NICOMATIC R&D LABORATORY	QUALIFICATION TEST REPORT	QTR18042a
EMM SERIE ACCORDING TO MIL-DTL-83513G STANDARD		Page : 1 /19
		Qualification status : PASSED

FUNGUS RESISTANCE

According to RTCA DO 160G,
section 13, category F & MIL-STD-810G

ISSUE	MODIFICATION	VISA	DATE
a	Original Issue	AJ	21/05/18
b			
c			

	Name	Duty	Date	Visa
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1 Conclusion

The EMM connectors are **qualified** grade 0-1* regarding FUNGUS RESISTANCE according to RTCA DO 160G, section 13, category F.

2 Technical Features Proposal

FUNGUS Severities:
Incubation time: 28 days, Tp 30±1°C, RH 97±2 %
Fungal strains:
- Aspergillus niger ATCC 9642
- Aspergillus versicolor ATCC 11730
- Penicillium funiculosum ATCC 11797
- Chaetomium globosum ATCC 6205
- Aspergillus flavus ATCC 9643

3 Connate Reports

ADETESTS 2418 combiné.pdf

4 Information about the tests

4.1 Object

These tests determine whether equipment material is adversely affected by fungi under conditions favorable for their development, namely, high humidity, warm atmosphere and presence of inorganic salts.

4.2 General Effects

Typical problems caused by fungi growing on equipment are:

a. Microorganisms digest organic materials as a normal metabolic process, thus degrading the substrate, reducing the surface tension and increasing moisture penetration.
b. Enzymes and organic acids, produced during metabolism, diffuse out of the cells and onto the substrate and cause metal corrosion, glass etching, hardening of grease and other physical and chemical changes to the substrates.
c. The physical presence of microorganisms produces living bridges across components that may result in electrical failures.
d. The physical presence of fungi can also cause health problems and produce aesthetically unpleasant situations in which users will reject using the equipment.

4.3 Reference documents/Qualification Plan

- MDC.P16020.a
- RTCA DO 160G, section 13, category F

4.4 Tested Products

Designation	Article Reference*	Drawing issue*	Batch / DI*	Quantity
C18892-30 (Female, Straight on PCB, E60 guiding)	C18892-30	na	DI7576	20
C18900-30 (Female Straight on PCB, E50)	C18900-30	na	DI7577	20
C18891-30 (Male, Straight on PCB, E10)	C18891-30	na	DI7579	20
C18904-30 (Male, 90° on PCB, E11 guiding)	C18904-30	na	DI7578	20
C18893-30 (Female, 90° on PCB, E61 guiding)	C18893-30	na	DI7580	20
C18901-30 (Female, 90° on PCB, E51 jackscrew)	C18901-30	na	DI7581	20
C18981-30-0250 (Male, on cable AWG30, E01 jackscrew)	C18981-30-0250	na	DI7592	20
C18980-30-0250 (Male, on cable AWG28, E01 jackscrew)	C18980-30-025	na	DI7591	20
C18902-30-0250 (Male, on cable AWG26, E01 jackscrew)	C18902-30-0250	na	DI7588	20
C18979-30-0250 (Male, on cable AWG24, E01 jackscrew)	C18979-30-0250	na	DI7589	20
C18902-30-0250-BP (Male, on cable AWG26, E01 jackscrew BP)	C18902-30-0250-BP	na	DI7586	20
18224-AWG24	18224-AWG24	na	DI7594	25
18224-AWG26	18224-AWG26	na	DI7596	25
18240-AWG28	18240-AWG28	na	DI7597	25
18240-AWG30	18240-AWG30	na	DI7598	25

4.5 Persons present during the tests

Name	Duty
A.JAGHMIM	Test & Measurement Manager

4.6 Date and place of the tests

MUSEUM NATIONAL D'HISTOIRE NATURELLE Lab. from 19/03/18 to 24/04/18

4.7 Environmental conditions

Ambient temperature: See Test procedure
Pressure: ambiant
Humidity: See Test procedure

4.8 Incidents during the test

None

4.9 Test Equipments

See "List of Measurement Equipment and Facilities"

