

1. Purpose

Technical delivery specification for aluminium block material in accordance with **DIN EN 1676:2010-06** with a partially restricted composition. Listed under "3. chemical composition [%]" of the respective alloy.

2. Applicability

This document is valid for the following companies:

DGH Heidenau GmbH & Co. KG

and

DGH Hof GmbH & Co. KG

Müglitztalstraße 43

Ferdinand-Porsche-Straße 11

D-01809 Dohna

D-95028 Hof-Gattendorf

referred to herein as DGH GROUP or the Principal.

3. Chemical composition [%]

Financial rounding in accordance with DIN EN 1676:2010 (D) 6.3 as well as DIN EN 1780-3 shall be applied, see point 3.1.

Numerical designation:

EN AB-46000

Designation of chemical symbols:

EN AB-Al Si9Cu3(Fe)

Short symbols / colour code of the DGH GROUP:

Al alloy 226D RED

%	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Pb	Sn	Ti ¹	Other additives ^{2,3} individually	Other additives ^{2,3} in total	Al
min.	8.0	0.8	2.0		0.15									Remainder
max.	11.0	1.1	4.0	0.55	0.55	0.15	0.55	1.2	0.35	0.15	0.20	0.05	0.25	

The aforementioned data diverge from EN AB-46000 for the following constituents: Fe.

Numerical designation:

EN AB-47100

Designation of chemical symbols:

EN AB-Al Si12Cu1(Fe)

Short symbols / colour code of the DGH GROUP:

Al alloy 231D GREEN

%	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Pb	Sn	Ti ¹	Other additives ^{2,3} individually	Other additives ^{2,3} in total	Al
min.	10.5	0.6	0.7											Remainder
max.	13.5	1.1	1.2	0.55	0.35	0.10	0.30	0.55	0.20	0.10	0.15	0.05	0.25	

Numerical designation:

EN AB-43400

Designation of chemical symbols:

EN AB-Al Si10Mg(Fe)

Short symbols / colour code of the DGH GROUP:

Al alloy 239D BLUE

%	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Pb	Sn	Ti ¹	Other additives ^{2,3} individually	Other additives ^{2,3} in total	Al
min.	9.0	0.45			0.25	-								Remainder
max.	11.0	0.9	0.08	0.55	0.50	-	0.15	0.15	0.15	0.05	0.15	0.05	0.25	

List of revisions:	2	FB	Approved on:	03/11/2016
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Checked by:	H. Volkmann	QMO	Signature:	H. Volkmann
Approved by:	V. Barth	MD	Signature:	V. Barth

Numerical designation: **EN AB-44300**
 Designation of chemical symbols: **EN AB-Al Si12(Fe)**
 Short symbols/ colour code of the DGH GROUP: **Al alloy 230D BLACK**

%	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Pb	Sn	Ti ¹	Other additives ^{2,3} individually	Other additives ^{2,3} in total	Al
min.	10.5	0.45			-	-	-		-	-				Rema
max.	13.5	0.9	0.08	0.55	-	-	-	0.15	-	-	0.15	0.05	0.25	inder

- 1) Grain refiner such as Ti or B as well as master alloys containing germ-forming particles such as TiB₂, may not be considered contaminants. However, both the minimum and maximum limits for the elements used in connection with grain refinement must be agreed between the manufacturer and the customer.
- 2) "Other admix" contains elements that do not serve grain refinement or to refine the melts such as Na, Sr, Sb and P.
- 3) "Other admix" contains all elements not listed in the chemical composition or for which no specific value has been specified.

3.1 Colour coding

Every ingot stack must have a distinct colour mark

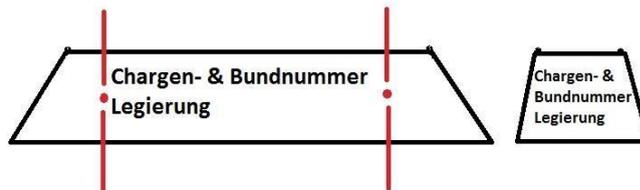
- Al alloy 226D red 
- Al alloy 230D black 
- Al alloy 231D green 
- Al alloy 239D blue 

with 20 mm wide vertical colour stripes around the perimeter of the stack.
 Bottom ingots must also be colour marked.
 The colour marking does not include fastening bands.

3.2 Analysis of the chemical composition

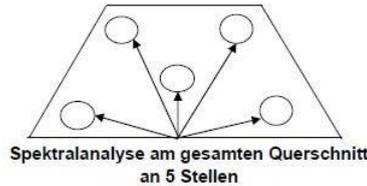
The chemical analysis of the ingot is performed in accordance with the following rules:

- Sampling of any ingot for each batch;
- 2 samples must be taken from deliveries consisting of only one batch,
- Labelling of the ingots (batch, delivery unit number and alloy) with a permanent marker,
- Separation of a piece (must be clearly labelled) with a saw (see sketch)



- Face milling of the cut surface using a milling cutter

- Chemical analysis on the spectrometre (see sketch)



3.3 Rounding rules (in accordance with DIN EN 1780-3)

The following rounding rules must be applied:

- If the number directly behind the last number to be kept is less than 5, then the last number to be kept shall remain unchanged (e.g. in the case of the decimal number: 0.14 becomes 0.1)
- if the number located directly behind the last number to be kept is greater than or equal to 5 and at least one number follows that is not zero, the last number to be kept increases by one (e.g. in the case of two decimal places: 1.0451 becomes 1.05),
- if the number directly behind the last number to be kept is equal to 5 and only zeros follow, the last number to be kept shall remain unchanged; if it is an even number it will be increased by one and, if it is an odd number it will remain unchanged (e.g. in the case of two decimal places. 0.3550 is 0.36 or 0.3450 is 0.34),
- the rounded number may not exceed or fall short of the defined limits ,
- if the sample analysis A is not positive, a B and C analysis will be performed with separate ingots and other ingot delivery units. This process is provided for in the work instruction "WE tests/ complaint to suppliers".

4. Quality

The ingots must be free of:

- visible flaws in the casting surface, oil, dirt and patches of corrosion, slag or other debris including paint
(exception: DGH GROUP colour coding, point 3),
- metallic or non-metallic inclusions,
- gas porosity
- Shrinkage cavities from production where the surface is open / cracked,
- surface moisture

5. Delivery conditions

Every delivery unit e.g. each ingot stack must have the respective colour label (see 3.1) and the following data:

- identity of the contractual partner,
- origin of the goods including the production site, name of the manufacturer,
- the alloy designation (see 3);
- the number of the melt batch, no more than 4 batches,
- the ingot from the delivery unit.

The type of labelling must be securely affixed to the delivery unit, be sufficiently weather-proof and may not result in any contamination.

Each ingot stack may only originate from one melt batch. The banding must be stable enough so that the ingot stack can be transported with a forklift without breaking or slipping. Bottom ingots are a secure part of the ingot stack.

It must be ensured that the ingot delivery unit is arranged in three stacks at the delivery location.

The maximum height of a delivery unit (1,000 mm) must be ensured with the same number of layers per delivery unit and batch within a delivery.

The individual ingots can be delivered as two-piece ingots with the following dimensions:

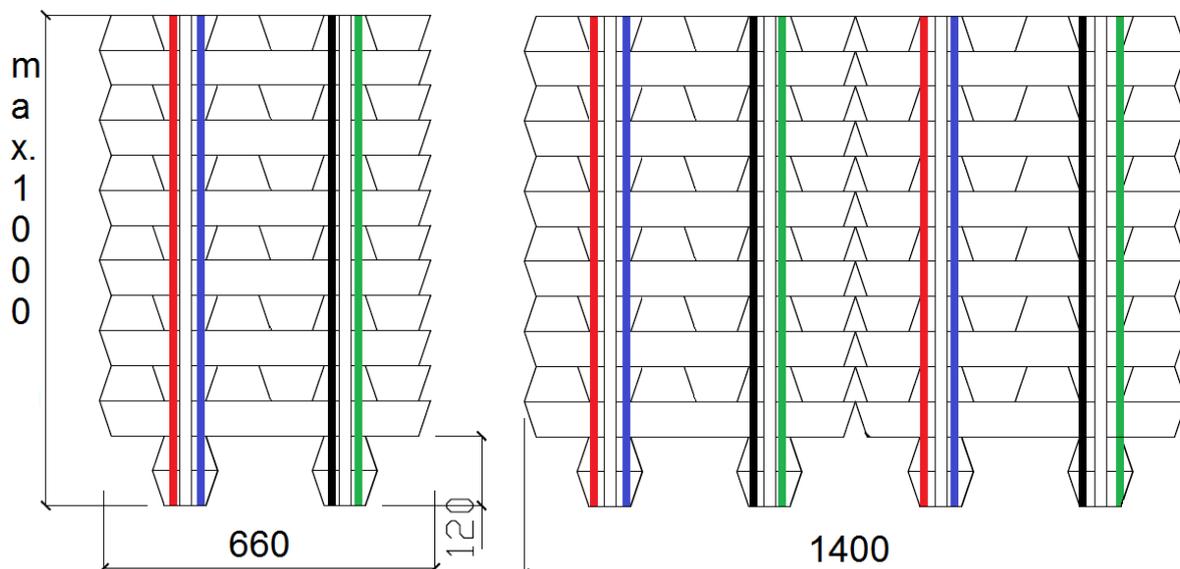
- Length: max. 660 mm
- Width: max. 130 mm
- Height: max.80 mm
- Piece weight: max. 8 kg
- Stack max. 1,000mm
- Delivery unit max. 660 mm individual delivery unit, max. 1.400 mm double delivery unit height:
- Delivery unit Individual delivery unit max. 600 kg, delivery max. 1,000 kg. weight:

Alternatively, horizontal continuously cast ingots will be delivered with the following dimensions:

- Length: max. 600 mm
- Width: max. 60 mm
- Height: max.80 mm
- Piece weight: max. 7 kg
- Stack height: max. 1,000 mm
- Delivery unit max. 600 mm
- Delivery unit Individual delivery unit max. 650 kg. weight:

5.1 Stack arrangement/ banding

The colour marking does not include fastening bands.



