ELISENTAL

WIRE
HIGH QUALITY
ROD
AL(L)-IN-ONE

Aluminium welding fillers

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Contents

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Aluminium welding fillers

Ideas are stimulation for unlimited possibilities.

WIRE. ROD. AL(L)-IN-ONE. We supply more than just drawn wire. Since the founding of the Spanish company ESAL ROD ALLOYS S.A., specialised in manufacturing continuous cast rod, we have had a direct influence on the production of the starting materials for manufacturing our welding filler metals. This means we are able to respond independently and individually to customer demands. This in turn guarantees the highest degree of quality, flexibility and security of supply. Rational investments in highly sophisticated manufacturing systems are fundamentally important for our continuous advancement.

As an independent family-run business, we have nearly 100 years of experience and extensive resources to draw on, and therefore look to the future with confidence. Our decision to focus on the material aluminium in the early days has since allowed us to develop into a leading European manufacturer of aluminium wire. We have been working intensively on producing aluminium alloy welding fillers for half a century now.

ELISENTAL
Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Full process control – since day one

ELISENTAL products stand out for their consistently high and stable quality. Since day one, we have had control over the entire manufacturing process. Thus, we create the basis for top quality starting already with the production of continuous cast wire.

Use of continuous cast wire from our own pre-production gives our customers many advantages. Benefits include, in particular:

– High security of supply
– Control over the entire process
– Latest generation plant technology
– Innovative alloy developments
– Special tolerance of compatible chemical composition

All of these factors result in absolutely constant process capability at very stable, high quality.

Modern drawing equipment, diverse surface treatments and specially developed cleaning processes are all parts of the continuous process that guarantees the excellent weldability of our twist-free, layer-wound welding filler metals at consistently high quality.

Extensive approvals from various certification and classification bodies attest to the excellent wire quality. ELISENTAL welding filler metals are regularly subjected to independent quality controls and tested for their suitability for welding. Our products satisfy the requirements of our most demanding customers, particularly in sensitive applications.

INNOVATION

ELISENTAL-alloy development

S Al 4020 (AlSi3Mn1) – A material of great potential

- Al-based filler metal for aluminium–aluminium welding as well as aluminium–steel and steel–steel joint brazing
- Alloy developed with optimised parameters in terms of grain refinement, improved mechanical properties and influence of diffusion
- Filler metal that achieves the highest assessment group according to DIN EN ISO 10042 with excellent porosity values
- Very low hydrogen content in the filler metal
- Especially suitable for working with extra-large gaps
- On average 10 to 15% higher strengths with simultaneously much higher ductility
- Well established in automotive OEM series applications

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Move forward with in-depth consultation

We see ourselves not only as a supplier of German quality wires but also as a development and optimisation partner for our customers.

Providing you, the customer, with support and advice is of primary concern to us. As a premium supplier, we develop new alloys, identify optimisation potentials together with you and develop solutions to improve the customer-side manufacturing processes – naturally including technical application advice with onsite support from our welding specialists.

You will find a number of general recommendations for welding with aluminium wires at the end of this catalogue.

We are firmly convinced that it is not just about quality, rather it is always the sum of multiple factors that makes for lastingly successful cooperation.

**ELISENTAL –
UNLIMITED POSSIBILITIES
FOR IDEAS FOR THE FUTURE!**

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WIRE HIGH QUALITY ROD AL(L)-IN-ONE

ELISENTAL at a glance

- From raw material to wire – everything from one source: WIRE. ROD. AL(L)-IN-ONE.
- Continuous monitoring of the entire process chain
- The continuous cast wires for producing welding filler metals are degassed multiple times already at the beginning of the process to reduce hydrogen content.
- The segregation layer of the continuous cast wire is removed by machining immediately after hardening.
- Consistently excellent wire quality thanks to modern drawing equipment, innovative surface treatment processes and specially developed cleaning processes
- Development and implementation of newly conceived cleaning processes specifically for welding filler metals
- Continuous and in-process control of the surface quality of our welding filler metals
- Long-term investments in highly technically sophisticated drawing and surface treatment technologies
- Absolute focus on a constant process for the most reliable customer application
- Development and consulting partner with nearly 100 years of experience and the possibility to influence the composition of the starting material
- Collaboration with universities and technical colleges in research and development
- Our cooperation is especially close with BTU Cottbus-Senftenberg.
- Cooperation with external, accredited testing institutes for independent quality controls regarding welding suitability
- Active involvement in standards committees for developing the frameworks for topics relating to aluminium welding
- We are a member of the German Welding Society (DVS), Deutscher Verband für Schweißen und verwandte Verfahren e.V.
- ELISENTAL is a member of the Association of manufacturers of welding consumables, Schweißelektroden-Vereinigung e.V.
- As a member of the Gesamtverband der Aluminiumindustrie e.V. (GDA), we have long been committed to the material aluminium.

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btu Brandenburgische Technische Universität Cottbus - Senftenberg

FT Tribologie Fertigungstechnik

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Our research – your benefit!

Department of manufacturing technology / tribology (F/T) of the Brandenburg University of Technology Cottbus-Senftenberg (BTU C-S) focuses on the fields of joining and coating technology. They conduct research into joining mechanisms and develop joining and coating technologies.

Many problems to be solved relate to lightweight construction and development of resistant surfaces. Aluminium is a very important component in these respects, given its chemical–physical properties. Current R&D topics include continuous quality work, development of new alloys, production of coatings with aluminium filler metals and development of mixed-metal joints (aluminium–steel and aluminium–magnesium).

Latest generation equipment is available for assessing theoretical approaches. This applies to arc technology, generators for inductive heating processes and laser technology.

All physical and chemical parameters are determined for Al-based filler metals, for example:

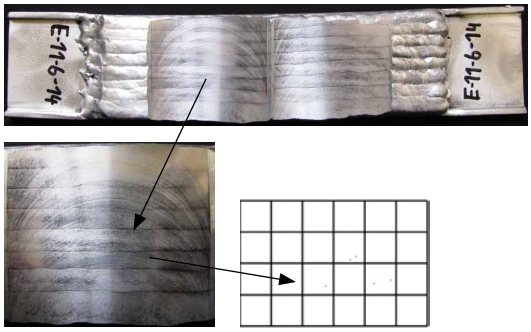
- Diameter
- Roundness
- Friction
- On-centre spacing
- Suitability for welding
- Chemical/metallographic analysis
- Measurement of H2 content
- Porosity (according to DIN EN ISO 10042) (see picture) with suitability reports prepared according to EN 14532.

Furthermore, welds and brazed joints are made and the physical and chemical properties of the joints determined. Sprayed coatings are analysed for their corrosive and tribological properties.

The water content is determined using the carrier gas melt extraction method using a G8 GALILEO from Bruker Elemental GmbH (see picture). Standards, such as DIN EN ISO 18273 and DIN EN ISO 3690, and guidelines of DVS Bulletin 0947 are observed.

This continuous and successful collaboration is a good basis for future-oriented development and consistent, sustainable quality.

MIG welding of Al-based filler metals



Testing S Al 4020 (AlSi3Mn1) for porosity

Hydrogen analyser G8 GALILEO (Bruker Elemental GmbH)

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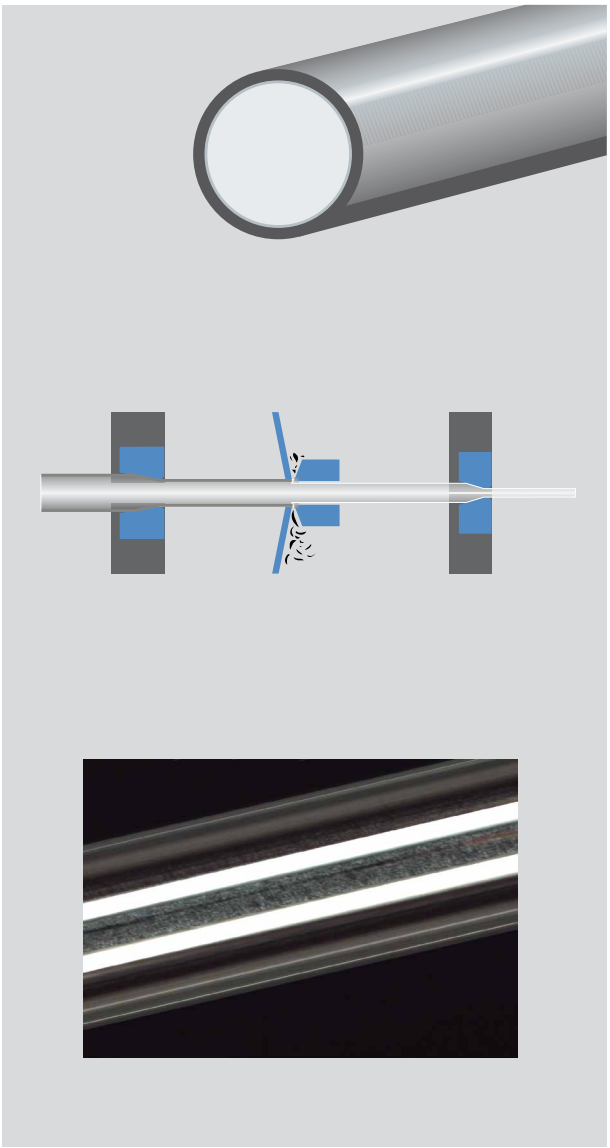
Manufacturing process

Aluminium wires are DRAWN on modern multi-wire drawing machines with precisely matched cross-section reductions. Wires of utmost diameter precision are drawn using continually optimised lubricants and drawing tools.

