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Measurement Report

Cleanroom suitability tests on ergonomic mats manufactured by Ergomat A/S

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1 Introduction and objectives

Ergomat A/S develops, manufactures and sells the internationally acknowledged ERGOMAT® anti-fatigue mats. The components are produced under high quality requirements and are successfully implemented in a wide range of industries.

To secure the market position of Ergomat A/S in the sector of cleanroom technology, the aim is to identify optimization potentials for its products. The suitability of a product for use in clean areas is significantly influenced by the materials used in its manufacture.

The industrial alliance "Cleanroom Suitable Materials CSM" has developed procedures for determining the cleanroom suitability of materials. Depending on the area of implementation concerned, the behaviour of materials with regard to particle emission and outgassing is taken into consideration. The tests are carried out in a standardized way in compliance with relevant national and international norms.

The results obtained provide an objective and substantiated basis for comparison and can be referred to when selecting suitable materials for specific manufacturing environments and areas of implementation. In consequence, this improves the cleanroom suitability of the respective products.

2 Materials tested

TESTED MATERIALS	
NAME (FULL LENGTH)	**COLOR**
Ergomat Infinity Smooth	White
Ergomat Hygiene	Green
Ergomat AB Classic	Anthracite
Ergomat Infinity Bubble	Black
Ergomat Optimal ESD	Grey

Figure 1 Overview of materials tested

3 Overview of results

Figure 2

TESTED MATERIALS	PERFORMED TESTS				
NAME (FULL LENGTH)	**PARTICLE EMISSION**	**OUTGASSING**	**CHEMICAL RESISTANCE**	**BIOLOGICAL RESISTANCE**	**MICROBICIDITY**
Ergomat Infinity Smooth (White)	x		x		
Ergomat Hygiene (Green)			x		
Ergomat AB Classic (Anthracite)	x				
Ergomat Infinity Bubble (Black)	x				
Ergomat Optimal ESD (Grey)	x				
PA6 Nylon	x				

PARTICLE EMISSION (ACCORDING TO ISO 14644-1)			
MATERIAL PAIRING			**ISO CLASS**
SPECIMEN	**COUNTER SPECIMEN**	**LUBRICANT**	
Ergomat Infinity Smooth (White)	PA6 Nylon	(none)	**5**
Ergomat AB Classic (Anthracite)	PA6 Nylon	(none)	**5**
Ergomat Infinity Bubble (Black)	PA6 Nylon	(none)	**6**
Ergomat Optimal ESD (Grey)	PA6 Nylon	(none)	**3**

CHEMICAL RESISTANCE (CSM CLASSIFICATION ACCORDING TO ISO 4628)			
MATERIAL	**TECHNIQUE**	**CHEMICALS**	**OVERALL RESULT**
Ergomat Infinity Smooth (White)	Immersion (23°C)	formalin (37%)	**good**
		ammoniac (25%)	
		hydrogen peroxide (30%)	
		sulfuric acid (5%)	
		phosphoric acid (30%)	
		peracetic acid (15%)	
		hydrochloric acid (5%)	
		isopropanol (100%)	
		sodium hydroxide solution (5%)	
		sodium hypochlorite (15%)	
Ergomat Hygiene (Green)	Immersion (23°C)	formalin (37%)	**very good**
		ammoniac (25%)	
		hydrogen peroxide (30%)	
		sulfuric acid (5%)	
		phosphoric acid (30%)	
		peracetic acid (15%)	
		hydrochloric acid (5%)	
		isopropanol (100%)	
		sodium hydroxide solution (5%)	
		sodium hypochlorite (15%)	

Figure 3 Overview of results obtained

4 Airborne particle emission tests on application of tribological stress

4.1 Procedure for particle emission tests

4.1.1 Cleanroom-suitable material test bench

A special, cleanroom-suitable material test bench developed by Fraunhofer IPA and called Material Inspec is used for the tests. The test bench enables material pairings to be subjected to controlled tribological stress and permits the resulting particulate emissions to be measured without the influence of any cross-contamination.

Figure 4 Cleanroom-suitable material test bench "Material Inspec" developed by Fraunhofer IPA with module for ball on disk test

Tribological stress

The cleanroom-suitable material test bench “Material Inspec” enables tests to be carried out using the tribological methods known as **ball-on-disk** and **reel-on-disk** tests.

With the ball-on-disk test, a ball with a **radius r** is pressed onto the face of a disk with a **normal force F**. In the process, the disk rotates with a **frequency f** so that a **relative velocity v** results at the point of contact. The **single measurement track s** is calculated from the circumference of the circle with the radius r. The **number of revolutions N** is the number of rotations completed by the disk beneath the ball during the test.

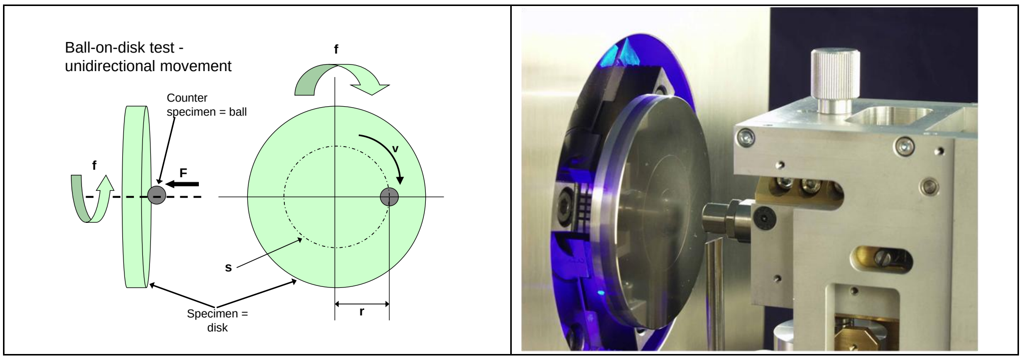

Figure 5 Tribological stress on material pairing – principle of **ball-on-disk test**

The ball-on-disk test simulates pure dynamic friction between two materials. The point of contact is punctiform; this fact needs to be taken into consideration when assessing the resulting local force applied.

The reel-on-disk test is based on the same principle as the ball-on-disk test with one difference: instead of a ball, a reel is used as counter specimen. According to the ball-on-disk test, the reel is pressed with a defined pressure onto the surface and the tribological generated particles are detected.

All of the tests which are carried out are model tests. This means that the forces mentioned or applied are similar to but may not be exactly the same as those encountered in reality. This fact requires special consideration when interpreting the results and transferring them to real components.

4.1.1.1 Force transmission and measurement recordings

The normal force is applied using a force transmission unit. For the ball-on-disk test, dead weights are implemented. For the reel-on-disk test, steel springs are utilized because of the increased forces.

The **normal force** applied is recorded continuously during the test using a load cell based on the principle of the strain gauge.
With the ball-on-disk test, in addition to the normal force, the frictional force acting vertically downwards at the point of contact is also recorded synchronously. This enables the **progression of the friction coefficient** to be determined as the ratio between frictional force and normal force.

Particle measurement
Particulate emissions are measured directly beneath the point of contact of the material test specimen. In the case of the ball-on-disk test (punctiform contact of the test specimen), a chamfered particle probe tube is used. With the reel-on-disk test, because of the broader line-shaped contact, a cylindrical particle probe with an aperture of 35 mm in diameter is used.
The area of contact has been specially designed from an airflow point of view to ensure that the majority of particles emitted are detected.

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4.1.2 Test parameters

For both the ball-on-disk and the reel-on-disk tests, the essential test parameters affecting particulate emission include the **single measuring track s**, the **relative velocity v**, the **normal force F** and the **number of revolutions N**. Standardized sets of stress parameters are formed using these values to facilitate the comparison of results obtained from the various tests.

SET OF PARAMETERS	*s*/mm	*v*/mm/s	*F*/N	N
A 01	70	50	1	1500
A 02	90	50	3	1500
A 03	110	50	5	1500
A 04	130	100	6	1500
A 05	150	100	8	1500
A 06	170	100	10	1500
A 07	200	100	11	1500
A 08	220	100	13	1500
A 09	240	100	15	1500
A 10	260	150	16	1500
A 11	280	150	18	1500
A 12	300	150	20	1500

SET OF PARAMETERS	*s*/mm	*v*/mm/s	*F*/N	N
B 01	250	150	15	1500
B 02	250	150	45	1500
B 03	250	150	75	1500
B 04	250	150	90	1500
B 05	250	150	120	1500
B 06	250	150	150	1500
B 07	250	150	165	1500
B 08	250	150	195	1500
B 09	250	150	225	1500
B 10	250	150	240	1500
B 11	250	150	270	1500
B 12	250	150	300	1500

Figure 6 Defined set of stress parameters; left: ball-on-disk test; right: reel-on-disk test

The amount of stress to be applied to each material pairing is decided upon individually by Fraunhofer IPA on taking into account the quantity of particles generated and the measuring range of the device used in the test.

The following table shows the degree of accuracy achieved when setting the test parameters as well as fluctuations in these parameters which are experienced during the tests.

	ACCURACY; MAXIMUM VARIATION DURING TEST	
	BALL-ON-DISK-TEST	REEL-ON-DISC-TEST
NORMAL FORCE FN	0.01 N; +/- 3 %	0.01 N; +/- 3 %
SINGLE MEASURING TRACK S	0.1 mm; n.a.	0.1 mm; n.a.
RELATIVE VELOCITY V	0.5 mm/s; +/- 3 %	0.5 mm/s; +/- 3 %
NUMBER OF REVOLUTIONS N	+/- 1 %	+/- 1 %

Figure 7 Degree of accuracy achieved when setting the test parameters and fluctuations thereof during the test

4.1.3 Cleanroom environment

All tests are carried out at the Fraunhofer IPA test center for semiconductor equipment. Measurements are taken in a cleanroom fulfilling Class 1 specifications (in accordance with ISO 14644-1). A vertical, unidirectional airflow prevails in the cleanroom with a first air flow velocity of 0.45 m/s. Environmental conditions are kept constant with a room temperature of 22 °C ± 0.5 °C and a relative humidity of 45 % ± 5 %.

In compliance with ISO 14644-1, Cleanroom "Class 1" means that only two particles the size of 0.2 µm may be found in a reference volume of one cubic meter in the first air (filtered air introduced into the cleanroom). In practical operation, even fewer particles are found in this class.

4.1.4 Particle measuring technique

Optical particle counters are utilized to determine particle emission during the tests.

Optical particle counters function according to the theory of scattered light. Using a sampling probe, a defined volume of air of 1 cubic foot (1 cft = 28.3 liters) is sucked in per minute and guided into a measuring chamber via a tube connected to it. The air sucked in is illuminated by a laser beam. As soon as a particle carried by the airflow is hit by a light ray, the light is scattered and recorded by photo-detectors.

The amount of impulses registered equates to the number of particles found in the volume of air; the height of the impulse gives an indication of particle size.

Depending upon the size and amount of particles generated, 3 different measuring devices are used.

MODEL	COMPANY	PARTICLE SIZES DETECTED
LasAir II 110	PMT AG, Heimsheim	0.1 / 0.2 / 0.3 / 0.5 / 1.0 / 5.0 µm

Figure 8 Optical particle counters used to record particle emissions

The volume of air sucked in by all devices is 1 cft/min = 28.3 l/min.
In order to obtain a chronological progression of the particles emitted, particle measurements are recorded every 6 seconds.

4.1.5 Test procedure

The test specimens are **introduced** into the cleanroom before the tests are commenced. In the process, the surfaces of the test pieces are cleaned to remove any sedimented particles or filmy contamination which may be present.

Where possible, the **tribological tests** are carried out using **3 different sets of stress parameters**, taking into account the quantity of particles generated. To ensure reliability of the results, **3 repeated tests** are carried out for each set of stress parameters.

4.2 Material samples for particle emission tests

TESTED MATERIALS				LOAD
ID	SPECIMEN	COUNTER SPECIMEN	LUBRICANT	
IP Ergomat 01	Ergomat Infinity Smooth (White)	PA6 Nylon	(none)	Reel-on-disk-test
IP Ergomat 03	Ergomat AB Classic (Anthracite)	PA6 Nylon	(none)	Reel-on-disk-test
IP Ergomat 05	Ergomat Infinity Bubble (Black)	PA6 Nylon	(none)	Reel-on-disk-test
IP Ergomat 06	Ergomat Optimal ESD (Grey)	PA6 Nylon	(none)	Reel-on-disk-test

Figure 9 Materials for the particle emission tests

The table also includes the codes used by the industrial alliance CSM to identify material pairings.

For the material pairing IP Ergomat 01, IP Ergomat 03, IP Ergomat 05, IP Ergomat 06, an ergonomic mat was bonded on a 15 mm thick and a diameter of 140 mm aluminum disk are used as a specimens.
A reel with a width of 60 mm and a diameter of 100 mm, made of PA6 Nylon, is used as counter specimen.

