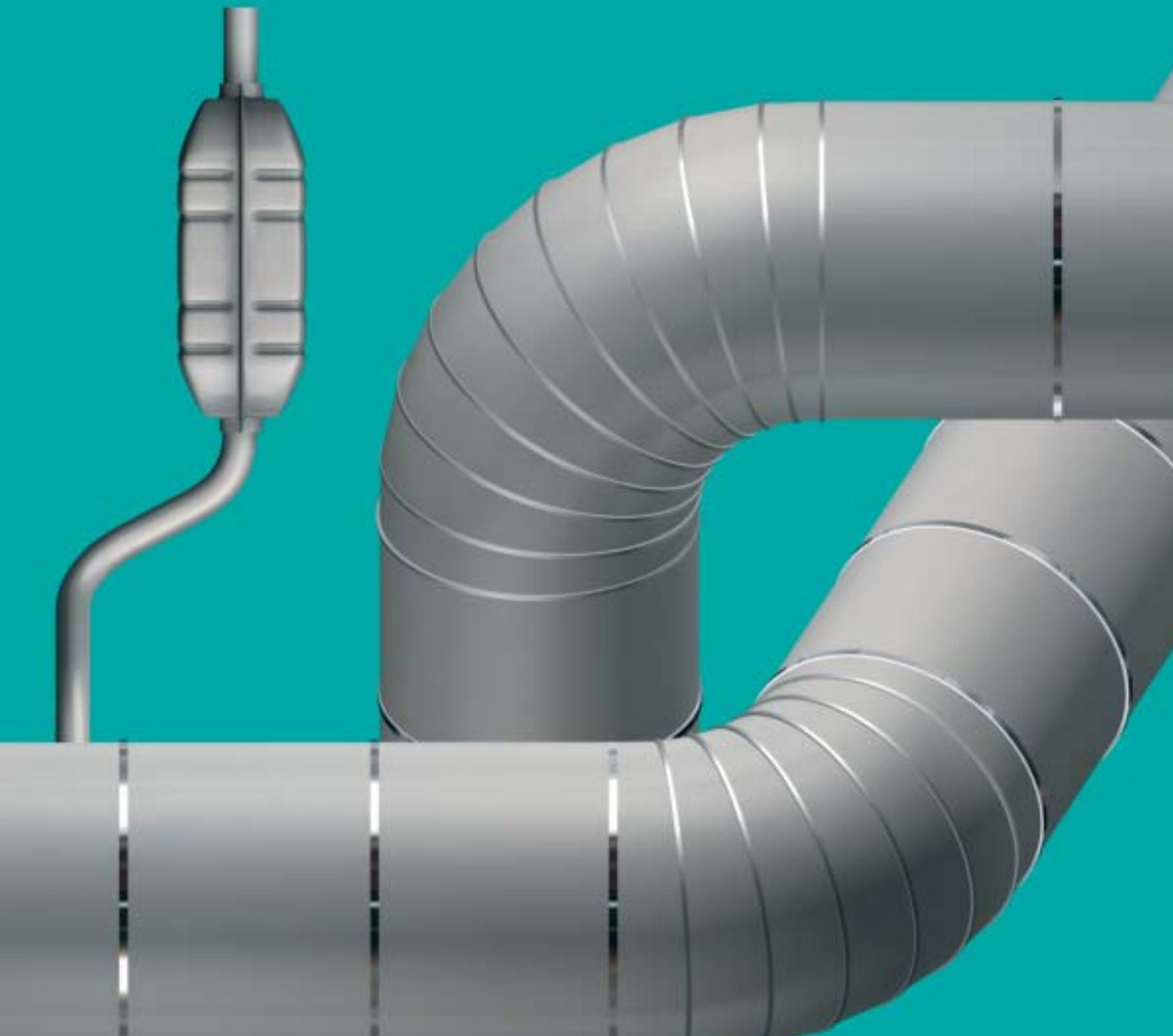


Aluminised Products

# Aludip

Hot-dip aluminium-silicon alloy coated steel



# Specify Aludip for corrosion resistance at elevated temperatures



Aludip provides corrosion resistance at elevated temperatures, plus the strength of steel. It comes to you with all the experience, quality, and back-up available from the Aluminised Products business of Corus.

## Benefits

Aludip offers high-performance properties for demanding applications.

- Superior corrosion resistance at high temperatures
- The strength of steel
- Sag resistance
- Heat reflectivity
- Tightly adherent coating
- Forming, drawing, and high-tensile grades
- Good weldability
- Excellent surface for painting
- Zinc-free
- Low radio-frequency interference

## Services

The benefits of using Aludip go beyond product performance.