The wires are SURFACE TREATED in a multi-stage process. In this process, all contamination layers, including the oxide layer from drawing stock production, are completely removed by machining, and a surface is produced that is essential for a high quality filler metal.

The wire surface is FINISHED on specially developed, multi-stage machinery. This machinery uses exclusively highly efficient and at the same time eco-friendly media. Firstly, this removes residues left over from the production process from the surface and, secondly, the innovative technology ensures good slip properties of the wires in the wire feed systems of welding machines. The result is absolutely constant surface quality of the ELISENTAL welding filler metals that are tailored to customer requirements.

The finished filler metals are PACKAGED either on modern semi-automatic winding machines for spooled wires, or on our drum winding machines for drum-type forms of supply. Welding rods are straightened on special straightening machines and embossed to meet standards.



TEST REPORT RESIDUE ANALYSER

Batch:	160006
Alloy:	5356 AlMg5Cr (A)
Diameter:	1,20 mm
Client:	Musterkunde
Works order:	190236
Spool No.:	2/200
Machine:	HAU 2

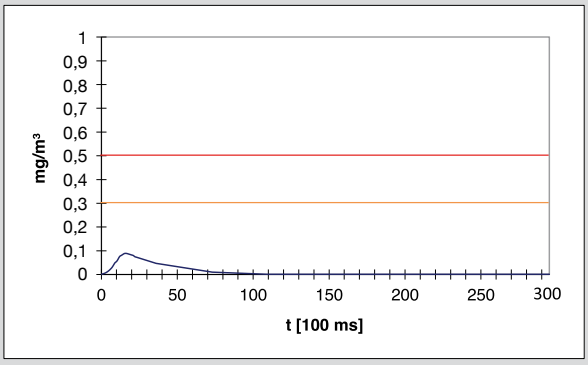
RESULTS

Peak:	0,089 mg/m³
Total:	0,158 mg/m³

DEVICE PARAMETERS

Pulsed current: 310 A Pulse duration: 500 ms

Diagram:



Example test report

Application recommendations

The overview on this page is provided to help you select the optimum welding filler metal for your application, and shows the type series for the respective combinations of wrought and/or cast base materials to be welded.

Which of the welding filler metals from the respective type series (see the table on page 10) will ultimately be used is determined by the specific welding task. Please also note the explanations given in the footnotes.

Base mat.	AlCuMn	AlCu	AlSiCu	AlSiMg	AlZnMg	AlMgSi	AlMg 5% etc. with Mn	AlMg 3% etc. with Mn	AlMg<1%	AlMn	Al
Al			4 4 4	4 4 4	5 5 5	4 o. 5 5 4	5 5 5	4 o. 5 5d 4 o. 5	4 o. 5 1 4	4 o. 5 1 4	4 1 4
AlMn			4 4 4	4 4 4	5 5 5	4 o. 5 5 4	5 5 5	5 5d o. 3 4	4 4 4	3 o. 4 3 4	
AlMg<1% [a]			4 4 4	4 4 4	5 5 5	4 o. 5 5 4	5 5 5	5 5d 4	4 4 4		
AlMg 3% etc. with Mn			4 4 4	4 4 4	5 5 5	5 5 4	5 5 5	5 5d 5			
AlMg 5% [b] etc. with Mn			4 4 4	4 4 4	5 5 5	5 5 4	5 5 5				
AlMgSi [c]		4 4 4	4 4 4	4 4 4	5 5 5	4 o. 5 5 4					
AlZnMg		4 4 4	4 4 4	4 4 4	5 5 5						
AlSiMg [e]		4 4 4	4 4 4	4 4 4							
AlSiCu [e, f]		4 4 4	4 4 4								
AlCu [e]		4									
AlCuMn	2 2 2										

Information in each box:

1. row = Optimum mechanical properties
2. row = Optimum corrosion properties
3. row = Optimum suitability for welding

No data = Not recommended

The base materials are listed according to their chemical composition, without reference to whether they are wrought or cast materials.

Footnote explanations

a) When welding without filler, these alloys are susceptible to forming solidification cracks. This can be prevented by employing rigid clamps, otherwise a change to a base material with Mg > 3 % is advisable.
b) Under certain environmental conditions, e.g. at temperatures > 65 °C, alloys with a Mg content > 3 % can be susceptible to intercrystalline corrosion and/or stress corrosion cracking. This susceptibility increases with increasing Mg content, where the degree of mixing must be considered.
c) These alloys are not recommendable for welding without a filler metal, since they are susceptible to forming cold cracks.
d) The resistance of type 5 against intercrystalline corrosion and stress corrosion cracking is increased if the Mg content does not exceed ~ 3 %. Under conditions that could possibly cause intercrystalline corrosion and/or stress corrosion cracking, the Mg content of the weld metal should be similar to that of the base material and should not be significantly greater. Accordingly, this must be observed when welding the base material with the corresponding alloys for the welding filler metals.
e) The Si content of the welding filler materials should be selected so as to match that of the cast base material as closely as possible.
f) The weldability of die cast alloys depends greatly on its gas content.

Grouping of aluminium welding fillers

Welding filler groups	Numerical designation	Chemical formula	Works name	Comments
Typ **1**	S Al **1**098 S Al **1**080 A S Al **1**450	S Al99,98 S Al99,8 (A) S Al99,5 Ti	DE 50 DE 51 DE 53	Ti makes grain finer and thus prevents formation of solidification cracks.
Typ **2**	S Al **2**319	S AlCu6MnZrTi	DE 71	
Typ **3**	S Al **3**103	S AlMn1	DE 54	
Typ **4**	S Al **4**020 S Al **4**043 A S Al **4**018 S Al **4**046 S Al **4**047 A	S AlSi3Mn1 S AlSi5 (A) S AlSi7Mg S AlSi10Mg S AlSi12 (A)	DE 33 DE 59 DE 68 DE 61 DE 60	Weld seams produced with Si filler oxidise upon anodising or environmental influences and, depending on the Si content, produce a grey to dark grey discolouration, which leads to colour differences between seam and base material. However, they are especially suitable for preventing the formation of solidification cracks (self-healing effect).
Typ **5**	S Al **5**249 S Al **5**554 S Al **5**754 S Al **5**356 S Al **5**556 A S Al **5**183 S Al **5**087	S AlMg2Mn0,8Zr S AlMg2,7Mn S AlMg3 S AlMg5Cr (A) S AlMg5Mn S AlMg4,5Mn0,7 (A) S AlMg4,5MnZr	DE 57 DE 65 DE 56 DE 58 DE 70 DE 63 DE 64	If good corrosion resistance and colour matching are of highest priority, then the Mg content of the welding filler metal should be equal to that of the base material. If high yield strengths and breaking strength are required, then a welding filler metal with a Mg content of 4,5–5,5% should be used. Cr = Reducing solidification cracks Zr = Reducing hot cracking

Note: The type numbers 1, 2, 3, 4 and 5 agree with the 1st numeral in the alloy numerical designation. They are shown in bold.

Notes on standards

DIN EN 573-3	Aluminium and aluminium alloys – Chemical composition and form of wrought products
EN ISO 18273	Welding consumables – Wire electrodes, wires and rods for welding of aluminium and aluminium alloys
DIN 1732 - 3	Filler metals for aluminium and aluminium alloys – Part 3: Test pieces, test specimens, mechanical and technological properties of all-weld metal
DIN EN ISO 544	Welding consumables – Technical delivery conditions for filler materials and fluxes
DIN EN 1011 - 4	Welding – Recommendations for welding of metallic materials
EUROCODE 9 DIN EN 1999-1-1	Design of aluminium structures
DIN EN ISO 9692 - 3	Welding and allied processes – Recommendations for joint preparation
DIN EN ISO 10042	Welding – Arc-welded joints in aluminium and its alloys – Quality levels for imperfections
DIN EN 13479	Welding consumables – General product standard for filler metals and fluxes for fusion welding of metallic materials
DIN EN 14532-3	Welding consumables – Test methods and quality requirements
DIN EN ISO 17672	Brazing – Filler metals

Certificate

Standard **ISO 9001:2008**

Certificate Registr. No. 01 100 4263

TÜV Rheinland Cert GmbH certifies:

Certificate Holder:

ELISENTAL

Drahtwerk Elisental W. Erdmann GmbH & Co.
Werdohler Straße 40
D - 58809 Neuenrade

Scope: Manufacture and sales of wire and rods of Aluminium, Aluminium-Alloys and Magnesium-Alloys

An audit was performed, Report No. 4263.
Proof has been furnished that the requirements according to ISO 9001:2008 are fulfilled.

