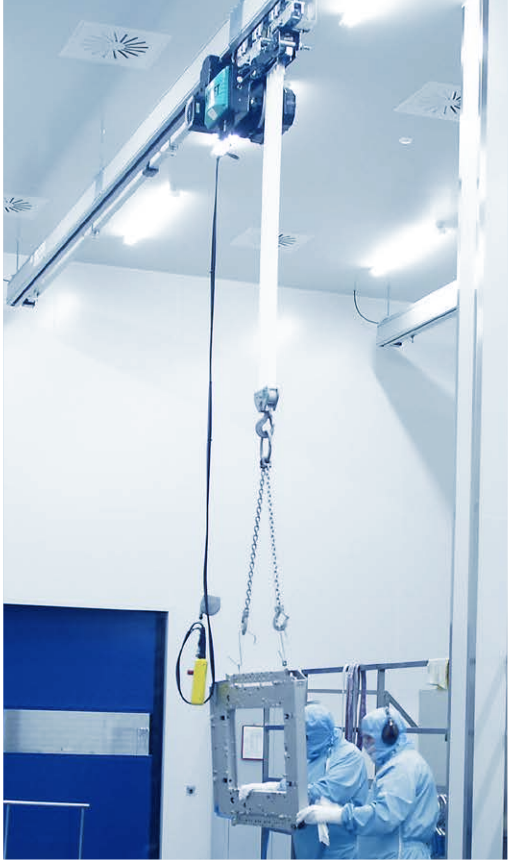


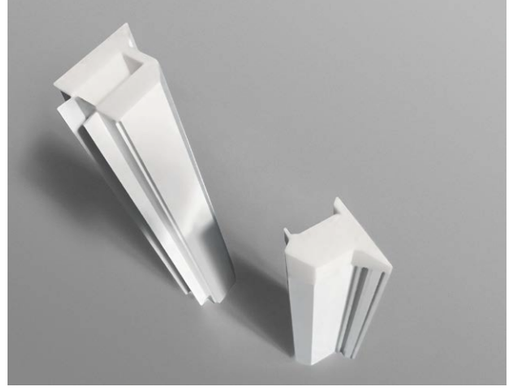
BRECON CASSETTE PANEL SYSTEM

Wall panels
Ceiling panels
Doors
Windows

IPA

Fraunhofer TESTED® DEVICE
Brecon Group
Brecon Casette Panel System
Report No. BR 1804-1024

BRECON
CLEANROOM SYSTEMS



BRECON **CASSETTE PANEL SYSTEM (BCPS)**

Designing and building dust-free or germ-free (GMP) cleanrooms or other spaces, within which specific requirements on cleanability and possibly a controlled environment apply, requires a specific approach and special construction products. The Brecon Group is a specialised company performing various activities in this Controlled Environment field of work. With more than 25 years of experience at international level, we are one of the leading companies in the Benelux. We design, build and maintain (GMP) cleanrooms, in a wide variety of market segments. The Brecon Group has the people with the right knowledge and experience in-house to be able to run its own R&D programme.

Since we started we have developed several wall and ceiling systems. We have had many moulds for special aluminium profiles or rubber seals designed, and the profiles produced using these are usually in stock. Where we use standard materials (locks, hinges, etc) we use only materials of the highest quality. The many years of partnership with our suppliers enable us to develop products together with them that are specifically designed for us. Window and door sections are built and assembled in-house.

