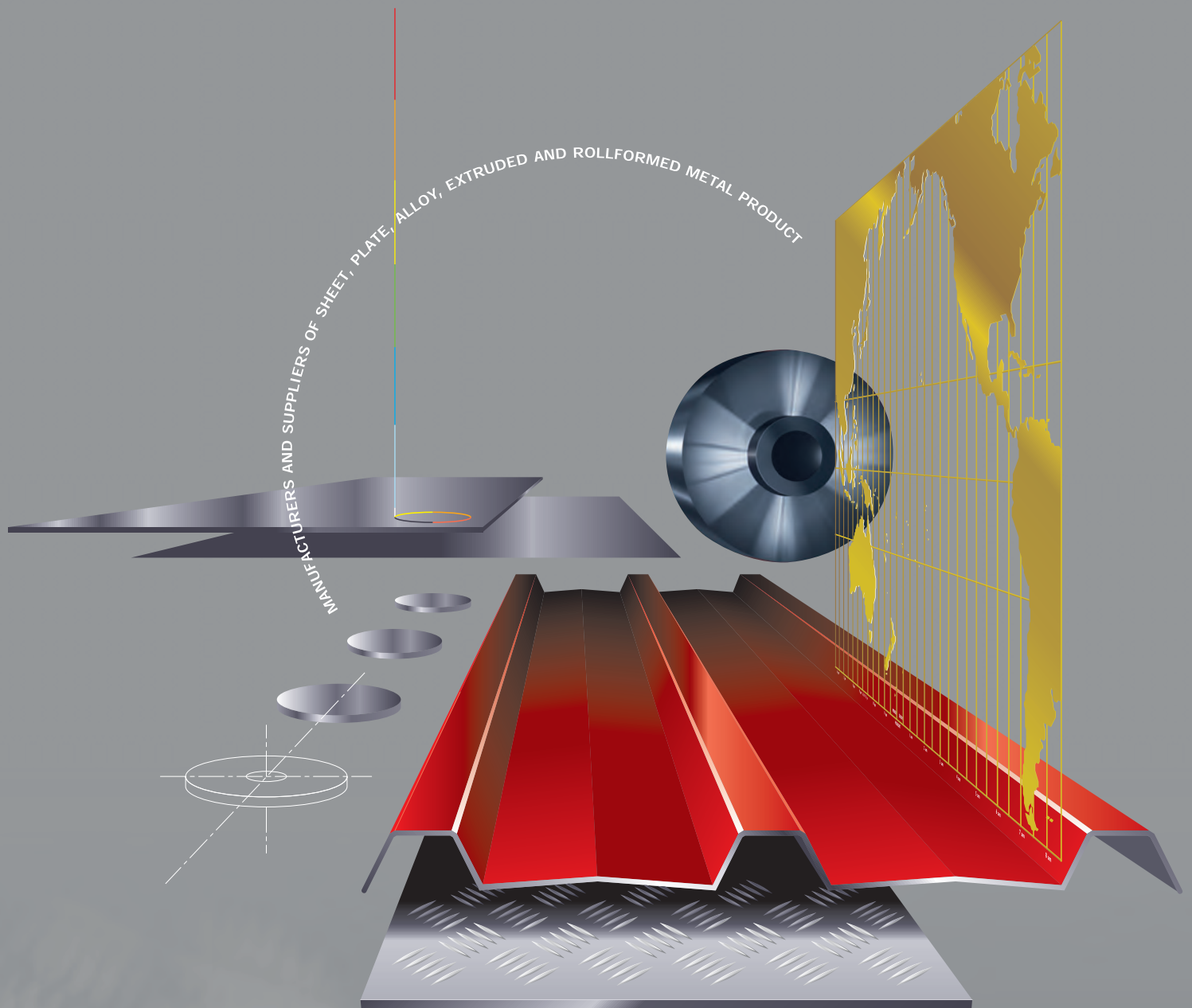


SHEET, PLATE AND ROLLFORMED METAL PRODUCTS



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QUALITY • SERVICE • INTEGRITY

DEFINITIONS USED IN THIS PUBLICATION

Sheet

A rolled rectangular section of thickness over 0.15mm and up to 6.0mm, with sheared, slit or sawn edges.

Alclad Sheet

A composite sheet having, on both surfaces, a metallurgically bonded aluminium or aluminium alloy coating which is anodic to the core alloy to which it is bonded, thus electrolytically protecting the core alloy against corrosion. Alclad one-side sheet has been treated on one surface only.

Plate

A rolled rectangular section of thickness greater than 6.0mm, with sheared or sawn edges.

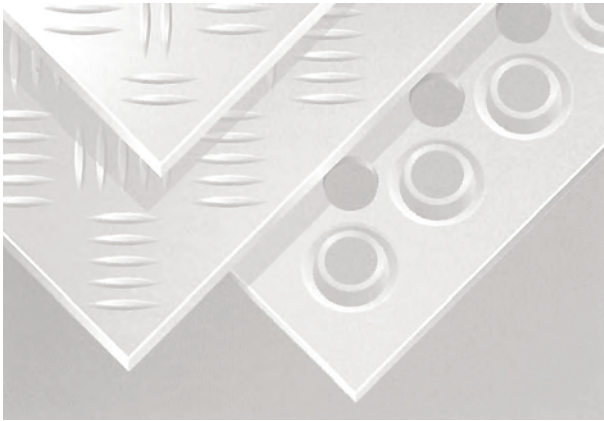
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IMPORTANT INFORMATION

While all care has been taken in the production of this publication, Ullrich Aluminium Co Ltd does not accept responsibility for any inaccuracy or errors contained therein. Ullrich Aluminium Co Ltd cannot therefore be responsible for its accuracy or correctness.

The information and values are intended only as a general guide to performance and suitability for application. Nothing herein contained shall constitute a warranty that any product is specifically suitable for a particular purpose. Data is not intended for design.





MECHANICAL PROPERTIES 5251-0 AND 5251-F

	SPECIFICATION (MPa)		TYPICAL (MPa) Not for design	
	UTS	YIELD	UTS	YIELD
Temper O	170-216	65 min	180	75
Temper F	231-276	179 min	260	240

F is 'as rolled', suitable for uses where higher strength than O is required

PLATE DATA 5-Bar 5251-F and 5052-0

Base thickness mm	2.0	2.5	3.0	4.0	4.5	6.0
Total thickness mm	3.7	4.2	4.7	5.7	6.7	7.7
Approx weight kg/m ²	6.0	7.5	8.9	12.1	14.1	18.0
Bendi radii O temper	3.5	3.75	4.5	6.0	7.5	9.5
W x L mm	1200 x 2400		1200 x 3600		1200 x 4800	

PLATE DATA Barley 5251-H34 and 5005-H34

Base thickness mm	1.2	1.6	2.0
Total thickness mm	2.2	3.7	4.2
Approx weight kg/m ²	4.7	6.0	7.5
Bend radii H34 temper	1.8	2.4	3.0
W x L mm	1200 x 2400		

PLATE DATA SafeDeck 6063, 6351 and 6261

Base thickness mm	2.5	3.0	4.0
W x L mm	900 x 2400 (not in 4mm)		1200 x 2400
Perforations Ø	Embossed hole 17mm Plain hole Ø 19.7mm		

Custom sheet sizes, hole sizes and spacings on request.

Available in mild steel, stainless steel and aluminium.

Finishes include powder-coated, electroplated, galvanised and natural.

Other stock transport industry fittings and accessories available on request.

SPANNING CAPABILITY *		FASTENED EACH CORNER ONLY					FASTENED ALONG ALL EDGES ¶					FOOTNOTES
Alloy 5251-F only		DISTRIBUTED LOAD (kg/m ²)					DISTRIBUTED LOAD (kg/m ²)					
THICK (mm)	LxW RATIO (mm) †	200	250	300	400	500	200	250	300	400	500	
2.5	1.0	390	360	340	310	290	570	535	500	455	425	* This spanning data applies only to alloy 5251-F temper and is based on the maximum possible deflection not exceeding SPAN÷ 200 for plates supported on all 4 edges.
	1.2	350	325	305	280	250	515	480	455	410	385	
	1.4	323	300	285	260	240	485	450	425	390	360	
	1.6	305	285	270	245	225	470	435	410	375	350	
	1.8	295	275	260	235	220	460	430	405	365	340	
	2.0	285	265	250	230	215	455	420	400	360	335	
	Above 2.0	265	245	230	210	195	450	420	395	360	335	
3.0	1.0	465	430	410	370	345	685	640	600	550	510	† By definition, width is less than or equal to length.
	1.2	415	390	365	335	310	620	575	540	495	460	
	1.4	385	355	340	310	285	580	540	510	465	430	
	1.6	365	335	320	295	270	560	525	495	450	420	
	1.8	350	330	310	280	260	550	515	485	440	410	
	2.0	340	320	300	275	255	545	505	480	435	405	
	Above 2.0	315	295	275	250	235	540	500	475	430	400	
4.0	1.0	620	575	540	495	460	910	850	800	730	680	¶ Fastening points along each edge must be spaced to prevent distortion of the plate under the distributed load between each point. As a guide, the interval between fastening points should not exceed SPAN ÷ 5.
	1.2	555	515	485	445	410	820	765	720	660	610	
	1.4	515	480	450	410	380	775	720	680	620	575	
	1.6	485	455	425	390	360	745	695	655	595	555	
	1.8	470	435	410	375	350	730	680	640	585	545	
	2.0	455	425	400	365	340	725	675	635	580	540	
	Above 2.0	420	390	370	335	310	715	665	630	575	535	
5.0	1.0	770	715	675	615	575	1135	1060	1000	910	845	
	1.2	690	640	605	555	515	1025	955	900	820	760	
	1.4	640	595	560	515	480	960	900	845	770	720	
	1.6	605	565	535	485	450	930	865	820	745	695	
	1.8	585	545	515	465	435	910	850	800	730	680	
	2.0	565	530	500	455	420	900	840	790	720	670	
	Above 2.0	520	485	460	420	390	890	830	785	715	665	
6.0	1.0	920	855	810	740	685	1355	1265	1195	1090	1015	
	1.2	825	770	725	660	615	1225	1140	1075	985	915	
	1.4	765	715	675	615	570	1150	1075	1015	925	860	
	1.6	725	675	640	580	540	1110	1035	980	895	830	
	1.8	700	650	615	560	520	1090	1015	960	875	815	
	2.0	675	630	595	545	505	1075	1005	945	865	805	
	Above 2.0	625	580	550	500	465	1065	995	940	855	800	



TECHNICAL DATA

Substrate material Aluminium plate,
stretched hot rolled

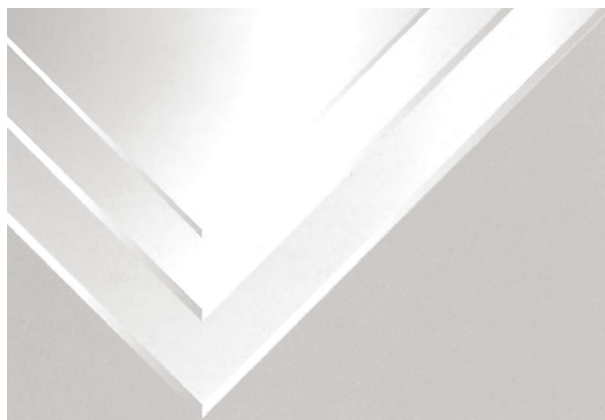
Coatings and finishes Mill

Plate size

Thickness 25.00 40.00 51.00
71.00 103.00

Flat width x length 1000 x 2000

Scope of use Machinery components



TECHNICAL DATA

Substrate material Aluminium plate,
stretched hot rolled

Alloy and temper 5083-H321 5083 H112

Coatings and finishes Mill

Sheet size

Thickness 3.00 4.00 5.00 6.00

Flat width x length 1200 x 2400

1200 x 4800

1200 x 6100

1530 x 6100

1830 x 6100

Thickness 8.00 10.00 12.00

Flat width x length 1200 x 2400

Standard compliance Refer to DNV Certification
Standards before project
commencement

Availability All main centres

Scope of use Marine hulls and components

How to calculate the weight of any sheet or plate
given aluminium base density of 2.71

1. Calculate weight per sq.m

Density x Mass x Thickness = weight per sq.m

ie: $2.71 \times 1.00 \times \text{Thickness}$

eg: Weight of 1.6mm sheet per sq.m:

$2.71 \times 1.00 \times 1.6 = 4.336 \text{ kg per sq.m}$

2. Multiply the weight per sq.m by the area of the sheet

eg: Weight of 1.6 x 1200 x 2400 sheet (2.88 sq.m)

$4.336 \times 2.88 = 12.487 \text{ kg}$

IMPORTANT INFORMATION

Certain sheet types, grades and sizes may not always be available at all supply centres. Please enquire on stock availability before project commencement and we will endeavour to fulfill your order promptly from alternative sources.

Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.

RELATED DATA ON PAGE

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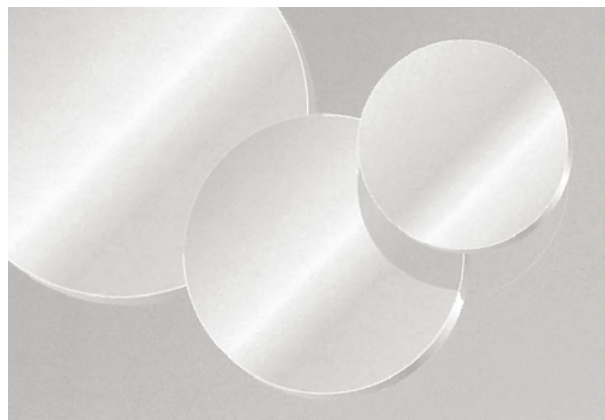
PANEL STEEL



TECHNICAL DATA

Substrate material	Mild Steel
Coatings and finishes	Cold rolled Zinc coated
Sheet size	
Thickness	0.7 0.9 1.2 1.6
Flat width x length	1200 x 2400
Availability	All main centres
Scope of use	General sheet metal work Panels Appliances

CIRCLES



TECHNICAL DATA

Substrate material	Aluminium plate, stretched hot rolled
Alloy and temper	1200 - O 1200 - H14 5005 - H34
Coatings and finishes	On request
Plate size	Cut to size per order, indent only
Availability	All main centres. Special small quantities can be cut at the Auckland plant
Scope of use	Appliances Cooking utensils Mouldings Spun and drawn containers

IMPORTANT INFORMATION

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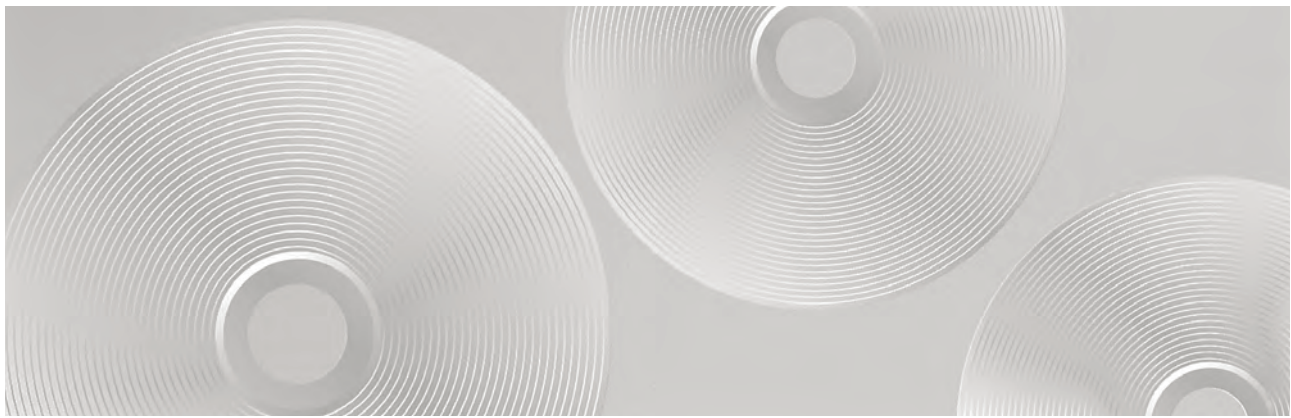
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TECHNICAL DATA			
Substrate material	Aluminium plate		
Alloy and temper	5005 - H32	5005 - H34	5251 - H34
	5052 - H32	5052 - H34	5454 - H34
		1200 - H34	3103 - H34
	5083 - H321, H116	5086 - H34	1200 - O
Coatings and finishes	Plain		
	Anodised (A) silver or bronze		
	Powdercoat (P) white or bronze		
	Stucco Embossed (SE)		
Sheet sizes 5005	Thickness x width x length		
0.45 x 900 x 2400	1.6 x 900 x 2400		
0.5 x 900 x 2400	1.6 x 1200 x 2400		
0.6 x 900 x 2400	2.0 x 900 x 2400		
0.6 x 1200 x 2400	2.0 x 1200 x 2400		
0.7 x 900 x 2400 SE	2.5 x 900 x 2400		
0.7 x 1200 x 2400 SE	2.5 x 1200 x 2400		
0.9 x 900 x 2400 SE	3.00 x 900 x 2400		
0.9 x 1200 x 2400 A P SE	3.0 x 1200 x 2400		
0.9 x 1200 x 3000	4.0 x 1200 x 2400		
0.9 x 1200 x 3600	5.0 x 1200 x 2400		
1.2 x 900 x 2400 SE	6.0 x 1200 x 2400		
1.2 x 1200 x 2400 A P SE			
1.2 x 1200 x 2700			
1.2 x 1200 x 3000			
1.2 x 1200 x 3600			
Availability	All main centres		
Scope of use	Refer to Typical Applications for specific alloys on page 32		

