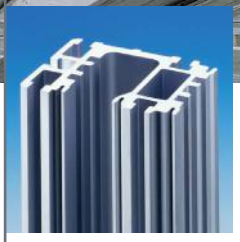
Pandolfo Alluminio

ANODIZING



Pandolfo Alluminio

PERFECT SURFACE

SUPERFICIE PERFETTA

The care given to aluminium surfaces is our greatest expertise.
Long experience in process development and the periodic modernisation of our production equipment allow us to supply surfaces that meet the highest expectations.
Anodizing is performed in an advanced automatic plant with 2 million m² annual output.
All the operative phases are controlled by dedicated software which guarantees the quality and repeatability of process. We can also perform surface colour anodizing in a range of colours that run from natural silver to black.
In our production plants we can achieve the following treatments: grinding, brushing, mechanical polishing, barrel processing, etching.
The process has received the European Qualanod certification.

La cura della superficie di alluminio è uno dei punti di forza di Pandolfo Alluminio che da più di 20 anni è attivo nel settore dell' ossidazione anodica.
La lunga esperienza nella messa a punto dei processi e l'ammodernamento continuo degli impianti consente di offrire una superficie che risponde al massimo delle aspettative.
L'ossidazione anodica viene realizzata da un avanzato impianto automatico dislocato nello stabilimento di Feltre, con capacità annua di 2 milioni di m² e una potenza installata di 48.000 Ampere. Tutte le fasi operative sono gestite da un software dedicato garantendo qualità e ripetibilità dei trattamenti. L'impianto è in grado di realizzare anche la elettrocolorazione della superficie con una gamma dall' argento naturale al nero.
Nei nostri stabilimenti produttivi si realizzano i trattamenti di sgrassaggio, disossidazione, burattatura, spazzolatura, lucidatura meccanica, satinatura chimica.
Il processo di ossidazione anodica ha ottenuto il marchio di qualità europeo QUALANOD.

Pandolfo Alluminio

ANODIZING

SALES INFORMATION

The catalogue presents the features of the anodizing service offered by Pandolfo Alluminio for extruded aluminium components.

Information

All enquiries for technical and sales information relating to products shown in the catalogue should be addressed to the Sales division of Pandolfo Alluminio in Italy.

Pandolfo Alluminio
Sales Department
Via della Provvidenza 143
35030 Rubano (PD) - Italy
Tel. +39 049 82 26 060
Fax +39 049 82 26 030
e-mail export@pandolfoalluminio.com

Orders

All orders should be faxed to the sales department on the number indicated, and must show the following information:

- Pandolfo Alluminio profile code
  (alternatively, attach a drawing of the section to be anodized, indicating the surfaces exposed to view)
- Pandolfo Alluminio anodizing code
- length and number of bars to be anodized.

Fax Orders to +39 049 82 26 030

Supply conditions

Maximum length of bars	7200 mm
Thickness of anodized layer	see "Standard Finishes" section

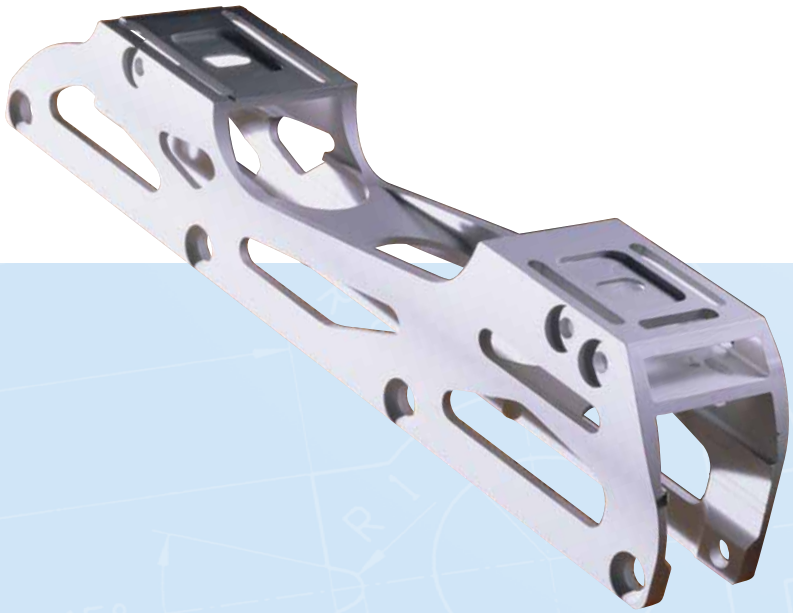
In order to confirm the feasibility of polishing and brushing pre-treatments, a drawing of the section (or alternatively, a sample) must be submitted to the Pandolfo Alluminio engineering department.