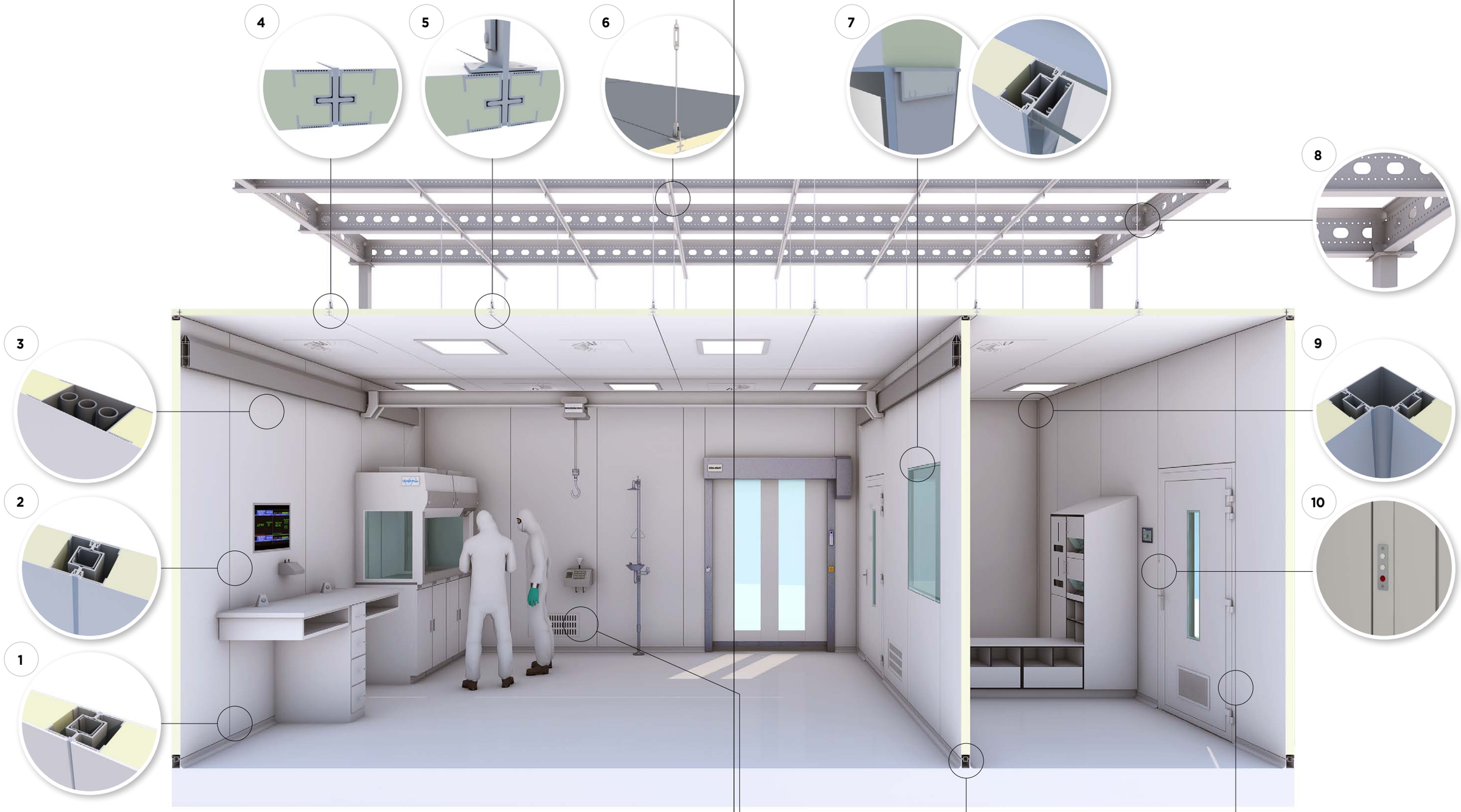
Our production and assembly employees are aware of the high demands placed on the products with which cleanrooms are assembled. Quality assurance systems are available for both our assembly business and the manufacturing unit! (ISO 9001 – 14001 and VCA** Safety)

During the course of 2016 we developed our Brecon Cassette Panel System. A wall and ceiling system, built and assembled using a number of high-quality components. The basis is made up of cassette panels with a module size of 1200 mm. The composition of the panels, both insulation material and surface finish, has a number of variants. This means it is possible to offer the right solution to meet the various customer requirements. Steel, HPL or maybe a Food Save variant. Insulated with Rockwool or Honeycomb. The Brecon Cassette Panel System offers a wide range of options.

