay settings of parameter)

When in parameter mode, use the SET key to cycle to the Trigger Edge setting parameter mode. To set the trigger edge as “Down Edge”, press “PHASE-” key or turn the dial counter clockwise. To set the trigger edge as “Up Edge”, press “PHASE+” key or turn the dial clockwise.

Operation	Expression
PHASE+ Press and release	 Trigger edge set as “up edge” Trigger edge set as “down edge”
PHASE- Press and release	 Trigger edge set as “down edge” Trigger edge set as “up edge”

3.3 LCD Display

3.3.1 Display Names and Descriptions

3.3.2 Main data display

-Flash rate value will be displayed in internal flashing mode.

-The frequency of external trigger will be displayed in external trigger mode.

-Display will indicate “P” or “LCD”(in ON/OFF setting of LCD backlight) in *parameter setting mode.

*For details about parameter setting mode, please refer to “4.5 parameter setting mode”

3.3.3 Sub data display

Internal mode display

-Display will indicate degree pg phase shift in internal flashing mode. To change the degree of phase shift, press PHASE + or PHASE - keys. The display will reflect the cumulative angle of phase shift.

When press RATIO, trigger angle will display on LCD. Adjust dial or press +, - to change flash time(The flash time range is 0.1 to 2.5)

External mode display

-In external trigger mode, the display will show the setting of delay time. For details about changing these settings, please see section 4.4.3

*Parameter mode display

-In parameter mode, the display will indicate the following settings: -selected measuring range

-Delay time(in ms)

-Backlight LCD(ON or OFF)

*For details about *parameter setting mode, please refer to 4.5 parameter setting mode

3.3.4 Function mode

The following will be displayed, according to the mode of measure and *parameter setting.

Internal flashing mode
- Set the positive edge in external trigger mode
- Set the negative edge in external trigger mode
- Set the measuring range in parameter setting mode*

Set the flash time
- Choose UP when set trigger edge in *parameter setting mode
- Choose DOWN when set trigger edge in *parameter setting mode
- Choose angle setting when delay set in *parameter setting mode
- Choose delay setting when delay set in *parameter setting mode

Set backlight LCD(ON or OFF)
- Set backlight LCD display time two ways of external trigger modes setting

Factory Initialize settings
Parameter store settings
For more information regarding the parameter setting, please see section 4.5

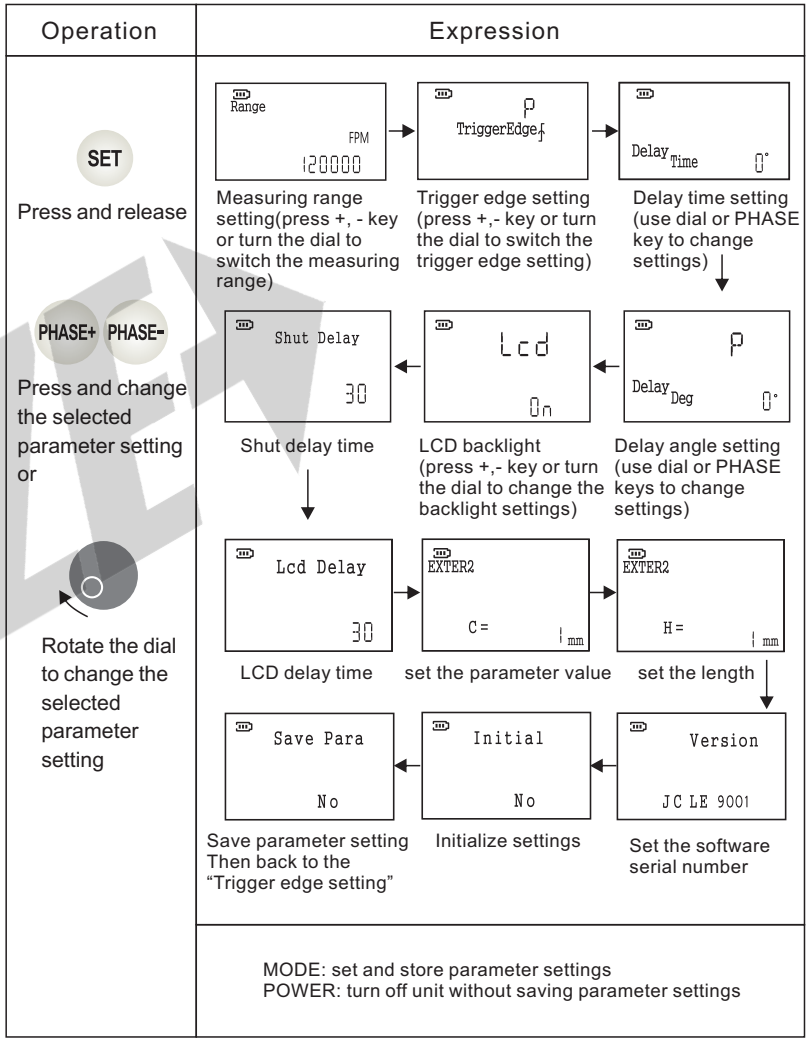
3.3.5 Battery indication

Battery capacity is full

The battery capacity is diminished

When battery is empty, the unit will power off and show “please charge battery”

