TWENTY-SIX PROCESS AND MATERIALS CONTROL DOCUMENTS

Societe des Accumulateurs Fixes et de Traction (SAFT)
Various dates (1964,1968,1969)

Translated by
Belov & Associates
for
N.A.S.A. GSFC Library
Contract NAS 5-10888
Item no. 10888-071
May 1970

JUN 1970
RECEIVED
NASA STI FACILITY
INPUT BRANCH

FACILITY FORM 602

N70-73686
(ACCESSION NUMBER)
(THRU)
53
(PAGES)
None
(CODE)
CR-110102
(NASA CR OR TMX OR AD NUMBER)
(CATEGORY)

METALS
LIGHT NICKEL POWDER FOR CALCINATION VO SPECIFICATION

Light nickel powder for calcination VO is intended for the manufacture for support for thin positive and negative calcinated plates.

1 - PHYSICAL CHARACTERISTICS

1.1 - Aspect and structure

Gray powder formed from very fine agglomerates of nickel: chains with very aerated particles in a lacy pattern.

1.2 - Apparent volumetric mass

Measured on the SCOTT VOLUMETER

/ 0,53 ± 0,05 g/cm3/

(Value obtained upon reception in our factory).

1.3 - Specific surface

Measured on the FISHER apparatus

/ 2500 ± 200 cm2/g /

1.4 - Angle of repose

/ 69 ± 2° /

2 - CHEMICAL CHARACTERISTICS

2.1 - Humidity

Water (H_2O)	less than or equal to	1.00%

2.2 - Nickel content

Nickel	greater than or equal to	99.70%

2.3 - Content of impurities

Carbon (C)	less than or equal to	0.150%
Oxygen (O)	less than or equal to	0.150%
Iron (Fe)	less than or equal to	0.010%
Lime (CaO)	less than or equal to	0.005%
Magnesium (MgO)	less than or equal to	0.005%
Silica (SiO_2)	less than or equal to	0.005%
Sulphur (S)	less than or equal to	0.001%

Aluminum (Al)	less than or equal to	0.005%
Chromium (Cr)	less than or equal to	0.001%
Zinc (Zn)	less than or equal to	0.001%
Copper (Cu)	less than or equal to	0.001%
Tin (Sn)	less than or equal to	0.001%
Lead (Pb)	less than or equal to	0.001%
Bismuth (Bi)	less than or equal to	0.001%

3 - PACKING FOR SHIPMENT

Nickel powder, sensitive to action of moisture in the air, should be delivered in cylindrical metal canisters total aperture defined by the French norm:

/NF H 31 103/

The control technique for nickel powder for calcination VO is defined in the technical document:

/A 01 05 03 /

METALS
LIGHT NICKEL POWDER FOR CALCINATION VO
CONTROL TECHNIQUE

NS
A 01 05 03
July 1969

1 - SAMPLES

Samples obtained with a borer (SAFT plan 84 000).

2 - PHYSICAL CHARACTERISTICS

2.1 - Apparent volumetric mass (Scott Volumeter).

Following the SAFT method of physical testing:

/Y 02 04 02/

2.2 - Specific surface (Fisher)

Following the SAFT method of testing:

/Y 02 02 02/

2.3 - Angle of repose

Following the SAFT method of physical testing:

/Y 02 03 02 /

3 - CHEMICAL CHARACTERISTICS

3.1 - Humidity

Following the SAFT method of chemical testing:

/X 02 01 02[a] /

3.2 - Proportion of Nickel

Following the SAFT method of chemical testing:

/ X 06 01 02 /

3.4 - Proportion of Impurities

Following the SAFT methods of chemical testing:

Carbon (C)	/X 06 03 02/
Oxygen (O)	/ X 06 08 02/
Iron (Fe)	/X 05 02 02[a]/

Calcium (CaO)	/X 05 02 02[a]/
Magnesium (MgO)	/X 05 02 02[a]/
Silica (SiO_2)	/X 05 03 02[a]/
Sulphur (S)	/X 06 02 02 /
Aluminum (Al)	/X 06 09 02 /
Chrome (Cr)	/X 06 10 02 /
Zinc (Zn)	/X 06 06 02 /
Copper (Cu)	/X 06 04 02 /
Tin (Sn)	/X 06 11 02 /
Lead (Pb)	/X 06 04 02 /
Bismuth (Bi)	/X 06 12 02 /

METHODS OF PHYSICAL TESTING
METALLIC POWDERS: FISHER SPECIFIC SURFACE
GENERAL METHODS OF TESTING

PN
Y 02 02 02
April 1968

1 - PRINCIPLE

Method of measuring the average dimension of powder particles known under the name of permeability of air: based on the fact that a current of air passes more quickly through a layer of metallic powder with large particles then a layer of fine powder of the same form, the same apparent volume and the same percentage of empty space.

2 - EQUIPMENT

Apparatus for measuring the exact dimensions of particles "SUBSIEVE SIZER" FISHER.

3 - MODE OF OPERATION

The detailed mode of operation is given in the note accompanying the apparatus.

4 - RESULTS

M = Mass in grams of the dry metallic powder equal to the real volumetric mass of this powder.

d = Diameter of the particles in 10^{-6} meters, read on the chart placed on the FISHER apparatus.

The specific surface of the metallic powder, expressedinsquare centimeters per gram of dry powder, is given by the expression:

$$\sqrt{\frac{6 \times 10^{-4}}{d \times M}}$$

METHOD OF PHYSICAL TESTING
METALLIC POWDERS: ANGLE OF REPOSE
GENERAL METHODS OF TESTING

NS
Y 02 03 02
July 1969

1 - SCOPE OF APPLICATION

This method of determining the angle of repose is applicable to the following metallic powders:

- Nickel powders for calcination VO
- Copper powder

2 - PRINCIPLE

Measure of the angle at the base of a cone of metallic powder in an uncompressed state.

This cone in the uncompressed state is obtained through passage of the powder through a guage screen placed at a determined distance from the cylinder being used for measure.

3 - EQUIPMENT

Standard 31 screen defined by the French standard /NF X 11 501/

Stainless steel cylinder with a diameter of 30 mm (drying of the whole apparatus = fig. 1)

Viewfinder for marking the top of the cone.

4 - MODE OF OPERATION

Place the standard 31 screen above the steel cylinder and adjust the distance between the screen and the upper part of the cylinder to 65 mm.

Pour the metallic powder on the screen until obtaining a cone whose height remains constant in the cylinder.

Mark the top of the cone with the aid of the eye piece.

5 - RESULTS

h = the height of the cone in millimeters
R = radius of the cylinder in millimeters
α = the angle of the base in degrees

The value of the tangent of the angle of repose is given by the formula:

$$\text{tangent}\,\alpha = \frac{h}{R}$$

The value of the angle of repose of the metallic powder is given by the trigonometric table.

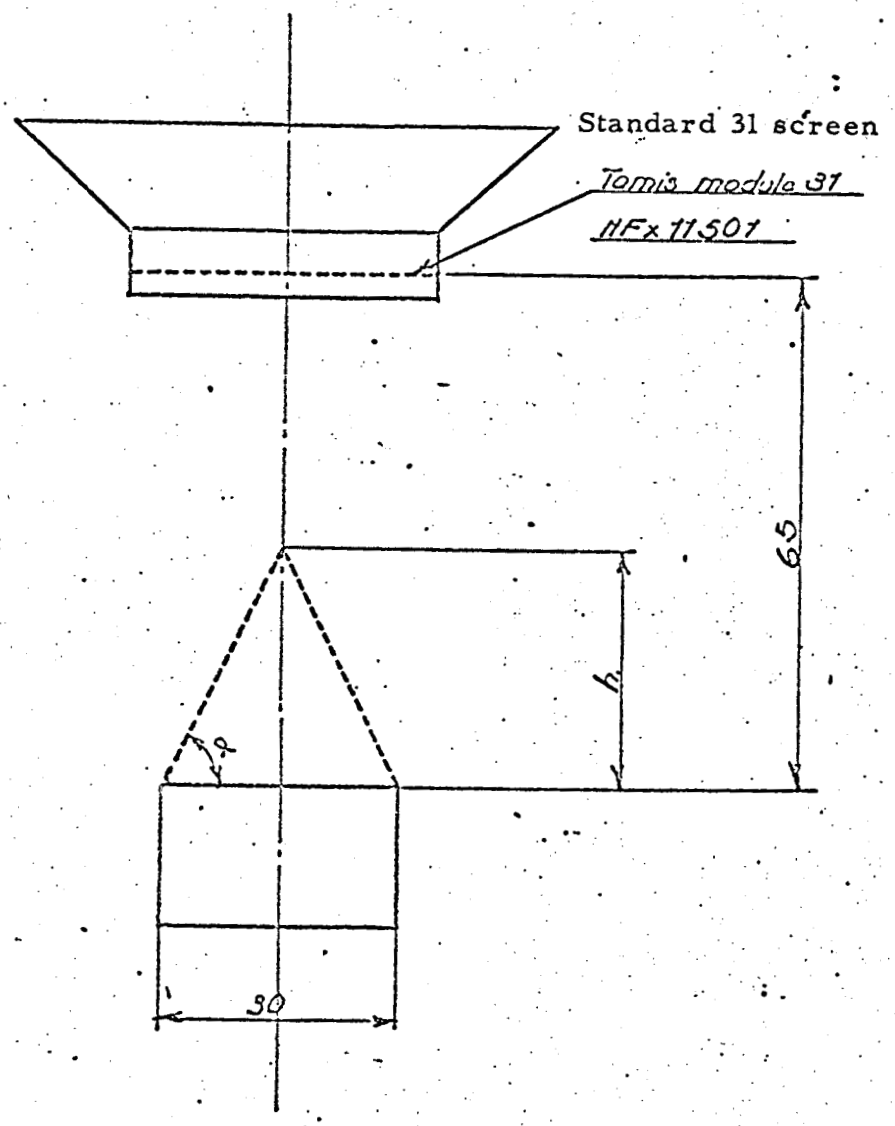


Fig. 1.

