Transport Simulation Test Report

Single-Use Shipper with 20 X 20 L CryoVault® Containers

MEISSNER

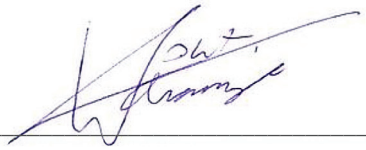
Index

Approval Signatures

Written:  Date: 12 February 2024

Antonio Francisco da Fonseca

Topa Institute, Mechanical Project Engineer

Verified:  Date: 12 February 2024

Wout Adriaanse

Topa Institute, Thermal Project Coordinator

Date:	12 February 2024
Report number:	T23-1239
Revision:	0
Research Date:	26 January 2024

Customer:	Topa Thermal Torenlaan 10 2215 RW Voorhout The Netherlands	**Test Facility:**	Topa Thermal Torenlaan 10 2215 RW Voorhout The Netherlands

Abstract: This report details the methods, specifications and results for the transport simulation of Single-Use Shipper with 20 x 20 L CryoVault® containers.

2. Test Overview

2.1 Objective

The objective of this test is to investigate the influence of worldwide pallet transport on the Single-Use Shipper with 20 x 20 L CryoVault® containers.

2.2 Test Results

The Single-Use Shipper with 20 x 20 L CryoVault® containers has been tested with the following results:

Test	Results
Preconditioning & Packing	No remarks
Rotational Corner Drop	No remarks
Rotational Flat Drop	No remarks
Random Vibration	No remarks
Rotational Corner Drop	No remarks
Rotational Flat Drop	No remarks

2.3 Conclusions

No visual damage to the outside of the pallet load or on the CryoVault® containers. The Single-Use Shipper with 20 x 20 L CryoVault® containers is suitable for worldwide pallet transport.

2.4 Recommendations

Corrugated cardboard has a lower tolerance for humidity than plastic. Replacing the current CryoVault® handling box from corrugated cardboard to 3 mm corrugated plastic will improve the performance of the handling box.

3. Test Product

The test product consists of:

Insulated Container

Description: One fully conditioned KCVS-DS0001A

Dimensions: 1,570 x 1,100 x 1,610 mm

Weight: 360.0 kg (including dry ice)

The KCVS-DS0001A will contain the following product load:

Product Load

Description: One pallet load containing 20 CryoVault® containers.

Dimensions: 1,200 x 800 x 1,280 mm

Weight: 151.0 kg

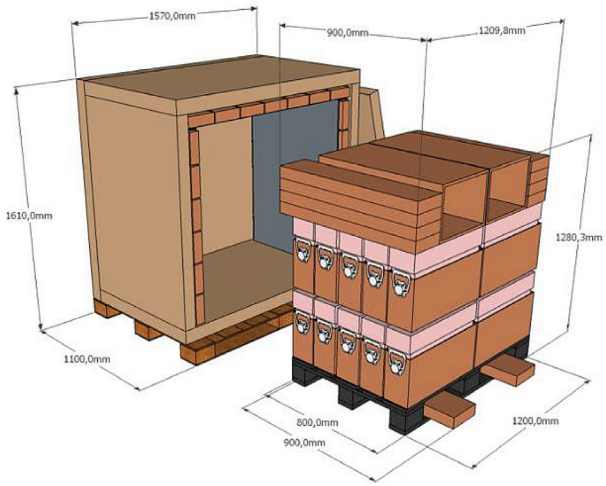
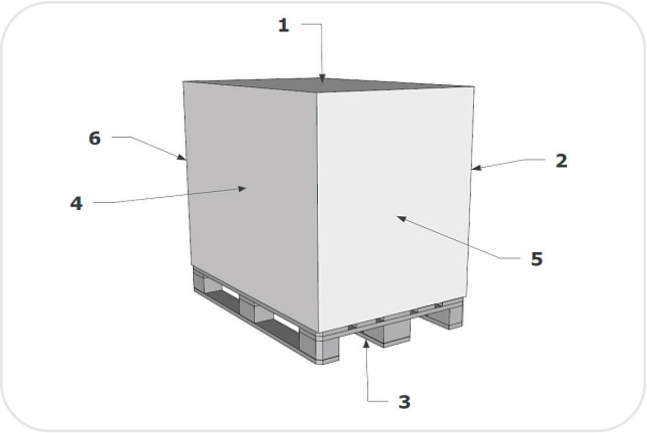


Figure 1: *Fully packed GTS-1150L4D-DI container*

4. Test Procedure

The testing procedure, according ASTM D4169-22, Distribution Cycle 2, consists of the following parts:



4.1 Pre-Test Inspection

Before the start of the test, the bags, components, and the insulated containers are inspected by an engineer from Topa Institute. Any damage or irregularities are noted. All faces of the test pallet are identified according to **Figure 2**, where Face 5 is one of the smallest vertical faces of the pallet.

4.2 Preconditioning & Packing

The CryoVault® containers are conditioned at -80 °C for at least 72 hours prior to packing. Once the CryoVault® containers are conditioned, a pallet load of 20 CryoVault® containers are built and placed inside the container before the start of the test.

Figure 2: *Conditioning setup*

4.3 Rotational Corner Drop Test (Method B)

A rotational corner drop test is conducted with a loaded pallet. Four drops are conducted; one drop on each corner of the pallet. The opposite corner of the corner on which the pallet is dropped is supported by a 100 mm thick piece of timber.

The drop height depends on the weight of the pallet. This test is based on ASTM D4169-22 and D6179-07 (Assurance Level II, Method B).

Pallet Weight	Assurance Level I	Assurance Level II	Assurance Level III
0 to 226.8 kg	305 mm	**229 mm**	152 mm
226.8 kg and up	229 mm	**152 mm**	76 mm

Table: *Drop Heights*

Figure 3: *Rotational Corner Drop setup*

Figure 4: *Rotational Flat Drop Test*

4.4 Rotational Flat Drop Test (Method C)

A rotational flat drop test is conducted with a loaded pallet. Two drops are conducted; one drop on the handling side of the pallet and one drop on the opposite side of the pallet. If the pallet can be handled in all directions, a flat drop on all four sides is conducted. The drop height depends on the weight of the pallet. This test is based on ASTM D4169-22 and D6179-07 (Assurance Level II, Method C).

Pallet Weight	Assurance Level I	Assurance Level II	Assurance Level III
0 to 226.8 kg	305 mm	**229 mm**	152 mm
226.8 kg and up	229 mm	**152 mm**	76 mm

Table: *Drop Heights*

4.5 Random Vibration Test

4.5.1 Truck Transport

In order to simulate vibrations during truck transport, a random vibration test is conducted. Three test profiles from ASTM D4169-22 and D4728-17 are used with a frequency range from 1 Hz to 200 Hz and average loads of 0.40 Grms for 40 minutes, 0.54 Grms for 15 minutes, and 0.70 Grms for 5 minutes. The entire test lasts 60 minutes.

	Truck Low Level	Truck Medium Level	Truck High Level
Average Load	0.40 Grms	0.54 Grms	0.70 Grms
Test Duration	40 minutes	15 minutes	5 minutes

Table: *Random Truck Vibration Test Distribution*

Figure 5: *Random Vibration Test setup*

4.5.2 Air Transport

In order to simulate vibrations during air transport, a random vibration test is conducted. Three test profiles from ASTM D4169-22 and D4728-17 are used with a frequency range from 1 Hz to 200 Hz and average loads of 0.16 Grms for 27 minutes, 0.22 Grms for 10 minutes, and 0.29 Grms for 3 minutes. This sequence is repeated three times. The entire test lasts 120 minutes.

	Air Low Level	Air Medium Level	Air High Level
Average load	0.16 Grms	0.22 Grms	0.29 Grms
Test duration	27 minutes (3x)	10 minutes (3x)	3 minutes (3x)

Table: *Random Air Vibration Test Distribution*

4.6 Rotational Corner Drop Test (Method B)

A rotational corner drop test is conducted with a loaded pallet. Four drops are conducted; one drop on each corner of the pallet. The opposite corner of the corner on which the pallet is dropped is supported by a 100 mm thick piece of timber. The drop height depends on the weight of the pallet. This test is based on ASTM D4169-22 and D6179-07 (Assurance Level II, Method B).

Pallet Weight	Assurance Level I	Assurance Level II	Assurance Level III
0 to 226.8 kg	305 mm	**229 mm**	152 mm
226.8 kg and up	229 mm	**152 mm**	76 mm

Table: *Drop heights*

4.7 Rotational Flat Drop Test (Method C)

A rotational flat drop test is conducted with a loaded pallet. Two drops are conducted; one drop on the handling side of the pallet and one drop on the opposite side of the pallet. If the pallet can be handled in all directions, a flat drop on all four sides is conducted. The drop height depends on the weight of the pallet. This test is based on ASTM D4169-22 and D6179-07 (Assurance Level II, Method C).

Pallet Weight	Assurance Level I	Assurance Level II	Assurance Level III
0 to 226.8 kg	305 mm	**229 mm**	152 mm
226.8 kg and up	229 mm	**152 mm**	76 mm

Table: *Drop Heights*

4.8 Post-Test Inspection

After all tests are performed, the bags, components, and the insulated containers are inspected by an engineer from Topa Institute. Any damage or irregularities are noted.

5. Test results

5.1 Pre-Test Inspection

Before the tests are performed, the outside of the pallet load is visually inspected by an engineer from Topa Institute.

Observations:

No remarks.

5.2 Preconditioning & Packing

The CryoVault® containers are conditioned at -80 °C for at least 72 hours prior to packing.

Observations:

No remarks.




Figures 6 to 9: *Packing*

5.3 Rotational Corner Drop Test (Method B)

Weight: Product/Packaging Combination	511.0 kg
Drop Height	152 mm
Faces Tested	5, 2, 6, and 4

Table: *Rotational Corner Drop Test*

Observations:

No remarks.

5.4 Rotational Flat Drop Test (Method C)

Weight: Product/Packaging Combination	511.0 kg
Drop Height	152 mm
Faces Tested	5, 2, 6, and 4

Table: *Rotational Corner Drop Test*

Observations:

No remarks.