No.	Name of Measurement Equipment, Facilities	Manufacturer	Register Number or Serial Number	Major Specification (Ratings, Capability, Accuracy Class, etc.)	Calibration (Inspection) institute, institute, or Organization (Calibration procedure document number should be specified.)	Manufacturer Calibration Expiration Date	direct calibration interval (internal methods)	Indirect calibration interval (internal methods)	Section of Applicable Test described in RTCA DO 160 F or G	Remarks
1	Temperature and Humidity Chamber	FROILABO SPS40, type BVEHP	216539	°C Temperature Range : 0~+60 Humidity Range : 10~98%R H Effective Space : 700W×1000H×700D mm (490 Liter) Temperature accuracy : < 0,5° C. Temperature fluctuation over 28 days (test duration) < 0,2 °C RH accuracy : <3%. Hygrometry fluctuation over 28 days (test duration) < 2 %	(Warranty expiration 15/03/2016) last control maintenance by the manufacturer the 27/04/2017	27/04/2018		permanently	13.4, 13.5, 13.6	Internal procedures Calibration by the use of one high precision thermohygrometer data logger placed permanently inside the climatic chamber
2	High Precision Thermo-hygrometer DATA LOGGER UNIT n° 1	MOINEAU 01715	150429715	Temp : -40 à +70°C Resol. 0,1°C /Accuracy ± 1°C Hygro : 0 à 100%RH Resol. 0,1% / Accuracy ±2%RH Recording at 5,55 mHz, 13440 records over 28 days	Unit n° 1 (Warranty expiration (05/01/2017) placed permanently inside the climatic chamber during the test	05/01/2017		Once per 3 month - 07/09/2017 - 11/12/2017 - 14/03/2018	13.4, 13.5, 13.6	Internal procedures, HR % Calibration by the use oneqpoint calibration (pure water 100 % or K2SO4 salt , 97% at 30°C)
	High Precision Thermo-hygrometer DATA LOGGER UNIT n° 2	MOINEAU 01715	161129048	Temp : -40 à +70°C Resol. 0,1°C /Accuracy ± 1°C Hygro : 0 à 100%RH Resol. 0,1% / Accuracy ±2%RH Recording at 5,55 mHz, 13440 records over 28 days	Unit n° 2 (Warranty expiration (15/05/2018) placed permanently inside the climatic chamber during the test with minor exceptions the first days for the recovery of the recorded data (calibration procedure).	15/05/2018	Once per 3 month - 07/09/2017 - 11/12/2017 - 14/03/2018			The direct calibration was processed inside the climatic chamber (temperature : 30°C) by placing the data logger inside an hermetic zip bag saturated with water vapors or with K2SO4 salt
4	Autoclave	SMI AV X90E	12054	°C Temperature Range : -110~135	Unity Lab services (Thermofisher Scientific) Last control : 14/12/2017	Next control test scheduled for December 2018 The efficiency of each sterilization cycle is checked by the use of visual strips	a priori once a year		13.5	Sterilization visual strips are used systematically to prove that media culture or recipients have been sterilized regularly !
5	Analytical Balance	Mettler MS 104S/01	B 106 109658	0-120 g readability 0,1 mg	Precisa France 12/09/2017	external procedures once a year (next control scheduled for October 2018)	Internal procedures with precision weights each month		13.5	
6	pH- meter	Hanna 9125		Temperature Range : -10~+ 100 pH -2-16 accuracy 0,01 pH , 0,5 °C	Warranty expiration 5/12/2017		calibration at each utilisation		13.5	2 points calibration 4.01, 7.01,

4.10 Test Tooling

Designation	Tooling reference

5 Requirements according to MIL-DTL-810G standard

Evaluation table

Amount of growth	Rating	Comments
None	0	Substrate is devoid of microbial growth
Trace	1	Sparse or very restricted microbial growth.
slight	2	Intermittent infestations or loosely spread microbial colonies on substrate surface and moderate reproduction. Include continuous filamentous growth extending over the entire surface, but underlying surfaces are still visible.
Medium	3	Substantial amount of microbial growth. Substrate may exhibit chemical, physical, or structural change.
Heavy	4	Massive microbial growth

6 Test Procedure according to DO160G, section 13

6.1 Preparation of Mineral-Salts Solution

The solution shall contain the following:

Potassium dihydrogen orthophosphate.....0.7 g
Potassium monohydrogen orthophosphate .....0.7 g
Magnesium sulfate heptahydrate .....0.7 g
Ammonium nitrate .....1.0 g
Sodium chloride .....0.005 g
Ferrous sulfate heptahydrate .....0.002 g
Zinc sulfate heptahydrate .....0.002 g
Manganous sulfate monohydrate .....0.001 g
Distilled Water .....1000 ml

Sterilize the mineral salts solution by autoclaving at 121 degrees C for 20 minutes. Adjust the pH of the solution by the addition of 0.01 normal solution of sodium hydroxide so that after sterilization the pH level is between 6.0 and 6.5. Prepare sufficient salt solutions for the required tests.

6.2 Purity of Reagents

Reagent grade chemicals shall be used in all tests. Unless otherwise specified, it is intended that all reagents shall conform to the specification of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.

6.3 Purity of Water

Unless otherwise specified, references to water shall be understood to mean distilled water or water of equal purity.

6.4 Preparation of Mixed Spore Suspension

The following test fungi shall be used:

Fungi	ATCC1	NLABS2
Aspergillus niger	9642	386
Aspergillus flavus	9643	380
Aspergillus versicolor	11730	432
Penicillium funiculosum	11797	474
Chaetomium globosum	6205	459