Photographs of the materials tested:

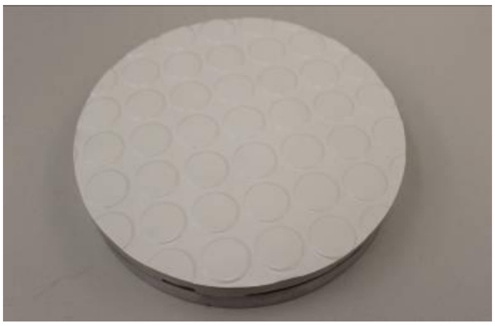


Figure 10 Materials tested – left: Ergomat Infinity Smooth (White); right: Ergomat AB Classic (Anthracite)

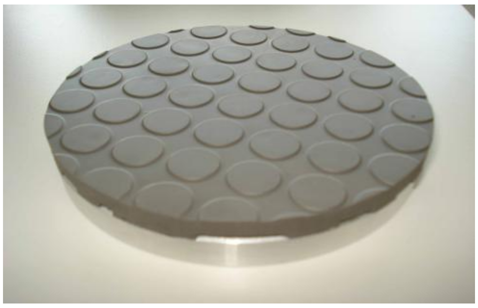
 

Figure 11 Materials tested – left: Ergomat Infinity Bubble (Black); right: Ergomat Optimal ESD (Grey)

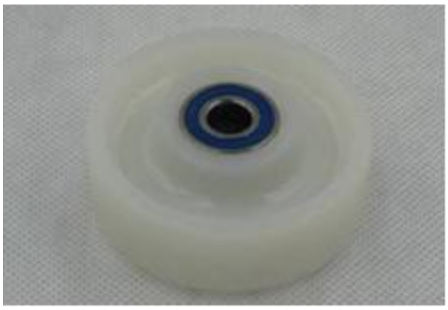


Figure 12 Materials tested – left: PA6 Nylon

4.3 Particle emission results

4.3.1 Differential progression of particle emission

4.3.1.1 Method

Particle emission is measured every 6 seconds during the application of tribological stress. Depending upon the particle counter used, particle emission is classified into various **particle size channels**. The values measured are expressed **cumulatively**, i.e. the result for one size always includes all particles equal to or larger than the reference size for that channel. For example, the information obtained for the particle size 0.1 µm includes all particles with a diameter of 0.1 µm or larger.

Each diagram shows the progression of particle emission measured in the smallest particle size channel for the three repeated tests on application of one set of stress parameters. Where appropriate, the **scale of the y-axis** is adjusted, please note that the scale may vary from one graph to another!

4.3.1.2 IP Ergomat 01: Ergomat Infinity Smooth (White) versus PA6 Nylon

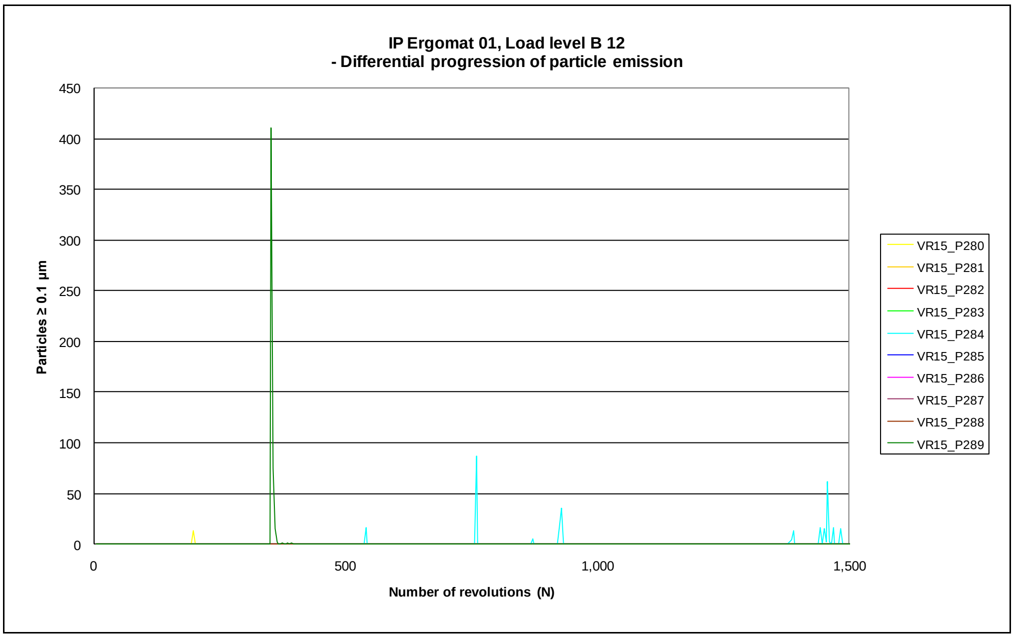


Figure 13 IP Ergomat 01 – progression of particle emission, particle size **0.1 µm**, set of stress parameters **B 12**

4.3.1.3 IP Ergomat 03: Ergomat AB Classic (Anthracite) versus PA6 Nylon

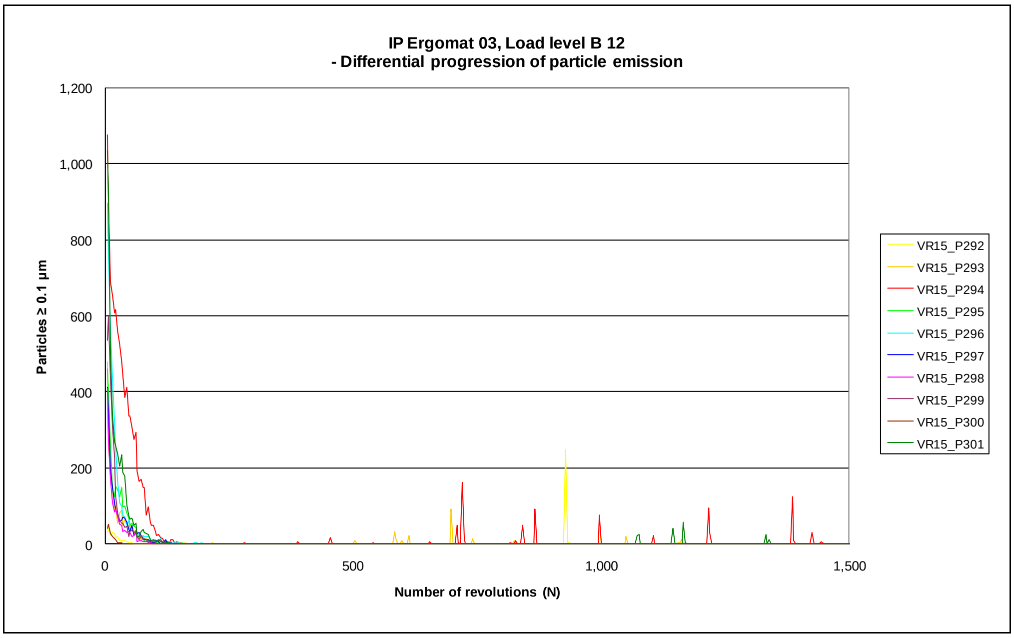


Figure 14 IP Ergomat 03 – progression of particle emission, particle size **0.1 µm**, set of stress parameters **B 12**

4.3.1.4 IP Ergomat 05: Ergomat Infinity Bubble (Black) versus PA6 Nylon

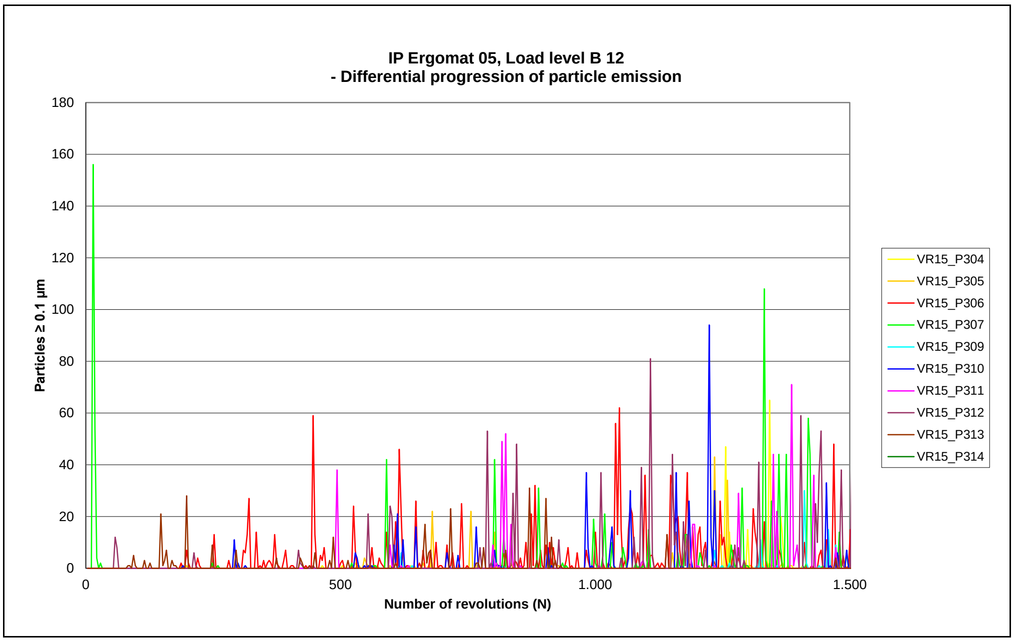


Figure 15 IP Ergomat 05 – progression of particle emission, particle size **0.1 µm**, set of stress parameters **B 12**

4.3.1.5 IP Ergomat 06: Ergomat Optimal ESD (Grey) versus PA6 Nylon

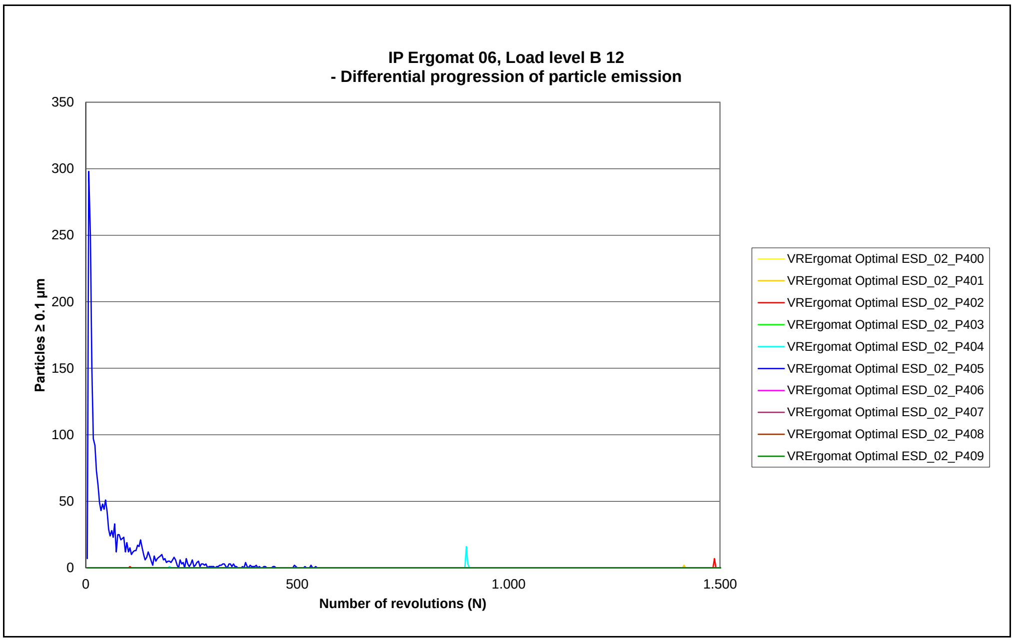


Figure 16 IP Ergomat 06 – progression of particle emission, particle size **0.1 µm**, set of stress parameters **B 12**

4.3.2 Size distribution of the emitted particles

4.3.2.1 Method

From the particle emission progression data, the percentage of each particle size in relation to the total count of emitted particles is calculated. If, for example, the particle sizes 0.1 µm, 0.2 µm, 0.3 µm, 0.5 µm, 1.0 µm and 5.0 µm are recorded by the optical particle counter, the percentage of the

- Particles in the size channel 0.1 µm relates to particles with a diameter of 0.1 µm to 0.2 µm,
- Particles in the size channel 0.2 µm relates to particles with a diameter of 0.2 µm to 0.3 µm,
- Particles in the size channel 0.3 µm relates to particles with a diameter of 0.3 µm to 0.5 µm,
- Particles in the size channel 0.5 µm relates to particles with a diameter of 0.5 µm to 1.0 µm,
- Particles in the size channel 0.5 µm relates to particles with a diameter of 0.5µm to 5.0µm,
- Particles in the size channel 5.0 µm relates to particles with a diameter equal to or greater than 5.0µm.

Values are obtained from all three repeated tests. The size channel stated is dependent upon the optical particle counter used in the tests.

In order to ensure reliability of the data, only those percentages of particles are calculated where a minimum of 100 particles was observed in the smallest size channel in the course of the entire test.

