

# TOCON selection guide

## pre-amplified UV Photodetectors, 0 ... 5V output



### What is a TOCON?

A TOCON is a pre-amplified UV photodetector with 0...5V output. The TOCON devices are using modern hybrid technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The output voltage can be directly connected to a controller or a voltage multimeter. No external amplifier is needed. Most of the TOCONs are powered by a Silicon Carbide (SiC) detector chip (ABC, A, E, C). The BLUE and GAP series works with a GaP chip. The TOCONs are available as:



...3 pin photodiodes in a TO39 housing



... or as easy to mount and connect stainless steel M12x1 thread housings, l = 32 mm, integrated plug

### TOCON NOMENCLATURE

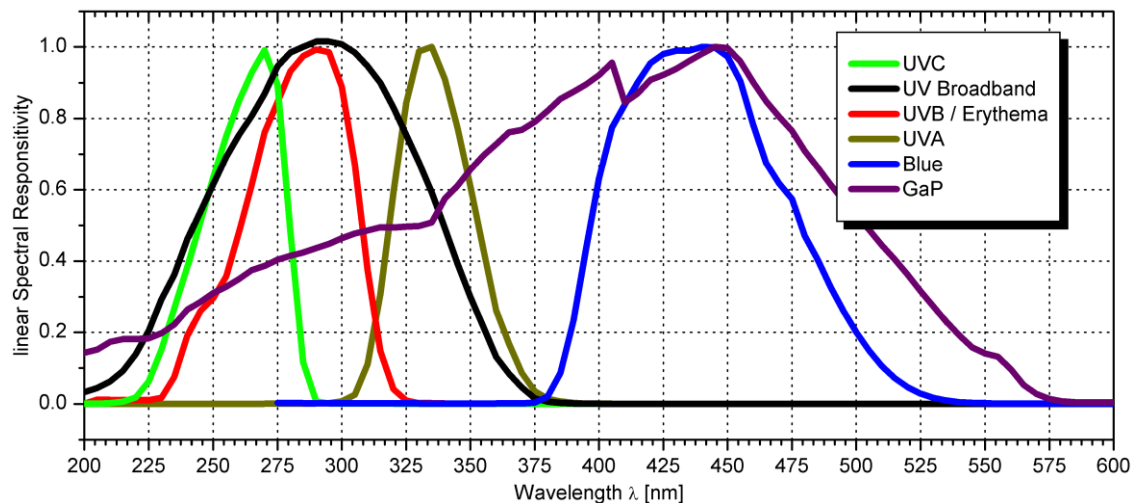
TOCON \_ {spectral} {dynamic range}

can be:	ABC	1 ... 10
	A	3 ... 9
	E	1 ... 3
	C	2 ... 9
	BLUE	1 ... 6
	GAP	1 ... 6
		("1" is very sensitive and "10" is very insensitive)

### How to find „my“ TOCON?

#### Step 1 → Selection of Spectral Response

The TOCONs are available with six different spectral responses, UV broadband “ABC”, UVA “A”, UVC “C” and Erythema Curve “E” (also useful for other selective UVB/UVC measurements) and blue light “BLUE” and “GaP” for near UV (UVA+blue VIS). The below table shows the spectral response of the different TOCONs. For detailed specification please refer to Appendix B (page 4) and the datasheet.



