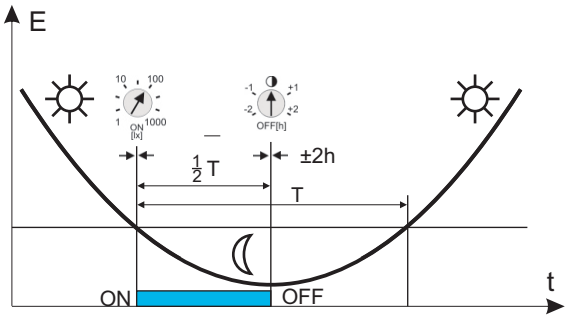

Fig. 3 .: Diagrams of the operation principles of the TS-43-3 TWILIGHT SWITCH.

V. Repair and maintenance

All repairs of the TWILIGHT SWITCH TS-43-3 are performed by the manufacturer. The device does not require any maintenance. When the sensor becomes contaminated, clean it with a clean, damp cloth. The device does not require any additional maintenance.

VI. Warranty Card

The manufacturer guarantees the correct operation of the TS-43-3 TWILIGHT SWITCH. The warranty period is 36 months from the date of sale. The warranty is extended by the time of repair. Warranty repairs are performed by the manufacturer free of charge after the AUTOMAT is delivered to the manufacturer. Improper use of the device or independent modifications to it will void the warranty.

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MART

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Made in Europe

The TS-43-3 TWILIGHT SWITCH meets the requirements of the European Union Directives:
- Directive LVD 2014/35/EU - Low Voltage Directive of 26 February 2014
- Directive EMC 2014/30/EU - Eletromagnetic Compatibility Directive of 26 February 2014

In order to protect the environment, do not throw away used electrical appliances and electronics together with municipal waste. Used equipment should be delivered to collection points for recycling free of charge. Any information on this can be obtained at sellers, distributors, manufacturer or on the Internet. The product's packaging is made of ecological materials. The PVC packaging tape will be used while stocks last.

TWILIGHT SWITCH

TS-43-3 ECO

MART

MADE IN EUROPE

FIRST ECO

3-YEAR WARRANTY

User manual

I. Purpose

The TWILIGHT SWITCH TS-43-3 is designed to automatically switch the receiver on at the moment of dusk and turns it off in the astronomical middle of the night (middle between sunset and sunrise). The shutdown time can be adjusted ± 2h. The TWILIGHT SWITCH has NO, NC contacts, so it can also perform the reverse function.

The TWILIGHT SWITCHTS-43-3 is designed to control the lighting: advertisements, shop windows and wherever you can turn off the lighting in the middle of the night, saving electricity.

The light intensity measurement sensor has a spectrum similar to that of the human eye, and the switch-on threshold adjustment has a logarithmic characteristic - also similar to that of the human eye.

Switching off in the astronomical middle of the night with the possibility of adjustment of ± 2h has the additional advantage that
on sunny (cloudless) days, the lamp is turned off later, and on cloudy days, correspondingly earlier.
Given the increased activity of people on sunny days, this is a favorable phenomenon.
Such an innovative design of the TS-43-3 TWILIGHT SWITCH makes the lighting control: economic and ecological.
The TS-43-3 TWILIGHT SWITCH includes:
>> TS-43 CONTROLLER - mounted in a distribution box on a 35 mm rail (one 18 mm module)
>> OUTDOOR SENSOR (IP65) - surface-mounted box mounted to the wall with two screws with a PG9 gland to insert the cable. Connection cable not longer than 100m.

II. Properties of the TS-43-3 ECO TWILIGHT SWITCH

>> precise logarithmic control of switching on - 1 ... 10 ... 100 ... 1000 lx
>> off - astronomical middle of the night with a correction of ± 2h
>> high switching power - 16A (4000 W) 250VAC, 16A (384 W) 24VDC
>> high inrush current - resistance to 100 A surge current
>> freedom of connections:
> executive relay contacts (one normally open contact - NO, one normally closed contact - NC) galvanically separated, which allows connections in various configurations
>> traffic light (LED):
> Green LED - indication of 230V AC supply voltage on LN terminals
> LED red:
- pulsating signaling (without delay) - the set (set) actuation threshold is exceeded
> Blue LED - changeover indication - switching on (contact 1-2), disconnection (contact 2-3)
>> 35mm rail mount - one 18mm module.

