

Translation

No. 13402

Language of translation: English

Translation of the document:

Document Test report No. 15-0009-0PR01 (PB-E01-06-de-01)

Titled:

Nachweis Prüfbericht Nr. 15-000173-PR01 (PB-E01-06-de-01)

Numbered:

15-000173-PR01 (PB-E01-06-de-01)

Issued on:

1.07.2015

By:

ift Rosenheim GmbH, Theodor-Gietl-Str. 7-9, D-83026 Rosenheim

Contracted by:

ALUPROF S.A., ul. Warszawska 153, 43-300 Bielsko-Biała



Lublin, 2020-12-18

Client ALUPROF S.A.
 Head office, plant in Bielsko Biala
 153 Warszawska street
 43-300 Bielsko-Biala
 Poland

Product Designation Roller shutter box with a shutter
 Different, see Chapter 1, Chapter 3 and Annex to this document

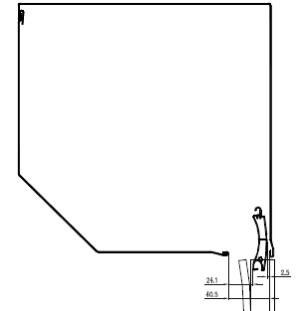
Product data relevant for the performance roller shutter; material aluminium alloy filled with insulating material and polyvinyl chloride (PVC-U); profile cross-section, nominal width x thickness 37 x 8 to 55 x 14; insert; material polyurethane foam (PU); bottom bar; sealing below; type stopper seal (rubber profile); joint width e_1 in mm 0; roller shutter box; outlet on top; joint width e_2 in mm 0 bis 25,5; guide; sealing on the side; type bottom slat or brush seal; joint width e_3 in mm 0

Special features -/-

Basis *)
 According to
 EN ISO 10077-2:2012
 EN13125:2001-04
 SG 06 binding
 NB-CPD/SG06/11/083 2011-09

Pictures

Tested sample



See annex for more information.

Notes concerning the use

The results can be used for documentation according to the above mentioned principles.

Applicability

The above-mentioned data and results refer exclusively to the tested and described sample.

This test does not allow for a statement on further performance and quality-determining characteristics of the construction.

Notes on publications

The "Instructions for using ift test documentation" applies. The document may only be published in its entirety.

Content

The document consists of 11 pages and annexes (26 pages).

Result
 Thermal resistance according to EN ISO 10077-2:2012 and additional thermal resistance according to EN 13125:2001-04



$$R_{sh} = 0.01 \text{ to } 0.13 \text{ (m}^2 \cdot \text{K)/W}$$

$$\Delta R = 0.09 \text{ to } 0.24 \text{ (m}^2 \cdot \text{K)/W}^*$$

* assignment of air permeability classes see Chapter 3 4

ift Rosenheim
 01.07.2015

Konrad Huber, Eng. (FH)
 Test station manager
 Construction physics

Till Stübgen, Eng. (FH)
 Test engineer
 Construction physics

1 Subject

1.1 Description of the test sample

| | |
|--|--|
| Product | Roller shutter box with a shutter |
| Manufacturer | ALUPROF S.A. (Poland) |
| Shutter | |
| Product identification | PA37, PA39, PA40, PA45. PA52, PA55, PE41, PE55, PT37, PT52 |
| Material | Aluminium alloy filled with insulating material and polyvinyl chloride (PVC-U) |
| Surface treatment | Aluminium varnished or powder coated PVC untreated |
| Profile cross-section in mm (Nominal width x thickness) | 37 x 8 to 55 x 14 |
| Insert | |
| Material | Polyurethane foam (PU). EN ISO 10456 |
| Thermal conductivity in W/(mK) | 0.05 |
| Bottom bar | |
| Product identification | LDG, LDG-E, LDG 40 |
| Material | Aluminium alloy and polyvinyl chloride (PVC-U) |
| Profile cross-section (width x thickness) in mm | 40 x 7 to 56 x 7 |
| Bottom sealing | Stop seal (rubber profile) |
| Joint width e_1 in mm | 0 |
| Roller shutter box | |
| Product identification | SAR-SK, SKO-P, SK, SK + MKT, SKP, SKP + MKT, SP, SP + MKT, SP-E, SKO, SKO + MKT, SKO-P, SKO-P + MKT, SKN, SKT, SKT + MKT |
| Material | Aluminium alloy and polyvinyl chloride (PVC-U) |
| Surface treatment | Aluminium varnished or powder-coated PCV untreated |
| Outlet | |
| Sealing | Some with a bottom slat or brush seal |
| Joint width e_2 in mm | 0 to 25.5 (see Chapter 3.2) |
| Side guide | |
| Product identification | PU29, PU43, PP45, PP53, PP66, PP68, PP53/ODS, PK53, PPD79, PPD79/ODS, PPDO53, PPW66, PPW80, PPW90, |
| Profile cross-section (width x thickness) in mm | 29 x 29 to 31 x 90 Bottom slate or brush seal |
| Side sealing | 0 |
| Joint width e_3 in mm | |
| Installation | |
| Assembly | No detailed information on the installation of roller shutter systems was made available by the manufacturer. |

The description is based on the data provided by the Client and the test of the product in the ift. (Product names/ numbers as well as material data are provided by the Client unless they are marked as "checked by the ift".)

Pictures of the tested samples are documented in the annex "Pictures of the product/ tested sample".
Details of the construction were checked exclusively with regard to the following features/ performance;
Drawings are based on unchanged documents provided by the Client, unless stated otherwise.

1.2 Sampling

The ift was provided with the following data:

Sample ALUPROF S.A. Head office, plant in Bielsko Biala

provided by:

Document: A sampling report was not submitted to the ift.

ift sample 15-000173-PK01

number:

Date: 07.06.2015

2 Execution

2.1 Procedure documents *)

In accordance with EN ISO 10077-2:2012

Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 2 - Numerical method for frames

In accordance with EN ISO 10077-2:1998

EN 13125:2001-04

Shutters and blinds - Additional thermal resistance - Allocation of a class of air permeability to a product

SG 06 binding NB-CPD/SG06/11/083 2011-09

EN 14351-1:2006 Treatment of unventilated rectangular cavities when calculating thermal properties to EN ISO 10077-2

*) and the corresponding national versions, e.g. DIN EN

2.2 Short description of the procedure

Calculation of thermal resistance R_{sh}

The profile cross-section is divided into a sufficient number of elements, whereby a smaller subdivision would lead to no significant change in the total rate of heat flow. The corresponding materials or boundary conditions were documented, and the total rate of heat flow was determined. The rate of heat flow was a basis for the calculation of thermal resistance.

Calculation of additional thermal resistance ΔR

Based on geometric consideration, shutters are assigned to an air permeability class by adding the gaps between the shutter and its surroundings, and the associated additional thermal resistance is calculated according to EN ISO 10077-1.

3 Detailed results

3.1 Calculation of thermal resistance as input value for the calculation of additional thermal resistance

Calculation of thermal resistance

| | | | |
|-------------------------------|---|----------------------|-----------|
| Project no. | 15-000173-PR01 | Procedure No. | 15-000173 |
| Basis for the tests | EN ISO 10077-2:2012 Thermal performance of windows, doors and shutters - Calculation of thermal transmittance Part 2 - Numerical method for frames SG 06 binding NB-CPD/SG06/11/083 2011-09 EN 14351-1:2006 Treatment of unventilated rectangular cavities when calculating thermal properties to EN ISO 10077-2 | | |
| Used testing equipment | Sim/ 020841 - ift calculation plan | | |
| Tested sample | Shutter | | |
| Sample number | 15-000173-PK01 | | |
| Test date | 12.06.2015 | | |
| Responsible tester | Till Stübben | | |
| Tester | Till Stübben | | |

Information on the test setup / test procedures

| | |
|-----------------------|---|
| Test procedure | There are following deviations from the test procedure with reference to the standard/ basis: In contrast to the test basis, thermal resistance was determined on the basis of mean surface temperatures in the room and outside. |
| Note | The applied test method in accordance with EN ISO 10077-2: 2012 is identical to the one in EN ISO 10077-2: 1998, Section 6. |

Boundary conditions

| Boundary conditions | | Values | Source ¹⁾ | |
|---------------------|--|-----------------------|----------------------|-----|
| θ_i | Air temperature in the room | °C | 20 | -/- |
| θ_e | Air temperature outside | °C | 0 | -/- |
| ΔT | Temperature difference | K | 20 | -/- |
| R_{si} | Heat transfer resistance on the side of the room | (m ² ·K)/W | 0.13 | -/- |
| R_{se} | Heat transfer resistance on the external side | (m ² ·K)/W | 0.04 | -/- |

Material properties

| Material properties | | Values | Source ¹⁾ | |
|---------------------|--|---------|----------------------|-----|
| ϵ_n | Emission degree | | 0.9 | -/- |
| λ | Thermal conductivity of aluminium (Si alloys) | W/(.mK) | 160 | -/- |
| λ | Thermal conductivity of PU foam | W/(mK) | 0.05 | -/- |
| λ | Thermal conductivity of hard PVC (polyvinyl chloride) | W/(mK) | 0.17 | -/- |
| λ | Thermal conductivity of a replacement panel EN ISO 10077-2 | W/(mK) | 0.035 | -/- |

1) Unless otherwise stated, the data are taken from the EN ISO 10456 and EN ISO 10077-2 standards.
The emissivity of low-emitting layers must be ensured by a factory production control.

Calculation of thermal resistance R_{sh}

Thermal resistance is determined by:

$$R_{sh} = \frac{(\theta_{si} - \theta_{se}) \times b_{ges}}{Q_{ges}}$$

| Definition | Unit |
|---|----------------------|
| R_{sh} Thermal resistance | (m ² K)/W |
| b_{ges} Total width | m |
| θ_{si} Mean surface temperature on the side of room | K |
| θ_{se} Mean surface temperature on the external side | K |
| Q_{ges} Country-specific heat flux | W/m |

| PK- no. | Note | b_{ges} | θ_{si} | θ_{se} | Q_{ges} |
|---------|----------------|-----------|---------------|---------------|-----------|
| PK01 | Shutter "PA37" | 0.043 | 5.4 | 4.7 | 5.206 |
| PK02 | Shutter "PA39" | 0.044 | 5.5 | 4.7 | 5.377 |
| PK03 | Shutter "PA40" | 0.048 | 5.4 | 4.7 | 5.476 |
| PK04 | Shutter "PA45" | 0.052 | 5.4 | 4.6 | 6.141 |
| PK05 | Shutter "PA52" | 0.060 | 5.8 | 4.5 | 7.068 |
| PK06 | Shutter "PA55" | 0.065 | 5.8 | 4.5 | 7.431 |
| PK07 | Shutter "PE41" | 0.049 | 10.1 | 3.1 | 3.863 |
| PK08 | Shutter "PE55" | 0.064 | 11.5 | 2.7 | 4.398 |
| PK09 | Shutter "PT37" | 0.044 | 9.4 | 3.5 | 3.88 |
| PK10 | Shutter "PT52" | 0.060 | 10.8 | 3.0 | 4.735 |

Test result

Thermal resistance in (m²K)/W:

| | | Calculation value | Rounded value according to EN 13125:2001 |
|------|-------|-------------------|--|
| PK01 | Rsh = | 0.006 | 0.01 |
| PK02 | Rsh = | 0.007 | 0.01 |
| PK03 | Rsh = | 0.007 | 0.01 |
| PK04 | Rsh = | 0.007 | 0.01 |
| PK05 | Rsh = | 0.011 | 0.01 |
| PK06 | Rsh = | 0.011 | 0.01 |
| PK07 | Rsh = | 0.088 | 0.09 |
| PK08 | Rsh = | 0.129 | 0.13 |
| PK09 | Rsh = | 0.066 | 0.07 |
| PK10 | Rsh = | 0.098 | 0.10 |

3.2 Calculation of additional thermal resistance

Requirement for the assignment of the air permeability class according to EN 13125:2001 and calculation of additional thermal resistance ΔR according to Table 1.

Table 1: Overview of air permeability classes and ΔR calculation

| Air permeability class | Total width of the gaps in [mm] | Calculation of additional thermal resistance AR in (m ² K) / W |
|------------------------|---------------------------------|---|
| 1 | $e_{tot} > 35$ | $\Delta R = 0.08$ |
| 2 | $15 < e_{tot} \leq 35$ | $\Delta R = 0.25R_{sh} + 0.09$ |
| 3 | $8 < e_{tot} \leq 15$ | $\Delta R = 0.55R_{sh} + 0.11$ |
| 4 | $e_{tot} \leq 8$ | $\Delta R = 0.80R_{sh} + 0.14$ |
| 5* | $e_{tot} \leq 3$ | $\Delta R = 0.95R_{sh} + 0.17$ |

* Additional installation requirements as a condition for the assignment to air permeability class 5 according to EN 13125:2001, section 4.3.

Joint width bottom e_1 0 mm (stop seal with rubber profile)
 Joint width, top e_2 : See table 2 (corresponds to the total joint width e_{tot})
 Joint width side e_3 : 0 mm (guides with a bottom slat)

Table 2: Total joint width e_{tot} and assignment to an air permeability class

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-----|
| | | e_{tot} in mm ($e_1 + e_2 + e_3$) / assignment to an air permeability class | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SAR SK | 250 | - | - | - | - | - | - | - | - | - | - | 2.5* | |
| | 300 | - | - | - | - | - | - | - | - | - | - | 2.5* | |
| SAR SKO-P | 230 | - | - | - | - | - | - | - | - | - | - | 3.4 | |
| | 250 | - | - | - | - | - | - | - | - | - | - | 3.1 | |
| | 300 | - | - | - | - | - | - | - | - | - | - | 3.1 | |
| SK | 125 | 4.5 | - | 4.3 | 4.0 | - | - | - | - | - | - | - | |
| | 137 | 4.5 | 4.2 | 4.3 | 4.0 | 4.1 | 4.0 | 4.7 | - | 4.3 | 4.7 | - | |
| | 150 | 4.3 | 4.0 | 4.1 | 3.8 | 3.9 | 3.8 | 4.5 | - | 4.1 | 4.5 | - | |
| | 165 | 4.5 | 4.2 | 4.3 | 4.0 | 4.1 | 4.0 | 4.7 | 4.5 | 4.3 | 4.7 | 4.2 | 4.5 |
| | 180 | 4.5 | 4.2 | 4.3 | 4.0 | 4.1 | 4.0 | 4.7 | 4.5 | 4.3 | 4.7 | 4.2 | 4.4 |
| | 205 | 4.5 | 4.2 | 4.3 | 4.0 | 4.1 | 4.0 | 4.7 | 4.5 | 4.3 | 4.7 | 4.2 | 4.4 |
| SK + MKT | 150 | 11.7 | - | 11.5 | 11.3 | 11.4 | 11.2 | - | - | 11.5 | - | | |
| | 165 | 11.6 | - | 11.4 | 11.1 | 11.2 | 11.1 | - | - | 11.3 | - | | |
| | 180 | 12.1 | - | 11.9 | 11.7 | 11.8 | 11.6 | - | - | 11.9 | - | | |
| | 205 | 12.7 | - | 12.5 | 12.2 | 12.3 | 12.2 | - | - | 12.4 | - | | |
| SKP | 137 | 4.3 | 4.3 | 4.1 | 3.8 | 3.9 | 3.8 | 4.8 | - | 4.0 | 5.2 | - | |
| | 150 | 4.5 | 4.5 | 4.3 | 4.1 | 4.2 | 4.0 | 5.0 | - | 4.3 | 5.5 | - | |
| | 165 | 4.3 | 4.3 | 4.1 | 3.8 | 3.9 | 3.8 | 4.8 | 4.5 | 4.0 | 5.2 | 4.3 | 4.5 |
| | 180 | 4.3 | 4.3 | 4.1 | 3.8 | 3.9 | 3.8 | 4.8 | 4.5 | 4.0 | 5.2 | 4.3 | 4.5 |
| | 205 | 4.1 | 4.1 | 3.9 | 3.6 | 3.7 | 3.6 | 4.6 | 4.3 | 3.8 | 5.0 | 4.1 | 4.3 |