Sheet sizes 5052	Thickness x width x length
0.7 x 900 x 2400	3.0 x 900 x 2400
0.7 x 1200 x 2400	3.0 x 1200 x 2400
0.9 x 900 x 2400	4.0 x 1200 x 2400
0.9 x 1200 x 2400	5.0 x 1200 x 2400
1.2 x 900 x 2400	6.0 x 1200 x 2400
1.2 x 1200 x 2400	9.0 x 1200 x 2400
1.2 x 1200 x 3600	10.0 x 1200 x 2400
1.6 x 900 x 2400	12.0 x 1200 x 2400
1.6 x 1200 x 2400	19.0 x 1200 x 2400
2.0 x 900 x 2400	
2.0 x 1200 x 2400	

Sheet sizes 5083	Thickness x width x length
3.0 x 1200 x 2400	8.0 x 1200 x 2400
3.0 x 1200 x 6100	8.0 x 1525 x 6100
3.0 x 1350 x 6100	8.0 x 2000 x 8000
3.0 x 1200 x 2100	8.0 x 1830 x 6100
3.0 x 1830 x 6100	10.0 x 1200 x 2400
4.0 x 1200 x 2400	10.0 x 1830 x 6100
4.0 x 1200 x 4800	10.0 x 2000 x 8000
4.0 x 1200 x 6100	12.0 x 1200 x 2400
4.0 x 1525 x 6100	12.0 x 1830 x 6100
4.0 x 1830 x 6100	12.0 x 2000 x 8000
5.0 x 1200 x 2400	16.0 x 1200 x 2400
5.0 x 1200 x 4800	16.0 x 2000 x 8000
5.0 x 1200 x 6100	20.0 x 1200 x 2400
5.0 x 1830 x 6100	25.0 x 1200 x 2400
5.0 x 1200 x 7100	32.0 x 1200 x 2400
5.0 x 2000 x 8000	32.0 x 2000 x 8000
6.0 x 1200 x 2400	40.0 x 1200 x 2400
6.0 x 1200 x 6100	50.0 x 1200 x 2400
6.0 x 1500 x 7100	60.0 x 1200 x 2400
6.0 x 1600 x 9000	75.0 x 1200 x 2400
6.0 x 1830 x 6100	140.0 x 1200 x 2400
6.0 x 2000 x 8000	
6.0 x 1830 x 7100	

5

**TECHNICAL DATA - ALUMINIUM COILED SHEET**

Alloy and temper	5005 - H34	
Coatings and finishes	Plain	
Sizes Thickness x width	0.7 x 1200	0.9 x 1200
	1.2 x 1200	1.6 x 1200
Weight	1200 kg - 1500 kg per coil	
Availability	All main centres Slitting service on indent	
Scope of use	Appliances, utensils, general sheet metal work, high-strength foil	

TECHNICAL DATA - ALUMINIUM OPOSSUM COIL

Alloy and temper	5005 - H32
Coatings and finishes	Prepainted eg: nut brown, lichen
Sizes Thickness x width	0.45 x 590 (34m approx length)
Weight	25 kg per coil
Availability	All main centres
Scope of use	Opossum and vermin barriers

TECHNICAL DATA - ULFOIL ALUMINIUM FOIL

Supplied	Jumbo freestanding dispenser
	Caterer dispenser carton
Sizes Thickness x width	0.15 x 450 (Caterer also 0.13)
Lineal yield per kg	Jumbo 55m, Caterer 90m
Weight	Jumbo 36kg, Caterer 1.6kg
Scope of use	Culinary

TECHNICAL DATA - ALUMINIUM ROOFING COIL

Alloy and temper	3004 - H16
Coatings and finishes	Plain or stucco embossed
Sizes Thickness x width	0.55 x 940
	0.7 x 940
	0.7 x 1220
	0.9 x 1220
	1.2 x 1220
	0.7 x 610
	0.9 x 610
	1.2 x 610
Weight	1200 kg - 1500 kg per coil
Availability	All main centres Slitting services on indent
Scope of use	Roofing, barge rolls, ridging

TECHNICAL DATA - ALUMINIUM WIDE COIL

Alloy and temper	3003 - H16
Coatings and finishes	Plain or stucco embossed
Sizes Thickness x width	0.9 x 2500
Weight	1100 kg per coil (approx)
Availability	All main centres Slitting service on indent
Scope of use	Truck canopies Coachwork Vehicle bodies

IMPORTANT INFORMATION

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Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.

RELATED DATA ON PAGE**18 - 34**

EXPANDED MESH



TECHNICAL DATA - EXPANDED MESH

Substrate material Aluminium

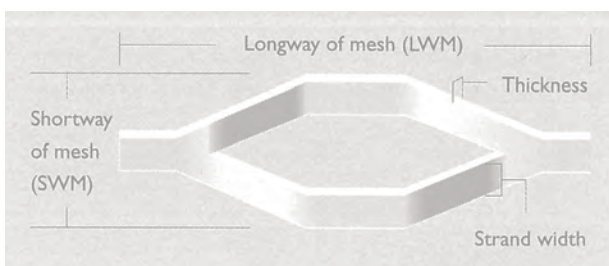
Coatings and finishes Mill

Standard sheet sizes

Length x width
600 x 600
1200 x 900
1800 x 900
1200 x 2400

Mesh sizes

SWM = short way mesh 3mm SWM x 11mm LWM to
LWM = long way mesh 12mm SWM x 312mm LWM



IMPORTANT INFORMATION

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MINIATURE PROFILED SHEET



TECHNICAL DATA -MINIATURE PROFILED SHEET

Substrate material Aluminium

Types Miniature Industrial (MI)
Miniature Mansard (MM)
Shallow Trough (ST)

Coatings and finishes Plain mill, stucco embossed

Standard sheet sizes

Thickness x length x width 0.7 x 1200 x 2400 MI MM ST
0.9 x 1200 x 2400 MI MM ST
1.2 x 1200 x 2700 MI MM

Finished profile width Dependent on selected profile and number of pitches per sheet required - see diagrams

Custom sheet sizes

Maximum lengths MI 2740mm
MM 3650mm
ST 2740mm

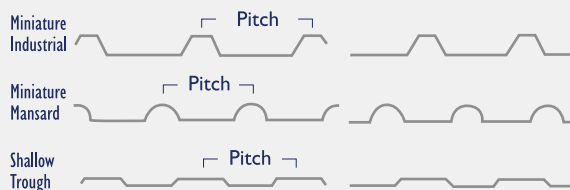
Pitches (centre to centre) 50mm 75mm 100mm 150mm

Typical uses Decorative interior and exterior cladding, infill panels

MINIATURE SHEET PROFILES

STANDARD PROFILE EDGE

NON- STANDARD PROFILE EDGE



RELATED DATA ON PAGE
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**TECHNICAL DATA - STORM SHUTTER Series 10**

Substrate material	Aluminium
Thickness mm	LT3 sheet: 0.7 (22 swg) 0.9 (20swg)
Coatings and finishes	Powder-coated Anodised
Single sheet cover width	460 mm
Overlap cover width	375 mm
Efficiency rating	Tested in controlled conditions to withstand hurricane force winds up to 190 kmh. Test reports are available on request from Wakefield Laboratories Ltd, Albany, New Zealand.

Top Channel UA1056	Bottom Channel UA1057	Wedge Pin UA1055	SHEET COVER			
			1	460	8	3085
			2	835	9	3460
			3	1210	10	3835
			4	1585	11	4210
			5	1960	12	4585
			6	2335	13	4960
			7	2710	14	5335

**TECHNICAL DATA - STORM SHUTTER Series 29**

Substrate material	Aluminium - extruded
Coatings and finishes	Powder-coated, anodised
Additional information	Refer to Ullrich Aluminium Extrusions catalogue for profile details and full technical specifications.

COMPONENT	MASS kg/m	PERIPHERY mm
UA 2916 Strike	0.899	423
UA 2917 Lock	1.040	489
UA 2918 Guide	0.806	399
UA 2919 Channel	0.606	301
UA 2920 Wheelguide	0.752	359
UA 2921 Shutter Slat	0.512	255
UA 2922 End	0.441	213

IMPORTANT INFORMATION

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Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.

RELATED DATA ON PAGE**18 - 34**

DEFINITION

Ullrich roofing and cladding sheets is typically 0.40mm or 0.55mm roll-formed steel treated with Colorsteel, Colour-Cote, Zinalume or Galvsteel finishing. Other substrate metals may be available on enquiry, although 0.55mm BMT steel is recommended for the best results in machine curving in most applications.

SCOPE OF USE

Ullrich roofing and cladding sheets is intended for use as long-run roofing, wall cladding and internal lining subject to the environmental limitations listed below for the appropriate grade of material selected.

It is critical to product performance that the life expectancy required and the severity of the environment in which the product will be installed are used as the basis for selection of the grade and type of material.

Before commencing any project using Ullrich roofing and cladding sheet, it is important to refer to *Environment Limitations, Handling, Storage and Installation and Maintenance*, and the further recommended references. Failure to follow these references may result in a significant reduction in a product's performance, for which Ullrich Aluminium Co Ltd will accept no liability.

ENVIRONMENT LIMITATIONS

Limitations on the use of each grade of material are given in literature from:

1. BHP Steel, incorporating Coloursteel, Zinalume and Galvsteel.
2. Pacific Coilcoaters, incorporating ColorCote ZR8 and ColorCote ZRX 1994.

It is important to use these references before commencement of any project incorporating these products.

DESIGN, HANDLING, STORAGE AND INSTALLATION

Details of the correct installation procedures are outlined in the BHP Steel Installer's Guide, or alternatively in consultation with Ullrich technical staff. The following factors are amongst those which will limit product performance.

1. Site storage which allows sheets to become wet.
2. Damage to surface coating during handling, installation and other trade work on the building site.
3. Installation on spans which are excessive for the loads imposed.
4. Use of incorrect or insufficient fasteners to suit either the loads imposed or the local environmental factors, including allowances necessary for thermal expansion
5. Installation of roof pitches below the recommended minimum for each product (usually between 3° and 7°): In situations where the roof is curved, there may be sections where the roof is pitched below the recommended minimum - special attention must be given at design and installation stages, particularly if intended for (eg) areas subject to snow load stress.
6. Installation in contact with certain other materials listed in the product literature referred to above or on external areas of the building where natural rain washing or frequent cleaning does not occur.

MAINTENANCE

Careful and regular maintenance will extend the useful life of Ullrich roofing and cladding products. Follow these guidelines for the minimum degree of maintenance required to ensure expected performance:

1. Keep surfaces clean and free from continuous contact with moisture and debris.
2. Regularly clean the product if installed in areas not washed by regular rainfall. Use water spray and/or, if necessary, scrubbing with a soft nylon brush.
3. Inspect and replace any fasteners or fastener sealing washers that have deteriorated sufficiently to cause leakage risk.
4. At the first sign of surface corrosion, clean, spot-prime and repaint the sheet(s) to an appropriate paint manufacturer's recommendations.
5. Repaint surfaces as necessary to overcome the fading potential which naturally occurs in some surface coating colours.

USE OUTSIDE STATED GUIDELINES

If needs arise to use Ullrich roofing and cladding sheet outside the limitations and procedures given in this and other referenced literature, or if any doubt exists on product handling or use, written approval for specific details must be obtained from Ullrich Aluminium before project commencement.

STANDARDS COMPLIANCE NZBC

Test information from BHP Steel and Pacific Coilcoaters, as well as statistics based on experience with steel roof and cladding products indicate that Ullrich roofing and cladding sheet will meet the performance criteria set out in clause E2 of the NZ Building Code for a period of not less than 15 years, provided it is handled, stored, used and maintained in accordance with the guidelines and conditions in this manual and other referenced technical literature.

PRODUCT INFORMATION

Ullrich Aluminium have prepared this literature for all involved segments of the building industry, including designers, specifiers, contractors, installers and owner/managers.

We recommend that all parties involved in the use of Ullrich roofing and cladding sheet products be provided with copies of this information to ensure awareness of the design, construction, handling and maintenance requirements associated with the product's use.

Specification and product performance statements written for specific projects are available from Ullrich Aluminium on request. It is important these be obtained before project commencement.

Further detailed information is available either through your Ullrich Aluminium representative, or by directly contacting:

ROOFING PROFILES: CORRUGATE



DESCRIPTION

Corrugate is a traditionally styled roofing and cladding sheet. Its low material cost and rapid installation places it amongst the most economical products of its type available. It is machine-rollable to minimum inside radius curves of 400mm for (eg) barrel ridges, horizontally-clad wall corners and bullnosing. A variety of coatings, including natural galvanising and powder-coated process finished, are available to suit environmental and aesthetic criteria.

DIMENSIONS

Cover 762mm Sheet width 851mm Min Pitch 8° (approx 1:7)



MAX SPAN FOR 1kN CONCENTRATED LOAD FOR G550 STEEL

SPAN LOCATION ON ROOF	THICKNESS (BMT)		SHEET COVER	
	.40	.55		
End	900	1200	1 762	6 4572
Intermediate	1200	1600	2 1524	7 5334
			3 2286	8 6096
			4 3048	9 6858
Mass kg/m²	4.42	5.88	5 3810	10 7620

FASTENER LOCATIONS Crest Fixing

5 fasteners per width to end supports and end laps



3 fasteners per width to intermediate supports



Fasteners are fixed with a neoprene washer and may require a profiled metal washer in some situations. Spiral shanked nails may only be used on sheets up to 8mm long. To ensure fastener durability is at least equal to the durability of the sheet product, and for full details of installation procedures, contact Ullrich Technical Support.



12g x 50mm TYPE 17
SCREW FOR TIMBER

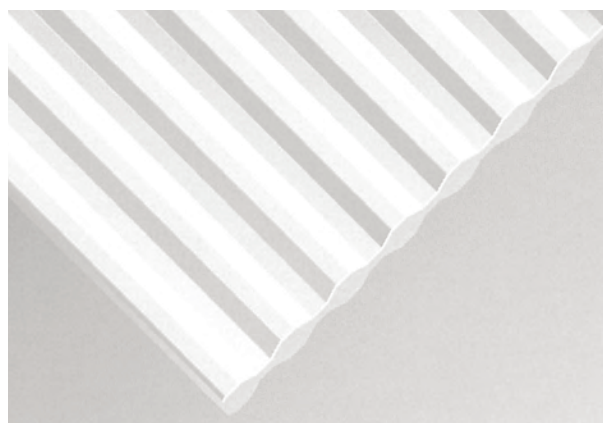
60mm SPIRAL SHANK
NAIL FOR TIMBER

12g x 35mm SELF DRILLING
TEK SCREW FOR STEEL

IMPORTANT INFORMATION

Flashings, fastener systems and accessories are available for Corrugate and Multi Rib, including matching translucent sheet profiles. Corrugate and Multi Rib roofing and cladding is warranted for coating performance, corrosion resistance and substrate integrity.

ROOFING PROFILES: MULTI RIB

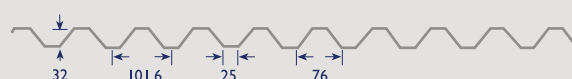


DESCRIPTION

Multi Rib's close symmetrical rib profile and high inherent strength for structural integrity and foot-traffic tolerance makes it ideal for industrial use and projects with unusual design demands. Its bold angular profile gives strong overlaps in minimal distance (51 mm) on an economical 915mm wide sheet. Multi Rib is crimp-curvable down to 400mm inside radius for barrel ridges, corners and bullnosing, and is available in a range of finishes, including natural galvanising and powder-coated enamel.

DIMENSIONS

Cover 915mm Sheet width 966mm Min Pitch 4° (approx 1:15)



MAX SPAN FOR 1kN CONCENTRATED LOAD FOR G550 STEEL

SPAN LOCATION ON ROOF	THICKNESS (BMT)		SHEET COVER	
	.40	.55		
End	1300	1750	1 915	6 5490
Intermediate	1650	2200	2 1830	7 6405
			3 2745	8 7320
			4 3660	9 8235
Mass kg/m²	4.78	6.57	5 4575	10 9150

FASTENER LOCATIONS Crest Fixing

5 fasteners per width to end supports



3 fasteners per sheet to intermediate supports



Fasteners are fixed with a neoprene washer and may require a profiled metal washer in some situations. To ensure fastener durability is at least equal to the durability of the sheet product, and for full details of installation procedures, contact Ullrich Technical Support.



