

**PRODUCTS APPLIED TO BODY-IN-WHITE
OR PAINT COATED BODY, PLASTICS
ACCELERATED AGEING**

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Drafted by :		Checked by :		Approved by :	
Géraldine MAINETTE DPTA/DMOV/IMT/MXP/CEB/ASG		Cédric GHEBAUDO DMOVQMS/QMXP		Thierry HARM DMOV/IMT/MXP/CEB	
Date	Signature	Date	Signature	Date	Signature
04/07/2006		04/07/2006		04/07/2006	

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RECORDS

Suffix	Date	Type of modifications
OR	01/02/1980	CREATION OF THE PSA NORME. REPLACES THE ASSOCIATION NORME No. 1165.
A	01/02/1983	COMPLETE REWRITE OF THE NORME.
B	01/06/1984	MODIFICATION TO § 4.8. AND APPENDICES 1, 2 AND 3.
C	01/09/1992	MODIFICATION TO § 3.8. AND APPENDIX 3 AND EDITORIAL MODIFICATIONS.
D	01/06/1994	COMPLETE REWRITE OF THE NORME.
E	18/12/1996	INTRODUCED INTO IDEM (<i>French only</i>).
F	07/02/1997	MODIFICATION TO TITLE, TO § 1. AND ADDITION OF AGEING CONDITIONS V-W-X, WITH FOREWORD DELETED.
G	17/02/1997	MODIFICATIONS TO PARAGRAPHS 4.3, 4.4 AND APPENDICES 2, 3 (1/2)
H	13/12/2005	BROUGHT INTO LINE WITH THE NEW FORMATTING OF NORMES D. ADDITION OF PRECISIONS TO THE H CYCLE.
J	12/07/2006	CHANGES TO THE SIGNATORY NAMES OF THIS NORME

PARTICIPANTS

The following persons took part in the drafting and/or checking of this norme:

DPTA/DMOV/IMT/MXP/CEB/ASG	Ludovic AUGE
SIKA Automotive	Herbert ACKERMANN
DPTA/DMFV/RHN/NCF	Guy DHENIN.

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1.OBJECT AND FIELD OF APPLICATION

The object of this method is to describe standard conditions of exposure to various environmental conditions: climatic or chemical, single, in combination or cyclic, in order to determine their effect on certain given characteristics.

It applies to products applied to body-in-white or paint coated bodies corresponding to bonding, sealing, damping, anti-chipping, anti-corrosion and protection functions, and plastics.

It is not, however, possible to establish a direct relationship between test results and performance over time under service conditions. On the other hand, in certain applications, the benefit of experience may allow a correlation to be established between a test and service life duration.

2.REFERENCE DOCUMENTS

2.1.NORMES

NF EN 29142 ADHESIVES. GUIDE FOR THE SELECTION OF NORMAL AGEING TEST CONDITIONS IN LABORATORY FOR BONDED ASSEMBLIES

2.2.REGULATIONS

Not applicable.

2.3.OTHER DOCUMENTS

Not applicable.

2.4.EXPRESSION ON DOCUMENTS

Not applicable.

3.TERMINOLOGY AND DEFINITION

A dictionary (glossary) of the main terms and their definitions used within the "Direction des Plates-formes, des Techniques et des Achats" can be consulted in-house via the DPTA glossary.
([Nectar](http://nectar.inetpsa.com) : <http://nectar.inetpsa.com>). This glossary is constantly up-dated.

3.1.DEFINITIONS

Not applicable.

3.2.ACRONYMS

Not applicable.

4.TEST METHOD PRINCIPLE

To define the ageing conditions from which shall be selected those which shall reproduce the optimum natural exposures, either from a temperature, humidity or corrosion point of view, or from a potential presence of liquid point of view, for each application.

5.EQUIPMENT

5.1.CONDITIONED CHAMBER

At 23 °C \pm 2 °C and 50 % \pm 5 % relative humidity.

5.2.DRY HEAT CHAMBER

Ventilated, adjustable between 20°C and 200 °C and enabling the curing cycles defined in standard documents to be observed.