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|---------|--|-------|-------|-------|-------|-------|-------|-------|-------|-----|-------|-----|
| | | e _{tot} in mm (e ₁ + e ₂ + e ₃) / assignment to an air permeability class | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | | PE 55 | |
| SKP + MKT | 150 | 13.0 | - | 12.8 | 12.5 | 12.6 | 12.5 | - | - | 12.7 | | - | |
| | 165 | 8.3 | - | 8.1 | 7.9 | 8.0 | 7.8 | - | - | 8.1 | | - | |
| | 180 | 8.3 | - | 8.1 | 7.9 | 8.0 | 7.8 | - | - | 8.1 | | - | |
| | 205 | 9.5 | - | 9.3 | 9.1 | 9.2 | 9.0 | - | - | 9.3 | | - | |
| SP | 137 | 4.5 | 4.5 | 4.3 | 4.0 | 4.1 | 4.0 | 5.0 | - | 4.3 | 5.4 | - | |
| | 165 | 4.5 | 4.5 | 4.3 | 4.0 | 4.1 | 4.0 | 5.0 | 4.7 | 4.3 | 5.4 | 4.5 | 4.7 |
| | 180 | 4.3 | 4.3 | 4.1 | 3.8 | 3.9 | 3.8 | 4.8 | 4.5 | 4.1 | 5.2 | 4.3 | 4.5 |
| | 205 | 4.5 | 4.5 | 4.3 | 4.0 | 4.1 | 4.0 | 5.0 | 4.7 | 4.3 | 5.4 | 4.5 | 4.7 |
| SP + MKT | 165 | 20.9 | - | 20.7 | 20.4 | 20.5 | 20.3 | - | - | 20.6 | | - | |
| | 180 | 10.0 | - | 9.8 | 9.5 | 9.7 | 9.5 | - | - | 9.8 | | - | |
| | 205 | 25.5 | - | 25.3 | 25.0 | 25.1 | 24.9 | - | - | 25.2 | | - | |
| SP-E | 137 | 4.2 | 4.1 | 4.0 | 3.7 | 3.8 | 3.7 | 4.7 | - | 3.9 | 5.1 | - | |
| | 150 | 4.1 | 4.2 | 4.0 | 3.7 | 3.8 | 3.7 | 4.7 | - | 3.9 | 5.1 | - | |
| | 165 | 4.5 | 4.5 | 4.3 | 4.0 | 4.1 | 4.0 | 5.0 | 4.7 | 4.2 | 5.4 | 4.5 | 4.7 |
| | 180 | 4.2 | 4.2 | 4.0 | 3.7 | 3.8 | 3.7 | 4.7 | 4.4 | 3.9 | 5.1 | 4.2 | 4.4 |
| | 205 | 3.9 | 4.0 | 3.8 | 3.5 | 3.6 | 3.5 | 4.5 | 4.2 | 3.7 | 4.9 | 4.0 | 4.2 |
| SP-E + MKT | 150 | 8.1 | - | 7.9 | 7.7 | 7.7 | 7.6 | - | - | 7.9 | | - | |
| | 165 | 7.8 | - | 7.6 | 7.3 | 7.5 | 7.3 | - | - | 7.5 | | - | |
| | 180 | 10.3 | - | 10.1 | 9.9 | 10.0 | 9.8 | - | - | 10.1 | | - | |
| | 205 | 9.1 | - | 8.9 | 8.6 | 8.8 | 8.6 | - | - | 8.8 | | - | |
| SKO | 137 | 3.9 | 3.9 | 3.8 | 3.5 | 3.6 | 3.4 | 4.4 | - | 3.7 | 4.9 | - | |
| | 165 | 3.9 | 3.9 | 3.8 | 3.5 | 3.6 | 3.4 | 4.4 | 4.2 | 3.7 | 4.9 | 3.9 | 4.2 |
| | 180 | 3.9 | 3.9 | 3.7 | 3.5 | 3.6 | 3.4 | 4.4 | 4.2 | 3.7 | 4.9 | 3.9 | 4.2 |
| | 205 | 3.9 | 3.9 | 3.8 | 3.5 | 3.6 | 3.4 | 4.4 | 4.2 | 3.7 | 4.9 | 3.9 | 4.2 |
| SKO + MKT | 165 | 8.5 | - | 8.3 | 8.0 | 8.1 | 8.0 | - | - | 8.2 | | - | |
| | 180 | 9.1 | - | 8.9 | 8.6 | 8.7 | 8.6 | - | - | 8.6 | | - | |
| | 205 | 8.5 | - | 8.3 | 8.0 | 8.2 | 8.0 | - | - | 8.3 | | - | |
| SKO-P | 137 | 3.2 | 3.2 | 3.1 | 2.8* | 2.9* | 2.8* | 3.8 | - | 3.0* | 4.1 | - | |
| | 150 | 3.3 | 3.3 | 3.1 | 2.9* | 3.0* | 2.8* | 3.8 | - | 3.0* | 4.2 | - | |
| | 165 | 3.2 | 3.2 | 3.1 | 2.8* | 2.9* | 2.8* | 3.7 | 3.5 | 3.0* | 4.1 | 3.2 | 3.5 |
| | 180 | 3.2 | 3.2 | 3.0* | 2.8* | 2.8* | 2.7* | 3.7 | 3.4 | 2.9* | 4.1 | 3.2 | 3.4 |
| | 205 | 3.1 | 3.0* | 2.9* | 2.6* | 2.7* | 2.6* | 3.5 | 3.3 | 2.8* | 3.9 | 3.0* | 3.3 |
| SKO-P + MKT | 150 | 12.0 | - | 11.8 | 11.5 | 11.6 | 11.5 | - | - | 11.7 | | - | |
| | 165 | 14.5 | - | 14.3 | 14.1 | 14.2 | 14.0 | - | - | 14.3 | | - | |
| | 180 | 10.3 | - | 10.1 | 9.8 | 9.9 | 9.8 | - | - | 10.0 | | - | |
| | 205 | 11.0 | - | 10.8 | 10.5 | 10.6 | 10.5 | - | - | 10.7 | | - | |
| SKN | MW 24 | 6.9 | 6.5 | 6.7 | 6.4 | 6.5 | 6.4 | 7.0 | 6.8 | - | | - | |
| | MW 30 | 6.9 | 6.5 | 6.7 | 6.4 | 6.5 | 6.4 | 7.0 | 6.8 | - | | - | |
| | MW 36.5 | 6.9 | 6.5 | 6.7 | 6.4 | 6.5 | 6.4 | 7.0 | 6.8 | - | | - | |

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | etot in mm (ei + ej + es) / assignment to an air permeability class | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKT | 170 | 1.1* | 0* | 0.9* | 0.6* | 0.7* | 0.6* | 0* | 0* | - | - |
| | 210 | 1.1* | 0* | 0.9* | 0.6* | 0.7* | 0.6* | 0* | 0* | - | - |
| | 240 | 1.1* | 0* | 0.9* | 0.6* | 0.7* | 0.6* | 0* | 0* | - | - |
| SKT + MKT | 170 | 1.1* | 0* | 0.9* | 0.6* | 0.7* | 0.6* | 0* | 0* | - | - |
| | 210 | 1.1* | 0* | 0.9* | 0.6* | 0.7* | 0.6* | 0* | 0* | - | - |
| | 240 | 1.1* | 0* | 0.9* | 0.6* | 0.7* | 0.6* | 0* | 0* | - | - |

| | | | | | |
|---------------------------|---|---|---|---|----|
| Air permeability classes: | 1 | 2 | 3 | 4 | 4* |
|---------------------------|---|---|---|---|----|

* Additional installation requirements as a condition for the assignment to air permeability class 5 in accordance with EN 13125: 2001, Section 4.3 are not met.

Table 3: Additional thermal resistance ΔR in (m²K)/W

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| | | Additional thermal resistance AR in (m ² K)/W / W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | | PE 55 | |
| SARSK | 250 | - | - | - | - | - | - | - | - | - | - | - | 0.24 |
| | 300 | - | - | - | - | - | - | - | - | - | - | - | 0.24 |
| SAR SKO-P | 230 | - | - | - | - | - | - | - | - | - | - | - | 0.24 |
| | 250 | - | - | - | - | - | - | - | - | - | - | - | 0.24 |
| | 300 | - | - | - | - | - | - | - | - | - | - | - | 0.24 |
| SK | 125 | 0.20 | - | 0.15 | 0.15 | - | - | - | - | - | - | - | - |
| | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | - |
| | 150 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | - |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| SK + MKT | 150 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | - |
| | 165 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | - |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | - |
| | 205 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | - |
| SKP | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | - |
| | 150 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | - |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| SKP + MKT | 150 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | - |
| | 165 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | - |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | - |
| | 205 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | - |

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|---------|---|----------|----------|----------|----------|----------|----------|----------|-------|------|-------|------|
| | | Additional thermal resistance AR in (m ² K)/W) / W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | | PE 55 | |
| SP | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| SP + NI KT | 165 | 0.11 | - | 0.09 | 0.09 | 0.09 | 0.09 | - | - | 0.11 | | - | |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | |
| | 205 | 0.11 | - | 0.09 | 0.09 | 0.09 | 0.09 | - | - | 0.11 | | - | |
| SP-E | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 150 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| SP-E + MKT | 150 | 0.15 | - | 0.15 | 0.15 | 0.15 | 0.15 | - | - | 0.21 | | - | |
| | 165 | 0.20 | - | 0.15 | 0.15 | 0.15 | 0.15 | - | - | 0.21 | | - | |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | |
| | 205 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | |
| SKO | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| SKO + MKT | 165 | 0.15 | - | 0.12 | 0.15 | 0.12 | 0.15 | - | - | 0.16 | | - | |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | |
| | 205 | 0.15 | - | 0.12 | 0.15 | 0.12 | 0.15 | - | - | 0.16 | | - | |
| SKO-P | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 150 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| SKO-P + MKT | 150 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | |
| | 165 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | |
| | 205 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | | - | |
| SKN | MW 24 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |
| | MW 30 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |
| | MW 36.5 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |
| SKT | 170 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |
| | 210 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |
| | 240 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |
| SKT + MKT | 170 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |
| | 210 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |
| | 240 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - | - | |

Note: Additional thermal resistance AR must be taken into account when calculating the heat transfer coefficient U_{ws} of a window with closed shutters as follows:

$$U_{ws} = \frac{1}{\frac{1}{U_w} + \Delta R}$$

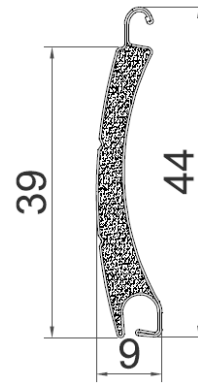
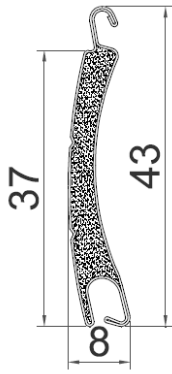


Figure 1: Cross-section of the probe BOS 01 (PA37) Figure 2: Cross-section of the probe NH02 (PA39)

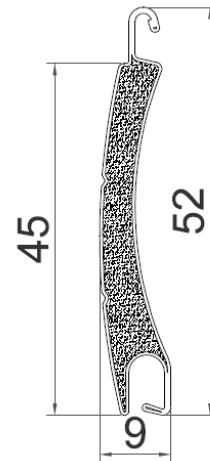
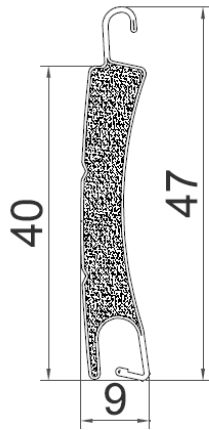


Figure 3: Cross-section of the probe PK 03 (PA40) Figure 4: Cross-section of the probe PK 04 (PA45)

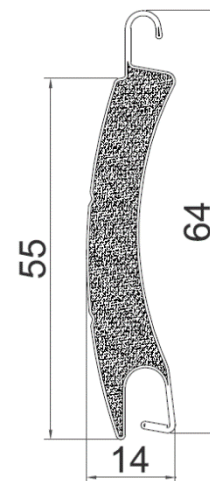


Figure 5: Cross-section of the probe PK 05 (PA52) Figure 6: Cross-section of the probe PK 06 (PA55)

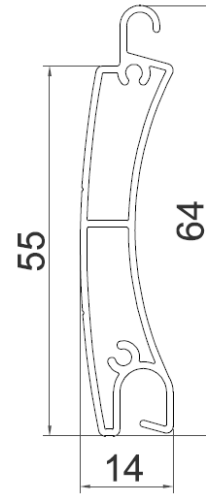
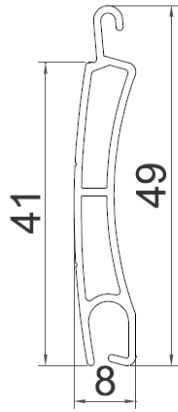
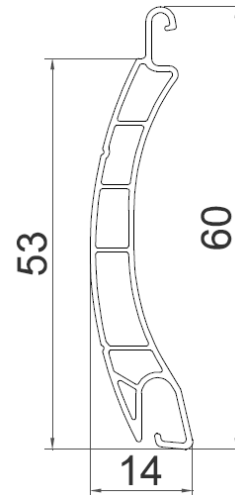
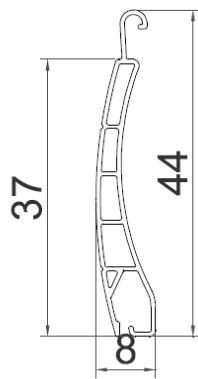


Figure 7: Cross-section of the probe PK 07 (PE41) Figure 8: Cross-section of the probe PK 08 (PE55)



Picture 9: Cross-section of the probe PK 09 (PT37) Figure 10: Cross-section of the probe PK 10 (PT52)

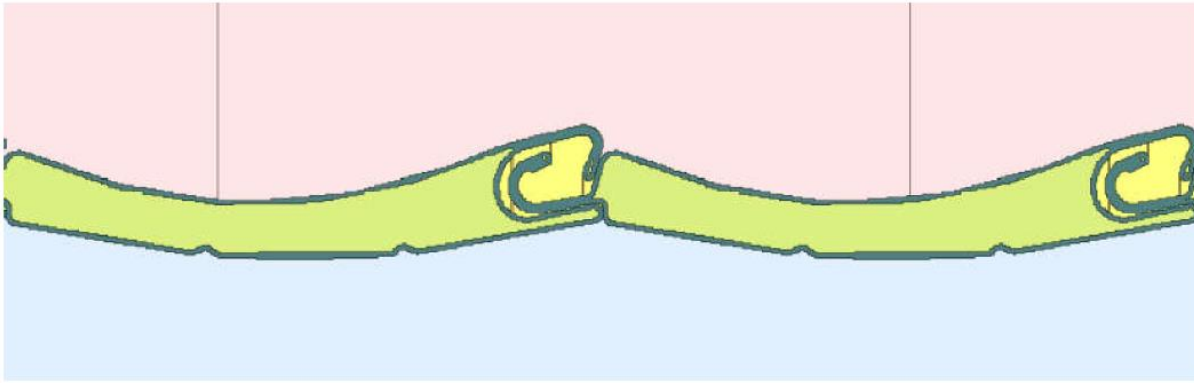


Figure 11: Simulation model for the probe PK 01 (PA37)

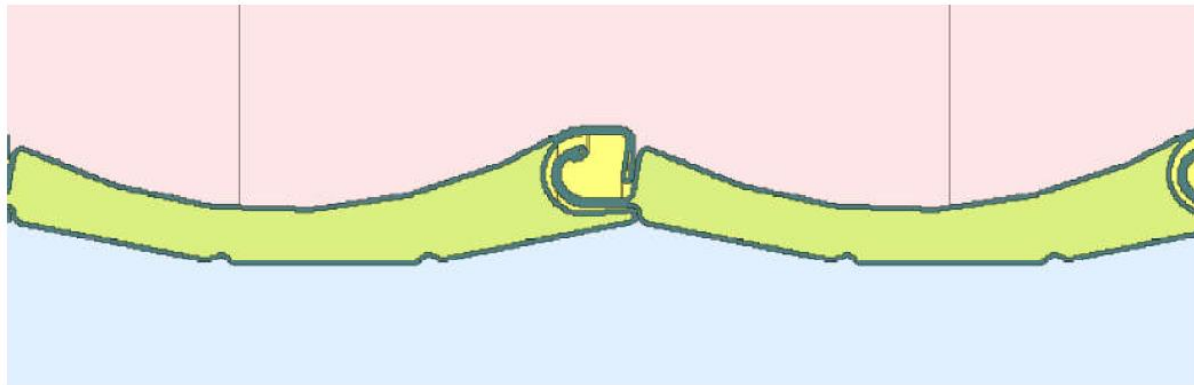


Figure 12: Simulation model for the probe PK 02 (PA39)

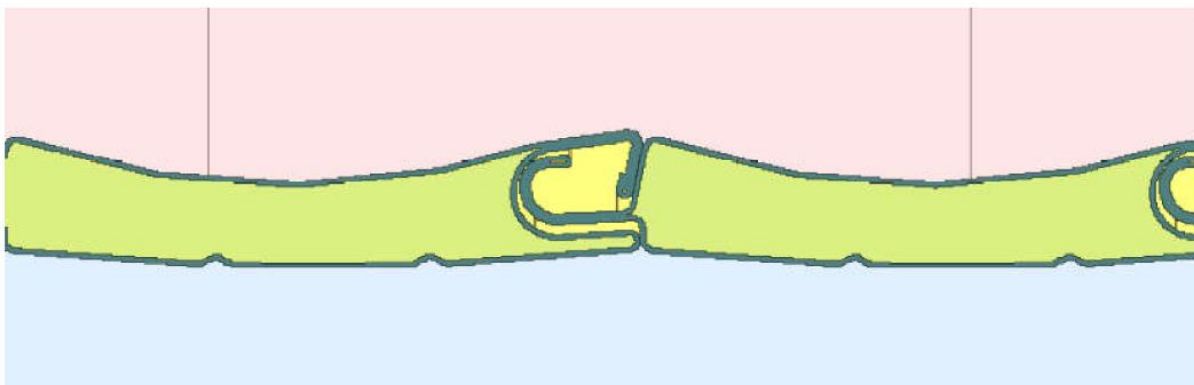


Figure 13: Simulation model for the probe PK 03 (PA40)

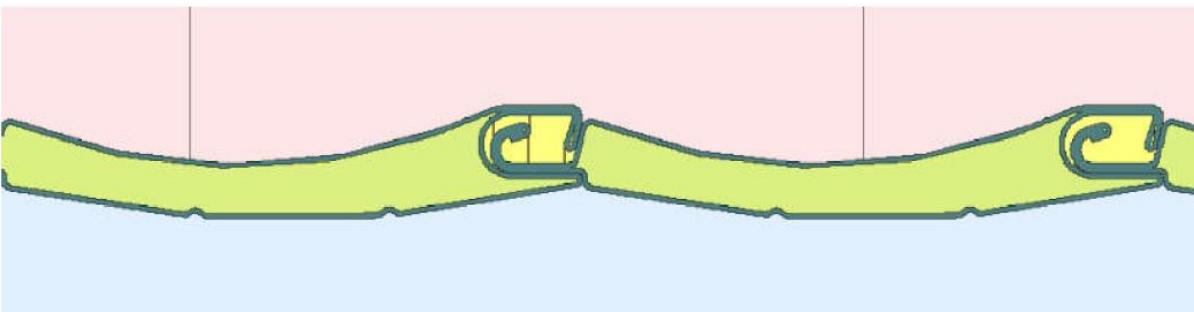


Figure 14: Simulation model for the probe PK 04 (PA45)