Maintain cultures of these fungi separately on an appropriate medium such as potato dextrose agar. However, the culture of chaetomium globosum shall be cultured on strips of filter paper on the surface of mineral salts agar. (Mineral salts agar is identical to the mineral salts solution described in paragraph 13.5.1, but contains in addition 15.0 g of agar/liter.) The stock cultures may be kept for not more than four months at 6 "4 degrees C, at which time subcultures shall be made and new stocks shall be selected from the subcultures. If genetic or physiological changes occur, obtain new cultures as specified above. Subcultures used for preparing new stock cultures or the spore suspension shall be incubated at 30 degrees C for seven to ten days.
Prepare a spore suspension of each of the five fungi by pouring into one subculture of each fungus a 10 ml portion of a sterile solution containing 0.05 g/liter of a non-toxic wetting agent such as sodium dioctyl sulfosuccinate or sodium lauryl sulfate. Use a sterile platinum or nichrome inoculating wire to scrape gently the surface growth from the culture of the test organism. Pour the spore charge into a sterile l25 ml glass-stoppered Erlenmeyer flask containing 45 ml of sterile water and 10 to 15 solid glass beads, five millimeters in diameter. Shake the flask vigorously to liberate the spores from the fruiting bodies and to break the spore clumps. Filter the dispersed fungal spore suspension through a six millimeter layer of glass wool, contained in a glass funnel, into a sterile flask. This process should remove large mycelial fragments and clumps of agar that could interfere with the spraying process. Centrifuge the filtered spore suspension aseptically and discard the supernatant. Resuspend the residue in 50 ml of sterile water and centrifuge. Wash the spores obtained from each of the fungi in this manner three times. Dilute the final washed residue with sterile mineral-salts solution in such a manner that the resultant spore suspension shall contain 1,000,000 "200,000 spores/milliliter as determined with a counting chamber. Repeat this operation for each organism used in the test and blend equal volumes of the resultant spore suspension. The spore suspension may be prepared fresh each day and maintained at 6 "4 degrees C not more than four days.

6.5 Viability of Inoculum Control

With each daily group of tests, place each of three pieces of sterilized filter paper, 2.54 cm square on hardened mineral-salts agar in separate Petri dishes. Inoculate these with the spore suspension by spraying the suspension from a sterilized atomizer1 until initiation of droplet coalescence. Incubate these at 30 degrees C at a relative humidity not less than 85 percent, and examine them after seven days of incubation. There shall be copious growth on all three of the filter paper control specimens. Absence of such growth requires repetition of the test.

6.6 Control Items

In addition to the viability of inoculum control, known susceptible substrates shall be inoculated along with the test item to insure that proper conditions are present in the incubation chamber to promote fungus growth. The control items shall consist of cotton duck 234 g strips that are 3.2 cm wide, that have been dipped into a solution containing 10% glycerol, 0.1% potassium dihydrogen orthophosphate, 0.1% ammonium nitrate, 0.025% magnesium sulfate, and 0.05% yeast extract (pH level 5.3), and from which the excess liquid has been removed. The strips should be hung to air dry before being inoculated and placed into the chamber.

6.7 Inoculation of Test Control

a. Mount the test and control items on suitable fixtures or suspend from hangers.
b. Precondition the chamber and its contents at 30 degrees C and 97 "2% relative humidity for at least four hours.
c. Inoculate the test and control items with the mixed fungus spore suspension (paragraph 6.4) by spraying it on the test and control items in the form of a fine mist from a previously sterilized atomizer or nebulizer. In spraying the test and control items, care should be taken to cover all surfaces. If the surfaces are non-wetting, spray until initiation of droplet coalescence. Incubation is to be started immediately following the inoculation.

6.8 Incubation

a. Maintain the test chamber at 30 degrees C and 97 "2% relative humidity (minimum) during the life of the test. Keep the test chamber closed during the incubation period, except during inspection or for addition of other test items.
b. After seven days, inspect the growth on the control items to be assured that the environmental conditions are suitable for growth. If inspection reveals that the environmental conditions are unsuitable for growth, the entire test shall be repeated.
c. If the control items show satisfactory fungus growth, continue the test for a period of 28 days from the time of inoculation or as specified in the equipment specification.

6.9 Inspection

At the end of the incubation period, inspect the test item immediately. If possible, inspect the item within the chamber. If the inspection is not completed in eight hours, return the test item to the humid environment for a minimum of twelve hours. Except for hermetically sealed equipment, open the equipment enclosure and examine both the interior and exterior for evidence of deterioration. The equipment shall then be tested to DETERMINE COMPLIANCE WITH APPLICABLE EQUIPMENT PERFORMANCE STANDARDS (here MIL-STD-810G).

6.10 Precautions

The fungi specified for this test are not normally considered a serious hazard for human handling. It is possible for an individual to be allergic to one of them, and for this reason it is wise to exercise care when performing the test. Surgical gloves may be worn to protect the hands, and care should be taken not to splash the suspension on other areas of the skin or on clothes.

