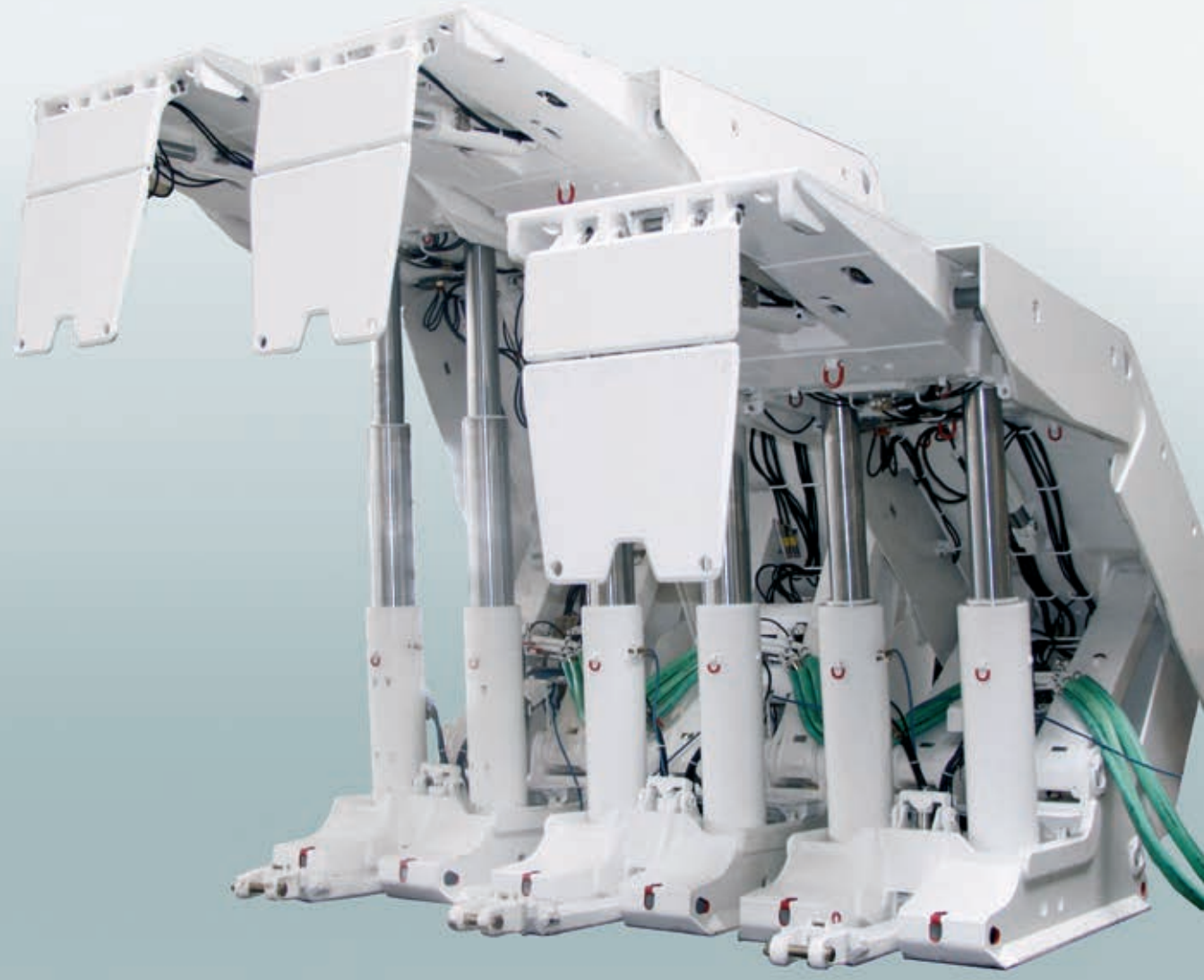
aldur®



HIGH-STRENGTH QUENCHED AND TEMPERED FINE-GRAINED STEELS

Technical terms of delivery for heavy plates
1 March 2019

voestalpine Grobblech GmbH
www.voestalpine.com/grobblech

voestalpine
ONE STEP AHEAD.

These general terms apply to all deliveries of high-strength quenched and tempered fine-grained steel – aldur® supplied as heavy plate by companies in the voestalpine Steel Division. Please use the following link to find a list of the companies affiliated with the Steel Division:

www.voestalpine.com/stahl/en/Companies

The names of companies in the voestalpine Steel Division are referred to simply as **voestalpine** in this document.

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INTRODUCTION

voestalpine operates one of Europe's most modern steelmaking facilities in Linz. Each of the modern lines required for the production of high-quality heavy plates is located next to related facilities and is highly integrated into the works.

Our goal is to innovate and go beyond standard steels, to continually offer high-quality products. The most modern manufacturing technologies, continuous quality control systems as well as intense research and development guarantee optimum product quality.