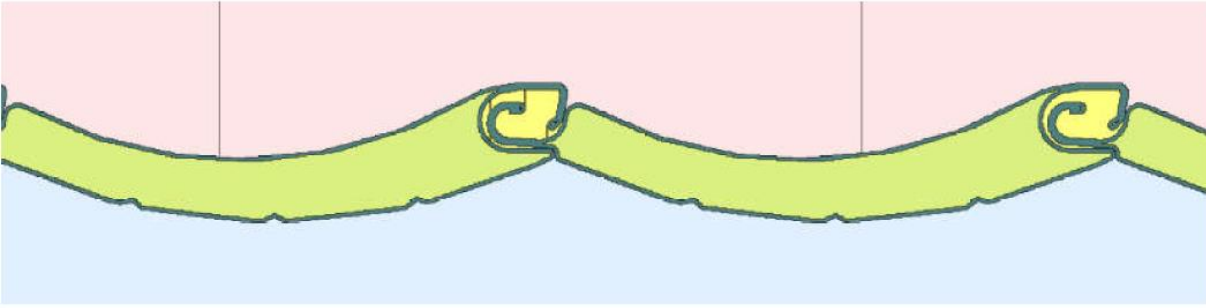


Figure 15: Simulation model for the probe PK 05 (PA52)

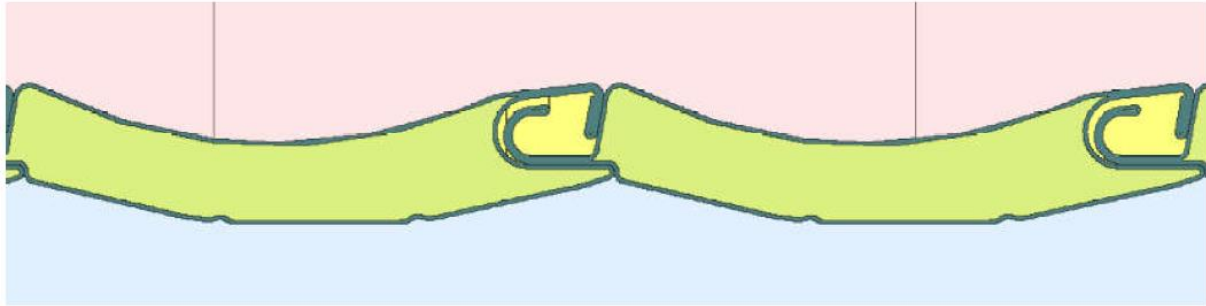


Figure 16: Simulation model for the probe PK 06 (PA55)

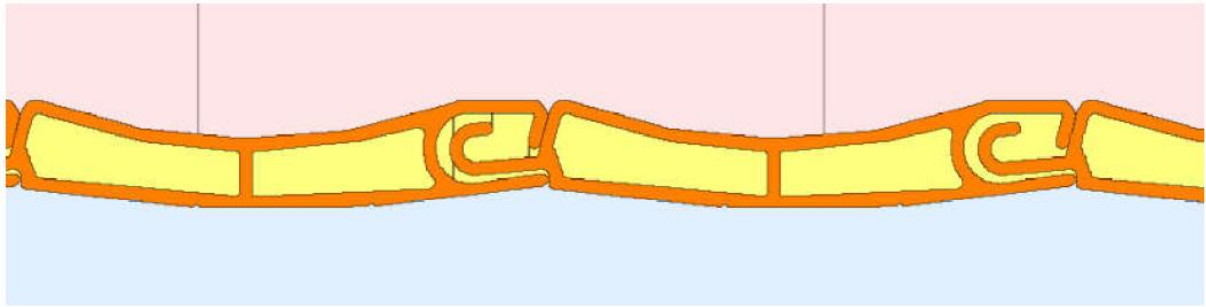


Figure 16: Simulation model for the probe PK 07 (PE41)

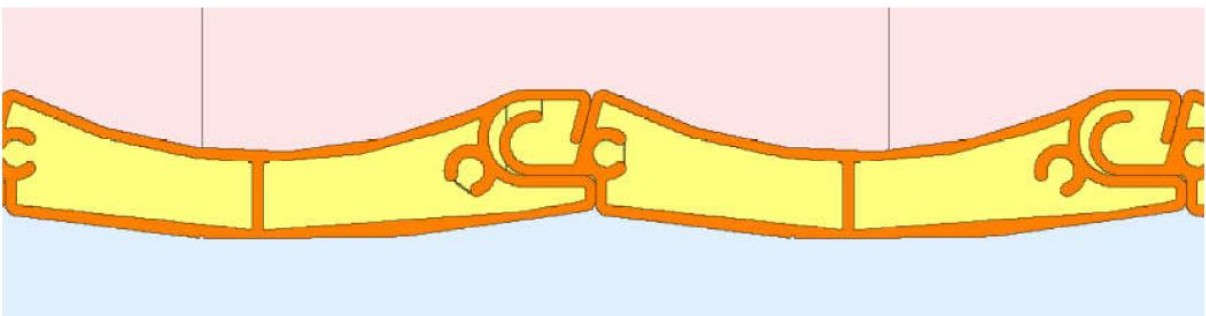


Figure 17: Simulation model for the probe PK 08 (PE55)

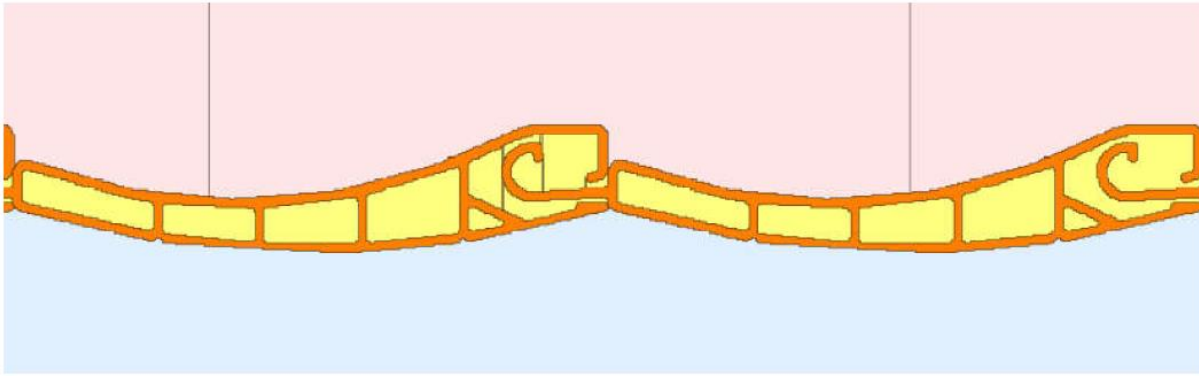


Figure 19: Simulation model for the probe PK 09 (PT37)

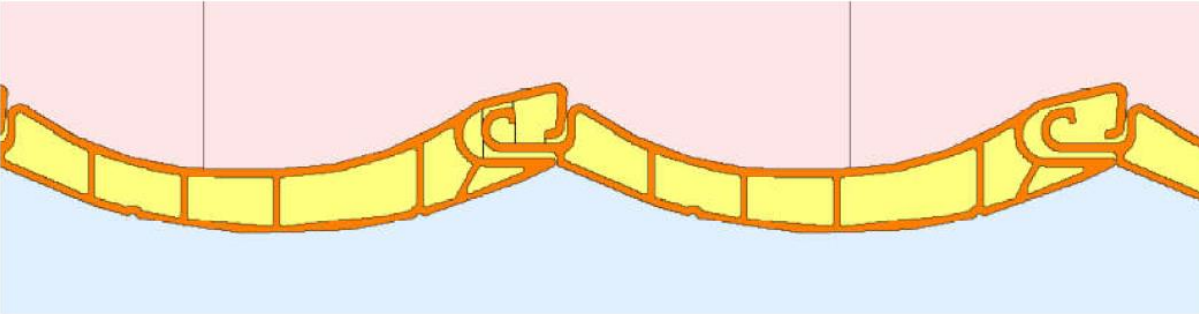


Figure 20: Simulation model for the probe PK 10 (PT52)

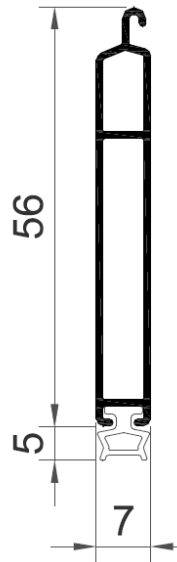


Figure 21: Cross-section of the bottom bar (LDG)

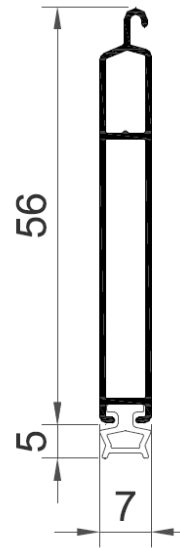


Figure 22: Cross-section of the bottom bar (LDG-E)

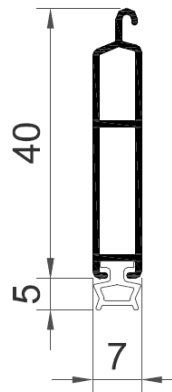


Figure 23: Cross-section of the bottom bar (LDG 40)



Figure 24: Cross-section side guide (PU29), with a bottom slat or brush seal



Figure 25: Cross-section side guide (PP45), with a bottom slat or brush seal



Figure 26: Cross-section side guide (PP53), with a bottom slat or brush seal

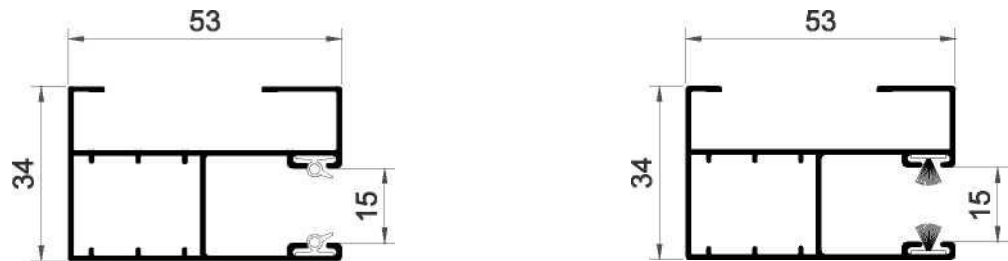


Figure 27: Cross-section side guide (PP53 / ODS), with a bottom slat or brush seal

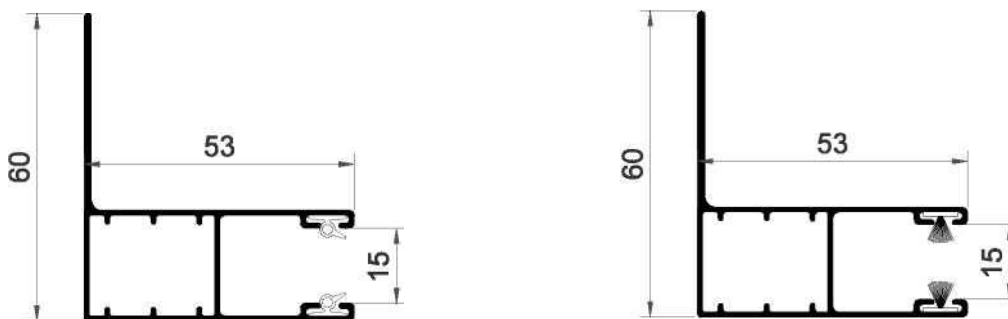


Figure 28: Cross-section side guide (PK53), with a bottom slat or brush seal

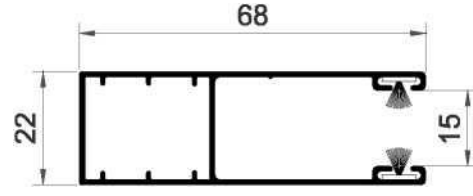
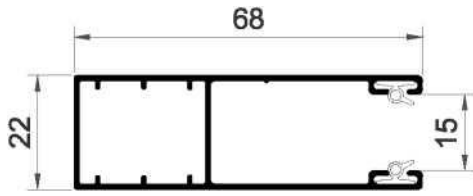


Figure 29: Cross-section side guide (PP68), with a bottom slat or brush seal

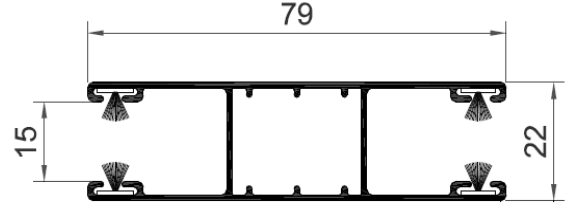
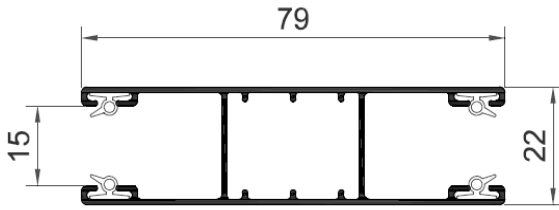


Figure 30: Cross-section side panel (PPD79), with a bottom slat or brush seal

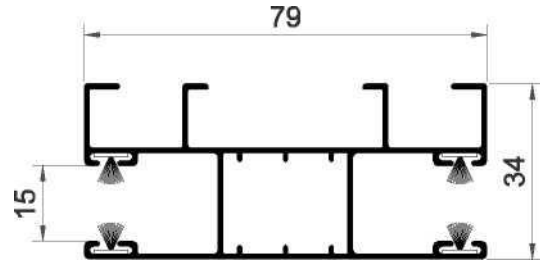
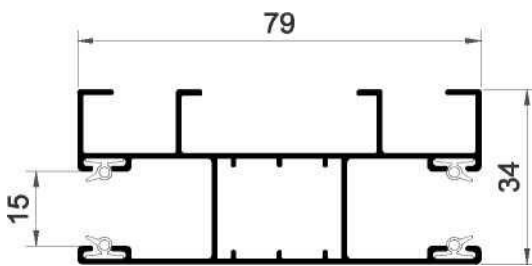


Figure 31: Cross-section side panel (PPD79 / ODS), a bottom slat or brush seal

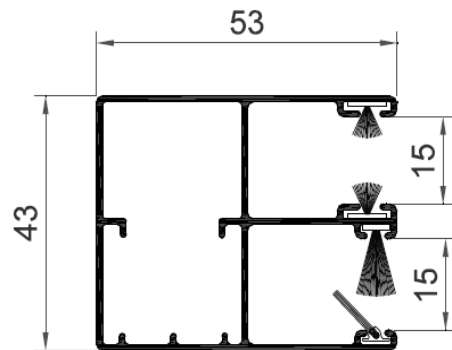
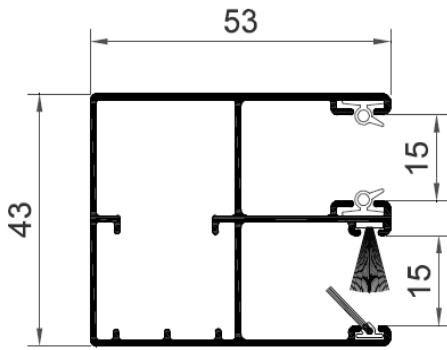


Figure 32: Cross-section side guide (PPDO53), with a bottom slat or brush seal

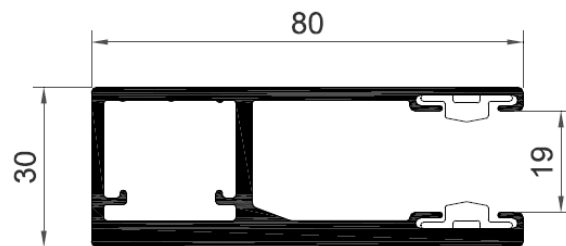
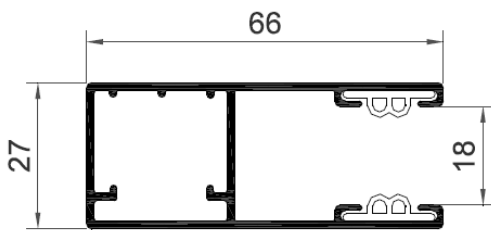


Figure 33: Cross-section side guide (PP66) with a bottom slat

Figure 34: Cross-section side guide (PPW80) with a bottom slat



Figure 35: Cross-section side guide (PPW90) with a bottom slat

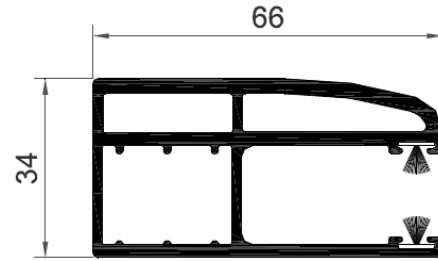


Figure 36: Cross-section side guide (PPW66) with a brush seal

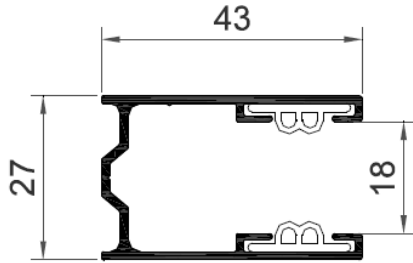


Figure 37: Cross-section side guide (PU43) with a bottom slat

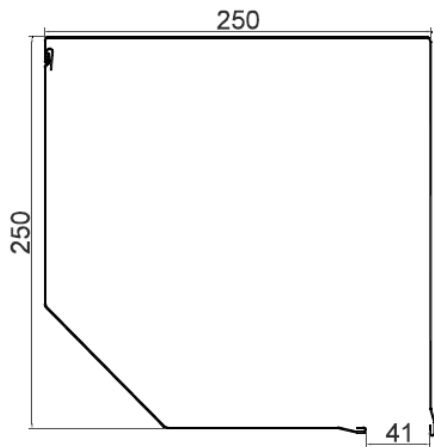


Figure 38: Cross-section roller shutter box (SAR SK 250)