Quality testing

The protective layer provided by anodization undergoes quality control procedures in conformity with European standards of the EN 12373 series and with QUALANOD quality label specifications.

Guided tour of the anodizing process

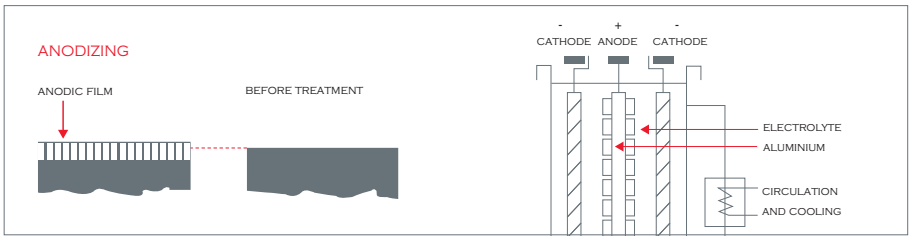
Technical staff of Pandolfo Alluminio will be pleased to provide customers with a demonstration of the features and potential offered by the company's anodizing facilities.
A visit can be arranged simply by contacting the Sales department.



BRIEF INTRODUCTION TO THE ANODIZING PROCESS

What is anodizing?

Anodizing is an electrochemical process that involves depositing a stable oxide film on the surface of a metal. The anodic coating can be applied to aluminium by passing a direct current through an electrolyte, of which there are various types. To produce an anodic film, the aluminium component being coated is made the anode of the electrolytic circuit, with another suitable metal providing the cathode.



Anodic coating processes are classified on the basis of the electrolyte used to produce the anodic film.
Sulphuric acid solution is undoubtedly the electrolyte used most extensively in anodizing processes. The electrolyte used in the anodizing facility operated by Pandolfo Alluminio is a solution of water and approximately 20% sulphuric acid.

Why anodizing?

There are substantially three main reasons why coatings are requested for aluminium surfaces.

Protection

This is the primary purpose of anodization. In effect, when a thin oxide film is generated on the surface of a metal, the metal will remain protected from outside external agents, particularly weathering agents. This means an optimum barrier against corrosion.

Appearance

The second reason is that of being able to alter the appearance of the aluminium surface for aesthetic purposes. Anodizing can be used to create a variety of surface finishes, including bright, coloured and textured.

Properties

The third reason is that of treating the surface so as to obtain selected technical characteristics. For example, anodization can be used to increase the hardness of the surface and its resistance to abrasion, also to form coatings with anti-friction properties, and so forth.

How is the anodizing process conducted?

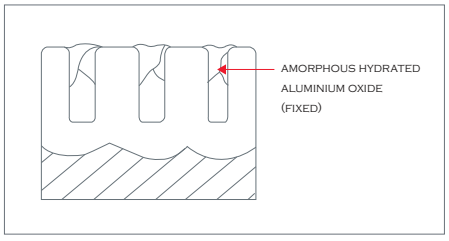
The process of anodizing a metal includes a number of different steps, described below. First of all, components for anodization can be pre-treated mechanically, for example by polishing or scratchbrushing. These initial treatments are performed, with the aid of suitable systems, on bars or on discrete items.

The pieces to be coated are then secured to special loading structures that will ensure the electrical continuity needed for the electrolytic process. The components are then thoroughly degreased in a suitable solution, so as to remove oil, dust and other foreign matter. The next step is pickling. This operation involves inducing a controlled chemical attack to remove material from the metal, producing a matte and uniform surface. Thereafter, the components are washed in cold water, immersed in neutralizing baths designed to eliminate any compounds that may be left on the surface, and finally transferred to the anodizing line proper.