Wall and ceiling panels are, in principle, simple building components and once fully installed in a cleanroom, they do not stand out. The many options in our panels, as attractive window sections or integrated air ducts, make our wall systems stand out. We believe our door sections are of a fine calibre and they meet the highest quality standards. Our detailing is of a high standard and the innovative solutions for specific contamination problems reflect our material knowledge and broad experience.

We could try to convince you of the unique properties based on an impressive story. However, the proof of the pudding is in the eating! Therefor we have our complete system tested, including the windows, doors and in the two basic materials Steel and HPL, filled with Aluminum Honeycomb or Rockwool. The result of this Fraunhofer IPA test is shown to you on the last two pages of this brochure.

Is this not enough convincing, we are happy to visit you to provide further explanation or showing you a model of this system or discussing some reference projects.



1 Connection of two HPL wall panels with steel profile
2 Connection of two Steel wall panels with steel profile
3 Technical duct channel for utilities (electro, data, gases etc.)
4 Connection of two accessible Steel ceiling panels with aluminium profile
5 Connection of two accessible Steel ceiling panels with aluminium profile, including suspension
6 Suspension unit with swivel for height setting
7 Window frame including 3D printed PP fitting to close the profile
8 Mezzanine construction as an option
9 Profile with vertical round inside corner
10 Interlock system in PAL and MAL with light signal on door frame
11 Door closure in frame with double rubber seal for optimal airtightness
12 Fitting of door frame, plus door, connected into the panel
13 Floor base profile with extra provision for round flush skirting
14 Flush grid for internal air duct, inside of the panel (500 m3/hr.)

BRECON **CASSETTE PANEL SYSTEM**

WALL PANELS

The BCPS (wall) System consists of 70 mm. thick panels with a maximum height of 6 meters and have a standard width of 1200 mm. Pass panels must be at least 200 mm. wide. The panels do not have any construc-tive function.

System Built-up
A panel is based on a heavy framework made by aluminium profiles, specifically designed for this BCPS wall system. The panels can be delivered in two variants:

- With steel slides of 0.6 mm on both sides. The steel is coated with a coil coating (standard 25 micron layer thickness). Optionally, the panels can be supplied with a PVC food-safe coating of 110-micron layer thickness. (Colour RAL 9010)
- With HPL slides of 3 mm on both sides. Optionally the HPL can be delivered in a special quality, capable in killing microbiologic contamination. (Silver Ions)

The panels can be provided with a sound and heat insulating:
- Rockwool insulating material with high pressure and a S.G. of 100 kg/m^3.
- Aluminum honeycomb material, with a structure size of 20 mm.

The panels are interconnected with a steel tube profile (1.5 mm thickness). Joints between windows, frames and panels are created automatically by the construction of the panels and the design of the profiles for the flush finishing with a cleanroom sealant. For the 90° angles, as well as T connections, special aluminium profiles are used with a 30 mm radius on the inside (hollow corners in colour RAL 9010). Panels can be supplied as an integrated air duct installed as a normal panel, but with an internal airflow of 500 m^3/hr.

It is also possible to provide panels with a technical space for cables or piping. (max 600 mm width). Airtight cable boxes or sockets can be installed in cut outs manually created during the installing process of the panels.

The panels are placed on an aluminium floor profile with a height of 70 mm and provided with a joint for the sealant between the skirting and the panel. The design of this profile is carried out in such a way that the installation of a hollow skirting, flush installed, is possible (Epoxy mortar or PVC floor).

Assembly requirements for the floor related to the walls
Floor flatness requirement in accordance with NEN 2747, 2001 class 2. Maximum deviation in gradient: in accordance with DIN 18202; 5.3.

Application
The BCPS wall system is suitable for the construction of laboratories or cleanrooms for the pharmaceutical, medical, cosmetic and health care industry, where GMP regulations are obligated.

Classification
According to ISO 14644, GMP, EHEDG guideline 44 and European Pharmacopoeia standards.

Sound insulation value
Based on the use of rockwool insulating material in a 60 mm layer thickness, the system meets the requirements of ISO 717 / DIN 52210: Rw = 45 dB.