The due date for all future audits is 06-12 (dd.mm).

Validity: The certificate is valid from 2014-02-17 until 2017-02-16.

First certification 1994

2014-02-20

TÜV Rheinland Cert GmbH
Am Grauen Stein · 51105 Köln

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Certificate

Standard **ISO / TS 16949:2009**
(3rd edition, 2009-06-15)

Certificate Registr. No. 01 111 4263
IATF Certificate No. 0179710

Certificate Holder: **Drahtwerk Elisental**
W. Erdmann GmbH & Co.
Werdohler Straße 40
D - 58809 Neuenrade

Scope: Production of wire and rods of Aluminium and Aluminium-Alloys

Proof has been furnished by means of an audit that the requirements of ISO / TS 16949:2009 are met.

Issue date/Expiry date: The certificate is valid from 2014-02-17 until 2017-02-16.

Release date: 2015-02-26 (Change)

TÜV Rheinland Cert GmbH
Am Grauen Stein · 51105 Köln
Germany

IATF
2-IAO-QMC 01003

1 / 1

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Approvals

Symbol of approval authority	Approvals	Works name	Numerical designation
DNV·GL	Det Norske Veritas Germanischer Lloyd Shipbuilding	DE 56 DE 58 DE 63 DE 64	S Al 5754 S Al 5356 S Al 5183 S Al 5087
LR	Lloyd`s Register of Shipping Shipbuilding	DE 58 DE 63	S Al 5356 S Al 5183
RINA	Registro Italiano Navale Shipbuilding	DE 56 DE 58 DE 63 DE 64	S Al 5754 S Al 5356 S Al 5183 S Al 5087
ABS	American Bureau of Shipping Shipbuilding	DE 58 DE 63 DE 64	S Al 5356 S Al 5183 S Al 5087
BV	Bureau Veritas Shipbuilding	DE 58 DE 63 DE 64	S Al 5356 S Al 5183 S Al 5087
DB	Deutsche Bahn AG Rail vehicle construction	DE 33 DE 51 DE 53 DE 56 DE 57 DE 58 DE 59 DE 60 DE 63 DE 64 DE 65 DE 68	S Al 4020 S Al 1080 A S Al 1450 S Al 5754 S Al 5249 S Al 5356 S Al 4043 A S Al 4047 A S Al 5183 S Al 5087 S Al 5554 S Al 4018
TÜV	Technischer Überwachungs-Verein Pressure vessel construction	DE 33 DE 50 DE 51 DE 53 DE 56 DE 57 DE 58 DE 59 DE 63 DE 64 DE 65	S Al 4020 S Al 1098 S Al 1080 A S Al 1450 S Al 5754 S Al 5249 S Al 5356 S Al 4043 S Al 5183 S Al 5087 S Al 5554
BWB	Federal Office of Bundeswehr for military defence technology and procurement High-stressed components for military defence material	DE 63 DE 64	S Al 5183 S Al 5087

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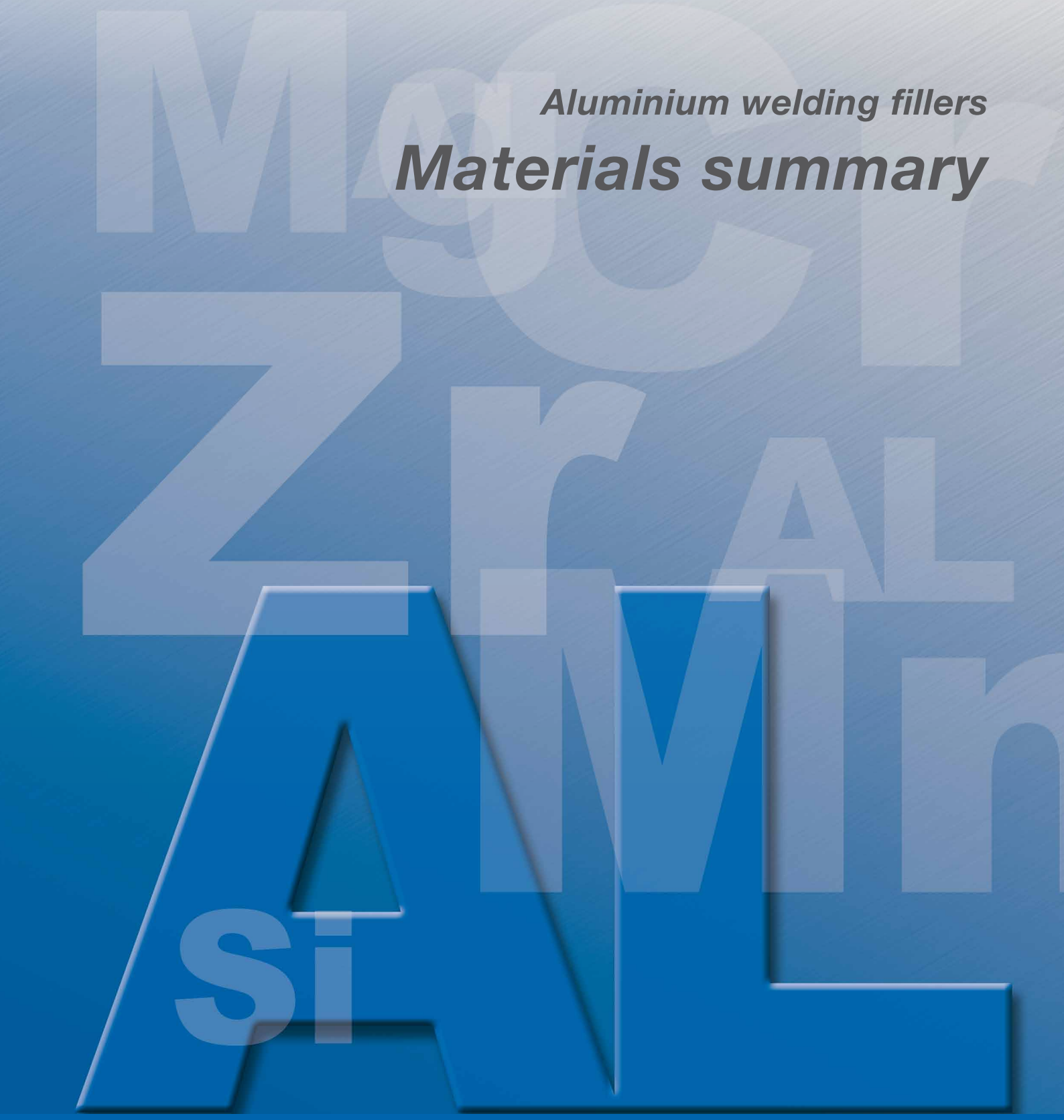
Aluminium welding fillers

Materials summary



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WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Technical data