METHODS OF CHEMICAL TESTING
POWDERS: HUMIDITY
GENERAL METHODS OF TESTING

NS
X 02 01 02
January 1969

1 - SCOPE OF APPLICATION

The method of determining humidity is applicable to the following products:

- Nickel, copper, cobalt powder, nickel flake.
- Active positive and negative materials: Nickel and cadmium hydroxydes.
- "Active" positive and negative masses: Graphitized positive mass, cadmium/iron and iron/cadmium masses and iron/copper mass.

2 - PRINCIPLE

Loss of the mass of the powder through drying in the oven until constant mass.

3 - EQUIPMENT

Frozen translucid silica capsule 85 ml
Ventilated electric oven
Desiccator with a ground flat lid, NF B 35 010

4 - MODE OF OPERATIONS

Test sample: E = 20.00 ± 0.05 grams of powder

Weigh a translucid silica capsule to within 0.1 mg and put the test sample E in this capsule. Dry in the oven at 80 ± 5°C for 1 hour and until constant mass (2 successive weighings taking place at 15 minute intervals should not differ by more than 0.01 %). Cool in a desiccator and weigh the capsule after cooling to within 0.1 mg.

5 - RESULTS

E = Mass, in grams, of the test sample

M_1 = Mass, in grams, of the capsule and of the powder before drying.

M_2 = Mass, in grams, of the capsule and of the powder after drying.

The water content in the powder or the "active" mass, is given by the expression:

$$\boxed{\frac{M_1 - M_2}{E} \times 100}$$

METHODS OF CHEMICAL TESTING
NKELS = PROPORTION OF NICKEL
GENERAL METHODS OF TESTING

NS
X 06 01 02
April 1969

1 - SCOPE OF APPLICATION

The method of determining the proportion of nickel is applicable to the following products not containing cobalt:

- Light nickel powder for calcination VO
- Heavy nickel powder for calcination VO

2 - PRINCIPLE

Nickel combined with the ammoniac gives a tetra-amino nickel compound. This compound gives a yellow coloration with the murexide which turns purple when EDTA Na_2 has compounded all the nickel.

3 - REACTIVE

Hydrochloric acid $(d_4^{20} = 1,18)$ pure through analysis diluted to 1/2

Ammoniac $(d_4^{20} = 0,92)$ pure through analysis

EDTA Na_2 : solution 0.1 M: 37.21 g EDTA Na_2, 2 H_2O/liter of distilled water(to be conserved in a plastic flask)

Murexide: mixed in the mortar 1.0 g of murexide with 100 g of sodium chloride pure through analysis

4 - EQUIPMENT

Flat bottom flask with ground neck 500 ml, NF B 35 005
250 ml test tube, NF B 35 302
500 mm bulb reflux condensor ground below, NF B 35019
An electric flask heater with regulator for 500 ml flask
500 ml graduated flask, NF B 35 307

500 ml erlenmeyer, NF B 35 008
50 ml burette, graduated in 0.1 ml, NF B 35 301

5 - MODE OF OPERATION

Test sample: E = 10.00 ± 0.01 g of nickel powder.

Introduce the test sample into a 500 ml flask with 100 ml of hydrochloric acid diluted by 1/2, equip the flask with a reflex condensor and heat until dissolution of the nickel. Put in a 500 ml graduated flask, fill up to the calibration mark after cooling with distill water: The V is to represent this volume. Take out 10 ml of this solution with a precision pipette: v which represents this volume and put the test sample in a 500 ml erlenmeyer: add 200 ml of distilled water, ammoniac and murexide until it becomes yellow in color.

Titrate by EDTA Na_2 0.1 M until a purple toning is reached: N is to represent the number of ml of EDTA Na_2 0.1 M poured.

6 - RESULTS

1 ml of EDTA Na_2 0.1 M $\longrightarrow$ 0.00587 g Nickel

E = mass, in grams, of the test sample

V = volume, in ml, of the graduated flask containing the solution after dissolution of the test sample in hydrochloric acid

v = volume, in ml, of hydrochloric solution retained for the titration of nickel

N = volume, in ml, of EDTA Na_2 0.1 M poured

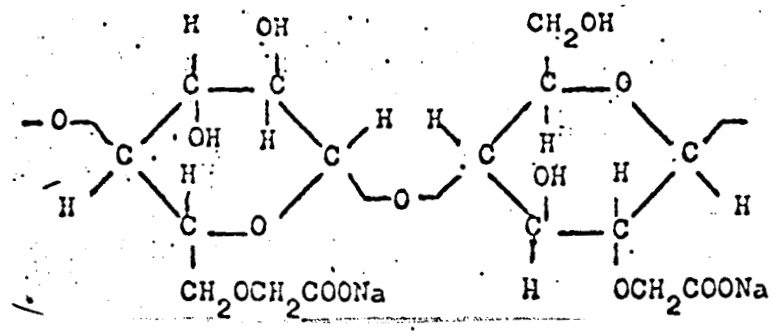
The percentage of nickel content, in the nickel powder, is given by the expression:

$$\frac{0.00587 \times N \times V}{v \times E} \times 100 \text{ or: } \frac{0.587 \times N \times V}{v \times E}$$

CHEMICAL PRODUCTS
CARBOXYMETHYLCELLULOSE 7 H 3 SP
SPECIFICATION

PN
B 08 01 01
Sept. 1968

Carboxyméthylcellulose: CMC 7H3SF is a cellulose ether of the developed formula:



or sodium carboxyméthylcellulose.

Carboxyméthylcellulose 7H3SF is utilized as a binder for plaster molds in the manufacture of thin calcinated strips.

1 - PHYSICAL CHARACTERISTICS

1.1 - Aspect

White powder, faintly yellowish.

1.2 - Solubility

Soluble in water producing colloidal solutions or gels.

1.3 - Viscosity

Viscosity of the solution prepared following three different concentrations should be at 20°C above the dry product:

Concentration CMC 7 H3SF g% ml of water	Viscosity in centipoises
1,20	4 000 ± 1 000
1,40	7 000 ± 3 000
1,60	13 000 ± 5 000

2 - CHEMICAL CHARACTERISTICS

2.1 - Humidity

Water (H_2O) less than or equal to 5.00%

The other chemical characteristics are determined on the product dried in the oven at 105 ± 5° C.

2.2 - Degree of substitution

Or average number of ether (carboxyméthyl) groups per unity of glucose:

/D S = 0,80 ± 0,15/

2.3 - pH at 20° C

/pH = 6,5 ± 0,5/

2.4 - Chloride content

Chlorides (NaCl) less than or equal to 0.20%

3 - PACKING FOR SHIPMENT

Sensitive to the action of moisture, carboxyméthylcellulose 7H3SF should be delivered in stacks made of several thicknesses of paper coated with polyethylene.

Lightly hygroscopic, carboxyméthylcellulose 7H3SF should be stored in a dry place and any open sacks should be hermetically resealed.

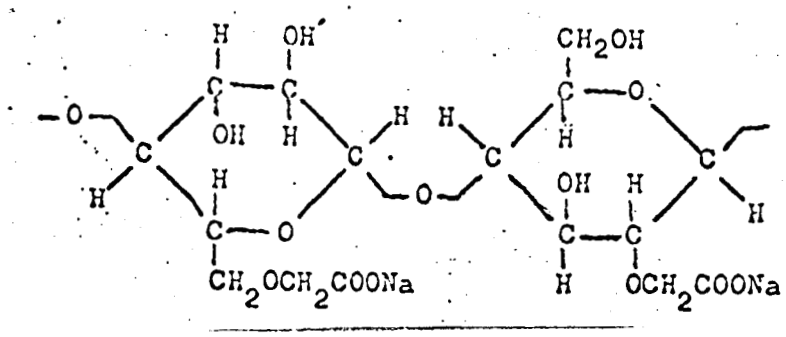
The methods and equipment for testing carboxyméthylcellulose 7H3SF are defined in the technical document:

/ B 08 01 03 /

CHEMICAL PRODUCTS
CARBOXYMETHYLCELLULOSE: TYLOSIS C 6000
SPECIFICATION

PN
B 08 02 01
Sept. 1968

Tylosis C 6000 is a cellulose ether with the formula:



or sodium carboxyméthylcellulose.

