INTERNATIONAL STANDARD

ISO

8007-2

First edition
1999-08-01

Carbonaceous materials used in the production of aluminium — Sampling plans and sampling from individual units —

Part 2:
Prebaked anodes

Produits carbonés utilisés pour la production de l'aluminium — Plans d'échantillonnage et échantillonnage pour unités individuelles —

Partie 2: Anodes précuites

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8007-2 was prepared by Technical Committee, ISO/TC 47, *Chemistry*, Subcommittee SC 7, *Aluminium oxide, cryolite, aluminium fluoride, sodium fluoride, carbonaceous products for the aluminium industry*.

ISO 8007 consists of the following parts, under the general title, *Carbonaceous materials used in the production of aluminium — Sampling plans and sampling from individual units:*

— *Part 1: Cathode blocks*

— *Part 2: Prebaked anodes*

Part 3, which is in preparation, will give procedures for sampling sidewall blocks.

Annex A of this part of ISO 8007 is for information only.

iii

Carbonaceous materials used in the production of aluminium — Sampling plans and sampling from individual units —

Part 2:
Prebaked anodes

1 Scope

This part of ISO 8007 specifies procedures for the creation and execution of a sampling plan for prebaked anodes from a large consignment or from a batch.

NOTE   The term "batch" can be substituted by the term "lot" if desired.

This part of ISO 8007 also specifies the preferred locations for taking test samples from individual anodes.

Cathode blocks and prebaked anodes are considered separately. Procedures for sampling cathode blocks are given in ISO 8007-1.

For advice on safety, the reader is referred to ISO 3165:1976, *Sampling of chemical products for industrial use — Safety in sampling.*

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 8007. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 8007 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3534 (all parts), *Statistics — Vocabulary and symbols*.

ISO 5022:1979, *Shaped refractory products — Sampling and acceptance testing*.

3 Definitions

For the purposes of this part of ISO 8007, the definitions given in ISO 3534 (all parts) and ISO 5022 apply.

4 Sampling plans for large consignments or for batches

4.1 General

The sampling plan may be defined in terms of an acceptable quality level (AQL). It may be applied when the parties concerned have agreed to do so and have therefore, by common consent, made a choice between the various options described in this part of ISO 8007. The parties shall also agree on the various properties to be measured (for example, density and electrical resistivity) so that the sampling plan is suitable for its ultimate purpose of providing representative samples for subsequent testing.

It is also possible to apply the procedures given in this part of ISO 8007 while modifying, by prior agreement between the parties concerned, the recommended values given in the sampling plans (see Tables 1, 2, 3 and 4).

The efficiency of a sampling plan depends solely on the number of sampled units, n, whatever the size of the batch, N, provided that n/N is less than 10 %. Tables 1, 2, 3 and 4 shall be used to determine, on the basis of the required efficiency, what the sample size, n, shall be.

If experience shows that the quality of the manufacturer's production corresponds to the agreements, it is possible, when batches of the same quality are frequently subjected to acceptance procedures, that a plan with lower efficiency be chosen. This would imply the use of a smaller sample size, n.

If later experience shows that the quality of production fails to correspond to the agreements when judged against pre-set criteria, then it is necessary to return to the original, higher efficiency, sampling plan.

Alternatively, a sampling plan may be defined in terms of average test values together with a limitation on the range of test values instead of, or in addition to, acceptable quality levels (AQLs).

Statistical process control (SPC) or statistical quality control (SQC) charts are recommended tools when operating the sampling plan.

4.2 Single unit of product

The single unit of product shall be agreed between seller and buyer. It may be a single prebaked anode or it may be 1 t of anodes.

4.3 Drawing up a sampling plan based on acceptable quality level (AQL)

Before the sampling plan can be drawn up from the tables, it is necessary to agree on the parameters given below:

a) The acceptable quality level, i.e. the the poorest quality that can be considered acceptable as the process average.

b) Whether normal or tightened inspection is to be used. This is decided by studying the sampling results for the last few batches. The rules for switching from one kind of inspection to another are given in 4.5.2.

c) The batch size, which may be the amount produced in a production batch (or lot) or, preferably, the amount produced or received in a one-month time period.

4.4 Operating the sampling plan based on acceptable quality level (AQL)

4.4.1 Table 1 gives suitable values for the three parameters described in 4.3. Buyer and seller may replace the recommended values with their own values if required. This shall be included in the sampling report [see 6 c)].