The following diagrams show the particle size distribution for the material pairings and the corresponding sets of stress parameters. If data is absent in the diagram, this means that the required minimum count of 100 particles was not recorded in the smallest size channel.

4.3.2.2 IP Ergomat 01: Ergomat Infinity Smooth (White) versus PA6 Nylon

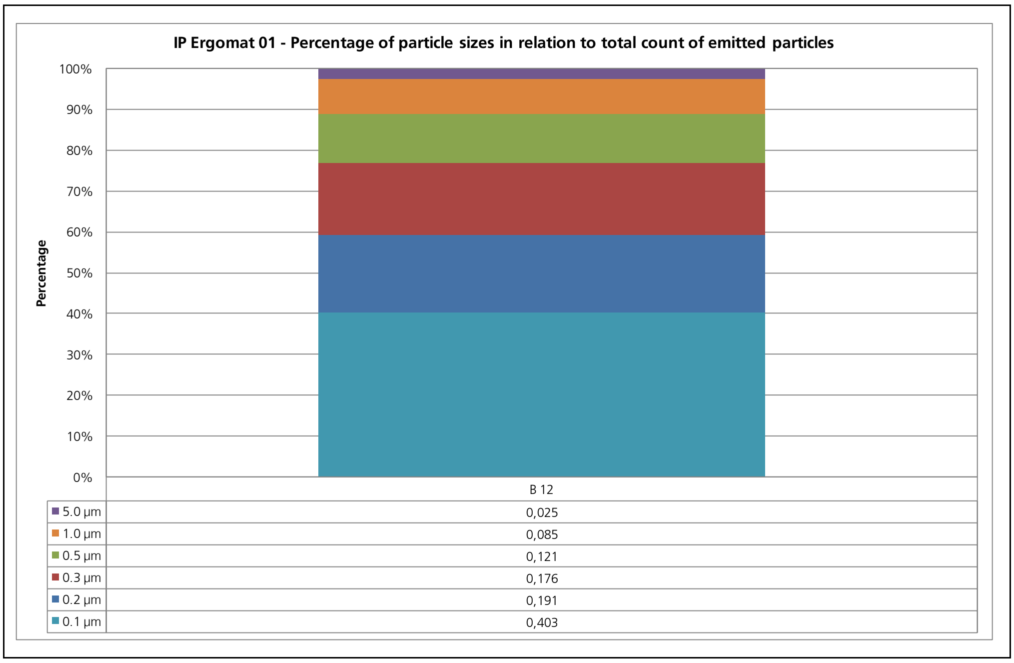


Figure 17 IP Ergomat 01– required minimum count of 100 particles was not recorded

4.3.2.3 IP Ergomat 03: Ergomat AB Classic (Anthracite) versus PA6 Nylon

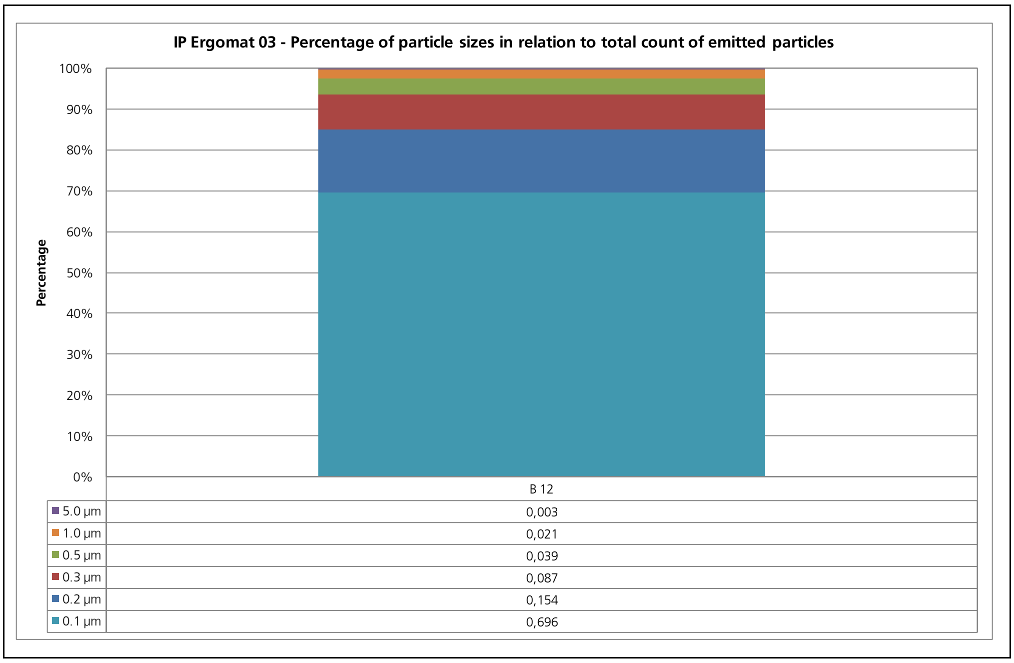


Figure 18 IP Ergomat 03

4.3.2.4 IP Ergomat 05: Ergomat Infinity Bubble (Black) versus PA6 Nylon

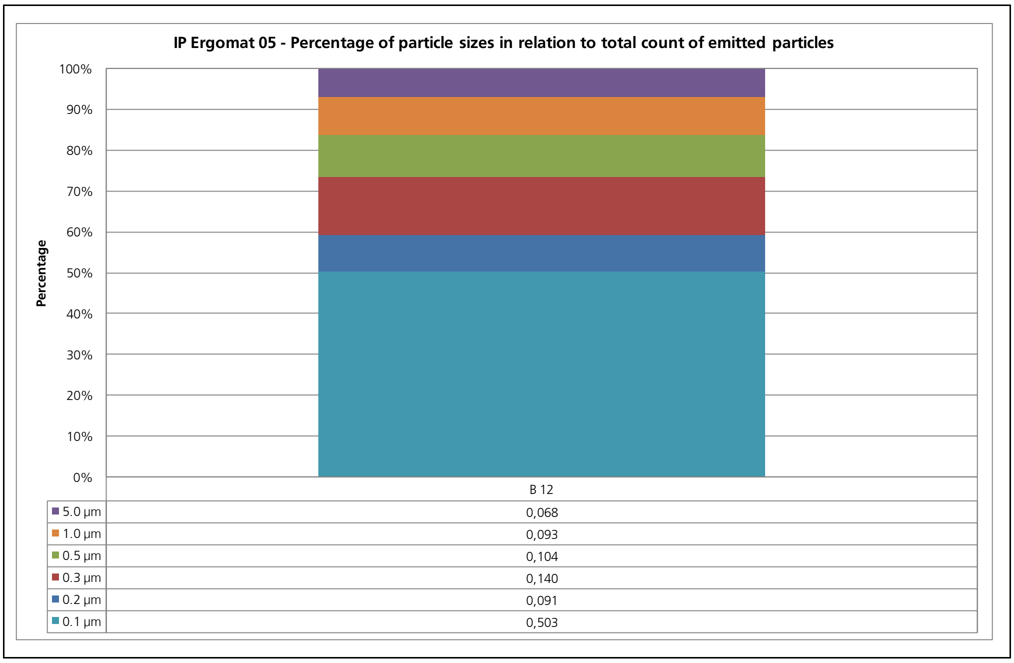


Figure 19 IP Ergomat 05

4.3.2.5 IP Ergomat 06: Ergomat Optimal ESD (Grey) versus PA6 Nylon

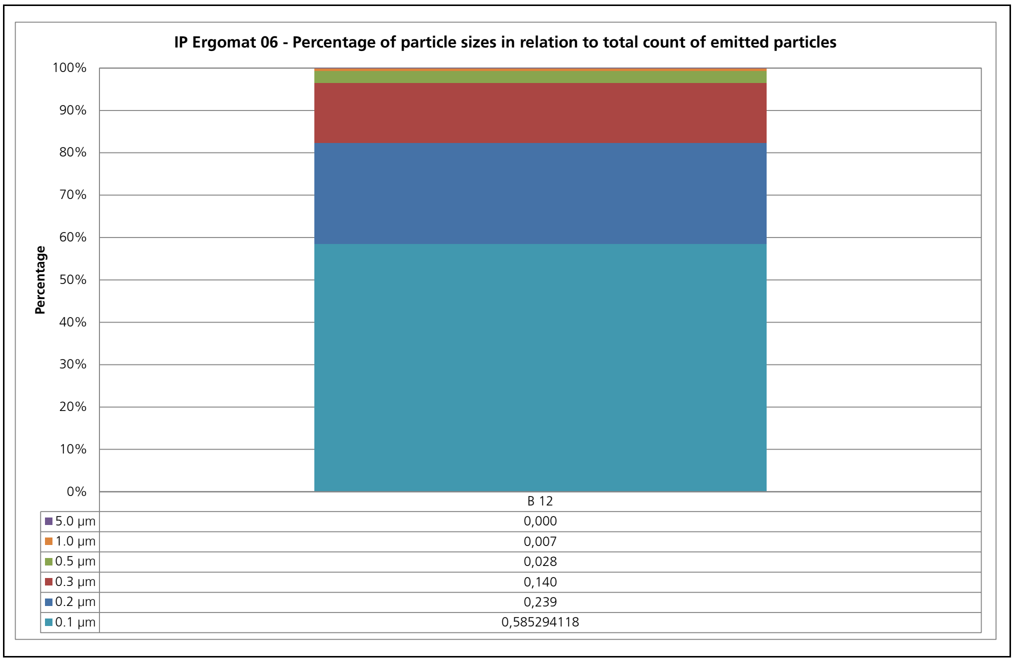


Figure 20 IP Ergomat 06

4.3.3 Classification

4.3.3.1 Method

In general, airborne particulate contamination is the main issue considered when assessing cleanroom suitability. The most important aspects of this are the size and concentration of airborne particles. Relevant standards state limiting values for the concentration of airborne particles in dependence upon particle size, as found in ISO 14644-1. This norm describes the quality of cleanrooms using Air Cleanliness Classes ranging from 1 to 9. The lowest class, Class 1, fulfills the highest requirements with regard to air cleanliness; the limiting value of particles permitted increases with each successive cleanroom class. Calculations can be made for limiting values of any particle size between 0.1 µm and 5.0 µm for all classes using the method for calculating permitted limiting values as described in ISO 14644-1. The norm states the maximum permitted number of particles of each size for the reference volume (in this case: 1 m^3).

The tests performed record particle emissions generated when tribological stress is applied to material pairings. The amounts of particles measured are dependent upon the material pairing concerned and the set of stress parameters applied. In order to better appreciate the differences, Fraunhofer IPA has developed a method which enables classifications to be made based on the measurement results obtained using the procedure stated in ISO 14644-1.

In accordance with the procedure laid down in ISO 14644-1 for determining the permitted particle concentration of different Air Cleanliness Classes, limiting values are ascertained for the given particle size classes taking the test conditions into consideration. The limiting value is obtained from the test volume of air (sampling time multiplied by the particle counter's constant volume flow of 28.3 l / min) and the permitted particle concentrations (particles / m^3) for the corresponding Air Cleanliness Class and particle size. A comparison of these limiting values with the total counts of emitted particles gives the classification figure for the test. The calculation method has been extended to include particles sized between 0.1 µm and 25.0 µm.
Care is to be taken when comparing the classification figures; consideration of the particle size in relation to the values and also of the set of parameters applied in the respective test.

Three repeat measurements are carried out on each material pairing for each set of parameters. The highest value classification figure obtained applies. This figure is used in the corresponding tables and diagrams.
The following tables show the classification figures obtained for the material pairing. The availability of classification figures for the various particle sizes depends upon the resolution of the optical particle counter used.

4.3.3.2 Overview of classification results

LOAD LEVEL	NORMAL FORCE	DETECTED PARTICLE SIZE					
		0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	5.0 µm
B 12	300 N	2.3	2.7	3.0	3.3	3.7	4.6
CLASSIFICATION RELEVANT TO DOCUMENTS							**5**

Figure 21 IP Ergomat 01: Ergomat Infinity Smooth (White) versus PA6 Nylon
Overview of classification value attained in accordance with ISO 14644-1

The level of particulate contamination emitted during application of tribological stress on the material pairing **Ergomat Infinity Smooth (White) versus PA6 Nylon** lies within the permissible values of the corresponding Air Cleanliness Classes **ISO Class 5** in accordance with ISO 14644-1.