5.3.REGULATED CHAMBER

for relative humidity and temperature, fitted with:

- a device for measuring the degree of relative humidity to within 5 %,
- a device for measuring the temperature to within 1 °C .

5.4.COLD CHAMBER

Adjustable down to - 40 °C \pm 3 °C.

5.5.CLIMATIC CHAMBER

An automatic temperature and humidity control device, capable of creating repetitive climatic cycles as per the diagram in Appendix 4.

5.6.ENCLOSURE FOR IMMERSION IN WATER

Not applicable

5.7.GLASS JARS

"Jam" type sealed with a leak tight rubber seal lid.

5.8.LOW DENSITY POLYETHYLENE BAGS

120 μ m \pm 10 μ m thick and with a gram per square metre capacity of 100 g/m² \pm 10 g/m².

5.9.SOLDERING GUN FOR POLYETHYLENE

Not applicable.

5.10.COTTON WOOL

Not applicable.

5.11.BALANCE

Accurate to 1mg

5.12.MEASURING CYLINDER

Of 500 ml capacity.

6.REAGENTS

6.1.DISTILLED OR DE-IONISED WATER

With sodium lauryl sulphate added at a concentration of 10 g/litre, of analytical quality.

6.2.DISTILLED OR DE-IONISED WATER

Of resistivity $\geq 100\ 000\ \Omega\cdot\text{cm}$.

6.3.ASTM N°1 OIL

Not applicable.

6.4.IRM 902 OIL

Not applicable.

6.5.IRM 903 OIL

Not applicable.

6.6.COOLANT

50/50 mixture of ethylene glycol and de-ionised water (§ 6.2).

6.7.AFNOR C FLUID

50/50 mixture of 2,2,4- trimethyl pentane (isooctane) and toluene.

7.PREPARATION OF SOLUTIONS

Not applicable.

8.REPRESENTATIVENESS OF SAMPLES

The samples must be representative of the size to be characterised. To ensure this representativeness, it is necessary to find out the basic characteristics of the population studied. The selection criteria of test specimens or samples must be specified in the Test Report (RE), as per norme A10 0156.

9.PREPARATION OF TEST SPECIMENS

Prepare the test specimens as per the instructions from the various test methods specified for each product to be examined. Then place them in the conditioned chamber (§ 5.1) for a minimum duration of 24 hours prior to subjecting them to the various ageing conditions.

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10.PROCEDURE

10.1.DETERMINE THE CHARACTERISTICS

Determine the characteristics adopted according to the procedure of the corresponding test method, after conditioning and before exposure.

10.2.EXPOSE THE TEST SPECIMENS

Expose the test specimens to the environmental conditions according to the chosen ageing method and as defined in Appendices 1 and 2.

- Atmospheric conditions, see Appendix 1.
- Exposure in their unprepared state or prepared as per the instructions in Appendix 3 for the humid cataplasms.
- In fluids, exposure in jars (§ 5.7) 4/5 filled and hermetically sealed.
- Use a new jar for each product.

10.3.DETERMINE THE CHARACTERISTICS AFTER EXPOSURE

Determine the characteristics adopted according to the procedure of the corresponding test method, after exposure to the environmental conditions, and followed by conditioning in the chamber (§ 5.1), of:

- at least 2 hours and no longer than 4 hours in the case of humid test specimens,
- at least 24 hours for others.

If necessary, and before establishing (a) new type(s) of ageing not indicated in this method, consult the French standard NF EN 29142.

11.REMARKS

Not applicable.

12.EXPRESSION OF RESULTS

In addition to the test results obtained in this way, record any visible changes during the ageing test, before, during and after the destructive test, in addition to any observations made on test specimens prior to ageing. The aim is to attribute no manufacturing defects in test specimens to the standard ageing conditions.

For verification purposes, it is desirable to keep a batch of reference test specimens in a conditioned chamber (§ 5.1).

In the case of measurable characteristics, the results obtained are expressed:

- either as an absolute value,
- or as a relative variation against the initial value.

In the case of non-measurable characteristics, specify the type of changes observed, such as a failure between substrate and adhesive, cohesive failure in the adhesive seal during partial or total corrosion of the substrate under the adhesive, etc.