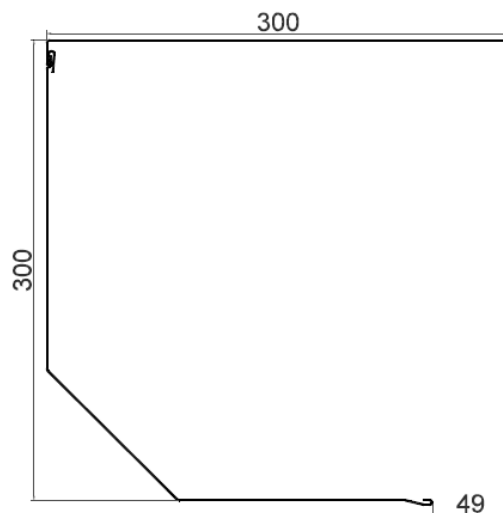


Figure 39: Cross-section roller shutter box (SAR SK 300)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| | | Additional thermal resistance ΔR in $(\Delta K) / W$ | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | |
| SAR SK | 250 | - | - | - | - | - | - | - | - | - | - | 0.24 |
| | 300 | - | - | - | - | - | - | - | - | - | - | 0.24 |

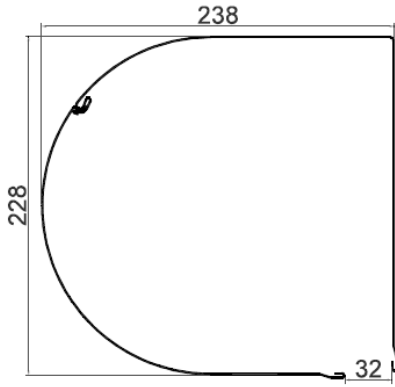


Figure 40: Cross-section roller shutter box (SAR SKO-P 230)

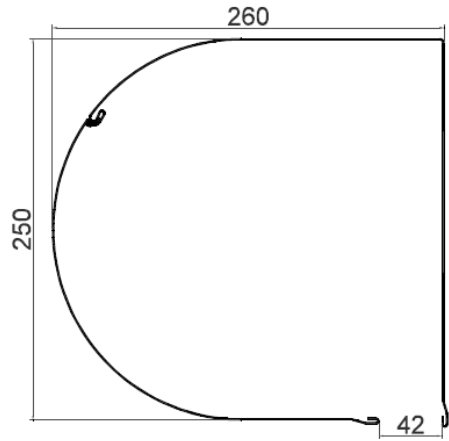


Figure 41: Cross-section roller shutter box (SAR SKO-P 250)

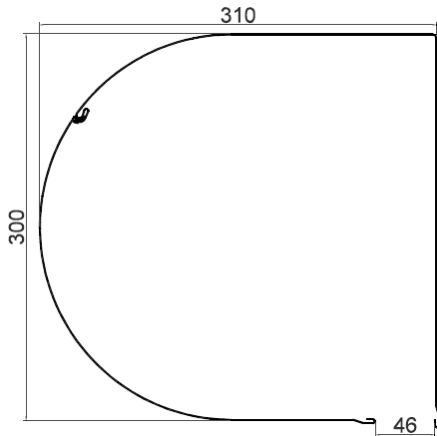


Figure 42: Cross-section roller shutter box (SAR SKO-P 300)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance ΔR in (ΔK) / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SAR SKO-P | 230 | - | - | - | - | - | - | - | - | - | 0.24 |
| | 250 | - | - | - | - | - | - | - | - | - | 0.24 |
| | 300 | - | - | - | - | - | - | - | - | - | 0.24 |

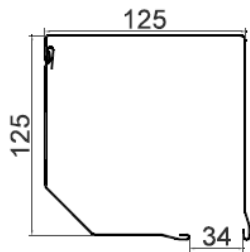


Figure 43: Cross-section roller shutter box (SK125)

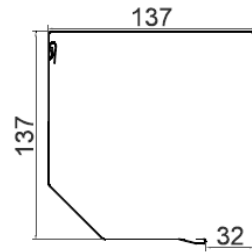


Figure 44: Cross-section roller shutter box (SK137)

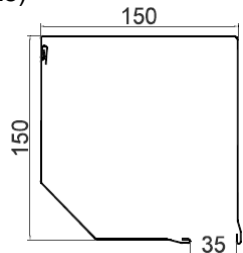


Figure 45: Cross-section roller shutter box (SK150)

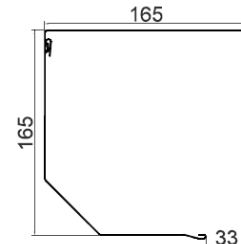


Figure 46: Cross-section roller shutter box (SK165)

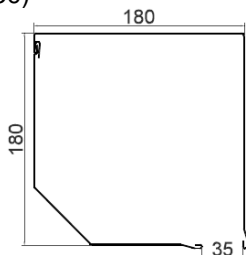


Figure 47: Cross-section roller shutter box (SK180)

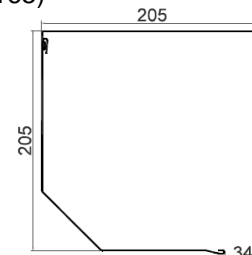


Figure 48: Cross-section roller shutter box (SK205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | | Additional thermal resistance AR in (m ² K/W) / W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SK | 125 | 0.20 | - | 0.15 | 0.15 | - | - | - | - | - | - | - | - |
| | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | - |
| | 150 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | - |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |

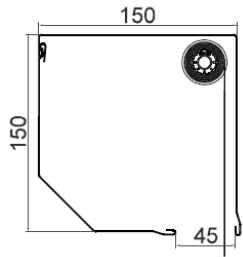


Figure 49: Cross-section roller shutter box (SK + MKT 150)

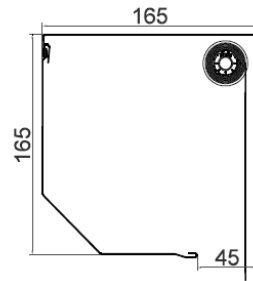


Figure 50: Cross-section roller shutter box (SK + MKT 165)

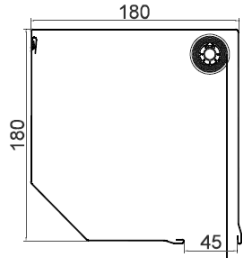


Figure 51: Cross-section roller shutter box (SK + MKT 180)

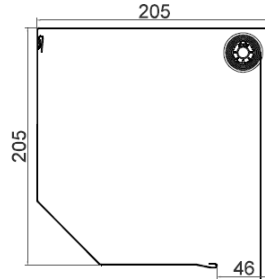


Figure 52: Cross-section roller shutter box (SK + MKT 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance ΔR in (ΔK) / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SK + MKT | 150 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 165 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 205 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |

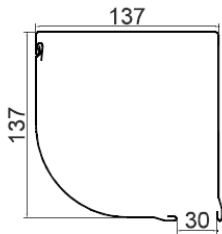


Figure 53: Cross-section roller shutter box (SKP 137)

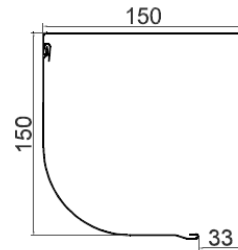


Figure 54: Cross-section roller shutter box (SKP 150)

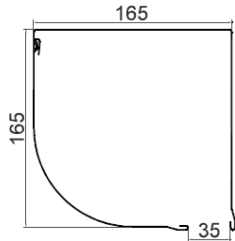


Figure 55: Cross-section roller shutter box (SKP 165)

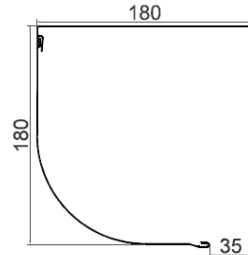


Figure 56: Cross-section roller shutter box (SKP 180)

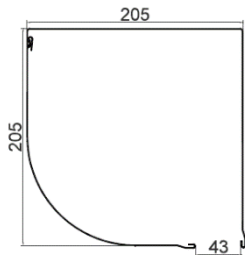


Figure 57: Cross-section roller shutter box (SKP 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| | | Additional thermal resistance AR in (m ² K) / W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | | PE 55 | |
| SKP | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 150 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |

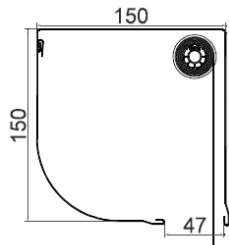


Figure 58: Cross-section roller shutter box (SKP + MKT 150)

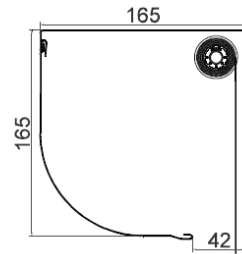


Figure 59: Cross-section roller shutter box (SKP + MKT 165)

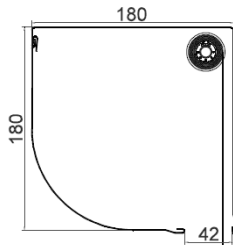


Figure 60: Cross-section roller shutter box (SKP + MKT 180)

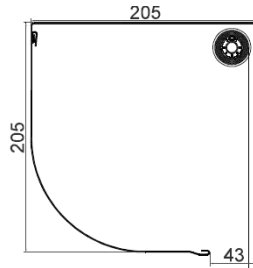


Figure 61: Cross-section roller shutter box (SKP + MKT 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance AR in (m ² K/W) / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKP + MKT | 150 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 165 | 0.15 | - | 0.12 | 0.15 | 0.15 | 0.15 | - | - | 0.16 | - |
| | 180 | 0.15 | - | 0.12 | 0.15 | 0.15 | 0.15 | - | - | 0.16 | - |
| | 205 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |

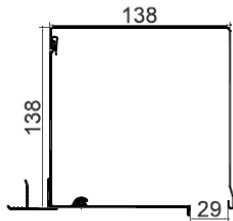


Figure 62: Cross-section roller shutter box (SP 137)

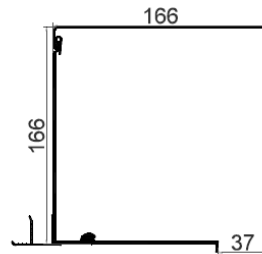


Figure 63: Cross-section roller shutter box (SP 165)

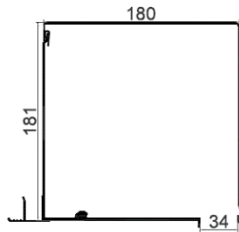


Figure 64: Cross-section roller shutter box (SP 180)

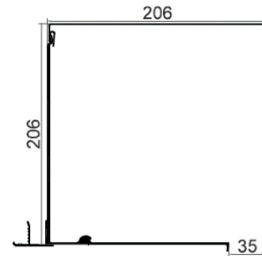


Figure 65: Cross-section roller shutter box (SP 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | | Additional thermal resistance ΔR in (ΔK) / W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SP | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |

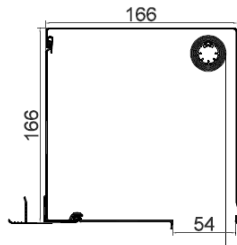


Figure 65: Cross-section roller shutter box (SP + MKT165)

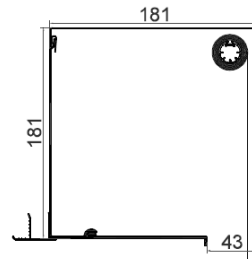


Figure 66: Cross-section roller shutter box (SP + MKT 180)

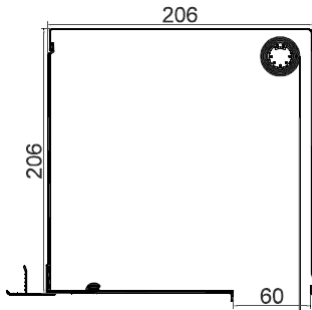


Figure 67: Cross-section roller shutter box (SP + MKT 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance AR in (m ² K)/W / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SP + MKT | 165 | 0.11 | - | 0.09 | 0.09 | 0.09 | 0.09 | - | - | 0.11 | - |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 205 | 0.11 | - | 0.09 | 0.09 | 0.09 | 0.09 | - | - | 0.11 | - |

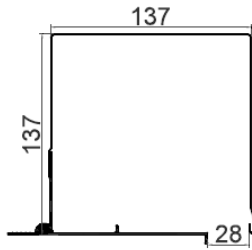


Figure 68: Cross-section roller shutter box (SP-E 137)

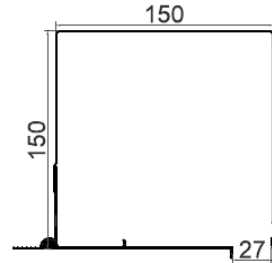


Figure 69: Cross-section roller shutter box (SP-E 150)

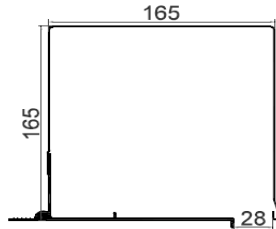


Figure 70: Cross-section roller shutter box (SP-E 165)

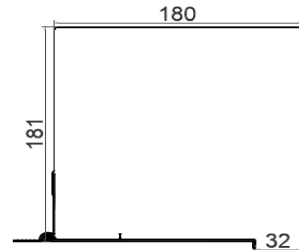


Figure 71: Cross-section roller shutter box (SP-E 180)

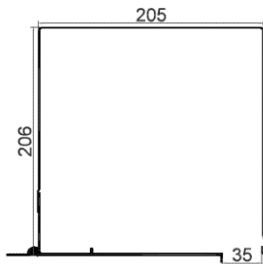


Figure 72: Cross-section roller shutter box (SP-E 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| | | Additional thermal resistance AR in (m ² K/W) / W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | | PE 55 | |
| SP-E | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 150 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |

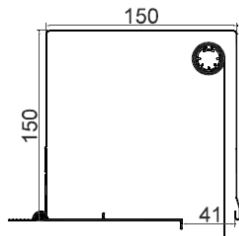


Figure 73: Cross-section roller shutter box (SP-E + MKT 150)

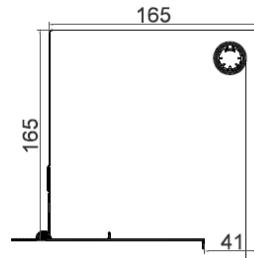


Figure 74: Cross-section roller shutter box (SP-E + MKT 165)

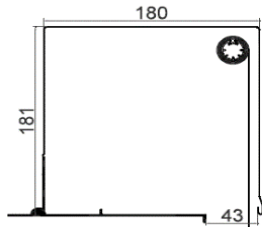


Figure 75: Cross-section roller shutter box (SP-E + MKT 180)



Figure 76: Cross-section roller shutter box (SP-E + MKT 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance ΔR in $(\Delta K) / W$ | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SP-E + MKT | 150 | 0.15 | - | 0.15 | 0.15 | 0.15 | 0.15 | - | - | 0.21 | - |
| | 165 | 0.20 | - | 0.15 | 0.15 | 0.15 | 0.15 | - | - | 0.21 | - |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 205 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |

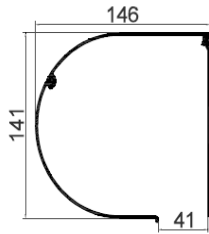


Figure 77: Cross-section roller shutter box (SKO 137)

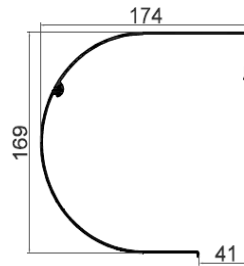


Figure 78: Cross-section roller shutter box (SKO 165)

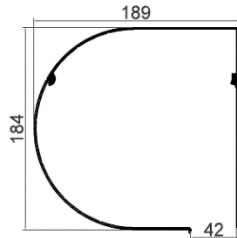


Figure 79: Cross-section roller shutter box (SKO 180)

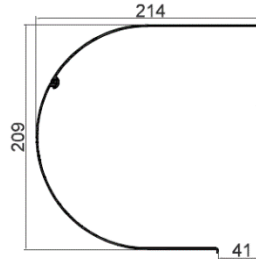


Figure 80: Cross-section roller shutter box (SKO 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|------|
| | | Additional thermal resistance ΔR in (ΔK) / W | | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | | PE 55 | | |
| SKO | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |

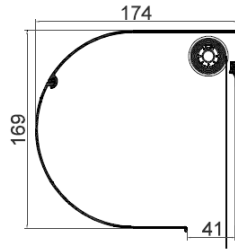


Figure 81: Cross-section roller shutter box (SKO + MKT 165)

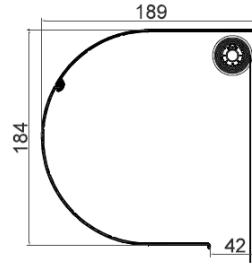


Figure 82: Cross-section roller shutter box (SKO + MKT 180)

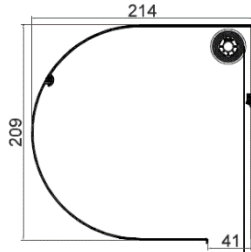


Figure 83: Cross-section roller shutter box (SKO + MKT 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance AR in (m ² K/W) / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKO + MKT | 165 | 0.15 | - | 0.12 | 0.15 | 0.12 | 0.15 | - | - | 0.16 | - |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 205 | 0.15 | - | 0.12 | 0.15 | 0.12 | 0.15 | - | - | 0.16 | - |

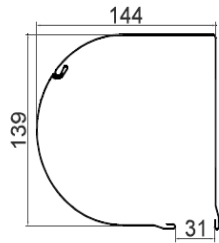


Figure 84: Cross-section roller shutter box (SKO-P 137)

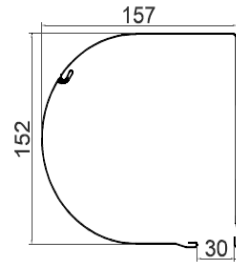


Figure 85: Cross-section roller shutter box (SKO-P 150)

