# TOCON selection guide
## amplified UV Photodetectors, 0 … 5V output

sglux The UV Experts

## *What is a TOCON?*

**A TOCON is an 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, B, 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*}

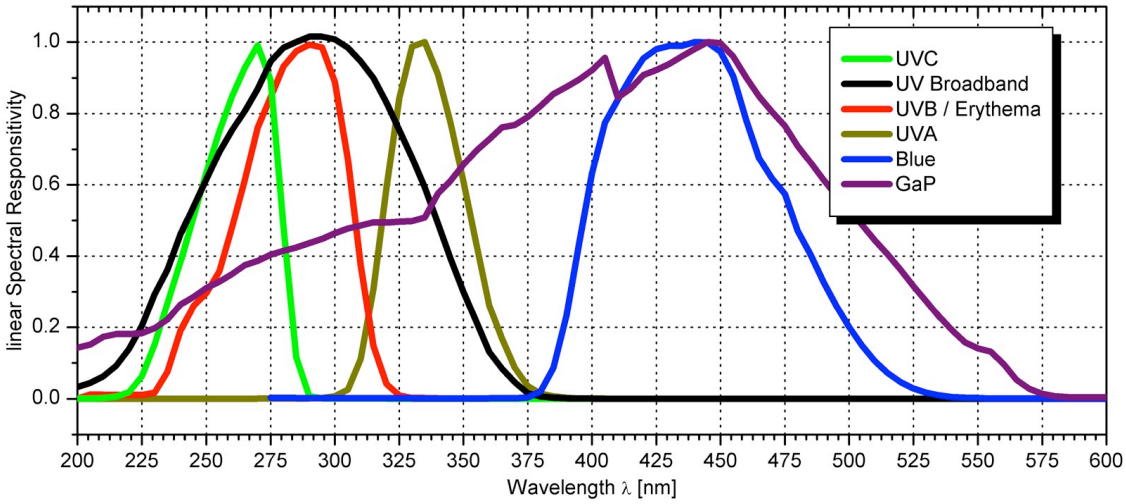
| can be: | | |
|---|---|---|
| | ABC | 1 …. 10 |
| | A | 4 …. 10 |
| | B | 4 …. 6 |
| | E | 1 …. 2 |
| | C | 2 …. 9 |
| | BLUE | 4 …. 9 |
| | GAP | 4 …. 9 |

("1" is very sensitive and "10" is very unsensitive)

## *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"** , UVB **"B"**, 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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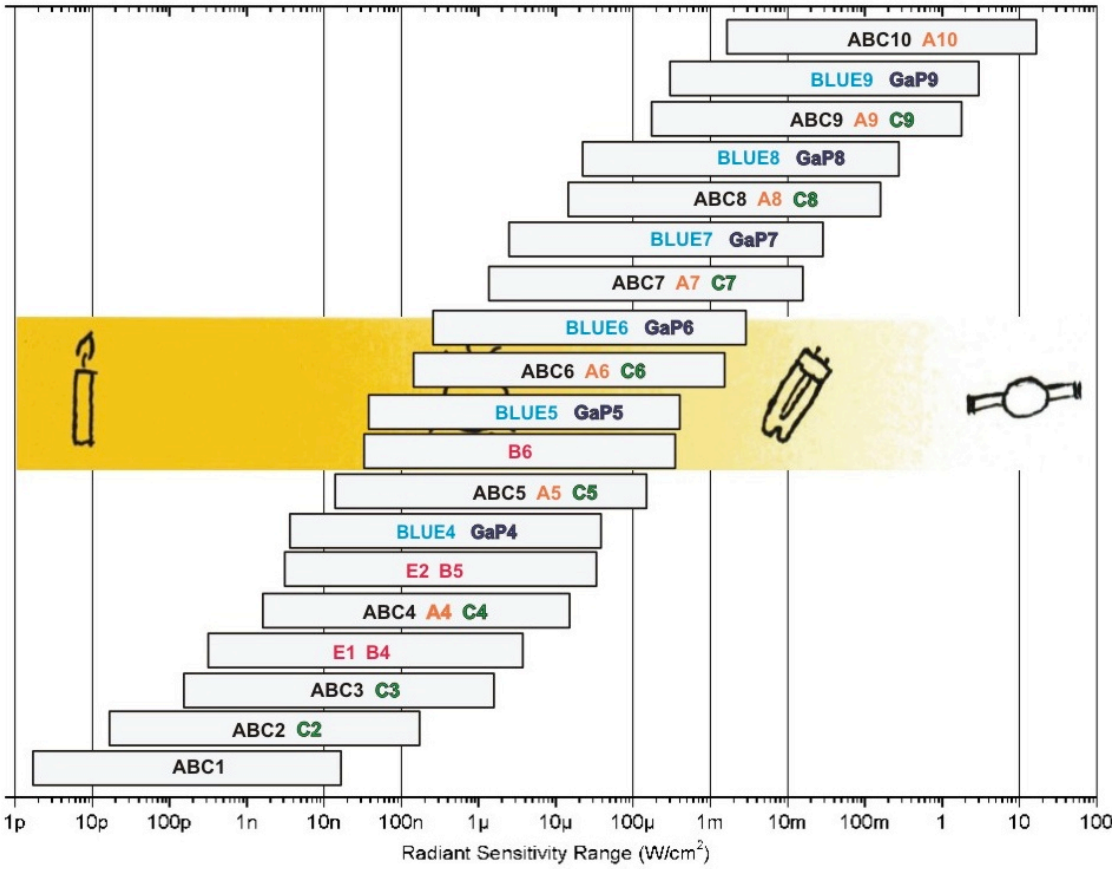
## *Step 2 → selection of Sensitivity Range*