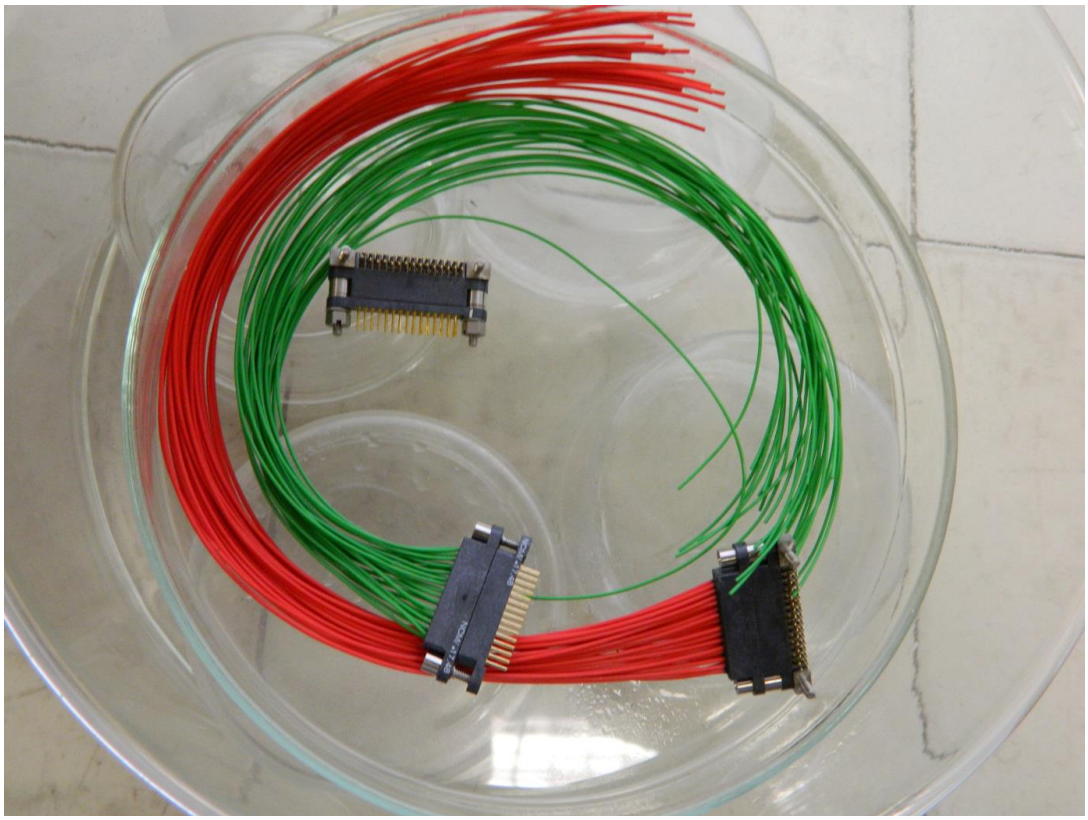
It is also possible, during the incubation period in the test chamber, for a foreign spore, present as an unintentional intruder, to develop; some of these fungi thus present as native to some testing locations may be injurious to the human system. For this reason there is a possibility that the specimen after exposure may be a hazard, and it should be handled with care.

The greatest danger, if some hazardous foreign spore is present on exposed specimens, is that small, dry, detached particles may become airborne and be carried into the lungs. This is only likely to happen after the specimen has dried out. If the specimen is carried quickly from the test chamber to a normal chemical fume hood before it has time to dry, the flow of air does not reach the operator and detached fragments cannot enter the nasal passages.

Detached portions of growth may be so small that no protection is offered by wearing a gauze mask and only a special respirator for sub-micron particles is effective. The use of a fume hood as suggested above, however, is considered an adequate precaution when performing this test.

Where the test location may contain such a harmful fungus, vestiges of it may remain in the test chamber and present a similar danger when it is being cleansed. High temperature steam, the preferred cleansing treatment, will render the chamber completely harmless. Where, however, fumigation with propylene oxide is adopted, it will be noted that fumigation prior to washing will ensure that all residues washed from the chamber are completely harmless.

7 Test setup





Temperature and Humidity Chamber	FROILABO SP540, type BVEHP

8 Measurements results

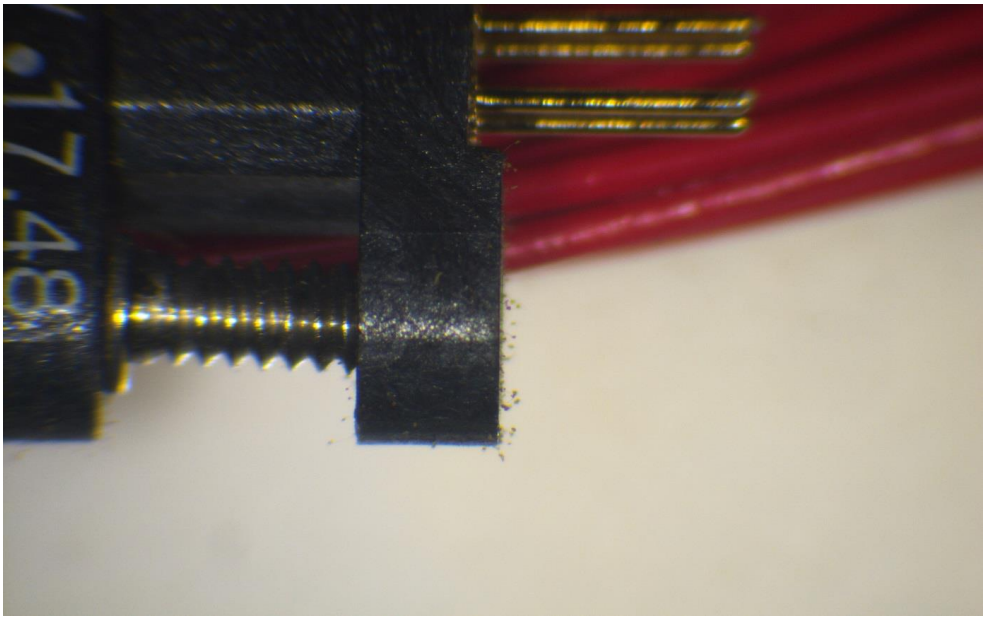
Amount of growth	Rating	Comments
None	0	Substrate is devoid of microbial growth
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Heavy	4	Massive microbial growth