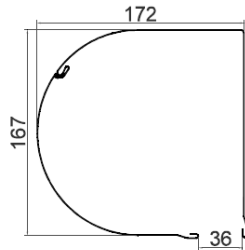


Figure 86: Cross-section roller shutter box (SKO-P 165)

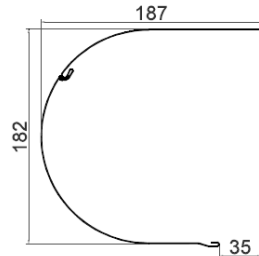


Figure 87: Cross-section roller shutter box (SKO-P 180)

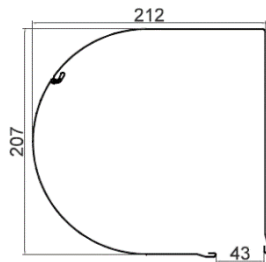


Figure 88: Cross-section roller shutter box (SKO-P 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | | Additional thermal resistance AR in (m ² K/W) / W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SKO-P | 137 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 150 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | 0.21 | 0.21 | - | |
| | 165 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 180 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |
| | 205 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.21 | 0.21 | 0.24 | 0.24 |

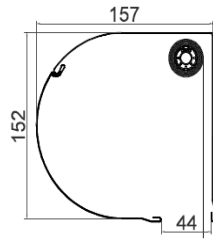


Figure 89: Cross-section roller shutter box (SKO-P + MKT 150)

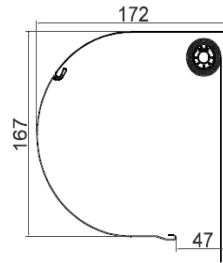


Figure 90: Cross-section roller shutter box (SKO-P + MKT 165)

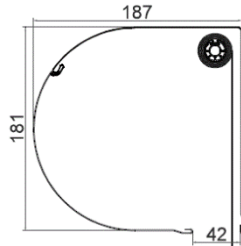


Figure 91: Cross-section roller shutter box (SKO-P + MKT 180)

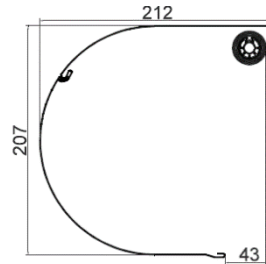


Figure 92: Cross-section roller shutter box (SKO-P + MKT 205)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance AR in (m ² K/W) / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKO-P + MKT | 150 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 165 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 180 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |
| | 205 | 0.15 | - | 0.12 | 0.12 | 0.12 | 0.12 | - | - | 0.16 | - |

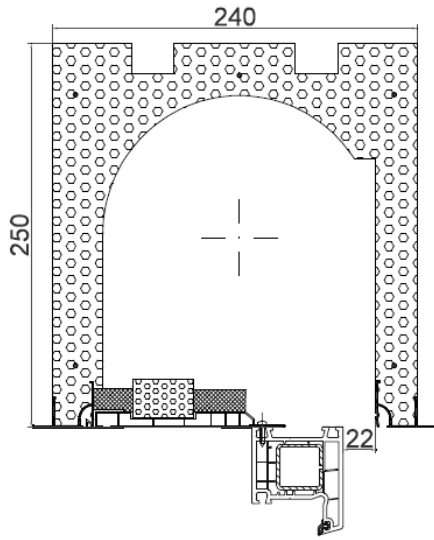


Figure 93: Cross-section roller shutter box (SKN MW24)

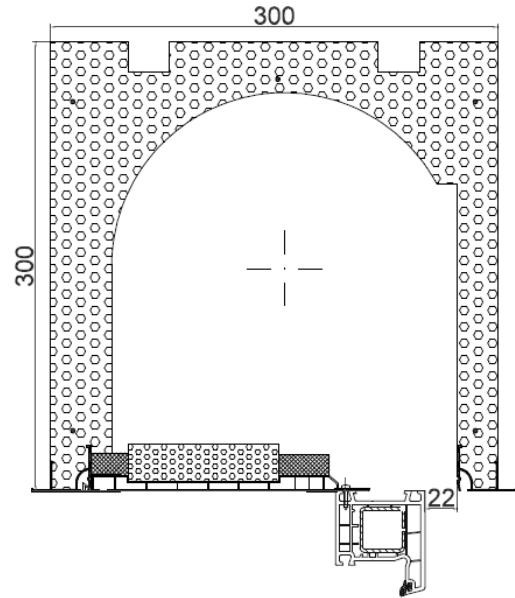


Figure 94: Cross-section roller shutter box (SKN MW30)

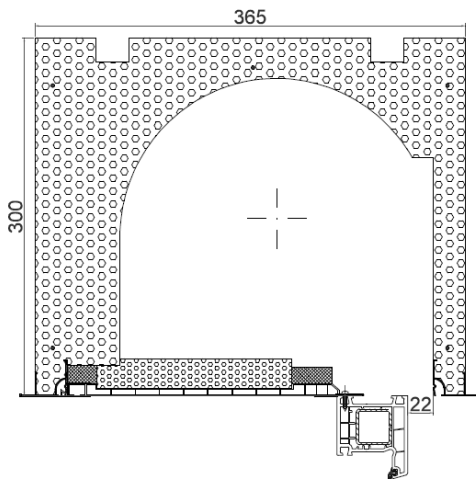


Figure 95: Cross-section roller shutter box (SKN MW36.5)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|---------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance ΔR in (ΔK) / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKN | MW 24 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |
| | MW 30 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |
| | MW 36.5 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |

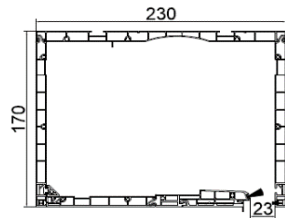


Figure 96: Cross-section roller shutter box (SKT 170)

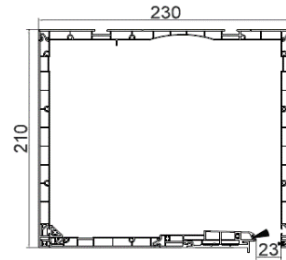


Figure 97: Cross-section roller shutter box (SKT 210)

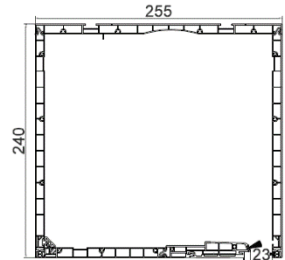


Figure 98: Cross-section roller shutter box (SKT 240)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance AR in (m ² K)/W / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKT | 170 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |
| | 210 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |
| | 240 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |

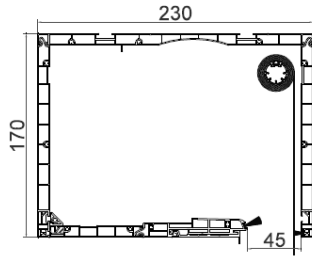


Figure 99: Cross-section roller shutter box (SKT+ M KT 170)

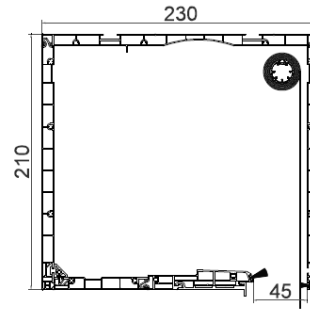


Figure 100: Cross-section roller shutter box (SKT + MKT 210)

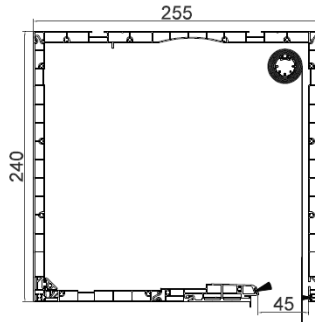


Figure 101: Cross-section roller shutter box (SKT + MKT 240)

| Roller shutter box | Size | Shutter profiles | | | | | | | | | |
|--------------------|------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | Additional thermal resistance AR in (m ² K/W) / W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKT + MKT | 170 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |
| | 210 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |
| | 240 | 0.20 | 0.22 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | - | - |

SOURCE DOCUMENT

follows unredacted and with a total number of 37 page.

Nachweis

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(PB-E01-06-de-01)

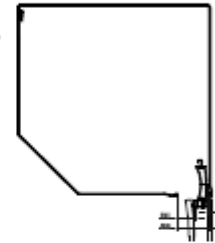


Auftraggeber ALUPROF S.A.
Centrala, Zakład Bielsko Biala
ul. Warszawska 153
43-300 Bielsko-Biala
Polen

Grundlagen *)
In Anlehnung an
EN ISO 10077-2:2012
EN 13125: 2001-04
SG 06-verpflichtend
NB-CPD/SG06/11/063 2011-09

Produkt **Rollladenkasten mit Rollladenpanzer**
Bezeichnung Variiert, siehe Kapitel 1, Kapitel 3 und Anhang dieses Dokuments
Leistungsrelevante Produktdetails **Rollladenpanzer; Material Aluminiumlegierung mit Dämmstoff befüllt und Polyvinylchlorid (PVC-U); Profilschnitt, Nennbreite x Dicke 37 x 8 bis 55 x 14; Einlage; Material Polyurethanschaum (PU); Abschlussstab; Abdichtung unten; Typ Anschlagdichtung (Gummi-profil); Fugenbreite e_1 in mm 0; Rollladenkasten; Auslass-schlitz oben; Fugenbreite e_2 in mm 0 bis 25,5; Lauf-schiene; Abdichtung seitlich; Typ Keder- bzw. Bürstendichtung; Fugenbreite e_3 in mm 0**
Besonderheiten -/-

Darstellung
Beispielhafter Probekörper



Weitere Probekörper siehe Anlage.

Ergebnis
Wärmedurchlasswiderstand in Anlehnung an EN ISO 10077-2:2012 und
Zusätzlicher Wärmedurchlasswiderstand nach EN 13125:2001-04



$$R_{sh} = 0,01 \text{ bis } 0,13 \text{ (m}^2 \cdot \text{K)/W}$$

$$\Delta R = 0,09 \text{ bis } 0,24 \text{ (m}^2 \cdot \text{K)/W}^*$$

* Zuordnung der Luftdurchlässigkeitsklassen siehe Kapitel 3

Verwendungshinweise

Die ermittelten Ergebnisse können für den Nachweis entsprechend den oben angegebenen Grundlagen verwendet werden.

Gültigkeit

Die genannten Daten und Ergebnisse beziehen sich ausschließlich auf den geprüften und beschriebenen Probekörper.

Diese Prüfung ermöglicht keine Aussage über weitere leistungs- und qualitätsbestimmende Eigenschaften der vorliegenden Konstruktion.

Veröffentlichungshinweise

Es gilt das "Merkblatt zur Benutzung von ift-Prüfdokumentationen". Das Dokument darf nur vollständig veröffentlicht werden.

Inhalt

Der Nachweis umfasst insgesamt 11 Seiten und Anlagen (26 Seiten).

ift Rosenheim
01.07.2015

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Prüfung und Kalibrierung – EN ISO/IEC 17020
Inspektion – EN ISO/IEC 17020
Zertifizierung ISO 9001 – EN ISO/IEC 17020
Zertifizierung Managementsysteme – EN ISO/IEC 17021

Notified Body BVP
DIN EN ISO 9001
DIN EN ISO 17020



1 Gegenstand

1.1 Probekörperbeschreibung

| | |
|---|--|
| Produkt | Rollladenkasten mit Rollladenpanzer |
| Hersteller | ALUPROF S.A, (Polen) |
| Rollladenpanzer | |
| Produktbezeichnung | PA37, PA39, PA40, PA45, PA52, PA55, PE41, PE55, PT37, PT52 |
| Material | Aluminiumlegierung mit Dämmstoff befüllt und Polyvinylchlorid (PVC-U) |
| Oberflächenbehandlung | Aluminium lackiert oder pulverbeschichtet PVC unbehandelt |
| Profilquerschnitt in mm (Nennbreite x Dicke) | 37 x 8 bis 55 x 14 |
| Einlage | |
| Material | Polyurethanschaum (PU) gem. EN ISO 10456 |
| Wärmeleitfähigkeit in W/(mK) | 0,05 |
| Abschlussstab | |
| Produktbezeichnung | LDG, LDG-E, LDG 40 |
| Material | Aluminiumlegierung und Polyvinylchlorid (PVC-U) |
| Profilquerschnitt (Breite x Dicke) in mm | 40 x 7 bis 56 x 7 |
| Abdichtung unten | Anschlagdichtung (Gummiprofil) |
| Fugenbreite e_1 in mm | 0 |
| Rollladenkasten | |
| Produktbezeichnung | SAR-SK, SAR SKO-P, SK, SK + MKT, SKP, SKP + MKT, SP, SP + MKT, SP-E, SKO, SKO + MKT, SKO-P, SKO-P + MKT, SKN, SKT, SKT + MKT |
| Material | Aluminiumlegierung und Polyvinylchlorid (PVC-U) |
| Oberflächenbehandlung | Aluminium lackiert oder pulverbeschichtet PVC unbehandelt |
| Auslassschlitz | |
| Abdichtung | Teilweise mit Keder- bzw. Bürstendichtung |
| Fugenbreite e_2 in mm | 0 bis 25,5 (Siehe Kapitel 3.2) |
| Laufschiene seitlich | |
| Produktbezeichnung | PU29, PU43, PP45, PP53, PP66, PP68, PP53/ODS, PK53, PPD79, PPD79/ODS, PPDO53, PPW66, PPW80, PPW90, |
| Profilquerschnitt (Breite x Dicke) in mm | 29 x 29 bis 31 x 90 |
| Abdichtung seitlich | Keder- bzw. Bürstendichtung |
| Fugenbreite e_3 in mm | 0 |
| Einbausituation | |
| Montage | Seitens des Herstellers liegen keine detaillierten Angaben zur Montage der Rollladensysteme vor, |



Prüfbericht Nr. 15-000173-PR01 (PB-E01-06-de-01) vom 01.07.2015

Auftraggeber: ALUPROF S.A. Centrala, Zakład Bielsko Biala, 43-300 Bielsko-Biala (Polen)

Die Beschreibung basiert auf den Angaben des Auftraggebers und der Überprüfung des Probekörpers im ift. (Artikelbezeichnungen/-nummern sowie Materialangaben sind Angaben des Auftraggebers, wenn nicht als „ift-geprüft“ ausgewiesen.)

Probekörperdarstellung/en sind in der Anlage „Darstellung Produkt/Probekörper“ dokumentiert.

Die konstruktiven Details wurden ausschließlich hinsichtlich der nachzuweisenden Merkmale / Leistung überprüft;

Zeichnungen basieren auf unveränderten Unterlagen des Auftraggebers, wenn nicht anders ausgewiesen.

1.2 Probennahme

Dem ift liegen folgende Angaben zur Probennahme vor:

Probennehmer: ALUPROF S.A. Centrala, Zakład Bielsko Biala

Nachweis: Ein Probennahmebericht liegt dem ift nicht vor.

ift-Pk-Nummer: 15-000173-PK01

Datum: 07.06.2015

Prüfbericht Nr. 15-000173-PR01 (PB-E01-06-de-01) vom 01.07.2015
Auftraggeber: ALUPROF S.A. Centrale, Zakład Bielsko Biela, 43-300 Bielsko-Biala (Polen)



2 Durchführung

2.1 Grundlagendokumente *) der Verfahren

In Anlehnung an EN ISO 10077-2:2012

Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 2 - Numerical method for frames

In Anlehnung an prEN ISO 10077-2:1998

EN 13125:2001-04

Shutters and blinds - Additional thermal resistance - Allocation of a class of air permeability to a product

SG 06-verpflichtend NB-CPD/SG06/11/083 2011-09

EN 14351-1:2006 Treatment of unventilated rectangular cavities when calculating thermal properties to EN ISO 10077-2

*) und die entsprechenden nationalen Fassungen, z.B. DIN EN

2.2 Verfahrenskurzbeschreibung

Berechnung des Wärmedurchlasswiderstandes R_{gl}

Der Profilquerschnitt wird in eine ausreichende Anzahl von Elemente geteilt, wobei eine kleinere Unterteilung zu keiner signifikanten Änderung des Gesamtwärmestroms führt. Die entsprechenden Materialien, bzw. Randbedingungen werden belegt, und der Gesamtwärmestrom ermittelt. Aus dem Wärmestrom wird der Wärmedurchlasswiderstand ermittelt.

Berechnung des zusätzlichen Wärmedurchlasswiderstandes ΔR

Auf Basis geometrischer Betrachtung wird die Abschlusssituation, durch Aufsummierung der Zwischenräume zwischen dem Abschluss und dessen Umgebung, einer Luftdurchlässigkeitsklasse zugeordnet und der damit verbundene, zusätzliche Wärmedurchlasswiderstand nach EN ISO 10077-1 berechnet.