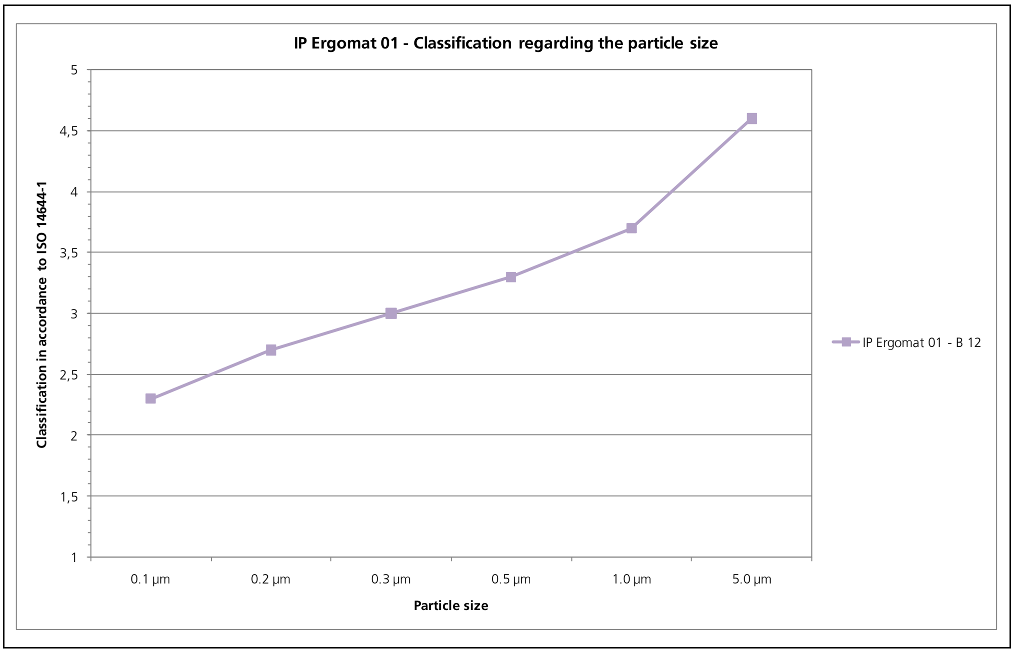


Figure 22 IP Ergomat 01: Ergomat Infinity Smooth (White) versus PA6 Nylon
Classification in accordance with ISO 14644-1 in dependence upon the particle size

4.3.3.3 Overview of classification results

LOAD LEVEL	NORMAL FORCE	DETECTED PARTICLE SIZE					
		0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	5.0 µm
B 12	300 N	3.7	3.8	3.9	3.9	4.2	4.8
CLASSIFICATION RELEVANT TO DOCUMENTS							5

Figure 23 IP Ergomat 03: Ergomat AB Classic (Anthracite) versus PA6 Nylon versus PA6 Nylon
Overview of classification value attained in accordance with ISO 14644-1

The level of particulate contamination emitted during application of tribological stress on the material pairing **Ergomat AB Classic (Anthracite) versus PA6** lies within the permissible values of the corresponding Air Cleanliness Classes **ISO Class 5** in accordance with ISO 14644-1.

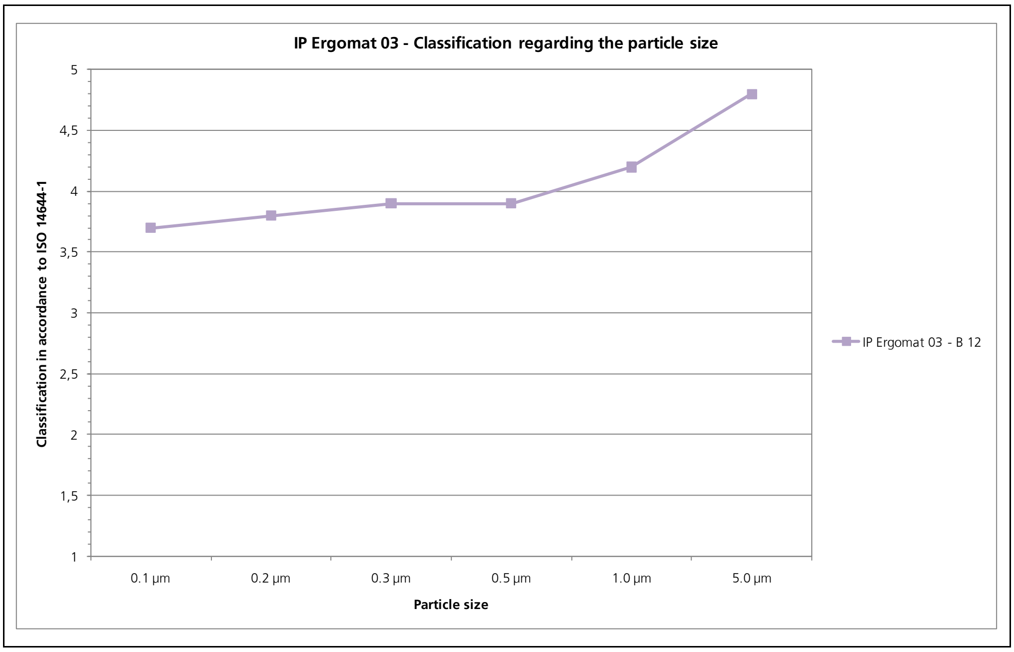


Figure 24 IP Ergomat 03 Ergomat AB Classic (Anthracite) versus PA6 Nylon
Classification in accordance with ISO 14644-1 in dependence upon the particle size

4.3.3.4 Overview of classification results

LOAD LEVEL	NORMAL FORCE	DETECTED PARTICLE SIZE					
		0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	5.0 µm
B 12	300 N	2.9	3.2	3.5	3.8	4.2	5.3
CLASSIFICATION RELEVANT TO DOCUMENTS							6

Figure 25 IP Ergomat 05: Ergomat Infinity Bubble (Black) versus PA6 Nylon
Overview of classification value attained in accordance with ISO 14644-1

The level of particulate contamination emitted during application of tribological stress on the material pairing **Ergomat Infinity Bubble (Black) versus PA6 Nylon** lies within the permissible values of the corresponding Air Cleanliness Classes **ISO Class 6** in accordance with ISO 14644-1.

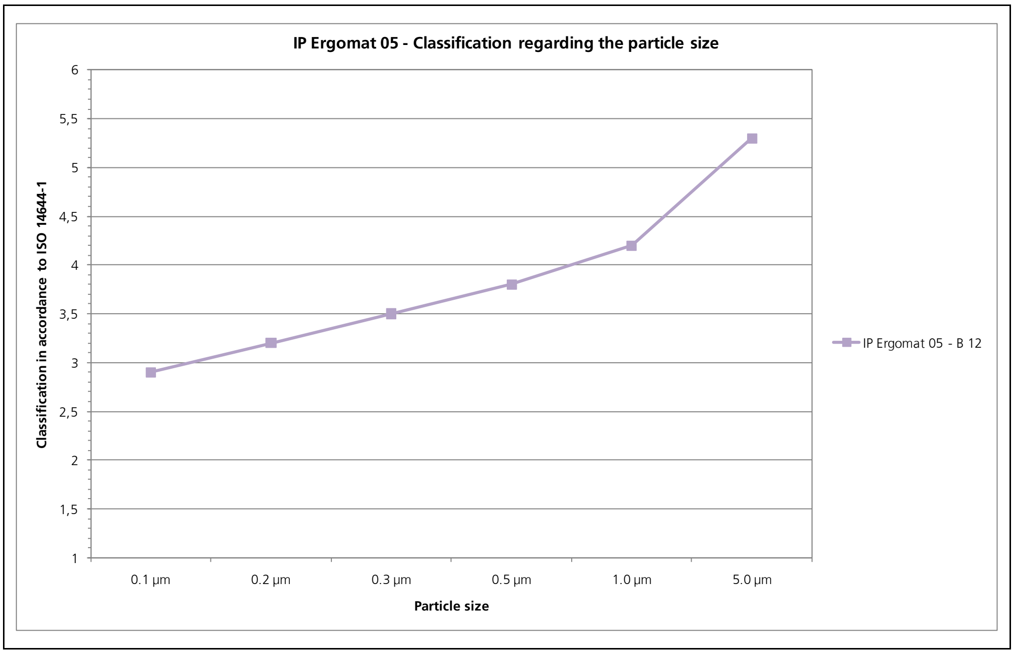


Figure 26 IP Ergomat 05: Ergomat Infinity Bubble (Black) versus PA6 Nylon
Classification in accordance with ISO 14644-1 in dependence upon the particle size

4.3.3.5 Overview of classification results

LOAD LEVEL	NORMAL FORCE	DETECTED PARTICLE SIZE					
		0.1 µm	0.2 µm	0.3 µm	0.5 µm	1.0 µm	5.0 µm
B 12	300 N	2.8	3.0	3.0	2.8	2.7	3.0
CLASSIFICATION RELEVANT TO DOCUMENTS							3

Figure 27 IP Ergomat 06: Ergomat Optimal ESD (Grey) versus PA6 Nylon Overview of classification value attained in accordance with ISO 14644-1

The level of particulate contamination emitted during application of tribological stress on the material pairing **Ergomat Optimal ESD (Grey) versus PA6 Nylon** lies within the permissible values of the corresponding Air Cleanliness Classes **ISO Class 3** in accordance with ISO 14644-1.

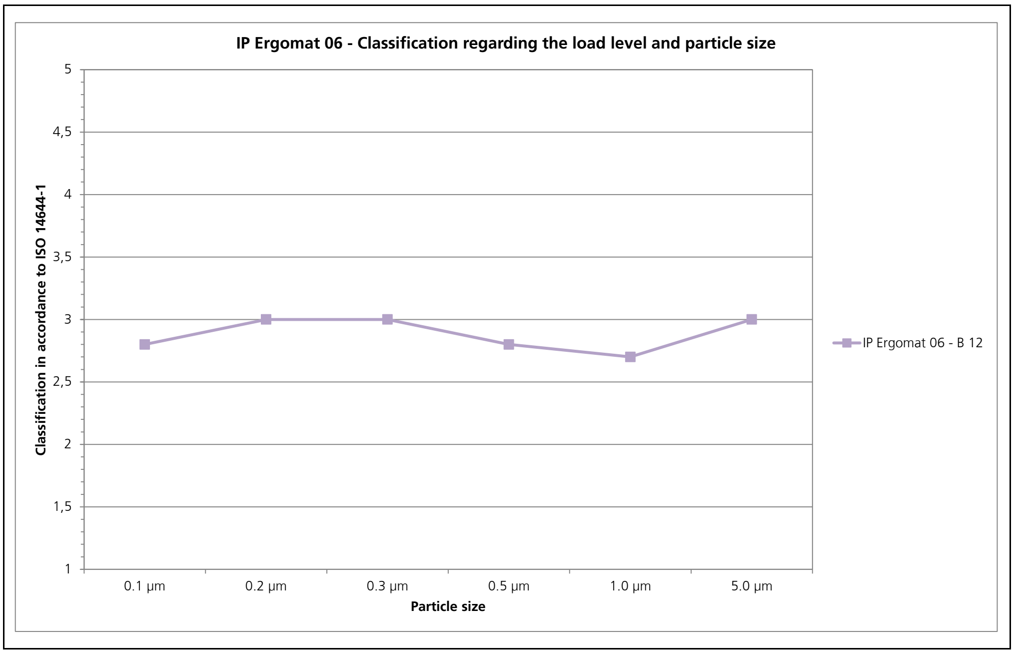


Figure 28 IP Ergomat 06: Ergomat Optimal ESD (Grey) versus PA6 Nylon
Classification in accordance with ISO 14644-1 in dependence upon the particle size

5 Chemical resistance

5.1 Test conditions

Chemical resistance tests show to what extent the materials under investigation may be used in a clean manufacturing environment. Among other things, the materials must be resistant to cleaning, process and disinfection reagents. The tests were carried out in accordance with the procedure laid down in ISO 2812-1 and chemical resistance to 10 typical reagents was tested.

5.2 Test procedure

In the chemical resistance tests, the material samples were subjected to a defined stress using the test chemicals. The determination was made using the immersion test procedure laid down in ISO 2812-1.

With the immersion test, a complete material sample is placed in a receptacle filled with the test chemical and then hermetically sealed.

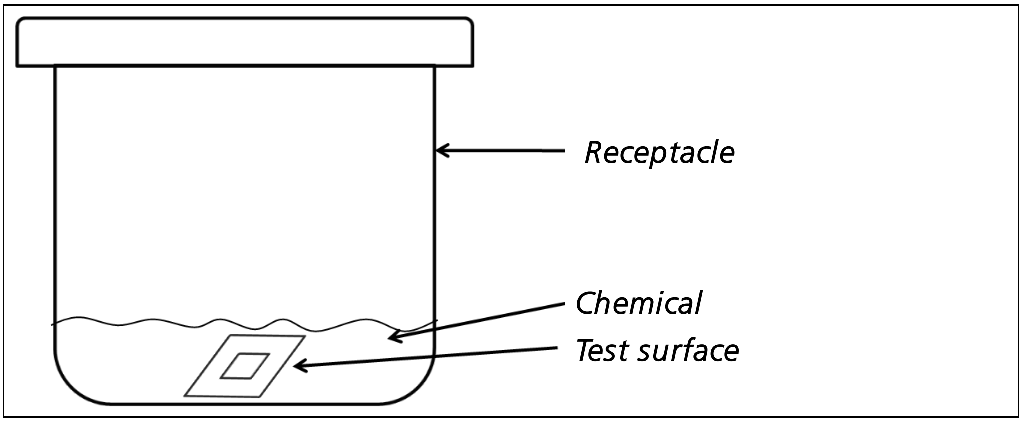


Figure 29 Diagrammatic sketch: immersion of a test sample into a chemical bath

Figure 30 Photo of a typical test set-up: test sample immersed in a chemical bath

The test samples were subjected to each reagent for a period of one, three, six and twenty-four hours and then examined for visible alterations.