Cleaning instructions
According to separate advice written by our PP4C partner WERO.

Assembly requirements HPL specific
During installation: temperature min. 20°C. Maximum humidity of 60%. The temperature is important be course of the shrinking- and expansion behaviour of HPL coursed by big temperature differences!

Glazing
Standard window section, size 1200 x 1200 x 70 mm. (hxwxd) both sides of the window are provided with 3.3.1. Safety glass, mounted on an aluminium frame. Joints between the window and the panel are created automatically by the design of the profiles for the technically correct flush finishing with cleanroom sealant. Where any opening, in hollow profiles of the window frames, could cause a contamination problem, specially designed 3D printed caps are installed for a complete seal. These caps are produced from a PP / PE material. If desired, dimensions of window units can be made to customer specifications.

The window can be provided with the following options:
- Polycarbonate: Window parts can be provided with 2x 6 mm polycarbonate, whether or not in an antistatic (AS) version.
- Venetian blinds installed between the two glass sections.
- It is possible to provide the glass panels with a splinter foil, often desired in the food sector.

BCPS TECHNICAL DATA

	Steel 0.6 mm Rockwool	Steel 0.6 mm Honeycomb	HPL 3 mm Rockwool	HPL 3 mm Honeycomb	HPL / Steel Rockwool	HPL / Steel Honeycomb	Steel 0.6 mm Rockwool	Steel 0.6 mm Honeycomb
	WALL	**WALL**	**WALL**	**WALL**	**CEILING**	**CEILING**	**CEILING**	**CEILING**
MaximumSize	1200x6000	1200x6000	1200x6000	1200x6000	1200x2400	1200x2400	1200x2400	1200x2400
Thickness	70 mm	70 mm	70 mm	70 mm	53 mm	53 mm	50 mm	50 mm
Density m³	100 kg	x	100 kg	x	100 kg	x	100 kg	x
Weight m²	18.4 kg	14.3 kg	15.8 kg	12.3 kg	15.6 kg	12.7 kg	16.2 kg	13.3 kg
Standard Coil Coating*	25 Micron	25 Micron	x	x	x	x	25 Micron	25 Micron
Food Safe Coating**	110 Micron	110 Micron	x	x	x	x	110 Micron	110 Micron
Silver Ion HPL	x	x	optional	optional	optional	x	x	x
Colour	RAL 9010	RAL 9010	Off white	Off white	Off white	Off white	RAL 9010	RAL 9010

BRECON **CASSETTE PANEL SYSTEM**

CEILING PANELS

Ceiling based on BCPS consists of 50 mm. thick panels with a standard length of 2.400 mm. and have a standard width of 1.200 mm. Pass panels must be at least 200 mm broad.

The combination of the strong panels, with the heavy suspension construction, makes the ceiling suitable for installation units up to 35 kg/m² or 90 kg / panel. Single loads of 150 kg for inspection and maintenance are allowed based on internal qualification reports and arithmetic evaluation by TNO in the Netherlands. Further practicable information is mentioned on the PDS.

System Built-up
A panel is based on a heavy framework made by aluminium profiles, specifically designed for this BCPS ceiling system. The panels can be delivered in two variants:

- With steel slides of 0.6 mm on both sides. The steel is coated with a coil coating (standard 25 micron layer thickness). Optionally, the panels can be supplied with a PVC food-safe coating of 110-micron layer thickness. (Colour RAL 9010)
- With HPL slide of 3 mm on one side (inside of the room), and steel on the topside. Optionally the HPL can be delivered in a special quality, capable in killing microbiologic contamination. (Silver Ions)

The panels can be provided with a sound and heat insulating:

- Rockwool insulating material with high pressure and a S.G. of 100 kg /m³.
- Aluminum honeycomb material, with a structure size of 20 mm.

The panels are interconnected with an aluminum profile. Joints between the panels are automatically created by means of the construction of the panels and the design of the profiles for the technically correct flush finishing.