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 Auftraggeber: ALUPROF S.A. Centrala, Zakład Bielsko Bielska, 43-300 Bielsko-Biala (Polen)

3 Einzelergebnisse

3.1 Berechnung des Wärmedurchlasswiderstandes als Eingangswert für die Berechnung des zusätzlichen Wärmedurchlasswiderstandes

Berechnung des Wärmedurchlasswiderstandes

| | | | |
|-------------------------|---|-------------|-----------|
| Projekt-Nr. | 15-000173-PR01 | Vorgang Nr. | 15-000173 |
| Grundlagen der Prüfung | EN ISO 10077-2:2012 Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 2 - Numerical method for frames S3 05-współczesny NB-GPD/S008/11/083 2011-09 EN 14351-1:2006 Treatment of unventilated rectangular cavities when calculating thermal properties in EN ISO 10077-2 | | |
| Verwendete Prüfmittel | Simu020841 - ift Berechnungsprogramm | | |
| Prüfkörper | Rollädenpanzer | | |
| Prüfkörpernummer | 15-000173-PK01 | | |
| Prüfdatum | 12.06.2015 | | |
| Verantwortlicher Prüfer | Til Stübgen | | |
| Prüfer | Til Stübgen | | |

Informationen zum Prüfaufbau / Prüfverfahren

| | |
|---------------|---|
| Prüfverfahren | Es gibt folgende Abweichungen zum Prüfverfahren gemäß Norm/Grundlage: Abweichend zur Prüfungsgrundlage wurde der Wärmedurchlasswiderstand auf Basis der gemittelten Oberflächentemperaturen raum- und außenseitig ermittelt. |
| Hinweis | Das angewandte Prüfverfahren in Anlehnung an EN ISO 10077-2:2012 ist in seiner Anwendung identisch zur prEN ISO 10077-2:1998, Abschnitt 6. |

Randbedingungen

| Randbedingungen | | Werte | Quelle ¹⁾ |
|-----------------|--------------------------------------|---------------------------|----------------------|
| θ_i | Lufttemperatur raumseitig | 20 °C | -/- |
| θ_e | Lufttemperatur außenseitig | 0 °C | -/- |
| ΔT | Temperaturdifferenz | 20 K | -/- |
| R_{si} | Wärmeübergangswiderstand raumseitig | 0,13 (m ² K)/W | -/- |
| R_{se} | Wärmeübergangswiderstand außenseitig | 0,04 (m ² K)/W | -/- |

Materialeigenschaften

| Materialeigenschaften | | Werte | Quelle ¹⁾ |
|-----------------------|--|---------------|----------------------|
| ϵ_g | Emissionsgrad | 0,9 | -/- |
| λ | Wärmeleitfähigkeit Aluminium (Si-Legierungen) | 160 W/(m K) | -/- |
| λ | Wärmeleitfähigkeit PU-Schaum | 0,05 W/(m K) | -/- |
| λ | Wärmeleitfähigkeit PVC-hart (Polyvinylchlorid) | 0,17 W/(m K) | -/- |
| λ | Wärmeleitfähigkeit Ersatzpaneel EN ISO 10077-2 | 0,035 W/(m K) | -/- |

¹⁾ Falls nicht anders vermerkt, sind die Daten den Normen EN ISO 10488 und EN ISO 10077-2 entnommen.
 Die Emissivität von niedrig emittierenden Schichten ist durch eine werkseitige Produktionskontrolle sicherzustellen.

Ermittlung des Wärmedurchlasswiderstandes R_{wh}

Der Wärmedurchlasswiderstand ergibt sich aus:

$$R_{wh} = \frac{(\theta_{si} - \theta_{se}) \times b_{ges}}{Q_{ges}}$$

| Definition | Einheit |
|---------------|---|
| R_{wh} | Wärmedurchlasswiderstand (m ² K)/W |
| b_{ges} | Gesamtbreite m |
| θ_{si} | Mittlere Oberflächentemperatur raumseitig K |
| θ_{se} | Mittlere Oberflächentemperatur außenseitig K |
| Q_{ges} | längenbezogene Wärmeströmdichte W/m |

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 Auftraggeber: ALUPROF S.A. Centrala, Zakład Bielsko Bielsa, 43-300 Bielsko-Biala (Polen)



| PK-Nr. | Bemerkung | k_{app} | δ_{si} | δ_{se} | C_{app} |
|--------|-----------------------|------------------|----------------------|----------------------|------------------|
| PK01 | Rolladenpanzer "PA37" | 0,043 | 5,4 | 4,7 | 5,206 |
| PK02 | Rolladenpanzer "PA39" | 0,044 | 5,5 | 4,7 | 5,377 |
| PK03 | Rolladenpanzer "PA40" | 0,048 | 5,4 | 4,7 | 5,476 |
| PK04 | Rolladenpanzer "PA45" | 0,052 | 5,4 | 4,6 | 6,141 |
| PK05 | Rolladenpanzer "PA52" | 0,060 | 5,6 | 4,5 | 7,068 |
| PK06 | Rolladenpanzer "PA55" | 0,065 | 6,0 | 4,5 | 7,431 |
| PK07 | Rolladenpanzer "PE41" | 0,049 | 10,1 | 3,1 | 3,863 |
| PK08 | Rolladenpanzer "PE66" | 0,064 | 11,6 | 2,7 | 4,368 |
| PK09 | Rolladenpanzer "PT37" | 0,044 | 9,4 | 3,5 | 3,68 |
| PK10 | Rolladenpanzer "PT52" | 0,060 | 10,8 | 3,0 | 4,736 |

Prüfergebnis

Wärmedurchlasswiderstand in (m²K)/W:

| | | Rechenwert | Gerundeter Wert gem. EN 13125:2001 |
|------|-------------------|------------|------------------------------------|
| PK01 | R _{sh} = | 0,006 | 0,01 |
| PK02 | R _{sh} = | 0,007 | 0,01 |
| PK03 | R _{sh} = | 0,007 | 0,01 |
| PK04 | R _{sh} = | 0,007 | 0,01 |
| PK05 | R _{sh} = | 0,011 | 0,01 |
| PK06 | R _{sh} = | 0,011 | 0,01 |
| PK07 | R _{sh} = | 0,009 | 0,009 |
| PK08 | R _{sh} = | 0,129 | 0,13 |
| PK09 | R _{sh} = | 0,066 | 0,07 |
| PK10 | R _{sh} = | 0,098 | 0,10 |

3.2 Berechnung des zusätzlichen Wärmedurchlasswiderstandes

Anforderung für die Zuordnung der Luftdurchlässigkeitsklasse nach EN 13125: 2001 und Berechnung des zusätzlichen Wärmedurchlasswiderstandes ΔR gemäß Tabelle 1.

Tabelle 1: Übersicht Luftdurchlässigkeitsklassen und ΔR Berechnung

| Luftdurchlässigkeitsklasse | Gesamtbreite der Zwischenräume e_{tot} in [mm] | Berechnung zusätzlicher Wärmedurchlasswiderstand ΔR in (m^2K/W) |
|----------------------------|--|---|
| 1 | $e_{tot} > 35$ | $\Delta R = 0,08$ |
| 2 | $15 < e_{tot} \leq 35$ | $\Delta R = 0,25R_{sh} + 0,09$ |
| 3 | $8 < e_{tot} \leq 15$ | $\Delta R = 0,55R_{sh} + 0,11$ |
| 4 | $e_{tot} \leq 8$ | $\Delta R = 0,80R_{sh} + 0,14$ |
| 5* | $e_{tot} \leq 3$ | $\Delta R = 0,95R_{sh} + 0,17$ |

*Zusätzliche Einbauanforderungen als Bedingung für die Zuordnung zur Luftdurchlässigkeitsklasse 5 gemäß EN 13125:2001, Abschnitt 4.3.

Fugenbreite unten e_1 : 0 mm (Anschlagdichtung mit Gummiprofil)
 Fugenbreite oben e_2 : Siehe Tabelle 2 (entspricht der Gesamtfugenbreite e_{tot})
 Fugenbreite seitlich e_3 : 0 mm (Führungsschienen mit Kernen ausgestattet)

Tabelle 2: Gesamtfugenbreite e_{tot} und Zuordnung der Luftdurchlässigkeitsklassen

| Rollladenkasten | Größe | Rollladenpanzer-Profile | | | | | | | | | | | |
|-----------------|-------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|------|
| | | e_{tot} in mm ($e_1 + e_2 + e_3$) / Zuordnung der Luftdurchlässigkeitsklassen | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SAR SK | 250 | - | - | - | - | - | - | - | - | - | - | - | 2,5* |
| | 300 | - | - | - | - | - | - | - | - | - | - | - | 2,5* |
| SAR SKO-P | 230 | - | - | - | - | - | - | - | - | - | - | - | 3,4 |
| | 250 | - | - | - | - | - | - | - | - | - | - | - | 3,1 |
| | 300 | - | - | - | - | - | - | - | - | - | - | - | 3,1 |
| SK | 125 | 4,5 | - | 4,3 | 4,0 | - | - | - | - | - | - | - | - |
| | 137 | 4,5 | 4,2 | 4,3 | 4,0 | 4,1 | 4,0 | 4,7 | - | 4,3 | 4,7 | - | - |
| | 150 | 4,3 | 4,0 | 4,1 | 3,8 | 3,9 | 3,8 | 4,5 | - | 4,1 | 4,5 | - | - |
| | 165 | 4,5 | 4,2 | 4,3 | 4,0 | 4,1 | 4,0 | 4,7 | 4,5 | 4,3 | 4,7 | 4,2 | 4,5 |
| | 180 | 4,5 | 4,2 | 4,3 | 4,0 | 4,1 | 4,0 | 4,7 | 4,5 | 4,3 | 4,7 | 4,2 | 4,4 |
| | 205 | 4,5 | 4,2 | 4,3 | 4,0 | 4,1 | 4,0 | 4,7 | 4,5 | 4,3 | 4,7 | 4,2 | 4,4 |
| SK + MKT | 150 | 11,7 | - | 11,5 | 11,3 | 11,4 | 11,2 | - | - | 11,5 | - | - | - |
| | 165 | 11,6 | - | 11,4 | 11,1 | 11,2 | 11,1 | - | - | 11,3 | - | - | - |
| | 180 | 12,1 | - | 11,9 | 11,7 | 11,8 | 11,6 | - | - | 11,9 | - | - | - |
| | 205 | 12,7 | - | 12,5 | 12,2 | 12,3 | 12,2 | - | - | 12,4 | - | - | - |
| SKP | 137 | 4,3 | 4,3 | 4,1 | 3,8 | 3,9 | 3,8 | 4,8 | - | 4,0 | 5,2 | - | - |
| | 150 | 4,5 | 4,5 | 4,3 | 4,1 | 4,2 | 4,0 | 5,0 | - | 4,3 | 5,5 | - | - |
| | 165 | 4,3 | 4,3 | 4,1 | 3,8 | 3,9 | 3,8 | 4,8 | 4,5 | 4,0 | 5,2 | 4,3 | 4,5 |
| | 180 | 4,3 | 4,3 | 4,1 | 3,8 | 3,9 | 3,8 | 4,8 | 4,5 | 4,0 | 5,2 | 4,3 | 4,5 |
| | 205 | 4,1 | 4,1 | 3,9 | 3,6 | 3,7 | 3,6 | 4,6 | 4,3 | 3,8 | 5,0 | 4,1 | 4,3 |

| Rolladen- asten | Größe | Rolladenpanzer-Profile | | | | | | | | | | | |
|--------------------|---------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|-----|
| | | e _{tot} in mm (e ₁ + e ₂ + e ₃) / Zuordnung der Luftdurchlässigkeitsklassen | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SKP + MKT | 150 | 13,0 | - | 12,8 | 12,5 | 12,6 | 12,5 | - | - | 12,7 | - | | |
| | 165 | 8,3 | - | 8,1 | 7,9 | 8,0 | 7,8 | - | - | 8,1 | - | | |
| | 180 | 8,3 | - | 8,1 | 7,9 | 8,0 | 7,8 | - | - | 8,1 | - | | |
| | 205 | 9,5 | - | 9,3 | 9,1 | 9,2 | 9,0 | - | - | 9,3 | - | | |
| SP | 137 | 4,5 | 4,5 | 4,3 | 4,0 | 4,1 | 4,0 | 5,0 | - | 4,3 | 5,4 | - | |
| | 165 | 4,5 | 4,5 | 4,3 | 4,0 | 4,1 | 4,0 | 5,0 | 4,7 | 4,3 | 5,4 | 4,5 | 4,7 |
| | 180 | 4,3 | 4,3 | 4,1 | 3,8 | 3,9 | 3,8 | 4,8 | 4,5 | 4,1 | 5,2 | 4,3 | 4,5 |
| | 205 | 4,5 | 4,5 | 4,3 | 4,0 | 4,1 | 4,0 | 5,0 | 4,7 | 4,3 | 5,4 | 4,5 | 4,7 |
| SP + MKT | 165 | 20,9 | - | 20,7 | 20,4 | 20,5 | 20,3 | - | - | 20,6 | - | | |
| | 180 | 10,0 | - | 9,8 | 9,5 | 9,7 | 9,5 | - | - | 9,8 | - | | |
| | 205 | 25,5 | - | 25,3 | 25,0 | 25,1 | 24,9 | - | - | 25,2 | - | | |
| SP-E | 137 | 4,2 | 4,1 | 4,0 | 3,7 | 3,8 | 3,7 | 4,7 | - | 3,9 | 5,1 | - | |
| | 150 | 4,1 | 4,2 | 4,0 | 3,7 | 3,8 | 3,7 | 4,7 | - | 3,9 | 5,1 | - | |
| | 165 | 4,5 | 4,5 | 4,3 | 4,0 | 4,1 | 4,0 | 5,0 | 4,7 | 4,2 | 5,4 | 4,5 | 4,7 |
| | 180 | 4,2 | 4,2 | 4,0 | 3,7 | 3,8 | 3,7 | 4,7 | 4,4 | 3,9 | 5,1 | 4,2 | 4,4 |
| SP-E + MKT | 150 | 8,1 | - | 7,9 | 7,7 | 7,7 | 7,6 | - | - | 7,9 | - | | |
| | 165 | 7,8 | - | 7,6 | 7,3 | 7,5 | 7,3 | - | - | 7,5 | - | | |
| | 180 | 10,3 | - | 10,1 | 9,9 | 10,0 | 9,8 | - | - | 10,1 | - | | |
| | 205 | 9,1 | - | 8,9 | 8,6 | 8,8 | 8,6 | - | - | 8,8 | - | | |
| SKO | 137 | 3,9 | 3,9 | 3,8 | 3,5 | 3,6 | 3,4 | 4,4 | - | 3,7 | 4,9 | - | |
| | 165 | 3,9 | 3,9 | 3,8 | 3,5 | 3,6 | 3,4 | 4,4 | 4,2 | 3,7 | 4,9 | 3,9 | 4,2 |
| | 180 | 3,9 | 3,9 | 3,7 | 3,5 | 3,6 | 3,4 | 4,4 | 4,2 | 3,7 | 4,9 | 3,9 | 4,2 |
| | 205 | 3,9 | 3,9 | 3,8 | 3,5 | 3,6 | 3,4 | 4,4 | 4,2 | 3,7 | 4,9 | 3,9 | 4,2 |
| SKO + MKT | 165 | 8,5 | - | 8,3 | 8,0 | 8,1 | 8,0 | - | - | 8,2 | - | | |
| | 180 | 9,1 | - | 8,9 | 8,6 | 8,7 | 8,6 | - | - | 8,6 | - | | |
| | 205 | 8,5 | - | 8,3 | 8,0 | 8,2 | 8,0 | - | - | 8,3 | - | | |
| SKO-P | 137 | 3,2 | 3,2 | 3,1 | 2,8* | 2,9* | 2,8* | 3,8 | - | 3,0* | 4,1 | - | |
| | 150 | 3,3 | 3,3 | 3,1 | 2,9* | 3,0* | 2,8* | 3,8 | - | 3,0* | 4,2 | - | |
| | 165 | 3,2 | 3,2 | 3,1 | 2,8* | 2,9* | 2,8* | 3,7 | 3,5 | 3,0* | 4,1 | 3,2 | 3,5 |
| | 180 | 3,2 | 3,2 | 3,0* | 2,8* | 2,8* | 2,7* | 3,7 | 3,4 | 2,9* | 4,1 | 3,2 | 3,4 |
| | 205 | 3,1 | 3,0* | 2,9* | 2,6* | 2,7* | 2,6* | 3,5 | 3,3 | 2,8* | 3,9 | 3,0* | 3,3 |
| SKO-P + MKT | 150 | 12,0 | - | 11,8 | 11,5 | 11,6 | 11,5 | - | - | 11,7 | - | | |
| | 165 | 14,5 | - | 14,3 | 14,1 | 14,2 | 14,0 | - | - | 14,3 | - | | |
| | 180 | 10,3 | - | 10,1 | 9,8 | 9,9 | 9,8 | - | - | 10,0 | - | | |
| | 205 | 11,0 | - | 10,8 | 10,5 | 10,6 | 10,5 | - | - | 10,7 | - | | |
| SKN | MW 24 | 6,9 | 6,5 | 6,7 | 6,4 | 6,5 | 6,4 | 7,0 | 6,8 | - | - | | |
| | MW 30 | 6,9 | 6,5 | 6,7 | 6,4 | 6,5 | 6,4 | 7,0 | 6,8 | - | - | | |
| | MW 36,5 | 6,9 | 6,5 | 6,7 | 6,4 | 6,5 | 6,4 | 7,0 | 6,8 | - | - | | |

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | e _{tot} in mm (e ₁ + e ₂ + e ₃) / Zuordnung der Luftdurchlässigkeitsklassen | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKT | 170 | 1,1* | 0* | 0,9* | 0,6* | 0,7* | 0,6* | 0* | 0* | - | - |
| | 210 | 1,1* | 0* | 0,9* | 0,6* | 0,7* | 0,6* | 0* | 0* | - | - |
| | 240 | 1,1* | 0* | 0,9* | 0,6* | 0,7* | 0,6* | 0* | 0* | - | - |
| SKT + MKT | 170 | 1,1* | 0* | 0,9* | 0,6* | 0,7* | 0,6* | 0* | 0* | - | - |
| | 210 | 1,1* | 0* | 0,9* | 0,6* | 0,7* | 0,6* | 0* | 0* | - | - |
| | 240 | 1,1* | 0* | 0,9* | 0,6* | 0,7* | 0,6* | 0* | 0* | - | - |

| | | | | | |
|------------------------------|---|---|---|---|----|
| Luftdurchlässigkeitsklassen: | 1 | 2 | 3 | 4 | 4* |
|------------------------------|---|---|---|---|----|

* Zusätzliche Einbau-Anforderungen als Bedingung für die Zuordnung zur Luftdurchlässigkeitsklasse 5 gemäß EN 13125:2001, Abschnitt 4,3 nicht erfüllt,