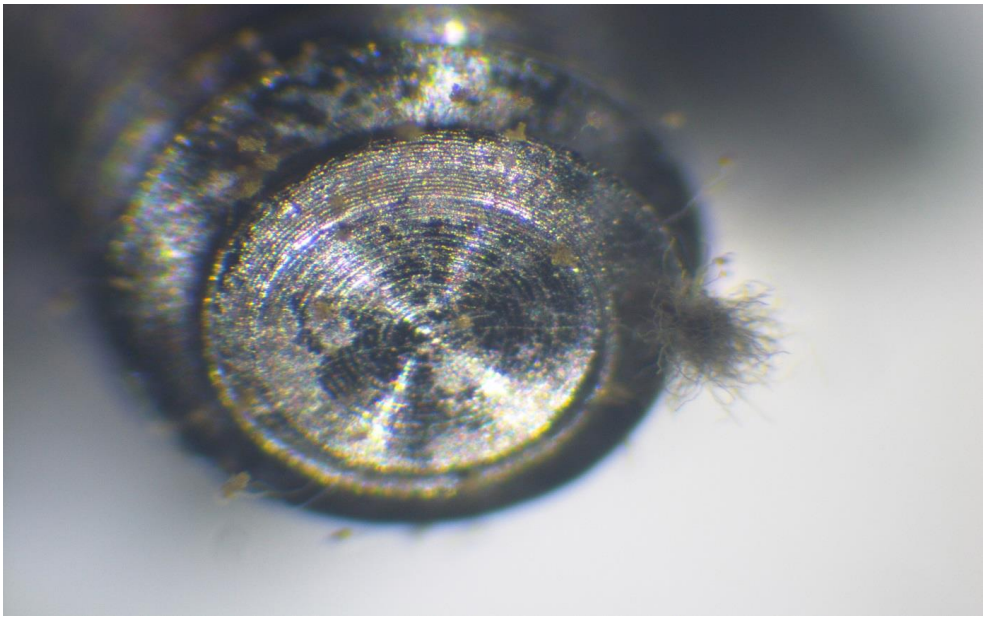
After test, grade 0-1*.