The suspension is provided with an M8 steel threaded rod, using a steel gaff, connected to a special aluminum fitting, bolted to the panel, and provided with a steel tensioning swivel for eventually needed height adjustment.

Optionally, recesses can be created with an additional aluminum reinforcement frame, fitted in the inside of the panel. As a result, it is possible to place anemostats and / or (LED) lighting units (semi) flush. Due to the extra aluminum reinforcement frame in the panel, the ceiling remains even in the presence of a 600 x 600 mm \ 600 x 1200 mm recess, over a minimum length of 240 cm, fully loadable (max 150 kg./m²), with exception of a 200 mm edge directly around the recess. This weakened space is provided in the work with a marking for safety!

Application
The BCPS ceiling system is suitable for the construction of laboratories or cleanrooms for the pharmaceutical, medical, cosmetic and health care industry, where GMP regulations are obligated.

Classification
According to ISO 14644, GMP, EHEDG guideline 44 and European Pharmacopoeia standards.

Cleaning instructions
According to separate advice written by our PP4C partner WERO.

Assembly requirements HPL specific
During installation: temperature min. 20°C. Maximum humidity of 60%. The temperature is important be course of the shrinking- and expansion behaviour of HPL coursed by big temperature differences!

BRECON **CASSETTE PANEL SYSTEM**

MANUAL DOORS

The door and the frame form a unique unit. The special design of the heavy aluminium profiles, ensures that a double seal is made possible, when closing the door. The rubber seal is placed in the frame as well as the door. This creates a higher airtight entrance.

ATTENTION: The rubber seal is developed on the basis of ETP, a tetra polymer rubber with excellent chemical resistance and high flexibility at low temperatures. This specific material shows no outgassing!

Built up
The door is created by the combination of a panel, filled with rockwool insulation material (100 kg / m3), and a specially designed aluminium framework. The doorframe fits perfectly around the framework of the door itself as a counter-shape.
A door-panel is based on a heavy framework made by aluminium profiles, specifically designed for this BCPS ceiling system. The panels can be delivered in two variants:

- With steel slides of 0.6 mm on both sides. The steel is coated with a coil coating (standard 25 micron layer thickness). Optionally, the panels can be supplied with a PVC food-safe coating of 110-micron layer thickness. (Colour RAL 9010)
- With HPL slides of 3 mm on both sides. Optionally the HPL can be delivered in a special quality, capable in killing microbiologic contamination. (Silver Ions)

Four very strong hinges, three-dimensionally adjustable, in a heavy aluminium version, realize the suspension of the door. (Total capacity of permissible load of 4 x 140 kg = 560 kg!) The hinges are maintenance-free! (No lubricants applied)

The lock is a mortise lock with extended latch and a PE/PP stop on the doorjamb. Optionally, the door can be provided with a provision for the installation of a cylinder lock.

The rosettes and door handles are made of stainless steel and are placed blind.

Where any recesses or other openings, in hollow profiles of the doors and frames, could cause a contamination problem, specially designed 3D printed caps and other provisions are installed for a complete seal. These caps are produced from a PP / PE material.

Size
Exterior size single door: 1.200 x 2.400 x 70 mm (WxHxD).
Exterior size double door: 2.400 x 2.400 x 70 mm (WxHxD).

The free passage at a full single open door is 1.035 mm. The free passage at a full double open door is 2.235 mm. The door can be provided with the following options:

Door closer: Surface-mounted / GEZE TS 5000 2-6 is suitable for doors up to a width of 1.400 mm and has an adjustable closing force of 2-6 in accordance with EN 1154. The door closer is also suitable for fire and smoke-proof doors. Hydraulic end stroke and adjustable closing speed.

Door closer: Built-in / GEZE Boxer 3-6 is suitable for doors up to a width of 1.400 mm and has an adjustable closing force of 3-6 to EN 1154. Door closer and slide rail are fully integrated into the door and the frame. The door closer is also suitable for fire and smoke protection doors. Hydraulic end stroke and adjustable closing speed.