5.5 Random Vibration Test

	Truck Low Level	Truck Medium Level	Truck High Level
Average Load	0.40 Grms	0.54 Grms	0.70 Grms
Test Duration	40 minutes	15 minutes	5 minutes

Table: *Random Truck Vibration Test Distribution Results*

	Air Low Level	Air Medium Level	Air High Level
Average Load	0.16 Grms	0.22 Grms	0.29 Grms
Test Duration	27 minutes (3x)	10 minutes (3x)	3 minutes (3x)

Table: *Random Air Vibration Test Distribution Results*

Results graphs for the random vibration tests can be found in Appendix B.

Observations:

No remarks.

5.6 Rotational Corner Drop Test (Method B)

Weight: Product/Packaging Combination	511.0 kg
Drop Height	152 mm
Faces Tested	5, 2, 6 and 4

Table: *Rotational Corner Drop Test Results*

Observations:

No remarks.

5.7 Rotational Flat Drop Test (Method C)

Weight: Product/Packaging Combination	511.0 kg
Drop Height	152 mm
Faces Tested	5, 2, 6 and 4

Table: *Rotational Flat Drop Test Results*

Observations:

No remarks.

5.8 Post-Test Inspection

After all tests are performed, the test product is thawed at lab conditions and is visually inspected with the following results:

Observations:

No visual damage to the outside of the pallet load.

No damage is found on the CryoVault® containers.

*F**igures 10 and 11:** Pallet load after testing*

The Topa Institute for packaging and distribution is emphasizing its activities on research and the optimization of products and packaging in their performance during their actual lifetime and distribution. Concerning advice and research, the Topa Institute for packaging and distribution is independent from any company, institute, or organization.

Responsibility

The Topa Institute for packaging and distribution or people acting in research activities are not responsible for damage sustained after use of results of esearch activities.

Appendix A: Applied Testing Equipment

1. Vibration Test System

• Manufacturer:	Lansmont Model 10000 TTV II
• Maximum size:	152 x 152 cm
• Maximum specimen weight:	1,100 kg
• Maximum amplitude (peak to peak):	6.4 cm
• Frequency range:	1 - 300 Hz
• Frequency range at maximum load:	1 - 200 Hz
• Acceleration range:	0 - 8 g
• Maximum acceleration at maximum load:	0.77 g
• Automatic displacement or acceleration control	
• Automatic sweep generator and random vibration facilities (Lansmont TouchTest Vibration system)	
• Accelerometer	
• Calibration due date:	June 2024

SONOR Kalibratie

Paletsingel 2
2718 NT Zoetermeer
Telefoon: +31 (0)85 8228 850
E-mail info@sonorkalibratie.nl
KvK nr.:82433607

Certificate of Calibration

Certificate number: TC-6013-6

Applicant	Name:	**Topa Instituut**
	Address :	**Torenlaan 10**
		2215 RW Voorhout
Shaker System	Manufacturer :	**Lansmont**
	Model	**10000 TTV2**
	Serial number	**M-15356**
	Customer ID nr	**-**
Ref transducer	Manufacturer :	**Kistler**
	Model	**8704B100**
	Serial number	**2097568**
	Customer ID nr	**-**

Calibration method:
The calibration was performed on site. A reference accelerometer is attached near to the center of the table and the values are compared to the display read out values of the system. Overall values are measured and FFT spectra taken

Uncertainties:
The uncertainties were calculated in accordance with EA-4/02: Expression of Uncertainty of Measurement in Calibration, A coverage factor of 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95%. Uncertainty 5 %

Traceability:
The measurements have been executed using standards traceable to (inter)natonal standards. Supporting documentation relative to traceability is on file and is available on request

Environmental conditions:

Air pressure	-	hPa
Temperature	-	°C
Relative humidity	-	%

Date of Receipt	At location in Voorhout
Date of Calibration :	15 juni 2023
Date of Certificate :	15 juni 2023

Ing. P. Smit

Authorized Signatory : Calibration Manager

Visual Inspection	Results
Connectors	Ok
Housing mechanics	Ok
Reference transducer fixing	Wax and cable protectors

The input is generated by applying several known profiles
The values are then compared with a calibrated accelerometer output. Profiles are measured from 1 Hz to 1 kHz as Overall value .
If the significant frequency is known then measured with a FFT analyser from 0 - 500 Hz with a 0,625 Hz bandwith.

Calibration profile : ASTM D 4169-09 rail level III

Ref value	Displayed value LANSMONT	Deviation	Unit
0,209	0,204	-0,005	g RMS

Calibration profile : ASTM D 4169-09 truck level II

Ref value	Displayed value LANSMONT	Deviation	Unit
0,528	0,521	-0,007	g RMS

Calibration profile : ASTM D 4169-09 air level I

Ref value	Displayed value LANSMONT	Deviation	Unit
1,538	1,510	-0,028	g RMS

Calibration profile : ASTM D 4169-09 air low 2022

Ref value	Displayed value LANSMONT	Deviation	Unit
0,163	0,157	-0,006	g RMS

Calibration profile : ISTA 3 A Pickup and delivery

Ref value	Displayed value LANSMONT	Deviation	Unit
0,460	0,458	-0,002	g RMS

Calibration profile : 1 " loose load test

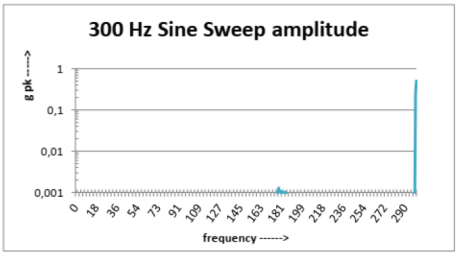
4 Hz

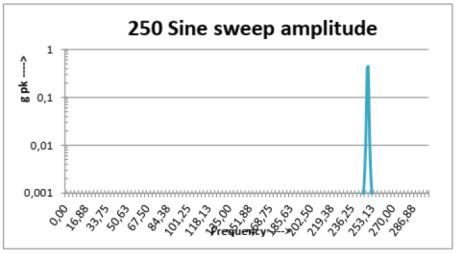
Ref value 4Hz	Displayed value LANSMONT	Deviation	Unit
0,730	0,820	0,090	g pk

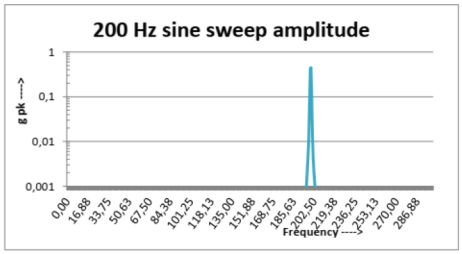
Calibration profile : Sine Sweep 3 - 300 Hz

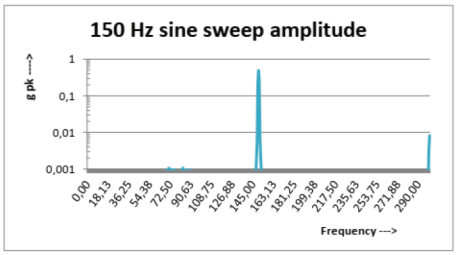
Frequency in Hz	Ref value in g pk	Displayed value LANSMONT in g pk	Deviation in g pk
5	0,533	0,500	-0,033
10	0,510	0,500	-0,010
20,1	0,501	0,500	-0,001
40,2	0,507	0,500	-0,007
80	0,504	0,500	-0,004
150,1	0,496	0,500	0,004
199,7	0,514	0,500	-0,014
250	0,513	0,500	-0,013
300	0,504	0,500	-0,004

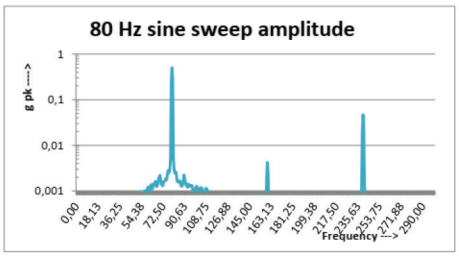
With g = 9,80665 m/s²

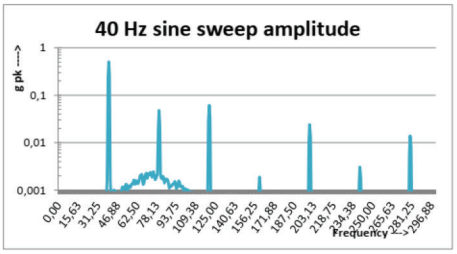


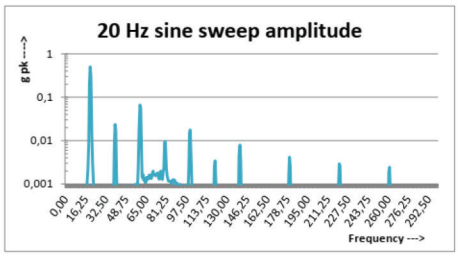


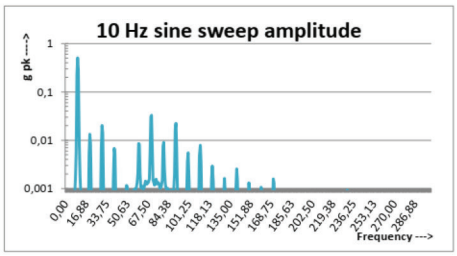


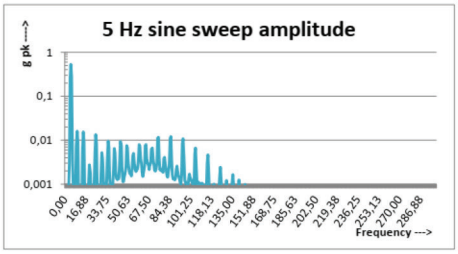


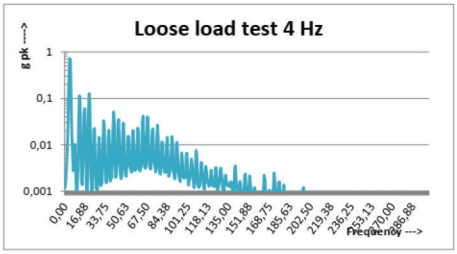












2. Pulley Block

• Manufacturer:	Demag
• Lifting capacity:	1,250 kg
• Hoisting velocity:	4 m/min or 2 m/min
• Year of construction:	2005
• Inspection due date:	April 2024