* Evaluation of the fungal growth according the standard MIL STD 810G

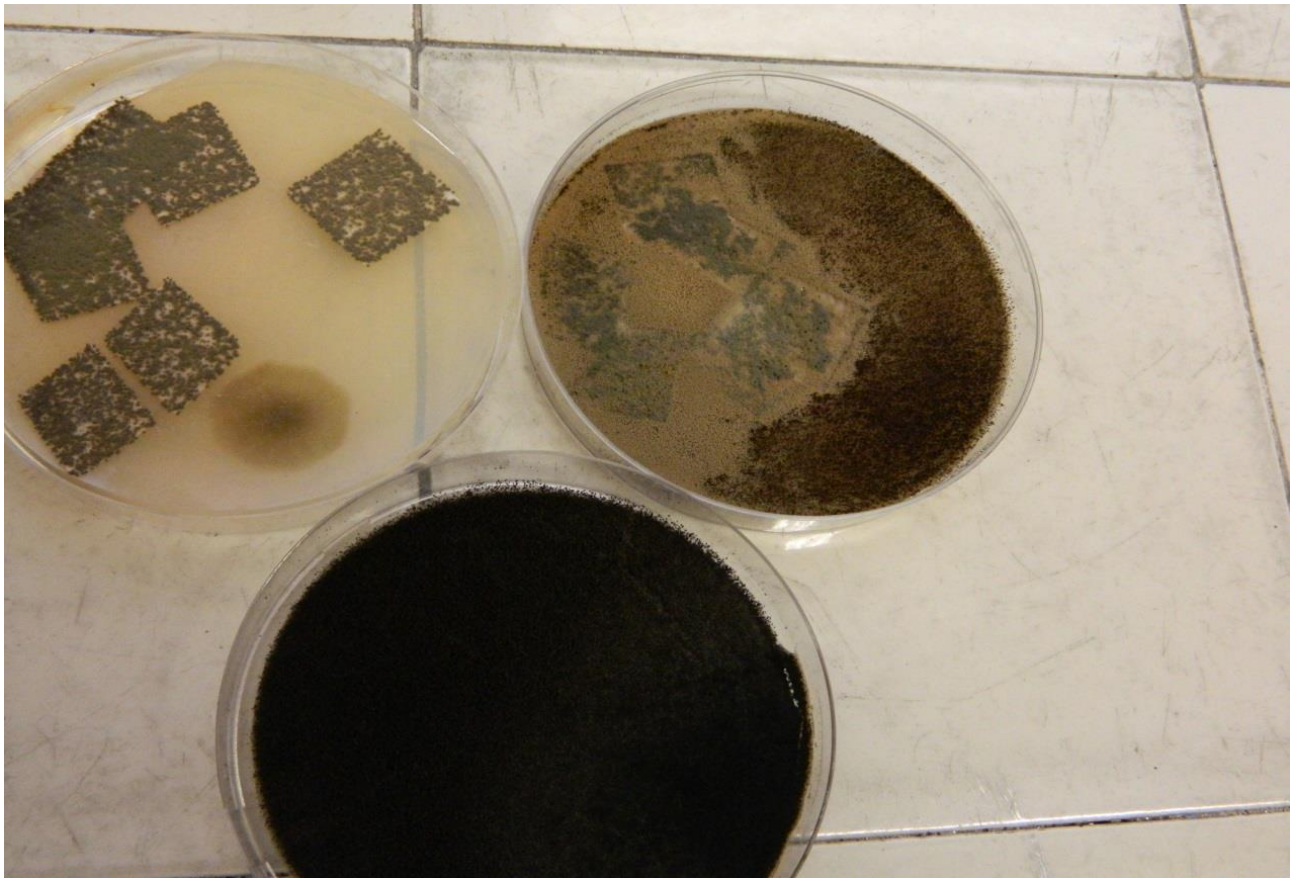
9 Visual Inspection

Required by the applicable standard ?			
YES		NO	☐





After test, grade 0-1, a surprising perithecium (here the substrate is metallic) produced by the cellulolytic *Chaetomium globosum* is visible



Control n°1, 2 & 3, from left to right and from top to bottom: inoculum spread respectively over inorganic Czapek medium + sterile filter papers, oat meal medium + sterile filter papers, and Ma 3%, after test, fructifications produced by *Chaetomium globosum , flavus and niger* are easily visible

