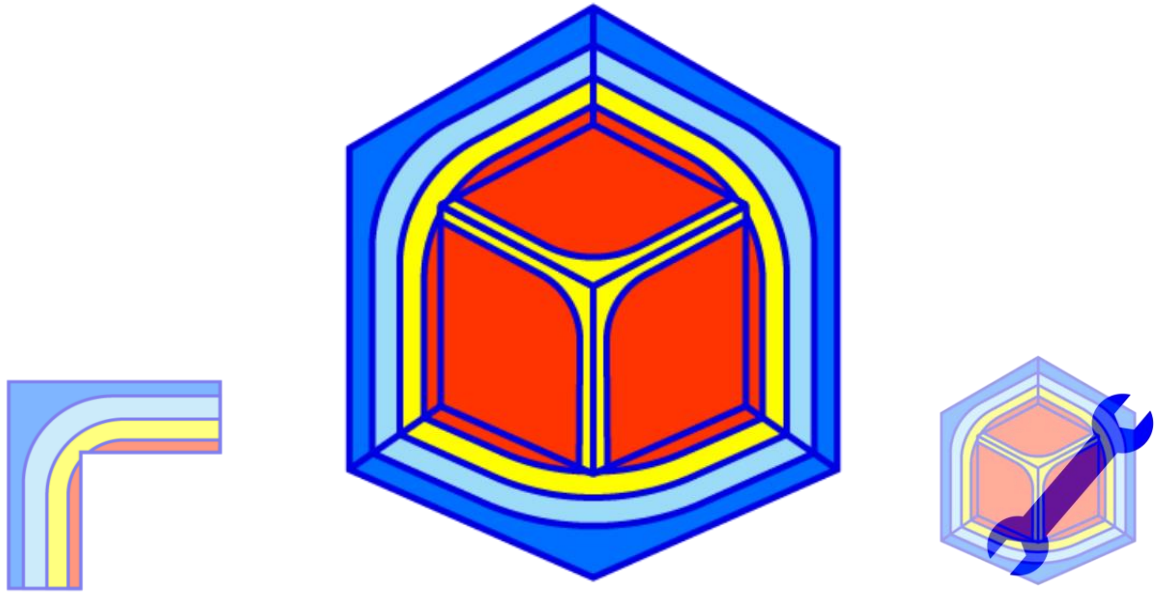
physibel

# TRISCO v16 New program performances



www.physibel.be/en/products/trisco

# TRISCO v16 – Overview

# A1. Introduction to Condensation Module

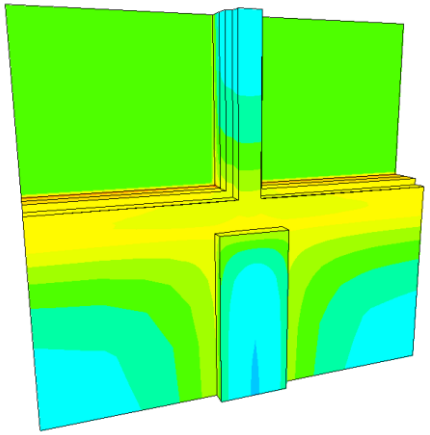
overview

Implementation of vapour transport in **TRISCO**:

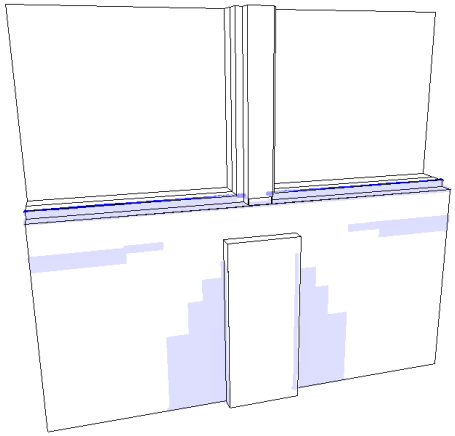
- Assessment of interstitial condensation
- Assessment of drying out (monthly)
- Internal and Surface relative humidity

→ 3D implementation of EN ISO 13788 (Glaser)

Façade renovation



Relative humidity

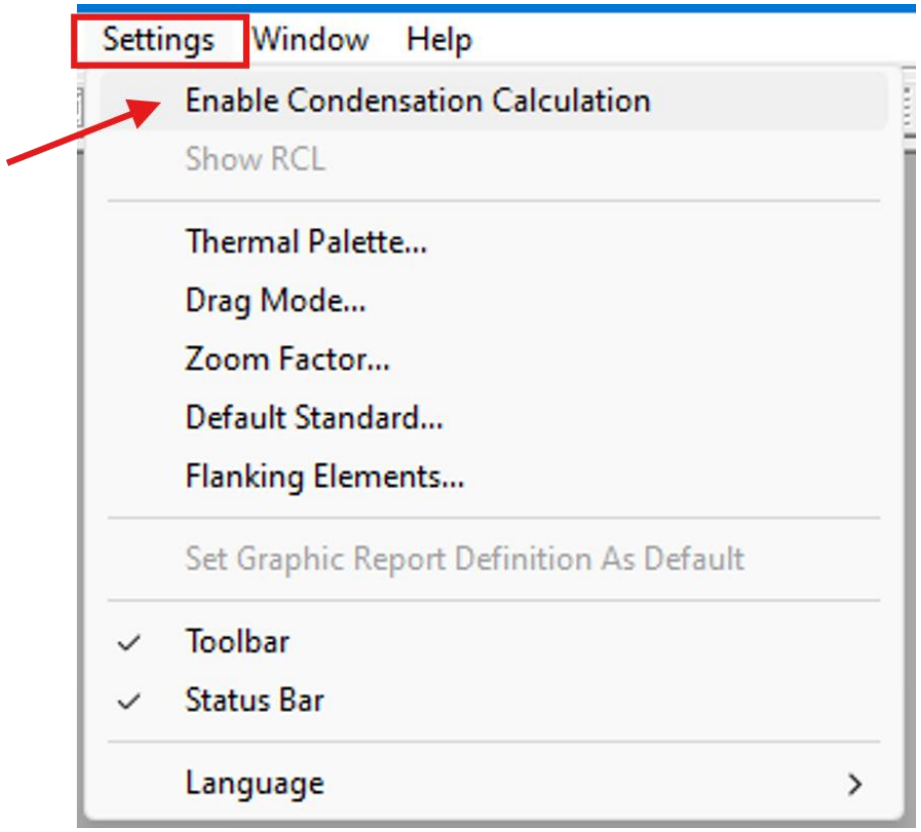


condensation

# A1. Introduction to Condensation Module

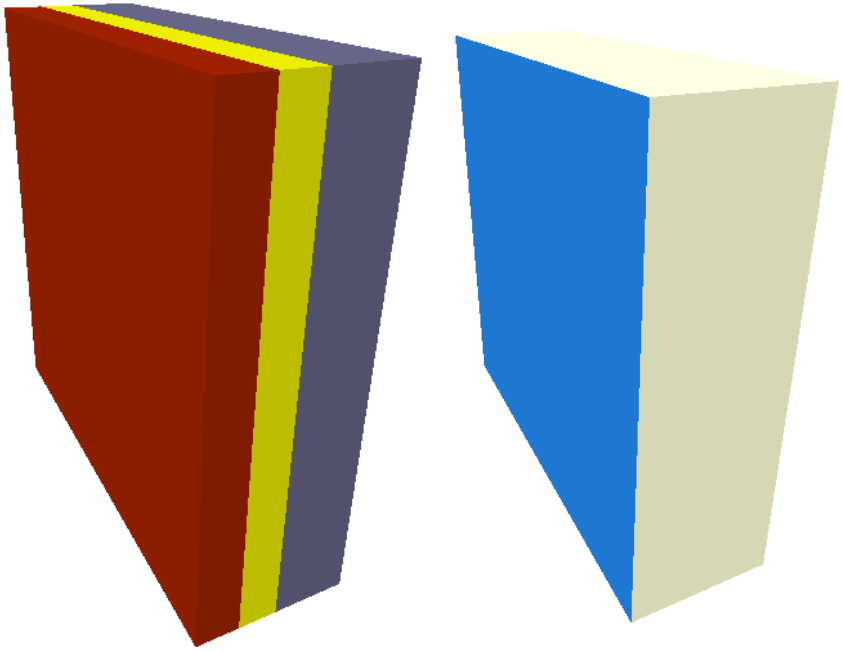
overview

Enable Condensation module in TRISCO in Settings.