Note: *It may be useful to verify that the variations in the characteristic measured are purely a result of the accelerated ageing test . To do this, from the following 3 values:*

A = value of the characteristic measured before the accelerated ageing test,

B = value of the characteristic measured on the reference test specimen subjected to intrinsic ageing in the conditions of :

23 °C ± 2 °C and 50 % ± 5 % relative humidity ,

C = value of the characteristic after the accelerated ageing test.

Calculate:

$$\frac{A - B}{A} \times 100$$

If different from zero, this determines the characteristics of intrinsic ageing

$$\frac{A - C}{A} \times 100$$

This determines the characteristics of total ageing (under standard conditions and intrinsic ageing).

$$\frac{B - C}{A} \times 100$$

This determines the characteristics of ageing under standard conditions.

13.TEST REPORT

The format and minimum contents of the test report are defined in norme A10 0156.

In addition to the results obtained, the test report shall indicate:

- the reference number of this method,
- the type of ageing used and referenced in Appendices 1 and 2, as well as the exposure duration,
- the results of the observations indicated in paragraphs 10 and 11,
- the operating details not specified in the method as well as any possible incidents which may have affected the results.

PSA PEUGEOT - CITROËN

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Appendix 1

Type of ageing							Details specified in documents
Ref.	Chambers used	Environment	Relative humidity in %	Temperature	Durations		
					Hours	Days	
A	3.2	Dry heat	-	70 °C	24	1	D47 1165-A-1 D47 1165-A-3 D47 1165-A-7 D47 1165-A-14 D47 1165-A-21
					72	3	
					168	7	
					336	14	
					504	21	
B	3.2	Dry heat	-	100 °C	24	1	D47 1165-B-1 D47 1165-B-3 D47 1165-B-7 D47 1165-B-14 D47 1165-B-21
					72	3	
					168	7	
					336	14	
					504	21	
C	3.4	Cold	-	- 20 °C	24	1	D47 1165-C-1 D47 1165-C-3 D47 1165-C-7 D47 1165-C-14 D47 1165-C-21
					72	3	
					168	7	
					336	14	
					504	21	
D	3.2	Dry heat	-	85 °C	24	1	D47 1165-D-1 D47 1165-D-3 D47 1165-D-7 D47 1165-D-14 D47 1165-D-21
					72	3	
					168	7	
					336	14	
					504	21	
E	3.4	Cold	-	- 30 °C	24	1	D47 1165-E-1 D47 1165-E-3 D47 1165-E-7 D47 1165-E-14 D47 1165-E-21
					72	3	
					168	7	
					336	14	
					504	21	
H	3.8 + 3.2 + 3.4	Humid cataplasma according to Appendix 3	-	-	24 + 2	1	D47 1165-H-1 D47 1165-H-3 D47 1165-H-7 D47 1165-H-14 D47 1165-H-21
					72 + 2	3	
					168 + 2	7	
					336 + 2	14	
					504 + 2	21	
J	3.2 + 3.6 + 3.4	Successive action of : - Dry heat - Humidity : total immersion in water - Cold according to Appendix 5	-	100 °C 23 °C - 20 °C	4 + 4 + 16	-	D47 1165-J
K	3.5	Climatic according to Appendix 4	≥ 95	70 °C - 30 °C	24	1	D47 1165-K-1 D47 1165-K-3 D47 1165-K-7 D47 1165-K-14 D47 1165-K-21
					72	3	
					168	7	
					336	14	
					504	21	
M	3.5	Climatic according to Appendix 4	≥ 95	80 °C - 40 °C	24	1	D47 1165-M-1 D47 1165-M-3 D47 1165-M-7 D47 1165-M-14 D47 1165-M-21
					72	3	
					168	7	
					336	14	
					504	21	
N	3.3	Humid	≥ 95	40 °C	24	1	D47 1165-N-1 D47 1165-N-3 D47 1165-N-7 D47 1165-N-14 D47 1165-N-21
					72	3	
					168	7	
					336	14	
					504	21	
R	3.3	Humid	≥ 95	55 °C	24	1	D47 1165-R-1 D47 1165-R-3 D47 1165-R-7 D47 1165-R-14 D47 1165-R-21
					72	3	
					168	7	
					336	14	
					504	21	
V	3.3 + 3.2	Humid	≥ 95 -	85 °C 85 °C	96 240	-	D47 1165-V
W	3.3	Humid	≥ 95	85 °C	24	1	D47 1165-W-1 D47 1165-W-3 D47 1165-W-7 D47 1165-W-14 D47 1165-W-21
					72	3	
					168	7	
					336	14	
					504	21	
X	3.3	Humid	≥ 95	35 °C	504	21	D47 1165-X-21