V	**MENNENS Amsterdam**	**020-5811811**
	MENNENS Dongen	**0162-383800**
	MENNENS Groningen	**050-3183031**
	MENNENS Hengelo	**074-2503504**
	MENNENS Rotterdam	**010-4373033**

EKH Keuringsrapport : TGT 290323 02

Opdrachtgever	Topa Verpakking bv	Werktuignummer	Kraan 1
Adres	Torenlaan 10	Bouwjaar	01-01-2005
Plaats	2215 RW Voorhout	Capaciteit	1.250 kg 2 P
Opdrachtnummer	760628	Hijshoogte	3.0 mtr. FEM 1Cm Hoogste Hijssnelh. 4/1 m/min.
Keuringsdatum	29 maart 2023	Locatie	Topa Instituur

BASISGEGEVENS > FABRIKAAT / MERK		Snelheden	MODEL / TYPE	SERIENUMMER	Electr.	Lucht	Hydr	Hand	Duw	Haspel
Kraan	Demag		Katbalk INP180x7000							
Takel	Demag	2V	DKUN 5-630 K V1 F4	61655659	V					
Loopkat	Demag		EU-RU 11 DK	61655659					V	

100 ALGEMEEN	A	B	C
101 Kraanboek aanwezig	-		
102 Staalkabelcertificaat	-		
103 Lastkettingcertificaat	-		
104 Lasthaakcertificaat	-		
105 Overzichtstekeningen	-		
106 Schema's	-		
107 Berekening lastdragende delen	-		
108 Toegang voor onderhoud	V		
109 Onderhouds- / bediening voorschriften	-		
110 EG-verklaring (CE)	-		
111 Draaglast aanduiding	V		
112 Functietest beveiligingen	-		
113 Controle verlichting	-		
200 CONSTRUCTIE	**A**	**B**	**C**
201 Bevestiging kraanbaan	-		
202 Kraanbaan	-		
203 Katbaan	V		
204 Speling loopvlak / wielflens	V		
205 Portaal van de kraan	-		
206 Staanders (vaste bok)	-		
207 Hoofdligger en hulpligger	-		
208 Wielkasten	-		
209 Baan eindstoppen / Buffers	V		
210 Zwenkarm en kolom	-		
211 Draaikransen	-		
212 Trappen en bordessen	-		
213 Lasverbindingen	-		
214 Bout- / penverbindingen	V		
215 Uithouders	V		
216 Conservering	V		
300 BEVEILIGINGEN / VEILIGHEID	**A**	**B**	**C**
301 Ontsporings- /opwip beveiliging (BL)	-		
302 Ontsporings- /opwip beveiliging (OH)	V		
303 Stormverankering	-		
304 Overlast beveiliging		1	14
305 Beveiliging overbelastingsstroom	-		
306 Werk- / eindschakelaars hijsen	-		
307 Werk- / eindschakelaars katrijden	-		
308 Werk- / eindschakelaars kraanrijden	-		
309 Botsbeveiliging	-		
310 Zone- / inblokbeveiliging	-		
311 Noodstopvoorziening	V		

400 HIJSEN / VIEREN	TAKEL 1 A	B	C	TAKEL 2 A	B	C
401 Elektromotor	V					
402 Koppeling	-					
403 Remtrommel	-					
404 Remvoering (mm)	V					
405 Remschijf (mm)	V					
406 Rembeweging (slag mm)	V					
407 Worm- / tandwielkasten	V					
408 Open tandwiel overbrenging	-					
409 Assen en lagers	V					
410 Bevestiging aandrijving	V					
411 Hulprembeweging of 2e rem	-					
412 Nestenschijf	V					
413 Staalkabels (mm)	-					
414 Staalkabelbevestiging	-					
415 Kabelschijven en lagers	-					
416 Kabelgeleider / -spanring	-					
417 Lastketting (D 5.3 x 15.2 mm)	V					
418 Kettingbak / -zak	V					
419 Kettingbevestiging / -eindstop	V					
420 Kettingschijven en lagers	V					
421 Slipkoppeling	V					
422 Ophangoog / -haak	V					
423 Hijshaak / Onderblok(Y mm)		1	1			

500 KATRIJDEN	LOOPKAT 1 A	B	C	LOOPKAT 2 A	B	C
501 Elektromotor	-					
502 Koppeling	-					
503 Remtrommel	-					
504 Remvoering (mm)	-					
505 Remschijf (mm)	-					
506 Rembeweging (slag mm)	-					
507 Worm- / tandwielkasten	-					
508 Open tandwiel overbrenging	-					
509 Assen en lagers	V					
510 Bevestiging aandrijving	-					
511 Hulprembeweging of 2e rem	-					
512 Loopwielen / Rondsels	V					

600 KRAANRIJDEN	A	B	C
601 Elektromotor	-		
602 Koppeling	-		
603 Remtrommel	-		
604 Remvoering (mm)	-		
605 Remschijf (mm)	-		
606 Rembeweging (slag mm)	-		
607 Worm- / tandwielkasten	-		
608 Open tandwiel overbrenging	-		
609 Assen en lagers	-		
610 Bevestiging aandrijving	-		
611 Hulprembeweging of 2e rem	-		
612 Loopwielen / Rondsels	-		
700 ELEKTRISCH GEDEELTE	**A**	**B**	**C**
701 Hoofdschakelaar	V		
702 Hoofdstroomrail (open)	-		
703 Koker sleepleidingen	-		
704 Kabelkat installatie	V		
705 Kabelhaspel	-		
706 Bekabeling	V		
707 Kabeldoorvoering / -wartels	-		
708 Schakelkasten	-		
709 Verdeelkasten	-		
710 Stuurstroomgedeelte 400 V	-		
711 Aarding	-		
712 Weerstanden	-		
713 Hangdrukknopkast	V		
714 Draadloze besturing	-		
715 Akoestische / optische signalering	-		
716 Lastaanwijzingen	-		
717 Bedrijfsurenteller : uur	-		
718 beschermingsleiding (NEN 3140)	-		
aantal metingen:			
719 isolatieweerstand (NEN 3140)	-		
aantal metingen:			
720 aardlekschakelaar (NEN 3140)	-		
800 Cabine	**A**	**B**	**C**
801 Constructie	-		
802 Standencontrollers	-		
803 Verlichting Cabine	-		
804 Verwarming / koeling cabine	-		
805 Brandblusmiddelen	-		
806 Vluchtmiddelen / -mogelijkheden	-		

A GEEN GEBREK
B GEBREK RISICOKLASSE, ZIE BLAD Opm.
C OPMERKING NUMMER, ZIE BLAD Opm.

000	afsluitende beoordeling	
001	hoogst gemeten risicoklasse	1
002	kraan vrijgegeven	Ja
003	kraan afgetest met proeflast	Ja
004	goedkeuringssticker geplakt	Ja
005	stickernummer:	

Naam keurmeester : T. de Groot

Handtekening

Naam contactpersoon :

Handtekening

423 Onderblok kan niet naar de grond i.v.m. aanwezig valklem in haak.

Mennens Groningen

BHS2021 rev.nr. 8 08-01-2015

3. Pallet Truck With Weighing Scale

• Manufacturer pallet truck:	Toyota BT Lifter LHM200SC
• Manufacturer weighing scale:	Ravas
• Range weighing scale:	0.0 – 2,000.0 Kg (± 0.1%)
• Record:	Digital
• Dimensions weighing platforms:	1,190 x 540 mm
• Year of construction:	2019
• Calibration due date:	April 2024

Kalibratiecertificaat nummer
NL0008-101-041423-ACC-RVA

Mettler Toledo B.V.
Franklinstraat 5
4004 JK
TIEL (NL)
0344-638363

METTLER TOLEDO

CALIBRATION
RvA K 016

Kalibratiecertificaat

Accuracy Calibration Certificate

Klant

Bedrijfsnaam:	Topa Verpakking BV		
Adres:	Torenlaan 10		
Plaats:	VOORHOUT	**Contactpersoon:**	Brigitte Zwart
Postcode:	2215 RW		

Weeginstrument

Fabrikant:	TOYOTA	**Type apparaat:**	Weeginstrument
Model:	LHM200SC / 2000kg	**Inventarisnr:**	n.v.t.
Serienr:	21903798.191402	**Terminal type:**	n.v.t.
Gebouw:	Loods	**Terminal serienr.:**	n.v.t.
Verdieping:	BG	**Terminal inv.nr.:**	n.v.t.
Kamer:	Expeditie		

Bereik	Max. capaciteit	Afleesbaarheid (d)
1	200 kg	0,2 kg
2	500 kg	0,5 kg
3	2000 kg	1 kg

Procedure

Kalibratierichtlijn:	EURAMET cg-18 v. 4.0 (11/2015)
Mettler Toledo Werkinstructie:	WI CAL 02

De kalibratie werd uitgevoerd bij de klant, tenzij anders aangegeven bij opmerkingen.

Het weeginstrument werd bijgeregeld vóór de nacontrole met een extern kalibratiegewicht.

In overeenstemming met EURAMET cg-18 (11/2015) werden de testbelastingen geselecteerd om het specifieke gebruik van de weeginrichting weer te geven of om rekening te houden met specifieke kalibratievoorwaarden.