These technical terms of delivery provide information on the ordering and processing of **high-strength quenched and tempered fine-grained heavy plates**. Please direct any of your questions to your responsible sales personnel or technical specialist at voestalpine.

Subject to change pursuant to further development.
The current version is available at www.voestalpine.com/stahl/en/Brands/aldur-R

STEEL GRADES

» aldur 500 Q, QL, QL1
» aldur 550 Q, QL, QL1
» aldur 620 Q, QL, QL1
» aldur 700 Q, QL, QL1
» aldur 900 Q, QL
» aldur 960 Q, QL

QUALITY MANAGEMENT

voestalpine is a quality leader in a challenging market environment, and it has become the company philosophy to meet the justified expectations and requirements of both the market and the customer with respect to every possible aspect of quality. Comprehensive quality management is a central component of the company strategy. In addition to this comprehensive quality management system, production monitoring using the most modern testing systems is also a necessity. These systems are inspected on a regular basis by external and independent agencies.

COMPREHENSIVE QUALITY MANAGEMENT

The voestalpine companies meet the highest standards of quality management and are certified pursuant to **Lloyd's Register QA Ltd.** in the United Kingdom as well as **ISO 9001** and **IATF 16949**.

This has been confirmed by numerous customer awards presented for best quality performance. Focus has been continually on this pursued path as well as on consistent implementation of all quality standards.

STATE-OF-THE-ART TESTING TECHNIQUES

voestalpine uses the most modern testing techniques and methods, laboratory information and management systems equipped with state-of-the-art technologies. The technical expertise of our testing and inspection laboratories is certified in accordance with international standards, e.g. **ISO/IEC 17025** and **ISO/IEC 17020**, and is accredited by Austrian national standards.

aldur® Q

The grades of the aldur® Q series are water-quenched and tempered, high-strength, weldable fine-grained structural steels. Main applications are welded structures subjected to extreme loads, e.g. in crane and vehicle manufacturing, for steel construction, in pressure vessel and pressure piping systems.

The steel grades are supplied in three groups:

- **Basic series aldur® ... Q**
  with guaranteed notch impact toughness at –20 °C
- **Low temperature series aldur® ... QL**
  with guaranteed notch impact toughness at –40 °C
- **Special low-temperature series aldur® ... QL1**
  with guaranteed notch impact toughness at –60 °C

The technical terms of delivery apply for plate thicknesses from

- 12 - 200 mm, depending on steel grade

STEEL GRADE OVERVIEW

Steel grade	Designation according to EN 10025-6	Material number
aldur 500 Q	S500Q	1.8924
aldur 500 QL	S500QL	1.8909
aldur 500 QL1	S500QL1	1.8984
aldur 550 Q	S550Q	1.8904
aldur 550 QL	S550QL	1.8926
aldur 550 QL1	S550QL1	1.8986
aldur 620 Q	S620Q	1.8914
aldur 620 QL	S620QL	1.8927
aldur 620 QL1	S620QL1	1.8987
aldur 700 Q	S690Q	1.8931
aldur 700 QL	S690QL	1.8928
aldur 700 QL1	S690QL1	1.8988
aldur 900 Q	S890Q	1.8940
aldur 900 QL	S890QL	1.8983
aldur 960 Q	S960Q	1.8941
aldur 960 QL	S960QL	1.8933

Table 1: Steel grades

PRODUCTION PROCESS

aldur® Q steels are produced via the LD-route.

CHEMICAL COMPOSITION

HEAT ANALYSIS

GUARANTEED VALUES

Table 2: Chemical composition

Steel grade	Mass [%]															
	C max.	Si max.	Mn max.	P max.	S max.	$Al_{tot.}$ min.	N max.	Cr max.	Ni max.	Mo max.	Cu max.	V max.	Nb max.	Ti max.	B max.	Zr max.
aldur 500 Q, QL, QL1	0.20	0.80	1.70	0.020	0.010	0.018	0.015	1.50	2.00	0.70	0.50	0.12	0.06	0.05	0.0050	0.15
aldur 550 Q, QL, QL1																
aldur 620 Q, QL, QL1																
aldur 700 Q, QL, QL1																
aldur 900 Q, QL																
aldur 960 Q, QL																

CARBON EQUIVALENT

Depending on the analyses employed, the following carbon equivalents result for varying plate thicknesses.

