



Klarwin[®]

Fluid
Perfection[®]

KLARWIN TESTING LABORATORY

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accredited for
TESTING

SR EN ISO/IEC 17025:2018
ACCREDITATION CERTIFICATE
LI 1216

Report No.: PER-233015-Z9X

1. Sample details

**CLEANLINESS
TEST REPORT**

F-KL-09_En

Version 5.0

Customer:	<i>*Customer*</i> <i>*Address*</i>	
Component type:	Housing Ref. 2323235_G	
Sampling origin/ Parts no.:	M1.2	
Date of sample reception:	21/01/2021	
Sample description:	The sample consists of one part, individually packed in a foil package	
Reference unit:	<input type="checkbox"/> Part <input checked="" type="checkbox"/> Area (1000 cm ²) <input type="checkbox"/> Volume (100 cm ³)	
	No. of parts = 1 A= 492.42 cm ² V= N/A	

Note 1. Sampling is the customer's responsibility.

Note 2. Information about the component type, sampling origin/ parts no. and the extraction parameters are provided by the customer.

2. Extraction

Extraction method:	Method of extraction of contaminants by pressure rinsing
Reference documents:	ISO 16232:2018, PL-KL-02
Extraction liquid:	Renoclean ISO
Volume of liquid:	4000 ml for rinsing the part + 1000 ml for rinsing the extraction equipment
Equipment, materials, and measurement parameters:	Pall PCC60 Cleanliness cabinet, including filtration equipment with vacuum pump Flow rate: 1500 ml/ min Nozzle diameter: 2.5 mm (round nozzle)
Date of analysis:	22/01/2021
Blank test:	OK, according to blank report no. 5/2021

3. Gravimetric results

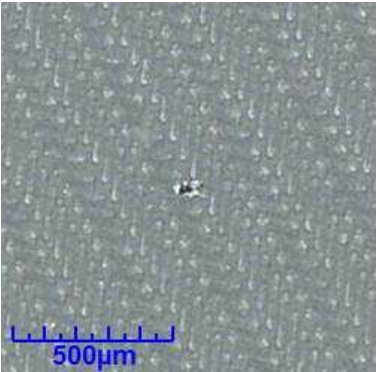
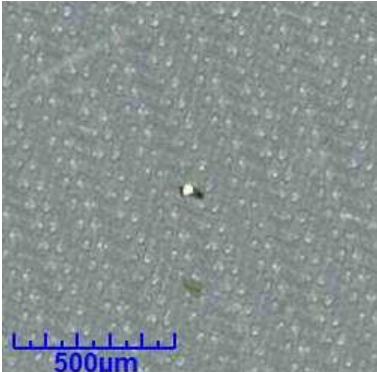
Method:	Particle mass determination by gravimetric analysis – industrial systems
Reference documents:	ISO 16232:2018, PL-KL-03
Equipment, materials, and measurement parameters:	Memmert UN55 drying oven (30 min, 110°C) + Sicco Desiccator (30 min) Kern & Sohn ABT 220-5DNM 5-digit analysis balance (0.01 mg) Filter type: 5 µm, mesh, 47 mm diameter
Date of analysis:	22/01/2021
Compliance specification:	< 2 mg/ 1000 cm ²
Results:	Initial weight: 108.13 mg Final weight: 108.17 mg Residue weight: 0.04 mg/ reference unit 0.08 mg/ 1000 cm²
Compliance of the results:	PASS <i>*According to customer specification, given above</i>

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4. Microscopic results

Method:		Particle sizing and counting by microscopic analysis					
Reference documents:		ISO 16232:2018, PL-KL-07					
Equipment, materials, and measurement parameters:		Jomesa HDF4 optical microscope Scale: 4.7 µm/Pxl Diameter of effective filtration area: 44 mm Fiber criterion: length: width ratio > 20, w < 50 µm					
Date of analysis:		22/01/2021					
Compliance specification:		Maximum particle size: 600 µm					
Results:		Particle count data – particles/reference unit					
Size range [µm]	Size code	Particles/per filter membrane		Particles/part		Particles/1000 cm ²	
		Total	Metallic	Total	Metallic	Total	Metallic
5 – 15	B	591	0	591.0	0.0	1200.2	0.0
15 – 25	C	206	0	206.0	0.0	418.3	0.0
25 – 50	D	132	0	132.0	0.0	268.1	0.0
50 – 100	E	45	2	45.0	2.0	91.4	4.1
100 – 150	F	6	0	6.0	0.0	12.2	0.0
150 – 200	G	2	0	2.0	0.0	4.1	0.0
200 – 400	H	3	0	3.0	0.0	6.1	0.0
400 – 600	I	0	0	0.0	0.0	0.0	0.0
600 – 1000	J	0	0	0.0	0.0	0.0	0.0
> 1000	K-N	0	0	0.0	0.0	0.0	0.0
Component cleanliness code acc. to ISO 16232:		CCC=A(B11/C9/D9/E7/F4/G3/H3/I00/J00/K-N00)					
Microscopic images of representative contaminants:							
							