	Temperatuur	
Voorcontrole	Start: 18,3 °C	Einde: 18,3 °C
Nacontrole	Start: 17,5 °C	Einde: 17,5 °C

Datum voorcontrole:	14-apr-2023	**Servicetechnicus:**	
Datum nacontrole:	14-apr-2023		Eric Geurtsen
Datum van uitgifte:	14-apr-2023		
Gewenste volgende kalibratiedatum:	30-apr-2024		

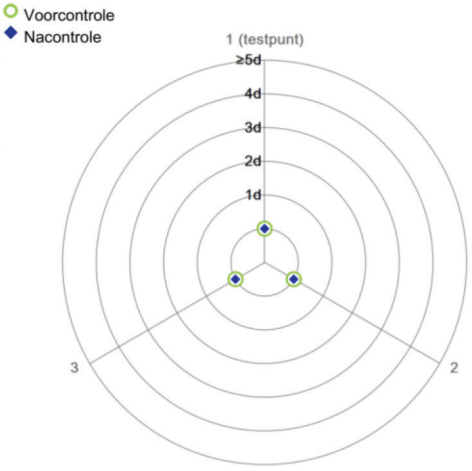
Meetresultaten

Herhaalbaarheid

Testgewicht: 200 kg

	Voorcontrole	Nacontrole
1	201,5 kg	200,0 kg
2	201,5 kg	200,0 kg
3	201,5 kg	200,0 kg

std afwijking	0,00 kg	0,00 kg



De "d" in de grafiek vertegenwoordigt de afleesbaarheid van het bereik waarin de test werd uitgevoerd

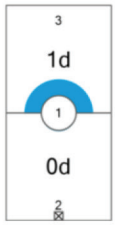
De resultaten in de grafiek zijn gebaseerd op de absolute waarden als verschil van de gemiddelde waarde.

Excentrische belasting

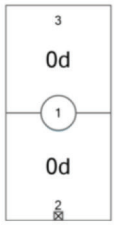
Testgewicht: 750 kg

Positie	Voorcontrole	Nacontrole
1	756 kg	750 kg
2	756 kg	750 kg
3	757 kg	750 kg

Maximale afwijking	1 kg	0 kg



Voorcontrole



Nacontrole

De "d" in de grafiek vertegenwoordigt de afleesbaarheid van het bereik waarin de test werd uitgevoerd

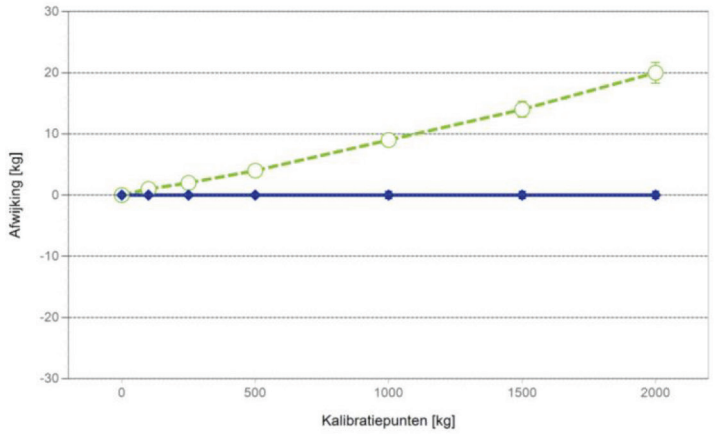
Afwijking

Voorcontrole

	Referentiewaarde	Aflezing	Afwijking	Vergrote onzekerheid	k
1	0 kg	0,0 kg	0,0 kg	0,12 kg	2
2	20 kg	20,0 kg	0,0 kg	0,16 kg	2
3	100 kg	101,0 kg	1,0 kg	0,18 kg	2
4	250 kg	252,0 kg	2,0 kg	0,37 kg	2
5	500 kg	504 kg	4 kg	0,7 kg	2
6	1000 kg	1009 kg	9 kg	1,0 kg	2
7	1500 kg	1514 kg	14 kg	1,3 kg	2
8	2000 kg	2020 kg	20 kg	1,7 kg	2

Nacontrole

	Referentiewaarde	Aflezing	Afwijking	Vergrote onzekerheid	k
1	0 kg	0,0 kg	0,0 kg	0,12 kg	2
2	20 kg	20,0 kg	0,0 kg	0,16 kg	2
3	100 kg	100,0 kg	0,0 kg	0,16 kg	2
4	250 kg	250,0 kg	0,0 kg	0,31 kg	2
5	500 kg	500 kg	0 kg	0,31 kg	2
6	1000 kg	1000 kg	0 kg	0,6 kg	2
7	1500 kg	1500 kg	0 kg	0,6 kg	2
8	2000 kg	2000 kg	0 kg	0,6 kg	2



Voor een betere leesbaarheid van de afbeeldingen, worden alleen toenemende meetpunten weergegeven en meetpunten dicht bij nul worden niet weergegeven.

De gerapporteerde onzekerheid is de vergrote onzekerheid, ontstaan door de standaardonzekerheid te vermenigvuldigen met een dekkingsfactor *k*, welke groter kan zijn dan 2 volgens EURAMET cg-18. Deze waarde ligt binnen een betrouwbaarheidsinterval van ongeveer 95 % . De standaardonzekerheid is bepaald volgens EA-4/02. Mettler Toledo adviseert de gebruiker om dezelfde omgevingscondities en dezelfde instellingen van het weeginstrument te handhaven als waren deze tijdens het uitvoeren van de kalibratie.

Testapparatuur

De metingen zijn uitgevoerd met standaarden waarvan de herleidbaarheid naar (inter-)nationale standaarden is aangetoond. Deze standaarden werden gekalibreerd en gecertificeerd door een geaccrediteerd kalibratielaboratorium.

Gewichtenset 1: OIML F1

Gewichtensetnr.:	798	Datum van uitgifte:	14-mrt-2023
Certificaatnummer:	E23/073/036	Volgende kalibratiedatum:	14-mrt-2024

Gewichtenset 2: OIML M1

Gewichtensetnr.:	DO6	Datum van uitgifte:	26-sep-2022
Certificaatnummer:	E22/269/029	Volgende kalibratiedatum:	26-sep-2023

Gewichtenset 3: OIML M1

Gewichtensetnr.:	C041	Datum van uitgifte:	26-sep-2022
Certificaatnummer:	E22/260/026	Volgende kalibratiedatum:	26-sep-2023

Gewichtenset 4: OIML M1

Gewichtensetnr.:	C040	Datum van uitgifte:	26-sep-2022
Certificaatnummer:	E22/269/022	Volgende kalibratiedatum:	26-sep-2023

Gewichtenset 5: OIML M1

Gewichtensetnr.:	B008	Datum van uitgifte:	26-sep-2022
Certificaatnummer:	E22/269/021	Volgende kalibratiedatum:	26-sep-2023

Gewichtenset 6: OIML M1

Gewichtensetnr.:	B010	Datum van uitgifte:	26-sep-2022
Certificaatnummer:	E22/269/021	Volgende kalibratiedatum:	26-sep-2023

Opmerkingen

De gebruiker dient de prestaties van de apparatuur ter plaatse opnieuw te verifiëren met de juiste normen voorafgaand aan gebruik

Meetonzekerheid van het weeginstrument in gebruik

De opgegeven onzekerheid is de vergrote onzekerheid met k = 2 in gebruik. De formule dient gebruikt te worden voor een inschatting van de onzekerheid met inachtname van de lineariteit. De R-waarde is de netto aflezing in de afleeseenheid van het apparaat.

Temperatuurcoëfficiënt t.b.v. de bepaling van de meetonzekerheid in gebruik: $10{,}0 \cdot 10^{-6}$ / K

Temperatuurbereik ter plaatse t.b.v. de bepaling van de meetonzekerheid in gebruik: 20 K

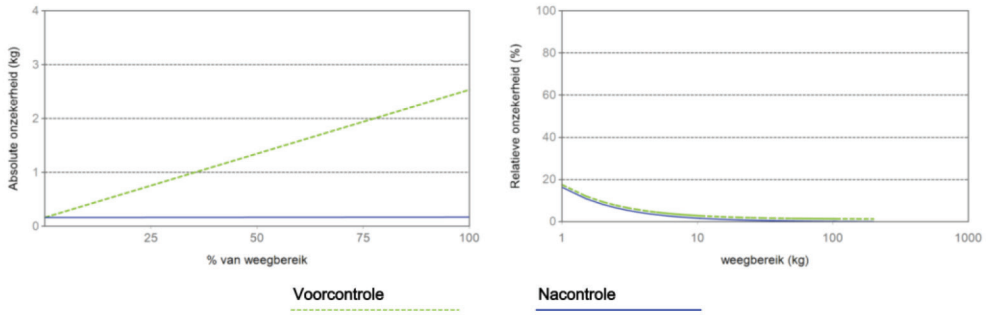
Formule ten behoeve van de onzekerheidsberekening

	Bereik		Voorcontrole	Nacontrole
	d	Max		
1	0,2 kg	200 kg	U_1 = 163 g + 11,9 g/kg · R	U_1 = 163 g + 0,0333 g/kg · R
2	0,5 kg	500 kg	U_2 = 311 g + 12,0 g/kg · R	U_2 = 311 g + 0,0431 g/kg · R
3	1 kg	2000 kg	U_3 = 589 g + 12,3 g/kg · R	U_3 = 589 g + 0,0825 g/kg · R

Om de stabiliteit van de linearisatie te optimaliseren, worden naast de nullast, alleen meetpunten gebruikt met een proefbelasting van 5% van het meetbereik of groter voor de berekening van de lineaire vergelijking.

Absolute- en relatieve meetonzekerheid bij gebruik voor verschillende netto indicaties (voorbeelden)

Netto aflezing	Voorcontrole		Nacontrole	
2,0 kg	0,19 kg	9,3%	0,16 kg	8,2%
20,0 kg	0,40 kg	2,0%	0,16 kg	0,82%
200,0 kg	2,5 kg	1,3%	0,17 kg	0,085%
1000 kg	13 kg	1,3%	0,67 kg	0,067%
2000 kg	25 kg	1,3%	0,75 kg	0,038%



Het weegbereik in de onzekerheidsgrafiek heeft betrekking op het fijnbereik of eerste interval van het weeginstrument

4. Ultra Low Freezer #15

• Manufacturer:	NuAire
• Type:	6512E
• Dimensions chamber (width x depth x height):	63 x 60 x 128 cm
• Door dimensions:	63 x 128 cm
• Temperature range:	-85 °C to –40 °C (± 2 °C)
• Programmable microprocessor for temperature:	N/A: constant temperature only
• Calibration due date:	February 2024

Certificate of Calibration
Fluke Nederland B.V.