Designation of the welding fillers		Chemical composition)[1])[2])[3])[4]		Physical properties		Welding deposit values (20 °C))[5]			Approvals
Numerical (works name)	Chemical	Alloy composition %	Permitted Ingredients %	Melting range °C ≈	Density g/cm³ ≈	0,2 - elongation limit N/mm²	Tensile strength N/mm²	Expansion (A5) %	
S Al 1098)[7] (DE50) *	S Al99,98	Al min. 99,98	Si 0,010 Fe 0,006 Cu 0,003 Zn 0,015 Ti 0,003 AE 0,003 AZ -	660	2,70	-	≥ 40	≥ 43	TÜV
S Al 1080 A (DE51) *	S Al99,8 (A)	Al min. 99,80	Si 0,15 Fe 0,15 Cu 0,03 Mn 0,02 Mg 0,02 Zn 0,06 Ga 0,03 Ti 0,02 AE 0,02 AZ -	658	2,70	-	≥ 60	≥ 40	TÜV DB
S Al 1450 (DE53) *	S Al99,5 Ti	Al min. 99,50 Ti 0,10 to 0,20	Si 0,25 Fe 0,40 Cu 0,05 Mn 0,05 Mg 0,05 Zn 0,07 AE 0,03 AZ -	647 to 658	2,71	≥ 20	≥ 65	≥ 35	TÜV DB
S Al 2319 (DE71) *	S AlCu6MnZrTi	Cu 5,8 to 6,8 Mn 0,20 to 0,40 Zr 0,10 to 0,25 Ti 0,10 to 0,20 Al Rest	Si 0,20 Fe 0,30 Mg 0,02 Zn 0,10 V 0,05 to 0,15	543 to 643	2,84	75)[6]	170)[6]	18)[6]	-
S Al 3103 (DE54)	S AlMn1	Mn 0,9 to 1,5 Al Rest	Si 0,50 Fe 0,7 Cu 0,10 Mg 0,30 Cr 0,10 Zn 0,20 Ti+Zr 0,10	648 to 657	2,73	≥ 35	≥ 90	≥ 24	-
S Al 4018 (DE68)	S AlSi7Mg	Si 6,5 to 7,5 Mg 0,50 to 0,8 Al Rest	Fe 0,20 Cu 0,05 Mn 0,10 Zn 0,10 Ti 0,20	550 to 625	2,70	≥ 80	≥ 140	≥ 2	DB
S Al 4020 (DE 33)	S AlSi3Mn1	Si 2,5 to 3,5 Mn 0,8 to 1,2 Al Rest	Fe 0,20 Cu 0,03 Mg 0,01 Cr 0,01 Ti 0,005 Zr 0,01 AE 0,02 AZ 0,10	575 to 579	2,71	≥ 50	≥ 120	≥ 25	TÜV DB
S Al 4043 A (DE 59)	S AlSi5 (A)	Si 4,5 to 6,0 Al Rest	Fe 0,6 Cu 0,30 Mn 0,15 Mg 0,20 Zn 0,10 Ti 0,15	573 to 625	2,68	≥ 40	≥ 120	≥ 8	TÜV DB
S Al 4046 (DE61)	S AlSi10Mg	Si 9,0 to 11,0 Mg 0,20 to 0,50 Al Rest	Fe 0,50 Cu 0,03 Mn 0,40 Zn 0,10 Ti 0,15	570 to 610	2,65	≥ 70	≥ 140	≥ 4	-
S Al 4047 A (DE60)	S AlSi12 (A)	Si 11,0 to 13,0 Al Rest	Fe 0,6 Cu 0,30 Mn 0,15 Mg 0,10 Zn 0,20 Ti 0,15	575 to 585	2,65	≥ 60	≥ 130	≥ 5	DB
S Al 5249 (DE57) *	S AlMg2Mn0,8Zr	Mg 1,6 to 2,5 Mn 0,50 to 1,1 Zr 0,10 to 0,20 Al Rest	Si 0,25 Fe 0,40 Cu 0,05 Cr 0,30 Zn 0,20 Ti 0,15	615 to 650	2,71	≥ 80	≥ 190	≥ 20	TÜV DB
S Al 5554 (DE65)	S AlMg2,7Mn	Mg 2,4 to 3,0 Mn 0,50 to 1,0 Al Rest	Si 0,25 Fe 0,40 Cu 0,10 Cr 0,05 to 0,20 Zn 0,25 Ti 0,05 to 0,20)[8]	602 to 648	2,68	≥ 100	≥ 215	≥ 18	TÜV DB
S Al 5754 (DE56)	S AlMg3	Mg 2,6 to 3,6 Al Rest	Si 0,40)[9] Fe 0,40 Cu 0,10 Mn 0,50 Cr 0,30 Zn 0,20 Ti 0,15 (Mn + Cr 0,10 to 0,6)	615 to 642	2,66	≥ 80	≥ 190	≥ 20	DNV GL RINA TÜV DB
S Al 5356 (DE58)	S AlMg5Cr (A)	Mg 4,5 to 5,5 Cr 0,05 to 0,20 Al Rest	Si 0,25 Fe 0,40 Cu 0,10 Mn 0,05 to 0,20 Zn 0,10 Ti 0,06 to 0,20)[8]	575 to 633	2,64	≥ 120	≥ 250	≥ 18	ABS BV DNV GL LR RINA TÜV, DB
S Al 5556 A (DE70)	S AlMg5Mn	Mg 5,0 to 5,5 Mn 0,6 to 1,0 Al Rest	Si 0,25 Fe 0,40 Cu 0,10 Cr 0,05 to 0,20 Zn 0,20 Ti 0,05 to 0,20)[8]	574 to 638	2,66	≥ 145	≥ 290	≥ 17	-
S Al 5183 (DE63)	S AlMg4,5Mn0,7 (A)	Mg 4,3 to 5,2 Mn 0,50 to 1,0 Al Rest	Si 0,40)[9] Fe 0,40 Cu 0,10 Cr 0,05 to 0,25 Zn 0,25 Ti 0,15	574 to 638	2,66	≥ 130	≥ 275	≥ 18	ABS, BV DNV GL LR RINA TÜV, DB BWB
S Al 5087 (DE64)	S AlMg4,5MnZr	Mg 4,5 to 5,2 Mn 0,7 to 1,1 Zr 0,10 to 0,20 Al Rest	Si 0,25 Fe 0,40 Cu 0,05 Cr 0,05 to 0,25 Zn 0,25 Ti 0,15	574 to 638	2,66	≥ 140	≥ 285	≥ 18	ABS, BV DNV GL RINA TÜV, DB BWB
Hartlot Al 112 DIN EN ISO 17672	B-Al88Si-575/585 (DIN EN ISO 3677)	Si 11,0 to 13,0 Al Rest	Fe 0,8 Cu 0,30 Mn 0,15 Mg 0,10 Zn 0,20 Cd 0,010 Pb 0,025	575 to 585	2,65	-	-	-	-

*** Material upon request**

)[1] Single values in the chart are maximum values.
)[2] Other elements individually max 0,05 %.
)[3] The sum of other elements max. 0,15 %.
)[4] All filler metals according to DIN EN ISO 18273 contain Be max. 0.0003
)[5] According to DIN 1732-3
)[6] Typical values.
)[7] Not contained in DIN EN ISO 18273.
)[8] The Ti content can be completely or partially substituted by other fine-grain-supporting elements.
)[9] In order to limit the risk of weld cracks, a Si content of 0,25 % is recommended.

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Aluminium alloy DE33 - 4020 - AlSi3Mn1

Reference analysis in wt. %			
Si	2,5 - 3,5	Ti	≤ 0,005
Fe	≤ 0,20	Zr	≤ 0,01
Cu	≤ 0,03	Be	≤ 0,0003
Mn	0,8 - 1,2	others each	≤ 0,02
Mg	≤ 0,01	others together	max. 0,10
Cr	≤ 0,01	Al	Rest

Standard designation	
DIN EN ISO 18273	S Al 4020 (AlSi3Mn1)

Base materials

Suitable for joint welding of aluminium alloys from 3000, 5000 and 6000 series.

Additional information

This alloy is mainly being used for welding applications. The material can be used for a wide range of welding applications. Under consideration of intermetallic phases this alloy can also be used for joining of aluminium alloys and zinc coated steel.
Most suitable for the last named application are the so called “cold arc” welding processes, e.g. CMT by Fronius.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	69000
Heat conductivity at 20°C [W/(mK)]	168
Coefficient of expansion (20°-100°C) [10^{-6}/K]	23,4*10^{-6}
Melting range [°C]	577 - 640
Electrical conductivity [m/Ω*mm²]	30,6
Density [g/cm³]	2,71

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 50
Tensile strength R_m [MPa]	≥ 120
Elongation A5 [%]	≥ 25
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

TÜV, DB

Dimensions Ø

MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods

Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium alloy DE54 - 3103 - AlMn1

Reference analysis in wt. %			
Si	≤ 0,50	Zn	≤ 0,20
Fe	≤ 0,7	Ti + Zr	≤ 0,10
Cu	≤ 0,10	Be	≤ 0,0003
Mn	0,9 - 1,5	others each	≤ 0,05
Mg	≤ 0,30	others together	max. 0,15
Cr	≤ 0,10	Al	Rest

Standard designation	
DIN EN ISO 18273	S Al 3103 (AlMn1)

Base materials
Suitable for joint welding of aluminium alloys from 3000 and 5000 series.

Additional information
A high level of corrosion resistance, formability and weldability.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	69500
Heat conductivity at 20°C [W/(mK)]	160 - 200
Coefficient of expansion (20°-100°C) [10^{-6}/K]	23,5*10^{-6}
Melting range [°C]	645 - 655
Electrical conductivity [m/Ω*mm²]	22 - 28
Density [g/cm³]	2,73

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 35
Tensile strength R_m [MPa]	≥ 90
Elongation A_5 [%]	≥ 24
Test temperature [°C]	20

Welding positions
PA, PB, PC, PF

Shielding gas
I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity
MIG =+, TIG ~

Approvals

Dimensions Ø	
MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods	
Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

ELISENTAL
Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE56 - 5754 - AlMg3

Reference analysis in wt. %			
Si	≤ 0,40	Zn	≤ 0,20
Fe	≤ 0,40	Ti	≤ 0,15
Cu	≤ 0,10	Be	≤ 0,0003
Mn	≤ 0,50	others each	≤ 0,05
Cr	≤ 0,30	others together	max. 0,15
Mn + Cr	0,10 - 0,6	Al	Rest
Mg	2,6 - 3,6		

Standard designation	
DIN EN ISO 18273	S Al 5754 (AlMg3)

Base materials

Suitable for joint welding of aluminium alloys from 5000 and 6000 series.