Tylosis C 6000 is used as a binder for plaster molds in the manufacture of thin calcinated strips.

1 - PHYSICAL CHARACTERISTICS

1.1 - Aspect

White powder, faintly yellowish.

1.2 - Solubility

Soluble in water producing colloidal solutions or gels.

1.3 - Viscosity

The viscosity of the solution prepared following three different concentrations should be at 20° C above the dry product:

Concentration Tylosis C 6000 g% ml of water	Viscosity in Centipoises
1,20	2000 ± 500
1,40	3000 ± 1000
1,60	7000 ± 1500

2 - CHEMICAL CHARACTERISTICS

2.1 - Humidity

Water (H_2O) less than or equal to 8.00%

The other chemical characteristics are determined on the product dried in the oven at 105 ± 5° C.

2.2 - Degree of substitution

or average number of ether (Carboxymethyl) groups per unity of glucose:

/ DS = 0,70 ± 0,05 /

2.3 - pH at 20° C

/pH = 5,9 ± 0,3/

2.4 - Chloride content

Chloride (NaCl) less than or equal to 0.500%

2.5 - Impurity content

Iron (Fe)	less than or equal to 0.005%
Lead (Pb)	less than or equal to 0.002%
Zinc (Zn)	less than or equal to 0.001%
Copper (Cu)	less than or equal to 0.001%
Sulphur (S)	less than or equal to 0.010%

3 - PACKING FOR SHIPMENT AND STORAGE

Sensitive to the action of moisture, tylosis C 6000 should be delivered in sacks made of several thicknesses of paper coated with polyéthylène.

Lightly hygroscopic, tylosis should be stored in a dry place and any open sacks should be hermetically resealed.

The methods and equipment for testing for tylosis C 6000 are defined in the technical document:

/B 08 02 03 /

CHEMICAL PRODUCT
CARBOXYMETHYLCELLULOSE 7 H 3 SF
METHODS AND EQUIPMENT FOR TESTING

PN
B 08 01 03
Sept. 1968

1 - SAMPLES

Samples should be obtained from one or several sacks from each lot of carboxyméthylcellulose: they should be placed in an air tight flask. After the end of the operation, the open sacks should also be carefully resealed.

2 - PHYSICAL CHARACTERISTICS

2.1 - Viscosity

Following the SAFT method of physical testing: /Y 03 01 02/

3 - CHEMICAL CHARACTERISTICS

3.1 - Humidity

Following the SAFT method of chemical testing: /X 12 01 02/

3.2 - Degree of substitution

Following the SAFT method of chemical testing: /X 12 02 02/

3.3 - pH

Following the SAFT method of chemical testing: /X 12 03 02/

3.4 - Chloride content

Following the SAFT method of chemical testing: /X 12 04 02/

CHEMICAL PRODUCTS
CARBOXYMETHYLCELLULOSE: TYLOSIS C 6000
METHODS AND EQUIPMENT FOR TESTING

PN
B 08 02 03
Sept. 1968

1 - SAMPLES

The samples should be obtained from one or several sacks of each lot of tylosis C 6000: they should be placed in an air tight flask. After the end of the operation the open sacks should also be carefully resealed.

2 - PHYSICAL CHARACTERISTICS

2.1 - Viscosity

Following the SAFT method of physical testing: /Y 03 01 02/

3 - CHEMICAL CHARACTERISTICS

3.1 - Humidity

Following the SAFT method of chemical testing: /X 12 01 02/

3.2 - Degree of substitution

Following the SAFT method of chemical testing: /X 12 02 02/

3.3 - pH

Following the SAFT method of chemical testing: /X 12 03 02/

3.4 - Chloride content

Following the SAFT method of chemical testing: /X 12 04 02/

3.5 - Impurity content

Iron (Fe)	/to be reserved/
Lead (Pb)	/to be reserved/
Zinc (Zn)	/to be reserved/
Copper (Cu)	/ to be reserved/
Sulphur (S)	/to be reserved/

Put the test sample in a 1000 ml beaker, add 150 ml distilled water and let rest for 12 hours.

Afterwards add 350 ml of distilled water, agitate with a turbine at 400 turns per minute until a clear gel is obtained, and let rest 1/2 hour before measuring the viscosity.

4.2 - Measure of the viscosity

Fill water to 125 ml calibrated test tube with the carboxyméthylcellulose gel. Bring to 20 ± 1° C the temperature of the gel and drop in the ball of acid. Measure with a chronometer the time of outflow between the two calibration marks on the graduated test tube: let T represent the time of fall in seconds.

5 - RESULTS

T = The time of fall, in seconds, of the ball between the two calibration marks on the test tube

The viscosity of carboxyméthylcellulose gel, at a fixed concentration, is given in centipoises by the formula:

$$\overline{/T \times 200/}$$

METHODS OF PHYSICAL TESTING
CARBOXYMETHYLCELLULOSES = VISCOSITY OF GELS
GENERAL METHODS OF TESTING

PN
Y 03 01 02
Oct. 1968

1 - SCOPE OF APPLICATION

The method of determining the viscosity of the gels is applicable to the following products:

- carboxymethylcellulose 7 H 3 SF
- tylosis C 6000
- blanose R 130

2 - PRINCIPLES

Preparation of gels at different concentrations and measure of the viscosity of these gels in measuring the time of fall of a calibrated ball from a given height.

3 - EQUIPMENT

1,000 ml beaker, NF B 35 001
Agitator with a 400 turnsper minute turbine
A 125 ml test tube, NF B 35 302 with two marks at 18.3 cm apart corresponding to the height of fall of a ball of acid
Balls of acid $(d_4^{20} = 7,71)$ of 0.1286 g and 16.68 mm3
Precision thermometer
Chronometer

4 - MODE OF OPERATION

4.1 - Preparation of carboxyméthylcellulose gels

Preparation of 500 ml of carboxymethylcellulose gels at different concentrations generally: 1.00, 1.20 and 1.40%.

Weigh:

5.00 ± 0.01 g crude carboxymethylcellulose for gel of 1.00%
6.00 ± 0.01 g crude carboxymethylcellulose for gel of 1.20%
7.00 ± 0.01 g crude carboxymethylcellulose for gel of 1.40%

Add to these masses, the quantity in grams of crude carboxyméthylcellulose corresponding to the moisture contained in the product determined following the method of chemical testing:

METHOD OF CHEMICAL TESTING
CARBOXYMETHYLCELLULOSES = HUMIDITY
GENERAL METHODS OF TESTING

PN
X 12 01 02
Oct. 1968

1 - SCOPE OF APPLICATION

The method of determining moisture in carboxyméthylcelluloses is applicable to the following products:

- carboxyméthylcellulose 7 H 3 SF
- tylosis C 6000
- blanose R 130

2 - PRINCIPLE

Loss of weight by carboxyméthylcellulose through drying in the oven.

3 - EQUIPMENT

Weighing bottle with ground lead, NF B 35 014
Ventilated electric oven
Dessicator with a ground flat lid, NF B 35 010

4 - MODE OF OPERATION

Test sample: E = 10.00 ± 0.01 g of carboxyméthylcellulose

Weigh a weighing bottle with its lid to within 0.1 mg, and add the test sample of E carboxyméthylcellulose.

Dry in the oven at 105 ± 5° C for 1 hour and put the weighing bottle and its lid in a dessicator. After cooling, close the empty weighing bottle and its lid.

5 - RESULTS

E = Mass, in grams, of the test sample

M_1 = Mass, in grams, of the empty weighing bottle and lid

M_2 = Mass, in grams, of the weighing bottle and its lid and the carboxyméthylcellulose after drying.

Moisture content, in the carboxyméthylcellulose is given by the expression:

$$\boxed{\frac{(M_1 + E) - M_2}{E} \times 100}$$

METHOD OF CHEMICAL TESTING PN
CARBOXYMETHYLCELLULOSE: DEGREE OF SUBSTITUTION X 12 02 02
GENERAL METHODS OF TESTING Oct. 1968

1 - SCOPE OF APPLICATION

The method of determining the degree of substitution is applicable to the following products:

- carboxymethylcellulose 7 H 3 SF
- tylosis C 6000
- blanose R 130

2 - PRINCIPLE

Degree of substitution designates the average number of ether or carboxyméthyl groups per unity of glucose.

Pyrogenation of the carboxyméthylcellulose and tritation of the sodium carbonate formed.