Tests were carried out at room temperature in accordance with ISO 2812-1 ("Determination of resistance to liquids – Part 1: Immersion in liquids other than water").

On completion of the stress period, the test chemical was wiped off the test surface with a cleanroom cloth and inspected. The sample was reassessed after one hour to see if further alterations had taken place or if any alterations had lessened.

5.3 Assessment criteria

The test area was visually assessed in accordance with ISO 4628-1:2003 with regard to the following criteria:

- Type of damage (alteration in degree of shine, discoloration or yellowing, swelling, softening or altered resistance to scratching, any other noticeable alterations)
- Amount of damage (N-values)
- Size of damage (S-values)
- Intensity of alteration(I-values)

5.3.1 Assessment of the amount of damage

The amount of damage to the coating, occurring in the form of irregularities or localized flaws in the coating which are irregularly distributed or only in specific places, is assessed according to the following table.

VALUE	AMOUNT OF DAMAGE
N0	No recognizable damage
N1	Very little, i.e. small, just recognizable amounts of damage
N2	Little, but significant amounts of damage
N3	Average amount of damage
N4	Severe amounts of damage
N5	Extreme amounts of damage

Figure 31 Criteria for assessing the amount of damage

5.3.2 Assessment of the size of damage

The average size of damage – if it makes sense - is assessed according to the following table.

VALUE	SIZE OF DAMAGE
S0	Not visible on 10x magnification
S1	Only visible on 10x magnification
S2	Just visible with the naked eye
S3	Clearly visible up to 0.5 mm
S4	Area 0.5 – 5 mm
S5	Larger than 5 mm

Figure 32 Criteria for assessing the size of damage

5.3.3 Assessment of the intensity of alteration

The intensity of regular alterations in the appearance of a coating such as changes in color, e.g. yellowing, is assessed according to the following table.

VALUE	INTENSITY OF ALTERATION
I0	Unchanged, no recognizable alteration
I1	Very slight, just recognizable alteration
I2	Slight, clearly recognizable alteration
I3	Average, clearly recognizable up to 0.5 mm
I4	Severe alteration
I5	Extreme alteration

Figure 33 Criteria for assessing the intensity of alteration

The analysis is made as follows:

"Blistering, N2-S2" or "Discoloring, I1"

Any other noticeable irregularities are also documented.

5.3.4 Reagents utilized

To simulate stress on the material samples due to cleaning, process and disinfection agents, the following standardized CSM-reagents were used:

- Formalin (37 %)
- Ammoniac (25 %)
- Hydrogen peroxide (30 %)
- Sulphuric acid (5 %)
- Phosphoric acid (30 %)
- Peracetic acid (15 %)
- Hydrochloric acid (5%)
- Isopropanol (100 %)
- Sodium hydroxide (5 %)
- Sodium hypochlorite (15 %)

5.3.5 Classification

The average of each worst value (N, S, I) after 24 hours incubation of all ten tested chemicals gives the classification value according to the following chart:

REFERENCE NUMBER (OBTAINED AVERAGE)	CLASSIFICATION
0	Excellent
1	Very good
2	Good
3	Weak
4	Very weak
5	none

Figure 34 Chemical resistance: Classification

5.4 Chemical Resistance Results of Ergomat Infinity Smooth (White)

A table has been selected to document the test results in order to show the chemical resistance of the test surfaces to the reagents. All images were recorded using a Zeiss stereo microscope, a color camera and annular/ring field illumination. Identical settings were used to record all images to enable a direct comparison to be made. Differences in the colors between the microscopic images may occur. Digital images were taken to show damages like swelling, deformation or discoloring. These alterations are not visible in their full size under a microscope.

The sample has a non-poreous surface and poreous edges and backside, therfor it is necessary to separate the results for surface and backside.

5.4.1 Formalin 37 %

5.4.1.1 Surface

TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 35 Ergomat Infinity Smooth (White) subjected to formalin 37 %

The results show that the chemical resistance for the **surface** of Ergomat Infinity Smooth (White) to **formalin 37 %** is **excellent.**

5.4.1.2 Backside

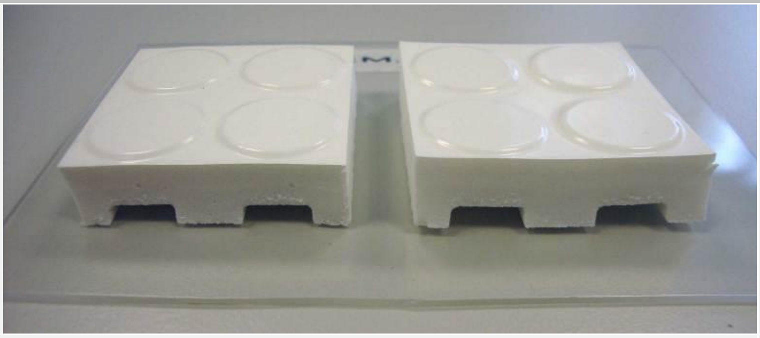
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
24h	
	Swelling I2

Figure 36 Ergomat Infinity Smooth (White) subjected to formalin 37 %

The results show that the chemical resistance for the **backside** of Ergomat Infinity Smooth (White) to **formalin 37 %** is **good.**

5.4.2 Ammoniac 25 %

5.4.2.1 Surface

TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 37 Ergomat Infinity Smooth (White) subjected to ammoniac 25 %

The results show that the chemical resistance from the **surface** of Ergomat Infinity Smooth (White) to **ammoniac 25 %** is **excellent.**

5.4.2.2 Backside

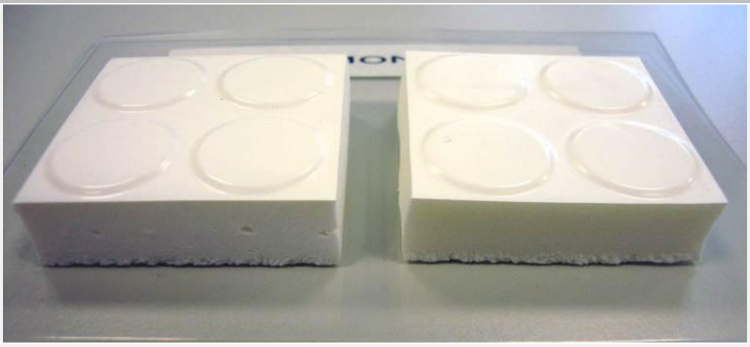
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
24h	
Value	Yellowing of the edges and the backside I2

Figure 38 Ergomat Infinity Smooth (White) subjected to ammoniac 25 %

The results show that the chemical resistance from the **backside** of Ergomat Infinity Smooth (White) to **ammoniac 25 %** is **good.**

5.4.3 Hydrogen peroxide 30 %

5.4.3.1 Surface

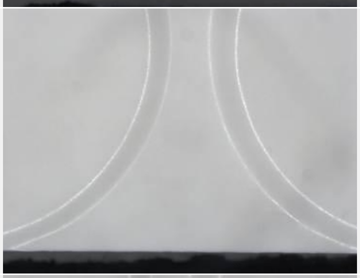
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 39 Ergomat Infinity Smooth (White) subjected to hydrogen peroxide 30 %

The results show that the chemical resistance from the **surface** of Ergomat Infinity Smooth (White) **to hydrogen peroxide 30 %** is **excellent.**

5.4.3.2 Backside

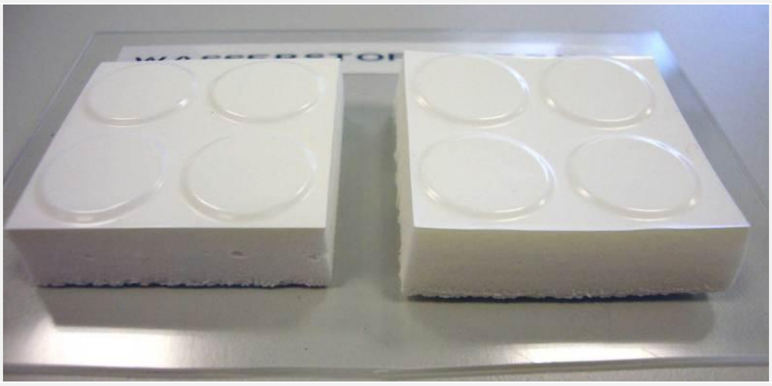
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
3h	
Value	Swelling I2
6h	
Value	Swelling I2, Deformation I1
24h	
Value	**Swelling I2, Deformation I1**

Figure 40 Ergomat Infinity Smooth (White) subjected to hydrogen peroxide 30 %

The results show that the chemical resistance from the **backside** of Ergomat Infinity Smooth (White) to **hydrogen peroxide 30 %** is **good.**

5.4.4 Sulphuric acid 5 %

5.4.4.1 Surface

TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		NO
3 h		NO
6 h		NO
24 h		**NO**

Figure 41 Ergomat Infinity Smooth (White) subjected to sulphuric acid 5 %

The results show that the chemical resistance of the **surface** of Ergomat Infinity Smooth (White) to **sulphuric acid 5 %** is **excellent.**

5.4.4.2 Backside

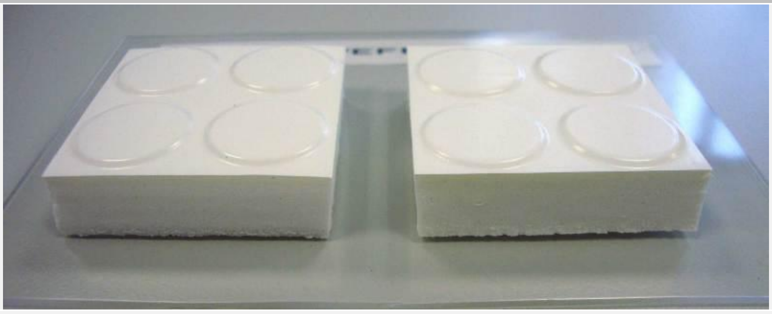
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
24 h	
Value	**N0**

Figure 42 Ergomat Infinity Smooth (White) subjected to sulphuric acid 5 %

The results show that the chemical resistance of the **backside** of Ergomat Infinity Smooth (White) to **sulphuric acid 5 %** is **excellent.**

5.4.5 Phosphoric acid 30 %

5.4.5.1 Surface

TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		NO
3 h		NO
6 h		NO
24 h		**NO**

Figure 43 Ergomat Infinity Smooth (White) subjected to phosphoric acid 30 %

The results show that the chemical resistance of the **surface** of Ergomat Infinity Smooth (White) to **phosphoric acid 30 %** is **excellent.**

5.4.5.2 Backside

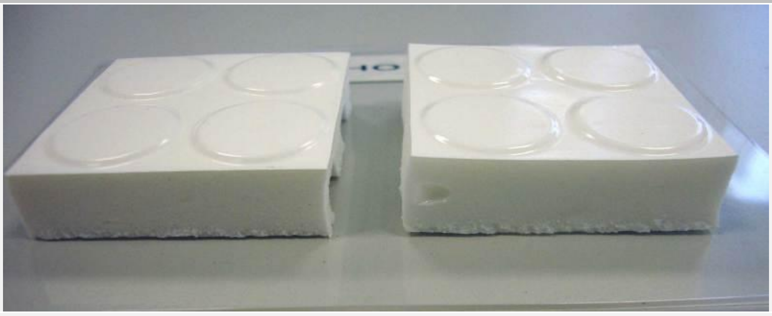
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
3 h	
Value	Swelling I2
6 h	
Value	Swelling I2, Deformation I1
24 h	
Value	**Swelling I2, Deformation I1**

Figure 44 Ergomat Infinity Smooth (White) subjected to phosphoric acid 30 %

The results show that the chemical resistance of the **backside** of Ergomat Infinity Smooth (White) to **sulfuric acid 5 %** is **good.**

