

AENOR

Keymark Certificate Solar thermal energy



078/000369

AENOR certifies that the organization

BDR THERMEA GROUP B.V

registered office MERCHANTSTRAAT, 55 7300 AA APELDOORN (Holanda - Países Bajos)

supplies Solar collectors

in compliance with UNE-EN 12975-1:2006+A1:2011 (EN 12975-1:2006+A1:2010)

Trade Mark BRÖTJE FKR-L 25
Technical information Specified in Annexes to the Certificate

Production site CL MANGANÉS, 2 POLIG. INDUSTRIAL CAN ALBAREDA 08755
CASTELLBISBAL (Barcelona - España)

Certification scheme In order to grant this Certificate, AENOR has tested the product and has verified the quality system implemented for its manufacture. AENOR performs these tasks periodically while the Certificate has not been cancelled, in accordance with Specific Rules RP 078.01.

First issued on 2020-11-26
Validity date 2025-11-26

Rafael GARCÍA MEIRO
Chief Executive Officer

Original Electronic Certificate

AENOR INTERNACIONAL S.A.U.
Génova, 6. 28004 Madrid. España
Tel. 91 432 60 00.- www.aenor.com

Product certification body accredited by ENAC, number 1/C-PR271



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|---|--|---|----------------------|------------------------------------|--|-------|--------------------------------|-------|------------------------------------|------------------------------------|-------|-------|-------|-----|
| Annex to Solar Keymark Certificate | | | | | Licence Number | | 078/000369 | | | | | | | |
| | | | | | Date issued | | 2020-11-26 | | | | | | | |
| | | | | | Issued by | | Aenor | | | | | | | |
| Licence holder | | BDR THERMEA GROUP B.V. | | | Country | | NETHERLANDS | | | | | | | |
| Brand (optional) | | BRÖTJE | | | Web | | http://www.bdrthermea.com | | | | | | | |
| Street, Number | | MARCHANSTRAAT 55 | | | E-mail | | oleguer.fuertes@BDRThermea.com | | | | | | | |
| Postcode, City | | 7300 AA, APPELDORN | | | Tel | | +34 902 89 80 00 | | | | | | | |
| Collector Type | | | | | Flat plate collector | | | | | | | | | |
| Collector name | | | | | Power output per collector | | | | | | | | | |
| | | | | | Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$ | | | | | | | | | |
| | | | | | 0 K | 10 K | 30 K | 50 K | 70 K | 90 K | | | | |
| | | | | | m ² | mm | mm | mm | mm | mm | mm | | | |
| BRÖTJE FKR-L 25 | | | | | 2,51 | 1.147 | 2.187 | 87 | 1.940 | 1.848 | 1.640 | 1.402 | 1.134 | 835 |
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| Power output per m ² gross area | | | | | 773 | 736 | 653 | 558 | 452 | 333 | | | | |
| Performance parameters test method | | Steady state - indoor | | | | | | | | | | | | |
| Performance parameters (related to A _G) | | η_0, b | a1 | a2 | a3 | a4 | a5 | a6 | a7 | a8 | Kd | | | |
| Units | | - | W/(m ² K) | W/(m ² K ²) | J/(m ³ K) | - | J/(m ² K) | s/m | W/(m ² K ⁴) | W/(m ² K ⁴) | - | | | |
| Test results | | 0,790 | 3,54 | 0,015 | 0,000 | 0,00 | 7.140 | 0,000 | 0,00 | 0,0E+00 | 0,86 | | | |
| Incidence angle modifier test method | | Quasi dynamic - outdoor | | | | | | | | | | | | |
| Incidence angle modifier | | Angle | 10° | 20° | 30° | 40° | 50° | 60° | 70° | 80° | 90° | | | |
| Transversal | | K _{θT, coll} | 1,00 | 0,99 | 0,97 | 0,95 | 0,91 | 0,83 | 0,68 | 0,34 | 0,00 | | | |
| Longitudinal | | K _{θL, coll} | 1,00 | 0,99 | 0,97 | 0,95 | 0,91 | 0,83 | 0,68 | 0,34 | 0,00 | | | |
| Heat transfer medium for testing | | | | | Water | | | | | | | | | |
| Flow rate for testing (per gross area, A _G) | | | | | dm/dt | 0,020 | kg/(sm ²) | | | | | | | |
| Maximum temperature difference during thermal performance test | | | | | ($\vartheta_m - \vartheta_a$) _{max} | 60 | K | | | | | | | |
| Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30$ °C) | | | | | ϑ_{stg} | 200 | °C | | | | | | | |
| Maximum operating temperature | | | | | $\vartheta_{max, op}$ | n.n. | °C | | | | | | | |
| Maximum operating pressure | | | | | p _{max, op} | 1000 | kPa | | | | | | | |
| Testing laboratory | | TÜV Rheinland Energy GmbH | | | | | http://www.tuv.com/st | | | | | | | |
| Test report(s) | | 21240494.002_SOL250H_R 21217925_EN_P_SOL250H | | | | | Dated | | 26/09/2017 04/06/2012 | | | | | |
| Comments of testing laboratory | | | | | Datasheet version: 6.1, 2019-07-11 | | | | | | | | | |
| *The initial thermal performance testing was not performed according to ISO 9806:2013, but EN 12975-2:2006. The steady state test evaluation was recalculated with gross area. The former values related to 2.372 m ² aperture area had been: eta0a=0.818; a1a=3.748; a2a=0.016. | | | | | Stamp & signature of test lab | | | | | | | | | |
| AENOR INTERNACIONAL, S.A.U. - Génova, 6. - 28004 - Madrid, España - Tel. 91 432 60 00 - www.aenor.com | | | | | | | | | | | | | | |
| Product certification body accredited by ENAC, number 1/C-PR271 | | | | | | | | | | | | | | |