3 - REACTIVE

Sulphuric acid: tritated solution N
Methylorange + bromocrésol green: solution at 0.35 g of methylorange and 0.65 g of bromocrésol green/liter of distilled water

4 - EQUIPMENT

Platinum crucible
500 ml beaker, NF B 35 001
250 ml test tube, NF B 35 302
50 ml burette, graduated in 0.1 ml, NF B 35 301
Electric muffle furnace equipped with a thermoregulation apparatus permitting the temperature to be maintained at 825 ± 25° C

5 - MODE OF OPERATION

Test sample: E = Mass, in grams, of crude carboxymethylcellulose corresponding to 2.50 g of dried product following the method of chemical testing:

/X 12 01 02/

Put the test sample in a platinum crucible, oxidize first on a Bunsen burner then add 825 ± 25° C in the electric muffle furnace.

After cooling, put the crucible in a 250 ml beaker adding 150 ml of distilled water and heat until dissolution.

Take out the crucible and rinse it in distilled water; put the wash waters in the 250 ml beaker, add two drops of bromocrésol green-methylorange and titrate with sulphuric acid N: let N represent the number of ml of sulphuric acid poured.

6 - RESULTS

$$1 \text{ ml } H_2SO_4N \longrightarrow 0,023 \text{ g sodium}$$

$$\% \text{ sodium} = \frac{DS \times 23 \times 100}{162 + 80\ DS}$$

Degree of substitution $(DS) = \dfrac{162 \times \text{Na fixed}}{2300 - 80 \text{ Na fixed}}$

E = Mass, in grams, of the test sample

N - Volume, in ml, of SO_4H_2 N poured

The quantity of fixed sodium content in the carboxyméthylcellulose is given by the formula:

$$\frac{2,3\ N}{E}$$

The degree of substitution of a carboxyméthylcellulose is given by the expression:

$$DS = \frac{162 \times \dfrac{2,3\ N}{E}}{2300 - 80 \times \dfrac{2,3\ N}{E}} = \frac{162\ N}{1000\ E - 80\ N}$$

METHODS OF CHEMICAL TESTING
CARBOXYMETHYLCELLULOSES = pH OF GELS
GENERAL METHODS OF TESTING

PN
X 12 03 02
Oct. 1968

1 - SCOPE OF APPLICATION

The method of determining pH of a gel is applicable to the following products:

- carboxyméthylcellulose 7 H 3 SF
- tylosis C 6000
- blanose R 130

2 - PRINCIPLE

Elaboration of a gel at 0.5% of carboxyméthylcellulose and measure of the pH of this colloidal solution.

3 - EQUIPMENT

250 and 500 ml beakers, NF B 35 001
Agitator with 400 turns/minute turbine
Standardized pH meter with determined buffer solutions
Mixed glass-mercurous oxide electrode
Thermometer

4 - MODE OF OPERATION

Test sample: E - Mass, in grams, of crude carboxyméthylcellulose corresponding to 1.00 g of dried product following the method of chemical testing:

/X 12 01 02/

4.1 - Preparation of gel at 0.5%

Put the test sample in a 500 ml beaker, adding 100 ml of distilled water and let rest 12 hours.

Add 100 ml of distilled water and agitate with a 400 turn/minute turbine until obtaining a clear gel.

4.2 - Measure of the pH

Put 150 ml of gel in a 250 ml beaker, bring the temperature to 20 ± 0.5° C and take a reading from the pH meter.

METHODS OF CHEMICAL TESTING
CARBOXYMETHYLCELLULOSES: CHLORIDE CONTENT
GENERAL METHODS OF TESTING

PN
X 12 04 02
Oct. 1968

1 - SCOPE OF APPLICATION

The method of determining the chloride content is applicable to the following products:

- carboxyméthylcellulose 7 H 3 SF
- tylosis C 6000
- blanose R 130

2 - PRINCIPLE

Extraction of soluble chlorides in diluted sulphuric acid and quantity determination of chloridesobtained by precipitation through silver nitrate of which the excess of Ag ions is titrated through a solution of potassium thiocyanate in presence of ammoniacal ferous alum.

3 - REACTIVES

Sulphuric acid /(d_4^{20} = 1,83)/ pure through analysis: solution diluted to 1/10

Nitric acid /(d_4^{20} = 1,38)/ pure through analysis

Silver nitrate: titrated solution N/50
Potassium thiocyanate: titrated solution N/50
Ammoniacal ferous alum: solution at 140.0 g/liter of distilled water

4 - EQUIPMENT

500 ml beaker, NF B 35 001
250 ml test tube, NF B 35 302
250 ml graduated flask, NF B 35 307
20 and 50 ml pipettes with 1 calibration mark, NF B 35 305
50 ml calcinated glass crucible, porosity N° 4
Cone shaped funnel 60°, long stem, /ϕ/ 55 mm, NF B 35 031
25 ml burette, graduated in 0.1 ml, NF B 35 301

5 - MODE OF OPERATION

Test sample: E = Mass, in grams, of crude carboxyméthylcellulose corresponding to 5.00 g of dried product following the method of chemical testing:

Put the test sample in a 500 ml beaker, adding 200 ml of sulphuric acid diluted to 1/10: bring to boiling for 10 minutes. After cooling, filter the solution through filter paper without ashes in a graduated flask of 250 ml, fill to the calibration mark with distilled water and shake well: let V represent this volume.

With a precision pipette take out 50 ml of the filtered solution and let the v represent this volume. Add 10 ml of pure nitric acid and 20 ml of N/50 silver nitrate: let it represent N_1 ml. Let rest 2 hours.

Filter the solution on a N° 4 calcinated glass crucible and keep the filtrate: wash the precipitate on the filter with distilled water containing a few drops of nitric acid until total disappearance of the silver nitrate; gather the wash waters and mix them with the filtrate.

Add to the filtrate 2 drops of ammoniacal ferous alum and titrate with the N/50 potassium thiocyanate until a persistent reddish brown tint is obtained: let N_2 represent the volume of KSCN N/50 poured.

6 - RESULTS

/1 ml of $AgNO_3$ N/50 ⟶ 0,00117 g of NaCl/

E = Mass, in grams, of carboxyméthylcellulose
V = Volume, in ml, of the solution obtained after treating the carboxyméthylcellulose with diluted sulphuric acid
v = Volume, in ml, of the solution taken out for sample
N_1 = Volume, in ml, of $AgNO_3$ N/50 added

N_2 = Volume, in ml, of KSCN N/50 poured

The percentage content of sodium chloride, express in NaCl, is given by the expression:

$$\frac{0,00117 \times (N_1 - N_2) \times V \times 100}{E \times v} \quad \text{or:} \quad \frac{0,117 \times (N_1 - N_2) \times V}{E \times v}$$

POSITIVE AND NEGATIVE PLATES
THIN CALCINATED STRIPS = CALCINATION
CONTROL TECHNIQUE

NS
KL 00 01 08a
March 1969

PHYSICAL CHARACTERISTICS OF STRIPS

Following the SAFT methods of physical testing:

Mass of nickel coating	/Y 01 01 02/
Thickness	/Y 01 02 02/
Porosity	/Y 01 03 02/
Cohesion of calcination	/Y 01 04 02/

METHODS OF PHYSICAL TESTING
THIN CALCINATED STRIPS = NICKEL COATING
GENERAL METHODS OF TESTING

NS
Y 01 01 02
March 1969

1 - SCOPE OF APPLICATION

The method of determining the mass of nickel coating is applicable to:

- Thin positive and negative calcinated strips: types VO, GP, VB, VR, VP.

2 - PRINCIPLE

Weighing of the sample with the same surface of calcinated band and perforated nickel coated ribbon coming from the same fabrication: the difference in mass between the two samples gives the mass of the nickel coating.

3 - EQUIPMENT

Balance: 0.01 g precision

4 - MODE OF OPERATION

Cut one or several samples of 10 ± 0.01 cm2 of calcinated strip and one sample of 10 ± 0.01 cm2 of perforated nickel coated ribbon from the same fabrication.

Individual weighing of each sample of 10 cm2 at 0.01 g.

5 - RESULTS

M = Mass, in grams, sample of calcinated strip 10 cm2
m = Mass, in grams, sample of perforated nickel coated ribbon 10 cm2

The mass of nickel coating in a sample of calcinated strip of 1 dm2 will be given by the expression:

$$/(M - m) \times 10/$$

Remark: The shape of the cut sample depends on the lengths of the calcinated part from which the sample is taken: it should be taken from a region comprised of more than 3 ± 1 mm of the wiped portion.

METHODS OF PHYSICAL TESTING
THICKNESS UNDER CONSTANT EFFORT
GENERAL METHODS OF TESTING

NS
Y 01 02 02
March 1969

1 - SCOPE OF APPLICATION

The method of determining thickness is applicable to:

- Thin positive and negative calcinated strips.
- Thin positive and negative impregnated calcinated plates: types VO, GP, VB, VR and VP.
- Separators for thin calcinated element plates.

2 - PRINCIPLE

Reference French standard /NF 0 03 016/

Measure under determined pressure, the thickness of a strip or of a plate between two flat parallel bars, moving the piece at a constant speed.