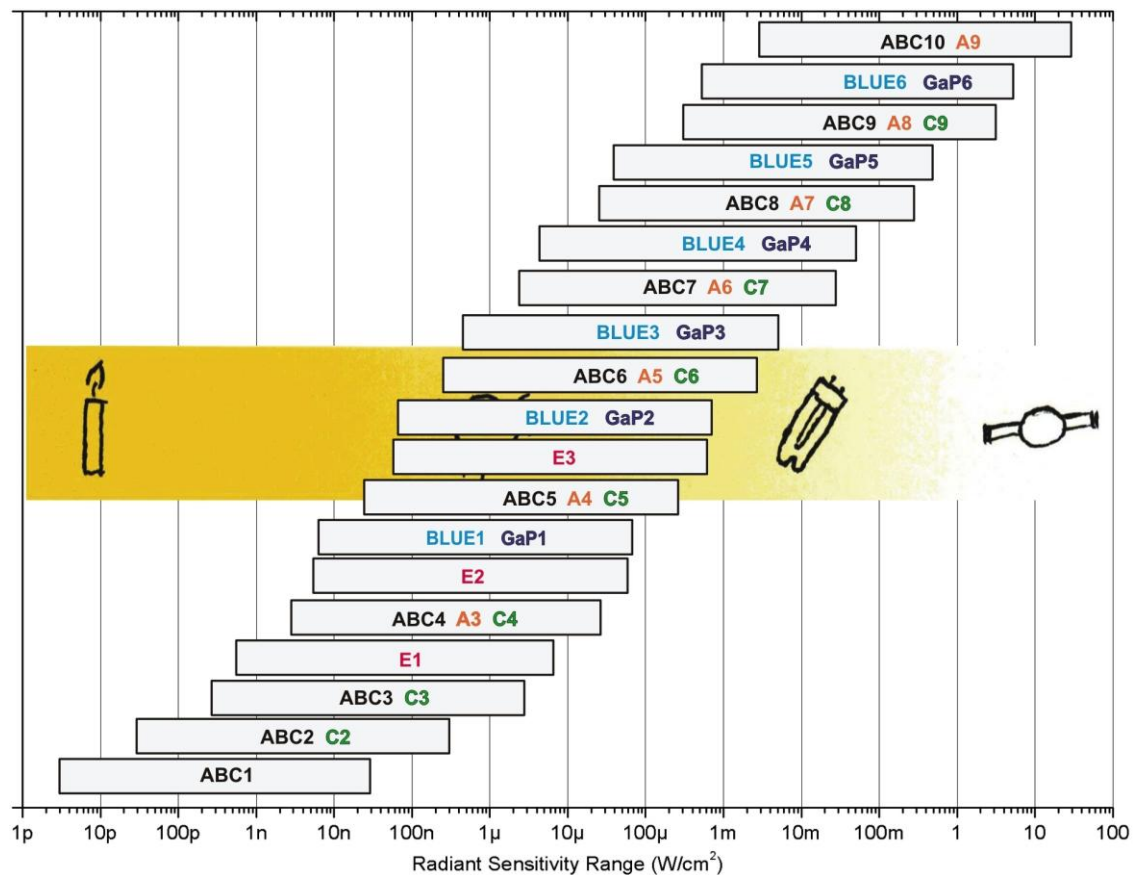
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### Step 2 → selection of Sensitivity Range

The selection of the sensitivity range must be thorough. If the TOCON is too sensitive it will saturate below the upper limit of the radiation range to be measured. Conversely, a TOCON that is too insensitive gives no or a too low voltage output. Thus, for dynamic range selection, please estimate, it is best to calculate what is the max. radiation your TOCON must measure without getting saturated (the sensor will not be damaged if saturated). The related min. radiation is lower by approx. factor 5000 – if the TOCON is powered with 5V. It is possible to power the TOCON with lower voltages down to 2,5V. However, this will reduce the dynamic range by factor  $5V/V_{supply}$ . The graph below shows the sglux TOCONs offered spread out over a radiant intensity range of 13 orders of magnitude. The dynamic range is determined by the numeric suffix from “1” = very sensitive for very low UV radiation (e.g. a flame) to “10” = very insensitive for very strong radiation. For detailed specification please refer to Appendix B (page 4) and the datasheet.



If a higher dynamic range than 15000 is needed, the sglux DIGITAL sensors (digital sensor with 5 orders dynamic range) could be interesting.

### How to use a TOCON?

The 0...5V output voltage can be directly connected to a voltmeter or a controller. Alternatively a controller of the sglux *SENSOR MONITOR 5.0* series can be used. These modules include free programmable versatile Radiometer and Dosimeter modules with 3 programmable relay outputs. A data connection and computer software are available. The *SENSOR MONITOR* is perfectly suited for developers.

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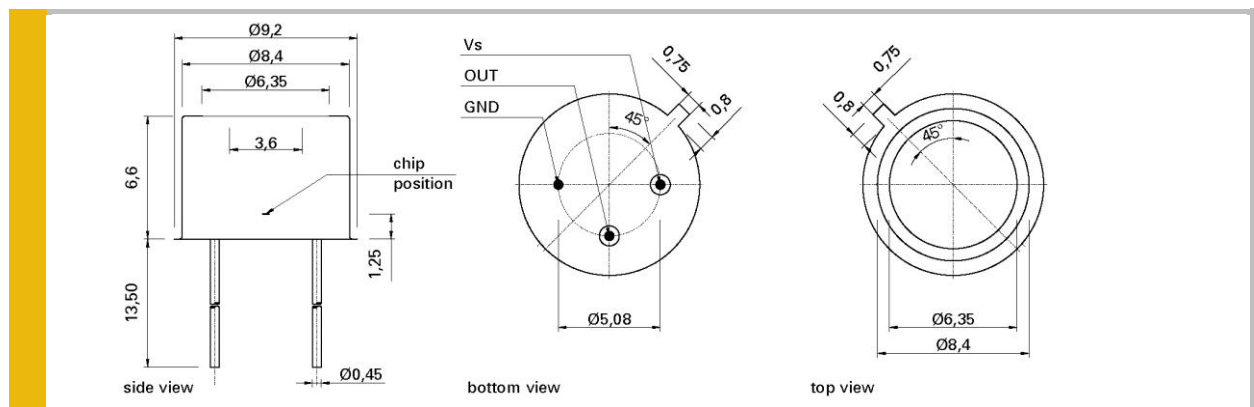
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### Appendix A<sub>1</sub> – General Specifications