STANDARD VALUES

Table 3: carbon equivalent

Steel grade		Carbon equivalent mass in % plate thickness in mm				
		≤ 50	> 50 ≤ 120			
aldur 500 Q, QL, QL1	CEV[1] max. acc. EN 10025-6	0.47	0.70			
	CEV[1] standard value	0.43	0.46			
	CET[2] standard value	0.27	0.29			
		≤ 30	> 30 ≤ 50	> 50 ≤ 120		
aldur 550 Q, QL, QL1	CEV[1] max. acc. EN 10025-6	0.65	0.77	0.77		
	CEV[1] standard value	0.43	0.46	0.46		
	CET[2] standard value	0.27	0.29	0.29		
			≤ 50	> 50 ≤ 120		
aldur 620 Q, QL, QL1	CEV[1] max. acc. EN 10025-6		0.65	0.77		
	CEV[1] standard value		0.46	0.52		
	CET[2] standard value		0.29	0.32		
		≤ 30	> 30 ≤ 50	> 50 ≤ 100	> 100 ≤ 120	> 120 ≤ 200
aldur 700 Q, QL	CEV[1] max. acc. EN 10025-6	0.65	0.65	0.77	0.83	0.83
	CEV[1] standard value	0.46	0.52	0.52	0.52	0.59
	CET[2] standard value	0.29	0.32	0.32	0.32	0.34
		≤ 30	> 30 ≤ 50	> 50 ≤ 100	> 100 ≤ 120	> 120 ≤ 180
aldur 700 QL1	CEV[1] max. acc. EN 10025-6	0.65	0.65	0.77	0.83	0.83
	CEV[1] standard value	0.46	0.52	0.59	0.59	0.59
	CET[2] standard value	0.29	0.32	0.34	0.34	0.34
			≥ 30 ≤ 60			
aldur 900 Q, QL	CEV[1] max. acc. EN 10025-6		0.82			
	CEV[1] standard value		0.66			
	CET[2] standard value		0.39			
			≥ 30 ≤ 50			
aldur 960 Q, QL	CEV[1] max. acc. EN 10025-6		0.82			
	CEV[1] standard value		0.66			
	CET[2] standard value		0.39			

[1] CEV = C + Mn/6 + (Cr + Mo +V)/5 + (Ni + Cu)/15, according to IIW
[2] CET = C + (Mn + Mo)/10 + (Cr + Cu)/20 + Ni/40, according to SEW 088

AS-DELIVERED CONDITION

The plates are delivered in water-quenched and tempered condition. Direct hardening after hot rolling is permitted.

MECHANICAL PROPERTIES

MECHANICAL PROPERTIES AT AMBIENT TEMPERATURE

Table 4: Mechanical properties

Steel grade	Material number	Yield Strength R_{eH}[1] MPa, min. plate thickness in mm			Tensile strength R_m[2] MPa plate thickness in mm			Fracture elongation $L_0 = 5.65 \sqrt{S_0}$ min.
		≤ 50	> 50 ≤ 100[3]	> 100 ≤ 200	≤ 50	> 50 ≤ 100[3]	> 100 ≤ 200	%
aldur 500 Q	1.8924							
aldur 500 QL	1.8909	500	480	440	590 - 770	590 - 770	540 - 720	17
aldur 500 QL1	1.8984							
aldur 550 Q	1.8904							
aldur 550 QL	1.8926	550	530	490	640 - 820	640 - 820	590 - 770	16
aldur 550 QL1	1.8986							
aldur 620 Q	1.8914							
aldur 620 QL	1.8927	620	580	560	700 - 890	700 - 890	650 - 830	15
aldur 620 QL1	1.8987							
aldur 700 Q	1.8931							
aldur 700 QL	1.8928	700	650	630	770 - 940	760 - 930	710 - 900	14
aldur 700 QL1	1.8988							
aldur 900 Q	1.8940	890	830		940 - 1100	880 - 1100		11
aldur 900 QL	1.8983							
aldur 960 Q	1.8941	960			980 - 1150			10
aldur 960 QL	1.8933							

[1] Where there is no distinct yield strength, the 0.2 %-proof stress (Rp 0.2) is established.
[2] Tensile test in accordance with EN ISO 6892-1 on transverse samples.
[3] aldur 700 Q, QL, QL1: > 50 < 110

NOTCH IMPACT ENERGY (VALID FOR CHARPY V-NOTCH SAMPLES)

Table 5: Notch impact energy

Steel grade	Notch impact energy AV[1] J, min. testing temperature in °C				
	Sample direction	-60	-40	-20	±0
aldur 500 Q, 550 Q, 620 Q, 700 Q, 900 Q, 960 Q	longitudinal	–	–	30	40
	transversal	–	–	27	30
aldur 500 QL, 550 QL, 620 QL, 700 QL, 900 QL, 960 QL	longitudinal	–	30	40	50
	transversal	–	27	30	35
aldur 500 QL1, 550 QL1, 620 QL1, 700 QL1	longitudinal	30	40	50	60
	transversal	27	30	35	40

[1] Notch impact test according to EN ISO 148-1 at longitudinal samples. Mean value from 3 individual samples must reach the specified requirements. No individual value may be below 70 % of the guaranteed mean value. Testing temperature is –20 °C for the basic series aldur Q, –40 °C for the low-temperature series aldur QL and –60 °C for the special low-temperature series aldur QL1.