# A1. Introduction to Condensation Module

overview



Grid

| No. | X [cm] | Y [cm] | Z [cm] |
|---|---|---|---|
| Sum | 52.000 | 100.000 | 100.000 |
| 0-1 | 10.000 | 100.000 | 100.000 |
| 1-2 | 15.000 | | |
| 2-3 | 8.000 | | |
| 3-4 | 9.000 | | |
| 4-5 | 10.000 | | |

Standard

Relative humidity (%)

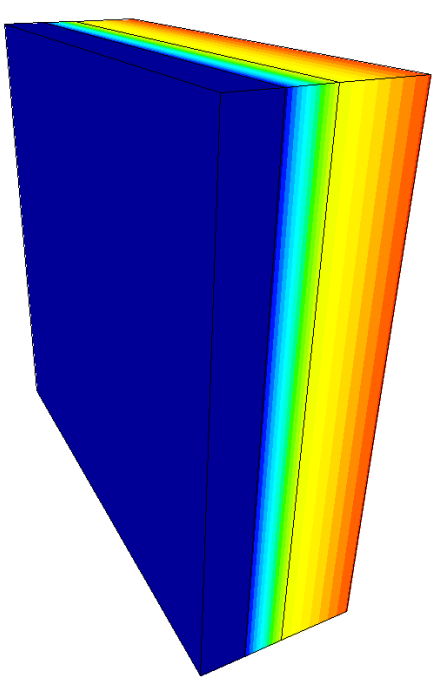
μ vapour diffusion resistance number (-)

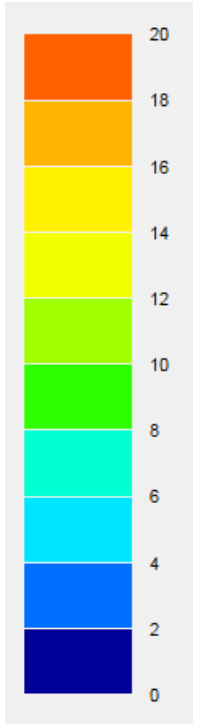
Colours

| Col. | | Type | Subtype | Physical flow dir. | Geometrical flow dir. | Name | λ [W/mK] | μ [-] | θ [°C] | RH [%] | h √/m²K] | q [W/m²] | Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 135 | | MATERIAL | | | | insulation 0.04 W/mK | 0.040 | 1.20 | | | | | |
| 136 | | MATERIAL | | | | aerated concrete | 0.120 | 5.00 | | | | | |
| **148** | | MATERIAL | | | | masonry medium density | 1.100 | 7.00 | | | | | |
| 170 | | BC_SIMPL | HE | | | exterior | | | 0.0 | 90.0 | 25.00 | 0 | EN13788 |
| 174 | | BC_SIMPL | HI | HOR | | interior (normal) horizontal heat flow | | | 20.0 | 40.0 | 7.70 | 0 | EN13788 |

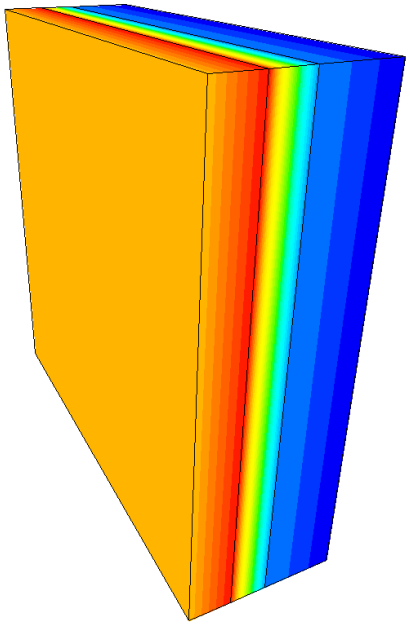
# A1. Introduction to Condensation Module

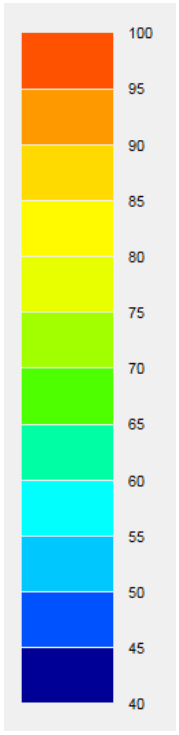
overview



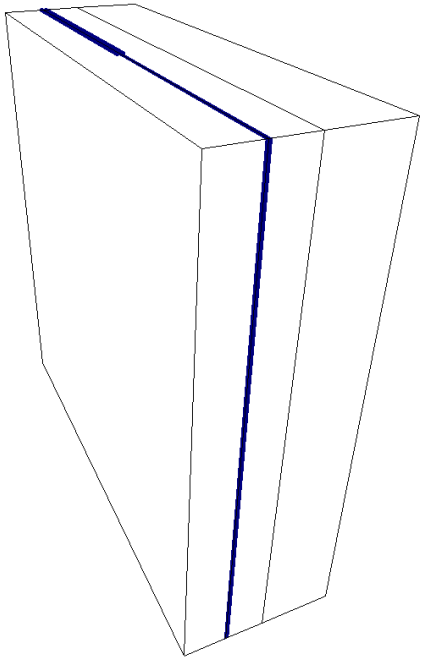



Temperature (°C)






Relative humidity (%)




Condensation (%)

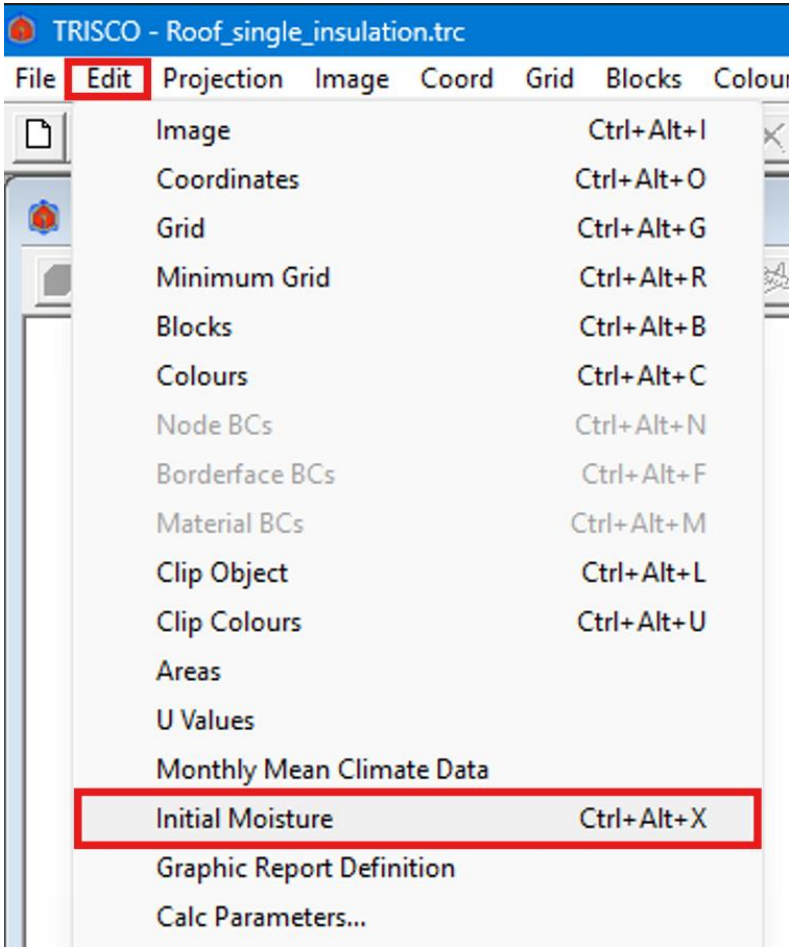

physibel

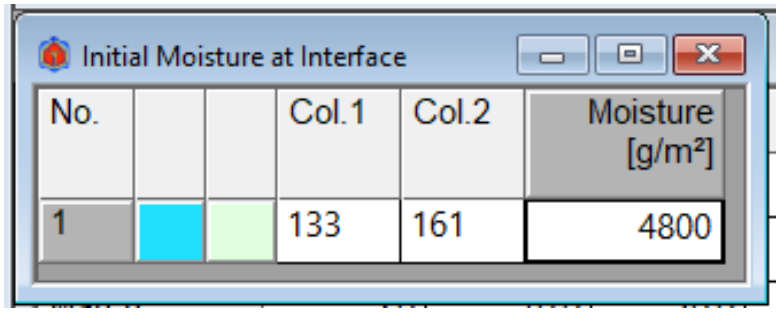
TRISCO v16

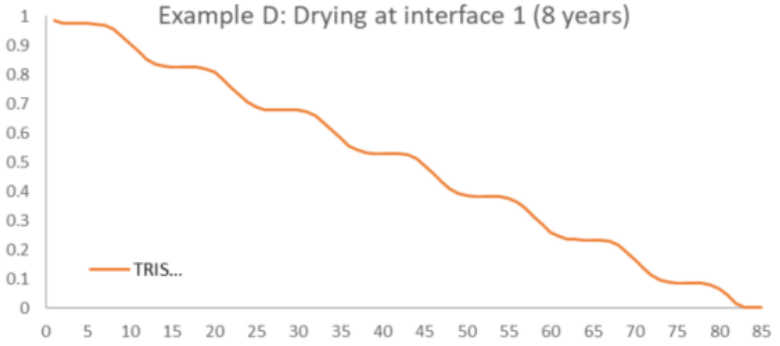
# A2. Initial moisture

overview

Specify the location and amount of excess moisture within the layers to calculate the drying rate.