12g x 65mm TYPE 17
SCREW FOR TIMBER

12g x 55mm SELF DRILLING
TEK SCREW FOR STEEL

RELATED DATA ON PAGE

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Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.

ROOFING PROFILES: STYLELINE

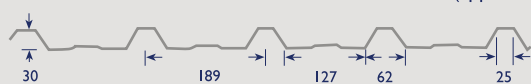


DESCRIPTION

Styleline's alternating swage profile offers stylish board-and-batten appeal with robustness and light-weight. With an excellent spanning/strength ratio permitting a minimum pitch limit of 3° (approx 1:20), Styleline is also crimp-curvable to a minimum radius of 400mm for barrel ridges, wall corners and bullnosing. This profile is available in a variety of coatings, including natural galvanising and powder-coated enamel, to suit environmental and aesthetic criteria.

DIMENSIONS

Cover 755mm Sheet width 810mm Min Pitch 3° (approx 1:20)



MAX SPAN FOR 1kN CONCENTRATED LOAD FOR G550 STEEL

SPAN LOCATION ON ROOF	THICKNESS (BMT)		SHEET COVER	
	.40	.55		
End	1200	1300	1	755
Intermediate	1500	1700	6	4530
			2	1510
			7	5285
			3	2265
Mass kg/m²	4.48	5.97	8	6040
			4	3020
			9	6795
			5	3775
			10	7550

FASTENER LOCATIONS Crest Fixing

4 fasteners per width to end and intermediate supports



Fasteners are fixed with a neoprene washer and may require a profiled metal washer in some situations. Spiral shanked nails may only be used on sheets up to 8mm long. To ensure the fastener durability is at least equal to the durability of the selected roofing material, and for full details of installation procedures, contact Ullrich Technical Support.



12g x 65mm TYPE 17
SCREW FOR TIMBER

75mm SPIRAL SHANK
NAIL FOR TIMBER

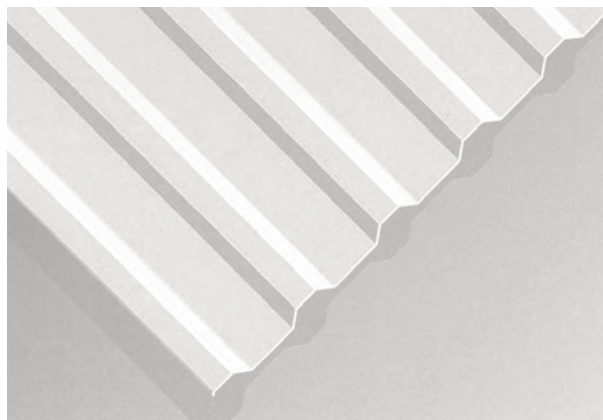
12g x 45mm SELF DRILLING
TEK SCREW FOR STEEL

IMPORTANT INFORMATION

Flashings, fastener systems and accessories are available for Styleline and BB900, including matching translucent sheet profiles. Styleline and BB900 roofing and cladding is warranted for coating performance, corrosion resistance and substrate integrity.

Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.

ROOFING PROFILES: BB900



DESCRIPTION

Bold, 150mm-spaced ribs and more fixing points on fewer purlins provides economy, industrial-strength toughness and high foot-traffic tolerance during installation and maintenance. BB900 has a low minimum pitch limit of 3° (approx 1:20), long-run process advantages to minimise endlaps, crimp-curvability down to a radius of 400mm for barrel ridges, corners and bullnosing and is available in a variety of coatings and finishes to suit environmental and aesthetic needs.

DIMENSIONS

Cover 900mm Sheet width 960mm Min Pitch 3° (approx 1:20)



MAX SPAN FOR 1kN CONCENTRATED LOAD FOR G550 STEEL

SPAN LOCATION ON ROOF	THICKNESS (BMT)		SHEET COVER	
	.40	.55		
End	1800	3000	1	900
Intermediate	2300	3700	6	5400
			2	1800
			7	6300
			3	2700
Mass kg/m²	4.86	6.68	8	7200
			4	3600
			9	8100
			5	4500
			10	9000

FASTENER LOCATIONS Crest Fixing

6 fasteners per width to end supports



3 fasteners per width to intermediate supports



Fasteners are fixed with a neoprene washer and may require a profiled metal washer in some situations. To ensure the fastener durability is at least equal to the durability of the selected roofing material, and for full details of installation procedures, contact Ullrich Technical Support.

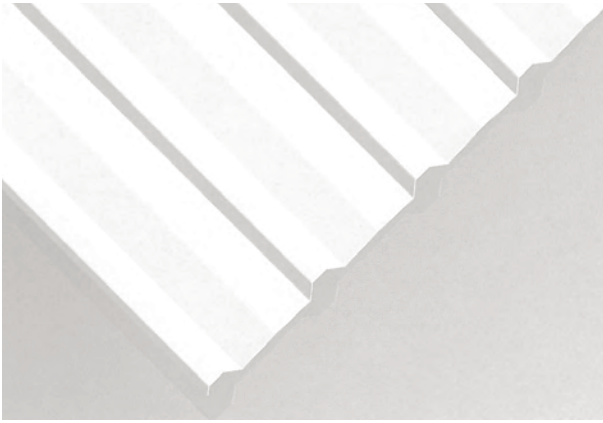


12g x 75mm TYPE 17
SCREW FOR TIMBER

12g x 65mm SELF DRILLING
TEK SCREW FOR STEEL

RELATED DATA ON PAGE

9 16

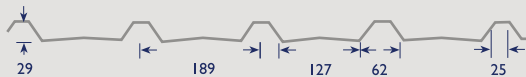


DESCRIPTION

The bold-crested, flute-panned profile offers an ideal combination of light weight, strength and wide span with the fashionable visual appeal of traditional board-and-batten construction. Attractive, economical, crimp-curvable to minimum inside radius curves of 400mm for barrel ridges, corners and bullnosing, Trim Rib offers a very low minimum pitch limit and a variety of finishes and colours to suit the environment and aesthetic criteria of modern residential architecture.

DIMENSIONS

Cover 755mm Sheet width 810mm Min Pitch 3° (approx 1:20)



MAX SPAN FOR 1kN CONCENTRATED LOAD FOR G550 STEEL

SPAN LOCATION ON ROOF	THICKNESS (BMT)		SHEET COVER			
	.40	.55				
End	1200	1400	1	755	6	4530
Intermediate	1600	1800	2	1510	7	5285
			3	2265	8	6040
			4	3020	9	6795
Mass kg/m²	4.45	5.93	5	3775	10	7550

FASTENER LOCATIONS Crest Fixing

4 fasteners per width to end and intermediate supports



Fasteners are fixed with a neoprene washer and may require a profiled metal washer in some situations. Spiral shanked nails may only be used on sheets up to 8mm long. To ensure fastener durability is at least equal to the durability of the selected roofing material, and for full details of installation procedures, contact Ullrich Technical Support.



12g x 65mm TYPE 17
SCREW FOR TIMBER

75mm SPIRAL SHANK
NAIL FOR TIMBER

12g x 45mm SELF DRILLING
TEK SCREW FOR STEEL

IMPORTANT INFORMATION

Flashings, fastener systems and accessories are available for Trim Rib, including translucent sheet in Trim Rib profile. Trim Rib roofing products are warranted for coating performance, corrosion resistance and substrate integrity.

Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.

RELATED DATA ON PAGE

9 16

ROOFING PROFILES: CIRCULAR



DESCRIPTION

Circular brings the additional benefits of aluminium to a familiar corrugated profile. Lighter and more corrosion resistant than typical substrates, its low material cost and rapid installation offers an economical alternative for roofing and siding. It is machine-rollable to minimum inside radius curves of 400mm for (eg) barrel ridges, horizontally-clad wall corners and bullnosing. A variety of finishes are available, including stucco-embossing, anodising and powder-coated enamel.

DIMENSIONS

Cover 762mm Sheet width 851mm Min Pitch 8° (approx 1:7)



Thickness 0.55mm

SHEET COVER

1	762	6	4572
2	1524	7	5334
3	2286	8	6096
4	3048	9	6858
5	3810	10	7620

FASTENER LOCATIONS Crest Fixing

5 fasteners per width to end supports and end laps



3 fasteners per width to intermediate supports



Fasteners are fixed with a neoprene washer and may require a profiled metal washer in some situations. Spiral shanked nails may only be used on sheets up to 8mm long. To ensure fastener durability is at least equal to the durability of the sheet product, and for full details of installation procedures, contact Ullrich Technical Support.



12g x 50mm TYPE 17
SCREW FOR TIMBER

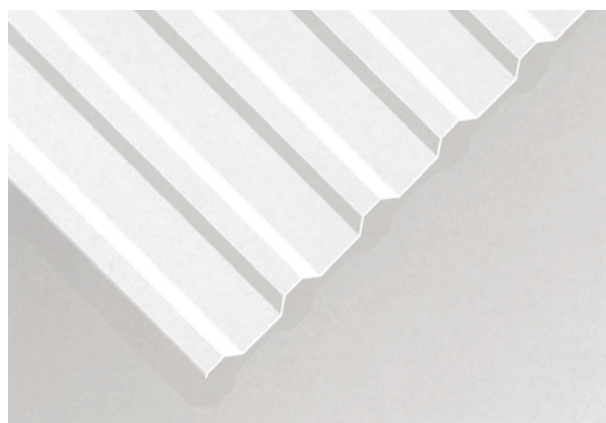
60mm SPIRAL SHANK
NAIL FOR TIMBER

12g x 35mm SELF DRILLING
TEK SCREW FOR STEEL

IMPORTANT INFORMATION

Flashings, fastener systems and accessories are available for Circular and Industrial 7, including matching translucent sheet profiles. Circular and Industrial 7 roofing and cladding is warranted for coating performance, corrosion resistance and substrate integrity.

ROOFING PROFILES: INDUSTRIAL 7

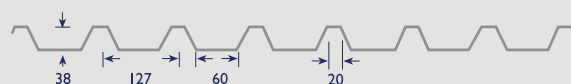


DESCRIPTION

This is a general-duty sheet for primarily industrial applications. Its bold rib profile offers high inherent strength in a relatively lighter weight sheet than typical alternatives. Its bold angular profile gives strong overlaps in minimal distance (44mm) on an economical 933mm wide sheet. Industrial 7 profile is a crimp-curvable down to 400mm inside radius for barrel ridges, corners and bullnosing, and is available in a range of finishes, including stucco-embossing, anodising and powder-coated enamel.

DIMENSIONS

Cover 889mm Sheet width 933mm



Thickness 0.70mm

SHEET COVER

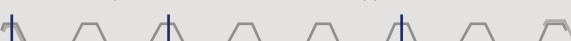
1	889	6	5334
2	1778	7	6223
3	2667	8	7112
4	3556	9	8001
5	4445	10	8890

FASTENER LOCATIONS Crest Fixing

4 fasteners per width to end supports



3 fasteners per width to intermediate supports



Fasteners are fixed with a neoprene washer and may require a profiled metal washer in some situations. To ensure fastener durability is at least equal to the durability of the sheet product, and for full details of installation procedures, contact Ullrich Technical Support.



12g x 65mm TYPE 17
SCREW FOR TIMBER

75mm SPIRAL SHANK
NAIL FOR TIMBER

12g x 55mm SELF DRILLING
TEK SCREW FOR STEEL

RELATED DATA ON PAGE

9 16 18 - 34

Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.



DESCRIPTION

WinterLite™ is a contoured mesh profile designed to provide effective visual privacy and year-round sunlight control in awnings, pergolas, fence panel and vertical privacy screen applications. The powder-coated, lightweight aluminium panels offer easy installation, good appearance and low maintenance. WinterLite's range of powder-coated colours are selected to provide architectural uniformity with contemporary roof finishes.

DIMENSIONS Profile side elevation

Cover 760mm Sheet width 800mm



Thickness 0.70mm Sheet Lengths 2000, 3000 and 4000mm

SHEET COVER

1	800	6	4600
2	1560	7	5360
3	2320	8	6120
4	3080	9	6880
5	3840	10	7640

FASTENER LOCATIONS

5 Tek screw fasteners per panel per rafter



Screw fasteners are fixed with a neoprene washer and may require a profiled metal washer in some situations. Multiple sheet installations require pop-riveted sheet jointing (see Panel Jointing Detail). To ensure fastener durability is at least equal to the durability of the sheet product, and for full details of installation procedures, contact Ullrich Technical Support.



12g TYPE 17 SCREW
FOR TIMBER RAFTERS

12g SELF-DRILLING TEK
SCREW FOR TIMBER RAFTERS

3.2 DIA x 6.4 GRIP-LENGTH
ALUMINIUM-STEM POP-RIVET

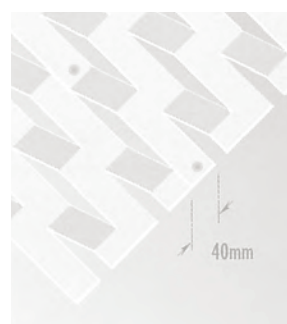
MATERIALS ORDERING

1. Calculate number of sheets required using the Sheet Cover information at left.
2. Calculate length of end capping required to cover open edges of perimeter of installation.
3. Calculate the number of fastenings at 5 fastenings per panel width at each rafter.
 - (a) For timber rafters, specify 12g x 65mm Type 17 screws at panel ends and 12g x 25mm Type 17 screws for intermediate fixings, OR
 - (b) For steel rafters, specify 12g x 65mm self-drilling Tek screws at panel ends and 12g x 20mm Tek screws for intermediate fixings.
4. Multiple panel installations require a 15mm overlap at end joints and 40mm overlap at side joints, fixed with 3.2dia x 6.4 grip-length pop-rivets as illustrated:

JOINT DETAIL - PANEL ENDS



JOINT DETAIL - PANEL SIDES



PANEL CUTTING DETAIL - ACROSS



PANEL CUTTING DETAIL - ALONG



INSTALLATION GUIDELINES

1. Install WinterLite panels using the recommended fasteners, fastener spacings, cutting guidelines and panel jointing techniques.
2. Predrill panels with 6mm dia holes for screw fixing.
3. Fix intermediate screws through the trough of the profile at the same angle as the profile.
4. Fix panel ends vertically through edge capping.
5. Avoid panel end joints at mid-span and plan for joins at rafters where possible.
6. Fit edge capping to open edges of perimeter of installation and fasten at each rafter contact, through the edge capping profile and the WinterLite panel.

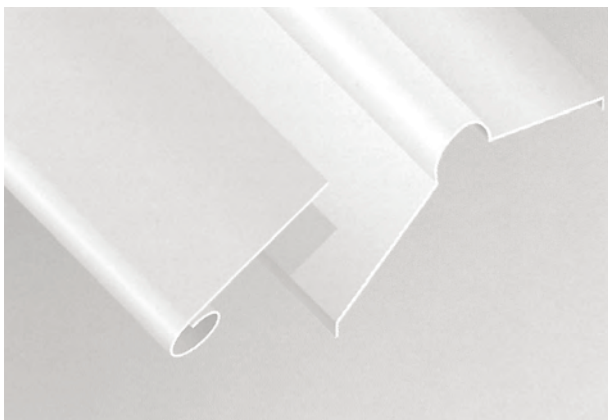
IMPORTANT INFORMATION

WinterLite™ is designed as a covering, not a structural roofing material, and should not be walked on. Where effective sunlight control is important in eg: pergola and awning applications, ensure that arrow indicators on panels face north.
CAUTION: Cut edges can be sharp.

Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.

RELATED DATA ON PAGE

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BARGE ROLL

Barge roll details to be supplied

Material, thickness, length etc, profile diagram with dimensions

RIDGING

Ridging details to be supplied

Material, thickness, length etc, profile diagram with dimensions

FASTENING SYSTEMS



Aluminium Hook Bolts

For fixing sheet to steel purlins and side rails. 80mm minØ, threaded min 38mm. Length and shape to order. Also supplied as straight bolt for shaping on-site.



1. Self-tapping Coach Screws

For fixing sheet to steel purlins and side rails. Stainless steel with prefitted neoprene washers. Twist-drill threads, hardened points.

Tek®: For drilling into steel up to 6.4mm thick. Length of the drilling flutes determine the amount of drilling chip expelled and therefore the material thickness able to be drilled. Consult Ullrich Technical Support for data on drilling capacity of various screw sizes, and the diameter, length and washer system to suit selected sheet and purlin material.