Window: Window part, flush placed, size 1.200 x 200 mm. Both sides of the door can be provided with 3.3.1. Safety glass, mounted on an aluminium frame. Joints between the window and the door panel are automatically created for the technically correct flush finishing with cleanroom sealant, thanks to the design of the profiles.

Further window options:

- Provide the glass panels with a splinter foil, often desired in the food sector.
- Windows can be equipped with 2x 6 mm polycarbonate whether or not in an antistatic (AS) version.
- If desired, dimensions of the window section in the door can be made to customer specifications.

Drop seal: Aluminium drop seal with a maximum extension of 15 mm. The drop seal has a 24 mm. wide TPE sealing lip. Equipped with an automatic skew mechanism.

Interlock: Choice of two-door lock system up to and including advanced sluice systems with multiple doors. Frame is equipped with push-button inputs and door position signalling as well as emergency controls. The electric door closure provides a holding force of 10.000 N. and automatically closes the door to 8 mm. In the event of a malfunction of the interlock system, an acoustic alarm signal is triggered within one minute. All built-in parts, as mentioned above, are flush placed in the frame or door.

Application
The BCPS door system is suitable for the construction of laboratories or cleanrooms for the pharmaceutical, medical, cosmetic and health care industry, where GMP regulations are obligated.

Classification
According to ISO 14644, GMP, EHEDG guideline 44 and European Pharmacopoeia standards.

Cleaning instructions
According to separate advice written by our PP4C partner WERO.

Assembly requirements HPL specific
During installation: temperature min. 20°C. Maximum humidity of 60%. The temperature is important be course of the shrinking- and expansion behaviour of HPL coursed by big temperature differences!

TECHNICAL DATA

Standard Coating system	Topside: 5 microns primer + 20 microns top coat Back: 12 microns backing coat
Gloss (Gardner 60°) (1)	30 GU
Appearance	Smooth
Temporary protection (optional)	Self-adhesive film or heat-sealed film
Performance Adhesion of the coating	(T-bend) ≤ 2 T
Resistance to cracking on bending	(T-bend) ≤ 3 T
Impact resistance	18 J
Surface “pencil” hardness	HB to H
Clemens scratch resistance	≥ 2 kg
Corrosion resistance:	
• Salt spray test	360 hours
• Corrosion resistance category	RC3
Condensation resistance (QCT)	1000 hours
UV resistance:	
• QUV (UVA + H2O) test (2000 hours)	ΔE ≤ 5; GR ≥ 30%
• UV resistance category	RUV2
Fire behavior classification (EN 13501-1)	A1
Food-safe Coating system	Thickness 140 micron (PVC co-laminated with PET) Thickness tolerance ± 7%
Adhesion after 6 mm indentation (ECCA T6):	No film detachment
Bending strength (ECCA T7 [1996]:	1 T2
Rapid deformation resistance	
(Method ASTM D 2794-93):	Not less than 140 inch/lb
Saline mist resistance ASTM B 117-95):	500 hours
Resistance to relative humidity of 100%	
(Method ASTM D 2247-94):	No inferior a 1000 hours
Pencil hardness (method ASTM D 3363-92a):	H
Brightness at 60° (ECCA T2 [1995]	
Method ASTM D 523-89)	33 ± 5 Gloss
Abrasion resistance TABER	
(Method ASTM D4060-95, CS10, 500 gr:	
• Abrasion resistance (at 1000 revs)	26,5 – 27,5
Resistance to artificial light	
(Method ASTM G 53-96):	>6
▸ Temperature:	55 ± 3 °C
▸ Lamp:	UV-A 340
▸ Cycle:	Irradiance only
▸ Reference:	International Blue Scale

HPL (Formica HGS)