The display will indicate a battery charge when the unit is being used with the AC/DC adapter.
When the voltage of the battery is lower than the operating voltage, the display will indicate “Please charge battery”.
Each time after charging the battery, the unit could keep working for more than 12hours.



4.5.1 Trigger edge setting(external modes)

In external mode, the trigger edge parameter will allow for selecting either the leading edge or trailing edge of the input pulse to trigger the stroboscope flash.

turned clockwise, and increase as it is turned counter clockwise.

4.4.5 ECO feature

To reduce the brightness and conserve battery power, press the ECO key. To turn original brightness, press and release the ECO key again.

Operation	Expression
ECO Press and release	 Normal flashing mode / ECO flashing mode / Return to normal flashing mode

4.5 Parameter settings instruction

To enter parameter setting mode, press “MODE” until the LCD display “P”.

When the display shows “P”, press the SET key to cycle between the various parameter settings available(range, trigger edge, delay time, and LCD backlight etc). For more information regarding the various parameter settings, please refer to sections 4.5.2 through 4.5.4 below. To store the settings and return to measuring modes, press the MODE key.

Note: MODE key must be pressed to store settings. Pressing the POWER key will not store the parameter settings in memory.

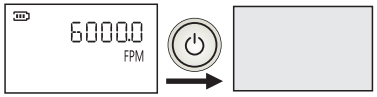
Function Instructions

4.1 Power on/off

When the unit is off, press the POWER key to turn on the unit. The unit begin to flash in internal mode and the display will indicate the flash rate(FPM=flashes per minute).

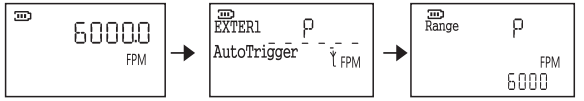
Operation	Indication
Power off  Press and release	 LCD light will begin to flash. Display flash rate of internal mode.

When the unit is on, press the POWER key to turn off the unit. The display will turn off, and the unit stop flashing.

Operation	Indication
Power off  Press and release	 Display turn off and unit stop flashing.

4.2 Mode section

To switch between INTERNAL, EXTERNAL and *PARAMETER mode, press and release the MODE key. For details about parameter setting mode, please refer to 4.5 parameter setting mode.

Operation	Indication
MODE Press and release to switch modes	 Internal flashing mode / External trigger mode / Parameter setting mode

4.3 Internal flashing mode

4.3.1 Instruction for internal flashing mode

4.3.2 Changing units of measure in internal mode

To change the measuring units from fpm to Hz, press and release the SET key.

Operation	Indication
SET Press and release	6000.0 FPM → 1000.0 Hz → 6000.0 Fpm Measuring unit “fpm” / Measuring unit “Hz” / Measuring unit “fpm”

Note: each time press “SET” key, unit of measure (fpm) will convert to the new unit of measure(Hz) and return this.

4.3.3 ECO function

Press “ECO” button, can enter the power saving mode, at this time, the LED brightness is 60% of the original, stroboscope can be used for longer time.

Operation	Indication
ECO Press and release	6000.0 FPM → 60000 FPM → 6000.0 Fpm Normal flashing mode / ECO flashing mode / Return to normal flashing mode

4.3.4 Flash rate and frequency setting in internal mode

You can set the flash rate(frequency) by turning the strobe encoder on the turntable. To increase the flash rate, turn the dial in the clockwise direction. To release the flash rate, turn the dial in the counter-clockwise direction.

For small adjustments, turn the dial slowly. For quick adjustment, rotate the dial quickly. The flash rate range and

flashes at the delay angle=0°.

Delay angle increase as the dial is rotated to the right. The angle settings will go to 0°as the angle increase past 359°.

	Expression
Turn clockwise	AutoTrigger Hz Delay Deg 358° → AutoTrigger Hz Delay Deg 359° → AutoTrigger Hz Delay Deg 0°

Delay angle decrease as the dial is rotated to the left. The settings will eventually go to 0°as the angle decrease past 359°.