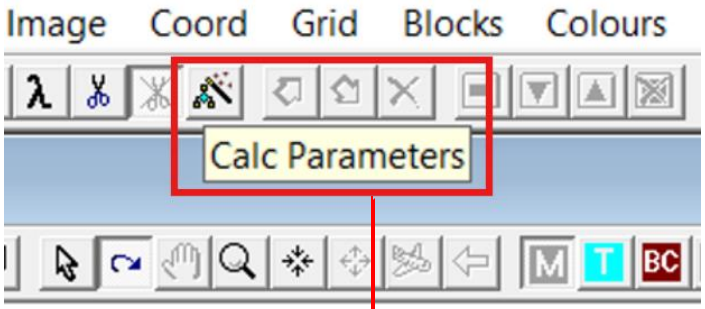

physibel

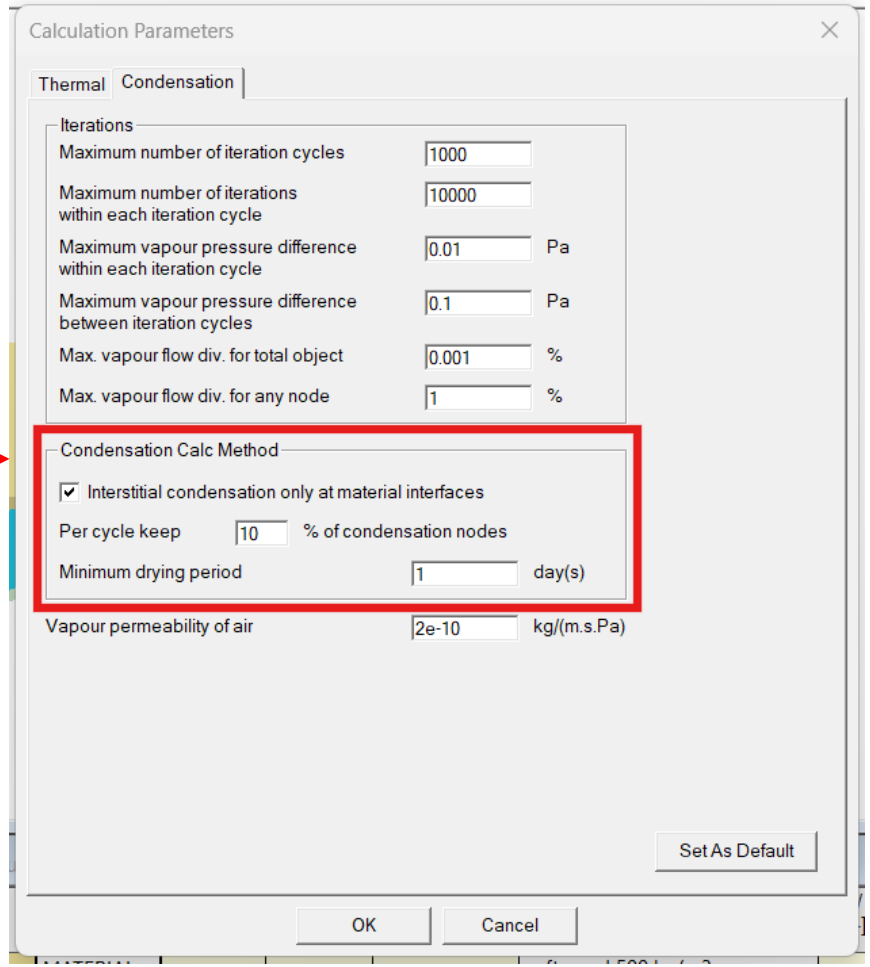
TRISCO v16

# A3. New calculation parameters

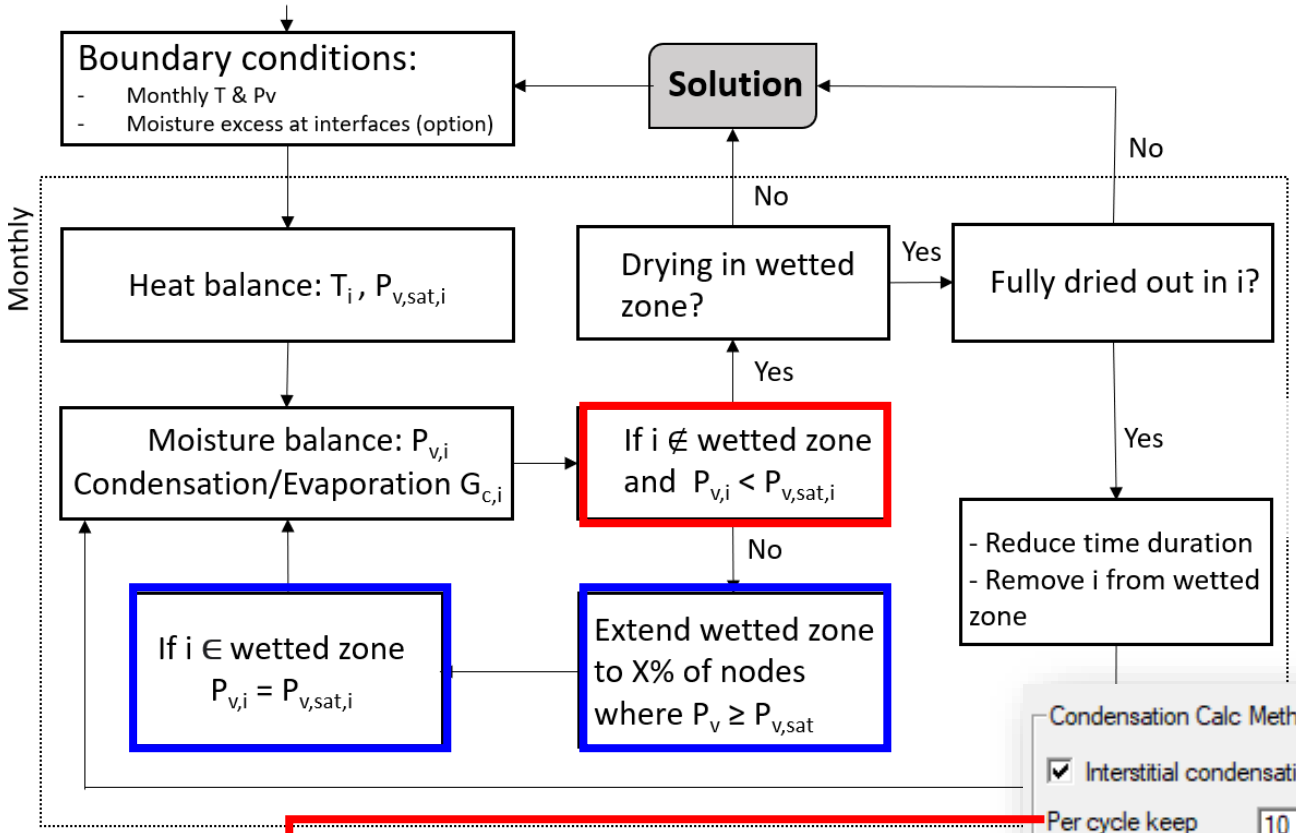
overview

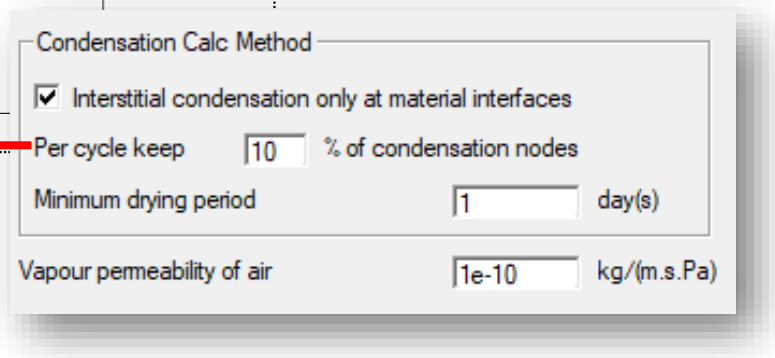
Optimize results and simulation time using the Condensation Calculation Method.