The TS-43-3 CONTROLLER uses a specialized OMRON G2RL-1-E-HR relay, designed to switch various types of lighting lamps. The special design of the relay enables effective switching of lamps with an inrush current up to 100 A.

III. Assembly

The TS-43-3 TWILIGHT SWITCH device may only be connected by a person authorized to operate electrical installations. Remember to choose the right protection.

On the front panel of the TS-43 CONTROLLER, there are three LED indicators: green, red, blue, and two knobs for setting the switch-on threshold in the ranges from 1 to 1000 lx and adjustment of the switch-off time ± 2 hours from the middle of the night.

On the side walls of the TS-43-3 CONTROLLER there are connection diagrams and the regulation characteristics.

In order to connect the TS-43-3 TWILIGHT SWITCH you should:
1. mount the TS-43 CONTROLLER in the switchboard on a 35 mm rail
2. Fix the SENSOR on a vertical wall with two screws.
Lead the connection cable into the box from the bottom through the Pg9 gland and connect to the terminal block. After mounting and screwing cables to the terminal strip, tightly screw the PG9 gland.

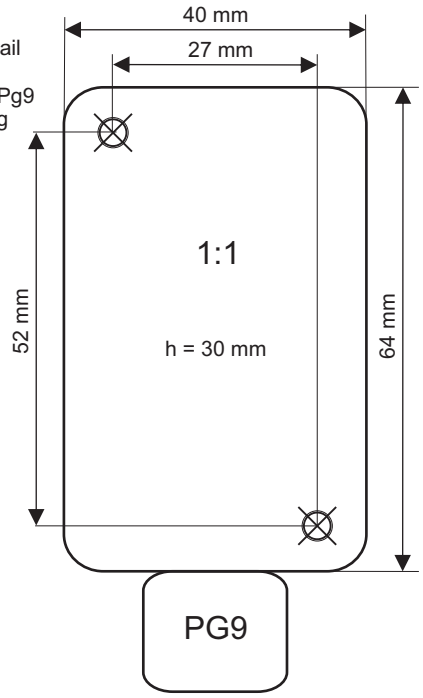

Fig 1. Photosensitive sensor - design, dimensions, template

3. Connect the wires in accordance with the diagram (fig. 2)
4. turn on the supply voltage - the green LED will light up and the red and blue LEDs will "blink" three times
5. set the activation thresholds.

When, during dimming, the level set on the ON knob is exceeded, the red LED will start to "blink" (without delay), and after about 60 seconds the operating relay will switch, which will be signalled by the blue LED. The activation delay of 60s should be counted from the moment of stable flashing of the red LED.

Using the control knobs, set the desired value of the switch-on threshold ON and switch-off OFF. Check operation of TWILIGHT SWITCH TS-43-3 and possibly correct the setting in real conditions (in the evening and at night). TWILIGHT SWITCH the first night works until morning, it “learns”. From the second night, AUTOMAT works until the middle of the night with the possibility of adjusting the switch-off time ± 2h. Every time the power fails, the TWILIGHT SWITCH restarts from the beginning. On the following nights, it works until the middle of the night ± 2 hours. Examples of mid-night hours are presented in Table 1.

CITY	LONGITUDE	21.12.2020			21.06.2020(summer time + 1h)		
		Sunset	Sunrise	Middle of the night	Sunset	Sunrise	Middle of the night
BIAŁYSTOK	23°10’E	15:11	07:39	23:25	20:57	04:00	00:28
WARSAW	21°01’E	15:25	07:42	23:34	21:01	04:14	00:37
SZCZECIN	14°33’E	15:44	08:15	00:00	21:34	04:32	01:03

Table 1- Sample information on sunrise, sunset and midnight hours.

The TWILIGHT SWITCH TS-43-3 is programmed in such a way, that on cloudy and dark days it switches off the lighting earlier, depending on the degree of cloudiness, and e days off respectively later.