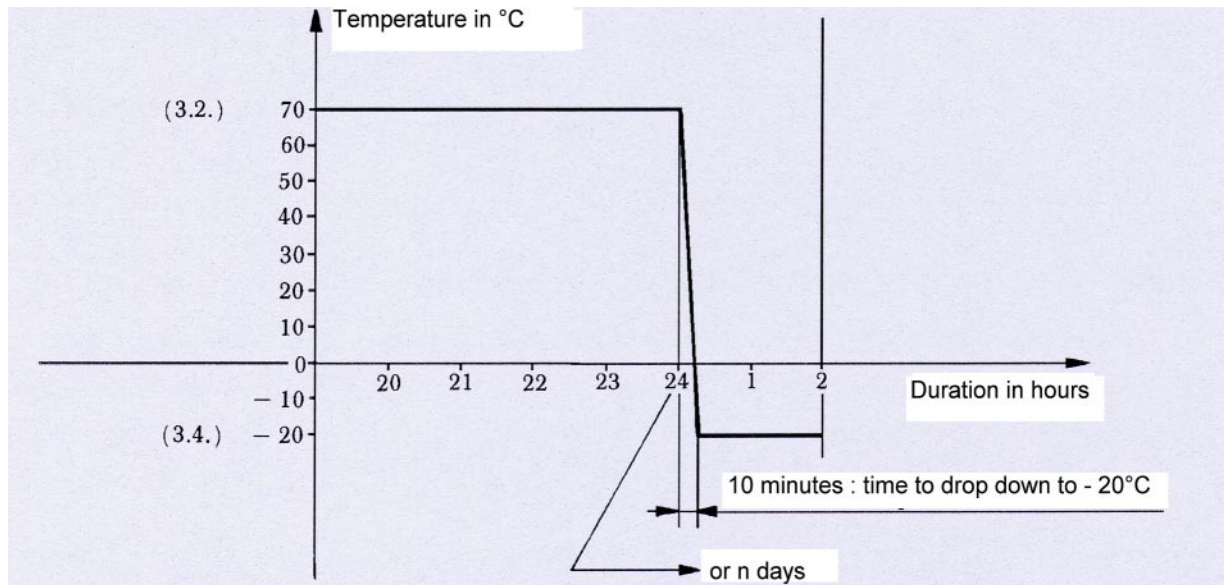
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Appendix 2