Parameter	Symbol	Value	Unit
<b>Maximum Ratings</b>			
Operating Temperature Range	$T_{opt}$	-25 ... +85	°C
Storage Temperature Range	$T_{stor}$	-40 ... +100	°C
Soldering Temperature (5s)	$T_{sold}$	300	°C
<b>General Characteristics (<math>T=25^{\circ}\text{C}</math>, <math>V_{supply}=+5\text{ V}</math>)</b>			
Supply voltage	$V_{supply}$	2,5 ... 5,0	V
Saturation voltage	$V_{sat}$	$V_{supply}$	V
Dark offset voltage	$V_{offset}$	0,05	mV
Temperature coefficient	$T_C$	<+0,3	%/K
Current consumption	$I$	0,8	mA
Bandwidth (-3 dB)	$\Theta$	15	Hz
Risetime (63%) <i>(other risetimes on demand)</i>	$t_{rise}$	10	ms
<b>Spectral Characteristics (<math>T=25^{\circ}\text{C}</math>, <math>V_{supply}=+5\text{ V}</math>)</b>			
Sensitivity at peak	$S_{max}$	see appendix B	nm
Wavelength of max. spectral sens.	$\lambda_{max}$	see appendix B	nm
Sensitivity range ( $S=0,1 * S_{max}$ )	-	see appendix B	nm
SiC Visible blindness ( $S_{max} / S_{>405nm}$ )	VB	$>10^{10}$ (SiC)	-

### Appendix A<sub>2</sub> - Drawing



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### Appendix B – Product Details of all TOCONs

Model	Optical input at peak, mW/cm <sup>2</sup> , for 2 V output	Approx. minimum irradiance (mW/cm <sup>2</sup> )	Approx. maximum irradiance (V <sub>supply</sub> = 5 V) (mW/cm <sup>2</sup> )	Applications
<b>UV broadband (SiC)</b> Peak wavelength = 280nm Sensitivity range (S=0,1*Smax) = 210nm - 380nm				
TOCON ABC1	7,00E-06	1,80E-09	1,80E-05	very low UV radiation detection, flame detection
TOCON ABC2	7,00E-05	1,80E-08	1,80E-04	low UV radiation detection, occupational safety
TOCON ABC3	7,00E-04	1,80E-07	1,80E-03	UV radiation detection, occupational safety
TOCON ABC4	7,00E-03	1,80E-06	1,80E-02	UV irradiation measurement
TOCON ABC5	7,00E-02	1,80E-05	1,80E-01	UV irradiation measurement
TOCON ABC6	7,00E-01	1,80E-04	1,80E+00	optimized for total sun UV measurements (not Erythema curve)
TOCON ABC7	7,00E+00	1,80E-03	1,80E+01	UV irradiation measurement, industrial standard UV radiation
TOCON ABC8	7,00E+01	1,80E-02	1,80E+02	curing lamp control
TOCON ABC9	7,00E+02	1,80E-01	1,80E+03	curing lamp control
TOCON ABC10	7,00E+03	1,80E+00	1,80E+04	UV hardening control and other very high radiation sources

Model	Optical input at peak, mW/cm <sup>2</sup> , for 2 V output	Approx. minimum irradiance (mW/cm <sup>2</sup> )	Approx. maximum irradiance (V <sub>supply</sub> = 5 V) (mW/cm <sup>2</sup> )	Applications
<b>UVA selective (SiC)</b> Peak wavelength = 335nm Sensitivity range (S=0,1*Smax) = 310nm - 395 nm				
TOCON A3	7,00E-03	1,80E-06	1,80E-02	UVA radiation detection
TOCON A4	7,00E-02	1,80E-05	1,80E-01	UVA irradiation measurement
TOCON A5	7,00E-01	1,80E-04	1,80E+00	UVA irradiation measurement
TOCON A6	7,00E+00	1,80E-03	1,80E+01	UVA irradiation measurement
TOCON A7	7,00E+01	1,80E-02	1,80E+02	Measurement of high UVA irradiation, curing lamp control
TOCON A8	7,00E+02	1,80E-01	1,80E+03	Measurement of very high UVA irradiation, curing lamp control
TOCON A9	7,00E+03	1,80E+00	1,80E+04	Measurement of very high UVA irradiation, curing lamp control