3 - EQUIPMENT

LHOMARGY micrometer MI 02:
Surface of touch: 2 cm2
Pressure: 1.00 ± 0.020 bar
Graduation: 0 to 2 mm in 10^{-2} mm

4 - MODE OF OPERATION

Before any measurement, adjust to zero: in order to deduce, loosen the adjusting button on the case, to the height of the axis and turn the dial to reestablish the adjustment at zero: then tighten the button.

Introduce the sample between the two bars, fixed and mobileand abandon completely the hand lever: under action of the air brake, the mobilebar comes to rest on the sample to be measured without shock.

Make a reading when the needle of the apparatus is stabilized.

METHODS OF PHYSICAL TESTING
THIN CALCINATED STRIPS = POROSITY SAFT
GENERAL METHODS OF TESTING

NS
Y 01 03 02
March 1969

1 - SCOPE OF APPLICATION

The method of determining the SAFT porosity is applicable to:

- Thin positive and negative calcinated strips: types VO, GP, VB, VR and VP.

2 - PRINCIPLE

2.1 - Definition

SAFT porosity is the ratio of the weight of absorbed water to the weight of nickel coating.

2.2 - Formula used in the measurement

The formula of SAFT porosity expressed in SAFT units is given by the expression:

$$P_{SAFT} = \frac{E - e}{M - m} - 11,2$$

E = Thickness, in 10^{-2} mm, of the calcinated strip

e = Thickness, in 10^{-2} of the perforated nickel coated ribbon

M = The Mass, in grams, of the sample of calcinated strip of 10 cm2

m = The Mass, in grams, of the sample of perforated nickel coated ribbon of 10 cm2

11.2 = 100/real volumetric mass of the nickel.

2.3 - Formula time the theoretic porosity to the SAFT porosity

The theoretic porosity is the ratio of the volume of empty space to the apparent volume of the nickel: it is defined in the SAFT standard:

/0 03 01 11/

By calculation, one obtains:

$$P_{SAFT} = \frac{d\ Ni - d\ app}{d\ Ni \times d\ app} \text{ and } P_{theoretic} = \frac{d\ Ni - d\ app}{d\ Ni}$$

d Ni = the real volumetric mass of the nickel
d app = apparent volumetric mass of the nickel

From these equations, it is deduced:

$$d\ apparent = \frac{P_{theoretic}}{P_{SAFT}} = \frac{100\ (M - m)}{E - e}$$

The formula tying the theoretic porosity to SAFT porosity is given by the expression:

$$P_{theoretic} = \frac{100\ (M - m)}{(E - e)} \times P_{SAFT}$$

3 - EQUIPMENT

Micrometer LHOMARGY MIO_2
Balance: 0.01 g precision

4 - MODE OF OPERATION

4.1 - Thickness

Thickness of the calcinated strip and of the perforated nickel coated ribbon following the SAFT method of physical testing:

/Y 01 02 02/

4.2 - Mass of nickel coating

Mass of nickel coating of a sample of 10 cm2 of calcinated strip and of perforated nickel coated ribbon, following the SAFT method of physical testing:

/Y 01 01 02/

5 - RESULTS

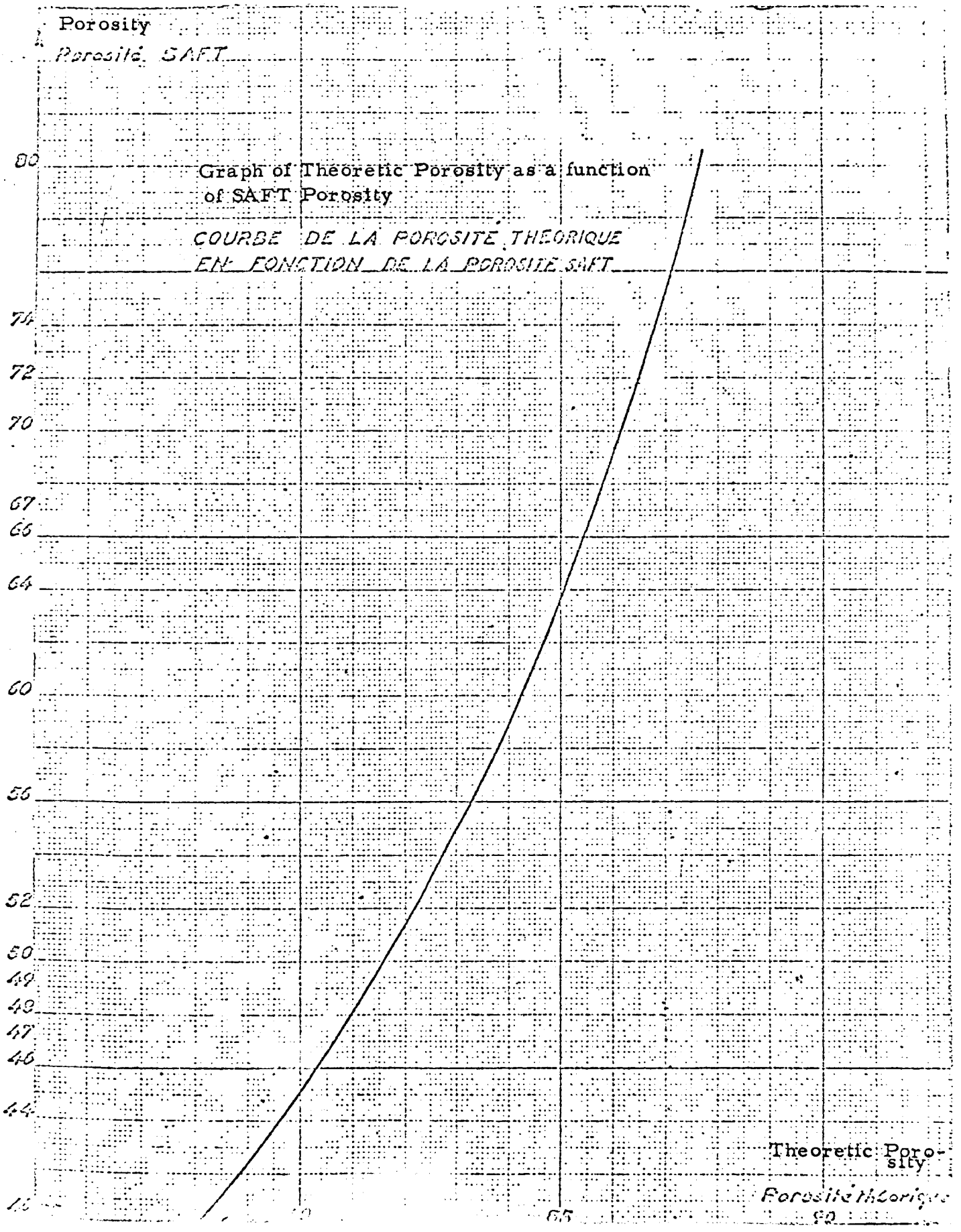
SAFT porosity of a sample of calcinated strip is given by the expression:

$$\frac{E - e}{M - m} - 11,2 \text{ units SAFT}$$

The graph on page 3/3 gives the values of SAFT porosity as a function of theoretic porosity.

METHODS OF PHYSICAL TESTING
THIN CALCINATED STRIPS = POROSITY SAFT
GENERAL METHODS OF TESTING

NS
Y 01 03 02
March 1969



METHODS OF PHYSICAL TESTING
THIN CALCINATED STRIPS: COHESION OF CALCINATION
GENERAL METHODS OF TESTING

PN
Y 01 04 02
March 1969

1 - SCOPE OF APPLICATION

The method of determining the cohesion of calcination is applicable to:

- Thin positive and negative calcinated bands: types VO, GP, VB, VR and VP.

2 - PRINCIPLE

Characterize the effectiveness of calcination by measuring the effort with which it opposes the perforation of a cylindrical borer at right angles to the perforation of the ribbon.

3 - EQUIPMENT

Punch for a rectangular or circular sample of 10 ± 0.01 cm2.
Measuring apparatus including:

- Dynamometer equipped with an apparatus for immobilization of the needle on maximum deviation.
- System of transmission of force by compression (cylinder-system)
- Cylindrical borer with a diameter of $1,20^{+0}_{-0,02}$ mm

  of which the end is a partial sphere.
- Two centering needles

(Drawing of the whole apparatus: fig. 1)

4 - MODE OF OPERATION

4.1 - Preparation of the samples

Cut discs or rectangles with 10 ± 0.01 cm2 of surface area from a thin calcinated strip.

4.1.1 - Mark the direction of the perforation with a pencil mark.

4.1.2 - Cut the discs with the punch: a disc or rectangle by wiping with a minimum of two per sample.

4.2 - Measure of the solidity

4.2.1 - Center the disc or rectangle on the two centering needles (the pencil mark indicating the direction of perforation should be parallel to the plan of the two needles).

4.2.2 - Replace the needle of the dynamometer at zero.

4.2.3 - Lower the hand lever to bring the borer to the point of perforation of the calcination.

4.2.4 - Read on the dial of the apparatus the deviation of the needle until perforation of the calcination.

5 - RESULTS

The force of rupture is expressed in kilograms force.