It should be remembered that the optimal setting of the activation thresholds has an impact on the costs of electricity used and contributes to environmental protection.

In order to limit the impact of temporary large changes in lighting, e.g. car lamps, lightning flash, etc. on the operation of the SWITCH, an actuation delay (approx. 60s) has been applied.

When setting the ON threshold, remember that on a sunny day, covering the sensor with your bare hand may not be sufficient. Then you should cover the SENSOR more effectively.

A pictorial diagram of the TS-43-3 TWILIGHT SWITCH operation principle is shown in Fig. 3.

NOTE: Avoid mounting the SENSOR directly in the light beam of the lamp being switched on, because lighting with the SENSOR lamp may interfere with operation - the lamp will be turned on periodically and turned off from evening until morning.

IV. Technical data

Rated supply voltage LN	230V AC, + 10%, - 15%
Rated frequency	50Hz
Maximum load current (power):	
> resistive load	16A, AC1 (4 000 W)
> incandescent lamps	10A (2500 W)
> halogen lamps	8A (2000 W)
> fluorescent lamps	8A (2000 W)
> energy-saving lamps and LED	8A (2000 W)
Instantaneous inrush current	100A
Executive contacts	1 x NO, 1 x NC
Rated power consumption	0,7 W
Logarithmic control range ON	1...10...100...1000 lx
Adjustment range OFF	Astronomical middle of the night ± 2h
Switch-on and switch-off delay	60s (± 10%)
Mechanical durability	100 000 operations
CONTROLLER protection level	IP 20
Installation of the CONTROLLER	One 18 mm field, 35 mm rail
CONTROLLER work position	Vertical
CONTROLLER working temperature	-25...+50 °C
CONTROLLER weight	50g
SENSOR protection class	IP 65
SENSOR dimensions	40mm x 30mm x 64mm + PG9
SENSOR assembly	Two screws
SENSOR working position	Vertical
Cable length to the SENSOR	Max 100 m (2 x 0,5 mm^2)
SENSOR working temperature	-25...+50 °C
SENSOR weight	50g

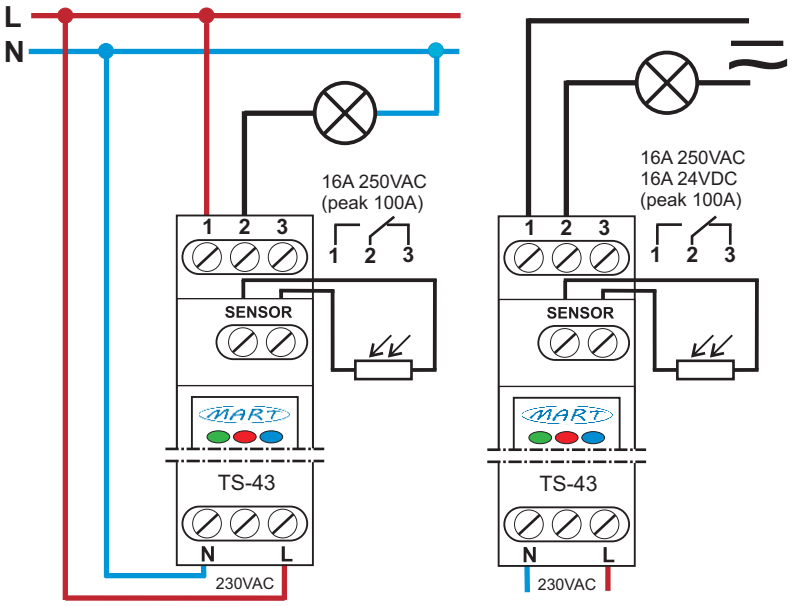

Fig. 2 .: Connection diagrams for the TS-43-3 TWILIGHT SWITCH automatic device.

For the Central European Time zone, in places located on the 15th meridian (this condition is approximately met by: Stargard, Żary, Gorlitz, Liberec, Salerno), during the winter time, the astronomical middle of the night falls approximately (with an accuracy of several minutes) at 00:00 (at midnight), and during summer time approximately at 01:00 AM (table1).