**********END OF REPORT**********

10 APPENDIX

Internal use only ?			
YES	☐	NO	☒

10.1 The Laboratory Advice

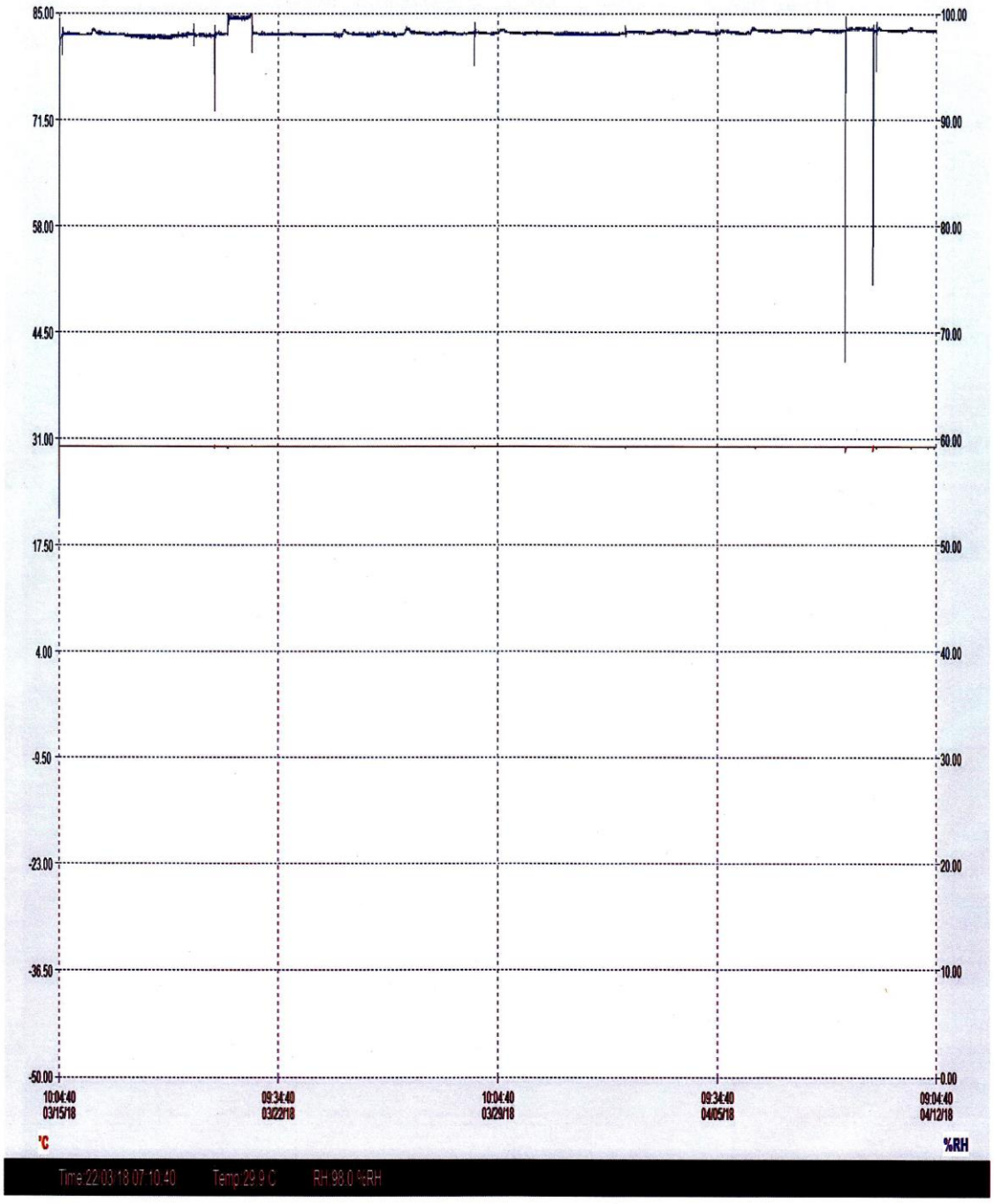
10.2 Pictures

Start Time: 15/03/18 10:04:40 End Time: 12/04/18 09:13:40 sampling rate: 180sec Data number: 13404

Temp Alarm HI: 40 C Temp Alarm Low: 17 C RH Alarm HI: 100 %RH RH Alarm Low: 40 %RH

Temp MAX: 30.1 C @08:49:40 10/04/18 Temp MIN: 24.7 C @10:04:40 15/03/18 Temp AVG: 29.93 C

RH MAX: 100.0 %RH @12:49:40 21/03/18 RH MIN: 52.6 %RH @10:04:40 15/03/18 RH AVG: 98.17 %RH

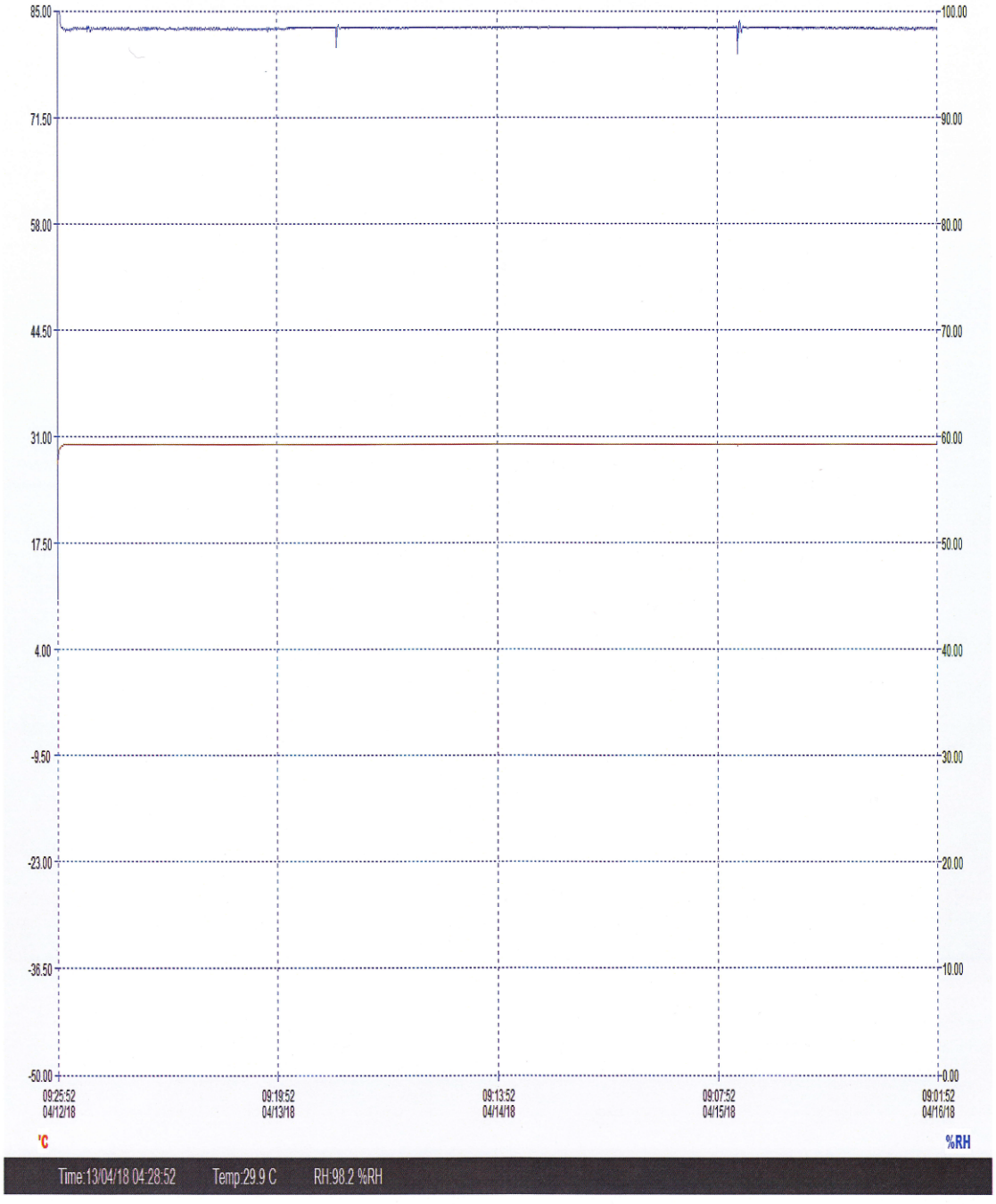


Start Time: 12/04/18 09:25:52 End Time: 16/04/18 09:01:52 sampling rate: 180sec Data number: 1913