Tabelle 3: Zusätzlicher Wärmedurchlasswiderstand ΔR in (m²K)/W

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SAR SK | 250 | - | - | - | - | - | - | - | - | - | 0,24 |
| | 300 | - | - | - | - | - | - | - | - | - | 0,24 |
| SAR SKO-P | 230 | - | - | - | - | - | - | - | - | - | 0,24 |
| | 250 | - | - | - | - | - | - | - | - | - | 0,24 |
| | 300 | - | - | - | - | - | - | - | - | - | 0,24 |
| SK | 125 | 0,20 | - | 0,15 | 0,15 | - | - | - | - | - | - |
| | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 |
| | 150 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 |
| SK + MKT | 150 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 165 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| SKP | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 |
| | 150 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 |
| SKP + MKT | 150 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 165 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |

| Rollladen- kasten | Größe | Rollladenpanzer-Profile | | | | | | | | | | | |
|----------------------|---------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SP | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | - |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| SP + MKT | 165 | 0,11 | - | 0,09 | 0,09 | 0,09 | 0,09 | - | - | 0,11 | - | - | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| | 205 | 0,11 | - | 0,09 | 0,09 | 0,09 | 0,09 | - | - | 0,11 | - | - | - |
| SP-E | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | - |
| | 150 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | - |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| SP-E + MKT | 150 | 0,15 | - | 0,15 | 0,15 | 0,15 | 0,15 | - | - | 0,21 | - | - | - |
| | 165 | 0,20 | - | 0,15 | 0,15 | 0,15 | 0,15 | - | - | 0,21 | - | - | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| SKO | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | - |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| SKO + MKT | 165 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| SKO-P | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | - |
| | 150 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | - |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| SKO-P + MKT | 150 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| | 165 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - | - | - |
| SKN | MW 24 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |
| | MW 30 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |
| | MW 36,5 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |
| SKT | 170 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |
| | 210 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |
| | 240 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |
| SKT + MKT | 170 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |
| | 210 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |
| | 240 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - | - | - |



Hinweis: Der zusätzliche Wärmedurchlasswiderstand ΔR ist bei der Berechnung des Wärmedurchgangskoeffizienten U_{WS} eines Fensters mit geschlossenen Abschlüssen wie folgt zu berücksichtigen:

$$U_{WS} = \frac{1}{\frac{1}{U_W} + \Delta R}$$

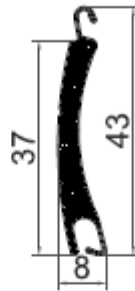


Bild 1: Querschnitt Probekörper PK 01 (PA37)



Bild 2: Querschnitt Probekörper PK 02 (PA39)

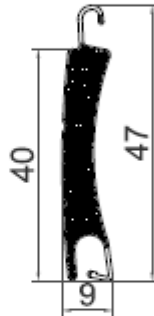


Bild 3: Querschnitt Probekörper PK 03 (PA40)

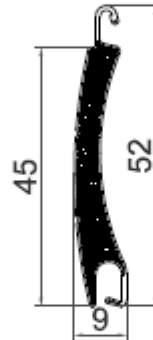


Bild 4: Querschnitt Probekörper PK 04 (PA45)

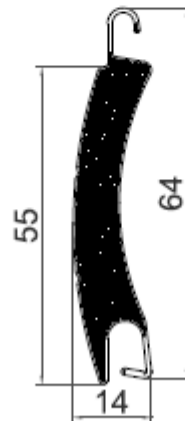


Bild 5: Querschnitt Probekörper PK 05 (PA52)

Bild 6: Querschnitt Probekörper PK 06 (PA55)

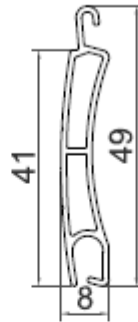


Bild 7: Querschnitt Probekörper PK 07 (PE41)

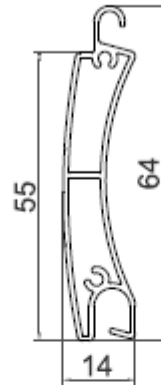


Bild 8: Querschnitt Probekörper PK 08 (PE55)

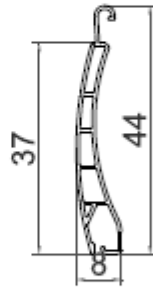


Bild 9: Querschnitt Probekörper PK 09 (PT37)

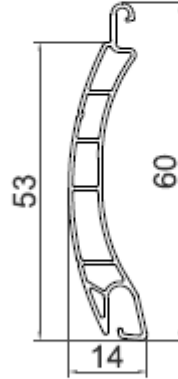


Bild 10: Querschnitt Probekörper PK 10 (PT52)

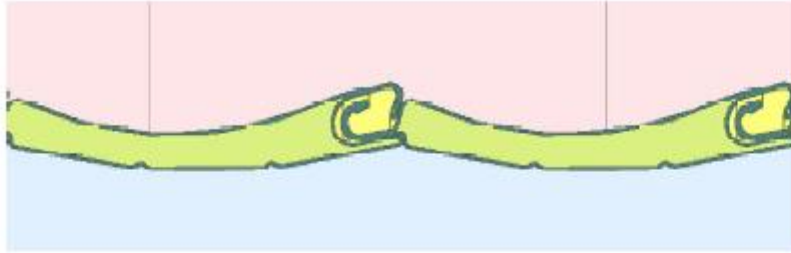


Bild 11: Simulationsmodell Probekörper PK 01 (PA37)



Bild 12: Simulationsmodell Probekörper PK 02 (PA39)



Bild 13: Simulationsmodell Probekörper PK 03 (PA40)



Bild 14: Simulationsmodell Probekörper PK 04 (PA45)



Bild 15: Simulationsmodell Probekörper PK 05 (PA52)



Bild 16: Simulationsmodell Probekörper PK 06 (PA55)



Bild 17: Simulationsmodell Probekörper PK 07 (PE41)

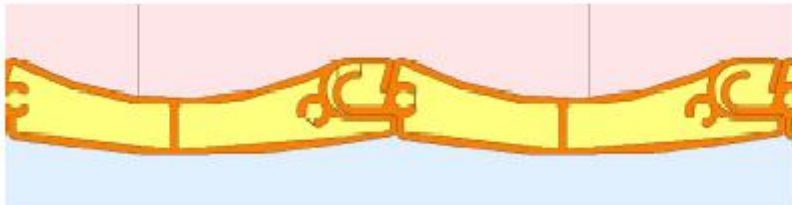


Bild 18: Simulationsmodell Probekörper PK 08 (PE55)

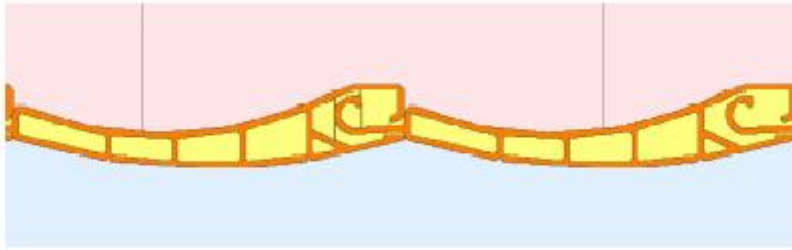


Bild 19: Simulationsmodell Probekörper PK 09 (PT37)

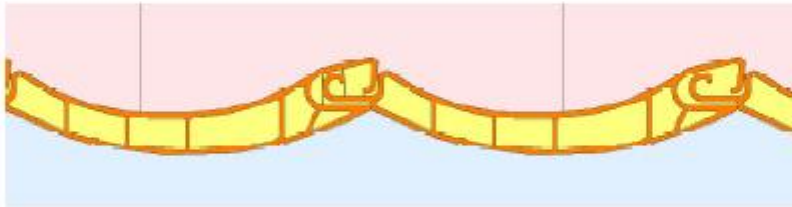


Bild 20: Simulationsmodell Probekörper PK 10 (PT52)

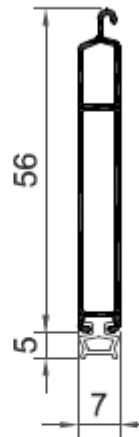


Bild 21: Querschnitt Endstab (LDG)

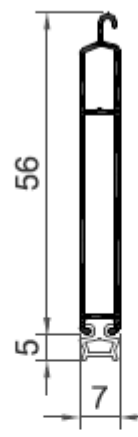


Bild 22: Querschnitt Endstab (LDG-E)

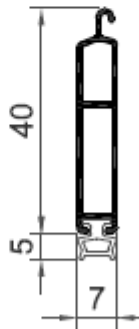


Bild 23: Querschnitt Endstab (LDG 40)

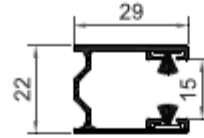
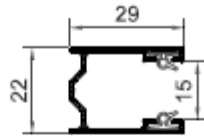


Bild 24: Querschnitt seitliche Führungsschiene (PU29), mit Keder- bzw. Bürstendichtung

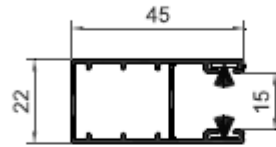
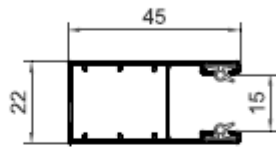


Bild 25: Querschnitt seitliche Führungsschiene (PP45), mit Keder- bzw. Bürstendichtung

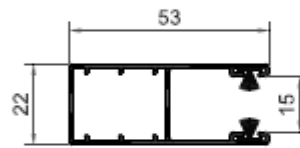
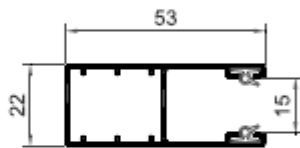


Bild 26: Querschnitt seitliche Führungsschiene (PP53), mit Keder- bzw. Bürstendichtung

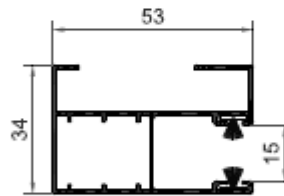
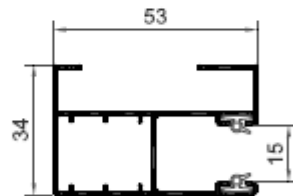


Bild 27: Querschnitt seitliche Führungsschiene (PP53/ODS), mit Keder- bzw. Bürstendichtung

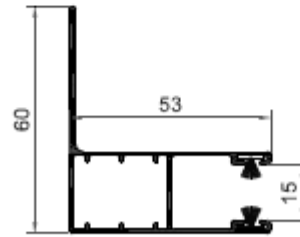
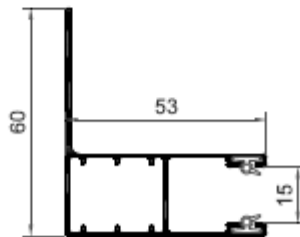


Bild 28: Querschnitt seitliche Führungsschiene (PK53), mit Keder- bzw. Bürstendichtung

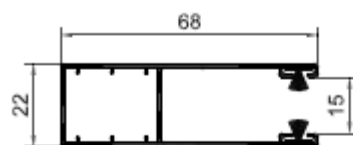
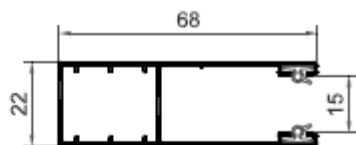


Bild 29: Querschnitt seitliche Führungsschiene (PP68), mit Keder- bzw. Bürstendichtung

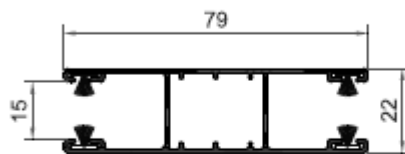
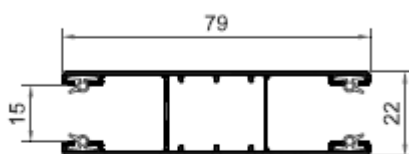


Bild 30: Querschnitt seitliche Führungsschiene (PPD79), mit Keder- bzw. Bürstendichtung

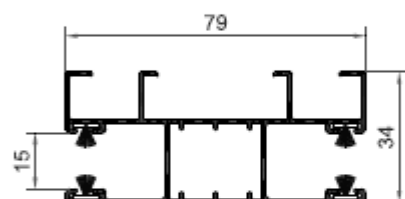
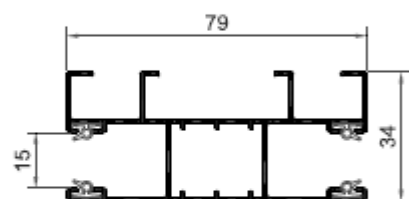


Bild 31: Querschnitt seitliche Führungsschiene (PPD79/ODS), mit Keder- bzw. Bürstendichtung

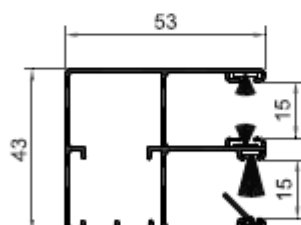
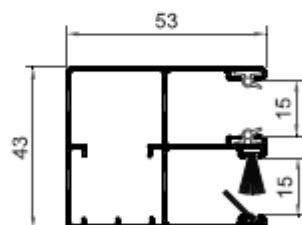


Bild 32: Querschnitt seitliche Führungsschiene (PPD053), mit Keder- bzw. Bürstendichtung

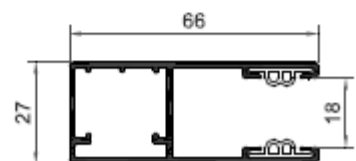


Bild 33: Querschnitt seitliche Führungsschiene (PP66) mit Keder

Bild 34: Querschnitt seitliche Führungsschiene (PPW80) mit Keder

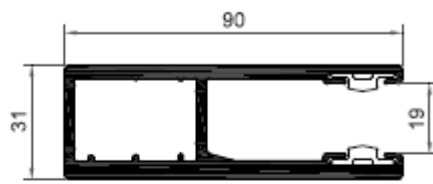


Bild 35: Querschnitt seitliche Führungsschiene (PPW90) mit Keder

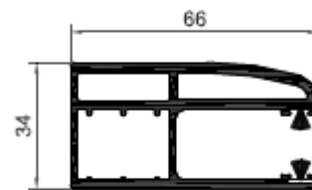


Bild 36: Querschnitt seitliche Führungsschiene (PPW66) mit Bürstendichtung

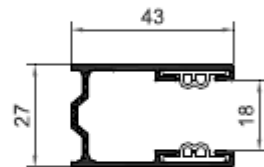


Bild 37: Querschnitt seitliche Führungsschiene (PU43) mit Keder

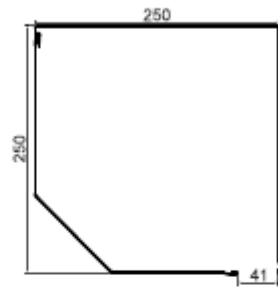


Bild 38: Querschnitt Rollladenkasten
(SAR SK 250)

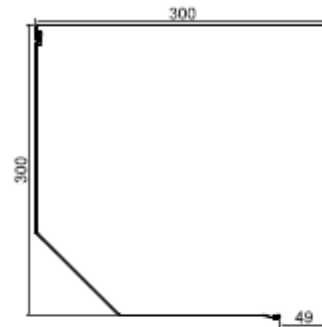


Bild 39: Querschnitt Rollladenkasten
(SAR SK 300)

| Rollladen- kasten | Größe | Rollladenpanzer-Profile | | | | | | | | | |
|----------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SAR SK | 250 | - | - | - | - | - | - | - | - | - | 0,24 |
| | 300 | - | - | - | - | - | - | - | - | - | 0,24 |

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Auftraggeber: ALUPROF S.A.
Centrala, Załad Bielsko Biels, 43-300 Bielsko-Biala (Polen)

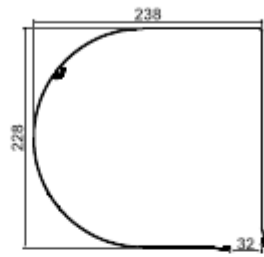


Bild 40: Querschnitt Rollladenkasten
(SAR SKO-P 230)

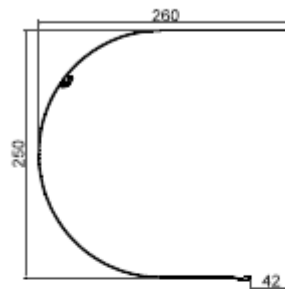


Bild 41: Querschnitt Rollladenkasten
(SAR SKO-P 250)

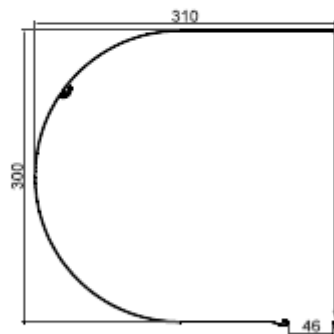


Bild 42: Querschnitt Rollladenkasten
(SAR SKO-P 300)

| Rollladen- kasten | Größe | Rollladenpanzer-Profile | | | | | | | | | |
|----------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SAR SKO-P | 230 | - | - | - | - | - | - | - | - | - | 0,24 |
| | 250 | - | - | - | - | - | - | - | - | - | 0,24 |
| | 300 | - | - | - | - | - | - | - | - | - | 0,24 |

Prüfbericht Nr. 15-000173-PR01 (PB-E01-06-de-01) vom 01.07.2015
 Auftraggeber: ALUPROF S.A.
 Centrala, Załad Bielsko Biels, 43-300 Bielsko-Biala (Polen)

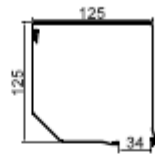


Bild 43: Querschnitt Rollladenkasten (SK 125)

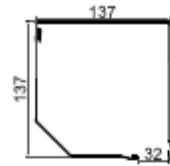


Bild 44: Querschnitt Rollladenkasten (SK 137)

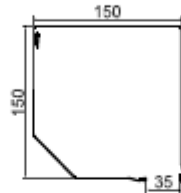


Bild 45: Querschnitt Rollladenkasten (SK 150)