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|---|----------------|------------|
| Annex to Solar Keymark Certificate Supplementary Information | Licence Number | 078/000369 |
| | Issued | 2020-11-26 |

| Annual collector output in kWh/collector at mean fluid temperature ϑ_m | | | | | | | | | | | | | |
|--|-------------------------------------|---|-------|-------|-------------------------|-------|------|-------------------------|-------|------|-------------------------|-------|------|
| Collector name | Standard Locations ϑ_m | Athens | | | Davos | | | Stockholm | | | Würzburg | | |
| | | 25°C | 50°C | 75°C | 25°C | 50°C | 75°C | 25°C | 50°C | 75°C | 25°C | 50°C | 75°C |
| BRÖTJE FKR-L 25 | | 3.005 | 2.133 | 1.373 | 2.286 | 1.568 | 968 | 1.680 | 1.094 | 653 | 1.823 | 1.176 | 690 |
| Annual output per m ² gross area | | 1.197 | 850 | 547 | 911 | 625 | 386 | 670 | 436 | 260 | 726 | 469 | 275 |
| Annual efficiency, η_a | | 68% | 48% | 31% | 56% | 38% | 24% | 57% | 37% | 22% | 58% | 38% | 22% |
| Fixed or tracking collector | | Fixed (slope = latitude - 15°; rounded to nearest 5°) | | | | | | | | | | | |
| Annual irradiation on collector plane | | 1765 kWh/m ² | | | 1630 kWh/m ² | | | 1166 kWh/m ² | | | 1244 kWh/m ² | | |
| Mean annual ambient air temperature | | 18,5°C | | | 3,2°C | | | 7,5°C | | | 9,0°C | | |
| Collector orientation or tracking mode | | South, 25° | | | South, 30° | | | South, 45° | | | South, 35° | | |

The collector is operated at constant temperature ϑ_m (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 6.1 (July 2019). A detailed description of the calculations is available at <http://www.estif.org/solarkeymarknew/>

| Additional Information | | | | | |
|--|---|----------------------|----|------------------------------|-----|
| Collector heat transfer medium | Water-Glycole | | | | |
| The collector is deemed to be suitable for roof integration | Yes | | | | |
| The collector was tested successfully under the following conditions: | | | | | |
| Climate class (A+, A, B or C) | | | | A | -- |
| G (W/m ²) > | 1000 | ϑ_a (°C) > | 20 | H_x (MJ/m ²) > | 600 |
| Maximum tested positive load | | | | 5400 | Pa |
| Maximum tested negative load | | | | 3000 | Pa |
| Hail resistance using ice balls (diameter) | | | | 35 | mm |
| Additional collector attribute(s) | | | | | |
| <input type="checkbox"/> Using external power source(s) for normal operation | <input type="checkbox"/> Active or passive measure(s) for self-protection | | | | |
| <input type="checkbox"/> Co-generating thermal and electrical power | <input type="checkbox"/> Façade collector(s) | | | | |

| Energy Labelling Information | | Additional Informative Technical Data | |
|------------------------------|---|---------------------------------------|--|
| | Reference Area, A_{sol} (m ²) | Hydraulic Designation Code | Aperture Area, A_a (m ²) |
| BRÖTJE FKR-L 25 | 2,51 | {F}-{O}-{CL}-{A:Ø,L}-{C:Ø,L}-{D} | 2,37 |
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| Data required for CDR (EU) No 811/2013 - Reference Area A_{sol} | | Data required for CDR (EU) No 812/2013 - Reference Area A_{sol} | |
|--|-----|---|-------|
| Collector efficiency (η_{col}) | 61% | Zero-loss efficiency (η_0) | 0,77 |
| Remark: Collector efficiency (η_{col}) is defined in CDR (EU) No 811/2013 as collector efficiency of the solar collector at a temperature difference between the solar collector and the surrounding air of 40 K and a global solar irradiance of 1000 W/m ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017. | | First-order coefficient (a_1) | 3,54 |
| | | Second-order coefficient (a_2) | 0,015 |
| | | Incidence angle modifier IAM (50°) | 0,90 |
| | | Remark: The data given in this section are related to collector reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806. Consistent data sets for either aperture or gross area can be used in calculations like in the regulation 811 and 812 and simulation programs. | |