Type 17: For fastening metal roofing sheet into timber. Screw threads extend right to the point to pull the screw into the timber as it is driven, reducing operator pressure and preventing over-running (stripping of screw thread due to insufficient pressure).



2. Aluminium Drive Nail

For fixing sheet to timber purlins and side rails or steel purlins with nailing strips. Light-trough profiles: 64mm min length. Deep-trough profiles: 90mm min length.



3. Aluminium Roundhead Screw

For fixing sheet to timber purlins and side rails or steel purlins with nailing strips. Light-trough profiles: 63.5mm min length. Deep-trough profiles: 88.9mm min length.



4. Angular Profile Washer

For use with fasteners 1, 2 or 3 to fix angular profiled sheet.

Aluminium, neoprene-lined, stucco-embossed. 1.2mm minimum thickness.



5. Curved Profile Washer

For use with fasteners 1, 2 or 3 to fix curved profiled sheet.

Aluminium. 1.2mm minimum thickness.



7. Domed Aluminium Washer

For use with neoprene ring (8) and fasteners 2 or 3 to fix curved profile sheet. Material thickness 0.7mm or 0.9mm.

8. Neoprene Ring

For use under domed aluminium washer, in conjunction with fasteners 2 or 3 to fix curved profile sheet.



9. Mushroom-head Seam Bolt

For side-lap fastening of sheet to side rails. Stainless steel.

10. Flat Aluminium Washer

For use in conjunction with mushroom-head seam bolt and flat neoprene washer.

11. Flat Neoprene Washer

For use in conjunction with mushroom-head seam bolt and flat aluminium washer.

IMPORTANT INFORMATION

Verify with Ullrich Technical Support that fastener durability is at least equal to the selected substrate. Continuous sheet lengths of over 8 metres require special sliding fixings to allow for thermal movement (eg: Industrial 7; aluminium industrial profile: 1.12mm per metre at 50°C).

Dimensions are shown in mm, are nominal and may vary with types and grades of material. Diagrams and illustrations are schematic only.

RELATED DATA ON PAGE 9-13

Ano-Fol reflective substrates are specially rolled and processed through an electrolytic brightening process to achieve their highly reflective qualities. Total reflective values ranging from 85% to 88%, specular values up to 90% and diffusion values up to 5% are achieved, providing high control over light reflection. The following figures relate to the Ano-Fol standard range - even higher light reflectivity is achievable with the enhanced Abno-Fol 1000 specifications. Reflectormatt and Multidirectional

finishes are designed to provide a higher diffuse reflectively than the specular Ano-Fol finishes, creating the higher surface illuminance necessary for some design criteria. All Ano-Fol finishes feature a very durable anodic film with high ductility to enable cutting, roll-forming and bending during manufacture without structural damage to the aluminium or the anodic layer. Contact your Ullrich Aluminium Technical Consultant for information on the latest Ano-Fol design and manufacturing advances.

ANO-FOL CODE	PURITY OR ALLOY	MECHANICAL PROPERTIES N/mm²			REFLECTANCE TOTAL DIN5036/3		SPECULAR REFLECTANCE DIN 67530 %60		TR+ % ≥	D/I ≥	IRID	DESCRIPTION OF FINISH
		Rm TS ≥	Rp 0.2 0.2% PS ≥	A10 (%) ER10 ≥	TOTAL (%) ≥	DIFFUSE (%) ≤	≥	≥				
							I TRANS	= LONG				
TECHNICAL DATA FOR SPECULAR AND BRIGHT SURFACES - Low iridescence												
910.31	99.98	140	120	2	88	6	89	90	88	94	1	High purity, v.high specular
910.41	99.98	140	120	2	86	9	88	89	88	94	2	High purity, high specular
930.31	99.90	140	120	2	86	10	85	89	88	93	2	High specular
930.38	99.90	140	120	2	86	16	83	85	88	85	2-3	Specular bright
920.31	98.98 clad	150	130	4	86	10	85	88	87.5	93	2	High specular
715.30	99.85	150	130	4	86	10	88	88	88	93	2-3	High specular
715.38	99.85	150	130	4	85	15	83	84	87	90	2-3	High specular
740.30	99.80	140	120	2	85	20	72	78	87	91	3	High specular
TECHNICAL DATA FOR SPECULAR AND BRIGHT SURFACES - Standard												
810.33	99.85	140	120	2	86	15	83	85	87.5	93	3	Specular bright
820.03	99.85	150	130	4	85	23	70	75	87	93	4	Grade II specular
710.33	99.85	150	130	2	85	18	80	82	87.5	92	4	Grade II specular bright
715.33	99.85	150	130	4	85	15	80	82	87.5	92	4	Grade II specular bright
730.33	99.80	140	120	3	85	20	80	84	87	92	4	Grade II specular bright
740.33	99.80	140	120	2	85	25	72	78	87	95	4	Grade II specular bright
TECHNICAL DATA FOR MATT AND SEMI-SPECULAR SURFACES Gloss and specular reference values are averaged.												
610.35	99.90	140	120	2	86	78	26	52	87		1	Reflectomatt
610.37	99.90	140	120	2	86	78	25	51	87		2	Reflectomatt
610.34	99.90	140	120	2	86	78	25	50	87		2-3	Reflectomatt
510.37	99.90	140	120	2	86	55	50	60	87		2	Multi-directional
630.37	99.85	100	90	3	86	84	12	6	83		2	Bright diffuse
120.34	99.50	150	130	3	83	79	10	30	82		4	Grade II Reflectomatt
120.35	99.50	150	130	3	83	80	9	30	82		2-3	Grade II Reflectomatt
410.33	AlMgl	160-200	130-195	3	82	60	40	46	83	60-80	3	Semi-specular
415.30	AlMgl	150	140	3	85	35	60	66	85	50	2-3	Semi-specular bright
110.02	AlMgl 5005	145	120	4	80	76	7	18	78		4	Mill
110.19	AlMgl 5005	145	120	4	75	78	< 1.5	<2.0	77		2-3	2-sided etched
TECHNICAL DATA FOR PATTERNED SURFACES												
211.33												
Concave	99.80	120	100	5	85	86			87		1-2	Large hammer, bright
216.33												
Concave	99.80	120	100	5	85	86			87		1-2	Small hammer, bright
217.33												
Convex	99.80	120	100	5	85	86			87		1-2	Small hammer, bright
240.33	99.80	120	100	5	85	86			87		1-2	Stucco pattern
250.18	AlMgl 5005	170		3	75	80		<1.5	77		1-2	2-sided etch, tree pattern
251.38	99.85	170		3	79	82		5.0	81		2-3	2-sided bright, tree pattern
NOTES												

Above information is based on current data for 0.5 gauge material. Figures are intended as a guide and do not contain any form of guarantee. Protective tapes are available and are recommended for most finishes.

Iridescence Classification:

1 = None. 2 = Low. 3 = Limited. 4 = Not guaranteed + 30 degree total reflectance.

THICKNESS TOLERANCES ^{1 2} (± mm) FLAT SHEET & PLATE

SPECIFIED THICKNESS (mm) OVER	SPECIFIED THICKNESS (mm) UP TO	SPECIFIED WIDTHS (mm)							
		OVER > UP TO >	900	1200	1500	1800	2100	2250	2400
0.15	0.25		0.04	0.06	0.07				
0.25	0.45		0.04	0.06	0.08				
0.45	0.70		0.05	0.06	0.10	0.10			
0.70	0.90		0.05	0.06	0.13	0.13			
0.90	1.10		0.06	0.08	0.13	0.13			
1.10	1.80		0.08	0.10	0.15	0.15			
1.80	2.00		0.08	0.10	0.15	0.15			
2.00	2.50		0.09	0.10	0.15	0.15			
2.50	2.80		0.10	0.13	0.18	0.18			
2.80	3.00		0.11	0.13	0.18	0.18	0.20	0.41	0.46
3.00	3.50		0.11	0.13	0.18	0.30	0.36	0.41	0.46
3.50	4.50		0.15	0.20	0.23	0.36	0.41	0.43	0.48
4.50	5.00		0.18	0.25	0.28	0.41	0.43	0.43	0.56
5.00	6.00		0.23	0.28	0.33	0.46	0.46	0.46	0.61
6.00	8.00		0.33	0.33	0.38	0.51	0.51	0.51	0.64
8.00	11.00		0.48	0.48	0.51	0.58	0.64	0.64	0.66
11.00	16.00		0.64	0.64	0.64	0.64	0.76	0.76	0.89
16.00	22.00		0.76	0.76	0.76	0.76	0.94	0.94	1.14
22.00	28.00		0.89	0.89	0.89	0.89	1.14	1.14	1.40
28.00	35.00		1.02	1.02	1.02	1.02	1.32	1.32	1.65
35.00	40.00		1.14	1.14	1.14	1.14	1.52	1.52	1.91
40.00	50.00		1.32	1.32	1.32	1.32	1.78	1.78	2.24
50.00	60.00		1.52	1.52	1.52	1.52	2.03	2.03	2.54
60.00	70.00		1.91	1.91	1.91	1.91	2.54	2.54	3.18
70.00	80.00		2.29	2.29	2.29	2.29	3.05	3.05	3.81

WIDTH TOLERANCES (± mm) FLAT SHEET & PLATE

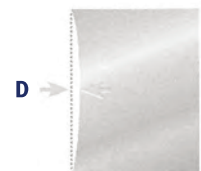
SPECIFIED THICKNESS (mm) OVER	SPECIFIED THICKNESS (mm) UP TO	SPECIFIED WIDTHS (mm)							
		OVER > UP TO >	100	600	900	1200	1800	3000	3000
0.15	2.50	± 1.0	± 2.0	± 2.0	± 3.0	± 4.0	± 5.0		
2.50	6.00	± 3.0	± 3.0	± 3.0	± 5.0	± 5.0	± 6.0		
6.00	12.00	+ 10.0	+ 10.0	+ 10.0	+ 10.0	+ 10.0	+ 10.0		
		- 0.0	- 0.0	- 0.0	- 0.0	- 0.0	- 0.0		
12.00	80.00							+ 5.0	+ 10.0
								- 0.0	- 0.0

WIDTH TOLERANCES (± mm) SLIT COILED SHEET

SPECIFIED THICKNESS (mm) OVER	SPECIFIED THICKNESS (mm) UP TO	SPECIFIED WIDTHS (mm)				
		OVER > UP TO >	150	300	600	1200
	2.0		0.25	0.40	1.0	1.5
2.0	3.0		0.30	0.50	1.0	1.5

LATERAL BOW TOLERANCES (mm) COILED SHEET

SPECIFIED THICKNESS (mm) OVER	SPECIFIED THICKNESS (mm) UP TO	SPECIFIED WIDTHS (mm)				
		OVER > UP TO >	12 ³	25	50	100
0.15	1.60		20.0	15.0	10.0	6.0
1.60	3.00 ⁴				10.0	6.0



Allowable deviation (D) in 1800mm, of a side edge from a straight line.


LATERAL BOW TOLERANCE ¹ (mm) FLAT SHEET & PLATE

SPECIFIED WIDTH (mm)		SPECIFIED THICKNESS (mm)		SPECIFIED LENGTHS (mm)												
OVER	UP TO	OVER	UP TO	OVER > UP TO >	900	1500	2400	3000	3900	4500	5400	6000	7200	8100	9000	9900
100		0.15	3.00		2.0	6.0	13.0	25.0	38.0	51.0	76.0	102.0	112.0	133.0	153.0	173.0
100	900	0.15	6.00		1.0	2.0	3.0	3.0	5.0	25.0	38.0	51.0	70.0	83.0	98.0	113.0
900		0.15	6.00		1.0	2.0	3.0	3.0	5.0	8.0	11.0	15.0	18.0	21.0	24.0	27.0
300		6.00	80.00		2.0	6.0	13.0	25.0	38.0	51.0	76.0	102.0	112.0	133.0	153.0	173.0 ⁵
300	450	6.00	80.00		1.0	2.0	3.0	6.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0 ⁵
450		6.00	80.00		1.0	2.0	3.0	3.0	5.0	8.0	11.0	15.0	18.0	21.0	24.0	27.0 ⁵

LENGTH TOLERANCE (\pm mm) FLAT SHEET & PLATE

SPECIFIED THICKNESS (mm)		SPECIFIED WIDTHS (mm)										
OVER	UP TO	OVER > UP TO >	1200	3000	3600	4500	6000					
			1200	3000	3600	4500	6000	300	300	1200	2100	
0.15	6.00		± 2.0	± 3.0	± 4.0	± 4.0	± 6.0	± 6.0				
6.00	12.00		+ 10.0	+ 10.0	+ 10.0	+ 11.0	+ 11.0	+ 13.0				
			- 0.0	- 0.0	- 0.0	- 0.0	- 0.0	- 0.0				
12.00	80.00							+ 5.0	+ 5.0	+ 13.0	+ 16.0	
								- 0.0	- 0.0	- 0.0	- 0.0	

SQUARENESS TOLERANCE ¹ (mm) FLAT SHEET & PLATE

SPECIFIED WIDTH (mm)		SPECIFIED LENGTH (mm)		
OVER	UP TO	UP TO 3600	OVER 3600	
	300	3.0	5.0	Allowable difference (BB-AA) between diagonals 
300	600	5.0	8.0	
600	1200	8.0	11.0	
1200	1500	11.0	14.0	
1500	1800	13.0	18.0	
1800	2100	14.0	21.0	
2100	2400	16.0	23.0	
2400	2700	19.0	25.0	
2700	3600	22.0	29.0	

DIAMETER TOLERANCE ¹ (\pm mm) BLANKED & SHEARED SHEET CIRCLES

SPECIFIED THICKNESS (mm)		SPECIFIED DIAMETER (mm)				
OVER	UP TO	OVER > UP TO >	60	100	450	600
			600	450	600	1500
			Blanked	Sheared	Sheared	Sheared
0.5	3.5		0.5	1.0	1.0	1.5
3.5	6.0		1.0	1.5	2.5	3.0

FLATNESS TOLERANCE ^{8 9 10} (mm) FLAT SHEET ⁶

ALLOY	SPECIFIED THICKNESS (mm)		LONGITUDINAL OR TRANSVERSE DISTANCE OF BUCKLES OR EDGE WAVES ⁷ (mm, centre-to-centre)							
	OVER	UP TO	OVER >	600	900	1200	1800			
			UP TO >	600	900	1200	1800			
Group I	0.5	1.6		3.0	5.0	6.0	10.0	13.0		
	1.6	6.0		3.0	6.0	10.0	13.0	16.0		
Group II	0.5	1.6		5.0	6.0	10.0	13.0	16.0		
	1.6	6.0		5.0	10.0	13.0	16.0	19.0		
Group I Alloys	1080A	1050	1150	1350	1100	1200	3102	3003	3203	3005
	3105	4343	5005	5050A	5457	5557	8006	8008	8011	
Group II Alloys	2014	2024	Alclad 2024		3004	Alclad 3004		5251	5052	
	5252	5154A	5454	5182	5083	5086	6061	7072		

LONGITUDINAL FLATNESS TOLERANCE ¹² (mm) SAWN OR SHEARED PLATE

ALLOY	SPECIFIED THICKNESS (mm)		ALLOWABLE DEVIATION FROM FLAT ¹¹
	OVER	UP TO	
All except 6061	6.0	80.0	7.0 mm in any 1800mm or less
6061	6.0	16.0	8.0 mm in any 1800mm or less
	16.0	80.0	25.0 mm in any 1800mm or less

TRANSVERSE FLATNESS TOLERANCE ¹² (mm) SAWN OR SHEARED PLATE

ALLOY	SPECIFIED THICKNESS (mm)		SPECIFIED WIDTH (mm)	600	1200
	OVER	UP TO	OVER > UP TO >	1200	1800 ¹³
All except 6061	6.0	16.0	Only short-cycle	10.0	13.0
	16.0	40.0	flatness applies	7.0	10.0
	40.0	80.0		5.0	7.0
6061	6.0	40.0	Only short-cycle	10.0	13.0
	40.0	80.0	flatness applies	7.0	10.0

SHORT-CYCLE FLATNESS TOLERANCE ¹² ¹⁴ (mm) SAWN OR SHEARED PLATE

ALLOY	SPECIFIED THICKNESS (mm)		ALLOWABLE DEVIATION FROM FLAT ¹⁵
	OVER	UP TO	
All except 6061	6.0	16.0	3.5
	16.0	80.0	2.5
6061	6.0	80.0	6.5

FOOTNOTES

- 1 When a dimension tolerance other than an equal bilateral tolerance is specified, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permitted under the tolerance.
- 2 For products rolled for brightness on a flat sheet mill, these tolerances do not apply. Consult the supplier.
- 3 Tolerances for widths up to and including 12mm will be agreed upon between purchaser and vendor at the time the contract or order is entered.
- 4 Tolerances for thickness greater than 1.6mm, in widths up to and including 50mm, will be agreed upon between purchaser and vendor at the time the contract or order is entered.
- 5 Also applicable to any 9900mm segment of longer plate.
- 6 Not applicable to cut-to-length sheet, panel flat sheet, coiled sheet or sheet over 1500mm wide.
- 7 Also applicable to overall sheet length or width if only one longitudinal and/or transverse buckle or edge wave present.
- 8 Allowable deviation from flat with sheet positioned on a flat horizontal surface to minimise deviation.
- 9 Not applicable to annealed (O temper) or HX8 tempers.
- 10 Not applicable to end or corner turn-up.
- 11 Measured with the plate on a flat surface, concave side up, using straight-edge and a feeler gauge, dial gauge or scale.
- 12 Not applicable to annealed (O temper) plate in any alloy, or F temper plate in heat-treatable alloys.
- 13 For widths over 1800mm, these tolerances apply for any 1800mm of total width.
- 14 Short-cycle flatness is the flatness over any 600mm span in any direction.
- 15 Measured with plate on flat surface, using a frame with rollers at 600mm centres, with a depth gauge in the centre.