	Expression
Turn counter clockwise	AutoTrigger Hz Delay Deg 0° → AutoTrigger Hz Delay Deg 359° → AutoTrigger Hz Delay Deg 358°

4.4.4 Units of measurement-changing from FPM to Hz

To change the units of measure “FPM” to “Hz” while in External Trigger ring made, press and release the “SET” key.

Operation	Expression
SET Press and release	6000.0 FPM → 100.00 Hz → 6000.0 FPM Measuring unit “fpm” / Measuring unit “Hz” / Measuring unit “fpm”

Note: As the display ed value changes, fraction generated.

turned clockwise, and increase as it is turned counter clockwise.

Operation	Expression
Turn clockwise	EXTER1 AutoTrigger FPM Delay Time 0° → EXTER1 AutoTrigger FPM Delay Time 3° → EXTER1 AutoTrigger FPM Delay Time 357°
Turn counter clockwise	EXTER1 AutoTrigger FPM Delay Time 0° → EXTER1 AutoTrigger FPM Delay Time -3° → EXTER1 AutoTrigger FPM Delay Time -357°

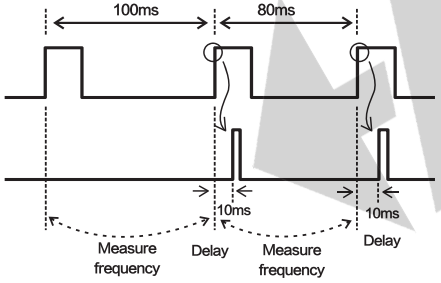
4.4.3.2 Delay angle setting(static delay angle setting)

As the period of the external input is 360°, the delay angle can be set from 0° to 360°, by every 1°. Because the internal calculation time is 60us, the actual delay time is as follows:

Delay angle setting/360° x period of external input + appox. 60us.

While the unit does not flash at the 1st trigger pulse as shown below in the chart.

[example] Trigger : positive Delay angle: 36°



If the current period of external trigger input changes, the time of the flash is not accurate, because the time is calculated based on the previous measurement period.

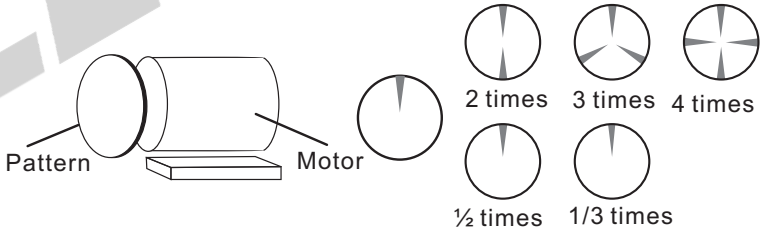
If the current period of external trigger input is less than the previous period and the next trigger input occurs before the flash time, the delay angle setting is ignored and the unit

resolution will be different according to the selected measuring range. For details regarding the setting measuring range, please see 4.5.1.

Notes for setting the flash rate.

One function of stroboscope is to provide a “stopped” image of a rotating target when the flash rate of the stroboscope has matched the rotational speed of the target object. The stroboscope will also show a single image when the flash rate or frequency is set to a lesser multiple of the true RPM(½,1/3, etc.) When the flash rate is increased to a high multiple(2, 3, etc.), multiple images will appear. To find the true RPM of the target object, reduce the flash rate to a lower multiple until only one image appears. For more information regarding the multiply / divide by 2 function, please see 4.3.5.

Stopped image



True rotational speed of target object(rpm)	Flash rate of stroboscope(fpm)	Multiple of true rotational speed	Number of stopped images
900rpm	3600	4 times	4
	2700	3 times	3
	1800	2 times	2
	900	1 times	1
	450	½ times	1
	300	1/3 times	1

4.3.5 Multiple/Divide by 2 function

The flash rate or frequency can be doubled or halved by x2 and ½ keys on the operation panel.

1) Doubling the flashing rate(x2)

Press x2 key to multiply the current flash rate by a factor 2.

Operation	Indication
x2 Press and release	 Ex. Flash rate 1500fpm New flash rate 3000fpm New flash rate 6000fpm

Note: The use of the x2 key will have no effect when multiplication of current flash would result in a value that exceeds the maximum flash rate of the unit.

After the flash rate(frequency) changes, it becomes the new value based on the set display resolution.

Therefore, the frequency is likely not the original frequency, even if the "½" key is passed after pressing the x2 key.

2) Having the flash rate(½)

Press "½" key to divide the current flash rate by a factor of 2.