QUALITY TEST

TEST UNIT

Unless otherwise agreed upon ordering, 40 t of a heat or a smaller portion is used as test unit for the mechanical properties. The test unit must consist of plates with the same steel grade and the same thickness range for the yield strength according to table 4. The thickness of the plate in the test unit may not differ more than 5 mm from the thickness of the sample.

POSITION OF TEST SAMPLES

The sample position in the rolled plate is at one end and at a quarter of the width.

SCOPE OF TESTING

The following tests are carried out on the test samples:
» Tensile test at ambient temperature on transverse samples
» Notch impact test on longitudinal samples

The heat analysis is provided as proof of the chemical composition.

A transverse sample has to be taken for the tensile test at ambient temperature. Usually flat samples are used for thicknesses up to 42 mm (aldur 500, 550, 620) resp. up to 20 mm (aldur 700); at least one rolled surface shall remain on the sample. Round samples are permitted. For plate thicknesses higher than mentioned above as well as for the steel grades aldur 900 and 960 round samples are used in any case.

Unless otherwise agreed, 3 longitudinal samples are taken from each position for the notch impact tests. For plate thicknesses of up to 40 mm, one side of the sample must be as near as possible to the rolled surface. In the case of plate thicknesses above 40 mm, the samples are taken in such a manner that their longitudinal axes are at a distance of a quarter of the plate thickness from the surface, or as near as possible to this point. The notch must be vertical to the plate surface.

TOLERANCES AND SURFACE FINISH

Unless otherwise agreed, tolerances according to EN 10029 (thickness tolerance according to class A, flatness tolerance according to class N) and surface finish according to EN 10163-A1 are valid.

MARKING

In general, marking consists of:
» voestalpine symbol
» Steel grade designation
» Heat number
» Plate number

MATERIAL TESTING CERTIFICATE

Type of certificate according to EN 10204 must be agreed upon ordering.

PROCESSING GUIDELINES

COLD FORMING

aldur® Q plates are well-suited for the standard cold forming processes in general steel construction work.

RECOMMENDED MINIMUM BENDING RADII

Bending line	transverse	parallel	to the rolling direction
Bending radius	≥ 3	≥ 4	x plate thickness
Bending radius aldur 900 Q, QL and 960 Q, QL	≥ 4	≥ 5	

Table 6: Minimum bending radii

The recommended minimum bending radius is only valid on condition that cut edges have been removed and that the bending process is done professional.

HOT FORMING

Hot forming at temperatures above the permissible maximum stress-relief temperature (560 °C) can influence the original tempered condition. In that case water-quenching and tempering must be repeated after hot forming.