Table 1 — Recommended values for operating the sampling plan

Acceptable quality level (AQL)	2,5
Normal or tightened inspection	Normal
Batch size	Tonnes per month of production or number of units of product in batch or lot

4.4.2 Refer to Table 2 and, using the agreed values from Table 1, find the correct sample-size code-letter (SSCL).

2

Table 2 — Sample-size code-letter

Lot or batch size	Sample-size code-letter (see Tables 3 and 4)
2 to 8	A
9 to 15	B
16 to 25	B
26 to 50	C
51 to 90	C
91 to 150	D
151 to 280	E
281 to 500	F
501 to 1 200	G
1 201 to 3 200	H
3 201 to 10 000	J
10 001 to 35 000	K
35 001 to 150 000	L
1 500 001 to 500 000	M
500 001 and over	N

4.4.2.1 If the quality control or quality assurance plan is being operated by acceptance number (Ac) and rejection number (Re) for the acceptance or rejection of a batch, refer to Table 3 and use the SSCL and AQL values to obtain the acceptance and rejection number.

4.4.2.2 If the sampling plan is being operated on tightened sampling, then refer to Table 4 to get the acceptance number (Ac) and rejection number (Re) values.

4.4.2.3 The acceptability of a batch is determined by testing the samples obtained in accordance with the agreed sampling plan. If the number of defective units, or the tonnage of defective units, found in the sample population is equal to or less than the acceptance number (Ac), then the batch shall be considered acceptable. If the number of defectives is equal to or greater than the rejection number (Re), then the batch shall be rejected as non-conforming.

NOTE 1   In this case, it is strongly recommended that the buyer and seller discuss an action plan. The recommended action plan is to divide the original batch or consignment into two or more smaller batches or consignments. Each of these should be sampled in accordance with this part of ISO 8007 and then re-examined. The objective is to minimize the number of anodes which have to be rejected.

NOTE 2   It is strongly recommended that it is agreed in advance how the extra expense arising from any re-sampling and re-testing is divided between seller and buyer. An 80:20 apportionment may be considered appropriate.

The words "defective unit" shall apply to any unit which gives a value in a contractual-specification test which is outside the agreed range of acceptability. For most purposes, the acceptability range is defined in terms of a maximum value, or a minimum value, or both.

Table 3 — Sampling plans for normal inspection (master table)

Acceptable quality levels (normal inspection). Each cell gives the acceptance number (Ac) and rejection number (Re). ↓ = use first sampling plan below arrow; ↑ = use first sampling plan above arrow.

Sample size code letter	Sample size	0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
A	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31
B	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45
C	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑
D	8	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑
E	13	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑
F	20	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑
G	32	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑
H	50	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑
J	80	↓	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑	↑
K	125	↓	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑	↑	↑
L	200	↓	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑	↑	↑	↑
M	315	↓	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
N	500	↓	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
P	800	↓	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Q	1 250	↓	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
R	2 000	↓	0 1	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑

↓ = Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, carry out 100 % inspection.

↑ = Use first sampling plan above arrow.

Ac = Acceptance number

Re = Rejection number

NORMAL

Table 4 — Sampling plans for tightened inspection (master table)

Acceptable quality levels (tightened inspection)

Each cell gives **Ac Re** (Acceptance number, Rejection number). ↓ = Use first sampling plan below arrow. ↑ = Use first sampling plan above arrow.

Code	Sample size	0,010	0,015	0,025	0,040	0,065	0,10	0,15	0,25	0,40	0,65	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000
A	2																	0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28
B	3																0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28	41 42
C	5															0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28	41 42	↑
D	8														0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28	41 42	↑	
E	13													0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	27 28	41 42	↑		
F	20												0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑	↑	↑			
G	32											0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑						
H	50										0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑							
J	80									0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑								
K	125								0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑									
L	200							0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑										
M	315						0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑											
N	500					0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑												
P	800				0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑													
Q	1 250			0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑														
R	2 000		0 1	↓	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑															
S	3 150	0 1	↑	1 2	2 3	3 4	5 6	8 9	12 13	18 19	↑																

↓ = Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, carry out 100 % inspection.
↑ = Use first sampling plan above arrow.
Ac = Acceptance number
Re = Rejection number

TIGHTENED

4.5 Drawing up a sampling plan based on average test values

4.5.1 If the quality control or quality assurance plan is to be operated on the basis of average test values for a representative sample, then the first two columns of Table 3 give the sample size if normal inspection is to be used to determine the number of units (anodes) to be sampled. If tightened inspection is to be used, then the first two columns of Table 4 apply.