5.4.6 Peracetic acid 15 %

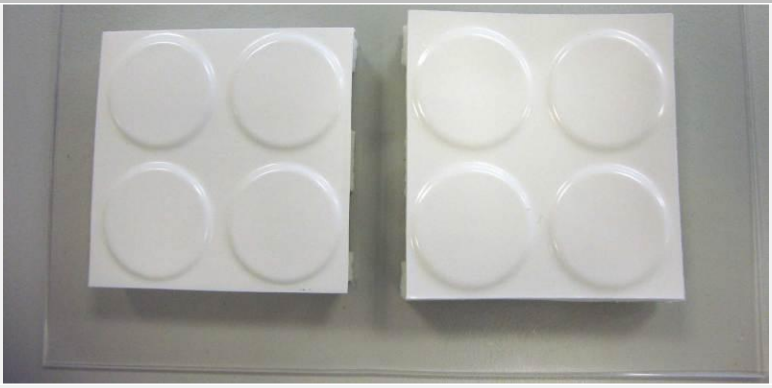
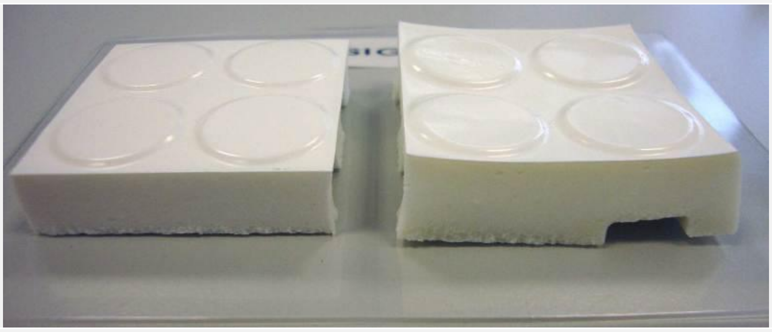
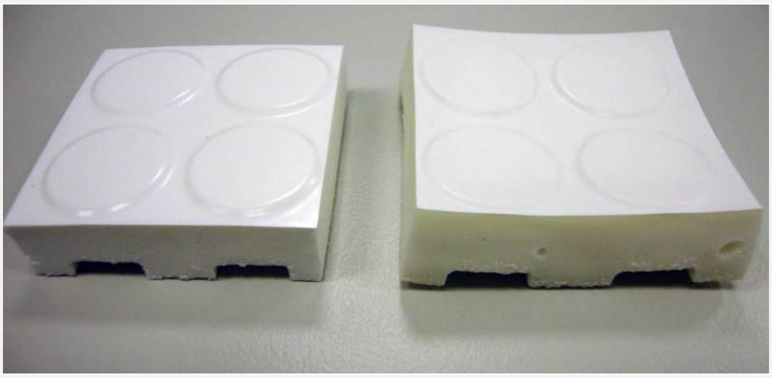
5.4.6.1 Surface

TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 45 Ergomat Infinity Smooth (White) subjected to peracetic acid 15 %

The results show that the chemical resistance of the **surface** of Ergomat Infinity Smooth (White) to **peracetic acid 15 %** is **excellent.**

5.4.6.2 Backside

TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
1 h	
Value	Swelling, Deformation I2
3 h	
Value	Swelling, Deformation I3
6 h	
Value	Swelling, Deformation I3

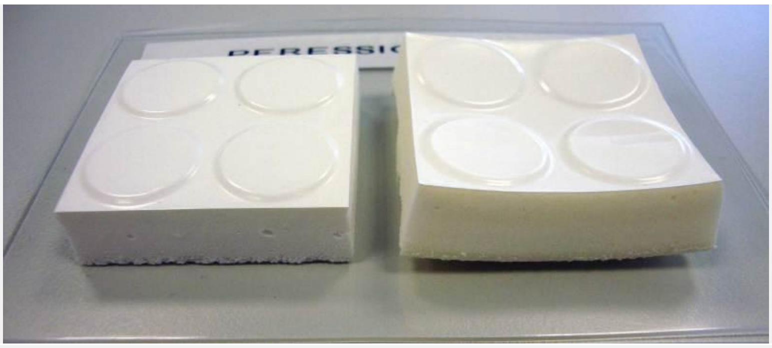
24 h	
Value	**Swelling, Deformation I3, Yellowing I1**

Figure 46 Ergomat Infinity Smooth (White) subjected to peracetic acid 15 %

The results show that the chemical resistance of the **backside** of Ergomat Infinity Smooth (White) to **peracetic acid 15 %** is **weak.**

5.4.7 Hydrochloric acid 5 %

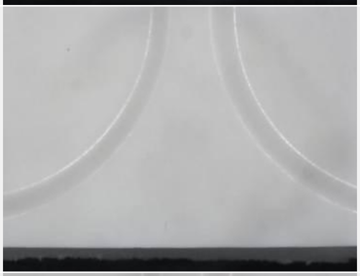
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 47 Ergomat Infinity Smooth (White) subjected to hydrochloric acid 5 %

The results show that the chemical resistanceof the **surface** of Ergomat Infinity Smooth (White) to **hydrochloric acid 5 %** is **excellent.**

5.4.7.1 Backside

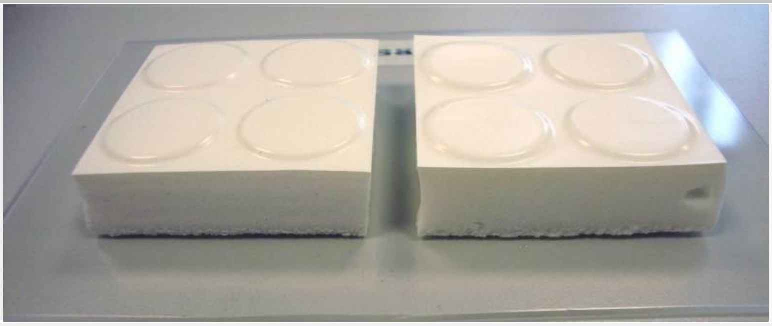
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
24 h	
Value	**N0**

Figure 48 Ergomat Infinity Smooth (White) subjected to hydrochloric acid 5 %

The results show that the chemical resistance of the **backside** of Ergomat Infinity Smooth (White) to **hydrochloric acid 5 %** is **excellent.**

5.4.8 Isopropanol 100 %

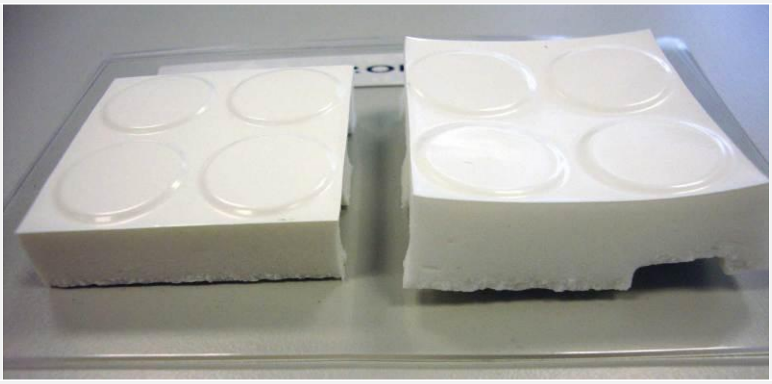
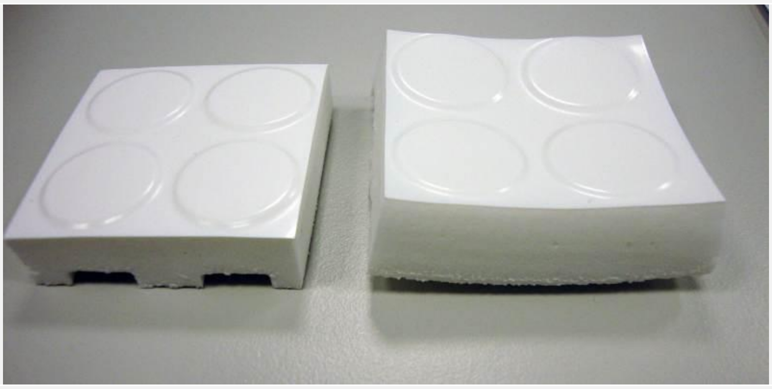
5.4.8.1 Surface

TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 49 Ergomat Infinity Smooth (White) subjected to isopropanol 100 %

The results show that the chemical resistance of the **surface** of Ergomat Infinity Smooth (White) to **isopropanol 100 %** is **excellent.**

5.4.8.2 Backside

TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
1 h	
Value	Swelling, Deformation I3
3 h	
Value	Swelling, Deformation I3
6 h	
Value	Swelling, Deformation I4

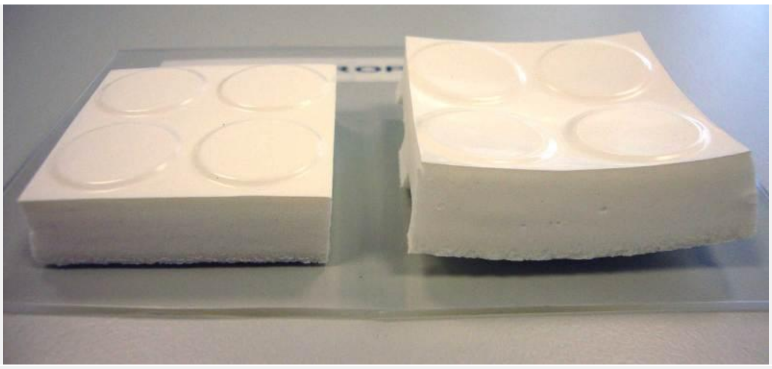
24 h	
Value	**Swelling, Deformation I4**

Figure 50 Ergomat Infinity Smooth (White) subjected to isopropanol 100 %

The swelling and deformation of the sample is fully reversible after a time of nearly 24 hours drying at room temperature. After that no deformation can be observed.

The results show that the chemical resistance of the **backside** of Ergomat Infinity Smooth (White) to **isopropanol 100 %** is **very weak.**

5.4.9 Sodium hydroxide 5 %

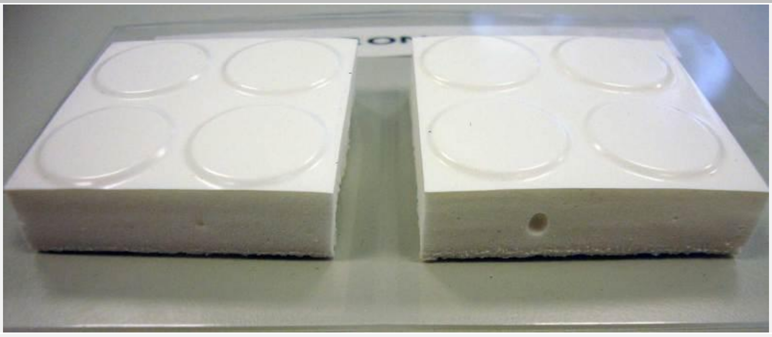
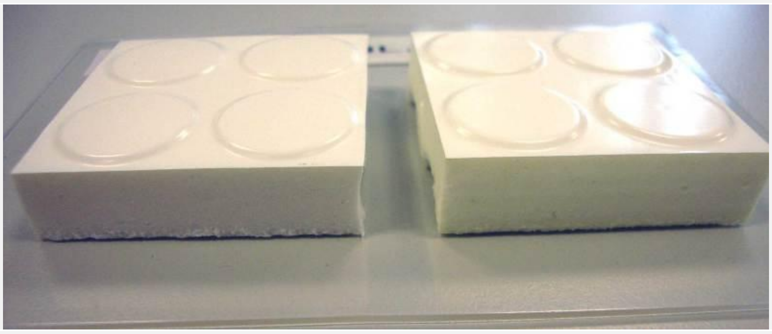
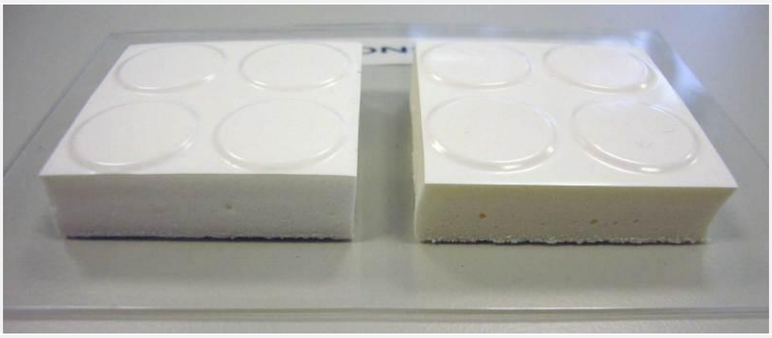
5.4.9.1 Surface

Time	Microscopic image 10x magnification	Value
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 51 Ergomat Infinity Smooth (White) subjected to sodium hydroxide 5 %

The results show that the chemical resistance of the **surface** of Ergomat Infinity Smooth (White) to **sodium hydroxide 5 %** is **excellent.**

5.4.9.2 Backside

TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
1 h	
Value	Yellowing of the edges I1
3 h	
Value	Yellowing of the edges I2
6 h	
Value	Yellowing of the edges I2

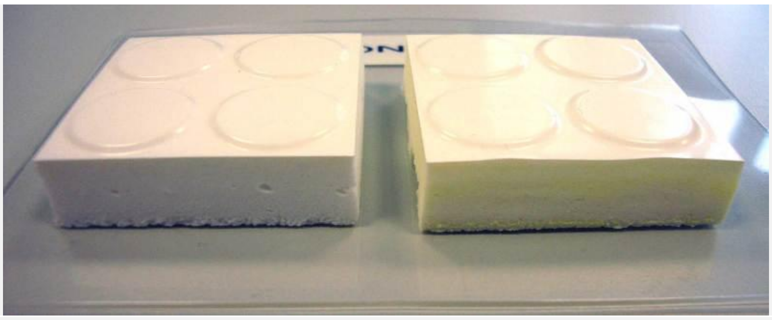
24 h	
Value	**Yellowing of the edges I3**