Carry out two measures per sample of 10 cm2: if there is a deviation of more than 200 gf between the two measures, take a third measurement and eliminate the value which deviates the most.

METHODS OF PHYSICAL TESTING
THIN CALCINATED STRIPS: COHESION OF CALCINATION
GENERAL METHODS OF TESTING

PN
Y 01 04 02
March 1969

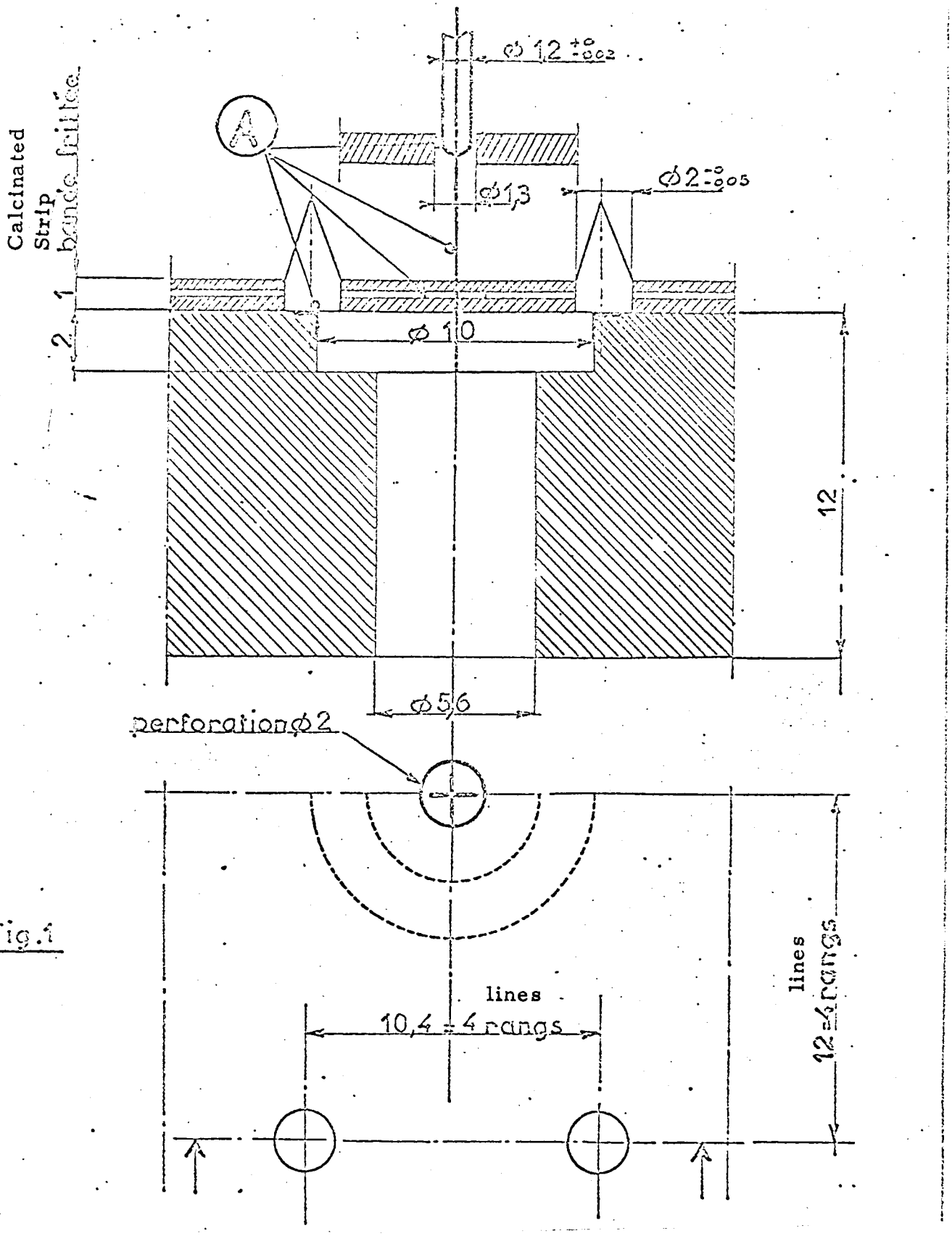


Fig. 1

Alone, the surfaces indicated in heavy lines (A) are defined by the present standard as well as the sides which are attached to them.

POSITIVE PLATES
VO PLATES: AVIATION QUALITY
SPECIFICATION

PN
K 01 05 01
Sept. 1969

1 - OBJECT

This specification defines the characteristics of thin positive calcinated plates VO aviation quality, responding to the following SAFT standards:

Calcination	/Appendix 2 Reference 1/
Impregnation	/Appendix 2 Reference 2/
Electrochemical cleansing	/Appendix 2 Reference 3/

The quality of thin positive calcinated plates VO aviation quality, results from a mixture obtained with the accepted plates after classifying by manufacture and recovery.

2 - REPRESENTATION

Each type of VO positive plate, aviation quality is defined by a drawing, following SAFT standard:

/Appendix 2 Reference 4/

3 - PHYSICAL CHARACTERISTICS

3.1 - Aspect (Appendix 1)

The plates should not have the following defects:

- Disintegration of the calcination
- Lumps from wiping
- Oxidation, perforation and tears in the tops of the plates
- Pock marks
- Lack of substance above 1 hole
- Lack of substance through shock and stamping (except 1 groove not reaching the ribbon)
- Splits
- Breaks (except slight deformation of the plate)
- Excess of substance above 5×10^{-2} mm of extra thickness
- Stamp: lack of concordance between the cutting mark and the stamp mark
- Compression: lack of or checked wear and tear on the plate
- Cut: bad positioning of the cutting strip: absence of stamp on part of the plate or dimensional variation of the plate

- Disintegration of the plate edges
- Broken angles
- Soldering on the tops of the plates: loosening of the plate top, soldering flashes, poor setting of the top

Besides, the VO positive plates should conform after recovery to the SAFT standard:

/Appendix 2 Reference 5/

3.2 - Thicknesses

3.2.1 - Thickness on impression

/47,0 ± 2,0 x 10^{-2} mm/

3.2.2 - Thickness on plate

Value obtained after mixture of plates following the SAFT technology of manufacture:

/Appendix 2 Reference 6/

Averages obtained on samples of 5 packets of 10 plates:

Normal thickness =/93,5 ± 1,5 x 10^{-1} mm/

Reduced thickness =/83,0 ± 1,5 x 10^{-1} mm/

and inspected following the technology of control:

/Appendix 2 Reference 7/

4 - CHEMICAL CHARACTERISTICS

Defined by the SAFT standard:

Impregnation	/Appendix 2 Reference 2/
Electrochemical cleansing	/Appendix 2 Reference 3/

5 - ELECTRIC CHARACTERISTICS

Theoretic specific capacity

Theoretic specific capacity of unimpressed surface following SAFT standard:

/Appendix 2 Reference 8/

Semi-impervious, semi-open elements:

/C_s = 2,92 Ah/dm2/

POSITIVE PLATES
VO PLATES: AVIATION QUALITY
SPECIFICATION

PN
K 01 05 01
Sept. 1969

ANNEXE 1
Appendix 1

AVANT PROJET

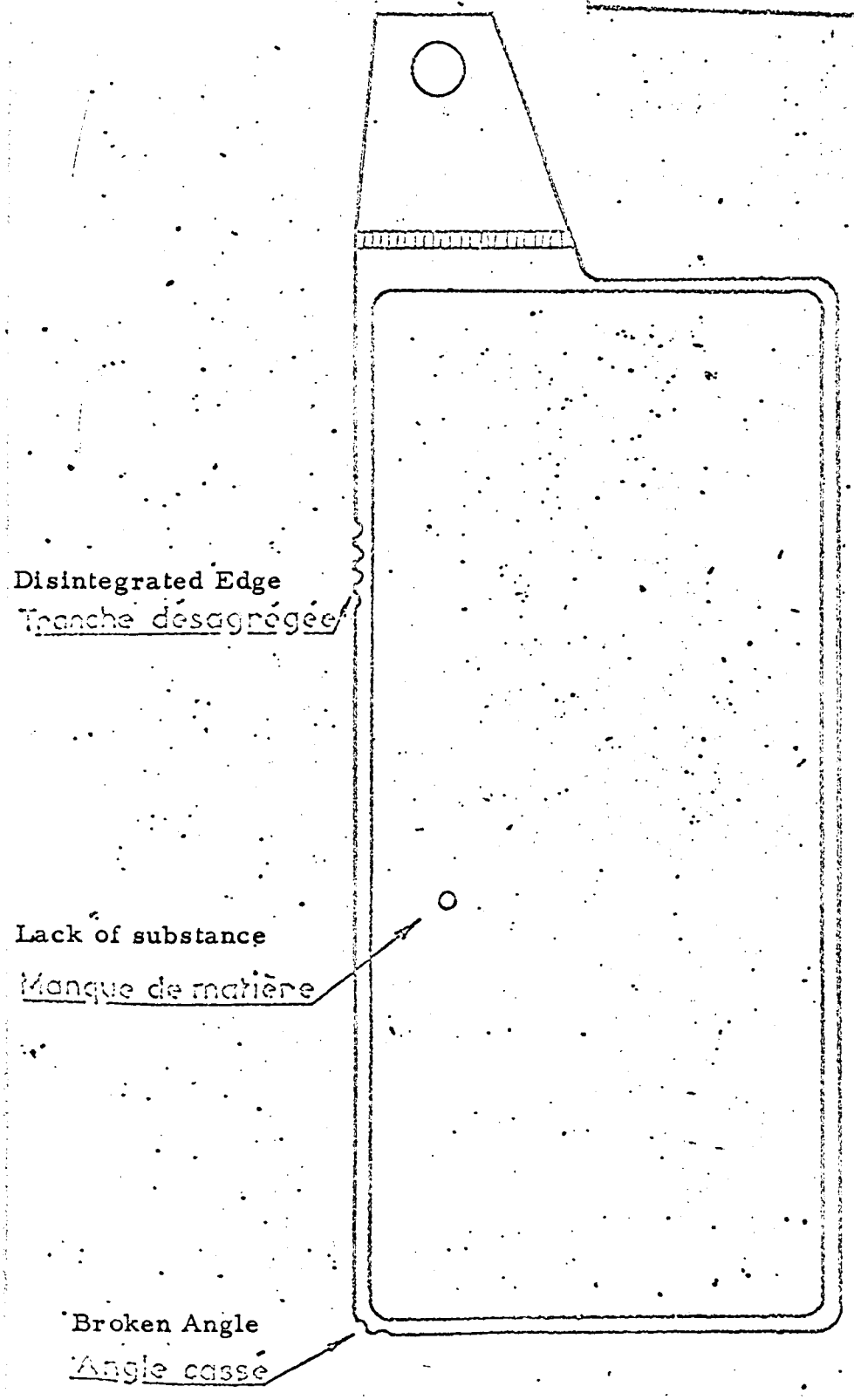


FIG. 1

APPENDIX 2

Recapitulative of SAFT project standards utilized in:

/PN K 01 05 01/

Reference 1	Calcination VO	/K 01 01 01/
Reference 2	Impregnation VO	/K 01 02 01/
Reference 3	Electrochemical cleansing	/K 01 03 01/
Reference 4	Representation of product	/KL 00 04 22/
Reference 5	Recovery VO	/KL 00 04 01/
Reference 6	Technology of manufacture	/KL 00 04 12/
Reference 7	Technology of control	/KL 00 04 02/
Reference 8	Concept of product: parallelepipedic elements	/N 00 00 11/

NEGATIVE PLATES
VO PLATES: AVIATION QUALITY
SPECIFICATION

PN
L 01 05 01
Sept. 1969

1 - OBJECT

This specification defines the characteristics of negative VO calcinated plates aviation quality responding to the following SAFT standard:

Calcination	/Appendix 1 Reference 1/
Impregnation	/Appendix 1 Reference 2/
Electrochemical cleansing	/Appendix 1 Reference 3/

The quality of then negative VO calcinated plates aviation quality, results from the mixture obtained with accepted plates after classification of manufacture and recovery.

2 - REPRESENTATION

Each type of VO negative plate is defined by a drawing following the SAFT standard:

/Appendix 1 Reference 4/

3 - PHYSICAL CHARACTERISTICS

3.1 - Aspect

The VO negative plates should conform to the SAFT standard:

/Appendix 1 Reference 5/

3.2 - Thicknesses

3.2.1 - Thickness on impression

/47,0 ± 2,0 x 10^{-2} mm/

3.2.2 - Thickness on plate

Value obtained after mixture of plates following the technology of manufacture:

/Appendix 1 Reference 6/

Averages obtained on samples of 5 packets of 10 plates:

Normal thickness = /86,0 ± 1,5 x 10^{-2} mm/

Reduced thickness = /81,0 ± 1,5 x 10^{-2} mm/

inspected following the control technique:

/Appendix 1 Reference 7/

4 - CHEMICAL CHARACTERISTICS

Defined by SAFT standards:

Impregnation	/Appendix 1 Reference 2/
Electrochemical cleansing	/Appendix 1 Reference 3/

NEGATIVE PLATES
VO PLATES: AVIATION QUALITY
SPECIFICATION

PN
L 01 05 01
Sept. 1969

Recapitulative of SAFT standards utilized in SAFT standard:

/PN L 01 05 01/

Reference 1	Calcination	/L 01 01 01/
Reference 2	Impregnation	/L 01 02 01/
Reference 3	Electrochemical cleansing	/L 01 03 01/
Reference 4	Representation of product	/KL 00 04 22/
Reference 5	Positive VO plates	/K 01 04 01 § 3.1/
Reference 6	Technology of manufacture	/KL 00 04 12/
Reference 7	Technology of control	/KL 00 04 02/

METHODS OF ELECTRICAL TESTING
POSITIVE VO PLATES: ELECTROCHEMICAL TESTING
GENERAL METHODS OF TESTING

PN
Z 04 01 02
July 1969

1 - SCOPE OF APPLICATION

Electrochemical testing is applicable to:

- Positive impregnated VO calcinated strips
- Positive VO calcinated plates

2 - PRINCIPLE

Electrochemical testing permits the obtaining of information on the electrical characteristics of VO plates but with less precision than that obtained on the mass of nickel hydroxyde.

Setting up a test element: obtaining the capacity and examining the aspect of the plates after a charge of 2 hours at 5 A and the discharge at 1.2 A until 1 V.

3 - ELECTROLYTES

Electrolytes N° 25 and N° 19: solution of caustic potassium defined by SAFT standard:

/J 02 00 01/

4 - EQUIPMENT

Counter-electrode of pure nickel
Separator perforated in P.V.C.
Test tank

defined by SAFT plan 100 402

Tables of charge and discharge equipped with meter and ammeter class 0.5.

Voltmeter: class 0.5.

5 - MODE OF OPERATION

Electrical testing is effectuated at regulated temperature:

/22 ± 2° C/

Cut samples of 0.5 ± 0.005 dm2 of strip or of impregnated calcinated plate (active portion).

Each sample is placed with its counter-electrode of nickel in a test tank containing N° 25 electrolyte for a minimum of 12 hours: this mass constitutes a monoplate test element.

The level of the electrolytes should be adjusted after putting in place the sample and counter-electrode: several tests may be made in the same tank without changing the electrolyte provided that a readjustment of level is made with the electrolyte N° 19.

Cycle of capacity test

Charge at 5 A for 2 hours.

Discharge at 1.2 A with individual reading:

- Every 0.05 Ah starting from 1.80 Ah discharging until a voltage stop of 1 V: let $/C_c/$ represent the capacity found.

Breaking down the test element: washing the sample in water.

The test elements can be tested consecutively and should be shunted after having obtained the voltage stop of 1 V.

6 - RESULTS

6.1 - Test capacity

C_c = Capacity of 0.5 dm2 sample with counter-electrode of nickel

The capacity, expressed in Ah, of 1 dm2 of active surface, is:

$$/C_c = C_c \times 2/$$

The value of this capacity for each spiral should be:

Capacity = /4,30 Ah/dm2/
Standard deviation = /0,30 Ah/dm2/

(this result has no specification value).

6.2 - Aspect

After electrical testing and drying, the sample is submitted to visual examination and classified in one of the following categories:

- Category A: plate without defect
- Category B: blistered plate (honey comb)
- Category G: pock marked plate
- Category C: lumpy plate
- Category D: disintegrated plate

METHODS OF ELECTRICAL TESTING
POSITIVE VO PLATES: ELECTROCHEMICAL TESTING
GENERAL METHODS OF TESTING

PN
Z 04 01 02
July 1969

1 - SCOPE OF APPLICATION

Electrochemical testing is applicable to:

- Negative impregnated VO calcinated strips
- Negative VO calcinated plate

2 - PRINCIPLE

Electrochemical testing permits obtaining information on the characteristics of the VO plate but with less precision than that obtained on the mass of cadmium hydroxyde.

Setting up a test element: obtaining positive and negative capacities after:

2.1 - A discharge of 2 hours at 2.5 A and a charge at 0.065 A until 0.5 V for the positive capacity.
2.2- A charge of 16 hours at 0.265 A and a discharge at 1.2 A until 1 V for the negative capacity.

3 - ELECTROLYTES

Electrolytes N° 25 and N° 19: solution of caustic potassium defined by SAFT standard:

/J 02 00 01/

4 - EQUIPMENT

Counter-electrode of pure nickel
Separator perforated in P.V.C.
Test tank

defined by SAFT plan 100 402

Tables of charge and discharge equipped with meter and ammeter, class 0.5.
Voltmeter: class 0.5.

5 - MODE OF OPERATION

Electrical testing is effectuated at regulated temperature:

/22 ± 2° C/

Cut samples of 0.5 ± 0.005 dm2 of strip or of impregnated calcinated plate (active portion).
Each sample is put with its counter-electrode of nickel in a test tank containing electrolyte N° 25 for a minimum of 12 hours: this combination constitutes a monoplate test element.