4.5.2 Switching between normal and tightened inspection shall be carried out as follows:

4.5.2.1 Normal inspection shall be used at the start of inspection unless otherwise agreed by both parties.

4.5.2.2 When normal inspection is being used, tightened inspection shall be instituted if two out of five consecutive batches have been determined not to be acceptable according to the sampling plan.

4.5.2.3 When tightened inspection is being used, normal inspection shall be instituted if five consecutive batches have been determined to be acceptable according to the sampling plan.

5 Taking test samples from individual anodes

5.1 Procedure

Using suitable core-drilling or sawing equipment with cutting edges preferably coated with diamond or another extremely hard material, take test samples in accordance with 5.2 and 5.3.

5.2 Dimensions of test samples

Choose the dimensions of each test sample according to the test to be carried out. Refer to the International Standards relating to the tests to be carried out to ensure that the samples taken from the anode are of suitable dimensions.

NOTE   If there are no instructions in the relevant International Standards, then the following guidelines should be followed:

a)   Samples of circular cross-section are preferred. A sample diameter of 50 mm is recommended.

b)   The smallest dimension of the sample should be three times the maximum particle size of the dry aggregate.

c)   The length of the sample should be at least 1,5 times the diameter for samples of circular cross-section and 1,5 times the diagonal if the sample has a square cross-section.

The test samples taken from the anode may already be of the correct dimensions. If not, they shall enable test pieces to be core-drilled or sawn or turned on a lathe from the test sample with a tolerance of 0,1 mm. The dimensions of the test samples shall be sufficient to allow test pieces with parallel sides to be prepared.

Report the dimensions of the test samples taken and the locations of the sampling points in the sampling report [see item 6 d)].

5.3 Sampling points

Figure 1 shows, in principle, the locations of sampling points and the direction of sampling for different sizes and designs of anode block.