Additional information

Anodizing quality allows excellent anodizing properties. Very good resistance to corrosion, especially in seawater and marine and industrial atmosphere.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	70500
Heat conductivity at 20°C [W/(mK)]	140 - 160
Coefficient of expansion (20°-100°C) [10^{-6}/K]	23,9*10^{-6}
Melting range [°C]	610 - 640
Electrical conductivity [m/Ω*mm²]	20 - 23
Density [g/cm³]	2,66
Specific heat capacity [J/(kg*K)]	900
Shear modulus [MPa]	26500

Mechanical properties (guideline values, without dilution)			
Yield strength $R_{p0,2}$ [MPa]	≥ 80	Elongation A_5 [%]	≥ 20
Tensile strength R_m [MPa]	≥ 190	Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

DNV GL, RINA, TÜV, DB

Dimensions Ø	
MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods	
Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE58 - 5356 - AlMg5Cr (A)

Reference analysis in wt. %			
Si	≤ 0,25	Zn	≤ 0,10
Fe	≤ 0,40	Ti	0,06 - 0,20
Cu	≤ 0,10	Be	≤ 0,0003
Mn	0,05 - 0,20	others each	≤ 0,05
Mg	4,5 - 5,5	others together	max. 0,15
Cr	0,05 - 0,20	Al	Rest

Standard designation	
DIN EN ISO 18273	S Al 5356 (AlMg5Cr (A))

Base materials

Suitable for joint welding of aluminium alloys from 5000 and 6000 series.

Additional information

The weld metal has a very good corrosion resistance to seawater and marine atmosphere. Suitable for anodizing when matching colors are required.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	69000
Heat conductivity at 20°C [W/(mK)]	110 - 150
Coefficient of expansion (20°-100°C) [10^{-6}/K]	23,9*10^{-6}
Melting range [°C]	575 - 633
Electrical conductivity [m/Ω*mm²]	15 - 19
Density [g/cm³]	2,64

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 120
Tensile strength R_m [MPa]	≥ 250
Elongation A_5 [%]	≥ 18
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

ABS, BV, DNV GL, LR, RINA, TÜV, DB

Dimensions Ø

MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods

Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE59 - 4043 A - AlSi5 (A)

Reference analysis in wt. %			
Si	4,5 - 6,0	Ti	≤ 0,15
Fe	≤ 0,6	Be	≤ 0,0003
Cu	≤ 0,30	others each	≤ 0,05
Mn	≤ 0,15	others together	max. 0,15
Mg	≤ 0,20	Al	Rest
Zn	≤ 0,10		

Standard designation	
DIN EN ISO 18273	S Al 4043 A (AlSi5 (A))

Base materials

Suitable for joint welding of aluminium alloys from 3000, 5000 and 6000 series.

Additional information

This alloy is used to prevent solidification cracks in combination with a high clamping. During anodizing there could be a dark- grey color change. The melting bath is very thin.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	69000
Heat conductivity at 20°C [W/(mK)]	170 - 190
Coefficient of expansion (20°-100°C) [10^{-6}/K]	22,1*10^{-6}
Melting range [°C]	573 - 625
Electrical conductivity [m/Ω*mm²]	24 - 32
Density [g/cm³]	2,68

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 40
Tensile strength R_m [MPa]	≥ 120
Elongation A_5 [%]	≥ 8
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

TÜV, DB

Dimensions Ø	
MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods	
Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE60 - 4047 A - AlSi12 (A)

Reference analysis in wt. %			
Si	11,0 - 13,0	Ti	≤ 0,15
Fe	≤ 0,6	Be	≤ 0,0003
Cu	≤ 0,30	others each	≤ 0,05
Mn	≤ 0,15	others together	max. 0,15
Mg	≤ 0,10	Al	Rest
Zn	≤ 0,20		

Standard designation	
DIN EN ISO 18273	S Al 4047 A (AlSi12 (A))

Base materials

Welding of cast alloys.

Additional information

This alloy is used to prevent solidification cracks in combination with a high clamping. During anodizing there could be a dark- grey color change. The melting bath is very thin.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	75000
Heat conductivity at 20°C [W/(mK)]	140 - 170
Coefficient of expansion (20°-100°C) [10^{-6}/K]	$20*10^{-6}$
Melting range [°C]	575 - 585
Electrical conductivity [m/Ω*mm²]	17 - 27
Density [g/cm³]	2,65

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 60
Tensile strength R_m [MPa]	≥ 130
Elongation A_5 [%]	≥ 5
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

DB

Dimensions Ø	
MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods	
Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE61 - 4046 - AlSi10Mg

Reference analysis in wt. %			
Si	9,0 - 11,0	Ti	≤ 0,15
Fe	≤ 0,50	Be	≤ 0,0003
Cu	≤ 0,03	others each	≤ 0,05
Mn	≤ 0,40	others together	max. 0,15
Mg	0,20 - 0,50	Al	Rest
Zn	≤ 0,10		

Standard designation	
DIN EN ISO 18273	S Al 4046 (AlSi10Mg)

Base materials

Suitable for joint welding of aluminium alloys from 3000, 5000and 6000 series.

Additional information

High stability. High weldability.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	74000
Heat conductivity at 20°C [W/(mK)]	150 - 170
Coefficient of expansion (20°-100°C) [10^{-6}/K]	$21*10^{-6}$
Melting range [°C]	570 - 610
Electrical conductivity [m/Ω*mm²]	19 - 25
Density [g/cm³]	2,65

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 70
Tensile strength R_m [MPa]	≥ 140
Elongation A_5 [%]	≥ 4
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

Dimensions Ø

MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods

Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE63 - 5183 - AlMg4,5Mn0,7 (A)

Reference analysis in wt. %			
Si	≤ 0,40	Zn	≤ 0,25
Fe	≤ 0,40	Ti	≤ 0,15
Cu	≤ 0,10	Be	≤ 0,0003
Mn	0,50 - 1,0	others each	≤ 0,05
Mg	4,3 - 5,2	others together	max. 0,15
Cr	0,05 - 0,25	Al	Rest

Standard designation	
DIN EN ISO 18273	S Al 5183 (AlMg4,5Mn0,7 (A))

Base materials

Suitable for joint welding of aluminium alloys from 5000 and 6000 series.

Additional information

The weld metal has a very good corrosion resistance to seawater and marine atmosphere as well as industrial atmosphere. Suitable to hard chrome plating and chemical nickel-plating.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	69000
Heat conductivity at 20°C [W/(mK)]	110 - 120
Coefficient of expansion (20°-100°C) [10^{-6}/K]	23,7*10^{-6}
Melting range [°C]	574 - 638
Electrical conductivity [m/Ω*mm²]	16 - 19
Density [g/cm³]	2,66

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 130
Tensile strength R_m [MPa]	≥ 275
Elongation A_5 [%]	≥ 18
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

ABS, BV, DNV GL, LR, RINA, TÜV, DB, BWB

Dimensions Ø	
MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods	
Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE64 - 5087 - AlMg4,5MnZr

Reference analysis in wt. %			
Si	≤ 0,25	Ti	≤ 0,15
Fe	≤ 0,40	Zr	0,10 - 0,20
Cu	≤ 0,05	Be	≤ 0,0003
Mn	0,7 - 1,1	others each	≤ 0,05
Mg	4,5 - 5,2	others together	max. 0,15
Cr	0,05 - 0,25	Al	Rest
Zn	≤ 0,25		

Standard designation	
DIN EN ISO 18273	S Al 5087 (AlMg4,5MnZr)

Base materials

Suitable for joint welding of aluminium alloys from 2000, 5000, 6000 and 7000 series.

Additional information

Weldseam has to be bright. Components should be heated up to 150°C to prevent welding defects and to avoid tension.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	69000
Heat conductivity at 20°C [W/(mK)]	110 - 120
Coefficient of expansion (20°-100°C) [10^{-6}/K]	23,7*10^{-6}
Melting range [°C]	574 - 638
Electrical conductivity [m/Ω*mm^2]	16 - 19
Density [g/cm^3]	2,66

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 140
Tensile strength R_m [MPa]	≥ 285
Elongation A_5 [%]	≥ 18
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

ABS, BV, DNV GL, RINA, TÜV, DB, BWB

Dimensions Ø

MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods

Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE65 - 5554 - AlMg2,7Mn

Reference analysis in wt. %			
Si	≤ 0,25	Zn	≤ 0,25
Fe	≤ 0,40	Ti	0,05 - 0,20
Cu	≤ 0,10	Be	≤ 0,0003
Mn	0,50 - 1,0	others each	≤ 0,05
Mg	2,4 - 3,0	others together	max. 0,15
Cr	0,05 - 0,20	Al	Rest

Standard designation	
DIN EN ISO 18273	S Al 5554 (AlMg2,7Mn)

Base materials

Suitable for joint welding of aluminium alloys from 5000 and 6000 series.