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 unsensitive 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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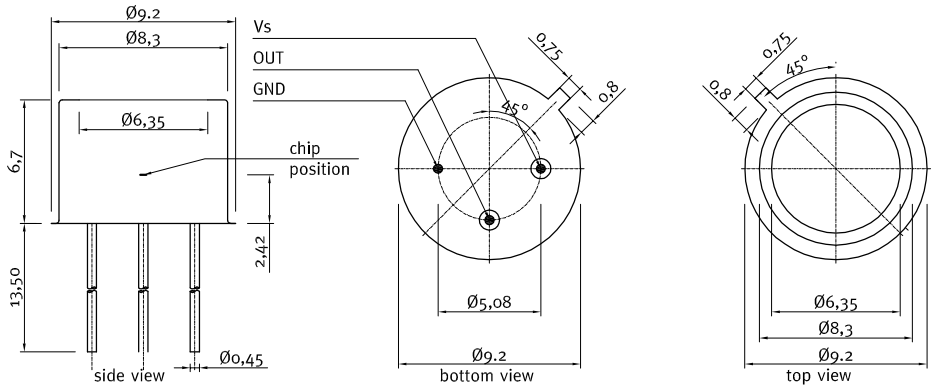
## *Appendix $A_1$ – General Specifications*

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| ***Maximum Ratings*** | | | |
| Operating Temperature Range | $T_{opt}$ | *-25 … +85* | *°C* |
| Storage Temperature Range | $T_{stor}$ | *-40 … +100* | *°C* |
| Soldering Temperature (5s) | $T_{sold}$ | *300* | *°C* |
| **General Characteristics *(T=25°C, $V_{supply}$=+5 V)*** | | | |
| Supply voltage | $V_{supply}$ | *2,5 … 5,0* | *V* |
| Saturation voltage | $V_{sat}$ | *$V_{supply}$ - 5%* | *V* |
| Dark offset voltage | $V_{offset}$ | *0,05* | *mV* |
| Temperature coefficient | *Tc* | *<-0,3* | *%/K* |
| Current consumption | *I* | *150* | *µA* |
| Bandwidth (-3 dB) | *Θ* | *15* | *Hz* |
| Risetime (10-90%) *(other risetimes on request)* | $t_{rise}$ | *0,058 - 0,182* | *s* |
| **Spectral Characteristics *(T=25°C, $V_{supply}$=+5 V)*** | | | |
| 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 $A_2$ - Drawing*



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# *Appendix B – Product Details of all TOCONs*

| Model | Approx. minimum irradiance ($mW/cm^2$) | Approx. maximum irradiance ($V_{supply}$ = 5 V) ($mW/cm^2$) | Applications |
|---|---|---|---|
| **UV broadband (SiC)** | **Peak wavelength = 290nm**<br>**Sensitivity range (S=0,1*Smax) = 227nm - 360nm** | | |
| TOCON_ABC1 | 1,80E-09 | 1,80E-05 | Very low UV radiation detection, flame detection |
| TOCON_ABC2 | 1,80E-08 | 1,80E-04 | Low UV radiation detection, occupational safety |
| TOCON_ABC3 | 1,80E-07 | 1,80E-03 | UV radiation detection, occupational safety |
| TOCON_ABC4 | 1,80E-06 | 1,80E-02 | UV irradiation measurement |
| TOCON_ABC5 | 1,80E-05 | 1,80E-01 | UV irradiation measurement |
| TOCON_ABC6 | 1,80E-04 | 1,80E+00 | Optimized for total sun UV measurements (not Erythema curve) |
| TOCON_ABC7 | 1,80E-03 | 1,80E+01 | UV irradiation measurement, industrial standard UV radiation |
| TOCON_ABC8 | 1,80E-02 | 1,80E+02 | Curing lamp control |
| TOCON_ABC9 | 1,80E-01 | 1,80E+03 | Curing lamp control |
| TOCON_ABC10 | 1,80E+00 | 1,80E+04 | UV hardening control and other very high radiation sources |