Ref.	Chambers used	Type of ageing					Duration		Details specified in documents
		Environment	Fluids	Type	Temperature		Hours	Days	
FA	3.5 + 3.7	Total immersion cycle according to Appendix 4	4.5	IRM 903 oil	100 °C - 30 °C		24	1	D47 1165-FA-1 D47 1165-FA-3 D47 1165-FA-7 D47 1165-FA-14 D47 1165-FA-21
							72	3	
							168	7	
							336	14	
							504	21	
FB	3.5 + 3.7	Total immersion cycle according to Appendix 4	4.5	IRM 903 oil	130 °C - 30 °C		24	1	D47 1165-FB-1 D47 1165-FB-3 D47 1165-FB-7 D47 1165-FB-14 D47 1165-FB-21
							72	3	
							168	7	
							336	14	
							504	21	
FC	3.5 + 3.7	Total immersion cycle according to Appendix 4	4.5	IRM 903 oil	150 °C - 30 °C		24	1	D47 1165-FC-1 D47 1165-FC-3 D47 1165-FC-7 D47 1165-FC-14 D47 1165-FC-21
							72	3	
							168	7	
							336	14	
							504	21	
FD	3.2 + 3.7	Total immersion	4.3	ASTM n° 1 oil	100 °C		24	1	D47 1165-FD-1 D47 1165-FD-3 D47 1165-FD-7 D47 1165-FD-14 D47 1165-FD-21
							72	3	
							168	7	
							336	14	
							504	21	
FE	3.2 + 3.7	Total immersion	4.3	ASTM n° 1 oil	130 °C		24	1	D47 1165-FE-1 D47 1165-FE-3 D47 1165-FE-7 D47 1165-FE-14 D47 1165-FE-21
							72	3	
							168	7	
							336	14	
							504	21	
FF	3.2 + 3.7	Total immersion	4.6	Ethylene-glycol	100 °C		24	1	D47 1165-FF-1 D47 1165-FF-3 D47 1165-FF-7 D47 1165-FF-14 D47 1165-FF-21
							72	3	
							168	7	
							336	14	
							504	21	
FH	3.5 + 3.7	Total immersion cycle according to Appendix 4	4.4	IRM 902 oil	70 °C - 30 °C		24	1	D47 1165-FH-1 D47 1165-FH-3 D47 1165-FH-7 D47 1165-FH-14 D47 1165-FH-21
							72	3	
							168	7	
							336	14	
							504	21	
FJ	3.5 + 3.7	Total immersion cycle according to Appendix 4	4.4	IRM 902 oil	150 °C - 30 °C		24	1	D47 1165-FJ-1 D47 1165-FJ-3 D47 1165-FJ-7 D47 1165-FJ-14 D47 1165-FJ-21
							72	3	
							168	7	
							336	14	
							504	21	
FK	3.5 + 3.7	Total immersion cycle according to Appendix 4	4.7	AFNOR C Fluid	55 °C - 30 °C		24	1	D47 1165-FK-1 D47 1165-FK-3 D47 1165-FK-7 D47 1165-FK-14 D47 1165-FK-21
							72	3	
							168	7	
							336	14	
							504	21	
FL	3.2 + 3.7	Total immersion	4.1	Water + wetting agent	55 °C		24	1	D47 1165-FL-1 D47 1165-FL-3 D47 1165-FL-7 D47 1165-FL-14 D47 1165-FL-21
							72	3	
							168	7	
							336	14	
							504	21	

Appendix 3

Condition H – Exposure in humid cataplasms



This exposure requires two chambers : One dry heat chamber (§ 5.2) and one cold chamber (§ 5.4), cotton wool (§ 5.10), weldable polyethylene bags (§ 5.8), a soldering gun for polyethylene (§ 5.9.), de-ionised water (§ 6.2), a balance (§ 5.11.), a measuring cylinder (§ 5.12.).

Preparation of the humid cataplasms

- Cut out and weigh a strip of cotton wool (§ 5.10) measuring 180 x 500 mm and with a mass of $45 \text{ g} \pm 5 \text{ g}$.

Note: the strip of cotton used must have the characteristics indicated above. It is necessary to use the mass of cotton specified. In the case of large parts, only the area to be tested needs to be covered with cotton.

- Place the first test specimen(s) on the first third of cotton wool length.
- Fold back the second third of cotton wool length on the test specimen(s).
- Deposit the second test specimen (or the other test specimens) and cover with the third 1/3 of the strip of cotton wool.
- Introduce the assembly into a polyethylene bag (§ 5.8).
- Add a mass of de-ionised water (§ 6.2) equal to 10 times that of the cotton wool, using the measuring cylinder (§ 5.12) taking care to distribute it uniformly.
- Remove as much air as possible by smoothing out the bag by hand.
- Close the polyethylene bag by welding it using the soldering gun (§ 5.9).
- To ensure a perfect seal, the assembly is placed in a second bag which must be soldered as previously.