Certificate Number:	SA01141933	**Date of Calibration:**	22 Feb 2023
Receive Condition:	IN TOLERANCE	**Date of Recalibration:**	22 Feb 2024
Return Condition:	IN TOLERANCE	**Place of Calibration:**	Voorhout
Manufacturer:	NUAIRE	**Temperature within:**	(23.0 ± 5) °C
Model:	NU-6512E	**Humidity within:**	(50 ± 30) %rh
Serial Number:	90403726		
Description:	ULTRA LOW FREEZER -40 TO -85 DEGREES		
Procedure:	Manual Procedure		

Customer:	TOPA INSTITUTE VOORHOUT
Customer Asset ID:	FREEZER 15
RMA Number:	606300972

All measurements are traceable to national and/or international standards or have been derived by approved ratio techniques. When possible standards used for this calibration are ISO/IEC 17025 accredited calibrated.

This calibration is performed by a DEKRA certified lab for ISO 9001. This certificate may not be reproduced other than in full. Calibration certificates without signatures, either electronic or handwritten, are not valid.

Issue Date: 22 Feb 2023

Electronically signed

Authorized By

D.W.G. de Visser

Fluke Nederland B.V.	**E-mail**	**Telephone**	**Rev** 230217
Brainport Industries Campus 1, 5657 BX, Eindhoven	service.nl@fluke.com	+31 40 267 5300	**Page** 1 of 3

Tektronix®

FLUKE®

Certificate of Calibration

Certificate Number: SA01141933

Remarks

- The calibration status found in this certificate on the top of each results page must be interpreted as:

  As Found : Data collected before the unit was adjusted and / or repaired
  As Left : Data collected after the unit has been adjusted and / or repaired
  Found / Left : Data collected without any adjustment and / or repair performed

- The calibration interval (due date) is the responsibility of the end user.

- According to the European norm 'Operation of electrical installations' NEN-EN 50110-1 release 2013 and the Dutch norm NEN 3140 release 2015 paragraph 5.102.12 through 5.102.16, a safety test is not required. Therefore not performed.

- Temperature conversions (if applicable) are performed according to ISO/IEC 60584:2013 for thermocouples, and ISO/IEC 60751:2022 for resistance temperature devices.

Standards and test-equipment used

Inventory No	Model	Serial No
TS0094	2626-S	C19075
TS0249	TEMPERATURE-PROBE	FTE PT-100 SET

CalNet®

FLUKE®

Calibration Data Report

Certificate number: SA01141933 **Calibration Date: 22 Feb 23**

Supplied value		Location	Lower limit	Measured value	Upper limit	% of Tol.
Temperature (ITS-90) calibration						
setpoint	indicator					
-85 °C	-84 °C	1	-90.0	-84.0 °C	-80.0	1
-85 °C	-84 °C	2	-90.0	-83.8 °C	-80.0	3
Temperature variation over time (30 minutes)			-1.0	0.8 °C	1.0	80
setpoint	indicator					
-40 °C	-41 °C	1	-45.0	-40.9 °C	-35.0	3
-40 °C	-41 °C	2	-45.0	-39.6 °C	-35.0	36
Temperature variation over time (30 minutes)			-1.0	0.2 °C	1.0	22

Location:

1	Lower
2	Upper

Remarks :
This measurement was done without test object(s) in the chamber.
Customer specification ± 2°C and ± 1°C for stability

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5. Ultra Low Freezer #20

• Manufacturer:	NuAire
• Type:	6625V30
• Dimensions chamber (width x depth x height):	86 x 60 x 128 cm
• Door dimension:	86 x 128 cm
• Temperature range:	-85 °C to –40 °C (± 2 °C)
• Programmable microprocessor for temperature:	N/A: constant temperature only
• Calibration due date:	February 2024

Certificate of Calibration
Fluke Nederland B.V.

Certificate Number:	SA01140641	**Date of Calibration:**	20 Feb 2023
Receive Condition:	IN TOLERANCE	**Date of Recalibration:**	20 Feb 2024
Return Condition:	IN TOLERANCE	**Place of Calibration:**	Voorhout
Manufacturer:	NEW BRUNSWICK	**Temperature within:**	(23.0 ± 5) °C
Model:	C660	**Humidity within:**	(50 ± 30) %rh
Serial Number:	1004-5488-0404		
Description:	ULTRA DEEP FREEZER		
Procedure:	Manual Procedure		

Customer:	TOPA INSTITUTE VOORHOUT
Customer Asset ID:	FREEZER 20
RMA Number:	606300972

All measurements are traceable to national and/or international standards or have been derived by approved ratio techniques. When possible standards used for this calibration are ISO/IEC 17025 accredited calibrated.

This calibration is performed by a DEKRA certified lab for ISO 9001. This certificate may not be reproduced other than in full. Calibration certificates without signatures, either electronic or handwritten, are not valid.

Issue Date: 20 Feb 2023

Electronically signed

Authorized By

D.W.G. de Visser

Fluke Nederland B.V.	**E-mail**	**Telephone**	**Rev** 230217
Brainport Industries Campus 1, 5657 BX, Eindhoven	service.nl@fluke.com	+31 40 267 5300	**Page** 1 of 3

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Certificate of Calibration

Certificate Number: SA01140641

Remarks

- The calibration status found in this certificate on the top of each results page must be interpreted as:

  As Found : Data collected before the unit was adjusted and / or repaired
  As Left : Data collected after the unit has been adjusted and / or repaired
  Found / Left : Data collected without any adjustment and / or repair performed

- The calibration interval (due date) is the responsibility of the end user.

- According to the European norm 'Operation of electrical installations' NEN-EN 50110-1 release 2013 and the Dutch norm NEN 3140 release 2015 paragraph 5.102.12 through 5.102.16, a safety test is not required. Therefore not performed.

- Temperature conversions (if applicable) are performed according to ISO/IEC 60584:2013 for thermocouples, and ISO/IEC 60751:2022 for resistance temperature devices.

Standards and test-equipment used

Inventory No	Model	Serial No
TS0094	2626-S	C19075
TS0249	TEMPERATURE-PROBE	FTE PT-100 SET

CalNet®

FLUKE®

Calibration Data Report

Certificate number: SA01140641 **Calibration Date: 20 Feb 23**

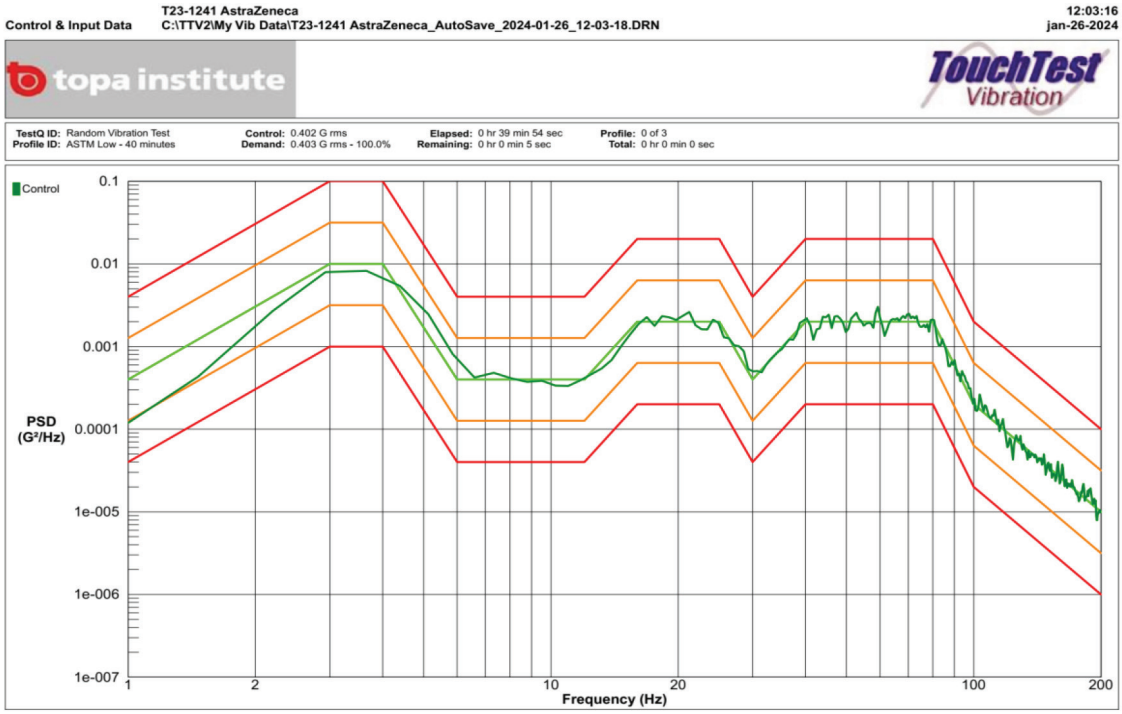
Supplied value		Location	Lower limit	Measured value	Upper limit	% of Tol.
Temperature (ITS-90) calibration						
setpoint	indicator					
-50.0 °C	-50.0 °C	1	-55.0	-51.0 °C	-45.0	21
-50.0 °C	-50.0 °C	2	-55.0	-51.1 °C	-45.0	22
-50.0 °C	-50.0 °C	3	-55.0	-50.2 °C	-45.0	4
-50.0 °C	-50.0 °C	4	-55.0	-49.7 °C	-45.0	6
-50.0 °C	-50.0 °C	5	-55.0	-50.4 °C	-45.0	8
Temperature variation over time (30 minutes)						
			-1.0	1.0 °C	1.0	99
Temperature (ITS-90) calibration						
setpoint	indicator					
-86.0 °C	-84.0 °C	1	-91.0	-86.2 °C	-81.0	4
-86.0 °C	-84.0 °C	2	-91.0	-86.2 °C	-81.0	4
-86.0 °C	-84.0 °C	3	-91.0	-83.9 °C	-81.0	42
-86.0 °C	-84.0 °C	4	-91.0	-83.5 °C	-81.0	50
-86.0 °C	-84.0 °C	5	-91.0	-84.2 °C	-81.0	36
Temperature variation over time (30 minutes)						
			-1.0	0.1 °C	1.0	10