Corus is highly experienced in establishing supply-chain relationships that reflect an understanding of the customer's requirements and improve communication, service and delivery.

Specify Aludip from Aluminised Products for an unbeatable combination of product performance and service, backed by Corus, one of the world's most experienced manufacturers of coated steels.



# Properties

Aludip has been hot-dip coated with a special aluminium alloy that forms a tightly adherent coating on both surfaces of the steel. The aluminium formulation contains approximately 10% silicon, which allows Aludip to be used in the most demanding deep-drawn applications.

## Corrosion resistance

During the coating process, an aluminium-iron alloy is formed at the interface with the steel substrate, whilst an aluminium oxide layer is formed at the outer surface. It is this thin but tenacious film of aluminium oxide which protects the steel. The aluminium coating is very reactive and 'takes' oxygen from air or water to seal itself from corrosive attack.

Aludip retains its surface lustre at temperatures up to 500°C, after which the coating is transformed into a dull grey aluminium-iron alloy. At this temperature, the alloy still retains its excellent oxidation resistance.

Aludip's corrosion resistance has been demonstrated both in accelerated laboratory tests to ASTM B117-64 and in practice for many years as automotive exhaust systems, flues, and protective wrapping for insulated pipes or vessels.

The Aludip range includes products that withstand the corrosive attacks of salt, flue gas, combustion condensates, weather, and atmospheric pollution.

## High temperature oxidation resistance of Aludip

The graph below shows the weight gain through oxidation at elevated temperatures for Aludip and mild steel.

The significantly lower gain of Aludip demonstrates its superior resistance to oxidation.

## Sag resistance

Aludip exhibits good sag resistance, which means that it can be used at elevated temperatures without suffering distortion.

## Heat reflectivity

Aludip reflects approximately 80% of incident light and heat at temperatures up to 500°C. This property means that Aludip can reduce the amount of energy required to maintain elevated temperatures relative to other steel products.

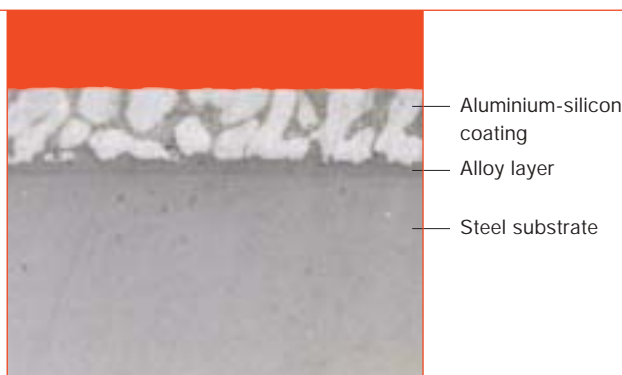
## Zinc-free

All products in the Aludip range are zinc-free. This is important in applications that use stainless steel, which can suffer bimetallic corrosion in the presence of zinc and water, especially in polluted environments.

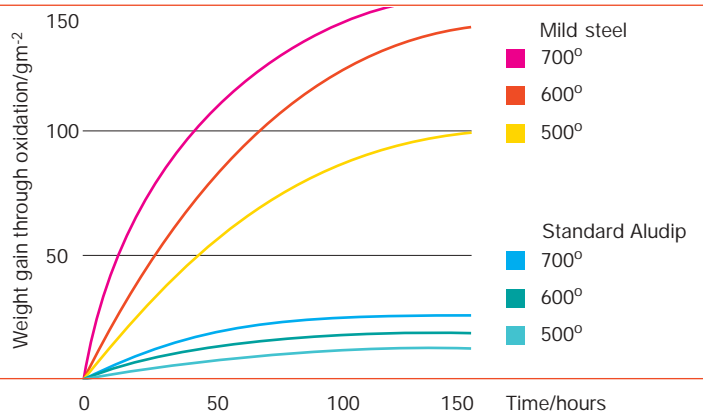
## Foodsafe

The aluminium-silicon coating, in an unpassivated condition, is suitable for foodsafe applications.