# A3. New calculation parameters




X% of calculation nodes are transferred from 'potential wetted zones' to 'wetted zones'

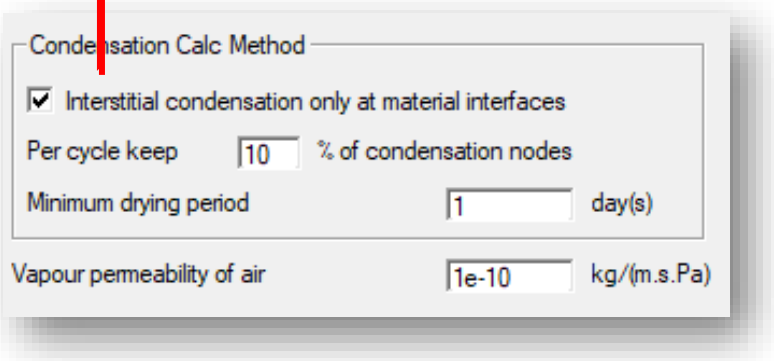
physibel

TRISCO v16

# A3. New calculation parameters

overview

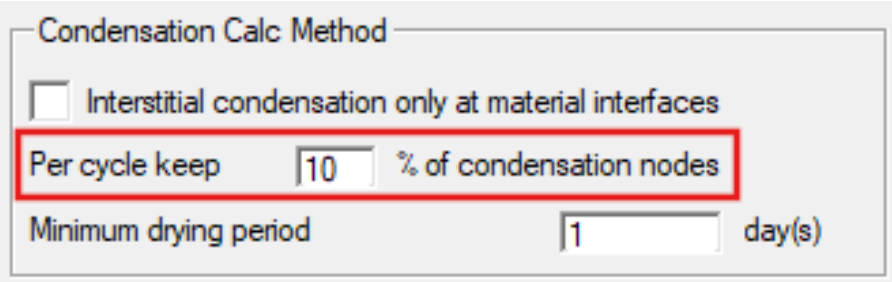
Interstitial condensation only at material interfaces (= according to EN ISO 13788).

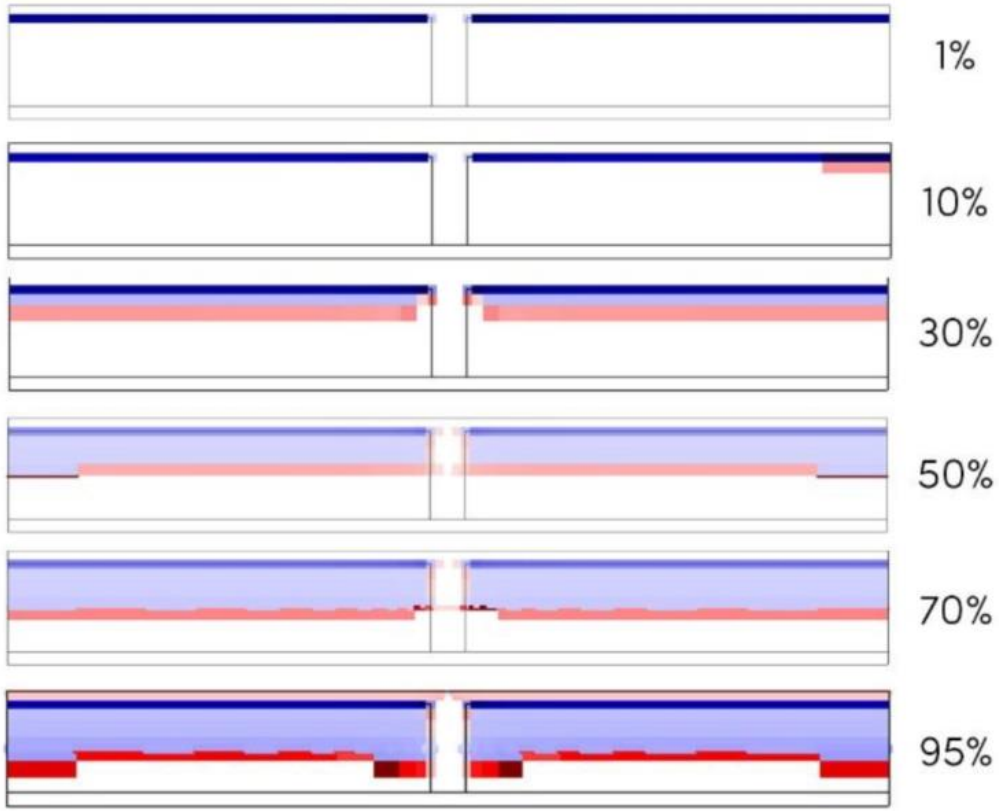


# A3. New calculation parameters

overview

## Per cycle keep … % of condensation nodes




More accurate results.
Longer simulation time

➔ A 10% setting is recommended for simple models, 30% or 50% for complex ones.

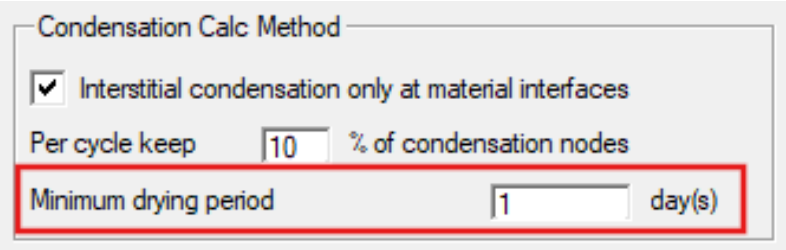
physibel

TRISCO v16

# A3. New calculation parameters

overview

Minimum drying period: … days




During the period drying it is likely that the wetted zone is fully dried out with a calculation step (1 month).

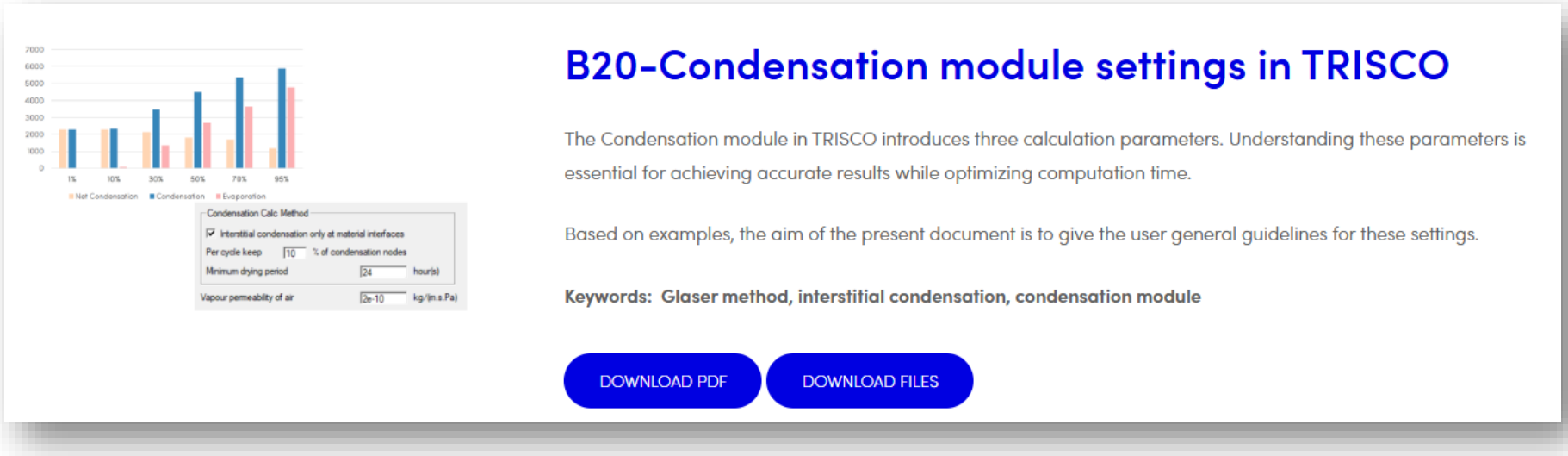
With this parameter the time step can be split to match the release of the wetted nodes within the resolution of 1 hour.