Temp Alarm HI: 40 C Temp Alarm Low: 17 C RH Alarm HI: 100 %RH RH Alarm Low: 40 %RH

Temp MAX: 30.0 C @08:58:52 16/04/18 Temp MIN: 25.9 C @09:25:52 12/04/18 Temp AVG: 29.90 C

RH MAX: 100.0 %RH @09:40:52 12/04/18 RH MIN: 44.7 %RH @09:25:52 12/04/18 RH AVG: 98.35 %RH

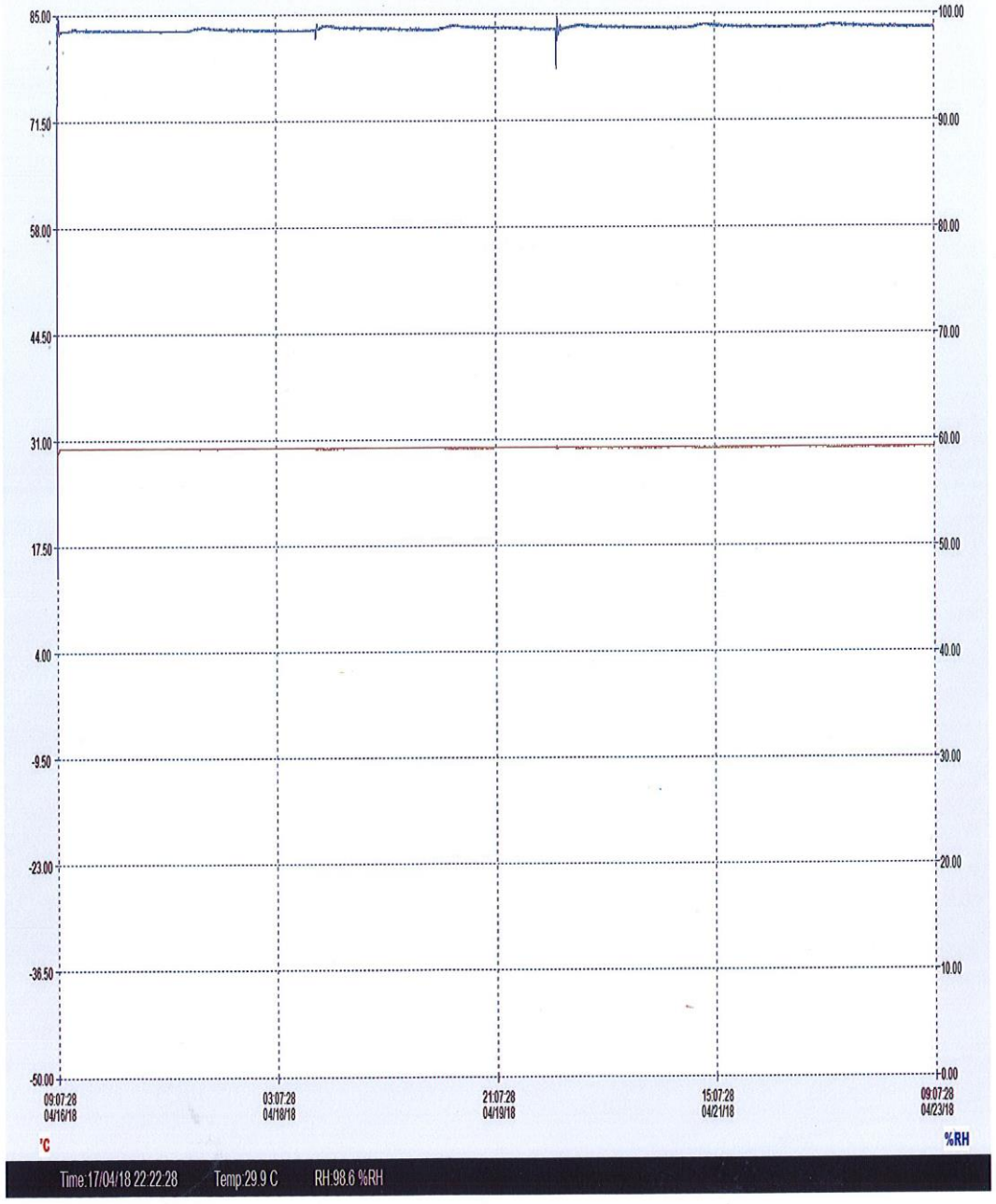


Start Time: 16/04/18 09:07:28 End Time: 23/04/18 09:10:28 sampling rate: 180sec Data number: 3362

Temp Alarm HI: 40 C Temp Alarm Low: 17 C RH Alarm HI: 100 %RH RH Alarm Low: 50 %RH

Temp MAX: 30.1 C @08:49:28 20/04/18 Temp MIN: 28.0 C @09:07:28 16/04/18 Temp AVG: 29.88 C

RH MAX: 99.8 %RH @09:28:28 16/04/18 RH MIN: 47.1 %RH @09:07:28 16/04/18 RH AVG: 98.62 %RH



**********END OF APPENDIX**********