Image 1. L x l: 95 µm X 52 µm Largest metallic shiny particle				Image 2. L x l: 81 µm X 35 µm Second largest metallic shiny particle			



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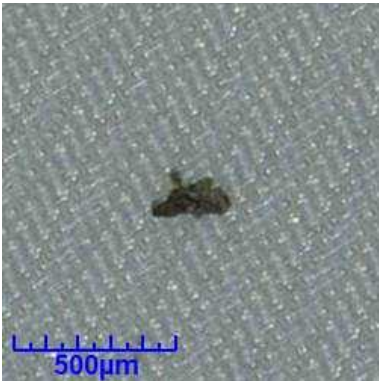
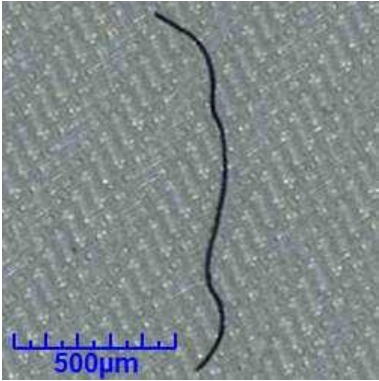
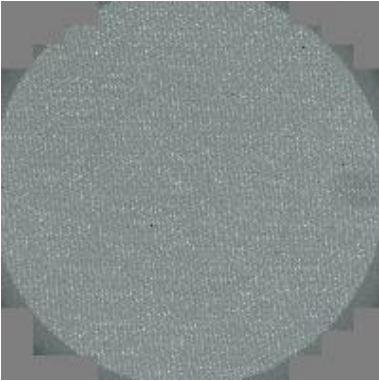
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 <p>Image 3. L x l: 291 µm x 42 µm Largest nonmetallic particle</p>	 <p>Image 4. L x l: 240 µm x 132 µm Second largest nonmetallic particle</p>
 <p>Image 5. Feret_{max} = 1106 µm / L_{str} = 1240 µm Longest fiber</p>	 <p>Image 6. Membrane overview 0.02 % Occupancy</p>
<p>Compliance of the results: PASS <i>*According to customer specification, given above</i></p>	

Note 3. The obtained results are referring exclusively to the analyzed sample and do not take into consideration the calculated measurement uncertainty.

Date of report: 22/01/2021

Issued:

Approved:

<p>Dipl. Eng. Alexandra Matei Oil & Parts Cleanliness Analyst Klarwin[®] Scientific & Laboratory</p> 	<p>Dipl. Eng. Nicoleta Rascol Laboratory Manager Klarwin[®] Scientific & Laboratory</p> 
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ISO 16232 detailed cleanliness classes for particle size distribution

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No. of particles/ reference unit (1000 cm ² / 100 cm ³)		CCC acc. to ISO 16232
More than	Up to and including	
500 000	1 000 000	20
250 000	500 000	19
130 000	250 000	18
64 000	130 000	17
32 000	64 000	16
16 000	32 000	15
8 000	16 000	14
4 000	8 000	13
2 000	4 000	12
1 000	2 000	11
500	1 000	10
250	500	9
130	250	8
64	130	7
32	64	6
16	32	5
8	16	4
4	8	3
2	4	2
1	2	1
0	1	0
0	0	00

Size class	Particle x size range, μm
B	5 ≤ x < 15
C	15 ≤ x < 25
D	25 ≤ x < 50
E	50 ≤ x < 100
F	100 ≤ x < 150
G	150 ≤ x < 200
H	200 ≤ x < 400
I	400 ≤ x < 600
J	600 ≤ x < 1000
K	1000 ≤ x < 1500
L	1500 ≤ x < 2000
M	2000 ≤ x < 3000
N	3000 ≤ x

~ End of test report ~