-> To achieve more accurate results, it is recommended to use a **1-day minimum drying period.**

# A3. New calculation parameters

overview

Guidelines and examples of these settings can be found on the Knowledge Base:



# B1. Colour Window

overview

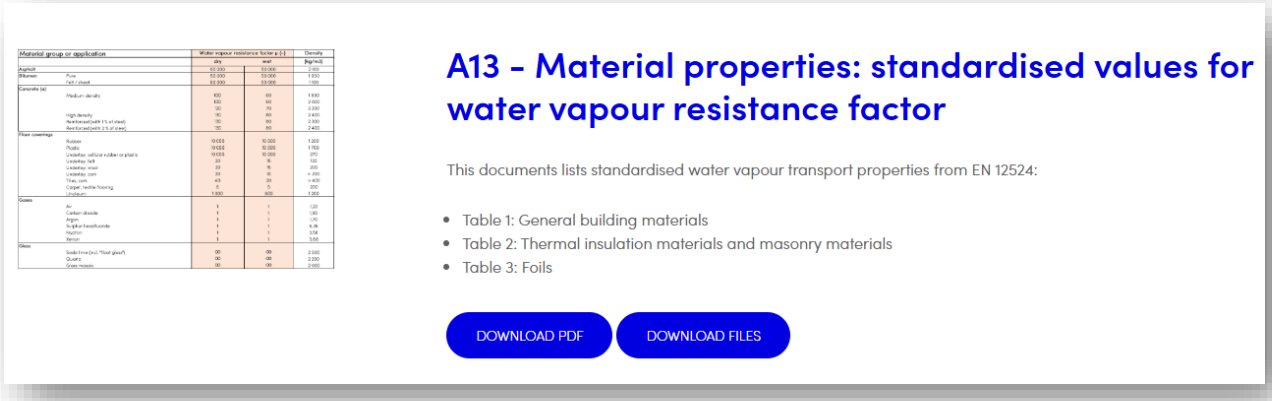
Vapour diffusion factor (μ-value) will be available from material database.

Colours

| Col. | | Type | Subtype | Physical flow dir. | Geometrical flow dir. | Name | ε1 / ε2 [- / -] | λ [W/mK] | ε [-] | μ [-] |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | MATERIAL | | | | softwood 500 kg/m3 | | 0.130 | | 50 |
| 133 | | MATERIAL | | | | insulation 0.030 W/mK | | 0.030 | | 1.50 |
| 161 | | MATERIAL | | | | gypsum plasterboard | | 0.250 | | 10 |

To be defined by user (and/or set in Colour Database)
(Default values in Colour Database: μ=1)

Examples available on Knowledge Base:



# B1. Colour Window

overview

Boundary coundition input for monthly calculation according to EN ISO 13788

Colours

| Col. | | Type | Subtype | Physical flow dir. | Geo flow | Name | ε1 / ε2 [- / -] | λ [W/mK] | ε [-] | μ [-] | θ [°C] | RH [%] | h [W/m²K] | q [W/m²] | θa [°C] | hc [W/m²K] | Pc [W] | θr [°C] | Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 161 | | MATERIAL | | | | gypsum plasterboard | | 0.250 | | 10 | | | | | | | | | |
| 170 | | BC_SIMPL | HE | | | exterior | | | | | -5.0 | 70.0 | 25.00 | 0 | | | | | EN13788 |
| 190 | | BC_SIMPL | HI | UP | | indoors; upwards heat flow | | | | | 20.0 | 80.0 | 10.00 | 0 | | | | | EN13788 |

physibel

TRISCO v16

# B1. Colour Window

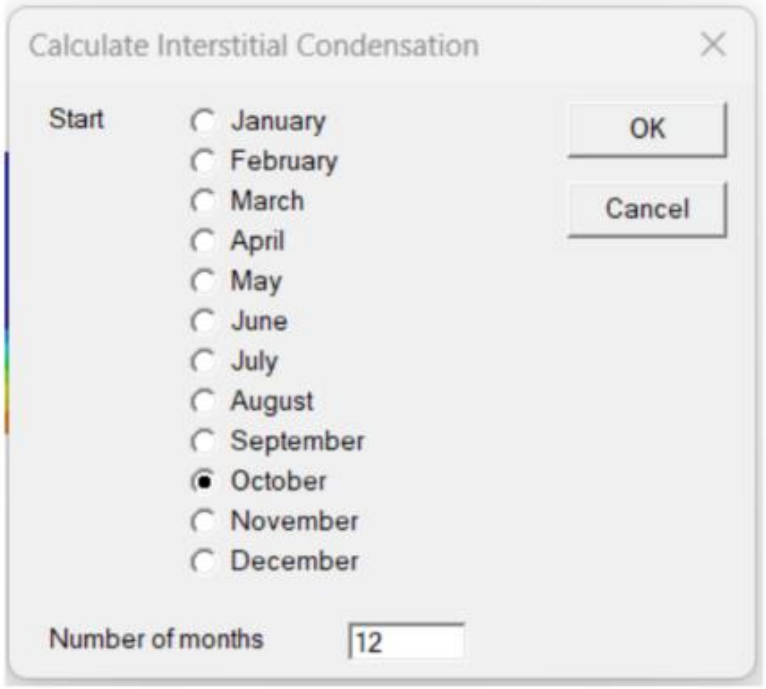
overview

Input monthly climate data to assess interstitial condensation accumulation over months or years.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170 | | BC_SIMPL | CLIM_E | | | exterior | | | | | CLIM | CLIM |
| 190 | | BC_SIMPL | CLIM_I | UP | | indoors; upwards heat flow | | | | | CLIM | CLIM |

Monthly Mean Climate Data

| Month | θe [°C] | RHe[%] | θi [°C] | RHi[%] |
|---|---|---|---|---|
| January | 0.0 | 70.0 | 20.0 | 60.0 |
| February | 3.0 | 70.0 | 20.0 | 60.0 |
| March | 5.0 | 70.0 | 20.0 | 60.0 |
| April | 10.0 | 70.0 | 20.0 | 60.0 |
| May | 12.0 | 70.0 | 20.0 | 60.0 |
| June | 15.0 | 70.0 | 20.0 | 60.0 |
| July | 18.0 | 70.0 | 20.0 | 60.0 |
| August | 20.0 | 70.0 | 20.0 | 60.0 |
| September | 15.0 | 70.0 | 20.0 | 60.0 |
| October | 12.0 | 70.0 | 20.0 | 60.0 |
| November | 8.0 | 70.0 | 20.0 | 60.0 |
| December | 5.0 | 70.0 | 20.0 | 60.0 |



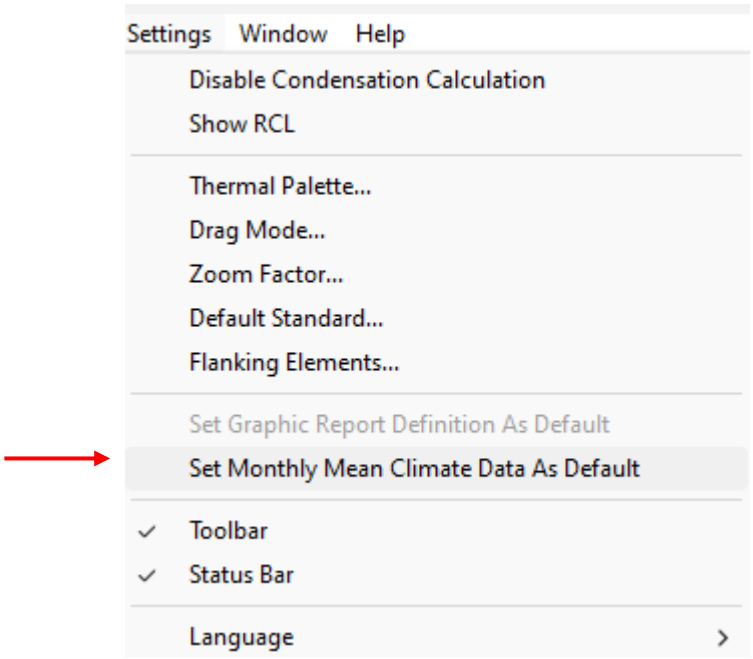

physibel

TRISCO v16

# B1. Colour Window

overview

Option to save generated Climatic data as default




Monthly Mean Climate Data

| Month | θe [°C] | RHe[%] | θi [°C] | RHi[%] |
|---|---|---|---|---|
| January | 0.0 | 70.0 | 20.0 | 60.0 |
| February | 3.0 | 70.0 | 20.0 | 60.0 |
| March | 5.0 | 70.0 | 20.0 | 60.0 |
| April | 10.0 | 70.0 | 20.0 | 60.0 |
| May | 12.0 | 70.0 | 20.0 | 60.0 |
| June | 15.0 | 70.0 | 20.0 | 60.0 |
| July | 18.0 | 70.0 | 20.0 | 60.0 |
| August | 20.0 | 70.0 | 20.0 | 60.0 |
| September | 15.0 | 70.0 | 20.0 | 60.0 |
| October | 12.0 | 70.0 | 20.0 | 60.0 |
| November | 8.0 | 70.0 | 20.0 | 60.0 |
| December | 5.0 | 70.0 | 20.0 | 60.0 |