WELDING

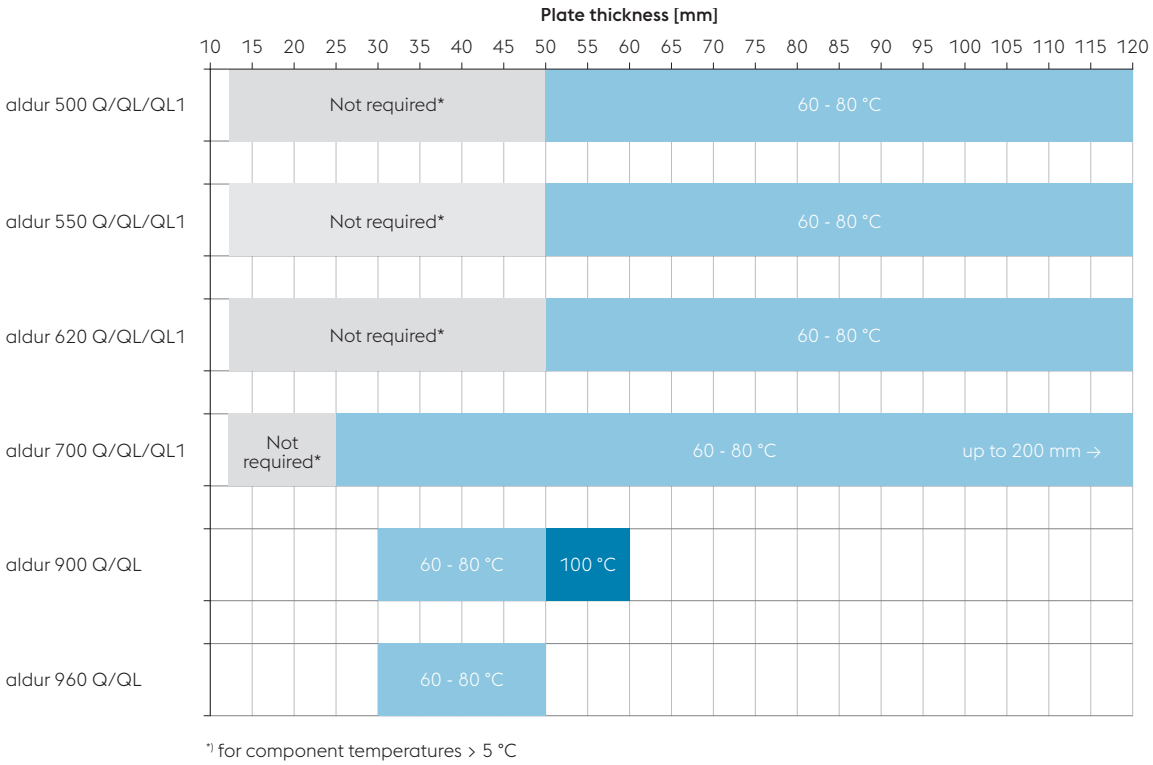
GENERAL

Compliance with the generally valid and accepted rules for the welding of low-alloy, high-strength, fine-grain structural steels is mandatory pursuant to EN 1011-2 and the STAHL-EISEN material data sheet SEW 088.

WELD SEAM PREPARATION

Weld preparation can be in the form of machining or thermal cutting. Figure 1 shows the recommended preheating temperatures for thermal cutting for the available ranges of plate thicknesses. The fusion faces must be dry and free of impurities before welding begins.

RECOMMENDED PREHEATING TEMPERATURES FOR THERMAL CUTTING



*) for component temperatures > 5 °C

Figure 1: Recommended preheating temperatures for thermal cutting

WELDING TECHNIQUES

All conventional welding techniques, both automatic and manual, can be used. Inert-gas-shielded arc welding (MAG, MIG) with solid wire has the advantage of very low hydrogen content in the weld metal and is particularly suitable with regard to resistance against cold cracking.

WELDING CONSUMABLES

The welding consumables should be selected so that the properties of the weld metal are matched to the mechanical-technological properties of the base material. The recommended welding consumables are listed in Table 7. The hydrogen content HD should not exceed 5 ml per 100 grams of weld metal. This is guaranteed by using solid wires in inert gas shielded arc welding. Basic electrodes or welding powder for submerged arc welding must be subjected to secondary drying. Compliance with the instructions of the manufacturer with regard to drying and hydrogen adjustment is mandatory.

RECOMMENDED WELDING CONSUMABLES FOR aldur 500 / 550 / 620 / 700 Q/QL/QL1 AND 900 / 960 Q/QL

Base material	Welding process, welding filler metals				
	Manual electric welding (SMAW) -111	WIG (GTAW) -141	MAG (GMAW) -135	MAG cored wire (FCAW) -136 / -138	UP (SAW) -12
aldur 500 Q/QL/QL1	BÖHLER FOX EV 65 (AWS A5.1: E8018-GH4R)	BÖHLER NiMo 1-IG (AWS A5.28: ER90S-G)	BÖHLER NiMo 1-IG (AWS A5.28: ER90S-G)	BÖHLER Ti 60 T-FD (AWS A5.36: E81T1-M21A8-Ni1-H4)	Union S2 NiMo 1 + UV421TT (AWS A5.23: F8A10-ENi1-Ni1)
				BÖHLER Ti 60 T-FD SR (AWS A5.36: E81T1-M21AP8-Ni1-H4)	Union S3 NiMo 1 + UV421TT (AWS A5.23: F9A8-EF3-F3)
	Phoenix SH Ni 2 K90[1] (AWS A5.5: E10018M)		Union Ni 2,5 (AWS A5.28: ER80S-Ni[2])	BÖHLER HL 53 T-MC (AWS A5.36: E80T15-M21A8-Ni1-H4)	BÖHLER SUBARC T60 + UV421TT (AWS A5.23: F9A8-EF3-F3)
aldur 550 Q/QL/QL1	BÖHLER FOX EV 65 (AWS A5.1: E8018-GH4R)	BÖHLER NiMo 1-IG (AWS A5.28: ER90S-G)	BÖHLER NiMo 1-IG (AWS A5.28: ER90S-G)	BÖHLER Kb 63 T-FD[1] (AWS A5.36: E90T5-M21A4-GH4)	Union S3 NiMo 1 + UV421TT (AWS A5.23: F9A8-EF3-F3)
	BÖHLER FOX EV 75 (AWS A5.5: E10018-GH4R)			BÖHLER Kb 65 T-FD[1] (AWS A5.36: E90T5-M21A4-GH4)	
	Phoenix SH Ni 2 K100[1] (AWS A5.5: E11018-G)		Union MoNi (AWS A5.28: ER90S-G)	BÖHLER HL 65 T-MC (AWS A5.36: E90T15-M21A4-K1-H4)	Union S3 NiMo 1 + UV421TT (AWS A5.23: F9A8-EF3-F3)
aldur 620 Q/QL/QL1	BÖHLER FOX EV 75 (AWS A5.5: E10018-GH4R)	BÖHLER NiCrMo 2.5-IG (AWS A5.28: ER110S-G)	BÖHLER NiCrMo 2.5-IG (AWS A5.28: ER110S-G)	BÖHLER Ti 80 T-FD (AWS A5.36: E111T1-M21A8-G-H4)	Union S3 NiMoCr + UV420TT-R (AWS A5.23: F9A8-EF3-F3-N)
	BÖHLER FOX EV 85 (AWS A5.5: E11018-GH4R)				
	Phoenix SH Ni 2 K100[1] (AWS A5.5: E11018-G)		Union NiMoCr (AWS A5.28: ER100S-G)	BÖHLER Ti 80 T-FD SR (AWS A5.36: E111T1-M21AP5-K3-H4)	
aldur 700 Q/QL/QL1	BÖHLER FOX EV 85 (AWS A5.5: E11018-GH4R)	BÖHLER NiCrMo 2.5-IG (AWS A5.28: ER110S-G)	BÖHLER NiCrMo 2.5-IG (AWS A5.28: ER110S-G)	BÖHLER 700 T-MC (AWS A5.36: E110T15-M21A8-K4-H4)	Union S3 NiMoCr + UV421TT (AWS A5.23: F11A8-EG-F6)
					BÖHLER Subarc T85 + UV421TT (AWS A5.23: F11A10-EC-F5-F5)
	Phoenix SH Ni 2 K100[1] (AWS A5.5: E11018-G)		Union NiMoCr (AWS A5.28: ER100S-G)	Union MV NiMoCr (AWS A5.28: E110C-K4H4)	BÖHLER Subarc T80 HP + UV422TT-LH (AWS A5.23: F12A6-EC-F5-H4)
aldur 900 Q/QL	Phoenix SH Ni 2 K130 (AWS A5.5: E12018-G)	---	BÖHLER X90-IG (AWS A5.28: ER120S-G)	BÖHLER 900 T-MC (AWS A5.28: E120C-H4)	BÖHLER Subarc T95 + UV422TT-LH (AWS A5.23: F13A5-ECF5-F5)
			Union X90 (AWS A5.28: ER120S-G)		
aldur 960 Q/QL	Phoenix SH Ni 2 K130[2] (AWS A5.5: E12018-G)	---	Union X96 (AWS A5.28: ER120S-G)	BÖHLER Kb 90 T-FD (AWS 5.36: E130T5-GM21-H4)	---