Figure 52 Ergomat Infinity Smooth (White) subjected to sodium hydroxide 5 %

The results show that the chemical resistance of the **backside** of Ergomat Infinity Smooth (White) to **sodium hydroxide 5 %** is **weak.**

5.4.10 Sodium hypochlorite 15 %

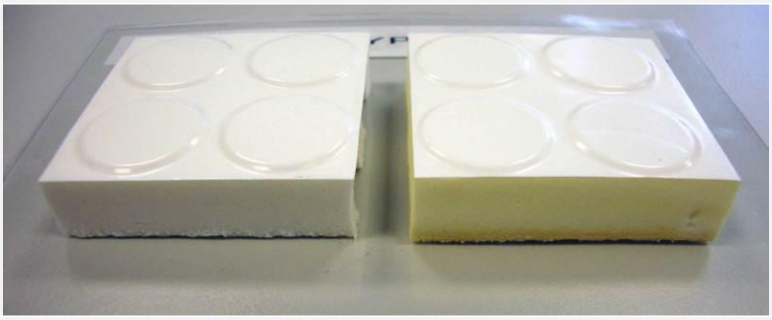
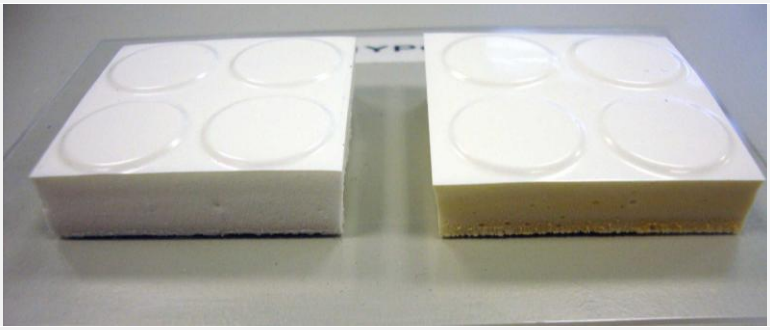
5.4.10.1 Surface

TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		NO
3 h		NO
6 h		NO
24 h		**NO**

Figure 53 Ergomat Infinity Smooth (White) subjected to sodium hypochlorite 15 %

The results show that the chemical resistance of the **surface** of Ergomat Infinity Smooth (White) to **sodium hypochlorite 5 %** is **excellent.**

5.4.10.2 Backside

TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
1 h	
Value	Yellowing of the edges I3
3 h	
Value	Yellowing of the edges I3, Contraction I1
6 h	
Value	Yellowing of the edges I3, Contraction I1

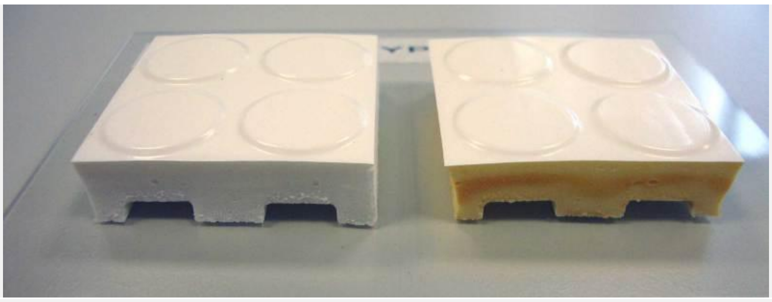
24 h	
Value	**Yellowing of the edges and the backside I4, Contraction I2**

Figure 54 Ergomat Infinity Smooth (White) subjected to sodium hypochlorite 15 %

The results show that the chemical resistance of the **backside** of Ergomat Infinity Smooth (White) to **sodium hypochlorite 5 %** is **weak.**

5.4.11 Summary results of the chemical resistance tests and CSM-classification

The following tables give an overall assessment of the material sample **Ergomat Infinity Smooth (White).**

5.4.11.1 Surface

CHEMICALS	INCUBATION			
	1 h	3 h	6 h	24 h
Formalin 37%	N0	N0	N0	N0
Ammoniac 25 %	N0	N0	N0	N0
Hydrogen peroxide 30%	N0	N0	N0	N0
Sulphuric acid 5 %	N0	N0	N0	N0
Phosphoric acid 30 %	N0	N0	N0	N0
Peracetic acid 15 %	N0	N0	N0	N0
Hydrochloric acid 5 %	N0	N0	N0	N0
Isopropanol 100 %	N0	N0	N0	N0
Sodium hydroxide 5 %	N0	N0	N0	N0
Sodium hypochlorite 15 %	N0	N0	N0	N0
Average value				**0**

Figure 55 Results of the chemical resistance tests on the material sample Ergomat Infinity Smooth (White) shown in the form of a table with corresponding values

CHEMICALS	INCUBATION			
	1 h	3 h	6 h	24 h
Formalin 37%	excellent	excellent	excellent	excellent
Ammoniac 25 %	excellent	excellent	excellent	excellent
Hydrogen peroxide 30%	excellent	excellent	excellent	excellent
Sulphuric acid 5 %	excellent	excellent	excellent	excellent
Phosphoric acid 30 %	excellent	excellent	excellent	excellent
Peracetic acid 15 %	excellent	excellent	excellent	excellent
Hydrochloric acid 5 %	excellent	excellent	excellent	excellent
Isopropanol 100 %	excellent	excellent	excellent	excellent
Sodium hydroxide 5 %	excellent	excellent	excellent	excellent
Sodium hypochlorite 15 %	excellent	excellent	excellent	excellent
CSM-Classification				**excellent**

Figure 56 Results of the chemical resistance tests on the material samples Ergomat Infinity Smooth (White) shown in the form of a table with the subsequent assessment into the CSM-classification

5.4.11.2 Backside

CHEMICALS	INCUBATION			
	1 h	3 h	6 h	24 h
Formalin 37%	N0	N0	N0	I2
Ammoniac 25 %	N0	N0	N0	I2
Hydrogen peroxide 30%	N0	I2	I2	I2
Sulphuric acid 5 %	N0	N0	N0	N0
Phosphoric acid 30 %	N0	I2	I2	I2
Peracetic acid 15 %	I2	I3	I3	I3
Hydrochloric acid 5 %	N0	N0	N0	N0
Isopropanol 100 %	I3	I3	I4	I4
Sodium hydroxide 5 %	I1	I2	I2	I3
Sodium hypochlorite 15 %	I3	I3	I3	I4
Average value				**2,1**

Figure 57 Results of the chemical resistance tests on the material sample Ergomat Infinity Smooth (White) shown in the form of a table with corresponding values

CHEMICALS	INCUBATION			
	1 h	3 h	6 h	24 h
Formalin 37%	excellent	excellent	excellent	good
Ammoniac 25 %	excellent	excellent	excellent	good
Hydrogen peroxide 30%	excellent	good	good	good
Sulphuric acid 5 %	excellent	excellent	excellent	excellent
Phosphoric acid 30 %	excellent	good	good	good
Peracetic acid 15 %	good	weak	weak	weak
Hydrochloric acid 5 %	excellent	excellent	excellent	excellent
Isopropanol 100 %	weak	weak	very weak	very weak
Sodium hydroxide 5 %	very good	good	good	weak
Sodium hypochlorite 15 %	weak	weak	weak	very weak
CSM-Classification				**good**

Figure 58 Results of the chemical resistance tests on the material samples Ergomat Infinity Smooth (White) shown in the form of a table with the subsequent assessment into the CSM-classification

5.5 Chemical Resistance Results of Ergomat Hygiene (Green)

A table has been selected to document the test results in order to show the chemical resistance of the test surfaces to the reagents. All images were recorded using a Zeiss stereo microscope, a color camera and annular/ring field illumination. Identical settings were used to record all images to enable a direct comparison to be made. Differences in the colors between the microscopic images may occur. Digital images were taken to show damages like swelling, deformation or discoloring. These alterations are not visible in their full size under a microscope.

5.5.1 Formalin 37 %

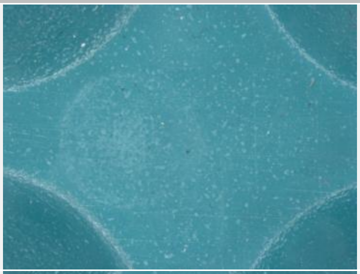
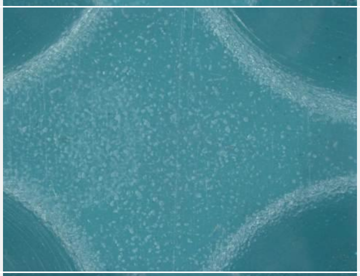
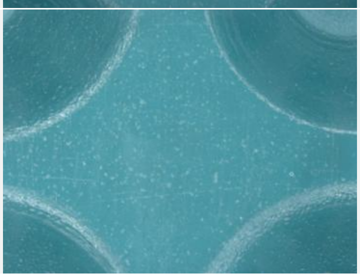
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 59 Ergomat Hygiene (Green) subjected to formalin 37 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **formalin 37 %** is **excellent.**

5.5.2 Ammoniac 25 %

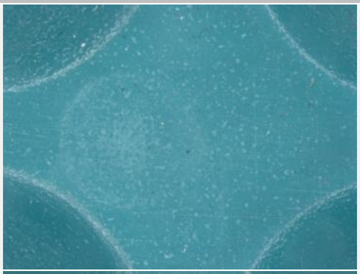
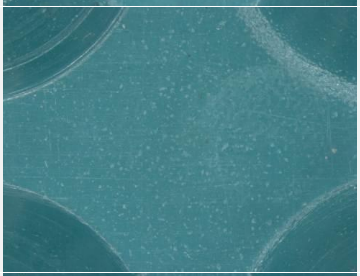
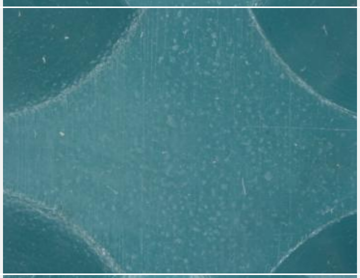
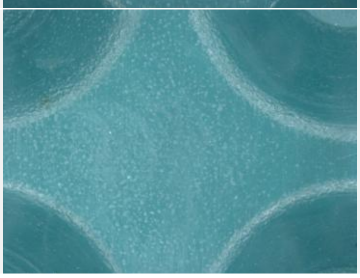
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		Discoloration (darker) I1
3 h		Discoloration (darker) I1
6 h		Discoloration (darker) I1
24 h		**Discoloration (darker) I1**

Figure 60 Ergomat Hygiene (Green) subjected to ammoniac 25 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **ammoniac 25 %** is **very good.**

5.5.3 Hydrogen peroxide 30 %

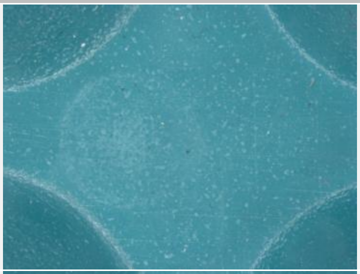
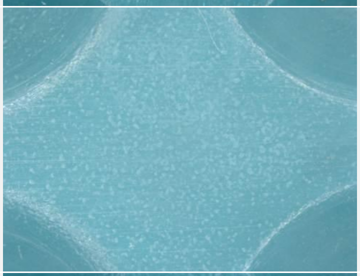
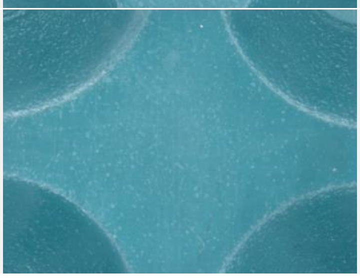
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		Loss of brilliance I1
24 h		**Loss of brilliance I1**

Figure 61 Ergomat Hygiene (Green) subjected to hydrogen peroxide 30 %

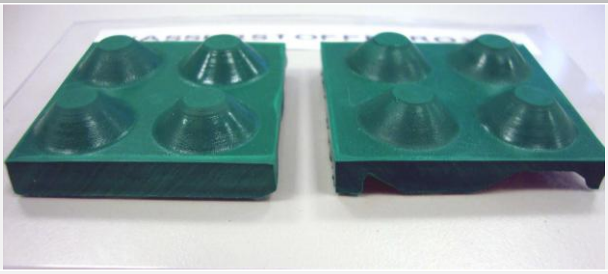
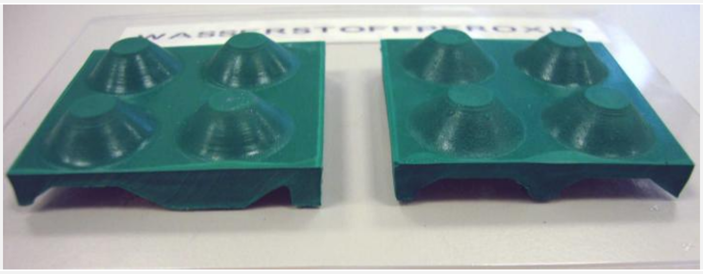
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
6h	
Value	Loss of brilliance I1
24h	
Value	Loss of brilliance I1