Characteristic	Method	Unit of Measure	HGS
Surface Defects	EN438: 2005-2-4		
• Dirt/Spots		mm2/m2	≤ 1
• Fibers/Hairs/Scratches		mm/m2	≤ 10
Thickness	EN438: 2005-2-5	mm	±0.1
Length & Width	EN438: 2005-2-6	mm	-0 / +10
Squareness	EN438: 2005-2-7	mm/m	≤ 1.5
Edge Straightness	EN438: 2005-2-8	mm/m	≤ 1.5
Flatness	EN438: 2005-2-9	mm/m	≤ 60
Surface Wear Resistance	EN438: 2005-2-10	revolutions	≥ 350
Immersion in Boiling Water	EN438: 2005-2-12	Class	
• Gloss			3
• Other			4
Resistance to Water Vapor	EN438: 2005-2-14	Class	
• Gloss			3
• Other			4
Resistance to Dry Heat (180°C)	EN438: 2005-2-16	Class	
• Gloss			3
• Other			4
Dimensional Stability	EN438: 2005-2-17	%	
• Longitudinal			≤ 0.55
• Transverse			≤ 1.05
Impact Resistance (Small Ball)	EN438: 2005-2-20	N	≥ 20
Resistance to Cracking	EN438: 2005-2-23	Class	4
Scratch Resistance	EN438: 2005-2-25	Class	
• Gloss			3
• Other			3
Stain Resistance	EN438: 2005-2-26	Class	
• Group 1 & 2			5
• Group 3			4
Light Fastness	EN438: 2005-2-27	Grey Scale	4 to 5
Resistance to Cigarette Burns	EN438: 2005-2-30	Class	3
Density		g/cm3	≥ 1.35
Fire Rating			D,s2-d0

EN438 Class Definitions:

Class 5 No visible change	Class 4 Slight loss of gloss / colour
Class 3 Moderate loss of gloss / colour	Class 2 Marked loss of gloss / colour
Class 1 Blisters and or delamination	

QUALIFICATION CERTIFICATES

IPA

Fraunhofer

TESTED® DEVICE

Brecon Group
Brecon Cassette Panel System
Report No. BR 1804-1024

Hygienic Design

Qualification Certificate

This is to certify that the product mentioned above, provided by

Brecon Cleanroom Systems B.V.
Tilburg, The Netherlands

has been awarded a Fraunhofer certificate TESTED DEVICE bearing the report number BR 1804-1024.

The Brecon Cassette Panel System is principally suitable for use in hygienic areas up to the following GMP Class according to EU GMP Annex 1:

Suitability
up to GMP Class A

However, this recommendation only pertains to the operating utility when in a resting state. An overall assessment of the Brecon Cassette Panel System can only be made after its installation.

DUPLICATE

This document only applies to the named product in its original state and is valid for a period of 5 years from the date the first document was issued. The document can be verified under **www.tested-device.com**.

Detailed information and parameters of the test environment can be found in the Fraunhofer IPA test report.

BR 1804-1024 — Report No. first document
Stuttgart, August 1, 2018 — Place, date of first document issued
-- — Report No. current document
-- — Place, current date
on behalf of — Dr.-Ing. Frank Bürger, Project Manager Fraunhofer IPA

Fraunhofer IPA

IPA

Fraunhofer

TESTED® DEVICE

Brecon Group
Brecon Cassette Panel System
Report No. BR 1804-1024

Particle Emission

Qualification Certificate

This is to certify that the product mentioned above, provided by

Brecon Cleanroom Systems B.V.
Tilburg, The Netherlands

has been awarded a Fraunhofer certificate TESTED DEVICE bearing the report number BR 1804-1024.

The Brecon Cassette Panel System (color: RAL 9010) was assessed in compliance with ISO 14644-14. When operated under the specified test conditions, it is suitable for use in cleanrooms fulfilling the specifications of the following Air Cleanliness Class according to ISO 14644-1:

Test parameter(s)	Air Cleanliness Class
structure-borne noise: approx. 5 to 50 Hz	3
Overall result	**3**

DUPLICATE

This document only applies to the named product in its original state and is valid for a period of 5 years from the date the first document was issued. The document can be verified under **www.tested-device.com**.

Detailed information and parameters of the test environment can be found in the Fraunhofer IPA test report.

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Fraunhofer IPA

‘WHEN THE RIGHT CONDITIONS ARE CRUCIAL’

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