Location:

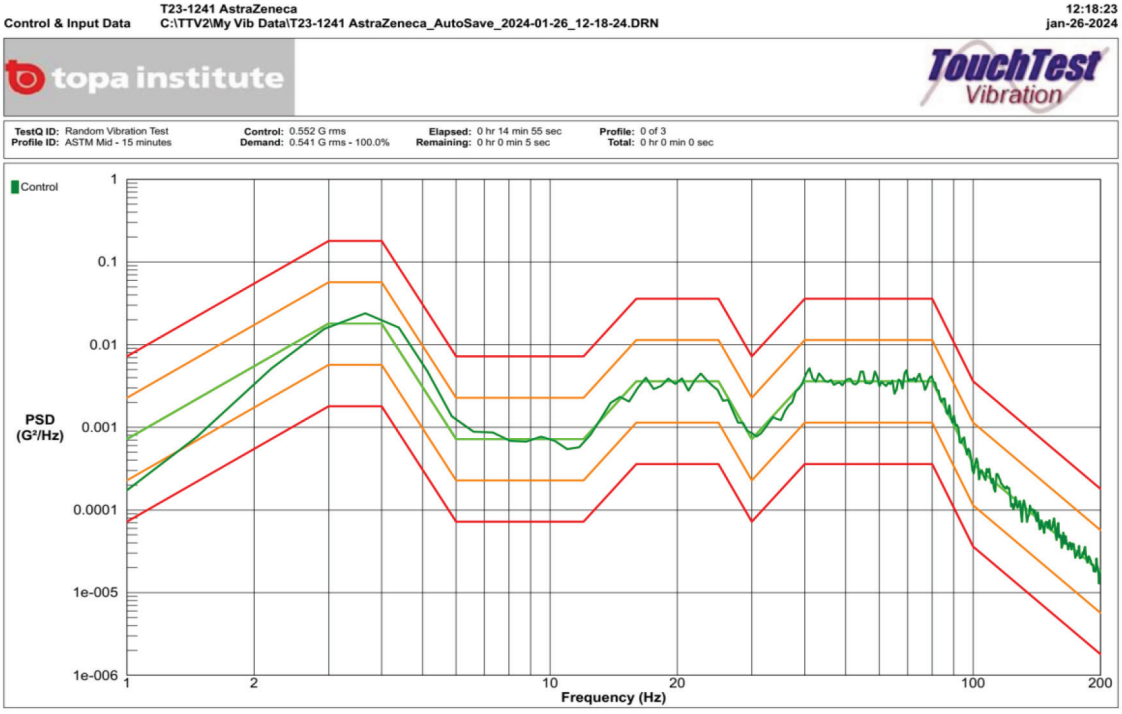
1 Lower left front
2 Upper left rear
3 Upper right front
4 Lower right rear
5 Center

Remarks :
This measurement was done with little test object(s) in the chamber.

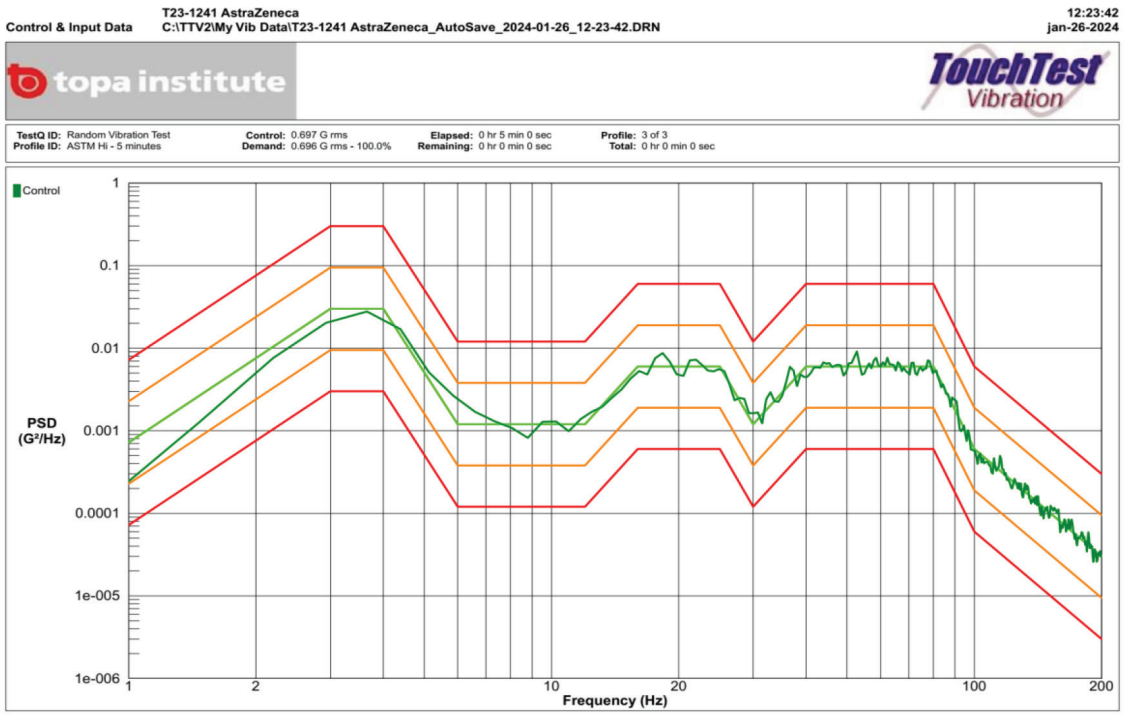
Appendix B: Random Vibration Test Graphs



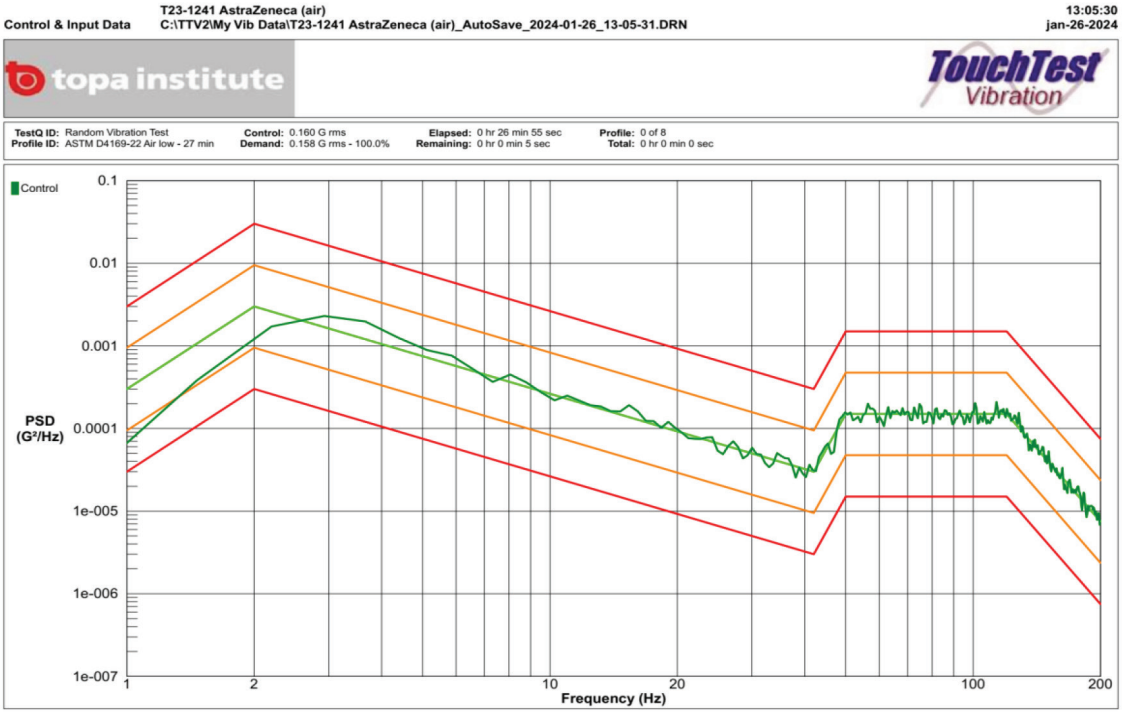
Graph of the Random Vibration Test, Truck Transport Low Level



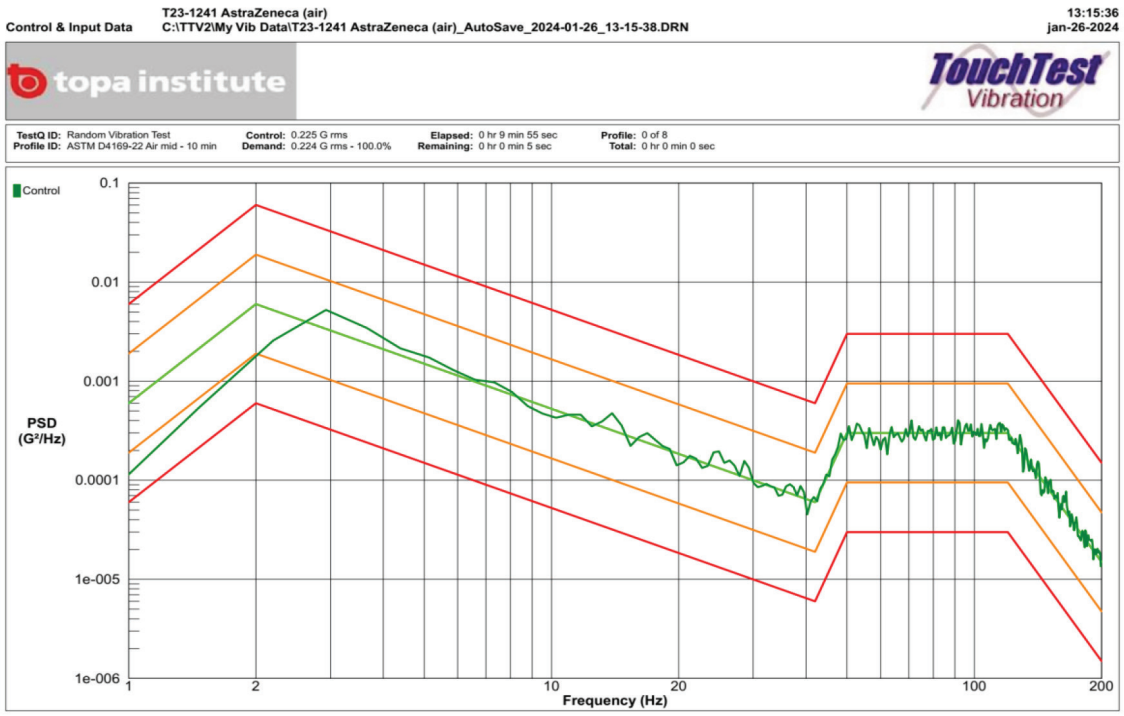
Graph of the Random Vibration Test, Truck Transport Medium Level