The level of electrolyte should be adjusted after putting in place the sample and the counter-electrode: several tests may be made in the same tank without changing electrolytes provided that an adjustment in the level is made with electrolyte N° 19.

Cycles of test capacity

5.1 - Positive capacity
- Discharge at 2.5 A for 2 hours
- Rest 12 hours minimum
- Charge at 0.065 A with individual reading:
  - Every 0.005 Ah until voltage stop of 0.5 V: let $/\overline{C_{cp}}/$ represent the positive capacity found.

5.2 - Negative capacity
- Charge at 0.265 A for 16 hours
- Discharge, without rest, at 1.2 A with individual reading:
  - Every 0.05 Ah starting from 1.80 Ah discharging until voltage stop of 1 V: let $/\overline{C_{cn}}/$ represent the negative capacity found.

The test elements may be tested consecutively and should be shunted after having attained stopping voltage of 0.5 V for the positive capacity and 1 V for the negative capacity.

6 - RESULTS

Capacity tests

C_{cp} = Positive capacity of sample of 0.5 dm2 with nickel counter-electrode
C_{cn} = Negative capacity of sample of 0.5 dm2 with nickel counter-electrode

The positive capacity, expressed in Ah per 1 dm2 of active surface is:

$$/\overline{C_{cp} = C_{cp} \times 2}/$$

The negative capacity, expressed in Ah per 1 dm2 of active surface is:

$$/\overline{C_{cn} = C_{cn} \times 2}/$$

The value of the positive capacity is defined for each spiral in SAFT standard:

/L 01 02 01/ and /L 02 02 01/

The value of the negative capacity for each spiral should be:

Capacity = /4,30 Ah/dm2/

Standard deviation = /0,30 Ah/dm2/

(This result has no specification value).

- Smoothness of ribbon:

The ribbon should be as smooth as possible and contain no lumps in the middle or excessive lateral undulations.

A strip 4 meters long, layed flat on a slab, the extremities being maintained by an apparatus exercising a tension on the order of 1 kg, should register on a parallelepipedic volume of section equal to the length of the band and 2mm of height.

- Cutting the ribbon:

The turned up edge should be less than or equal to 6 mm per 4 meters.

1.5 - Aspect:

The ribbon should not have any of the following defects:
- Curling on the edges
- Beginnings of tears
- Splitting of metal
- Rough edges from the cutting.

1.6 - Mechanical characteristics :

- E : elastic limit	: less than or equal to 16 kg
- R: Tensil strength per mm2	: less than or equal to 26 kg
- Ratio E/R	: less than 0.75
- A: elongation in percentage	: 10% less than A less than 20%

The characteristics indicated above are intended for:

. a cut test tube, in the center of the strip, 21 mm in length,
. test carried out by SAFT on the PETER machine with:

- Speed of traction	: 75 mm/minute
- Distance between jaws	: 65 mm
- Distance between marks for calculation of A%	: 65 mm.

The characteristics remarked upon capable of being influenced by the peculiar characteristics of the machines utilized, an adaptation of demanded values may be necessary following the control equipment which the supplier has at his disposal.

SAFT STANDARD

THIN RIBBON FOR ELEMENTS VR

SPECIFICATIONS

NS
A. 21. 500 a)
February 1964

The present Standard has for its object to define the characteristics of ribbons with a thickness of 0.05 mm, utilized by the fabrication of element plates VR.

The conditions of acceptance, the nature of the controls and the modalities of making up samples, are fixed by Standard A. 21. 501.

1 - CHARACTERISTICS:

1.1. - Quality of metal:

- Effervescent steel quality E.

1.2. - Analysis:

C	≤	0,08
Mn	≤	0,40
S	≤	0,05
P	≤	0,05

1.3. - Treatment:

- Cold laminated ribbon, white tempered.

1.4. - Geometric characteristics:

- Dimensions: 100 x 0.05 mm
  180 x 0.05 mm

The admitted tolerances are:

. on length $\pm$ 0.2 mm
. on thickness $^{+\,0.01}_{-\,0.005}$ mm

The length is therefore comprised between 179.8 and 180.2 mm for the ribbon of 180 mm and between 99.8 and 100.2 mm for the ribbon of 100 mm.

The thickness is comprised between 0.045 and 0.060 mm for the two types of ribbon.

In the case where ribbons of intermediate lengths would be delivered, one would apply to them the above mentioned tolerances.

2. - PACKING FOR SHIPMENT:

The ribbon is delivered on steel spools, in the form of rolls with an interior diameter of 250 mm.

The weight of the rolls is, in principle, 0.5 kg per mm of length without, however, being able to go past 60 kg for ribbons of 180 mm lengths.

To protect the ribbon against oxidation and against shock the rolls will be:

- Oiled (the products utilized, to this effect, should be easily soluble in normal scouring baths. The use of products with synthetic resin base, is prohibited).
- Packed in the middle of waxed crepe paper.
- Put in cases with oil paper lining.
- Carefully wedged.

3. - MARKING:

3.1. - Marking of lots:

- Each fabrication lot should include, on each type of ribbon, the following indications on the dispatch note:

  . Name of supplier
  . Reference number and designation of product
  . Net weight
  . Order number.

3.2. - Marking of rolls:

- Each roll should carry, on its packing, the following indications:

  . Lot number
  . Dimensions of ribbon.

These indications are also placed on the cases.

SAFT STANDARD — THIN RIBBONS FOR ELEMENTS VO OR VR — SPECIFICATIONS

NS
A. 21. 000 b)
February 1964

The present Standard has as its object to define the characteristics of ribbons with a thickness of 0.09 mm, utilized by the fabrication of element plates VO or VR.

The conditions of acceptance, the nature of controls and the modalities of making up samples are fixed by the Standard A. 21. 001.

1. - CHARACTERISTICS:

1.1. - Quality of metal:

- Effervescent steel quality E

1.2. - Analysis:

C	≤	0.08
Mn	≤	0.40
S	≤	0.05
P	≤	0.05

1.3. - Treatment:

- Cold laminated ribbon, white tempered.

1.4. - Geometric characteristics:

- Dimensions: 160 x 0.09 mm
  180 x 0.09 mm

The admitted tolerances are:

. on length $\pm$ 0.2 mm

. on width $^{+\,0.01}_{-\,0.005}$ mm

The length is then comprised between 179.8 and 180.2 mm for the ribbon of 180 mm and between 159.8 and 160.2 mm for the ribbon of 160 mm.

The thickness is comprised between 0.085 and 0.100 mm for the two types of ribbons.

In the case where ribbons of intermediate length are delivered, the above mentioned tolerances are applied to them.

- Smoothness of ribbon:

The ribbon should be as smooth as possible and contain no lumps in the middle or excessive lateral undulation.

A strip of 4 meters in length, layed flat on a slab, the extremities being maintained by an apparatus exercising a tension on the order of 1 kg, should register on a parallelepipedic volume of section equal to the length of the strip and 2mm of height.

- Cutting the ribbon:

The turning up of the edge should be inferior to or equal to 6 mm per 1 meters.

1.5. - Aspect:

The ribbon should not have any of the following defects:
- Curling on the edges
- Beginnings of tears
- Splitting of metal
- Rough edges from shearing.

1.6. - Mechanical characteristics:

- R: Tensil strength per mm2 : 26 to 34 kg
- E: Elastic limit, should be such that the ratio E/R is : $\boxed{0,52 < \frac{E}{R} < 0,65}$
- A: Elongation in % : greater than or equal to 15%

The characteristics mentioned above are understood for:

. a cut test tube, in the middle of the strip, of 21 mm lengths,
. test carried out by SAFT on PETER machine with:

- Speed of traction : 75 mm/minute
- Distance between jaws : 65 mm
- Distance between marks for calculation of A% : 65 mm.

The characteristics remarked upon capable of being influenced by the peculiar characteristics of the machine utilized, an adaptation of demanded values may be necessary following the control equipment which the supplier has at his disposal.

2. - PACKING FOR SHIPMENT:

The ribbon is delivered on steel spools, in the form of rolls with an interior diameter of 250 mm.

The weight of the rolls is comprised between 60 and 80 kg.

To protect the ribbon against oxidation and against shock, the rolls will be:

- Oiled (the products utilized for this purpose, should be readily soluble in normal scouring baths. The use of products with synthetic resin base is prohibited).
- Packed in the middle of waxed crepe paper.
- Delivered on wood pallets, of which the total weight should not be greater than 1.000 kg.

3. - MARKINGS:

3.1. - Marking of lots:

- Each fabrication lot should carry, on each type of ribbon, the following indications on the dispatch note:

  . Name of supplier

  . Reference number and designation of product

  . Net weight

  . Order number.

3.2. - Marking of rolls:

- Each roll should carry, on its packings, the following indications:

  . Lot number

  . Dimensions of ribbon.

These indications are carried also on the pallets.