The application of the sampling procedure shall not cause, as far as is possible, contamination, weakening or destruction of the anode block.
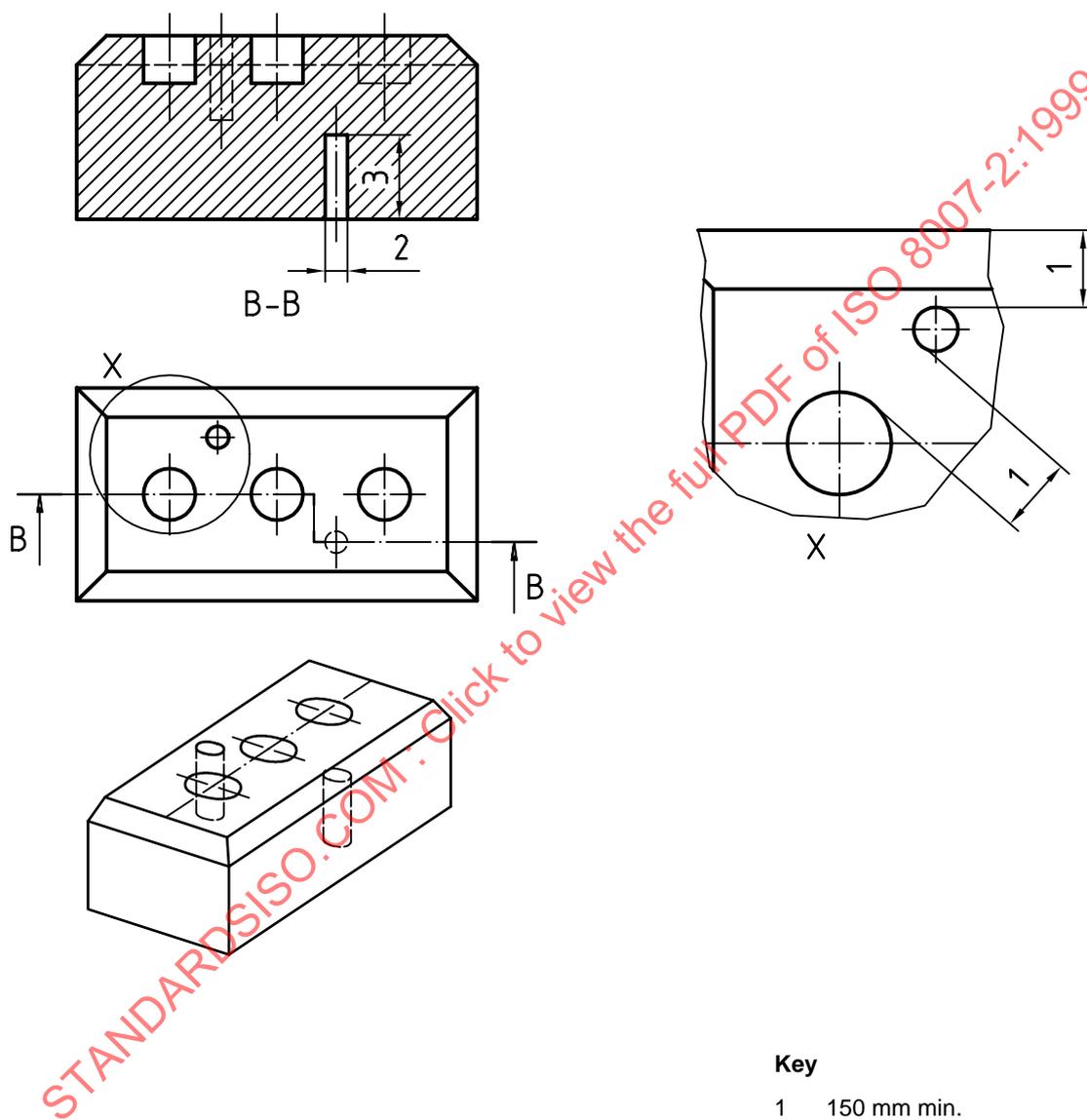
Key
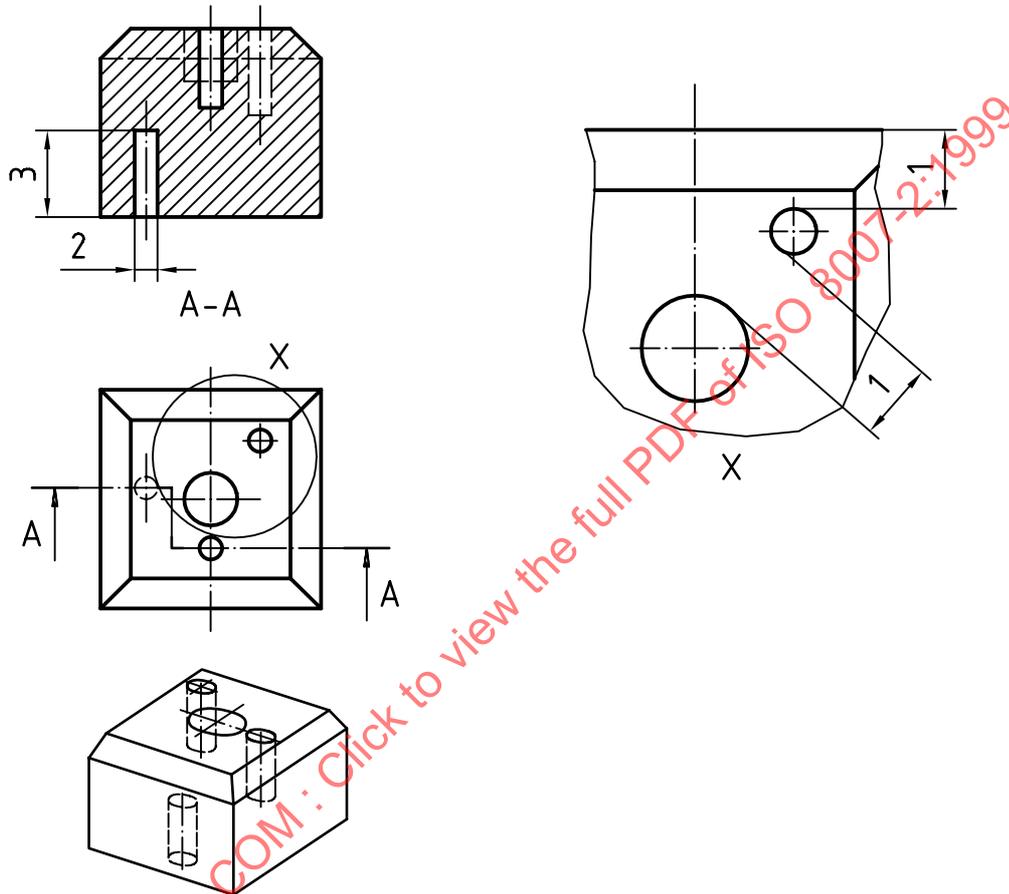
1   150 mm min.
2   Diameter 50 mm (or 30 mm)
3   Length 250 mm or 260 mm

a) Anodes with one stub hole

Figure 1 — Examples of the locations and the direction of sampling for different sizes and designs of anode blocks *(see also next two pages)*

Key

1   150 mm min.
2   Diameter 50 mm (or 30 mm)
3   Length 250 mm or 260 mm

b) Anodes with three stub holes

Figure 1 *(continued)*