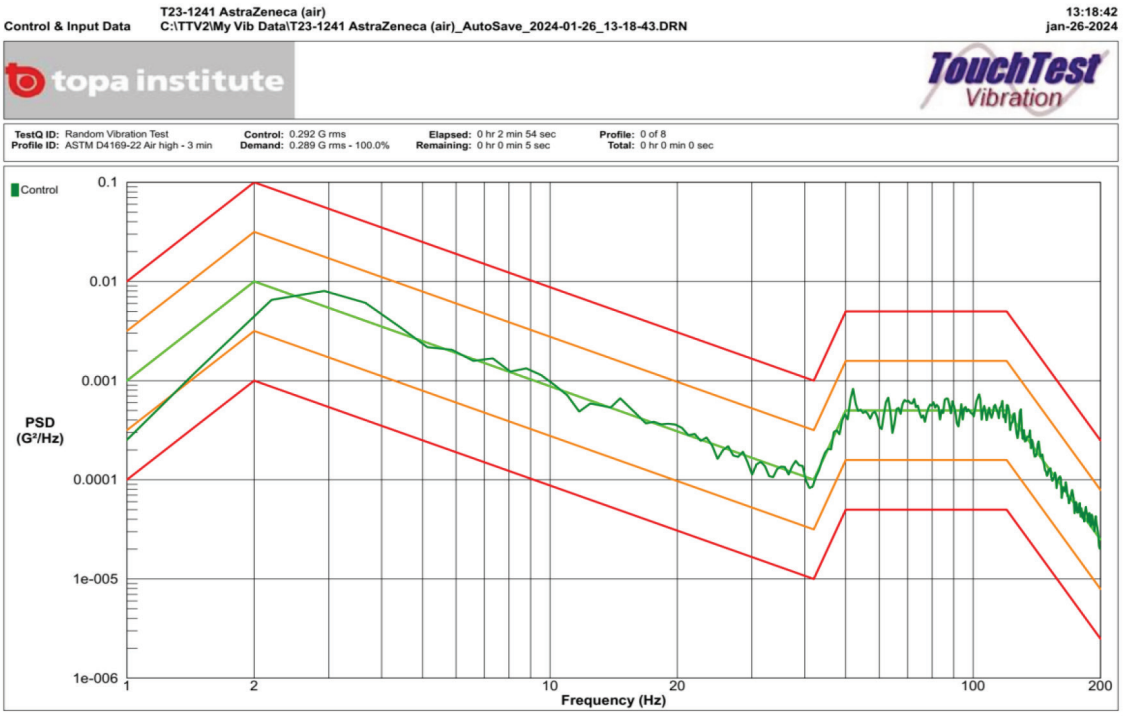
Graph of the Random Vibration Test, Truck Transport High Level



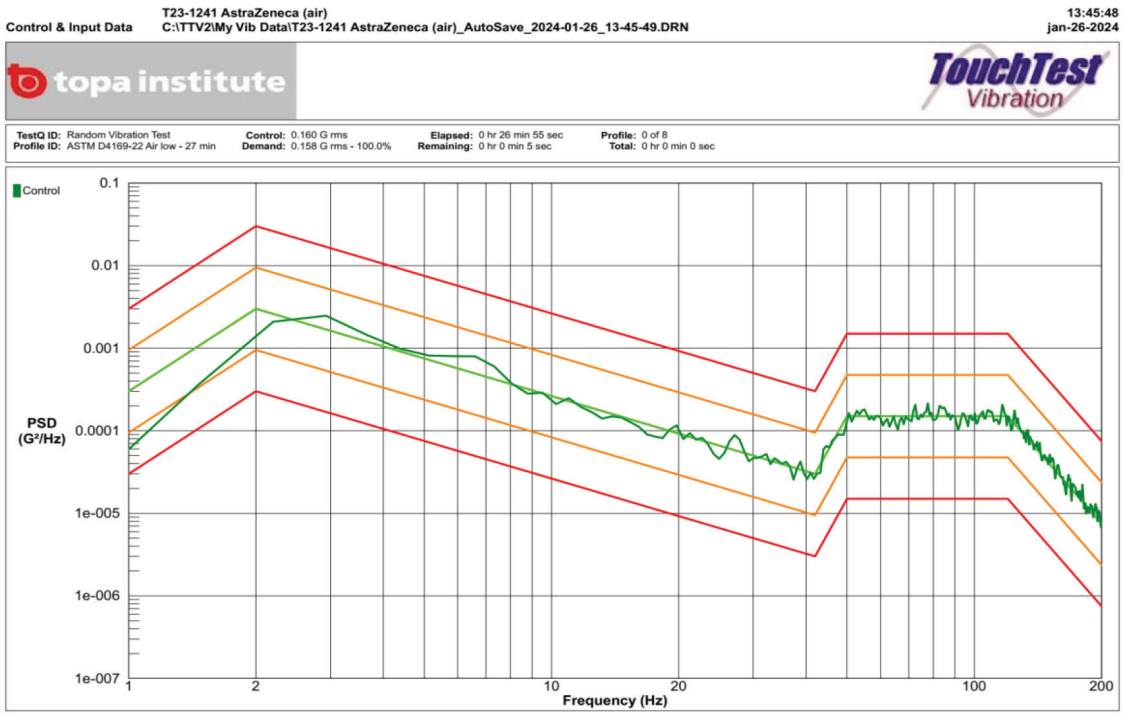
Graph of the Random Vibration Test, Air Transport Low Level, Cycle 1



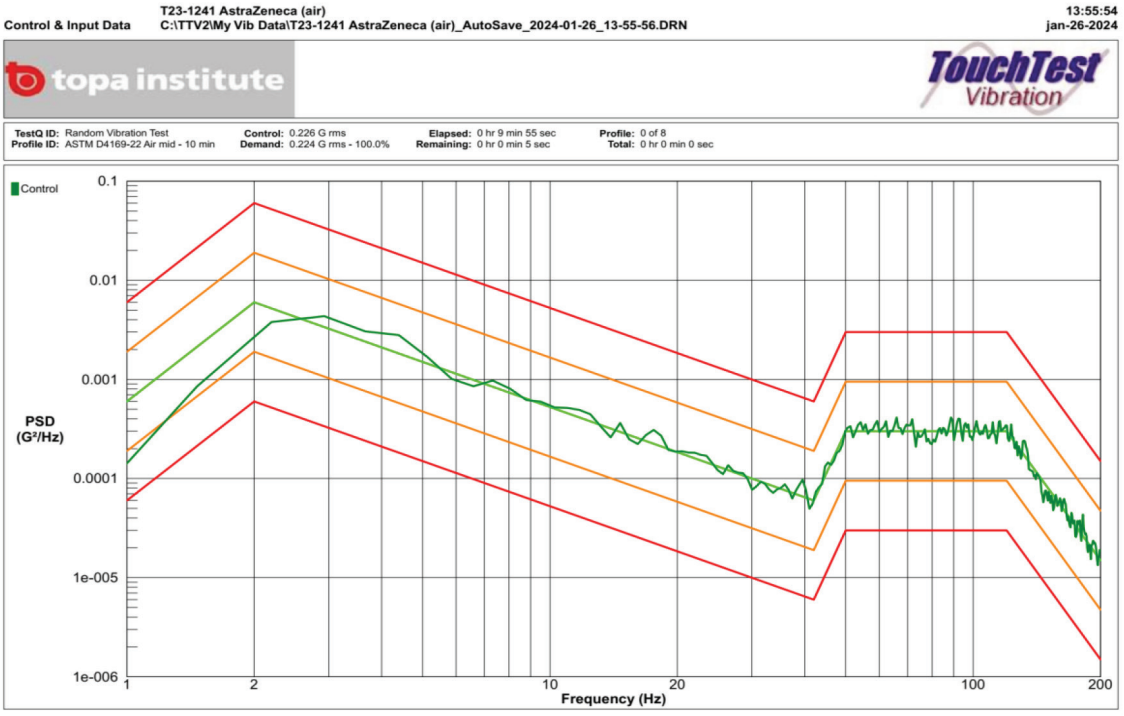
Graph of the Random Vibration Test, Air Transport Medium Level, Cycle 1