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Appendix 3 (continued) Cataplast exposure conditions

- Place the cataplast for the period(s) previously determined in the chamber (§ 5.2), maintained at the temperature of $70\text{ °C} \pm 2\text{ °C}$.
- Remove it, and immediately, take out the test specimen(s) from the bag and the cotton wool.
- Place this/these test specimen(s) for two hours in the chamber (§ 5.4) maintained at the temperature of $-20\text{ °C} \pm 2\text{ °C}$.
- Then place it (them) in the conditioned chamber (§ 5.1) for a minimum duration of 2 hours but no longer than 4 hours, before determining the characteristic adopted.

Note: Any bag to be found unsealed must lead to the rejection of the test specimens contained in it. To check the sealing, the bag must be checked for swelling after two days of exposure. When ageing is 14 days or more, the cataplast shall be completely re-formed using the method indicated above (using fresh cotton wool and bags) every 14 days, except in the case of organic products used in the body-in-white shop, the test specimens shall remain in the same cataplast for the time specified.

Appendix 4

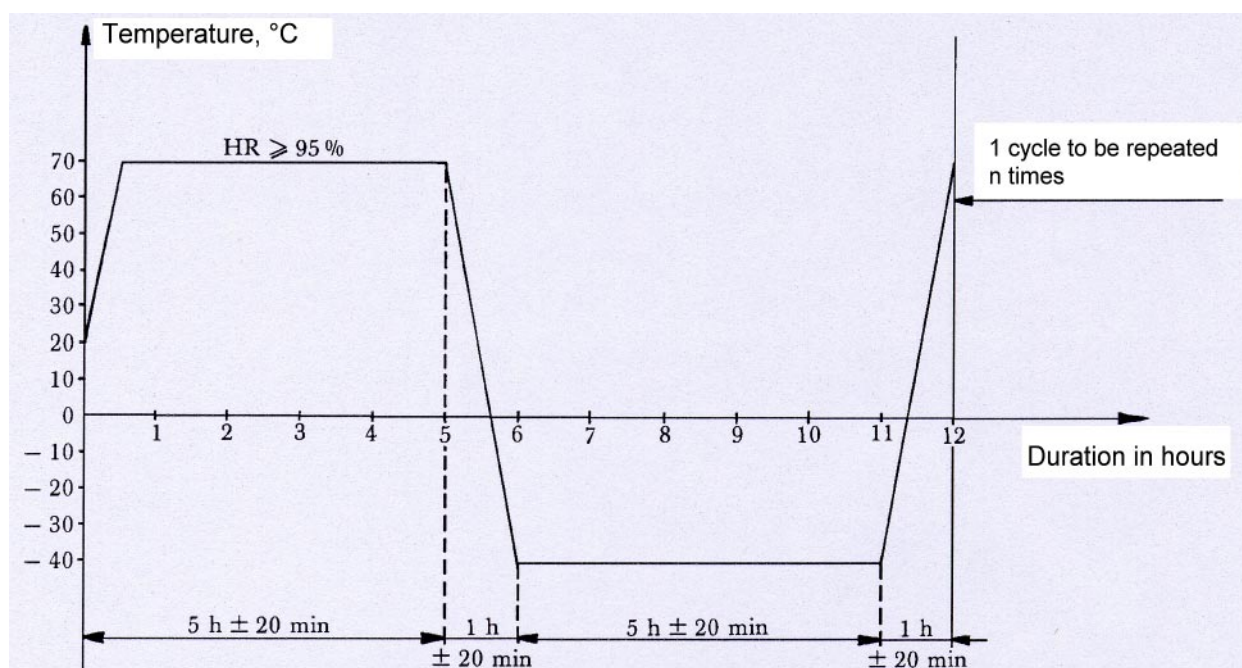
• CONDITIONS K - M

Humid heat and cold test cycles

• CONDITIONS FA - FB - FC - FH - FJ - FK

Hot and cold test cycles

Example of a climatic cycle in diagram form



This cycle requires a programmable chamber (§ 5.3) with automatic change from hot to cold and vice versa, capable of meeting the changeover times within the tolerances laid down.