Micrograph of Aludip coating

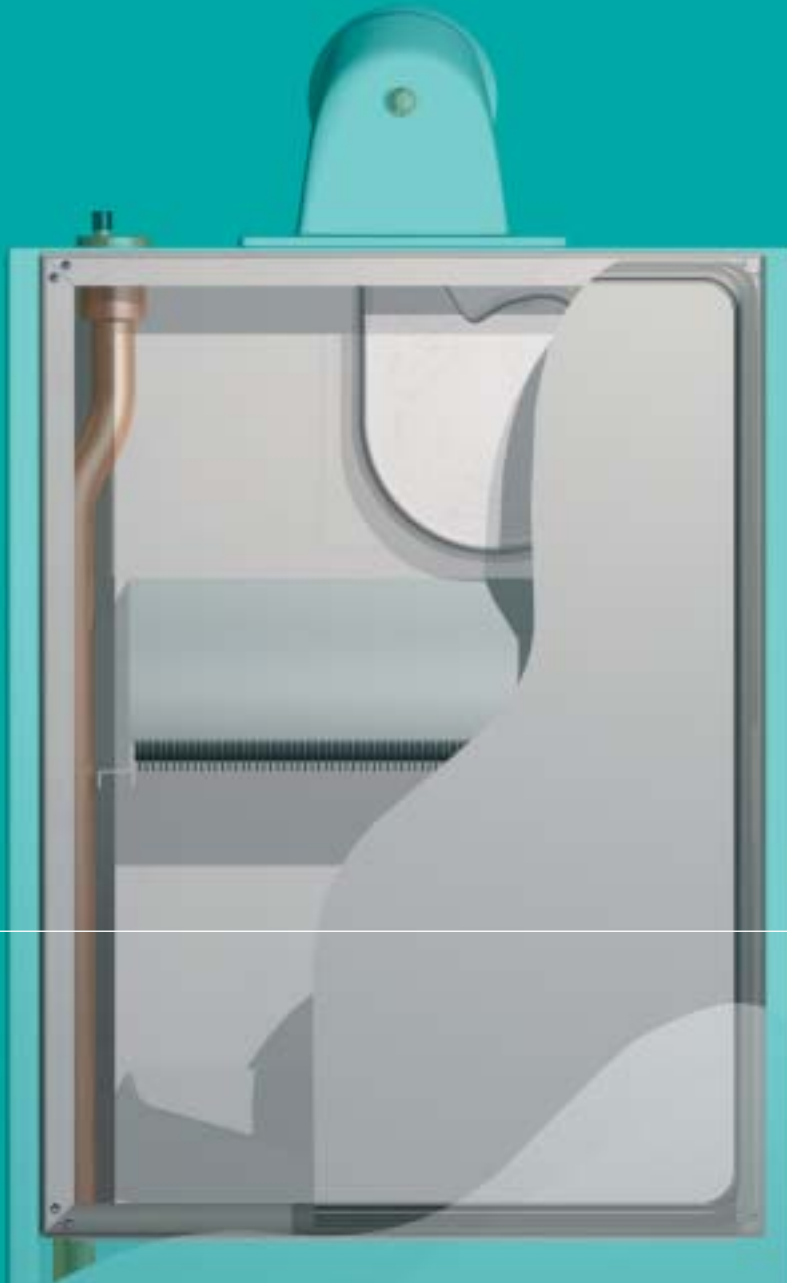


Weight gain through oxidation of Standard Aludip compared with mild steel at elevated temperatures



## Manufacturing process

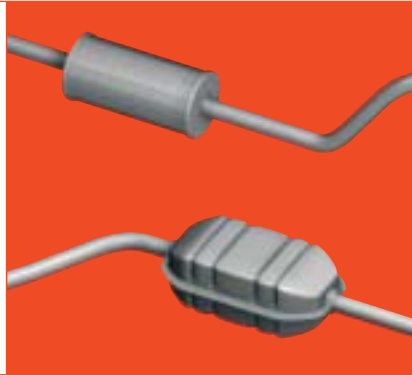
The strip steel is passed through a multi-zone, continuous annealing process where the final temperature can reach 825°C. The reducing atmosphere throughout the furnace prepares the surface of the strip, which ensures good coating adhesion. The strip steel is then cooled before being passed into a bath of molten aluminium, where the temperature is held at 680°C. A system of air knives carefully controls the coating weight of the aluminium, producing coating weights of 40-240g/m<sup>2</sup>.



Aludip's resistance to corrosion at high temperatures makes it ideal for domestic boilers.



Silencer box



Exhaust systems



Insulation cladding

## Applications

Aludip is suitable for many applications, including those listed below. Consult us for advice about these applications.