# C1. EN ISO standards

overview

Condensation module is a 3D implementation of EN ISO 13788 in TRISCO

Colours

| Col. | | Type | Subtype | Physical flow dir. | Geo flow | Name | ε1 / ε2 [- / -] | λ [W/mK] | ε [-] | μ [-] | θ [°C] | RH [%] | h [W/m²K] | q [W/m²] | θa [°C] | hc [W/m²K] | Pc [W] | θr [°C] | Standard |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 161 | | MATERIAL | | | | gypsum plasterboard | | 0.250 | | 10 | | | | | | | | | |
| 170 | | BC_SIMPL | HE | | | exterior | | | | | -5.0 | 70.0 | 25.00 | 0 | | | | | EN13788 |
| 190 | | BC_SIMPL | HI | UP | | indoors; upwards heat flow | | | | | 20.0 | 80.0 | 10.00 | 0 | | | | | EN13788 |

- Used as an assessment tool
- No capillary/hygroscopic materials
- When a monthly approach is justified
- No air transport involved

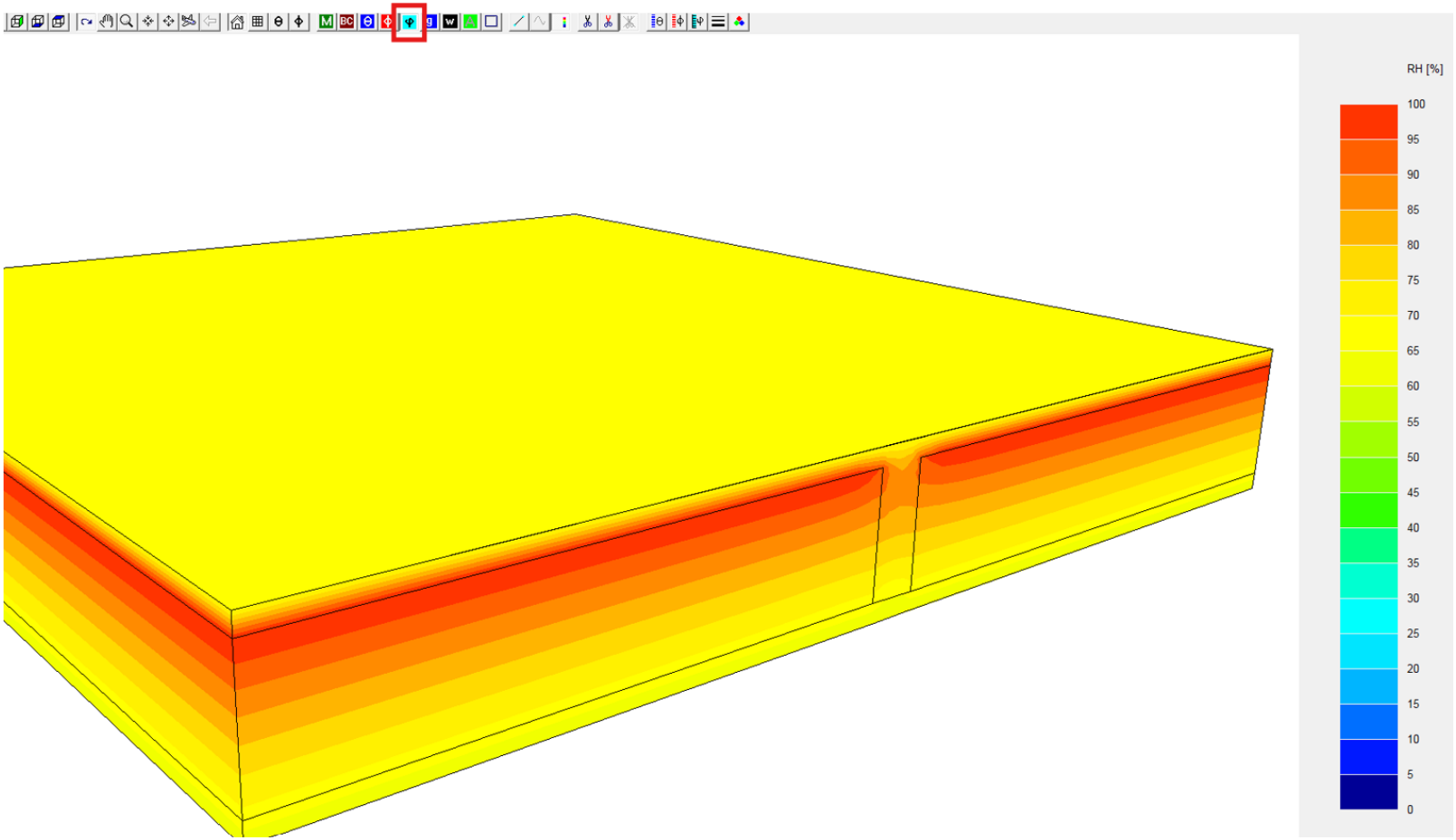
physibel

TRISCO v16

# D.1 Graphic output

overview

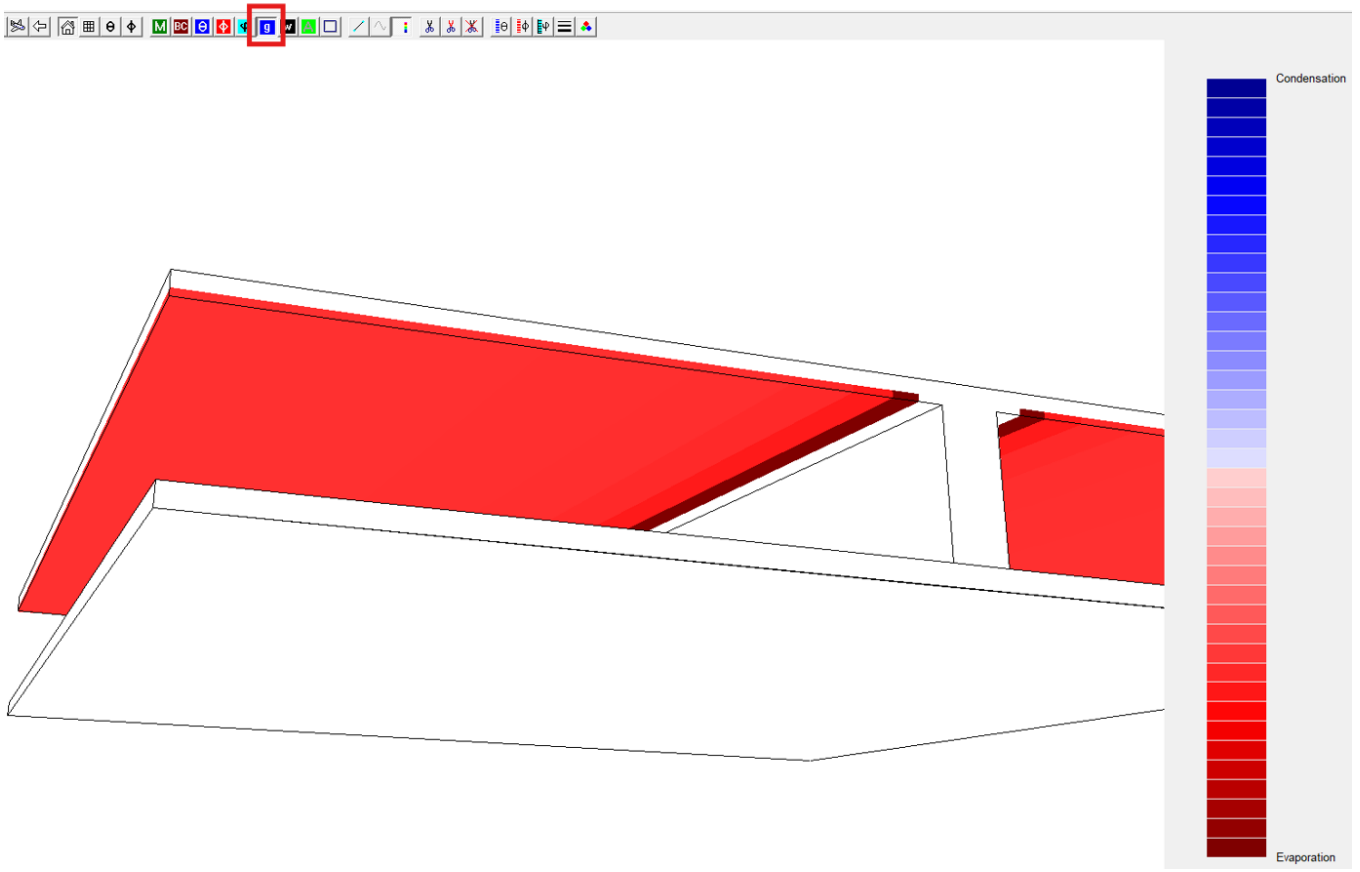
## Graphic Output -> Fill Relative Humidity