RECOMMENDED INSIDE BENDING RADII - SHEET & PLATE

ALLOY	TEMPER	MINIMUM RADII FOR 90° COLD FORMING ¹²³ FOR VARIOUS THICKNESSES							
		t=0.4	t=0.8	t=1.6	t=3.0	t=4.0	t=6.0	t=10.0	t=12.0
1080A	O	0t	0t	0t	0t	0t	0.5t	0.5t	1t
1050	H12	0t	0t	0t	0t	0t	0.5t	1t	1.5t
1350	H14	0t	0t	0t	0.5t	0.5t	1t	1.5t	2t
1150	H16	0t	0t	0.5t	1t				
	H18	0.5t	1t	1.5t	2t				
1100	O	0t	0t	0t	0t	0t	0.5t	1t	1.5t
1200	H12	0t	0t	0t	0.5t	1t	1t	1.5t	2t
	H14	0t	0t	0t	1t	1t	1.5t	2t	2.5t
	H16	0t	0.5t	1t	1.5t				
	H18	1t	1.5t	2t	3t				
2024 ²	O	0t	1t	1t	1t	1t	1t	2.5t	4t
	T42	2.5t	3t	4t	5t	5t	6t	7t	8t
3003	O	0t	0t	0t	0t	0.5t	1t	1t	1.5t
3203	H12	0t	0t	0t	0.5t	1t	1t	1.5t	2t
3005	H14	0t	0t	0t	1t	1t	1.5t	2t	2.5t
5005 ⁴	H16	0.5t	1t	1t	1.5t				
	H18	1t	1.5t	2t	3t				
3004	O	0t	0t	0t	0.5t	1t	1t		
	H32	0t	0t	0.5t	1t	1t	1.5t		
	H34	0t	1t	1t	1.5t	1.5t	2.5t		
	H36	1t	1t	1.5t	2.5t				
	H38	1t	1.5t	2.5t	3t				
5050A	O	0t	0t	0t	0.5t	1t	1t		
	H32	0t	0t	0t	1t	1t	1.5t		
	H34	0t	0t	1t	1.5t	1.5t	2t		
	H36	1t	1t	1.5t	2t				
	H38	1t	1.5t	2.5t	3t				
5052	O	0t	0t	0t	0.5t	1t	1t	1.5t	1.5t
5251	H32	0t	0t	1t	1.5t	1.5t	1.5t	1.5t	2t
	H34	0t	1t	1.5t	2t	2t	2.5t	2.5t	3t
	H36	1t	1t	1.5t	2.5t				
	H38	1t	1.5t	2.5t	3t				
5154A	O	0t	0t	0.5t	1t	1t	1t	1.5t	1.5t
5454	H32	0t	0.5t	1t	1.5t	1.5t	2t	2.5t	3.5t
	H34	0.5t	1t	1.5t	2t	2.5t	3t	3.5t	4t
	H112						2t	2.5t	3t
5083	O			0.5t	1t	1t	1t	1.5t	1.5t
	H311			1t	1.5t	1.5t	1.5t	2t	2.5t
	H321		1.5t	1.5t	2t	2t	2t	2.5t	3t
	H323			1.5t	2t	2.5t	3t		
	H343			2t	3t	3.5t	4t		
5086	O	0t	0t	0.5t	1t	1t	1t	1.5t	1.5t
	H32	0t	1.5t	1.5t	2t	2t	2t	2.5t	3t
	H34	0.5t	1t	1.5t	2t	2.5t	3t	3.5t	4t
	H36				3t	3.5t			
	H112					1.5t	2t	2t	2.5t
6061 ²	O	0t	0t	0t	1t	1t	1t	1.5t	2t
	T4 & T42	0t	0.5t	1t	1.5t	2.5t	3t	3.5t	4t
	T6 & T62	1t	1t	1.5t	2.5t	3t	4t	4.5t	5t

Bending transverse to rolling direction. t = thickness in mm

FOOTNOTES

- Radii listed are minimum recommended for bending sheets and plates without fracturing in a standard press brake with air-bend dies. Other types of bending operations may require larger radii or permit smaller radii. The minimum permissible radii will also vary with the design and condition of tooling.
- Heat-treatable alloys can be formed over appreciably smaller radii immediately after solution heat treatment.
- The H112 temper (applicable to non-heat-treatable alloys) is supplied in the as-fabricated condition without special property control, but usually can be formed over radii applicable to the H14 (or H34) temper or smaller.
- Applicable to 5005 H1X and H3X tempers.

CHEMICAL COMPOSITION LIMITS OF REGISTERED ALLOYS ^{1 2}

INT'L CODE	Si	Fe	Cu	Mn	Mg	Cr	Zn		Ti	Others ³ Each Total		Al
1199	0.006	0.006	0.006	0.002	0.006		0.006	0.005 Ga	0.005V	0.002	0.002	99.99 ⁵
1080A	0.15	0.15	0.03	0.02	0.02		0.06	0.03 Ga		0.02	0.02	99.80 ⁴
1050	0.25	0.40	0.05	0.05	0.05		0.05		0.05V	0.03	0.03	99.50 ⁴
1070	0.20	0.25	0.04	0.03	0.03		0.04		0.05V	0.03	0.03	99.70 ⁴
1350	0.10	0.40	0.05	0.01		0.01	0.05	0.03 Ga	0.05B	0.02V+Ti	0.03 0.10	99.50 ⁴
1145	0.55 Si+Fe		0.05	0.05	0.05		0.05		0.05V	0.03	0.03	99.45 ⁴
1150	0.45 Si+Fe		0.05-0.20	0.05	0.05		0.05			0.03	0.03	99.50 ⁴
1100	0.95 Si+Fe		0.05-0.20	0.05			0.10		⁶		0.05 0.15	99.00 ⁴
1120	0.10	0.40	0.05-0.35	0.01	0.20	0.01	0.05	0.03 Ga	0.05B	0.02V+Ti	0.03 0.10	99.20 ⁴
1200	1.00 Si+Fe		0.05	0.05			0.10		⁶	0.05	0.05 0.15	99.00 ⁴
1230	0.70 Si+Fe		0.10	0.05	0.05		0.10		0.05V	0.03	0.03	99.30 ⁴
2011	0.40	0.70	5.0-6.0				0.30		⁷		0.05 0.15	Rem
2014	0.50-1.2	0.70	3.90-5.0	0.40-1.20	0.20-0.80	0.10	0.25			0.15	0.05 0.15	Rem
2014A	0.50-0.9	0.50	3.90-5.0	0.40-1.20	0.20-0.80	0.10	0.25		0.10 Ni	0.20 Zn+Ti	0.05 0.15	Rem
2024	0.50	0.50	3.80-4.90	0.30-0.90	1.20-1.80	0.10	0.25			0.15	0.05 0.15	Rem
3003	0.60	0.70	0.05-0.20	1.0-1.50			0.10				0.05 0.15	Rem
3203	0.60	0.70	0.05	1.0-1.50			0.10		⁷		0.05 0.15	Rem
3004	0.30	0.70	0.25	1.0-1.50	0.80-1.30		0.25				0.05 0.15	Rem
3004A	0.40	0.70	0.25	0.80-1.50	0.80-1.50	0.10	0.25		0.03 Pb	0.05	0.05 0.15	Rem
3005	0.60	0.70	0.30	1.0-1.50	0.20-0.60	0.10	0.25			0.10	0.05 0.15	Rem
3105	0.60	0.70	0.30	0.30-0.80	0.20-0.80	0.20	0.40			0.10	0.05 0.15	Rem
4043	4.50-6.0	0.80	0.30	0.05	0.05		0.10		⁶	0.20	0.05 0.15	Rem
4343	6.80-8.20	0.80	0.25	0.10			0.20				0.05 0.15	Rem
4047	11.0-13.00	0.80	0.30	0.15	0.10		0.20		⁶		0.05 0.15	Rem
5005	0.30	0.70	0.20	0.20	0.50-1.10	0.10	0.25				0.05 0.15	Rem
5050A	0.40	0.70	0.20	0.30	1.10-1.80	0.10	0.25				0.05 0.15	Rem
5052	0.25	0.40	0.10	0.10	2.20-2.80	0.15-0.35	0.10				0.05 0.15	Rem
5251	0.40	0.50	0.15	0.10-0.50	1.70-2.40	0.15	0.15			0.015	0.05 0.15	Rem
5252	0.08	0.10	0.10	0.10	2.20-2.80		0.05		0.05 V		0.03 0.10	Rem
5154A	0.50	0.50	0.10	0.10-0.50	3.10-3.90	0.25	0.20	0.10-0.50 Mn+Cr	0.20		0.05 0.15	Rem
5454	0.25	0.40	0.10	0.50-1.0	2.40-3.0	0.05-0.20	0.25			0.20	0.05 0.15	Rem
5056	0.30	0.40	0.10	0.05-0.20	4.50-5.60	0.05-0.20	0.10				0.05 0.15	Rem
5356	0.25	0.40	0.10	0.05-0.20	4.50-5.50	0.05-0.20	0.10		⁶	0.06-0.20	0.05 0.15	Rem
5457	0.08	0.10	0.20	0.15-0.45	0.80-1.20		0.05		0.05 V		0.03 0.10	Rem
5557	0.10	0.12	0.15	0.10-0.40	0.40-0.80				0.05 V		0.03 0.10	Rem
5082	0.20	0.35	0.15	0.15	4.0-5.0	0.15	0.25			0.10	0.05 0.15	Rem
5083	0.40	0.40	0.10	0.40-1.0	4.0-4.90	0.05-0.25	0.25			0.15	0.05 0.15	Rem
5086	0.40	0.50	0.10	0.20-0.70	3.50-4.50	0.05-0.25	0.25			0.15	0.05 0.15	Rem
5182	0.20	0.35	0.15	0.20-0.50	4.0-5.0	0.10	0.25			0.10	0.05 0.15	Rem
6060	0.30-0.60	0.10-0.30	0.10	0.10	0.35-0.60	0.05	0.15			0.10	0.05 0.15	Rem
6103	0.35-1.00	0.60	0.20-0.30	0.80	0.80-1.50	0.35	0.20			0.10	0.05 0.15	Rem
6261	0.40-0.70	0.40	0.15-0.40	0.20-0.35	0.70-1.0	0.10	0.20			0.10	0.05 0.15	Rem
6106	0.30-0.60	0.35	0.25	0.05-0.20	0.40-0.80	0.20	0.10				0.05 0.10	Rem
6005A	0.50-0.90	0.35	0.30	0.12-0.50	0.40-0.70	0.30	0.20			0.10	0.05 0.15	Rem
6005	0.60-0.90	0.35	0.10	0.10	0.40-0.60	0.10	0.10					

INT'L CODE	Si	Fe	Cu	Mn	Mg	Cr	Zn		Ti	Others ³ Each	Total	Al
6082	0.70-1.30	0.50	0.10	0.40-1.0	0.60-1.20	0.25	0.20		0.10	0.05	0.15	Rem
6061A	0.40-0.80	0.70	0.15-0.70	0.15	0.80-1.20	0.04-0.35	0.25	0.003 Pb	0.15	0.05	0.15	Rem
6003	0.35-1.0	0.60	0.10	0.80	0.80-1.50	0.35	0.20		0.10	0.05	0.15	Rem
6101	0.30-0.70	0.50	0.10	0.03	0.35-0.80	0.03	0.10	0.06 B		0.03	0.10	Rem
6201A	0.50-0.70	0.50	0.04		0.60-0.90			0.06 B		0.03	0.15	Rem
6351	0.70-1.30	0.50	0.10	0.40-0.80	0.40-0.80		0.20		0.20	0.05	0.15	Rem
6253	⁸	0.50	0.10		1.0-1.50	0.04-0.35	1.60-2.40			0.05	0.15	Rem
6061	0.40-0.80	0.70	0.15-0.40	0.15	0.80-1.20	0.04-0.35	0.25		0.15	0.05	0.15	Rem
6262	0.40-0.80	0.70	0.15-0.40	0.15	0.80-1.20	0.04-0.14	0.25		0.15	0.05	0.15	Rem
6063	0.20-0.60	0.35	0.10	0.10	0.45-0.90	0.10	0.10		0.10	0.05	0.15	Rem
6463A	0.20-0.60	0.15	0.25	0.05	0.30-0.90		0.05			0.05	0.15	Rem
7005	0.35	0.40	0.10	0.20-0.70	1.0-1.80	0.06-0.20	4.0-5.0	0.80-0.20 Zr	0.01-0.06	0.05	0.15	Rem
7072	0.70 Si+Fe		0.10	0.10	0.10		0.80-1.30			0.05	0.15	Rem
7075	0.40	0.50	1.20-2.0	0.30	2.10-2.90	0.18-0.28	5.10-6.10		0.20			
8006	0.40	1.20-2.0	0.30	0.30-1.0	0.10		0.10			0.05	0.15	Rem
8008	0.60	0.90-1.60	0.20	0.50-1.0			0.10		0.10	0.05	0.15	Rem
8011	0.50-0.90	0.60-1.0	0.10	0.20	0.05	0.05	0.10		0.08	0.05	0.15	Rem

ALUMINIUM ALLOY DATA

Sheet, plate, coil and foil products

ALLOY & TEMPER	DESCRIPTION (indicative, not intended for design)	TYPICAL USE
1050 H24 Half hard	Low-strength alloy usually supplied as sheet. Excellent decorative appearance, excellent anodising quality.	Nameplates
1200 O Soft, more suitable for spinning and deep-drawing H14 Equivalent to half hard, good anodising (others on request)	General purpose commercial purity. For applications requiring very good corrosion resistance and formability. Low strength, easily weldable.	Cooking utensils, panelling and mouldings.
3103 H14 Equivalent to half hard	Common alum-manganese, low-to-medium strength. Good ductility, corrosion resistance and formability. Welds readily.	Roofing, vehicle bodies
5005 H34 Equivalent to half hard	Medium strength alum-magnesium, anodisable. Not susceptible to stress corrosion. Fine grain, suitable for pressings.	Sheetmetal work, appliances
5052 H32 Equivalent to quarter hard H34 Equivalent to half hard	Medium strength alum-magnesium. Good ductility and corrosion resistance. Weldable.	Marine, road vehicles, pressings, containers
5083 H321 Quarter hard	High strength alum-magnesium, similar to 5086.	Welded pressure vessels, aircraft, marine
5086 H112 Soft H24 Half hard	High strength alum-magnesium. Most attractive of non-heat-treatable alloys for marine use. Excellent weldability. Good ductility after welding, conforms to Lloyds specification for marine vessels. Not suitable for applications over 65°C.	Welded pressure vessels, aircraft, marine
5251 H32 Equivalent to quarter hard H34 Equivalent to half hard	Medium strength alum-magnesium. Good ductility and corrosion resistance. Weldable.	Marine, road vehicles, pressings, containers
5454 H122 Equivalent to soft H32 Quarter hard H34 Equivalent to half hard	Strong alum-magnesium. Good ductility. Resistant to stress corrosion in all tempers. Good weldability.	Heavy transport, road tankers, tippers
5754 H122 Quarter hard H24 Half hard	Medium strength alum-magnesium.	Treadplates

ROLLED PRODUCT TEMPERS

H111	H112 strain-hardened	H24	Strain-hardened, partially annealed
H12	Strain-hardened: quarter hard	H32	Strain-hardened, stabilised, magnesium alloys only, quarter hard
H14	As H12, extra strain-hardened, half hard	H34	Strain-hardened, stabilised, magnesium alloys only, half hard
H16	As H12, extra strain-hardened, 3-quarter hard		