### Automotive

- Chassis components
- Exhaust systems
- Fuel tanks, both petrol and diesel
- Heat shields
- Oil sumps
- Suspension arms

### Heating and ventilation

- Chimney inserts
- Domestic boilers
- Domestic fires
- Heat exchangers
- Industrial ovens and furnaces
- Industrial dryers
- Smoke stacks
- Water heaters for reflectors, burners and combustion chambers

### Appliances

- Bakeware
- Barbecues
- Cookers and ovens
- Mini-ovens and deep fryers
- Toasters

### Building industry

- Cladding
- Fire doors

The next section, entitled *Product range*, describes each of the Aludip products and their typical applications in more detail.



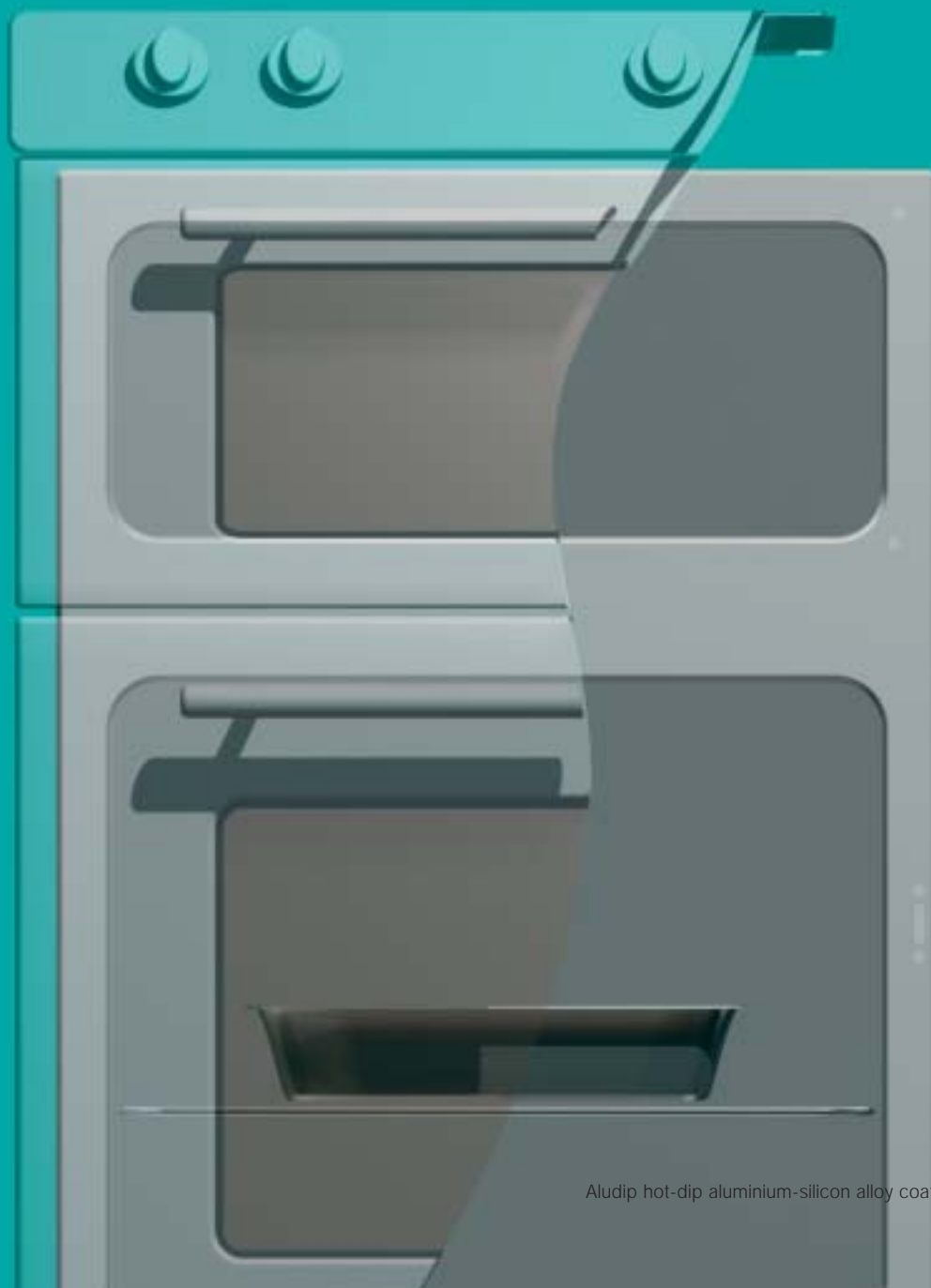
Domestic boilers



Backs of domestic fires



Cookers and bakeware



## Product range

Aludip is the name for the complete range of hot-dip aluminium-silicon alloy coated steels. It is available in its standard version and in two variations which have enhanced properties.