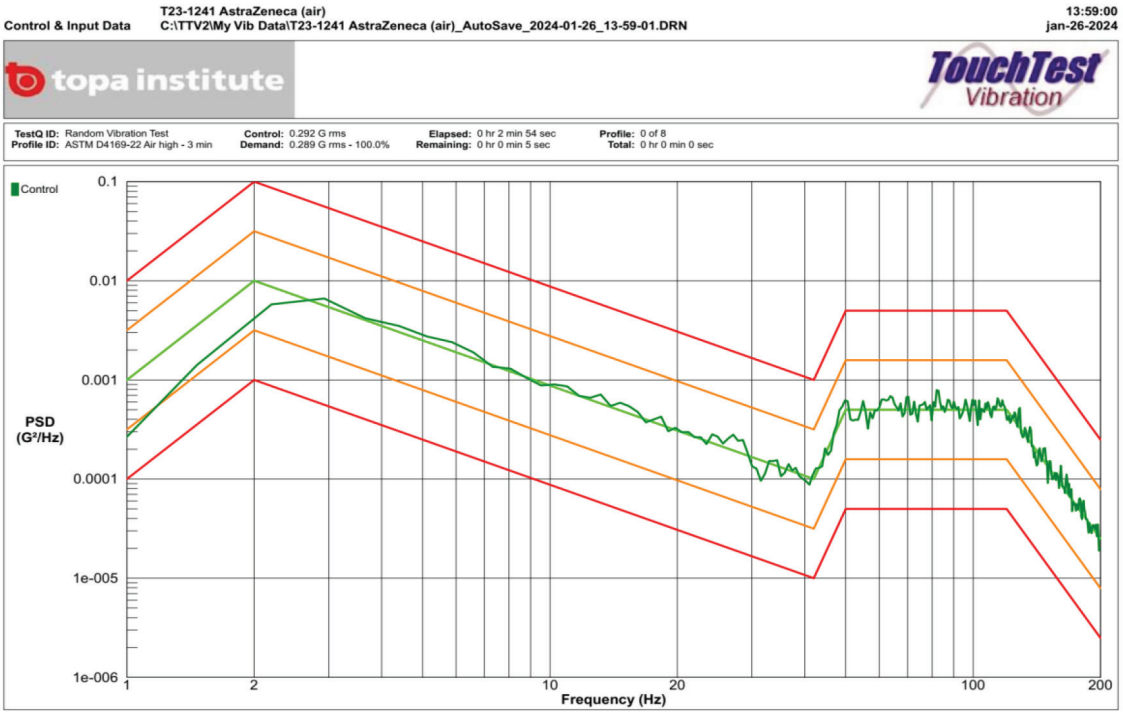
Graph of the Random Vibration Test, Air Transport High Level, Cycle 1



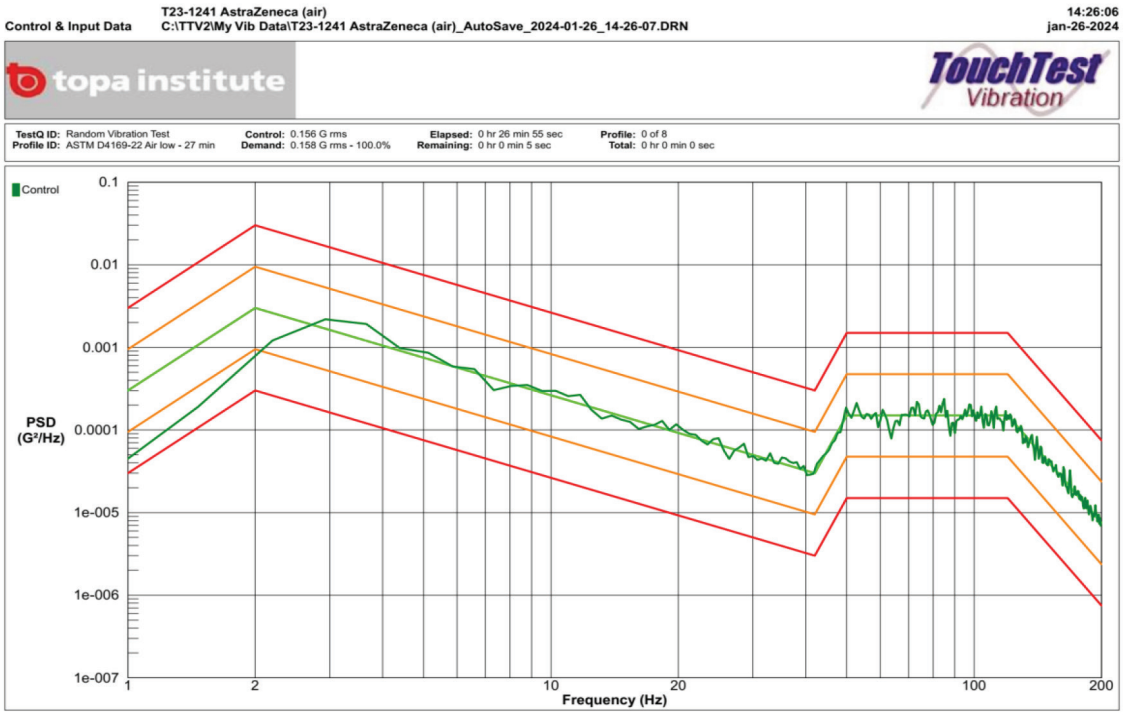
Graph of the Random Vibration Test, Air Transport Low Level, Cycle 2



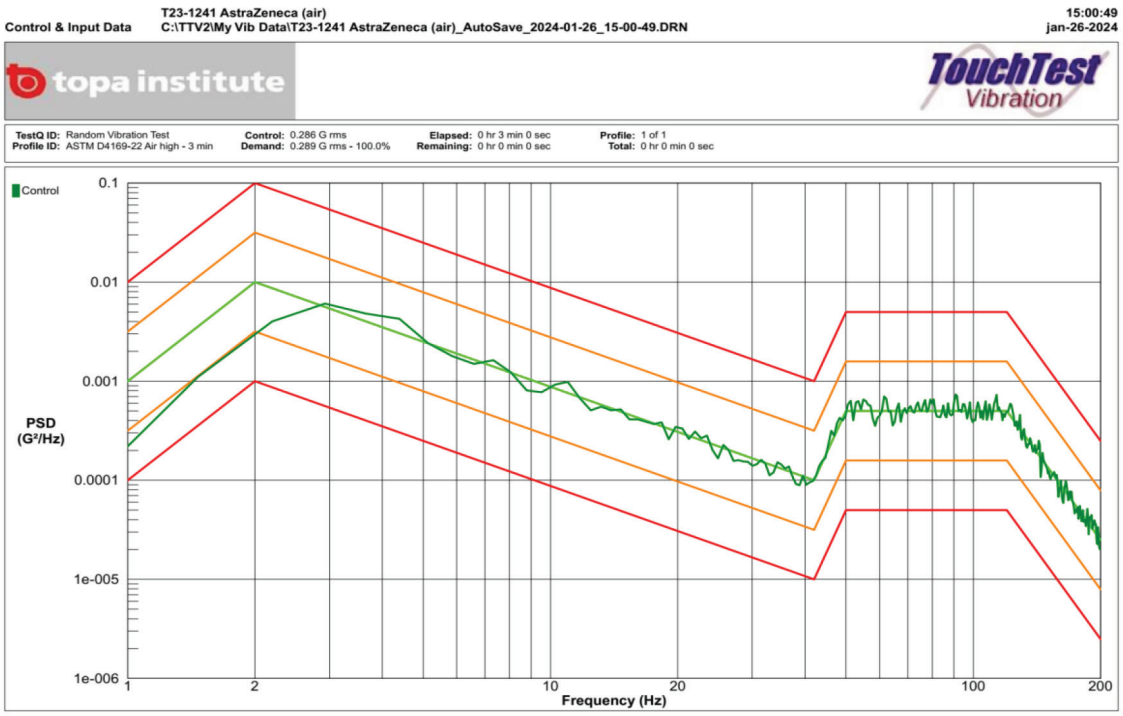
Graph of the Random Vibration Test, Air Transport Medium Level, Cycle 2



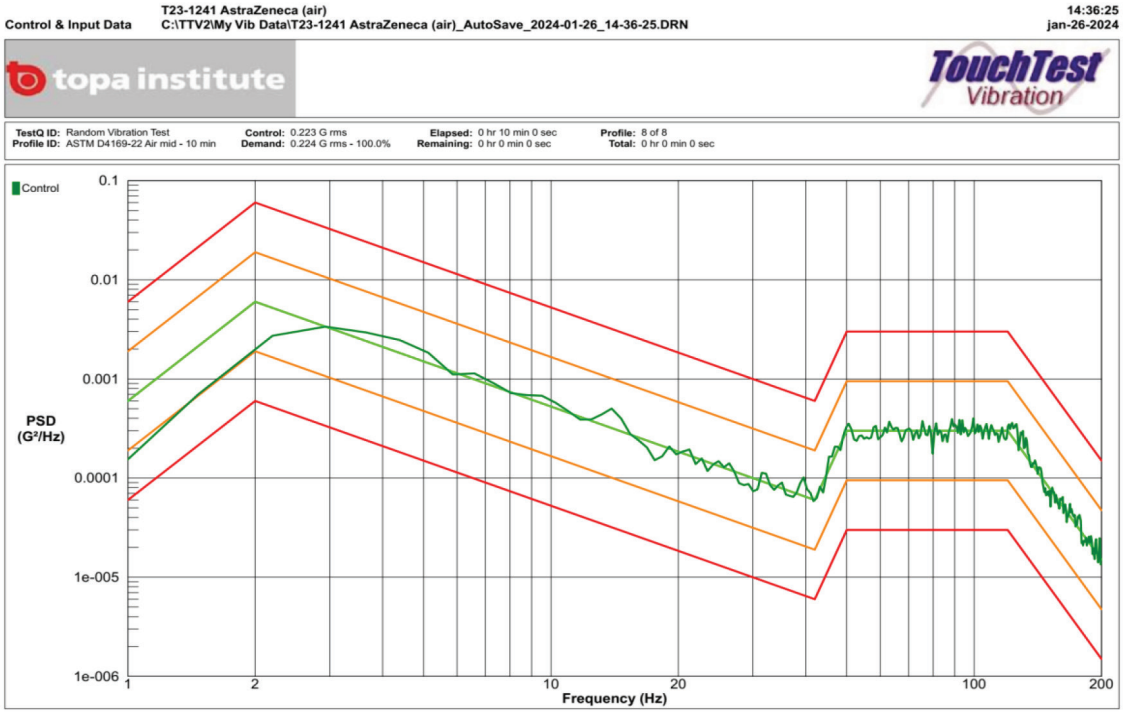
Graph of the Random Vibration Test, Air Transport High Level, Cycle 2



Graph of the Random Vibration Test, Air Transport Low Level, Cycle 3



Graph of the Random Vibration Test, Air Transport Medium Level, Cycle 3



Graph of the Random Vibration Test, Air Transport High Level, Cycle 3

Appendix C: History of Change

0	AF	12 February 2024	All	Create new document

Meissner Headquarters
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