[1] Compliance with the required notched bar impact energy value at –50 °C, e.g. for Q grades (at –20 °C) and QL (at –40 °C)
[2] Note the lower strength values and the associated „undermatching."

Table 7: Recommended welding consumables

You will find further information and alternative welding consumables at www.voestalpine.com/welding. Our experienced welding experts will be happy to consult you.

HEAT CONTROL DURING WELDING

Table 8 contains recommendations for heat control during the welding of aldur® plate grades. Welding parameters should be set to achieve $t_{8/5}$ times of 5 to 20 seconds in an effort to ensure high strength and toughness properties. Longer cooling times are permissible under certain conditions (such as overmatching) and must be verified, e.g. by means of testing in accordance with EN 15614-1.

RECOMMENDED HEAT CONTROL DURING THE ELECTRIC ARC WELDING OF aldur 500 / 550 / 620 / 700 Q/QL/QL1 and 900 / 960 Q/QL

Base material	Recommended preheating [°C]	Interpass temperature [°C]	Post-heating [°C] - [h]	$t_{8/5}$ range [s]
aldur 500 Q/QL/QL1	Ambient temperature (> 5) - 150 [1]	≤ 150	250 - 3 s ≥ 50 mm	5 - 20
aldur 550 Q/QL/QL1				
aldur 620 Q/QL/QL1				
aldur 700 Q/QL/QL1				
aldur 900 Q/QL	100 - 150		250 - 3	
aldur 960 Q/QL				

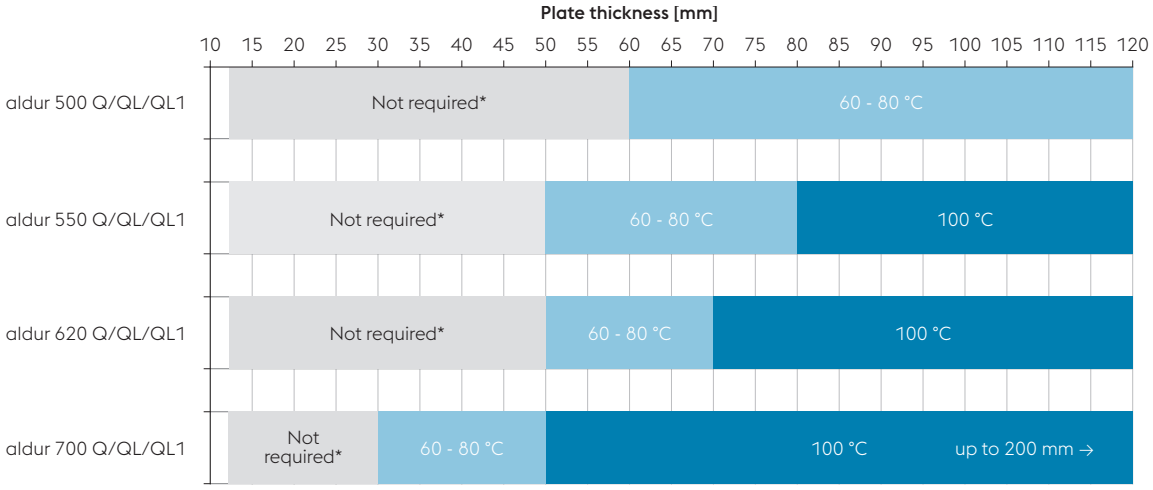
[1] When component temperatures fall below +5 °C or components are subject to higher humidity, the pre-drying of fusion faces immediately prior to welding is recommended (60 °C with electric heating mat or 80 °C with acetylene, propane or natural gas burner).