| | | | |
|---|---|---|---|
| **UVA selective (SiC)** | **Peak wavelength = 331nm**<br>**Sensitivity range (S=0,1*Smax) = 309nm - 367 nm** | | |
| TOCON_A4 | 1,80E-06 | 1,80E-02 | UVA radiation detection |
| TOCON_A5 | 1,80E-05 | 1,80E-01 | UVA irradiation measurement |
| TOCON_A6 | 1,80E-04 | 1,80E+00 | UVA irradiation measurement |
| TOCON_A7 | 1,80E-03 | 1,80E+01 | UVA irradiation measurement |
| TOCON_A8 | 1,80E-02 | 1,80E+02 | Measurement of high UVA irradiation, curing lamp control |
| TOCON_A9 | 1,80E-01 | 1,80E+03 | Measurement of very high UVA irradiation, curing lamp control |
| TOCON_A10 | 1,80E+00 | 1,80E+04 | Measurement of very high UVA irradiation, curing lamp control |

| | | | |
|---|---|---|---|
| **UVB+UVC selective (SiC)** | **Peak wavelength = 280nm**<br>**Sensitivity range (S=0,1*Smax) = 243nm - 303nm, for UVB+UVC measurements and for Erythema Curve, complies with CIE087 and DIN5050** | | |
| TOCON_B4 | 7,50E-07 | 7,50E-03 | UVB irradiation measurement |
| TOCON_B5 | 7,50E-06 | 7,50E-02 | UVB irradiation measurement |
| TOCON_B6 | 7,50E-05 | 7,50E-01 | UVB irradiation measurement |
| 1 UVI input produces electrical output of: | | | |
| TOCON_E1 | 0,01 UVI | 3 UVI | UV-Index measurements, if an attenuating diffusor is used |
| TOCON_E2 | 0,1 UVI | 30 UVI | UV-Index measurements |

| | | | |
|---|---|---|---|
| **UVC selective (SiC)** | **Peak wavelength = 275nm**<br>**Sensitivity range (S=0,1*Smax) = 225nm - 287nm, complies with DVGW W294(3) and ÖNorm** | | |
| TOCON_C2 | 1,80E-08 | 1,80E-04 | Low UVC radiation detection, occupational safety |
| TOCON_C3 | 1,80E-07 | 1,80E-03 | UVC radiation detection, occupational safety |
| TOCON_C4 | 1,80E-06 | 1,80E-02 | UVC irradiation measurement |
| TOCON_C5 | 1,80E-05 | 1,80E-01 | Purification lamp control |
| TOCON_C6 | 1,80E-04 | 1,80E+00 | Purification lamp control |
| TOCON_C7 | 1,80E-03 | 1,80E+01 | Purification lamp control |
| TOCON_C8 | 1,80E-02 | 1,80E+02 | Curing lamp control |
| TOCON_C9 | 1,80E-01 | 1,80E+03 | Curing lamp control |

| | | | |
|---|---|---|---|
| **Blue Light (GaP)** | **Peak wavelength = 445nm**<br>**Sensitivity range (S=0,1*Smax) = 390nm - 515nm, complies with 2006/25/EG** | | |
| TOCON_BLUE4 | 4,20E-06 | 4,30E-02 | Measurement of very low blue light irradiation, occupational safety |
| TOCON_BLUE5 | 4,20E-05 | 4,30E-01 | Measurement of low blue light irradiation, occupational safety |
| TOCON_BLUE6 | 4,20E-04 | 4,30E+00 | Measurement of blue light irradiation, occupational safety |
| TOCON_BLUE7 | 4,20E-03 | 4,30E+01 | Measurement of blue light irradiation, occupational safety |
| TOCON_BLUE8 | 4,20E-02 | 4,30E+02 | Measurement of high blue light irradiation, occupational safety |
| TOCON_BLUE9 | 4,20E-01 | 4,30E+03 | Measurement of very high blue light irradiation, occupational safety |

| | | | |
|---|---|---|---|
| **UV + VIS (GaP)** | **Peak wavelength = 445nm**<br>**Sensitivity range (S=0,1*Smax) = 190nm - 570nm** | | |
| TOCON_GaP4 | 4,20E-06 | 4,30E-02 | Measurement of very low UV & VIS light irradiation, occupational safety |
| TOCON_GaP5 | 4,20E-05 | 4,30E-01 | Measurement of low UV & VIS light irradiation, occupational safety |
| TOCON_GaP6 | 4,20E-04 | 4,30E+00 | Measurement of blue UV & VIS light irradiation, occupational safety |
| TOCON_GaP7 | 4,20E-03 | 4,30E+01 | Measurement of blue UV & VIS light irradiation, occupational safety |
| TOCON_GaP8 | 4,20E-02 | 4,30E+02 | Measurement of high UV & VIS light irradiation, occupational safety |
| TOCON_GaP9 | 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_PTFE_housing** | miniature PTFE housing (M12x1) with TOCON installed and removable 5-pin connector with 2m cable, easy to mount and connect, dirt repellent |
| **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 |



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