Additional information

Very good resistance to seawater and atmospheric corrosion. Good strength in applications for temperatures in the 65 – 160°C range.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	70 GPA
Heat conductivity at 20°C [W/(m*K)]	
Coefficient of expansion (20°-100°C) [m/K]	
Melting range [°C]	602 - 648
Electrical conductivity [m/Ω*mm²]	
Density [g/cm³]	2,68

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 100
Tensile strength R_m [MPa]	≥ 215
Elongation A_5 [%]	≥ 18
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

TÜV, DB

Dimensions Ø

MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods

Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE68 - 4018 - AlSi7Mg

Reference analysis in wt. %			
Si	6,5 - 7,5	Ti	≤ 0,20
Fe	≤ 0,20	Be	≤ 0,0003
Cu	≤ 0,05	others each	≤ 0,05
Mn	≤ 0,10	others together	max. 0,15
Mg	0,50 - 0,8	Al	Rest
Zn	≤ 0,10		

Standard designation	
DIN EN ISO 18273	S Al 4018 (AlSi7Mg)

Base materials

Suitable for joint welding of aluminium alloys from 3000, 5000 and 6000 series.

Additional information

A high level of corrosion resistance and weldability.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	65000 - 75000
Heat conductivity at 20°C [W/(mK)]	1,43 - 1,72
Coefficient of expansion (20°-100°C) [10^{-6}/K]	$22*10^{-6}$
Melting range [°C]	550 - 625
Electrical conductivity [m/Ω*mm²]	21 - 26
Density [g/cm³]	2,70

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 80
Tensile strength R_m [MPa]	≥ 140
Elongation A_5 [%]	≥ 2
Test temperature [°C]	20

Welding positions

PA, PB, PC, PF

Shielding gas

I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity

MIG =+, TIG ~

Approvals

DB

Dimensions Ø

MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods	
Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Aluminium alloy DE70 - 5556 A - AlMg5Mn

Reference analysis in wt. %			
Si	≤ 0,25	Zn	≤ 0,25
Fe	≤ 0,40	Ti	0,05 - 0,20
Cu	≤ 0,10	Be	≤ 0,0003
Mn	0,60 - 1,0	others each	≤ 0,05
Mg	5,0 - 5,5	others together	max. 0,15
Cr	0,05 - 0,20	Al	Rest

Standard designation	
DIN EN ISO 18273	S Al 5556 A (AlMg5Mn)

Base materials
Suitable for joint welding of aluminium alloys from 5000 and 6000 series.

Additional information
Very good resistance to seawater and atmospheric corrosion. Highest level of solidity.

Physical properties (guideline values, partly calculated)	
Modulus of elasticity [MPa]	69000
Heat conductivity at 20°C [W/(m*K)]	
Coefficient of expansion (20°-100°C) [m/K]	
Melting range [°C]	574 - 638
Electrical conductivity [m/Ω*mm²]	
Density [g/cm³]	2,66

Mechanical properties (guideline values, without dilution)	
Yield strength $R_{p0,2}$ [MPa]	≥ 145
Tensile strength R_m [MPa]	≥ 290
Elongation A_5 [%]	≥ 17
Test temperature [°C]	20

Welding positions
PA, PB, PC, PF

Shielding gas
I1, I2, I3 (argon, helium or argon/helium-mixture)

Polarity
MIG =+, TIG ~

Approvals

Dimensions Ø	
MIG - wires [mm]	0,80 - 2,40
TIG - rods [mm]	1,6 - 6,0

Forms of supply - spools and rods	
Standard spools: S 300 / B 300 / BS 300	max. 6,0 kg / max. 7,0 kg / max. 7,0 kg
Special spools: B 435 / B 400	max. 14 kg / max. 40 kg
Small spools: S 100 / S 200	0,5 kg / 2,0 kg
Drums: Ø 500 x 800 mm / Ø 580 x 890 mm	max. 80 kg / max. 140 kg
TIG - rods: 1000 mm	2,5 kg / 5 kg / 10 kg

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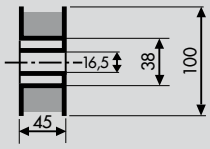
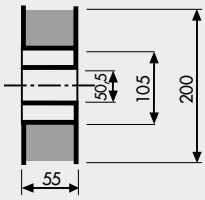
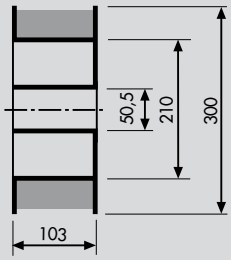
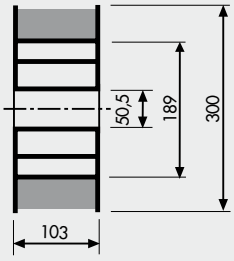
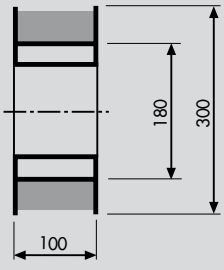
WIRE
HIGH QUALITY
ROD
AL(L)-IN-ONE

Aluminium Welding Fillers

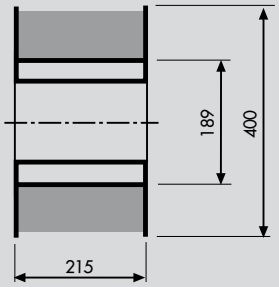
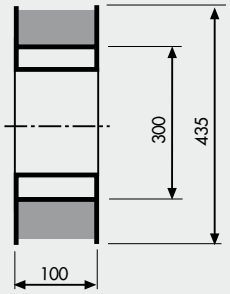
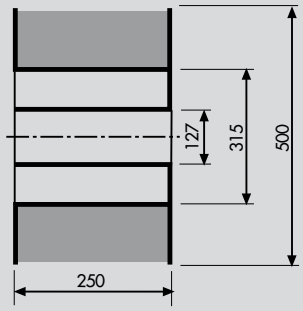
Forms of supply

Forms of supply

Spool type	Dimensions [mm]	Net weight [kg]
 **Mandrel-mounted reel S 100** DIN EN ISO 544		0,5
 **Mandrel-mounted reel S 200** DIN EN ISO 544		2,0
 **Mandrel-mounted reel S 300** DIN EN ISO 544		max. 6,0
 **Basket spool BS 300** DIN EN ISO 544		max. 7,0
 **Basket ring spool B 300** DIN EN ISO 544		max. 7,0

All details are given in nominal dimensions. Alternative spool types upon request.

Forms of supply

Spool type	Dimensions [mm]	Net weight [kg]
 **Basket ring spool B 400** not standardised		max. 40,0
 **Basket ring spool B 435** DIN EN ISO 544		max. 14,0
 **Large spool K 500** not standardised		max. 40,0

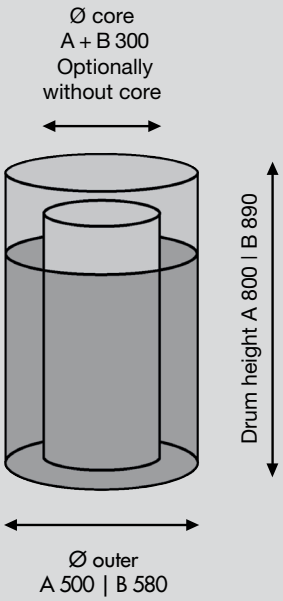
All details are given in nominal dimensions. Alternative spool types upon request.

Standard delivery dimensions

Forms of supply	Ø [mm]	Tolerances [mm] DIN EN ISO 544
Spools	1,00 I 1,20 I 1,60	+0,01 -0,04
Drums	1,20 I 1,60	+0,01 -0,04
Rods	1,60 I 2,00 I 2,40 I 3,20	± 0,10

Other dimensions upon request.

Forms of supply

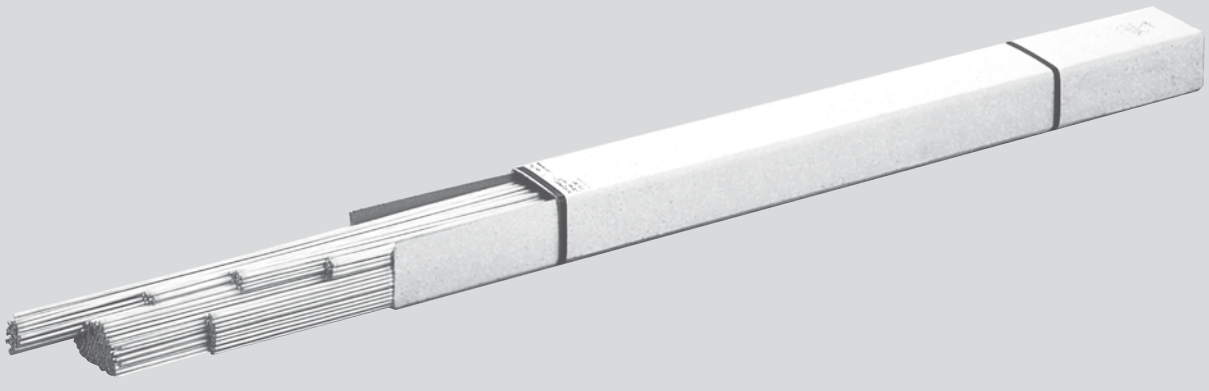
Drum	Dimensions [mm]	Net weight [kg]
 **Type A + B** Drum with metal handle or as all-paper drum with inset handles		Max. 140 depending on drum type and material

Please enquire about more drum versions.