Table 8: Recommended heat control during electric arc welding

The need for preheating to reduce excessive hardening in the heat-affected zone (HAZ) and thus to reduce the risk of cold cracking increases with higher carbon equivalent (CET), greater plate thickness, higher hydrogen content of the weld metal and lower heat input. Determination of each case separately pursuant to EN 1011-2 is recommended for this reason. Should the carbon equivalent CET of the base material not exceed that of the weld metal by at least 0.03 %, the CET of the weld metal must be applied in calculating the preheating temperature and must be increased by 0.03 %.

Submerged arc welding is usually preferred for thicker plates because of the high deposition rate. Under otherwise identical welding parameters/conditions, the high heat input associated with this welding technique means that the preheating temperature can be reduced as compared to welding processes with lower heat input. Figure 2 shows the recommended preheating temperatures in the example of submerged arc welds with a heat input of 3 kJ/mm and a hydrogen content HD of 3 ml per 100 gram of weld metal in dependence on the available plate thickness ranges (up to aldur 700 Q/QL/QL1).

RECOMMENDED PREHEATING TEMPERATURES FOR WELDING WITH HIGH HEAT INPUT
in the example of SUBMERGED ARC WELDING with ES = 3 KJ/MM (K = 0.95) and HD = 3 ML/100 G SG

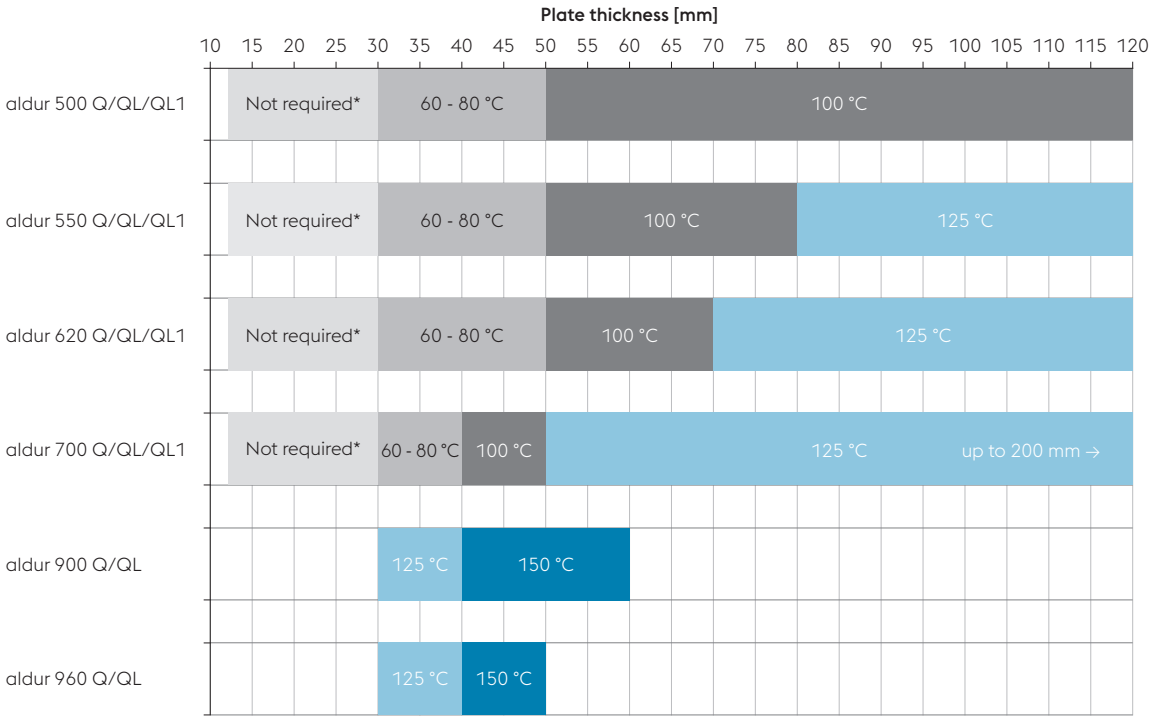


*) for component temperatures > 5 °C and dry, clean faces

Figure 2: Recommended preheating temperatures for submerged arc welding

If welding is to be carried out with low heat input, the recommended preheating temperatures in Figure 3 are shown for MAG welding with 1 kJ/mm as an example, depending on the range of available plate thicknesses.