BRIEF INTRODUCTION TO THE ANODIZING PROCESS

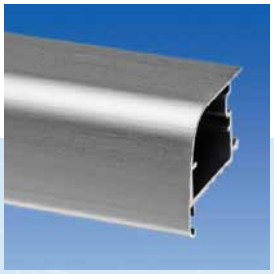
The electrolyte used in the anodizing facility operated by Pandolfo Alluminio is a solution of water and approximately 20% sulphuric acid. The aluminium components being anodized function as the anode in the electrolytic cell, to which a voltage of 20V d.c. (max) is applied, with maximum current of 12,000 A. The passage of current through the cell separates the water into its hydrogen and oxygen constituents. Oxygen is released at the anode, producing aluminium oxide.
The thickness of the oxide layer formed on the metal is proportionate to the duration of the process and to the strength of the current employed. The thickness class is specified generally by the customer.
Because the oxide that forms is structurally porous, the bottom of the pore cavity - which remains uncoated - would remain vulnerable to corrosion if not treated: accordingly, the pores must be sealed. This operation is known as fixing.

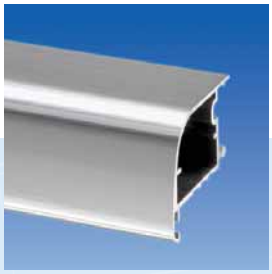
The fixing procedure most widely used is one of immersing the coated component in deionized water heated to near boiling point. During this treatment, a reaction between the aluminium oxide and the water molecules has the effect of sealing the pores hermetically (hydration). At the end of the process, the aluminium component emerges with the surface completely protected.

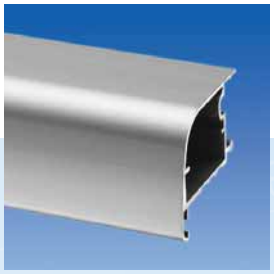


What finishes can be produced via the anodizing process, with aesthetic considerations in mind?

Anodization gives a wide variety of decorative effects, obtained by combining the selected pretreatment steps with suitable variations in process parameters. Broadly speaking, the finishes obtainable fall into three categories: satin, brushed, polished. A satin-finished surface presents a uniform silver colour with a flat lustre. Mechanical surface defects are less evident with a chemically etched satin finish. A brushed finish presents a uniform sheen with scratchbrush marks visible to the naked eye, and is brighter than the satin finish. In the case of the polished finish, the surface is cleaned and polished to a high gloss. Within these three broad classes of finish, there is scope for further variety obtainable through an appropriate combination of processing steps, mechanical and chemical alike.
Finally, there is the process of colouring the anodic layer (discussed under a separate heading), which extends the range of possibilities further. Examples of these different finishes are shown at the end of the catalogue.





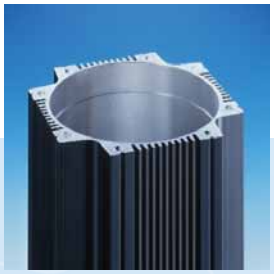


What are the effects on the weight and dimensions of the aluminium component?

The formation of an oxide layer on the surface of an aluminium component will increase its dimensions by an amount that depends on the thickness of the layer. On the other hand, most anodic finishes require a pickling step, and this tends naturally to reduce the thickness of the aluminium. Consequently, the additional thickness of the coating is generally offset, and in reality there may even be a net reduction in dimensions. Considering that a uniformly applied pickling action will remove some 30/40 µm of material, whereas the anodizing process results in the addition of a layer approximately 10 µm thick, the corresponding dimension of the component would be reduced by 20/30 µm overall. This in turn will mean a reduction in weight, the measure of which is determined by the ratio between the surface of the component and the gauge of the extruded aluminium. In other words, the smaller the gauge of the extruded section, the higher the percentage incidence of the weight loss.

Can the anodic layer be coloured?

The oxide film can be coloured by a special electrochemical process. At Pandolfo, this process is carried out before the fixing step. The aluminium components are dipped in an acid bath containing suitable metal salts, establishing an electrolytic cell through which a voltage of 18 V a.c. (max) is passed, with maximum current 6000 A. This process causes the metal salt to be deposited on the metal, producing various shades of bronze. The depth of the colour depends essentially on the amount of material deposited, and therefore on the duration of the electrocolouring process.



What controls are applied to anodized products and anodizing processes?

There are numerous types of quality control serving to verify particular characteristics of the anodic layer; moreover, these are conducted in accordance with European and international standards and certified by recognized quality labels. Listed below are the main tests conducted at facilities operated by Pandolfo Alluminio, together with the pertinent reference standards.