- Standard Aludip: The standard product.
- Aludip BQ: Aludip Building Quality.
- Aludip BQ Extra: Aludip BQ with a clear polyester film coating

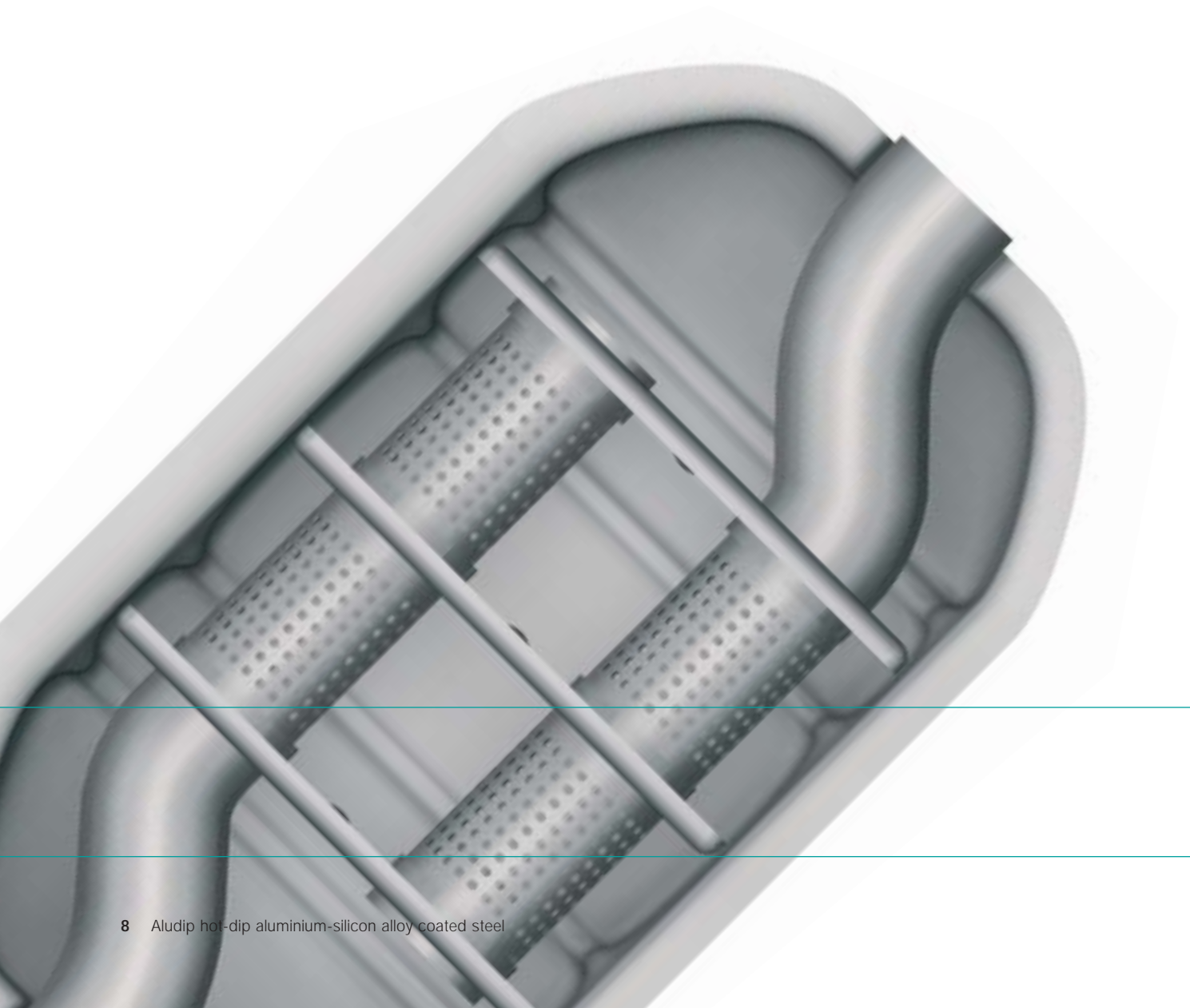
Aludip is manufactured to meet all the requirements of EN 10154: 1996.

Thickness and width limits, and thickness tolerances, for all Aludip products are shown on pages 9-11.