Figure 62 Ergomat Hygiene (Green) subjected to hydrogen peroxide 30 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **hydrogen peroxide 30 %** is **very good.**

5.5.4 Sulphuric acid 5 %

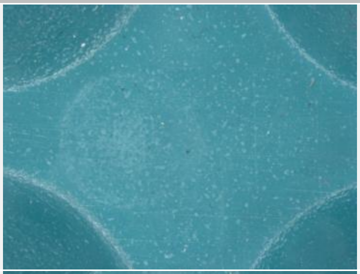
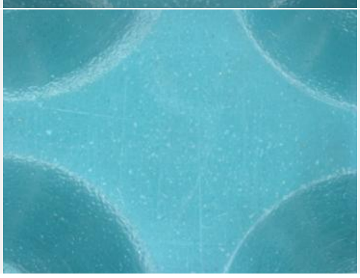
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 63 Ergomat Hygiene (Green) subjected to sulphuric acid 5 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **sulphuric acid 5 %** is **excellent.**

5.5.5 Phosphoric acid 30 %

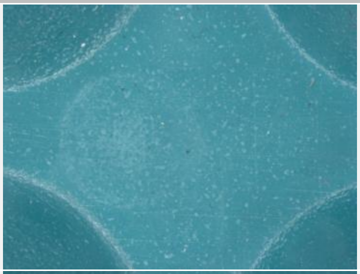
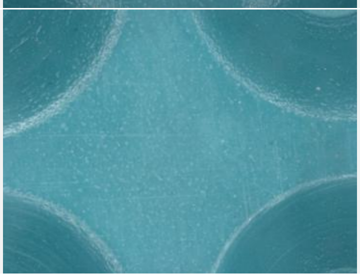
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 64 Ergomat Hygiene (Green) subjected to phosphoric acid 30 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **phosphoric acid 30 %** is **excellent.**

5.5.6 Peracetic acid 15 %

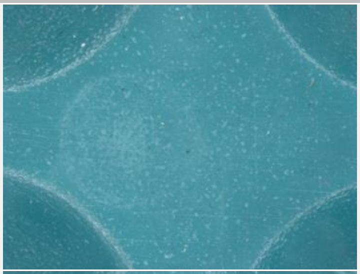
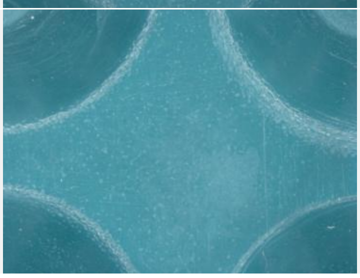
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 65 Ergomat Hygiene (Green) subjected to peracetic acid 15 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **peracetic acid 15 %** is **excellent.**

5.5.7 Hydrochloric acid 5 %

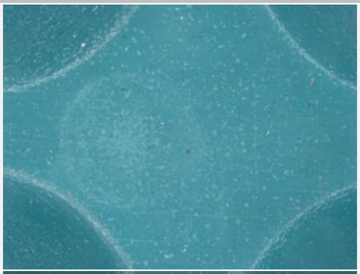
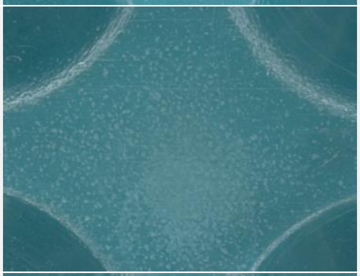
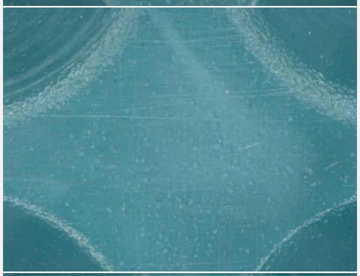
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		Dark patina after 24 hours at room temperature (permanent) I3
24 h		**Dark patina after 24 hours at room temperature (permanent) I3**

Figure 66 Ergomat Hygiene (Green) subjected to hydrochloric acid 5 %

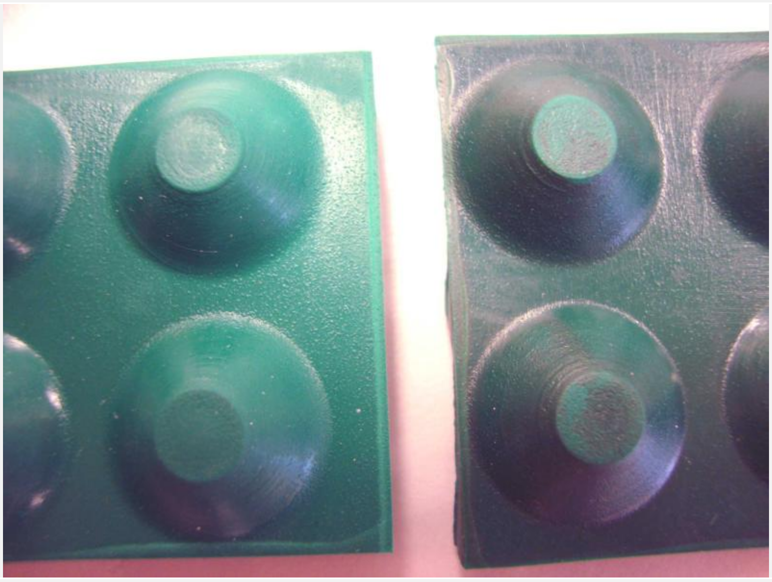
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
6h	
Value	Dark patina after 24 hours at room temperature (permanent) I3
24h	
Value	Dark patina after 24 hours at room temperature (permanent) I3

Figure 67 Ergomat Hygiene (Green) subjected to hydrochloric acid 5 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **hydrochloric acid 5 %** is **weak.**

5.5.8 Isopropanol 100 %

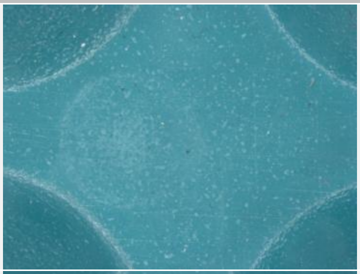
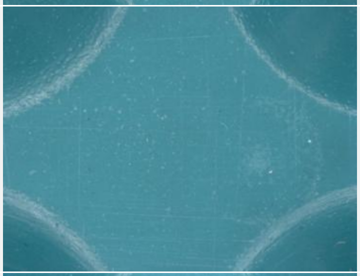
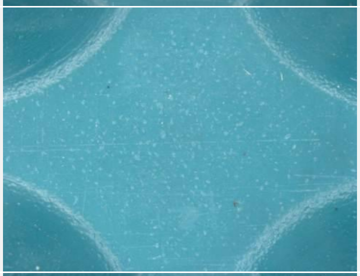
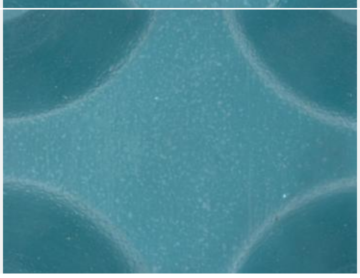
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		Loss of brilliance I2, Yellowing of the Isopropanol I2
24 h		**Loss of brilliance I2, Yellowing of the Isopropanol I2**

Figure 68 Ergomat Hygiene (Green) subjected to isopropanol 100 %

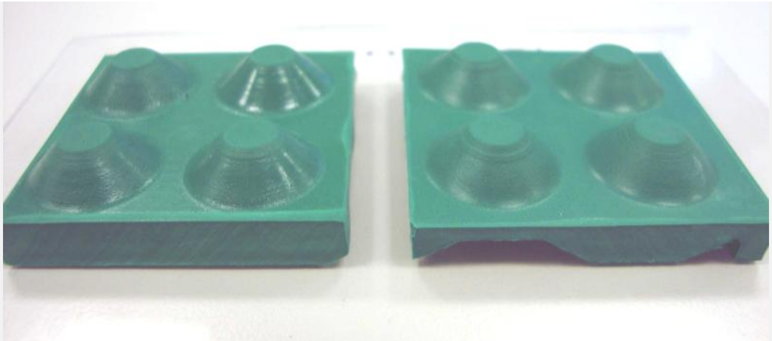
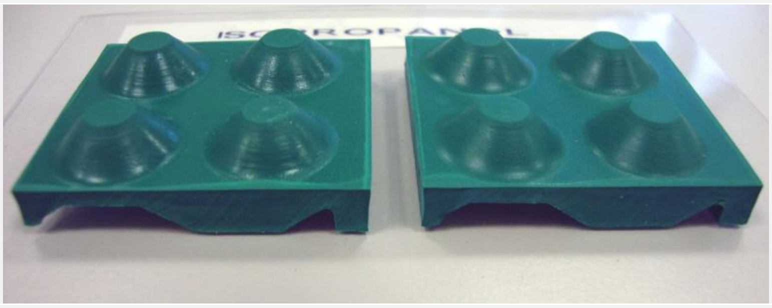
TIME	DIGITAL IMAGE LEFT: BLANK VALUE; RIGHT: SAMPLE
6h	
Value	Loss of brilliance I2, Yellowing of the Isopropanol I2
24h	
Value	Loss of brilliance I2, Yellowing of the Isopropanol I2

Figure 69 Ergomat Hygiene (Green) subjected to isopropanol 100 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **isopropanol 100 %** is **good.**

5.5.9 Sodium hydroxide 5 %

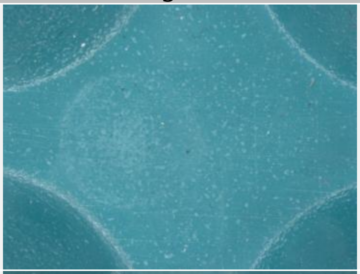
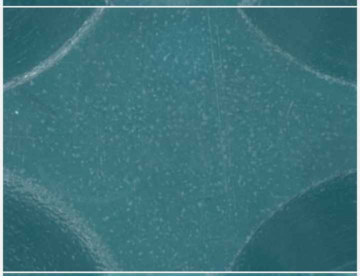
Time	Microscopic image 10x magnification	Value
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 70 Ergomat Hygiene (Green) subjected to sodium hydroxide 5 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **sodium hydroxide 5 %** is **excellent.**

5.5.10 Sodium hypochlorite 15 %

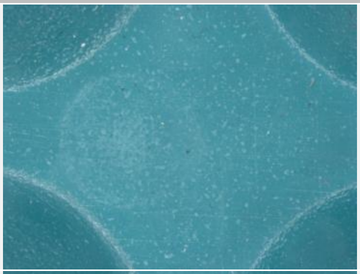
TIME	MICROSCOPIC IMAGE 10X MAGNIFICATION	VALUE
Blank value		Before testing
1 h		N0
3 h		N0
6 h		N0
24 h		**N0**

Figure 71 Ergomat Hygiene (Green) subjected to sodium hypochlorite 15 %

The results show that the chemical resistance of Ergomat Hygiene (Green) to **sodium hypochlorite 15 %** is **excellent.**

5.6 Summary results of the chemical resistance tests and CSM-classification

The following tables give an overall assessment of the material sample **Ergomat Hygiene (Green) .**

CHEMICALS	INCUBATION			
	1 h	3 h	6 h	24 h
Formalin 37%	N0	N0	N0	N0
Ammoniac 25 %	I1	I1	I1	I1
Hydrogen peroxide 30%	N0	N0	I1	I1
Sulphuric acid 5 %	N0	N0	N0	N0
Phosphoric acid 30 %	N0	N0	N0	N0
Peracetic acid 15 %	N0	N0	N0	N0
Hydrochloric acid 5 %	N0	N0	I3	I3
Isopropanol 100 %	N0	N0	I2	I2
Sodium hydroxide 5 %	N0	N0	N0	N0
Sodium hypochlorite 15 %	N0	N0	N0	N0
Average value				**0,7**

Figure 72 Results of the chemical resistance tests on the material sample Ergomat Hygiene (Green) shown in the form of a table with corresponding values

CHEMICALS	INCUBATION			
	1 h	3 h	6 h	24 h
Formalin 37%	excellent	excellent	excellent	excellent
Ammoniac 25 %	very good	very good	very good	very good
Hydrogen peroxide 30%	excellent	excellent	very good	very good
Sulphuric acid 5 %	excellent	excellent	excellent	excellent
Phosphoric acid 30 %	excellent	excellent	excellent	excellent
Peracetic acid 15 %	excellent	excellent	excellent	excellent
Hydrochloric acid 5 %	excellent	excellent	weak	weak
Isopropanol 100 %	excellent	excellent	good	good
Sodium hydroxide 5 %	excellent	excellent	excellent	excellent
Sodium hypochlorite 15 %	excellent	excellent	excellent	excellent
CSM-Classification				**very good**

Figure 73 Results of the chemical resistance tests on the material samples Ergomat Hygiene (Green) shown in the form of a table with the subsequent assessment into the CSM-classification