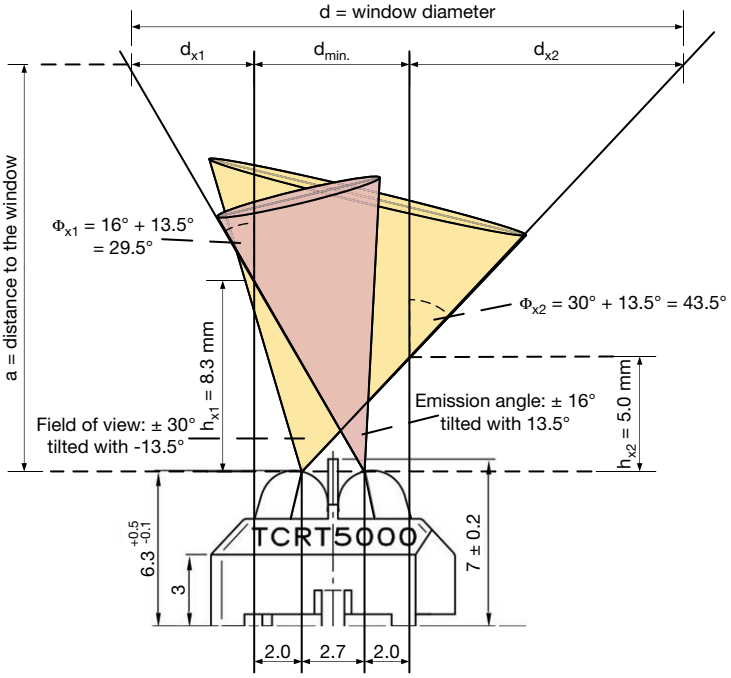
# Window Size Calculator for TCRT5000 and TCRT5000L

## INTRODUCTION

This calculation is used to dimension an appropriately sized window for the TCRT5000 depending on its distance to the sensor. The angles at half intensity / half sensitivity of emitter and detector are considered. A window should be at least large enough so that a signal path over these half intensity / half sensitivity angles is not blocked by an aperture. Blocking the emitted signal can result in increased offsets or decreased sensitivity.

## WINDOW CALCULATOR IN X-DIRECTION




### Parameters and Formula

$h_{x1}$ = 4.7 mm / tan(29.5°) = 8.3 mm

$h_{x2}$ = 4.7 mm / tan(43.5°) = 5.0 mm

$d_{x1}$ = tan(29.5°) x (a - 8.3 mm)

$d_{x2}$ = tan(43.5°) x (a - 5.0 mm)

$d_{min.}$ = 6.7 mm

If the distance **a** to the window is smaller than 5.0 mm, then:

d = $d_{min.}$ = 6.7 mm

If the distance **a** to the window is greater than 5.0 mm but smaller than 8.3 mm, then:

d = $d_{min.}$ + $d_{x2}$ = 6.7 mm + tan(43.5°) x (a - 5 mm)

If the distance a to the window is greater than 8.3 mm, then:

d = $d_{min.}$ + $d_{x1}$ + $d_{x2}$ = 6.7 mm + tan(29.5°) x (a - 8.3 mm) + tan(43.5°) x (a - 5 mm)

### Example Calculations

a = **0** mm →d = $d_{min.}$ = 6.7 mm

a = **1** mm →d = $d_{min.}$ = 6.7 mm

...

a = **5** mm →d = $d_{min.}$ = 6.7 mm

a = **6** mm →d = $d_{min.}$ + $d_{x2}$ = 6.7 mm + tan(43.5°) x (**6** mm - 5 mm) = 7.6 mm

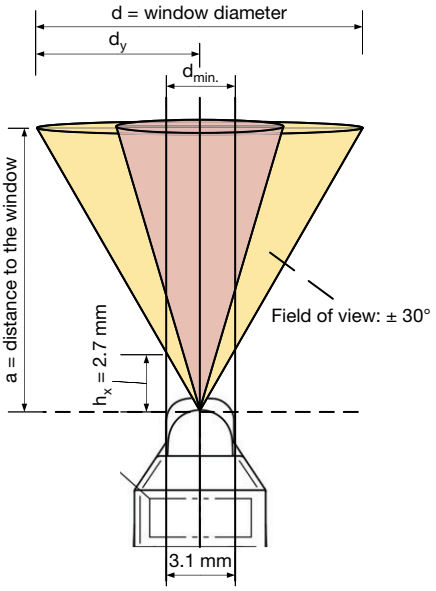
a = **7** mm →d = $d_{min.}$ + $d_{x2}$ = 6.7 mm + tan(43.5°) x (**7** mm - 5 mm) = 8.6 mm

...

a = **9** mm →d = $d_{min.}$ + $d_{x1}$+ $d_{x2}$ = 6.7 mm + tan(29.5°) x (**9** mm - 8.3 mm) + tan(43.5°) x (**9** mm - 5 mm) = d = 6.7 mm + 0.4 mm + 3.8 mm = 10.9 mm

a = **10** mm →d = $d_{min.}$ + $d_{x1}$+ $d_{x2}$ = 6.7 mm + tan(29.5°) x (**10** mm - 8.3 mm) + tan(43.5°) x (**10** mm - 5 mm) = d = 6.7 mm + 1.0 mm + 4.7 mm = 12.4 mm

## WINDOW CALCULATOR IN Y-DIRECTION




### Parameters and Formula

$d_y$ = tan(30°) x a

$h_x$ = 1.55 mm / tan(30°) = 2.7 mm

If the distance a to the window is smaller than 2.7 mm, then:

d = $d_{min.}$ = 3.1 mm

If the distance a to the window is greater than 2.7 mm, then:

d = 2 x $d_y$ = 2 x tan(30°) x a

### Example Calculations

a = **0** mm →d = d min = 3.1 mm

a = **1** mm →d = d min = 3.1 mm

a = **2** mm →d = d min = 3.1 mm

a = **3** mm →d = 2 x tan(30°) x **3** mm

d = 1.16 x **3** mm = 3.5 mm

a = **4** mm →d = 1.16 x **4** mm = 4.6 mm

a = **5** mm →d = 1.16 x **5** mm = 5.8 mm

...

a = **10** mm →d = 1.16 x **10** mm = 11.6 mm