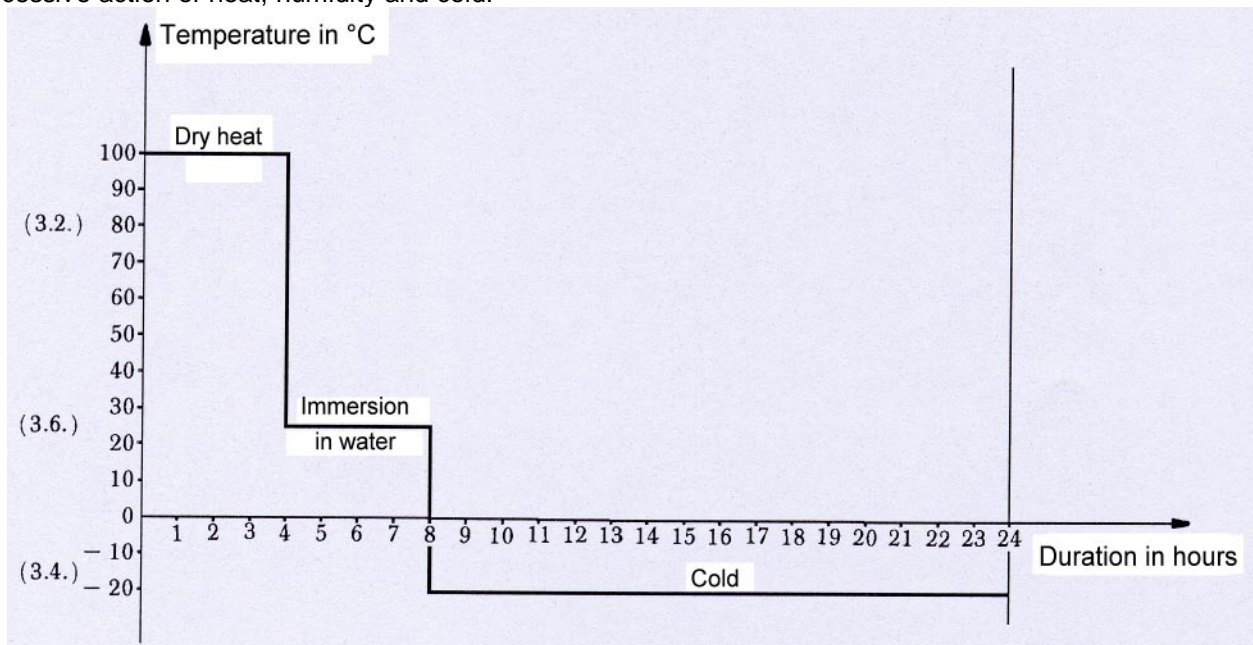
It comprises:

- a period of 5 hours \pm 20 minutes at a temperature of $70\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and a relative humidity of $\geq 95\%$ (this humidity is not compulsory for conditions FA - FB, etc.),
- changing from hot to cold within 1 hour \pm 20 minutes,
- a period of 5 hours \pm 20 minutes at a temperature of $-40\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$,
- changing from cold to hot within 1 hour \pm 20 minutes,
- conditioning at $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $50\% \pm 5\%$ relative humidity for 24 hours prior to determining the characteristic adopted.

Appendix 5

• **CONDITION J**

Successive action of heat, humidity and cold.



This cycle requires 3 chambers: one dry heat chamber (§ 5.2), one enclosure for immersion in water (§ 5.6) and one cold chamber (§ 5.4).

It consists of :

- a period of 4 hours in the chamber (§ 5.2) maintained at a temperature of $100\text{ °C} \pm 2\text{ °C}$,
- changing within 3 minutes from chamber (§ 5.2) to enclosure (§ 5.6) maintained at $23\text{ °C} \pm 2\text{ °C}$ and totally immersed in water,
- a period of 4 hours in the enclosure (§ 5.6),
- changing within 3 minutes from enclosure (§ 5.6) to chamber (§ 5.4) maintained at a temperature of $20\text{ °C} \pm 2\text{ °C}$,
- remaining for 16 hours in the chamber (§ 5.4),
- conditioning at $23\text{ °C} \pm 2\text{ °C}$ and $50\% \pm 5\%$ relative humidity for 24 hours prior to determining the characteristic adopted.