# D.1 Graphic output

overview

## Graphic Output -> Fill Interstitial Condensation Rate

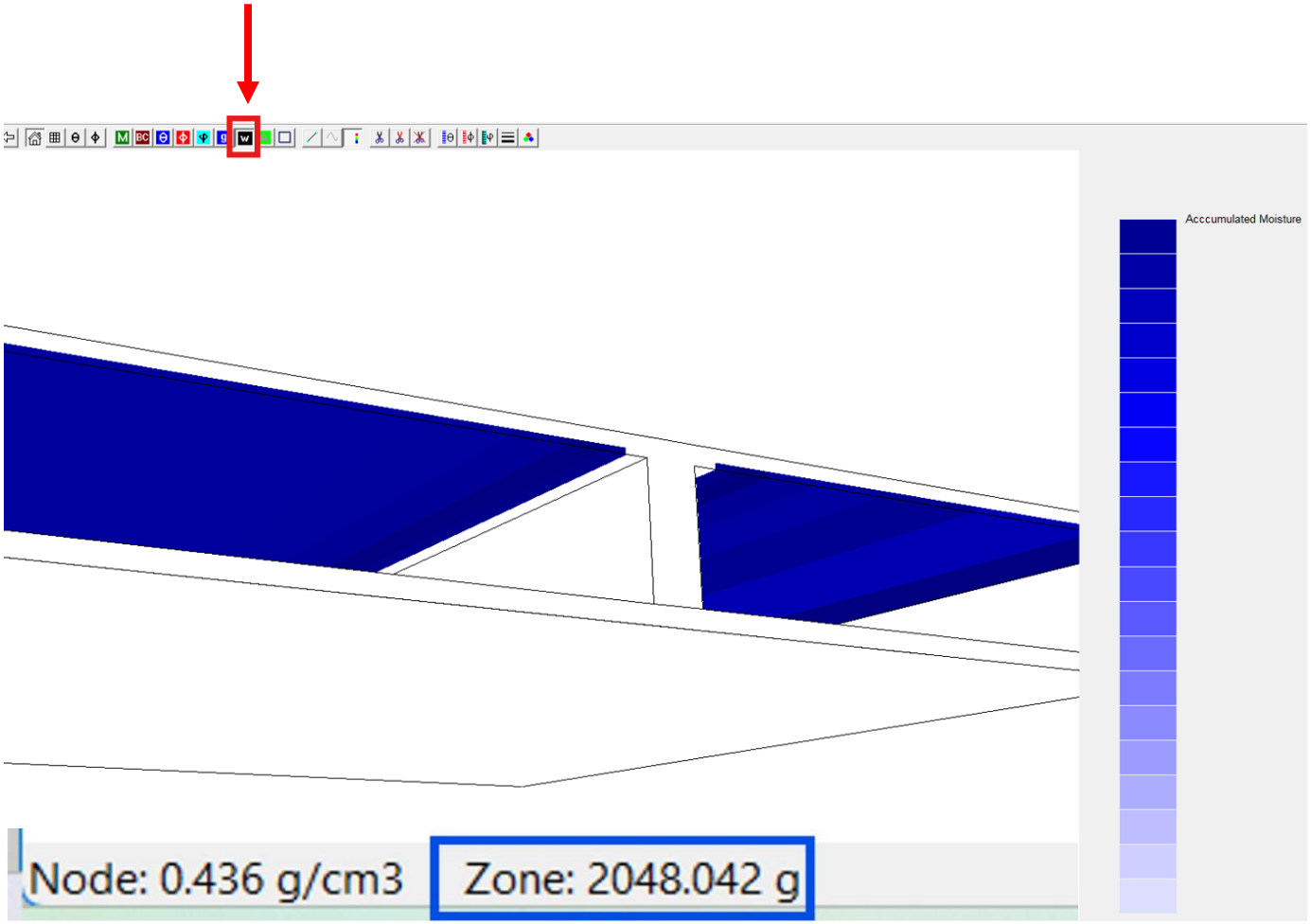



Last calculation period

# D.1 Graphic output

overview

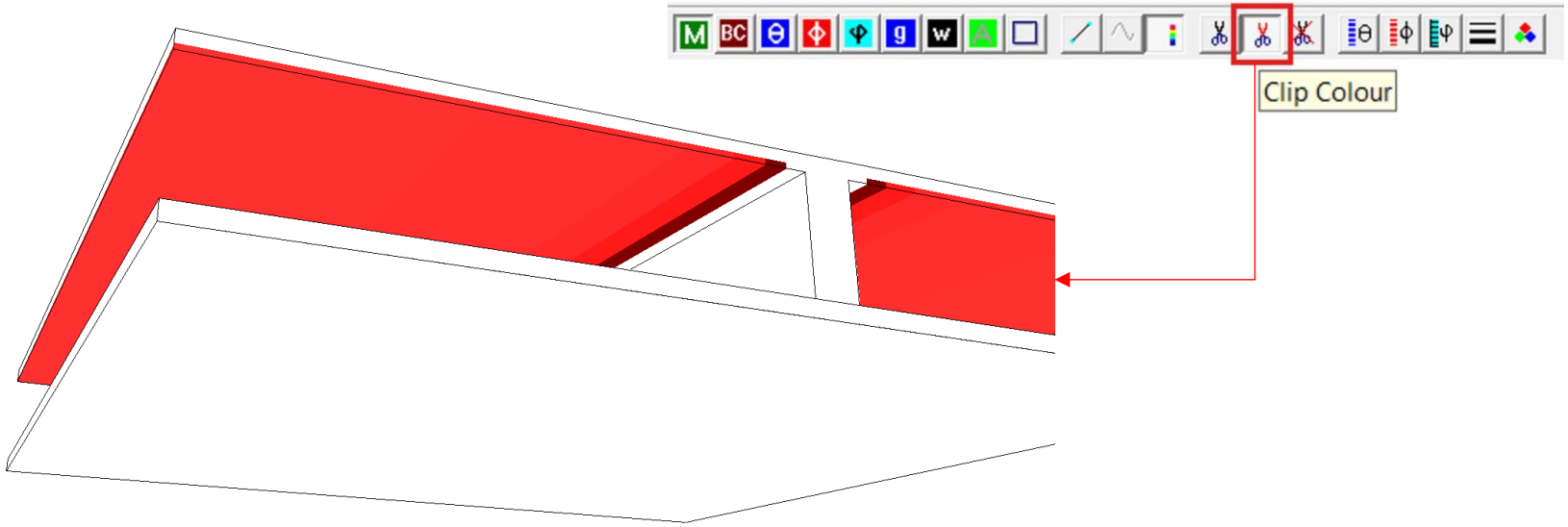
Graphic Output -> Fill Accumulated Interstitial Moisture