Operation	Indication
1/2 Press and release	 Ex. Flash rate 1500fpm New flash rate 750fpm New flash rate 375fpm

Note: The use of the 1/2 key will have no effect when the division of current flash would result in a value that goes below the minimum flash rate.

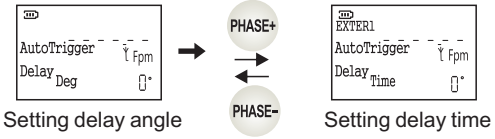
After the flash rate(frequency) changes, it becomes the value based on the set display resolution.

Therefore, the frequency is likely not the original frequency, even if the "½" key is passed after pressing the x2 key.

4.3.6 Phase shift(Angle)

Firstly, please press "SET" key 3times, then can enter this mode.

When the rotation speed of the target object and the flash rate of the unit become equal, the phase shift function can be used to delay the flash so that the image will appear to rotate incrementally. Phase shift angle can be increased or

Operation	Indication
PHASE+ PHASE- Press and release	 Setting delay angle Setting delay time

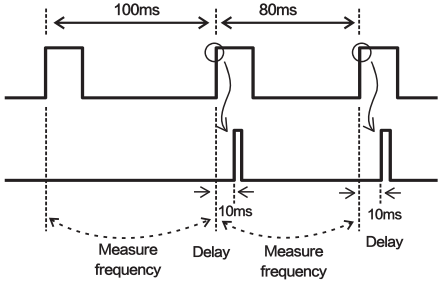
4.4.3.1 Delay time setting(Dynamic continuous time delay setting)

The delay signal of the external pulse input can be set to incorporate with the unit flash, the delay range is 0-359ms.

The internal calculation time of the unit is 60ms, which result in the actual delay time is 60ms more than the setting delay time. The unit will begin flashing after the 1st trigger pulse. See timing chart below [example]

Trigger: positive edge Delay time: 10ms

Flash delay time doesn't depend on the time of an external input, the unit flashes 10ms after receiving the signal.



If the period of the external input is less than the setting of the delay time, the delay time is meaningless and the unit flash delay is 0ms.

External pulse signal same as delay time will be set as 0ms.

Note: Because of the existence of a delay in internal calculation, the unit flashes 60ms after receiving an external signal input.

While in "External" trigger mode, press the "PHASE+, PHASE-" key to select the delay time setting. Turn the dial to set the delay time. Delay time will increase as the dial is

set the "C" value(Unit:mm)

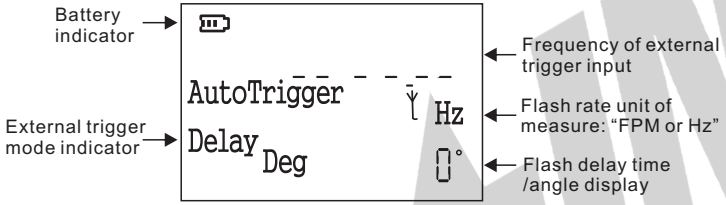
2) Continuous press “SET” three times again, LCD screen display the length of the detected object (using “H” express), by adjusting the rotary encoder or “+” or “-” or “x2” or “½” to set the “H” value(Unit:mm)

Special instructions

There is no special requirement for the driven roller, generally the driven roller should be in the vicinity of the detected object, and has big friction with the detected object, not easy to skid or slide.

After setting the parameters, generally the detected object has advance or lag phenomenon. Adjust in this way: when in “C” display mode, adjust the “PHASE+” or “PHASE-” fine-tuning it, change the perimeters, so that detected object achieve image still. In setting process, the system will automatically save the last settings mode.

4.4.2 External trigger mode: LCD display information



The frequency of external signal is measured each period, while the latest external frequency measurement is updated every 50ms.

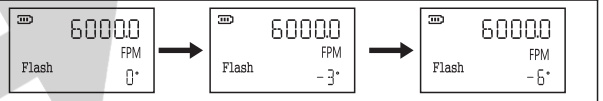
4.4.3 Flash delay angle setting

A flash angle delay can be programmed into the unit to flash, after an external trigger signal is detected.

The unit of delay degree(°)

Use “PHASE+” or “PHASE-” key to alternate to between the setting of delay angle. Please refer the next section for information regarding the values of delay time and delay angle.

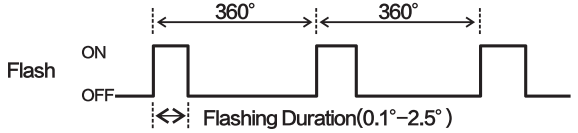
decreased 3°, each time the “PHASE+” or “PHASE-”key is pressed. The display will show the cumulative angle of the phase shift.