### Standard Aludip

With its resistance to heat and corrosion, standard Aludip is used primarily for exhaust systems. It is also used for structural and other functional parts in domestic appliances, especially heating appliances. Other uses include chimney flues and gas boiler heat exchangers.

Standard Aludip will withstand forming, deep drawing, or lock seaming without flaking or peeling.





**Forming and drawing qualities**

Grade (EN 10154)	Suitability	Max. yield strength $R_e$ (N/mm <sup>2</sup> )	Max. tensile strength $R_m$ (N/mm <sup>2</sup> )	Min. elongation $A_{80}$ (%)	Plastic strain ratio $r_{90}$ (min.)	Strain hardening exponent $n_{90}$ (min.)
CQ <sup>1</sup>	commercial quality	-	-	-	-	-
DX51D+AS	bending and profiling	-	500	22	-	-
DX52D+AS	drawing quality	300	420	26	-	-
DX53D+AS	deep drawing	260	380	30	-	-
DX54D+AS	special deep drawing	220	360	34	1.4	0.18
DX55D+AS <sup>2</sup>	special deep drawing, heat resistance up to 800°C	240	370	32	-	-
DX56D+AS <sup>3</sup>	extra deep drawing	180	330	39	1.7	0.2

**Notes to table above:**

Specific:

1. This grade is additional to EN 10154.
2. Please consult us about the availability of this grade.
3. This grade has been specially developed to meet the requirements of deep-drawn automotive fuel tanks and heat shields. Please consult us for thicknesses below 0.8mm.

General:

For thicknesses between 0.5mm and 0.7mm inclusive, the minimum elongation value ( $A_{80}$ ) shall be reduced by 2%. In addition, for these thicknesses, the  $r_{90}$  and  $n_{90}$  values, where specified, shall be reduced by 0.2 and 0.01 respectively.

For thicknesses above 1.5mm, the  $r_{90}$  value shall be reduced by 0.2.

**Structural qualities**

Grade (EN 10154)	Min. yield strength $R_e$ (N/mm <sup>2</sup> )	Min. tensile strength $R_m$ (N/mm <sup>2</sup> )	Min. elongation $A_{80}$ (%)
S250GD+AS	250	330	19
S280GD+AS	280	360	18
S320GD+AS <sup>1</sup>	320	390	17
S350GD+AS <sup>1</sup>	350	420	16

**Notes to table above:**

Specific:

1. Please consult us about the availability of these grades.

General:

For thicknesses between 0.5mm and 0.7mm inclusive, the minimum elongation value ( $A_{80}$ ) shall be reduced by 2%.

**Coating mass**

Designation	Minimum coating mass, total both sides (g/m <sup>2</sup> )		Equivalent coating thickness, each side (μm)
	Triple spot test	Single spot test	
AS 40 <sup>1</sup>	40	30	7
AS 60	60	45	10
AS 80	80	60	13
AS 100	100	75	17
AS 120	120	90	20
AS 150	150	115	25

**Notes to table above:**

1. This coating designation is in addition to EN 10154: 1996 and satisfies the requirement for a lightweight coating.



## Aludip BQ

Aludip BQ has been specially designed to give exceptional corrosion resistance when used as insulation cladding in the power generating, petrochemical, and oil industries.

With its Young's modulus of approximately three times that of pure aluminium sheet, Aludip BQ can be used in relatively thin sheets and still retain superior strength, offering the opportunity for cost savings.

The mechanical strength of steel, even at elevated temperatures, makes Aludip BQ an effective, protective wrapping or cladding for insulated pipes or vessels. It also contributes to structural integrity in the case of fire damage.

Aludip BQ has the same heat resistant and reflective properties as Standard Aludip. It is a non-combustible product as defined in BS 476: Part 4.

Because of its excellent resistance to atmospheric corrosion, Aludip BQ does not normally need to be painted. If painting is necessary, Aludip BQ provides an excellent base for paint, especially heat-resistant paint.

Aludip BQ will withstand moderate forming and lock-seaming and can be bent to a minimum diameter of twice its thickness without flaking or peeling.

The abrasion resistance of Aludip BQ is as good or better than many metallic or paint-coated products.

Aludip BQ is available with a low-carbon cold-reduced substrate. For design purposes, the product may be deemed to conform with the mechanical property requirements of S250GD.

## Aludip BQ Extra

This product is based upon Aludip BQ, but has a nominal 10 micrometre, clear matte-finish polyester film to improve resistance to atmospheric corrosion and to enhance and maintain its aesthetic appearance. The protective film gives a high degree of protection against chloride ion attack and also provides an excellent base for paint, if desired, including heat-resistant paint.