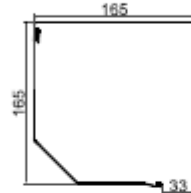


Bild 46: Querschnitt Rollladenkasten (SK 165)

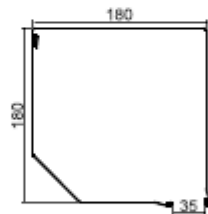


Bild 47: Querschnitt Rollladenkasten (SK 180)

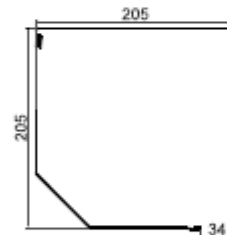


Bild 48: Querschnitt Rollladenkasten (SK 205)

| Rolladenkasten | Größe | Rolladenpanzer-Profile | | | | | | | | | | | |
|----------------|-------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SK | 125 | 0,20 | - | 0,15 | 0,15 | - | - | - | - | - | - | - | |
| | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | |
| | 150 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |

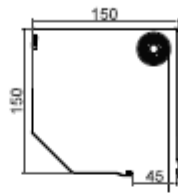


Bild 49: Querschnitt Rolladenkasten (SK+MKT 150)

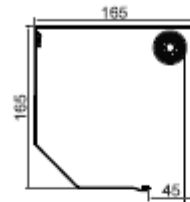


Bild 50: Querschnitt Rolladenkasten (SK+MKT 165)

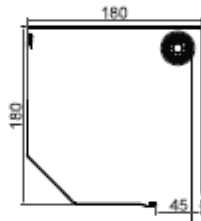


Bild 51: Querschnitt Rolladenkasten (SK+MKT 180)

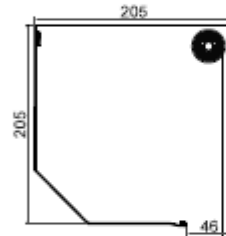


Bild 52: Querschnitt Rolladenkasten (SK+MKT 205)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SK + MKT | 150 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 165 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |

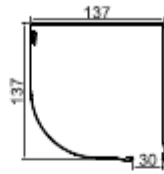


Bild 53: Querschnitt Rolladenkasten (SKP 137)

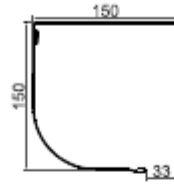


Bild 54: Querschnitt Rolladenkasten (SKP 150)

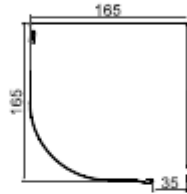


Bild 55: Querschnitt Rolladenkasten (SKP 165)

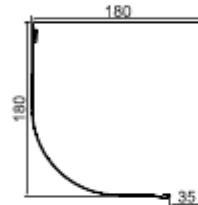


Bild 56: Querschnitt Rolladenkasten (SKP 180)

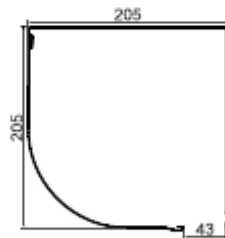


Bild 57: Querschnitt Rolladenkasten (SKP 205)

| Rolladenkasten | Größe | Rolladenpanzer-Profile | | | | | | | | | | | |
|----------------|-------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SKP | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | |
| | 150 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |

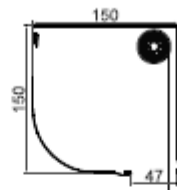


Bild 58: Querschnitt Rollladenkasten
(SKP + MKT 150)

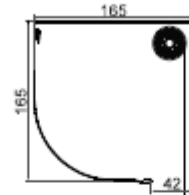


Bild 59: Querschnitt Rollladenkasten
(SKP + MKT 165)

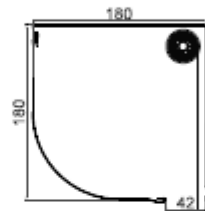


Bild 60: Querschnitt Rollladenkasten
(SKP + MKT 180)

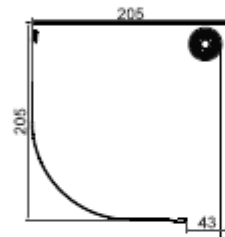


Bild 61: Querschnitt Rollladenkasten
(SKP + MKT 205)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKP + MKT | 150 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 165 | 0,15 | - | 0,12 | 0,15 | 0,15 | 0,15 | - | - | 0,16 | - |
| | 180 | 0,15 | - | 0,12 | 0,15 | 0,15 | 0,15 | - | - | 0,16 | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |

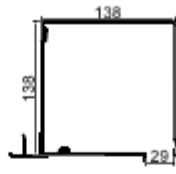


Bild 62: Querschnitt Rollladenkasten (SP 137)

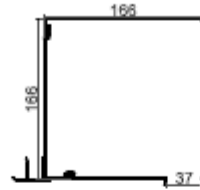


Bild 63: Querschnitt Rollladenkasten (SP 165)

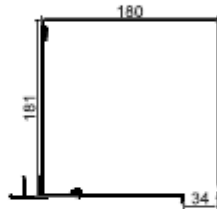


Bild 64: Querschnitt Rollladenkasten (SP 180)

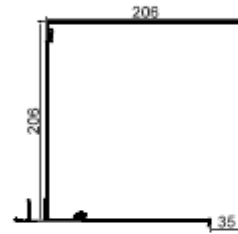


Bild 65: Querschnitt Rollladenkasten (SP 205)

| Rolladenkasten | Größe | Rolladenpanzer-Profile | | | | | | | | | | | |
|----------------|-------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SP | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |

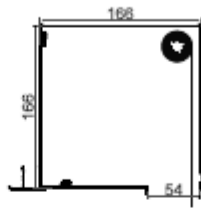


Bild 65: Querschnitt Rolladenkasten
(SP + MKT 165)

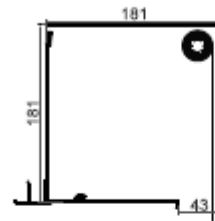


Bild 66: Querschnitt Rolladenkasten
(SP + MKT 180)

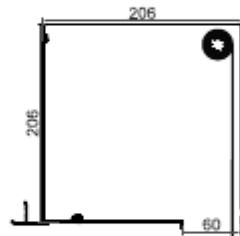


Bild 67: Querschnitt Rolladenkasten
(SP + MKT 205)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SP + MKT | 165 | 0,11 | - | 0,09 | 0,09 | 0,09 | 0,09 | - | - | 0,11 | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 205 | 0,11 | - | 0,09 | 0,09 | 0,09 | 0,09 | - | - | 0,11 | - |

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Auftraggeber: ALUPROF S.A.
Centrala, Zakład Bielsko Biala, 43-300 Bielsko-Biala (Polen)

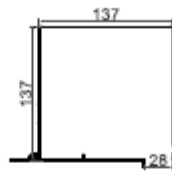


Bild 68: Querschnitt Rolladenkasten (SP-E 137)



Bild 69: Querschnitt Rolladenkasten (SP-E 150)

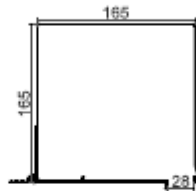


Bild 70: Querschnitt Rolladenkasten (SP-E 165)

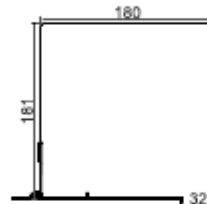


Bild 71: Querschnitt Rolladenkasten (SP-E 180)

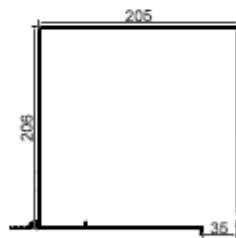


Bild 72: Querschnitt Rolladenkasten (SP-E 205)

| Rolladenkasten | Größe | Rolladenpanzerprofile | | | | | | | | | | | |
|----------------|-------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SP-E | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | - |
| | 150 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | - |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |

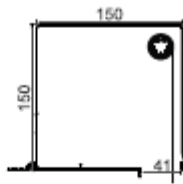


Bild 73: Querschnitt Rolladenkasten
(SP-E + MKT 150)

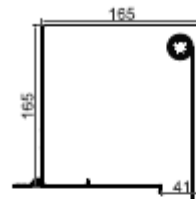


Bild 74: Querschnitt Rolladenkasten
(SP-E + MKT 165)

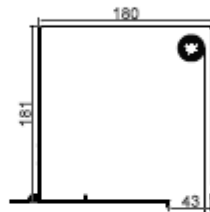


Bild 75: Querschnitt Rolladenkasten
(SP-E + MKT 180)

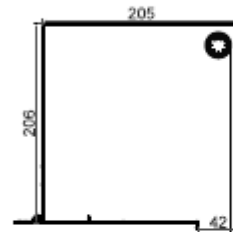


Bild 76: Querschnitt Rolladenkasten
(SP-E + MKT 205)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SP-E + MKT | 150 | 0,15 | - | 0,15 | 0,15 | 0,15 | 0,15 | - | - | 0,21 | - |
| | 165 | 0,20 | - | 0,15 | 0,15 | 0,15 | 0,15 | - | - | 0,21 | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |

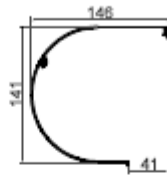


Bild 77: Querschnitt Rollladenkasten
(SKO 137)

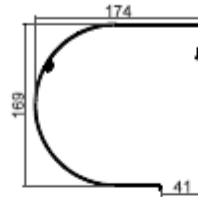


Bild 78: Querschnitt Rollladenkasten
(SKO 165)

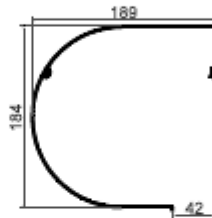


Bild 79: Querschnitt Rollladenkasten
(SKO 180)

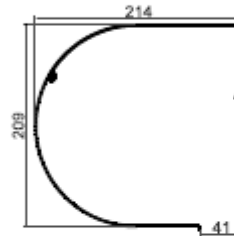


Bild 80: Querschnitt Rollladenkasten
(SKO 205)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SKO | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 |

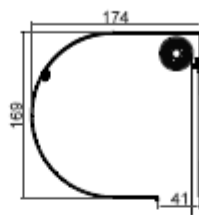


Bild 81: Querschnitt Rollladenkasten
(SKO + MKT 165)

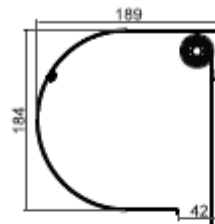


Bild 82: Querschnitt Rollladenkasten
(SKO + MKT 180)

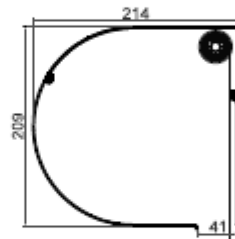


Bild 83: Querschnitt Rollladenkasten
(SKO + MKT 205)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKO + MKT | 165 | 0,15 | - | 0,12 | 0,15 | 0,12 | 0,15 | - | - | 0,16 | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 205 | 0,15 | - | 0,12 | 0,15 | 0,12 | 0,15 | - | - | 0,16 | - |

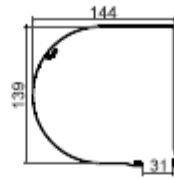


Bild 84: Querschnitt Rollladenkasten
(SKO-P 137)

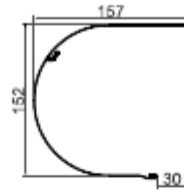


Bild 85: Querschnitt Rollladenkasten
(SKO-P 150)

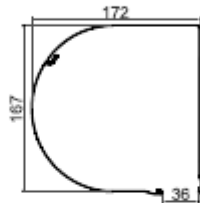


Bild 86: Querschnitt Rollladenkasten
(SKO-P 165)

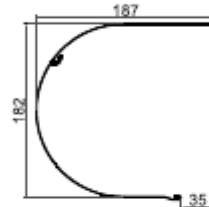


Bild 87: Querschnitt Rollladenkasten
(SKO-P 180)

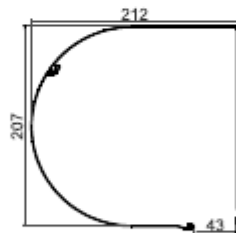


Bild 88: Querschnitt Rollladenkasten
(SKO-P 205)

| Rolladen- kasten | Größe | Rollladenpanzer-Profile | | | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|------|------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | | |
| SKO-P | 137 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | |
| | 150 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | 0,21 | 0,21 | - | |
| | 165 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 180 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |
| | 205 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,21 | 0,21 | 0,24 | 0,24 |

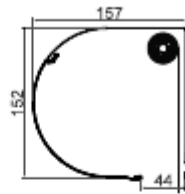


Bild 89: Querschnitt Rolladenkasten
(SKO-P + MKT 150)

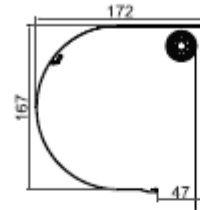


Bild 90: Querschnitt Rolladenkasten
(SKO-P + MKT 165)

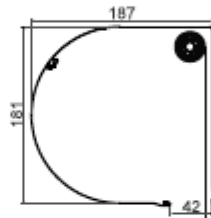


Bild 91: Querschnitt Rolladenkasten
(SKO-P + MKT 180)

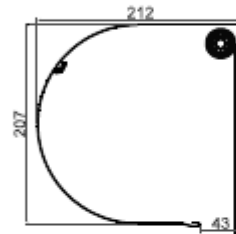


Bild 92: Querschnitt Rolladenkasten
(SKO-P + MKT 205)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKO-P + MKT | 150 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 165 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 180 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |
| | 205 | 0,15 | - | 0,12 | 0,12 | 0,12 | 0,12 | - | - | 0,16 | - |

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Auftraggeber: ALUPROF S.A.
Centrala, Zakład Bielsko Biala, 43-300 Bielsko-Biala (Polen)

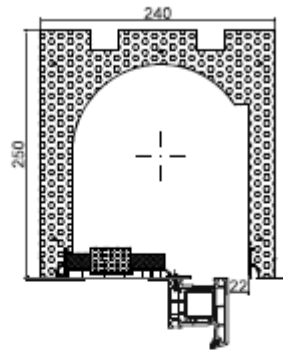


Bild 93: Querschnitt Rolladenkasten
(SKN MW24)

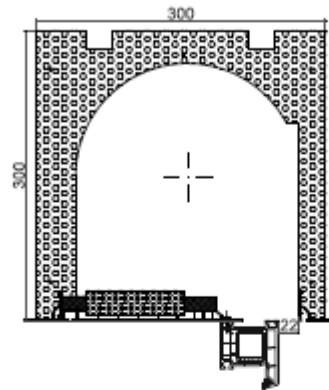


Bild 94: Querschnitt Rolladenkasten
(SKN MW30)

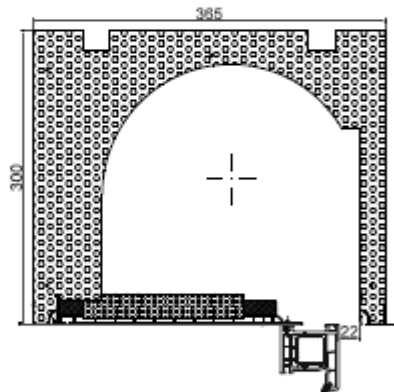


Bild 95: Querschnitt Rolladenkasten
(SKN MW36,5)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | | |
|---------------------|---------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|---|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 | |
| SKN | MW 24 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |
| | MW 30 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |
| | MW 36,5 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |

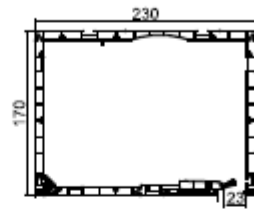


Bild 96: Querschnitt Rollladenkasten
(SKT 170)

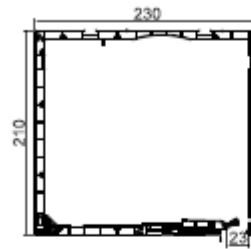


Bild 97: Querschnitt Rollladenkasten
(SKT 210)

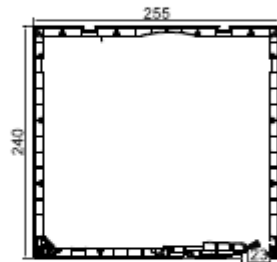


Bild 98: Querschnitt Rollladenkasten
(SKT 240)

| Rolladen- kasten | Größe | Rollladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKT | 170 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |
| | 210 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |
| | 240 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |

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 Auftraggeber: ALUPROF S.A.
 Centrala, Zakład Bielsko Bielsa, 43-300 Bielsko-Biała (Polen)

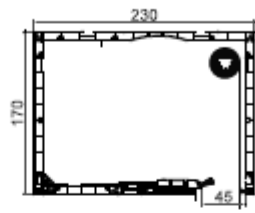


Bild 99: Querschnitt Rollladenkasten
(SKT + MKT 170)

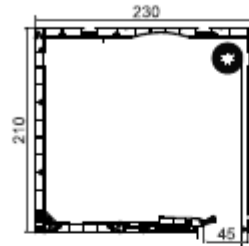


Bild 100: Querschnitt Rollladenkasten
(SKT + MKT 210)

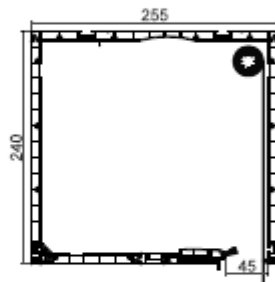


Bild 101: Querschnitt Rollladenkasten
(SKT + MKT 240)

| Rolladen- kasten | Größe | Rolladenpanzer-Profile | | | | | | | | | |
|---------------------|-------|--|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | | Zusätzlicher Wärmedurchlasswiderstand ΔR in (m ² K)/W | | | | | | | | | |
| | | PT 37 | PT 52 | PA 37 | PA 39 | PA 40 | PA 45 | PA 52 | PA 55 | PE 41 | PE 55 |
| SKT + MKT | 170 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |
| | 210 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |
| | 240 | 0,20 | 0,22 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | 0,15 | - | - |