It is recommended that bottom ingots are doubled banded!

- Double delivery units consisting of two individual delivery units located next to one another.
- Double delivery units are preferred by the DGH GROUP.
- The supplier is responsible for packaging that ensures secure transport and cargo securing.
- Aluminium strips for securing the ingot stack are preferred; plastic bands are a permissible alternative.
- It is not permissible to pack them with steel bands.
- It is prohibited to secure the bands with stretch or shrink wrap.

5.2 Delivery documents

The following delivery documents are handed over upon delivery with the data:

- the identity of the contractual partner,
- origin of the goods⁴⁾ including the production site⁵⁾, manufacturer name,
- order number,
- alloy designation (see 3);
- number(s) of the melt batch(es) -> no more than 4 batches per delivery,
- an acceptance inspection certificate 3.1 in accordance with DIN EN 10204 for the results of the chemical analysis for all elements listed under 3
- the confirmation "free of radioactively contaminated substances" (see 6),
- the mass of each delivery unit and the total mass (pack list);
- the shape of the product

4) **Ban on use of raw materials from conflict countries**

No conflict materials, that is raw materials like tantalum, tin, tungsten and gold are used to manufacture an Al casting alloy or must be demonstrably documented as conflict free. Conflict-free materials are raw materials that neither directly nor indirectly finance armed groups in the Democratic Republic of the Congo and their neighbouring countries through mining or trade.

5) **Manufacturing / production site**

The origin of the goods must be listed with the production site and the name of the producer in the enclosed documents.

6. Certificate of analysis

Sampling must be performed during pouring at the contractor's location in accordance with DIN EN 14361. The optical spark emission spectroscopy of the chemical composition must be performed in accordance with DIN EN 14726. The number of sparks must occur in each case with the same number on each specimen. At least 2 (two) spark points per specimen. The mean value for each specimen must be within the values defined by the Technical Delivery Specification (TDS) for the chemical composition (see point 3).

An acceptance inspection certificate 3.1 in accordance with DIN EN 10204 for each charge must be enclosed with each lot. The documentation must contain all individual values as well as the mean value for the specimen.

It must be confirmed on the acceptance inspection certificate that the delivered material is "Free of radioactively contaminated substances". A value of < 5µSv/h applies within the DGH GROUP.

7. Transport and storage

Storage and transport to the Principal must fulfil quality criteria, be protected from exposure to the elements (wetness and dirt) and comply with valid German/and European legislation.

The sender is responsible for proper loading and the freight carrier is responsible for properly securing the load. The contractor must enclose photo documentation of the load and securing of the load if the delivery documentation is requested.

8. Unloading conditions

The freight carrier must be loaded so as to ensure that the load can be unloaded on both sides at the delivery location. Ramp unloading may not occur at the companies of the DGH GROUP. Deficient securing of the load results in an objection and rejection of the acceptance of goods.

9. Complaints

Divergences from the General Business Terms, the Technical Delivery Guidelines, Framework Supply Agreements (FSA), the Quality and Logistics Agreements (QLA) of the DGH GROUP will lead to complaints.

Special written approval must be obtained from the DGH GROUP before delivering the materials in the event of divergences from the specification documents named.

The foundry/ smelter department will make the decision, which will be communicated to the supplier by the purchasing department

Without special approval, the entire delivery will be objected in the event of a divergence and acceptance will be refused.

Objections will be sent to the contractor in writing.

The expenses for an objection will be charged to the contractor.

The contractor will be given the opportunity to perform an inspection on it part.

If a counter inspection becomes necessary, the following accredited laboratories shall be designated as arbitration bodies:

- D. Schmitt, Zerstörungsfreie Materialprüfung GmbH & Co. KG
Robert-Bosch-Straße 18
67227 Frankenthal
- HQM induserv GmbH
Johann-Esche-Str. 1
09120 Chemnitz

The counter inspections to be performed by the supplier or a third party must be performed in accordance with this Technical Delivery Specification (TDS).

The costs incurred in connection with the resolution of the dispute will be charged to the party at fault. The acceptance or partial acceptance of the delivery/ batch can, in the event of a complaint, be arranged between the Principal and the Contractor with special approval. The customer shall make the decision in this regard.

10. Further applicable documents for deliveries

To properly account for technical advancement in the Technical Delivery Guideline (TDG), the Principal will revise the document at irregular intervals. The Contractor undertakes to obtain the current version of the General Business Terms for Purchasing (GBTP), the Technical Delivery Guideline (TDG) of the DGH GROUP on the part of the Principal and/or the website www.dghgroup.de.



Unless expressly agreed otherwise, the version of the respective Technical Delivery Instruction (TDI) valid at the time of the order applies to deliveries.

11. Revision

List of revisions	Approved on:	Revision
0	06/01/2016	New version of the document
1	22/02/2016	Limit of delivery to 4 batches
2	03/11/2016	Change to the layout and text passages

12. Confirmation of content

Supplier

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Name / date / signature