Locations such as offshore oil rigs and seashore terminals endure constant sea spray and 'salt air' attack, especially in areas with 'dead spaces' which are north facing, poorly ventilated, and not regularly washed with fresh rainwater. Such areas are prone to severe corrosion from high humidity coupled with high chloride ion concentrates which cause pitting corrosion of unprotected aluminium coatings. Aludip BQ Extra is designed to resist the corrosive effects of these conditions.

Aludip BQ Extra is available with a low-carbon cold-reduced substrate. For design purposes, the product may be deemed to conform with the mechanical property requirements of S250GD.

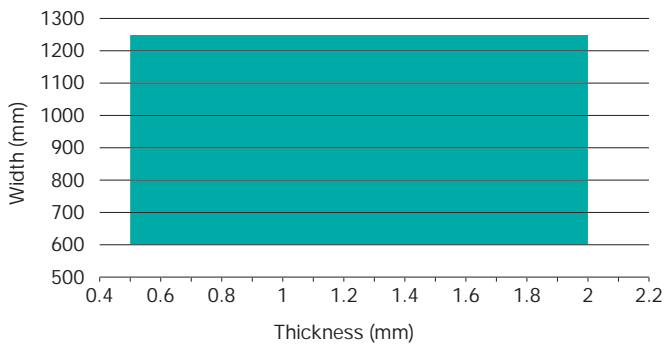
### Coating mass

Coating mass is within the range of 240-270g/m<sup>2</sup> (Triple spot test).

## All Aludip products

### Thickness and width manufacturing limits

#### Thickness and width limits for wide coils



#### Thickness tolerances\*

Thickness (mm)		Thickness tolerance ( $\pm$ mm)	
>	$\leq$	Widths $\leq$ 1200mm	Widths > 1200mm
0.50	0.60	0.06	0.07
0.60	0.80	0.07	0.08
0.80	1.00	0.08	0.09
1.00	1.20	0.09	0.10
1.20	1.60	0.11	0.12
1.60	2.00	0.13	0.14

\*Half thickness tolerances are available. Please consult us for information.

### Tolerances

Tolerances on thickness, width, flatness and edge camber conform to BS EN 10143: 1993.

#### Thickness

"Thickness" refers to the total thickness of the product, including its coating. It is measured at least 40mm from either edge or at the centre line.

#### Width

For coils 1200mm wide or less, the tolerance on width is  $-0+5$ mm; for coils greater than 1200mm wide, the tolerance on width is  $-0+6$ mm.

### Surface quality

Aludip is supplied skin-passed to the requirements of EN 10154: 1996, surface 'B'.

### Surface treatment

Aludip can be supplied with chemical passivation, protective oil, or both.

### Packing

Aludip is available in three types of packing: plain banded, paper wrapped, or full export.

### Coil size

The maximum coil size is 19 tonnes.

### Other specifications

Please consult us for information about the availability of specifications outside those shown in this section.

## Aludip from Aluminised Products

Aludip is manufactured solely by Aluminised Products at its plant in South Wales. The line has undergone major enhancements, including development of the furnace, improvements in the air knife system, and new chromating equipment. Continuous improvement underlies every aspect of the Corus philosophy.

Corus is committed to serving industry by manufacturing high quality, competitive products and by providing expert technical service. That commitment is based upon a policy of working closely with customers, applying quality assurance practices to all activities, and achieving technical excellence through research, development and capital investment.

Depending upon the requirements, Corus can also co-ordinate further, downstream handling and processing.

### Supply-chain efficiency

The manufacture of Aludip at a single, dedicated plant creates a unified, continuous production source as the first link in the supply chain.

Long experience combined with logistical expertise allows Corus to establish highly efficient supply-chain arrangements for companies that have especially demanding requirements.

Consult us for more information about supply-chain services and how they apply to your company.

### Ordering requirements

Technical advice is available from Corus at the address shown on the back cover of this brochure.

To help us supply the correct steel, please supply the information below, both on the enquiry and on the order.

---

Standard Aludip, Aludip BQ or Aludip BQ Extra.

---

Grade (CQ, DX51, DX52, DX53, DX54, DX55, DX56).

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Quantity.

---

Dimensions of width and thickness (mm).

---

Thickness tolerances (Full or Half).

---

Total coating mass (40, 60, 80, 100, 120, 150, 240).

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Passivation (Oiled and/or chromated).

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Maximum outside diameter (OD) of coil.

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Coil weight range (min. and max.).