Operation	Indication
PHASE+ Press and release	 Ex. Flash rate 6000fpm Increase phase shift by 3° Increase phase shift by 3° for a total phase shift of 6°
PHASE- Press and release	 Ex. Flash rate 1500fpm Increase phase shift by 3° Increase phase shift by 3° for a total phase shift of 6°

4.3.7 Flash brightness settings

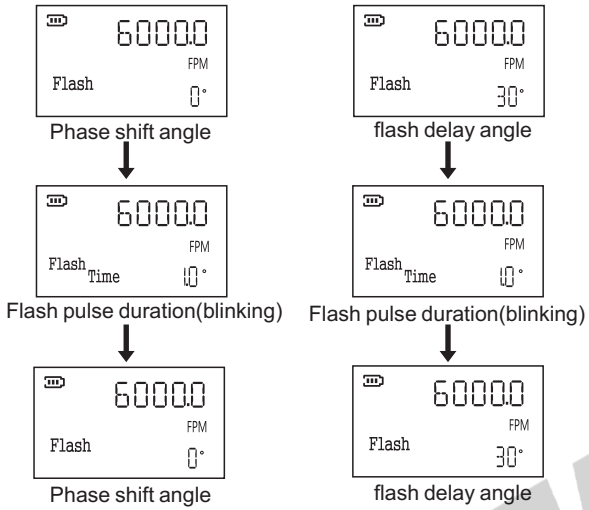
The flash duration(RATIO) can be set within the range of 0.1°/360°-2.5°/360°, with a resolution of 0.1°.

The 360° means the period of flashing.



When the flash duration is lengthened, the brightness of the flash will be increased; however the image of the target object may appear slightly out of focus. When the flash pulse duration is shorted, the brightness will be decreased, while the image of the target object will become more focused.

To change the flash pulse duration in either Internal or External, first press the “RATIO” key. Once pressed, “Flash time” will be indicated on the LCD and the current flash pulse duration(ratio) will be displayed and will flash on and off. This indicates that the flash pulse duration can now be modified.

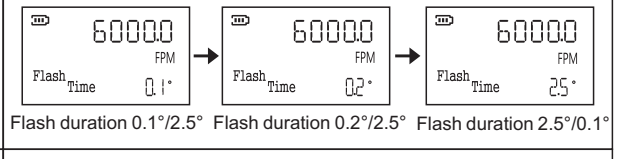
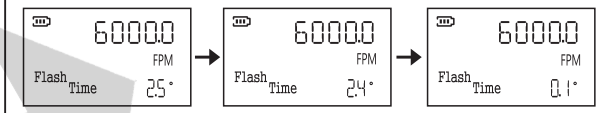
Operation	Indication
RATIO Press and release	

While in the flash pulse duration setting mode, if no manual changes are made to the setting for 5 seconds the LCD display will return to a normal indication of each mode.

To set the flash pulse duration while in the modification mode;

Press “PHASE+” key, turn the dial in the clockwise direction to increase the flash pulse duration by 0.1°.

Press “PHASE-” key, or turn the dial in the counter clockwise direction to decrease the flash pulse duration by 0.1°.

Operation	Indication
PHASE+ Press and release	 Flash duration 0.1°/2.5° Flash duration 0.2°/2.5° Flash duration 2.5°/0.1°
PHASE- Press and release	 Flash duration 2.5°/0.1° Flash duration 2.4°/0.1° Flash duration 0.1°/2.5°

4.4 External Trigger Mode

External trigger mode will allow the flash rate if the stroboscope to be controlled by an external signal, such that the flash rate will automatically increase or decrease when the signal is altered, so that it may remain consistent with the speed of a target object. For information regarding the external signal input, please refer to section 4.7.

Additionally, there are several settings that can be altered in External Trigger mode, including phase shift, delay time, and flash duration. For more information regarding these settings, please see appropriate section.

The flash timing can set by using the positive or negative edge of an external trigger signal. Also the delay of flash timing can freely be set by time(msec) or degree(°).

4.4.1 Two ways of external trigger mode

1. EX1 mode

Press “mode”once, system enter EXTER 1, in this mode, frequency(Hz) or speed(FPM) automatic flash according to the external trigger signal.

2. EX2 mode

2.1 Press “mode” once, system enter EXTER 1 press “mode” twice, system enter EXTER 2.

1) Continuous press “SET” three times, LCD screen display the perimeter of the driver roller(using “C” express), by adjusting the rotary encoder or “PHASE +”or “PHASE -” to