RECOMMENDED PREHEATING TEMPERATURES FOR WELDING WITH LOW ENERGY RANGE
in the example of MAG welds with ES = 1 KJ/MM (K = 0.85) and HD = 3 ML/100 G SG



*) for component temperatures > 5 °C and dry, clean faces

Figure 3: Recommended preheating temperatures for MAG welding

The preheating temperatures recommended here apply to butt welds. For single fillet welds, lower preheating temperatures can be assumed because of the lower residual stress under normal circumstances and assuming sufficient experience of the welder.

Where special strength and toughness is required of the weld metal, an interpass temperature of 150 °C should not be exceeded.

Hydrogen annealing (reheating) is recommended for plate thicknesses above 50 mm or for aldur 900/960 Q(L) in the entire plate thickness range.

High notch impact energy in the welded joint is achieved by multi-pass welding where the number of passes can be determined according to the following approximation:

$$\text{Minimum number of layers} \sim \frac{\text{Plate thickness (mm)}}{3}$$

STRESS RELIEF ANNEALING

If stress relief annealing is required due to design or processing conditions, temperatures should be kept below 560 °C. It is recommended that stress relief temperatures do not exceed 520 °C for optimum toughness properties in the welded joint.

WELDING CALCULATOR APP

With the Welding Calculator App from voestalpine (available for Android and iOS), you can now easily calculate cooling times $t_{8/5}$ and preheating temperatures pursuant to EN 1011-2 and based on your individual specifications. You can also optimize your welding activities with retroactive calculations. Based on climatic conditions, the app also recommends parameters for edge drying and features a module for calculating the required volume of welding consumables.

You will find more detailed information about the Welding Calculator App at
www.voestalpine.com/alform/en/Service/Welding-Calculator

DELIVERABLE DIMENSIONS aldur 500 Q, QL, QL1 AND aldur 550 Q, QL, QL1

Thickness mm																										
120																										
115																										
110																										
105																										
100																										
95																										
90																										
85																										
80																										
75																										
70																										
65																										
60																										
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50																										
45																										
40																										
35																										
30																										
25																										
20																										
12																										
Width mm		1,500	1,600	1,700	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700	2,800	2,900	3,000	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	

Maximum length: 13,200 mm

Different dimensions on request.

DELIVERABLE DIMENSIONS aldur 620 Q, QL, QL1

Thickness mm																										
120		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
115		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
110		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
105		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
100		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
95		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
90		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
85		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
80		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
75		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
70		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
65		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
60		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
55		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
50		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
45		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
40		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
35		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
30		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
25		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
20		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
12		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
Width mm		1,500	1,600	1,700	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700	2,800	2,900	3,000	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	

Maximum length: 13,200 mm

Different dimensions on request.

DELIVERABLE DIMENSIONS aldur 700 Q, QL, QL1

Thickness mm																										
200*)		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
180		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
160		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
140		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
120		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
100		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
95		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
90		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
85		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
80		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
75		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
70		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
65		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
60		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
55		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
50		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
45		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
40		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
35		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
30		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
25		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
20		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
12		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■								
Width mm		1,500	1,600	1,700	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700	2,800	2,900	3,000	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	

*) valid for aldur 700 Q and aldur 700 QL

Maximum length: 16,000 mm for thicknesses of up to 30 mm (18,000 mm on request)
Maximum length: 13,200 mm for thicknesses > 30 - 200 mm

Different dimensions on request.

DELIVERABLE DIMENSIONS aldur 900 Q, QL

Thickness mm													
60		■	■	■	■	■	■	■	■	■	■	■	
55		■	■	■	■	■	■	■	■	■	■	■	
50		■	■	■	■	■	■	■	■	■	■	■	
45		■	■	■	■	■	■	■	■	■	■	■	
40		■	■	■	■	■	■	■	■	■	■	■	
35		■	■	■	■	■	■	■	■	■	■	■	
30		■	■	■	■	■	■	■	■	■	■	■	
Width mm		1,500	1,600	1,700	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	

Maximum length: 13,200 mm

Different dimensions on request.

DELIVERABLE DIMENSIONS aldur 960 Q, QL

Thickness mm													
50		■	■	■	■	■	■	■	■	■	■	■	
45		■	■	■	■	■	■	■	■	■	■	■	
40		■	■	■	■	■	■	■	■	■	■	■	
35		■	■	■	■	■	■	■	■	■	■	■	
30		■	■	■	■	■	■	■	■	■	■	■	
Width mm		1.500	1.600	1.700	1.800	1.900	2.000	2.100	2.200	2.300	2.400	2.500	

Maximum length: 13,200 mm

Different dimensions on request.

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