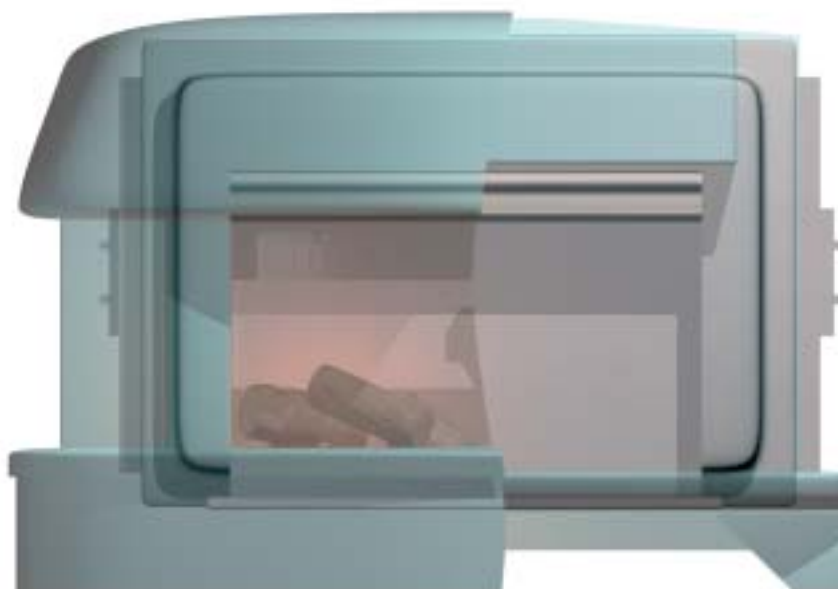
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Packing (plain banded, paper wrapped, full export).

---

Delivery address.

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## Using Aludip

Aludip is a high-performance product which will give excellent service. Its performance is enhanced by proper processing and by good practice in end-product design.

We can help customers choose the right Aludip product for their application and can advise them on proper processing methods to obtain the best results. Consult us for more information about using Aludip.

### Fabrication

Aludip's tightly adherent coating and its relatively thin alloy layer give it good fabricating properties. Because the coating is relatively soft, tools should be well lubricated and more care should be taken when fabricating Aludip than when fabricating uncoated mild steel.

### Welding Aludip

Good welded joints can be obtained using most conventional processes, together with modified procedures adapted to the special properties of the alloy coating. Resistance welding by spot or seam welding systems gives the same mechanical strength as welding bare steel. BS 1140 contains the parameters for spot-welding; BS 6265 for seam welding.

Equally effective are metal active gas welding systems (sometimes called gas metal arc), which use consumable electrode wire and gas shields such as argon or carbon dioxide, or a mixture of the two. Pulsed metal active gas systems offer considerable advantages over conventional processes, including more control over penetration and a minimum of spatter.

Consult us for advice about the weldability of Aludip BQ and BQ Extra.

### Painting

Both in its passivated and unpassivated forms, Aludip provides an excellent base for paint and does not require expensive pre-treatments other than an initial priming coat. The finishing coat can be as thin as 50 micrometres in some conditions, which can reduce both the cost of paint and its application.

## General

### Storage

Aludip is normally supplied in the oiled and chromated condition to reduce the risk of water staining. However, it is essential that both sheet and coil be stored in dry, protected conditions before use. The ingress of water or condensation can lead to unsightly surface staining. Careful and well-managed storage will prevent such problems.

### Standards

Aludip is manufactured in accordance with BS EN 10154: 1996, employing Quality Assurance principles, operating practices and controls certified to BS EN ISO 9002.

The tolerances for dimensions, flatness, and edge camber conform to BS EN 10143: 1993.

Aludip also conforms with other national and international standards including ISO 5000: 1993, NFA 36/340: 1991, ASTM A463M: 1995, JIS G3114: 1977, and several proprietary specifications.

### Health and safety

Standard Aludip and Aludip BQ are covered by Corus' Product Health and Safety Data Sheet number 66. Aludip BQ Extra is covered by number 68.

Copies of these data sheets are available from Corus (*Publications*) at the address on the back page of this brochure.

### Availability

Aludip is available from Aluminised Products, which is part of Corus.

Corus is highly experienced in supplying metals to meet demanding requirements and has been recognised for the excellence of its supply-chain performance. Consult us about your requirements.

## More information

For more information, please contact Corus at the address shown on the back cover of this brochure. Enquiries from outside the UK should be addressed to the nearest Corus sales office or agent, as listed below.

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