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 √A)
	OVER	UP TO	Ultimate Min	Ultimate Max			
1080A - O	0.15	0.50		80			15
	0.50	0.80		80			20
	0.80	1.30		80			25
	1.30	2.60		80			30
	2.60	6.00		80			35
1080A - H14 ⁴	0.25	0.30	90	115			1
	0.30	0.50	90	115			2
	0.50	0.80	90	115			3
	0.80	1.30	90	115			4
	1.30	2.60	90	115			5
1080A - H112	2.60	6.00	90	115			8
	6.00	25.0	55				30
	25.00	50.0	55				28
1050 - O	0.15	0.50		95			15
	0.50	0.80		95			20
	0.80	1.30		95			25
	1.30	6.00		95			30
1050 - H12 ⁴	0.25	0.50	80	110			4
	0.50	0.80	80	110			5
	0.80	1.30	80	110			6
	1.30	2.60	80	110			8
	2.60	6.00	80	110			12
1050 - H14 ⁴	0.25	0.30	100	125			2
	0.30	0.50	100	125			3
	0.50	0.80	100	125			4
	0.80	1.30	100	125			5
	1.30	2.60	100	125			6
	2.60	12.00	100	125			8
1050 - H16 ⁴	0.15	0.50	115	140			2
	0.50	0.80	115	140			3
	0.80	1.30	115	140			4
	1.30	4.00	115	140			5
1050 - H18	0.15	0.50	130				1
	0.50	0.80	130				2
	0.80	1.30	130				3
	1.30	1.60	130				4
	1.60	3.25	130				5
1050 - H112	6.00	25.00	60				30
1150 - O	0.15	0.50		105			15
	0.50	0.80		105			20
	0.80	1.30		105			25
	1.30	6.00		105			30
1150 - H12 ⁴	0.25	0.50	80	120			3
	0.50	0.80	80	120			4
	0.80	1.30	80	120			6
	1.30	2.60	80	120			8
	2.60	6.00	80	120			9

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 √ A)
	OVER	UP TO	Ultimate Min	Ultimate Max			
1150 - H14 ⁴	0.25	0.30	95	130			1
	0.30	0.50	95	130			2
	0.50	0.80	95	130			3
	0.80	1.30	95	130			4
	1.30	2.60	95	130			5
	2.60	6.00	95	130			6
1150 - H16 ⁴	0.15	0.50	115	150			1
	0.50	0.80	115	150			2
	0.80	1.30	115	150			3
	1.30	2.60	115	150			4
	2.60	4.00	115	150			5
1150 - H18 ⁴	0.15	0.50	135				1
	0.50	0.80	135				2
	0.80	1.30	135				3
	1.30	3.25	135				4
1100 - O	0.15	0.50	75	105	25 ⁵		15
	0.50	0.80	75	105	25 ⁵		20
	0.80	1.30	75	105	25 ⁵		25
	1.30	6.00	75	105	25 ⁵		30
	6.00	75.0	75	105	25 ⁵		26
1100 - H12 ⁴	0.40	0.50	95	130	75 ⁵		3
	0.50	0.80	95	130	75 ⁵		4
	0.80	1.30	95	130	75 ⁵		6
	1.30	3.00	95	130	75 ⁵		8
	3.00	6.00	95	130	75 ⁵		9
	6.00	12.00	95	130	75 ⁵		9
	12.00	50.00	95	130	75 ⁵		10
1100 - H14 ⁴	0.25	0.30	110	145			1
	0.30	0.50	110	145	95 ⁵		2
	0.50	0.80	110	145	95 ⁵		3
	0.80	1.30	110	145	95 ⁵		4
	1.30	3.00	110	145	95 ⁵		5
	3.00	6.00	110	145	95 ⁵		6
	6.00	12.00	110	145	95 ⁵		6
	12.00	25.00	110	145	95 ⁵		8
1100 - H16 ⁴	0.15	0.50	130	165	115 ⁵		1
	0.50	0.80	130	165	115 ⁵		2
	0.80	1.30	130	165	115 ⁵		3
	1.30	4.00	130	165	115 ⁵		4
1100 - H18	0.15	0.50	150				1
	0.50	0.80	150				2
	0.80	1.30	150				3
	1.30	3.25	150				4
1100 - H112	6.00	12.00	90		50 ⁵		9
	12.00	50.00	85		35 ⁵		13
	50.00	75.00	80		30 ⁵		18
1200 - O	0.15	0.50		105	25 ⁵		15
	0.50	0.80		105	25 ⁵		20
	0.80	1.30		105	25 ⁵		25
	1.30	6.00		105	25 ⁵		30
	6.00	75.00	75	105	25 ⁵		26

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 \sqrt{A})
	OVER	UP TO	Ultimate Min	Ultimate Max			
1200 - H12 ⁴	0.40	0.50	95	130	75 ⁵		3
	0.50	0.80	95	130	75 ⁵		4
	0.80	1.30	95	130	75 ⁵		6
	1.30	3.00	95	130	75 ⁵		8
	3.00	6.00	95	130	75 ⁵		9
	6.00	12.00	95	130	75 ⁵		9
	12.00	50.00	95	130	75 ⁵		10
1200 - H14 ⁴	0.25	0.30	110	145			1
	0.30	0.50	110	145	95 ⁵		2
	0.50	0.80	110	145	95 ⁵		3
	0.80	1.30	110	145	95 ⁵		4
	1.30	3.00	110	145	95 ⁵		5
	3.00	6.00	110	145	95 ⁵		6
	6.00	12.00	110	145	95 ⁵		6
1200 - H16 ⁴	0.15	0.50	130	165	115 ⁵		1
	0.50	0.80	130	165	115 ⁵		2
	0.80	1.30	130	165	115 ⁵		3
	1.30	4.00	130	165	115 ⁵		4
1200 - H18	0.15	0.50	150				1
	0.50	0.80	150				2
	0.80	1.30	150				3
	1.30	3.25	150				4
1200 - H112	6.00	12.00	90		50 ⁵		9
	12.00	50.00	85		35 ⁵		12
	50.00	75.00	80		30 ⁵		18
2024 - O ¹¹	0.25	6.00		220		95	12
2024 - T42	0.25	0.50	425		260		12
	0.50	6.00	425		260		15
2024 - T62 ¹²	0.25	6.00	440		345		5
2024 - T72 ⁸	0.25	6.00	415		315		5
Alclad 2024 - O ¹¹	0.25	1.60 ⁶		205		95	12
	1.60	5.00 ⁷		220		95	12
Alclad 2024 - T42	0.25	0.50 ⁶	395		235		12
	0.50	1.60 ⁶	395		235		15
	1.60	5.00 ⁷	415		250		15
Alclad 2024 - T62 ¹²	0.25	1.60 ⁶	415		325		5
	1.60	5.00 ⁷	425		335		5
Alclad 2024 - T72 ⁸	0.25	1.60 ⁶	385		295		5
	1.60	5.00 ⁷	400		310		5
3003 - O	0.15	0.20	95	130			14
	0.20	0.30	95	130			18
	0.30	0.80	95	130	35 ⁵		20
	0.80	1.30	95	130	35 ⁵		23
	1.30	6.00	95	130	35 ⁵		25
	6.00	75.00	95	130	35 ⁵		21
3003 - H12 ⁴	0.40	0.50	115	160	80 ⁵		3
	0.50	0.80	115	160	80 ⁵		4
	0.80	1.30	115	160	80 ⁵		5
	1.30	3.00	115	160	80 ⁵		6
	3.00	4.00	115	160	80 ⁵		7
	4.00	6.00	115	160	80 ⁵		8
	6.00	12.00	115	160	80 ⁵		9
	12.00	50.00	115	160	80 ⁵		8

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 √ A)
	OVER	UP TO	Ultimate Min	Ultimate Max			
3003 - H14 ⁴	0.25	0.30	135	180			1
	0.30	0.50	135	180	115 ⁵		2
	0.50	0.80	135	180	115 ⁵		3
	0.80	1.30	135	180	115 ⁵		4
	1.30	3.00	135	180	115 ⁵		5
	3.00	4.00	135	180	115 ⁵		6
	4.00	6.00	135	180	115 ⁵		7
	6.00	12.00	135	180	115 ⁵		8
3003 - H16 ⁴	12.00	25.00	135	180	115 ⁵		8
	0.15	0.50	165	205	145 ⁵		1
	0.50	0.80	165	205	145 ⁵		2
	0.80	1.30	165	205	145 ⁵		3
3003 - H18	1.30	4.00	165	205	145 ⁵		4
	0.15	0.50	185		165 ⁵		1
	0.50	0.80	185		165 ⁵		2
	0.80	1.30	185		165 ⁵		3
3003 - H112	1.30	3.25	185		165 ⁵		4
	6.00	12.00	115		70 ⁵		8
	12.00	50.00	105		40 ⁵		10
	50.00	75.00	100		40 ⁵		16
3203 - O	0.15	0.20		115			14
	0.20	0.30		115			18
	0.30	0.80		115			20
	0.80	1.30		115			23
	1.30	2.60		115			25
	2.60	6.00		115			30
	6.00	25.00		115	35 ⁵		25
3203 - H12 ⁴	0.50	0.80	115	145			4
	0.80	1.30	115	145			5
	1.30	2.60	115	145			8
	2.60	6.00	115	145			12
	6.00	25.00	115	145	80 ⁵		8
3203 - H14 ⁴	0.25	0.30	140	170			1
	0.30	0.50	140	170			2
	0.50	0.80	140	170			3
	0.80	1.30	140	170			4
	1.30	2.60	140	170			5
	2.60	6.00	140	170			7
	6.00	12.00	140	170	115 ⁵		8
3203 - H16 ⁴	0.15	0.50	160	195			1
	0.50	0.80	160	195			2
	0.80	1.30	160	195			3
	1.30	2.60	160	195			4
	2.60	4.00	160	195			5
3203 - H18	0.15	0.50	175				1
	0.50	0.80	175				2
	0.80	1.30	175				3
	1.30	3.25	175				4
3203 - H112	6.00	12.00	115		70 ⁵		8
	12.00	50.00	105		40 ⁵		10
	50.00	75.00	100		40 ⁵		16
3004 - O	0.15	0.20	150	200	60 ⁵		
	0.20	0.50	150	200	60 ⁵		10
	0.50	0.80	150	200	60 ⁵		14
	0.80	1.30	150	200	60 ⁵		16
	1.30	6.00	150	200	60 ⁵		18

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 \sqrt{A})
	OVER	UP TO	Ultimate Min	Ultimate Max			
3004 - H32 ⁴	0.40	0.50	195	240	145 ⁵		1
	0.50	0.80	195	240	145 ⁵		3
	0.80	1.30	195	240	145 ⁵		4
	1.30	3.00	195	240	145 ⁵		5
	3.00	6.00	195	240	145 ⁵		6
3004 - H34 ⁴	0.25	0.50	220	265	170 ⁵		1
	0.50	1.30	220	265	170 ⁵		3
	1.30	3.00	220	265	170 ⁵		4
	3.00	6.00	220	265	170 ⁵		5
3004 - H36 ⁴	0.15	0.20	240	285	195 ⁵		
	0.20	0.50	240	285	195 ⁵		1
	0.50	0.80	240	285	195 ⁵		2
	0.80	1.30	240	285	195 ⁵		3
	1.30	4.00	240	285	195 ⁵		4
3004 - H38 ⁴	0.15	0.20	260		215 ⁵		
	0.20	0.50	260		215 ⁵		1
	0.50	0.80	260		215 ⁵		2
	0.80	1.30	260		215 ⁵		3
	1.30	3.25	260		215 ⁵		4
Alclad 3004 - O ⁹	0.15	0.20	145	195	55 ⁵		
	0.20	0.50	145	195	55 ⁵		10
	0.50	0.80	145	195	55 ⁵		14
	0.80	1.30	145	195	55 ⁵		16
	1.30	6.00	145	195	55 ⁵		18
Alclad 3004 - H32 ^{4,9}	0.40	0.50	185	235	135 ⁵		1
	0.50	0.80	185	235	135 ⁵		3
	0.80	1.30	185	235	135 ⁵		4
	1.30	3.00	185	235	135 ⁵		5
	3.00	6.00	185	235	135 ⁵		6
Alclad 3004 - H34 ^{4,9}	0.25	0.50	215	255	165 ⁵		1
	0.50	1.30	215	255	165 ⁵		3
	1.30	3.00	215	255	165 ⁵		4
	3.00	6.00	215	255	165 ⁵		5
Alclad 3004 - H36 ^{4,9}	0.15	0.20	235	275	185 ⁵		
	0.20	0.50	235	275	185 ⁵		1
	0.50	0.80	235	275	185 ⁵		2
	0.80	1.30	235	275	185 ⁵		3
	1.30	4.00	235	275	185 ⁵		4
Alclad 3004 - H38 ⁹	0.15	0.20	255				
	0.20	0.50	255				1
	0.50	0.80	255				2
	0.80	1.30	255				3
	1.30	3.25	255				4
3005 - O	0.15	0.20	105	145			14
	0.20	0.25	105	145			18
	0.25	0.40	105	145			22
	0.40	6.00	105	145			24
3005 - H12 ⁴	0.15	0.25	125	165			3
	0.25	0.30	125	165			4
	0.30	0.80	125	165			5
	0.80	1.30	125	165			6
	1.30	6.00	125	165			7

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 √ A)
	OVER	UP TO	Ultimate Min	Ultimate Max			
3005 - H14 ⁴	0.15	0.25	150	195			1
	0.25	0.30	150	195			2
	0.30	0.80	150	195			3
	0.80	1.30	150	195			4
	1.30	6.00	150	195			5
3005 - H16 ⁴	0.15	0.25	180	230			
	0.25	0.30	180	230			1
	0.30	0.80	180	230			2
	0.80	1.30	180	230			3
	1.30	4.00	180	230			4
3005 - H18	0.15	0.30	205				
	0.30	0.80	205				1
	0.80	1.30	205				2
	1.30	3.25	205				3
3105 - O	0.30	0.65	95	145	35 ⁵		16
	0.65	1.20	95	145	35 ⁵		19
	1.20	2.00	95	145	35 ⁵		20
3105 - H12	0.40	0.65	130	180	105 ⁵		1
	0.65	1.20	130	180	105 ⁵		2
	1.20	2.00	130	180	105 ⁵		3
3105 - H14	0.30	0.65	150	200	125 ⁵		1
	0.65	1.20	150	200	125 ⁵		2
	1.20	2.00	150	200	125 ⁵		2
3105 - H16	0.30	0.65	170	220	145 ⁵		1
	0.65	1.20	170	220	145 ⁵		1
	1.20	2.00	170	220	145 ⁵		2
3105 - H18	0.30	0.65	190		165 ⁵		1
	0.65	1.20	190		165 ⁵		1
	1.20	2.00	190		165 ⁵		2
3105 - H25	0.30	0.65	160		130 ⁵		2
	0.65	1.20	160		130 ⁵		4
	1.20	2.00	160		130 ⁵		6
5005 - O	0.15	0.20	105	145			12
	0.20	0.30	105	145			14
	0.30	0.50	105	145	35 ⁵		16
	0.50	0.80	105	145	35 ⁵		18
	0.80	1.30	105	145	35 ⁵		20
	1.30	3.00	105	145	35 ⁵		21
	3.00	6.00	105	145	35 ⁵		22
5005 - H12	0.40	0.50	125	165	95 ⁵		2
	0.50	0.80	125	165	95 ⁵		3
	0.80	1.30	125	165	95 ⁵		4
	1.30	3.00	125	165	95 ⁵		6
	3.00	4.00	125	165	95 ⁵		7
	4.00	6.00	125	165	95 ⁵		8
5005 - H14	0.25	0.80	145	185	115 ⁵		1
	0.80	1.30	145	185	115 ⁵		2
	1.30	3.00	145	185	115 ⁵		3
	3.00	4.00	145	185	115 ⁵		5
	4.00	6.00	145	185	115 ⁵		6
5005 - H16	0.15	0.80	165	205	135 ⁵		1
	0.80	1.30	165	205	135 ⁵		2
	1.30	4.00	165	205	135 ⁵		3
5005 - H18	0.15	0.80	185				1
	0.80	1.30	185				2
	1.30	3.25	185				3