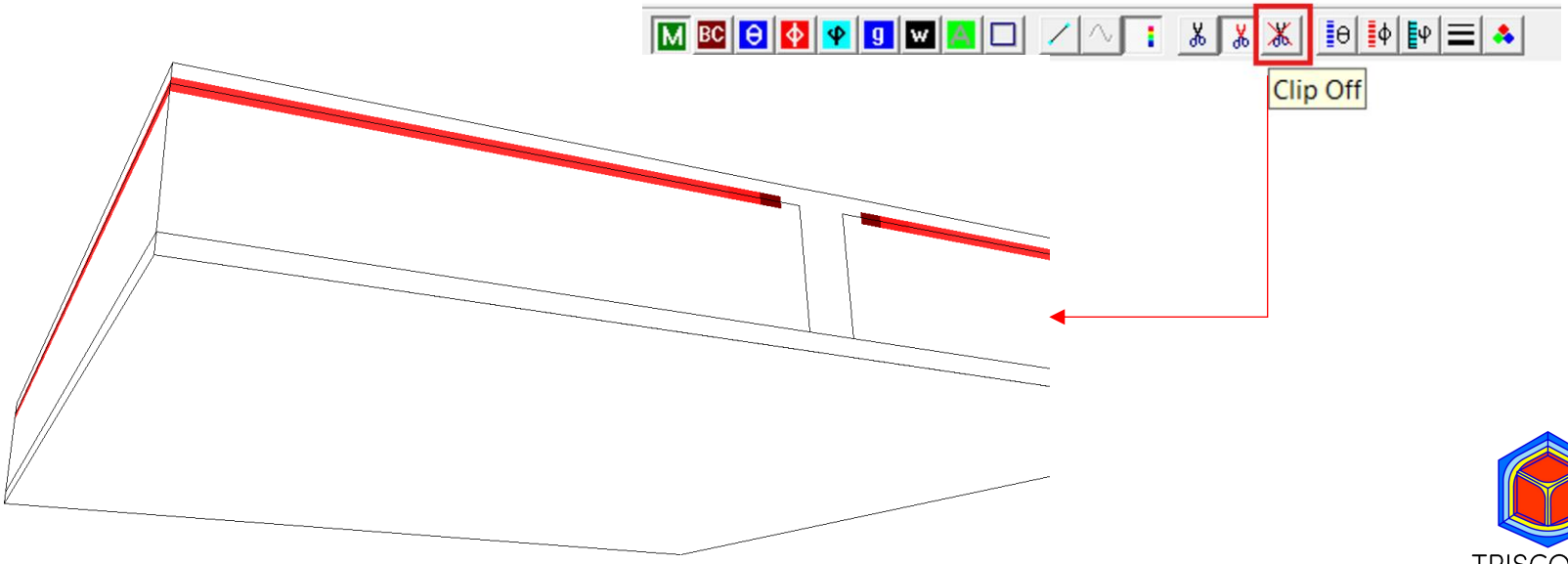


# D.1 Graphic output

overview

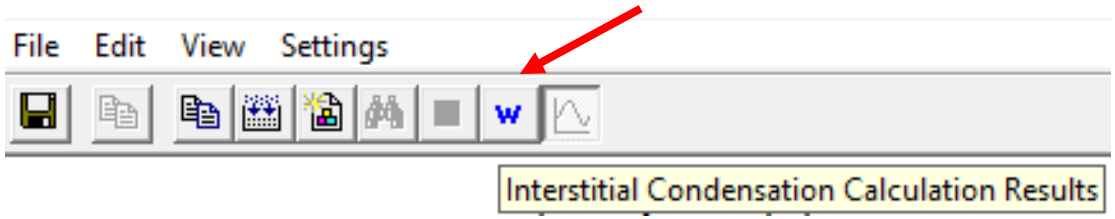
## Graphic Output -> Clip Colour/Clip Off



# E.1 Text Output

overview

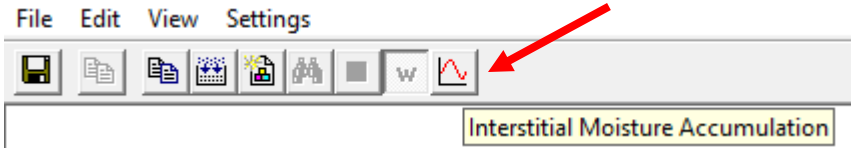



```
TRISCO - Interstitial Condensation Calculation Results

TRISCO data file: C5_HUMID.trc

Number of nodes = 32
Vapour flow divergence for total object = 3.61568e-10 %
Vapour flow divergence for worst node = 1.4008e-09 %

Net interstitial condensation rate in entire object (last calculation period)
Condensation - evaporation = -107.966 g/(30 days)
```

# E.1 Text Output

overview

## Text Output




| | Month | #Days | #Calculation periods | Condensation [g] | Accumulated [g] |
|---|---|---|---|---|---|
| 1 | October | 31 | 1 | 0.021 | 0.021 |
| 2 | November | 30 | 10 | 672.091 | 672.112 |
| 3 | December | 31 | 1 | 631.274 | 1303.386 |
| 4 | January | 31 | 1 | 1139.345 | 2442.732 |
| 5 | February | 28 | 1 | 770.075 | 3212.807 |
| 6 | March | 31 | 1 | 631.275 | 3844.083 |
| 7 | April | 30 | 1 | -45.059 | 3799.024 |
| 8 | May | 31 | 2 | -375.187 | 3423.837 |
| 9 | June | 30 | 4 | -904.288 | 2519.550 |
| 10 | July | 31 | 4 | -1589.154 | 930.396 |
| 11 | August | 31 | 12 | -930.385 | 0.011 |
| 12 | September | 30 | 9 | 0.005 | 0.016 |

The number of cycles in monthly simulation, depends on **Minimum Drying Period** setting

Monthly condensation or evaporation amount (g).

Accumulated moisture amount (g) over time.

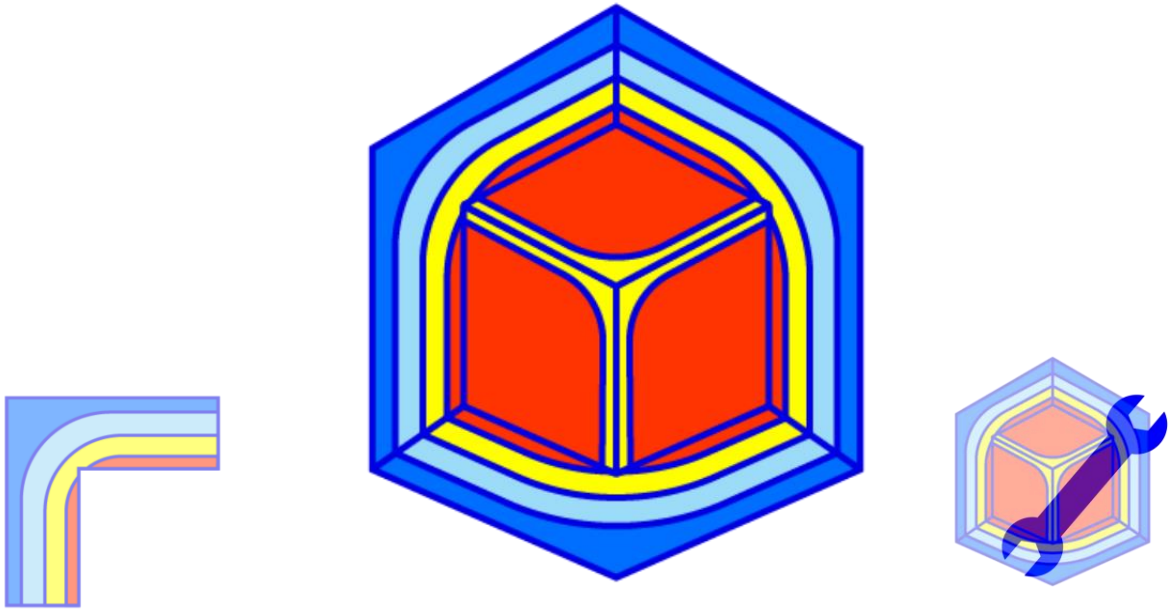
# F.1 Documentation of the Condensation module

overview

- S3 - Condensation module in TRISCO (seminar/article)
- B20 - Condensation module settings in TRISCO
- A13 - Material properties: standardised values for water vapour resistance factor
- A11-Validation of the condensation module (TRISCO) according to EN ISO 13788
- A15 - Validation of the condensation feature (TRISCO) according to ASHRAE handbook of fundamentals.
- F2- Preparing indoor and outdoor climate data for use in the Physibel program GLASTA according to EN ISO 13788
- T-TRCd - TRISCO short tutorial series: Youtube tutorial video

physibel

# TRISCO v16  New program performances



www.physibel.be/en/products/trisco

downloadable program demo version