Which reference standards are adopted?

The reference standards for the anodizing process are those of the EN 12373 series "Aluminium and aluminium alloys. Anodizing" published by the European Standards Body CEN from May 2001 onwards and valid in all countries of the European Union, including Switzerland and Norway. Another important standard is BS 3987. This contains specifications for architectural applications, adopted chiefly in the United Kingdom, which envisage stringent requirements with regard in particular to thickness and testing of the anodic oxide coating.

Thickness of oxide layer	Eddy current method	**ISO 2370**
Quality of fixing	Weight loss Admittance Dye drop test	**EN 12373-7** **EN 12373-5** **EN 12373-4**
Surface abrasion resistance	Abrasive paper	**BS 6161-18**
Corrosion resistance	Acetic Acid Salt Spray (AASS)	**ISO 9227**

What is QUALANOD?

In addition to the standards published by CEN, European manufacturers and suppliers favour compliance with the QUALANOD specifications issued by EURAS (European Aluminium Anodizers Association).
The purpose of this quality label is to establish a high level of quality for anodic oxidation of aluminium components utilized in building, mechanical, transport and other applications. QUALANOD specifications are based on exacting and stringent international standards. The label is granted only for plants and installations able to operate in total compliance with these standards. Companies holding a QUALANOD licence undergo periodic inspections by independent testing agencies. The anodizing plant installed at the premises of Feltre has held Qualanod licence, n° 715, since 1986.

Standard finishes

	SILVER	LIGHT BRONZE	MEDIUM BRONZE	DARK BRONZE
BRUSHED Uniform surface with scratchbrush marks visible to the naked eye, and bright sheen DESIGNATION EN 12373-1: E2	 ARS XX C0 5 - 10 -15 - 20 - 25	 ARS XX C32 15 - 20	 ARS XX C33 15 - 20	 ARS XX C335 15 - 20
SATIN Uniformly silver coloured surface with flat lustre DESIGNATION EN 12373-1: E6	 ARC XX C0 5 - 10 -15 - 20 - 25	 ARC XX C32 15 - 20	 ARC XX C33 15 - 20	 ARC XX C335 15 - 20
POLISHED Surface cleaned and polished to a high gloss DESIGNATION EN 12373-1: E3	 ARP XX C0 5 - 10	 ARP XX C32 15 - 20	 ARP XX C33 15 - 20	 ARP XX C335 15 - 20

C0	C32	C33	C335

The program of standard finishes offered with the anodized line is illustrated on the following pages. This presentation of the Pandolfo Alluminio anodized product range is not exhaustive, but designed to provide a general view of the most popular finishes. Other finish and colour options are available on request.
The examples of finishes illustrated below provide a useful reference guideline, but are indicative only.
The intensity and brightness of the finishes as they appear in reality cannot be reproduced with printing inks.

DARK BROWN BRONZE

ARS XX C34
15 - 20

ARC XX C34
15 - 20

ARP XX C34
15 - 20

BLACK

ARS XX C35
15* - 20

ARC XX C35
15* - 20

ARP XX C34
15* - 20

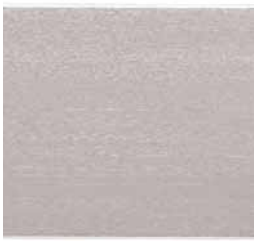
* INTERIORS ONLY

SPECIAL

UNTREATED

IND XX C0
5 - 10 -15 - 20 - 25

BRUSHED SISAL



ARS XX C0 SISAL
5 - 10 -15 - 20 - 25

C34 **C35**

KEY

ARS XX C0
5 - 10 -15 - 20 - 25

THICKNESS CLASSES

These indicate the possible classes of anodic film thickness, in microns (µM), for the selected finish.

PANDOLFO ALLUMINIO ANODIZATION CODE

ARC Indicates the type of pretreatment:
- IND Untreated
- ARS Brushed
- ARP Polished
- ARC Satin

XX These two digits indicate the selected thickness class

C0 Indicates the colouring of the anodic film
- C0 Natural (Silver)
- C32 Light bronze
- C33 Medium bronze
- C335 Dark bronze
- C34 Dark brown bronze
- C35 Black

Pandolfo Alluminio

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