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 √ A)
	OVER	UP TO	Ultimate Min	Ultimate Max			
5005 - H19	0.15	1.00	195				1
5005 - H32 ⁴	0.40	0.50	115	160	85 ⁵		3
	0.50	0.80	115	160	85 ⁵		4
	0.80	1.30	115	160	85 ⁵		5
	1.30	3.00	115	160	85 ⁵		7
	3.00	4.00	115	160	85 ⁵		8
	4.00	6.00	115	160	85 ⁵		9
5005 - H34 ⁴	0.25	0.30	135	180			2
	0.30	0.80	135	180	105 ⁵		3
	0.80	1.30	135	180	105 ⁵		4
	1.30	3.00	135	180	105 ⁵		5
	3.00	4.00	135	180	105 ⁵		6
	4.00	6.00	135	180	105 ⁵		7
5005 - H36 ⁴	0.15	0.20	160	200	125 ⁵		1
	0.20	0.50	160	200	125 ⁵		2
	0.50	0.80	160	200	125 ⁵		3
	0.80	4.00	160	200	125 ⁵		4
5005 - H38	0.15	0.30	180				1
	0.30	0.50	180				2
	0.50	0.80	180				3
	0.80	3.25	180				4
5050A - O	0.15	0.20	125	165			
	0.20	0.50	125	165	40 ⁵		16
	0.50	0.80	125	165	40 ⁵		18
	0.80	3.00	125	165	40 ⁵		20
	3.00	6.00	125	165	40 ⁵		22
5050A - H32 ⁴	0.40	1.30	150	195	110 ⁵		4
	1.30	6.00	150	195	110 ⁵		6
5050A - H34 ⁴	0.25	0.80	170	215	135 ⁵		3
	0.80	1.30	170	215	135 ⁵		4
	1.30	6.00	170	215	135 ⁵		5
5050A - H38	0.15	0.20	200				
	0.20	0.80	200				2
	0.80	1.30	200				3
	1.30	3.25	200				4
5052 - O	0.15	0.20	170	215			
	0.20	0.30	170	215			14
	0.30	0.50	170	215	65 ⁵		15
	0.50	0.80	170	215	65 ⁵		16
	0.80	1.30	170	215	65 ⁵		18
	1.30	3.00	170	215	65 ⁵		19
	3.00	6.00	170	215	65 ⁵		20
	6.00	75.00	170	215	65 ⁵		16
5052 - H32 ⁴	0.40	0.50	215	265	160 ⁵		4
	0.50	1.30	215	265	160 ⁵		5
	1.30	3.00	215	265	160 ⁵		7
	3.00	6.00	215	265	160 ⁵		9
	6.00	12.00	215	265	160 ⁵		11
	12.00	50.00	215	265	160 ⁵		10

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 √ A)
	OVER	UP TO	Ultimate Min	Ultimate Max			
5052 - H34 ⁴	0.25	0.50	235	285	180 ⁵		3
	0.50	1.30	235	285	180 ⁵		4
	1.30	3.00	235	285	180 ⁵		6
	3.00	6.00	235	285	180 ⁵		7
	6.00	25.00	235	285	180 ⁵		8
5052 - H36 ⁴	0.15	0.20	255	305			2
	0.20	0.80	255	305	200 ⁵		3
	0.80	4.00	255	305	200 ⁵		4
5052 - H38 ⁴	0.15	0.20	270				2
	0.20	0.80	270		220 ⁵		3
	0.80	3.25	270		220 ⁵		4
5052 - H39I	0.15	2.00	290		240 ⁵		3
5052 - H112	6.00	12.00	195		110 ⁵		7
	12.00	50.00	170		65 ⁵		10
	50.00	75.00	170		65 ⁵		14
5251 - O	0.20	0.50	170	215	65 ⁵		15
	0.50	0.80	170	215	65 ⁵		18
	0.80	6.00	170	215	65 ⁵		20
	6.00	75.00	170	215	65 ⁵		16
5251 - H32 ⁴	0.25	0.50	200	255	130 ⁵		4
	0.50	1.30	200	255	130 ⁵		5
	1.30	2.60	200	255	130 ⁵		7
	2.60	6.00	200	255	130 ⁵		9
	6.00	12.00	200	255	130 ⁵		11
	12.00	50.00	200	255	130 ⁵		10
5251 - H34 ⁴	0.25	0.50	230	275	180 ⁵		3
	0.50	1.30	230	275	180 ⁵		4
	1.30	3.00	230	275	180 ⁵		6
	3.00	6.00	230	275	180 ⁵		7
	6.00	25.00	230	275	180 ⁵		8
5251 - H36 ⁴	0.20	0.80	250	295	210 ⁵		3
	0.80	4.00	250	295	210 ⁵		4
5251 - H38 ⁴	0.20	0.80	260		225 ⁵		3
	0.80	3.25	260		225 ⁵		4
5252 - H25	0.50	0.80	215	270			7
	0.80	1.30	215	270			9
	1.30	2.30	215	270			10
5252 - H27	0.50	0.80	240	295			4
	0.80	2.30	240	295			5
5154A - O	0.50	0.80	215	285	75		12
	0.80	1.30	215	285	75		14
	1.30	3.00	215	285	75		16
	3.00	6.00	215	285	75		18
5454A - O	0.50	0.80	215	285	80		12
	0.80	1.30	215	285	80		14
	1.30	3.00	215	285	80		16
	3.00	75.00	215	285	80		16
5454 - H32 ⁴	0.50	1.30	250	305	180		5
	1.30	6.00	250	305	180		8
	6.00	50.00	250	305	180		10
5454 - H34 ⁴	0.50	1.30	270	325	200		4
	1.30	4.00	270	325	200		6
	4.00	6.00	270	325	200		7
	6.00	25.00	270	325	200		8

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 √ A)
	OVER	UP TO	Ultimate Min	Ultimate Max			
5454 - H112	6.00	12.00	220		125		8
	12.00	50.00	215		80		9
	50.00	75.00	215	150	80		13
5457 - O	0.50	0.80	110	150			18
	0.80	1.30	110	150			20
	1.30	2.30	110	215			22
5457 - H25	0.50	0.80	160	215			4
	0.80	1.30	160	215			6
	1.30	2.30	160	140			7
5557 - O	0.50	0.80	90	140			17
	0.80	2.30	90	185			20
5557 - H25	0.50	0.80	135	185			4
	0.80	2.30	135	350			6
5083 - O	1.30	40.00	275	345	125	200	14
	40.00	75.00	270	350	115	200	14
5083 - H111	6.00	40.00	290	385	170	285	12
5083 - H121	6.00	50.00	305	350	215	295	10
5083 - H311	6.00	40.00	290	385	170	285	14
5083 - H321	5.00	40.00	305	385	215	295	10
	40.00	75.00	280	375	200	295	10
5083 - H323	1.30	3.20	310	375	235	305	8
	3.20	6.00	310	405	235	305	10
5083 - H343	1.30	3.20	345	405	270	340	6
	3.20	6.00	345		270	340	8
5083 - H112	6.00	40.00	275		125		10
	40.00	75.00	270		115		10
5083 - H115 ¹⁰	20.00	50.00	310		255		7
	50.00	70.00	305		240		7
5083 - H116 ¹³	3.00	6.00	305		215		10
	6.00	30.00	305		215		10
5086 - O	0.50	1.30	240	290	95		15
	1.30	6.00	240	290	95		18
	6.00	50.00	240	290	95		12
5086 - H32 ⁴	0.50	1.30	275	325	195		6
	1.30	6.00	275	325	195		8
	6.00	50.00	275	325	195		10
5086 - H34 ⁴	0.25	0.50	305	350	235		4
	0.50	1.30	305	350	235		5
	1.30	6.00	305	350	235		6
	6.00	25.00	305	350	235		8
5086 - H36 ⁴	0.15	0.50	325	375	260		3
	0.50	1.30	325	375	260		4
	1.30	4.00	325	375	260		6
5086 - H38 ⁴	0.15	0.50	345		280		3
5086 - H112	4.80	6.00	250		125		8
	6.00	25.00	240		110		8
	25.00	50.00	240		95		12
	50.00	75.00	235		95		12
5182 - H14	0.15	0.50	325	385			5
5182 - H19	0.15	0.50	385				2
5383 - O	2.00	40.00	290		145		17
5383 - H111	2.00	40.00	290		145		17
5383 - H116	2.00	40.00	305		220		10
5383 - H32	2.00	40.00	305		220		10
5383 - H34	2.00	40.00	340		270		5
5182 - H321	2.00	40.00	305		220		10

MECHANICAL PROPERTY LIMITS ¹ (mm) SHEET & PLATE

ALLOY & TEMPER	THICKNESS ² (mm)		TENSILE STRENGTH (MPa)		Yield Min	Yield Max	ELONGATION ³ (mm) (% min in 50mm or 5.65 \sqrt{A})
	OVER	UP TO	Ultimate Min	Ultimate Max			
6061 - O ¹¹	0.25	0.50		150		85	14
	0.50	3.25		150		85	16
	3.25	12.00		150		85	18
	12.00	25.00		150			16
6061 - T4	0.25	0.50	205		115		14
	0.50	6.00	205		115		16
	6.00	25.00	205		115		16
6061 - T42 ¹²	0.25	0.50	205		95		14
	0.50	6.00	205		95		16
	6.00	25.00	205		95		16
6061 - T6 and 6061 - T62 ¹²	0.25	0.50	290		240		8
	0.50	12.00	290		240		10
	12.00	25.00	290		240		7
8011 - O	0.15	0.30	75	105			16
	0.30	0.80	75	105			20
	0.80	1.30	75	105			25
	1.30	5.00	75	105			30
8011 - H12	0.20	0.50	100	135			3
	0.50	0.80	100	135			4
	0.80	1.30	100	135			6
	1.30	3.00	100	135			8
	3.00	6.00	100	135			9
8011 - H14	0.20	0.50	115	150			2
	0.50	0.80	115	150			3
	0.80	1.30	115	150			4
	1.30	3.00	115	150			5
	3.00	6.00	115	150			7
8011 - H16	0.20	0.50	140	170			1
	0.50	0.80	140	170			2
	0.80	1.30	140	170			3
	1.30	3.00	140	170			4
	3.00	6.00	140	170			5
8011 - H18	0.20	0.50	160				1
	0.50	0.80	160				2
	0.80	1.30	160				3
	1.30	3.00	160				4

FOOTNOTES

- 1 Mechanical test specimens are taken as detailed under **Sampling and Testing**, Section 4, page 4.4
- 2 The type of test specimen used depends on the thickness of material: see **Sampling and Testing**, Section 4, page 4.5
- 3 A = Cross-sectional area of specimen.
- 4 For the corresponding H2 temper, the limits for maximum ultimate tensile strength and minimum yield strength do not apply.
- 5 These yield strengths are not determined or guaranteed unless specifically requested.
- 6 Cladding alloy is 1230 - 5% of composite thickness per side.
- 7 Cladding alloy is 1230 - 2.5% of composite thickness per side.
- 8 T72 is a special temper for improved stress corrosion resistance.
- 9 Cladding alloy is 7072 - 5% of composite thickness per side.
- 10 A special temper for armour plate.
- 11 Annealed (O temper) material shall, upon heat treatment or heat treatment and ageing, be capable of developing the mechanical properties applicable to T42 or T62 temper material respectively.
- 12 Material heat-treated (T42) or heat-treated and aged (T62), from any temper by the user, should attain the mechanical properties applicable to these tempers.
- 13 Material in this temper has characteristics which substantially eliminate the susceptibility of alloy 5083 to exfoliate under certain corrosion conditions. Representative samples from individual production batches are subjected to the ASSET exfoliation corrosion resistance test.

ALLOY	5005	5050A	5052	5251	5252	5154A	5182	5454	5056	5457	5557	5083	5086
Nominal Composition (%)	Mg 0.8	Mg 1.4	Mg 2.5	Mg 2.0	Mg 2.5	Mg 3.5	Mg 0.3	Mg 2.7	Mg 5.2	Mg 1.0	Mg 0.6	Mg 4.5	Mg 4.0
			Cr 0.25			Cr 0.25	Mg 4.5	Mn 0.8	Mn 0.1	Mn 0.2	Mn 0.2	Mn 0.7	Mn 0.5
								Cr 0.1	Cr 0.1	Cu 0.1	Cu 0.1	Cr 0.15	Cr 0.15
Commercial Form ¹	F S P	F S T P	S P	S P T F W S		S E B	S P	S P	W S	S	S	S P T E B	S P
Characteristics ²													
Corrosion resistance ³	A A	A A	A A	A A	A A	A A	A C	A A	AC	A A	A A	A C	A C
Machining	D C	D C	C B	C B	C B	C B	C B	C B	C B	C C	C C	C B	C B
Anodising ⁴	B B	B B	C C	C C	A A	C C	C C	C C	C C	A A	A A	C C	C C
Brazing	B	B	C	C	NR	D	D	D	D	NR	NR	D	D
Cold Forming	A C	A C	A C	A C	A C	A C	A C	A C	A C	A C	A C	A C	A C
Weldability													
Gas	A	A	A	A	NR	C	C	C	C	NR	NR	C	C
Inert gas	A	A	A	A	NR	A	A	A	A	NR	NR	A	A
Resistance spot	B A	B A	B A	B A	B C	B A	B A	B A	B A	B C	B C	B A	B A
Heat Treatment	No	No	No	No	No	No	No	No	No	No	No	No	No
FOOTNOTES	1. FORMS			2. Characteristics			3. Corrosion resistance			4. Anodising			
	F = Foil S = Sheet P = Plate T = Tube E = Extrusion B = Bar or rod W = Wire Inclusion of a form or alloy combination in this table does not necessarily indicate ready availability.			Relative ratings for all characteristics are given in decreasing order of merit from A to D. NR = Not recommended in relation to a usual end use of an alloy. Where applicable, ratings for both annealed and hardest temper are given (eg: A C)			These ratings indicate corrosion resistance of an alloy in non-anodised form. All aluminium alloys can be anodised for increased resistance to corrosion and wear.			These ratings indicate suitability of alloy for decorative quality anodising.			

ALLOY	TYPICAL APPLICATIONS
5005	Appliances and utensils, general sheetmetal work and high-strength foil
5050A	Refrigerator trim and painted sheet
5052	Sheetmetal work, appliances, marine applications
5251	Sheetmetal work, appliances, small boats, hydraulic tube, high-strength foil
5252	High-strength automobile trim
5154A	Welded structures, storage tanks, pressure vessels, marine applications
5182	Unfired pressure vessels, marine cryogenic applications, drilling rigs, can-end stock (should not be used at temperatures above 65°C)
5454	Welded structures, pressure vessels to be used at elevated temperatures
5056	Cable armouring, rivets, zippers, screen wire
5457	Automobile trim
5557	Automobile trim
5083	Unfired welded pressure vessels, marine applications, aircraft applications, cryogenic containers, TV towers, drilling rigs, transportation equipment, missile components (should not be used at temperatures above 65°C)
5086	As for 5083

	2 mm	3 mm	4 mm
Panel weight (kg/m ²)	2.9	3.8	4.8
Aluminium sheet thickness (mm)	0.30	0.30	0.30
Panel thickness tolerance (mm)	+/- 0.2		
Panel width tolerance (mm)	+/- 2		
Panel length tolerance (mm)	+/- 3		
Panel diagonal tolerance (mm)	+/- 5		
Aluminium sheet thickness tolerance (mm)	+/- 0.02		
Paint thickness (micron)	20 +/- 2		
Paint pencil hardness	>HB		
Paint toughness	3 T		
Impact strength (kg/cm)	50		
Temperature resistance	-50°C to +90°C		
Peel strength (180°)	>5 Newton/mm		
Boiling water resistance	2 hours without change		
Acid resistance	Immersed surface in 2% HCl for 24 hours without change		
Alkali resistance	Immersed surface in 2% Ca(OH) ² for 24 hours without change		
Solvent resistance	100 times with Dimethylbenzene without change		
Cleaning resistance	Over 100 times without change		

PANEL SIZES:

4 x 1220 x 2440mm

4 x 1500 x 3000mm

4 x 1500 x 3600mm

Other sizes on request - minimum quantity applies



SAWING



CUTTING



BENDING



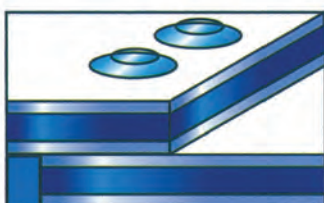
FOLDING



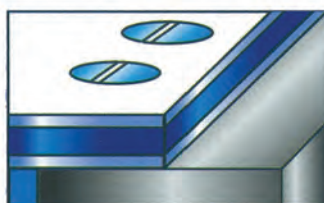
DRILLING



PUNCHING



RIVETING



SCREWING



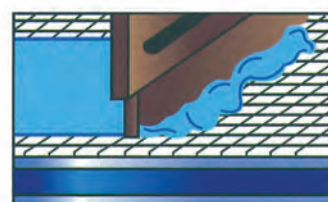
WELDING



GLUEING



DECORATIVE WORK



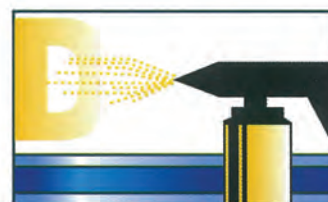
SCREEN PRINTING



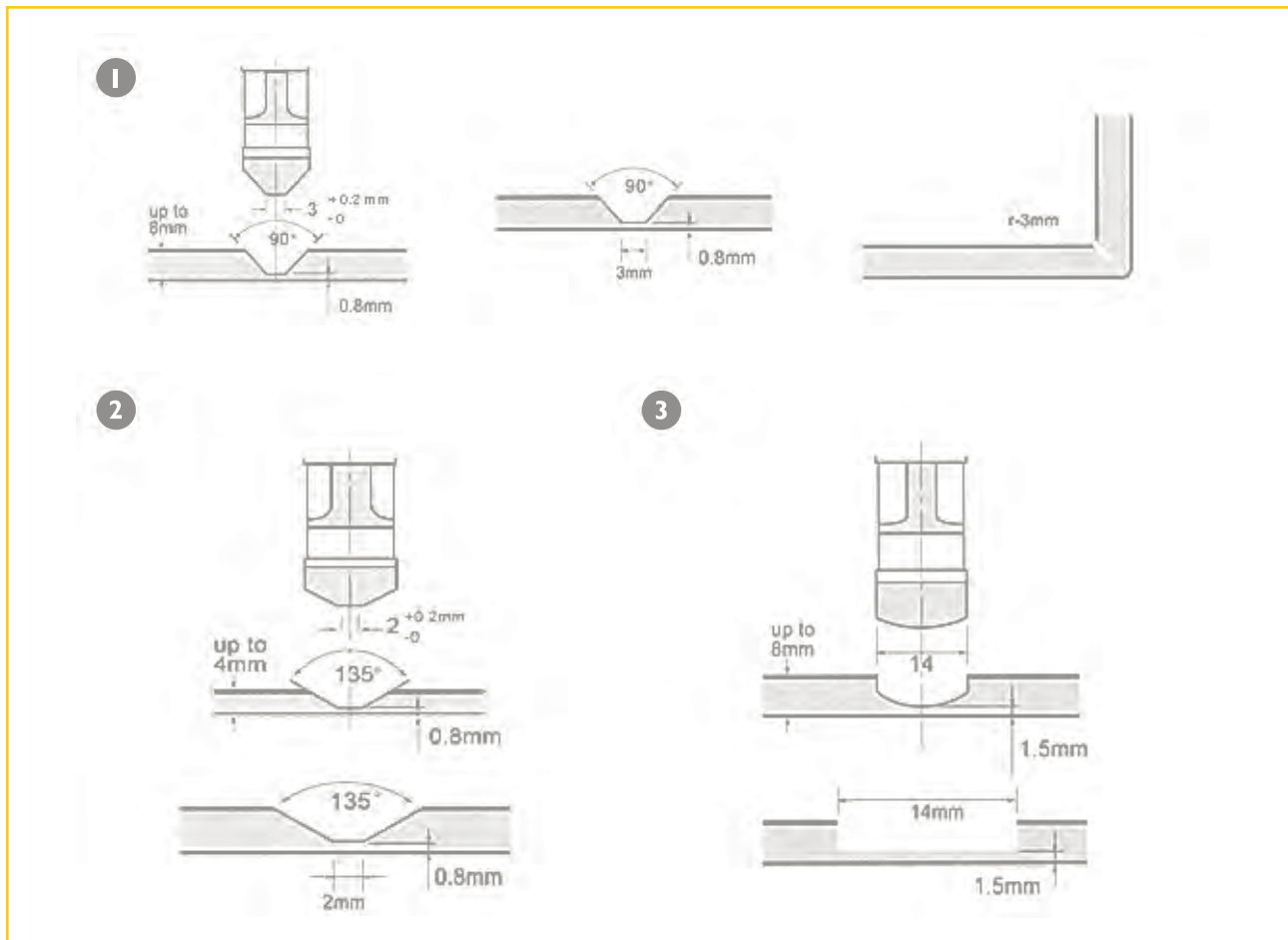
DIGITAL PRINTING



PHOTO MOUNTING



SPRAYING



- 1 By means of a knife at 90° bevel angle, the right angle configuration containing an inner angle $r=3\text{mm}$ can be manufactured.
- 2 The acute angle (45°) configuration containing an inner angle $r=2\text{mm}$ can be manufactured by means of a knife at 135° bevel angle.
- 3 The right angle configuration containing an inner angle $r=7\text{mm}$ can be manufactured by means of a knife at flat angle.

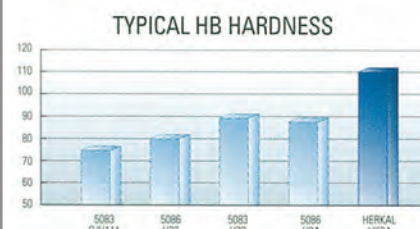
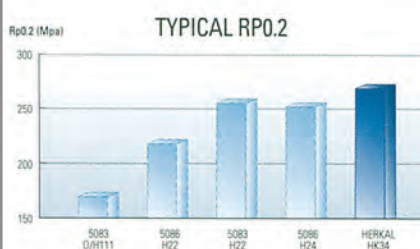
REMARK:

- Grooving and bending process environment temperature is over 20°.
- The exterior aluminium skin should be visible through the polyethylene core at the valley of rout. V grooving bottom should not reach the back of the aluminium skin and leave about 0.2-0.4mm of polyethylene core. Extreme care should be taken not to touch the exterior aluminium skin with the blade. Slight variation can occur due to the thickness changes in the sheet; constant depth of the rout ensures a good smooth line when the edge is folded.
- By grooving only one side, the sheet can be bent either upward or downward to create either an inside or outside corner.
- Note that as a result of the slight radius produced when bending, your finished panel dimensions will be 2-4mm larger.

Mechanical properties Minimal and typical

Thickness 4 to 10 mm	Min. Rm (MPa)	Min. Rp0.2 (MPa)	A%
HK34	330	240	10

Thickness 4 to 10 mm	Typical Rm (MPa)	Typical Rp0.2 (MPa)	A%	Typical HB hardness
HK34	360	270	17	110



Dimensional possibilities

Sheet Herkal HK34® is normally ordered in the following sizes:

- Thickness 5.5 to 10 mm
- Width < 2,400 mm
- Length < 12,500 mm

Please contact us for other dimensions. Measurement tolerances as per E.N.

Bending

Herkal HK34® is used flat for tipper floors. It can also be bent to suit the design of tippers that have a semi-circular cross-section. Bending guaranteed for angles > 90° with bending radius > 4 times the thickness of the sheet.

General physical properties

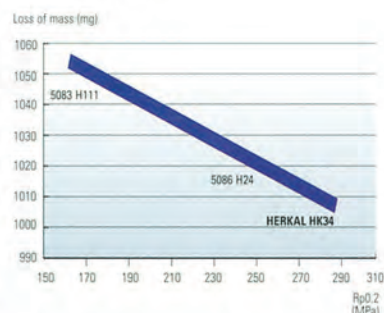
Density g/cm ³	2,66
Melting range °C	580-640
Linear expansion coefficient (0 to 100 °C) - °C ⁻¹ x 10 ⁻⁶	23,9
Modulus of elasticity (Mpa)	71000
Excellent capability of welding	MIG or TIG

Abrasion resistance test

The Taber® abrasion test using a grade H18 grinding wheel under a load of 1,000 g for 2,000 revolutions reveals the differences in behaviour of different types of aluminium sheet when subjected to wear. The fibrous structure and high limit of elasticity of Herkal HK34® result in lower loss of mass.

Taber® Test

Loss of mass against limit of elasticity



Reference specification:

IS 5091





SEALIUM®

Sheets and plates

Description

This specification defines the properties and characteristics of Sealium® marine grade aluminium alloy, delivered by Alcan Marine as sheets or plates.

Created and registered by Alcan Marine, Sealium® optimises the overall productivity of shipbuilders and the performance of vessels in general as it makes them more robust, safer, and user-friendly.

In just a few years, Sealium® has become the international industry reference for fast ferries.

Advantages

15 % higher welded yield strength than standard 5083 alloy:

- Increased margin of safety from same scantlings.
- Significant weight savings from optimized scantlings.

Proven improved corrosion resistance.

Increased fatigue strength.

Same usage properties as 5083 alloy:

- Formability: same cutting, bending and shaping.
- Welding: no change in welding procedure, consumables or heat induced deformation.

Greater recycling value for the entire Sealium® welded assembly.

Chemical composition

%	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Zr	other (max.)
min.				0.7	4.0					each: 0.05
max.	0.25	0.25	0.20	1.0	5.2	0.25	0.40	0.15	0.20	total: 0.15

Remainder: Al.

(Limits are in percent maximum unless stated otherwise).

Thickness

Thickness range			
standard		on request	
mm	in.	mm	in.
th ≤ 50	th ≤ 1.97	50 < th ≤ 80	1.97 < th ≤ 3.15

Applications

Sealium® may be used wherever a stronger welded aluminium structure is desired, from hulls to superstructures. Marine structures benefit from the excellent corrosion resistance offered by Sealium®.

Smaller boats (< 50 m) benefit from improved scantlings, which translate into structural weight savings on patrol craft, increased strength on workboats or added interior space in luxury yachts. Larger vessels (> 50 m) profit from the increased strength and improved fatigue behavior of Sealium®. Cruise ship superstructures can be lightened further while improving stability and not compromising strength or corrosion resistance.

Corrosion resistance

Sheets or plates made of Sealium® marine grade aluminium alloy offer a guaranty of intergranular and exfoliation corrosion resistance for severe marine applications as described in ASTM B928 (marine hull construction or marine applications where frequent or constant direct contact with sea water is expected). Accelerated tests and marine exposure (air and immersion) as well as experience have proven the long term corrosion resistance of Sealium®. Sealium® offers a better mechanical resistance on welded components than standard alloy 5083 with a good or better corrosion resistance.

Mechanical properties

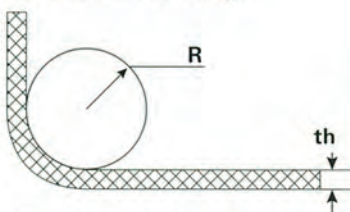
Thickness Range (mm)	R _{p0.2} (MPa)	R _m (MPa)	A (%)
$3 \leq th \leq 50$	220	305	10

Thickness Range (in.)	R _{p0.2} (ksi)	R _m (ksi)	A (%)
$0.125 \leq th \leq 2$	32	44	10

Minimal mechanical properties as per Alcan specification IS 5423. As information, welded Sealium® shows a R_{p0.2} minimal value of 145 MPa or 21 ksi to be compared to 125 MPa or 18 ksi for standard 5083 alloy. This value is considered by the main classification societies.

Bending properties

Sealium® sheets ($th < 12.5$ mm or 0.492 in.) are capable of being bent cold through an angle of 90 deg. around a pin having a radius equal to N times the thickness (th) of the sheet without cracking.



R is the bending radius
th is the thickness of the sheet
 $R \geq N \times th$

The certified minimum bending radius is given in the following table:

Thickness mm	in.	Certified minimum bending radius
$2 < th \leq 3$	$0.079 < th \leq 0.118$	$R \geq 2.0 \times th$
$3 < th \leq 6$	$0.118 < th \leq 0.236$	$R \geq 2.5 \times th$
$6 < th \leq 12.5$	$0.236 < th \leq 0.492$	$R \geq 4.0 \times th$

Type approval

Sealium® sheets/plates have been approved by the major classification societies :

- American Bureau of Shipping, USA (ABS)
- Bureau Veritas, France (BV)
- Det Norske Veritas, Norway (DNV)
- Germanischer Lloyd, Germany (GL)
- Lloyd's Register of Shipping, UK (LR)
- Nippon Kaiji Kyokai, Japan (Class NK)
- Registro Italiano Navale, Italy (RINA)

Standard manufacturing capabilities of Alcan Marine

Thickness		Max Width		Max Length	
mm	in.	mm	in.	mm	in.
$4 \leq th \leq 4.5$	$0.157 \leq th \leq 0.177$	2 260	89	15 000	590.55
$4.5 < th \leq 8$	$0.177 < th \leq 0.315$	2 400	94.5	15 000	590.55
$8 < th \leq 10$	$0.315 < th \leq 0.394$	2 400	94.5	12 500	492.13
$10 < th \leq 12.7$	$0.394 < th \leq 0.5$	2 400	94.5	10 350	407.48
$12.7 < th \leq 50$	$0.5 < th \leq 1.97$	3 050	120.1	*	*

* to be agreed on a case by case basis.

Contact us for non-standard dimensions.

Specific tolerances and properties are available upon request.

Reference specification

Alcan Marine specification: IS 5423.

SEALiUM®



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SEALIUM®

Extrusions

Description

This specification describes the properties and characteristics of Sealium® marine grade extrusions, created and delivered by Alcan Marine.

With best advantages specifically for aluminium designers, builders, operators and owners of modern technically advanced light marine crafts, Sealium® extrusions offer new ways to:

- Reduce total costs of metallic hull structure (after assembling),
- Radically improve vessel performance with the best available mechanical and corrosion resistance,
- Reduce weight and increase interior space.

Advantages

Sealium® extrusions combine the best available aluminium alloy for marine applications with optimised section designs.

Sealium® extrusions are to be used when a stronger aluminium structure is required, and whenever weight reduction or increased interior space is crucial.

Sealium® extrusions perform best when used with Sealium® sheets and plates to give the best overall structural performance from same alloy construction.

- Best strength available for marine applications (e.g. 26 % higher welded Yield Stress than 6082),
- High corrosion resistance,
- Improved weight reduction,
- Increased interior space,
- Intelligent shapes,
- Improved fatigue behavior,
- Greater scantling flexibility,
- Greater recycling value for the entire Sealium® welded assembly.

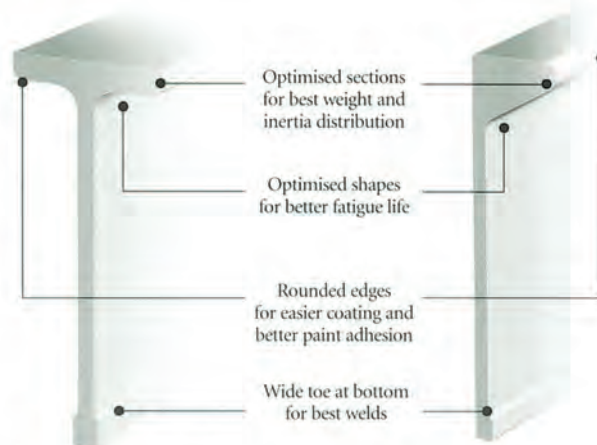
Drawing and dimensions

Two types of sections are available:

- Tees and bulb-flats. Various dimensions are available as standard, from 50 mm to 140 mm.

Further technical information can be downloaded at www.alcan-marine.com

- Shapes and dimensions have been specially designed to offer naval architects and boat builders new perspectives with optimised shapes to provide the best balance between highest section modulus, lowest weight and smallest dimensions.

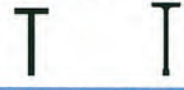


Any other specific shape may be created on request.

Comparison study

Better material and more effective section designs bring key advantages as described in the following examples:


not to scale



	standard T6082	T70 Sealium®
For same weight: increased strength		
Height mm	60	70
Section mm ²	516	536
Mass Kg/m	1.412	1.427
Effective section modulus ⁽¹⁾ (at bottom) cm ³	3.7	8.1

• Slightly taller section
• Section modulus is more than doubled !

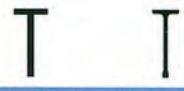
not to scale



	standard T6082	T50 Sealium®
For equivalent section modulus at bottom: more interior space		
Height mm	60	50
Section mm ²	516	299
Mass Kg/m	1.412	0.796
Effective section modulus ⁽¹⁾ (at bottom) cm ³	3.7	3.4

• Reduced height (- 17 %)
• Mass nearly halved (- 44 %)

not to scale



	standard T6082	T60 Sealium®
For same height: greater scantling flexibility		
Height mm	60	60
Section mm ²	516	402
Mass Kg/m	1.412	1.071
Effective section modulus ⁽¹⁾ (at bottom) cm ³	3.7	5.4

• Reduced mass (- 22 %)
• Significant increased section modulus (+ 46 %)

⁽¹⁾ Effective section modulus is the geometric section modulus with the material strength contribution considered (material strength factored as per DNV γ factor, with 6082 as the reference alloy).

Chemical composition

%	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Zr	other (max.)
min.				0.7	4.0					each: 0.05
max.	0.25	0.25	0.20	1.0	5.2	0.25	0.40	0.15	0.20	total: 0.15

Remainder: Al.

(Limits are in percent maximum unless stated otherwise).

Mechanical properties

Temper	Rp _{0.2}		Rm		A %
	MPa	ksi	MPa	ksi	%
H112 (Minimal)	190	27	310	45	13
H112 (Typical)	230	33	340	49	17

Sealium® extrusions are delivered in the H112 temper.

As information, welded Sealium® shows a Rp_{0.2} minimal value of 145 MPa or 21 ksi to be compared to 115 MPa or 17 ksi for standard 6082 alloy.

This value is considered by the main classification societies.

Reference specification

Alcan Marine specification: Pat PR-001.

Class approval

Sealium® extrusions can be delivered with a certification stamp from one of the major classification societies.

SEALiUM®



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