Welding rods

Long box

ELISENTAL welding rods are 1000 mm long in their standard version and have the material designation embossed on one side.
Packaging units:
10,0 kg
5,0 kg
2,5 kg



Other lengths and weights on request.

ELISENTAL
Aluminium welding fillers

WIRE HIGH QUALITY ROD AL(L)-IN-ONE

Length table

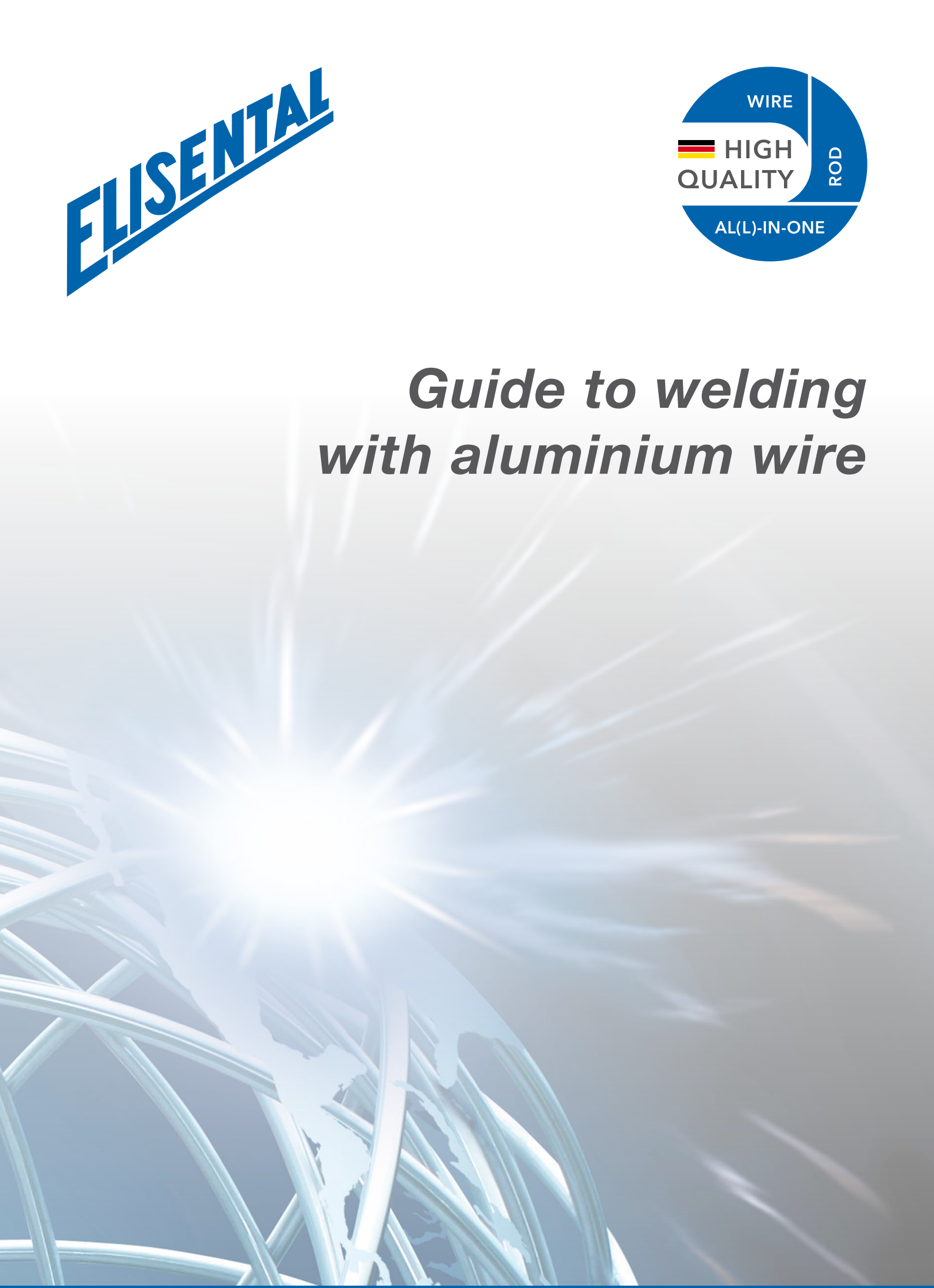
Net weight [kg]	Wire nom. Ø [mm]					
	0,60	0,80	1,0	1,2	1,6	2,4
0,5	655	368	236	164	92	-
2	-	1474	943	655	368	-
6	-	4421	2829	1965	1105	491
7	-	5157	3300	2292	1289	573
14	-	-	6601	4585	2579	1146
40	-	-	-	13099	7368	3275

Values (rounded) in [m]

ELISENTAL

WIRE
HIGH QUALITY
ROD
AL(L)-IN-ONE

Guide to welding with aluminium wire



Fundamentals of welding with aluminium wire

First, we would like to thank you for choosing a welding wire from Drahtwerk ELISENTAL W. Erdmann GmbH & Co. Your trust in our high quality welding wires makes us proud. Optimal welding results in your production operations are as much our goal as yours. We offer the corresponding services and high quality products to achieve that goal.

Storage

Our welding wires must be stored at a constant temperature and unchanging air humidity.
If either the temperature or air humidity at the storage site differs from the conditions at the welding workplace, then make sure the welding wire is kept under the same conditions as the welding workplace for 24 hours before use under the welding workplace conditions. Also make sure to always use the wire with the earliest production or delivery date. This so-called FIFO principle should guarantee that your entire welding wire stocks always remain in usable condition.
Visibly damaged or wet welding wire should only ever be used after a proper specialist has approved it for use (e.g. expert welder). It is not possible to dry wet or moist welding wire, since oxidation of the welding wire will always negatively affect the welding results.
There is no universal maximum shelf life applicable to ELISENTAL welding wire. If you are ever unsure whether the wire is still suitable for use, we recommend performing a test weld before using the material in production.

Summary:

- Protect the welding wire against extreme changes in temperature
- Protect the welding wire against excessively high air humidity
- Give the welding wire time to adapt to the environmental conditions at the welding workplace (24 hours before using the wire)
- Also give the base material time to adapt to the environmental conditions at the welding workplace. Water condensation, in particular, can cause lead to undesirable quality deterioration of the base material and welding wire alike.
- Store ELISENTAL welding wire in a safe and dry place.
- Store and retrieve ELISENTAL welding wires from stock strictly according to the FIFO principle.

Preparing the seam

Regardless of what method you use to prepare the seam, you should always work extremely thoroughly and precisely. Only with an optimally prepared seam can you benefit from the advantages of ELISENTAL welding wire.

Plasma cutting:
The arc should be concentrated as strongly as possible and the heat input minimised. Alloys of the 2000, 6000 and 7000 groups especially tend to form cracks in the heat-affected zone, and will therefore require machining at least 3 mm around the cut. Alloys of the 1000, 3000 and 5000 groups generally require no further working after cutting.

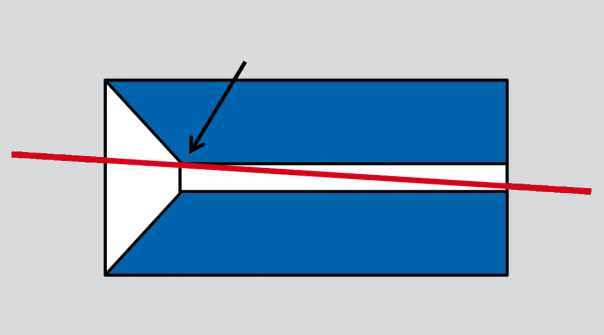
Machining:
Turning, milling or other chip-removing machining processes are especially suitable. Cutting fluids/ lubricants however should not be used. The cutting tools should be in perfect conditions in order to avoid unclean machining results.
Use exclusively stainless steel brushes in order to avoid carbon inclusions in the base material.