Model	Optical input at peak, mW/cm <sup>2</sup> , for 2 V output	Approx. minimum irradiance (mW/cm <sup>2</sup> )	Approx. maximum irradiance (V <sub>supply</sub> = 5 V) (mW/cm <sup>2</sup> )	Applications
<b>UVB selective (SiC)</b> Peak wavelength = 280nm Sensitivity range (S=0,1*Smax) = 230nm - 315nm, for Erythema Curve and other UVB measurements, complies with CIE087 and DIN5050				
1 UVI input produces electrical output of:				
TOCON E1	1,7 V per UVI	0,01 UVI	3 UVI	UV-Index measurements, if an attenuating diffusor is used
TOCON E2	170 mV per UVI	0,1 UVI	30 UVI	UV-Index measurements
TOCON E3	1,00E-01	5,00E-03	7,50E-01	UVB/UVC radiation measurements

Model	Optical input at peak, mW/cm <sup>2</sup> , for 2 V output	Approx. minimum irradiance (mW/cm <sup>2</sup> )	Approx. maximum irradiance (V <sub>supply</sub> = 5 V) (mW/cm <sup>2</sup> )	Applications
<b>UVC selective (SiC)</b> Peak wavelength = 270nm Sensitivity range (S=0,1*Smax) = 230nm - 285nm, complies with DVGW W294(3) and ÖNorm				
TOCON C2	7,00E-05	1,80E-08	1,80E-04	low UVC radiation detection, occupational safety
TOCON C3	7,00E-04	1,80E-07	1,80E-03	UVC radiation detection, occupational safety
TOCON C4	7,00E-03	1,80E-06	1,80E-02	UVC irradiation measurement
TOCON C5	7,00E-02	1,80E-05	1,80E-01	Purification lamp control
TOCON C6	7,00E-01	1,80E-04	1,80E+00	Purification lamp control
TOCON C7	7,00E+00	1,80E-03	1,80E+01	Purification lamp control
TOCON C8	7,00E+01	1,80E-02	1,80E+02	curing lamp control
TOCON C9	7,00E+02	1,80E-01	1,80E+03	curing lamp control

Model	Optical input at peak, mW/cm <sup>2</sup> , for 2 V output	Approx. minimum irradiance (mW/cm <sup>2</sup> )	Approx. maximum irradiance (V <sub>supply</sub> = 5 V) (mW/cm <sup>2</sup> )	Applications
<b>Blue Light (GaP)</b> Peak wavelength = 445nm Sensitivity range (S=0,1*Smax) = 390nm - 515nm, complies with 2006/25/EG				
TOCON BLUE1	1,70E-02	4,20E-06	4,30E-02	measurement of very low blue light irradiation, occupational safety
TOCON BLUE2	1,70E-01	4,20E-05	4,30E-01	measurement of low blue light irradiation, occupational safety
TOCON BLUE3	1,70E+00	4,20E-04	4,30E+00	measurement of blue light irradiation, occupational safety
TOCON BLUE4	1,70E+01	4,20E-03	4,30E+01	measurement of blue light irradiation, occupational safety
TOCON BLUE5	1,70E+02	4,20E-02	4,30E+02	measurement of high blue light irradiation, occupational safety
TOCON BLUE6	1,70E+03	4,20E-01	4,30E+03	measurement of very high blue light irradiation, occupational safety

Model	Optical input at peak, mW/cm <sup>2</sup> , for 2 V output	Approx. minimum irradiance (mW/cm <sup>2</sup> )	Approx. maximum irradiance (V <sub>supply</sub> = 5 V) (mW/cm <sup>2</sup> )	Applications
<b>UV + VIS (GaP)</b> Peak wavelength = 445nm Sensitivity range (S=0,1*Smax) = 190nm - 570nm				
TOCON GaP1	1,70E-02	4,20E-06	4,30E-02	measurement of very low UV & VIS light irradiation, occupational safety
TOCON GaP2	1,70E-01	4,20E-05	4,30E-01	measurement of low UV & VIS light irradiation, occupational safety
TOCON GaP3	1,70E+00	4,20E-04	4,30E+00	measurement of blue UV & VIS light irradiation, occupational safety
TOCON GaP4	1,70E+01	4,20E-03	4,30E+01	measurement of blue UV & VIS light irradiation, occupational safety
TOCON GaP5	1,70E+02	4,20E-02	4,30E+02	measurement of high UV & VIS light irradiation, occupational safety
TOCON GaP6	1,70E+03	4,20E-01	4,30E+03	measurement of very high UV & VIS light irradiation, occupational safety

Accessories	
TOCON housing	miniature stainless steel housing (M12x1) with TOCON installed and removable 5-pin connector with 2m cable, easy to mount and connect, robust
TOCON Starter Kit	Kit for initial testing setup, includes a TOCON socket, two banana plugs to connect with a voltmeter and a 9V block battery