Table 1
Sunrise, sunset and midnight for Stargard (15o03'E) in 2020

Date	Sunset	Sunrise	Middle of the night	Time
January 1	15:50	08:14	00:02	Winter
January 15	16:09	08:07	00:08	Winter
February 1	16:40	07:45	00:12	Winter
February 15	17:08	07:19	00:13	Winter
March 1	17:37	06:47	00:12	Winter
March 15	18:03	06:14	00:08	Winter
April 1	19:34	06:32	01:03	Summer + 1h
April 15	19:59	05:59	00:59	Summer + 1h
May 1	20:28	05:25	00:57	Summer + 1h
May 15	20:52	04:59	00:55	Summer + 1h
June 1	21:17	04:38	00:57	Summer + 1h
June 15	21:29	04:31	01:00	Summer + 1h
July 1	21:31	04:36	01:03	Summer + 1h
July 15	21:20	04:50	01:05	Summer + 1h
August 1	20:56	05:16	01:06	Summer + 1h
August 15	20:28	05:39	01:03	Summer + 1h
September 1	19:50	06:09	01:00	Summer + 1h
September 15	19:16	06:33	00:55	Summer + 1h
October 1	18:37	07:01	00:49	Summer + 1h
October 15	18:04	07:26	00:46	Summer + 1h
November 1	16:28	06:58	23:45	Winter
November 15	16:04	07:24	23:44	Winter
December 1	15:45	07:51	23:48	Winter
December 15	15:41	08:08	23:55	Winter

This condition is met despite the fact that the night lengths in the cities in the north and in the south differ significantly. Similar dependencies occur for other time zones - for places located on the 0 meridian
In the universal time zone (e.g., London) and for places located on the 30th meridian in the Eastern European time zone (e.g., around Kiev).

For places east of the 15th meridian, the middle of the night is earlier, and for places to the west it is later. The value of the clock shift in the middle of the night can be determined from the difference between the longitude of the place and the meridian. A change of latitude by 15o causes a shift in the middle of the night by 1 hour i.e., a change of latitude by 1o causes a shift in the middle of the night by 4 minutes.

The middle of the night determined by the TS-43-2 TWILIGHT SWITCH at different levels of cloudiness in the evening and in the morning may differ slightly from day to day. The current time change is in effect
From winter to summer, it causes a shift in the middle of the night from 0 per hour 1. Due to the more intense nightlife of the society in this period, the subsequent switching off of advertisements controlled by the TS-43-2 TWILIGHT SWITCH, display windows and other objects, in which there is no need to turn on the lighting for the whole night, is beneficial. In addition, the TWILIGHT SWITCH has the additional advantage that on sunny (cloudless) days the lamp is turned off later, and on cloudy days it is appropriate earlier.
Table 2 shows the sunrise and sunset times for selected cities in Europe and the calculated astronomical hours of the night centre for the longest night (December 21) and the shortest night (June 21).

Table 2
Sunsets and sunrises and calculated astronomical means of night for selected European cities in the Central European time zone.

City	Longitude	December 21			June 21 (summer time + 1h)		
Białystok	23°10'E	15:11	07:39	23:25	20:58	04:00	00:29
Warsaw	21°01'E	15:25	07;43	23:34	21:01	04:14	00:37
Stargard	15°03'E	15:43	08:12	23:58	21:31	04:31	01:01
Liberec	15°03'E	15:56	07:59	23:58	21:16	04:46	01:01
Salerno	14°47'E	16:36	07:21	23:59	20:35	05:29	01:02
Goerlitz	14°59'E	15:55	08:01	23:58	21:19	04:44	01:01
Berlin	13°24'E	15:54	08:15	00:04	21:33	04:43	01:08
Munich	11°34'E	16:22	08:01	00:11	21:17	05:13	01:15
Hamburg	10°01'E	16:01	08:34	00:17	21:53	04:50	01:21
Aachen	06°05'E	16:32	08:35	00:33	21:52	05:22	01:37
Paris	02°21'E	16:56	08:41	00:48	21:57	05:47	01:52
Madrid	03°42'W	17:51	08:34	01:12	21:48	06:44	02:16

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