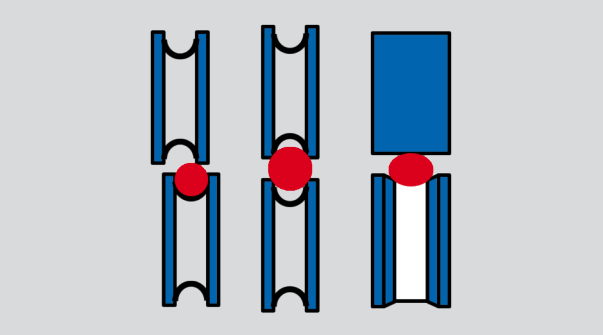
Chemical treatment:
Chemical cleaning methods should be employed immediately before the welding process. Suitable methods include, for example, pickling in alkaline solutions or applying hydrocarbon-based solutions (ethanol, acetone).
Generally take care to maintain a clean, dust- and dirt-free surface that is free of moisture, cutting fluid/ lubricant and other substances.

Welding with ELISENTAL welding wire

From spool to contact tip:

Make sure the welding wire from the spool to the contact tip does not get scratched or impaired by sharp edges. Critical points are shown for example in the following pictures:





Guide tubes and inlet nozzles are often improperly adjusted, are too small in diameter or have a burr. Also, contact tips suitable for light alloys must be selected. The bore diameter for aluminium welding wire must be on average 0,2 mm larger than for steel materials. Contact tips for steels are generally 0,15–0,2 mm larger than the welding wire diameter. That means, for aluminium welding fillers, the bore diameter must be around 0,35–0,4 mm larger than the wire diameter.

Wire feed rolls:

Rolls for aluminium welding wire must be designed specifically for the material characteristics of aluminium. So-called semi-round grooves or similar groove shapes are standard. The picture shows common mistakes regarding poor handling of wire feed rolls. The pressing force should be kept as low as possible. The pressing force must not be increased if sudden wire feed problems occur. Instead, the cause of the problem must be determined and eliminated.

Pore formation:

Frequently porosity is caused by unwanted intrusion of hydrogen into the inert gas atmosphere. Accordingly, you should regularly check the condition of the inert gas hoses for porosity or leaks. Should cooling hoses and gas hoses ever be mixed up, we recommend completely changing the hoses after the incident, since it is impossible to completely dry them or clean them.

Contamination:

The welding wire feed unit and all other parts of the system that come into contact with the welding wire must be kept as clean as possible. Never use lubricants or anti-spatter sprays. The wire spools must also be kept covered at all times to protect them from dirt and moisture.

Friction:

Aluminium has poor gliding properties. ELISENTAL makes every effort to improve the tribological properties of the welding wire, but the wire guide system must be specifically adjusted in particular for long travel distances. When the clamping lever of the wire feed rolls is open, it must be possible to push the wire through the entire wire guide while holding the wire with two fingers and applying gentle force. Instruments that measure the current to the wire feed motor are a good means to control this. The current should not differ greatly between when the motor is loaded or idle, and should be checked regularly.

TIG welding:

All information applies equally to TIG welding. You should take additional care to protect opened boxes against dirt and humidity. Directly before welding, the welding rod can be cleaned with fine steel wool. Note, however, that ELISENTAL welding rods may only be touched by clean, grease-free gloves.

Welding irregularities

Possible irregularities	Causes in TIG welding	Causes in MIG welding
Arc ignites poorly or not at all	Circuit broken, no earth connection, fault on HF or pulse unit, faulty inert gas flow.	Welding current circuit broken, wrong polarity, faulty wire feed (e.g. due to material wear).
Erratic arc	Erratic mains power, off-load voltage too low, faulty capacitors, electrode diameter too thick, workpiece too cold.	Wire feed faulty (wear, wire electrode kinked, leads bent too tightly), contact tip worn.
Grey-black and rough seam surface, spatter (common in MIG welding)	Disrupted inert gas atmosphere (e.g. air draughts), leaky cooling water or inert gas hose lines, unclean seam flank area or filler metal, nozzle distance too great, too little/too much inert gas, inert gas wet or impure.	
	Tungsten electrode contaminated by contact with molten workpiece.	Gun held improperly, arc too long.
Porous weld seam/oxide inclusions (more common in MIG welding)	The above mentioned causes can also be largely responsible for pores (hydrogen bubbles) and oxide inclusions.	
	Welding current too low, end of the molten welding rod comes into contact with air outside the inert gas shield.	Faults in the welding filler surface, gas nozzles heavily contaminated by spatter (take care when using unsuitable anti-spatter spray), gun held improperly, weld metal degassing inadequate due to too fast solidification (welding too cold), wire feed speed too low, arc too short, intermediate seam surface unclean during multi-pass welding. (weld metal diameter too thin).
Incomplete fusion (common in MIG welding)	Seam preparation inadequate (unclean, too steep), welding point and surroundings not adequately heated (thick sheet not preheated), fusing of base material inadequate (usually on one side) due to too fast welding speed or different material thicknesses.	

Welding irregularities

Possible irregularities	Causes in TIG welding	Causes in MIG welding
Weld seam cracks	Welding filler metal unsuitable, too high welding currents applied and design-related prevention of shrinkage (sub-optimal welding sequence), cracks in start and end craters due to inadequate feed of welding filler metal (if possible, place end crater on a run-off plate or work with the crater filling programme (MIG)).	
Poor fusion	Welding power too high or too low (voltage/filler feed), too fast or too slow welding speed with too hot or too cold weld pool, wrong weld gap.	
Poor weld penetration	Wrong gap shape, welding speed too high, arc to long, power source not transistor-controlled.	
Sticking or back-burn (MIG welding only)		If the wire feed is faulty or too small compared to the arc voltage, then the welding wire burns back and melts onto the copper tip of the torch.
Notes on inert gas: Argon-helium gas mixtures improve weld penetration and can also help to reduce pore formation due to the greater heat input. Minor additions of oxygen or nitrogen to the gas – so-called „doped“ inert gases – stabilise the arc, which can lead to a finer seam pattern and prevent spatter.		
Characteristics of perfect weld seams	Good TIG seams are essentially a result of optimally adjusted welding parameters. They are recognisable from a regular scale pattern. A narrow, white (deoxidise) zone runs through both sides of the seam. The seam surface is glossy and – unlike with MIG welding – smooth and free of deposits.	Good MIG seams are essentially a consequence of optimally adjusted welding parameters. They have an even, finely scaled pattern on the seam with a perfect transition to the base material. The deposits that sometimes occur on the surface can be brushed off easily.

Common problems and their causes

Type of	Possible causes of error	How to avoid error
Pore formation	Contaminated welding filler metal. Moisture on the surface of the wire	Check the welding wire and weld zone for cleanliness. Clean and dry the welding zone. Make sure the base material and welding filler metal are at room temperature. Weld at a temperature above the condensation point
	Unsuitable welding position	If possible, use welding positions PA/PB
	Degassing time too short	Increase the amount of heat and/or preheating. Optimise the pretreatments
	Inert gas contaminated by escaping cooling water or damaged gas line	Fix the line damage and check regularly
	Inert gas contaminated by intrusion of moisture and use of unsuitable hose materials	Use gasses according to EN 439. Use suitable hose material, replace old and porous hoses, keep hose lengths as short as possible
	No laminar gas flow due to too high or too low gas draw	Optimise the quality of the inert gases and avoid draughts of air
	Arc voltage too high	Adjust the welding voltage
	Electrode angle too small	Use a correct angle

Common problems and their causes

Type of	Possible causes of error	How to avoid error
Oxide inclusions	Formation of oxides in the arc or in the weld pool due to inflow of oxygen into the inert gas atmosphere, resulting from too low gas flow	Adjust the gas flow accordingly. Avoid air draughts. See the section „Pore formation“.
	Inadequate cleaning of the weld zone and/or preceding layers	Make sure the weld zone and/or preceding layers are clean
	Excess oxygen in the heating flame	Optimise the heating flame
	Improper handling of the welding rod	Do not bring the end of the welding rod back out of the inert gas
Cracks	Solidification characteristics of the weld pool	Select the optimal filler metal for your base material. Make a weld crater on a run-off plate or use a crater filling programme
	Internal voltage	Adapt your welding cycles to the voltages and keep distortions as low as possible
	Remelting of low-melting-point components neighbouring the grain boundaries of the heat-affected zone	Reduce the influence of heat and intermediate storage temperature. Reduce crack susceptibility using a single-pass technique. Reduce the internal voltages. Select suitable welding filler metals.
Tungsten inclusions	Tungsten inclusions due to too strong current or contact between electrode and weld pool	Reduce the current or choose a larger electrode diameter. Never dip the electrode into the weld pool
Copper inclusions	Copper inclusions during MIG welding due to overheating	Select the appropriate torch and tip to suit the current strength
	Inclusion of copper from the fixing plate	Replace the copper plate. If necessary, use a stainless steel, aluminium or ceramic fixing plate.

UNLIMITED POSSIBILITIES FOR IDEAS FOR THE FUTURE!

We can hardly imagine any modern industrial sector without aluminium wire products.

So many alloys have been invented for this base material – trusty, decades-old and modern advanced or modified alloys alike – that their applications are now practically unlimited.

Ideas are stimulation for unlimited possibilities.
We have ideas.

Aluminium welding fillers

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