# Atlac® 430

## Vinyl ester resin for corrosive environments

Components based on Atlac® 430 feature high mechanical strength and exhibit great resistance to chemicals and heat. With Atlac® 430 resin you can make strong and durable parts both with carbon and with glass fiber.

### Benefits

- Continued process operation
- Resisting elevated temperatures
- Freedom of design
- Low cost of ownership
- Can be used with carbon and glass fiber

### Application

Atlac® 430 can be used in all fabrication methods, but is especially adapted to meet the requirements of filament winding, centrifugal casting, hand lay-up and spray-up applications.

The resin provides resistance to a wide range of acids, alkali, and bleaches for the use in corrosive environments in the chemical processing industry. The favorable combination of thermal resistance and elongation makes this resin suitable for applications exposed to intermittent temperatures.

### Certifications and Approvals

Cured non-reinforced Atlac® 430 conforms to type 1310 according to DIN 16946/2 and is classified group 5 according to DIN 18820/1. According to EN13121/1 Atlac® 430 is classified group 7A.

WRAS approval of Atlac® 430 according to BS 6920: 2000 Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water.

Atlac® 430 resin meets China's Hygienic Standards for Uses of Additives in Food Containers and Packaging Materials (GB 4806-2016 and GB 9685-2016).

The resin is certified by Lloyd's Register and China Classification Society as gelcoat base resin and laminating resin for use in Marine applications.

### Liquid resin typical properties

| Property | Value | Unit | TM |
|---|---|---|---|
| Density | 1060 | kg/m$^3$ | TM 2160 |
| Refractive index | 1,5675 | - | TM 2150 |
| Flash point | 33 | °C | TM 2800 |
| Stability, no initiator, dark, 25 °C | 6 | Month | - |

### Product Specification

| Property | Value | Unit | TM |
|---|---|---|---|
| Appearance | Clear | - | TM 2265 |
| Solids content | 59.0-65.0 | % | TM 2033 |
| Viscosity, 23℃ | 400-550 | mPa.s | TM 2013 |
| Gel time (25 until 35 ℃) | 10-17 | min | TM 2625 |
| Peak time | 18-28 | min | TM 2625 |
| Peak temperature | 140-165 | °C | TM 2625 |

#### Remarks

Reactivity measurement @25℃: 2.0 g Butanox® LPT–IN (Nouryon) and 1.0 g Accelerator NL 49P (Nouryon) added to 100 g resin.

### Properties of cast unfilled resin (typical values)

| Property | Value | Unit | TM |
|---|---|---|---|
| Density, 20°C | 1145 | kg/m$^3$ | - |
| Tensile strength | 86 | MPa | ISO 527-2 |
| Tensile E-modulus | 3.6 | GPa | ISO 527-2 |
| Elongation at break | 6.1 | % | ISO 527-2 |
| Flexural strength | 150 | MPa | ISO 178 |
| Flexural E-modulus | 3.4 | GPa | ISO 178 |
| HDT | 105 | °C | ISO 75A |
| Impact res.-unnotched | 28 | KJ/m$^2$ | ISO 179 |
| Glass transition temp | 130 | °C | DIN 53445 |

#### Curing conditions

Cured with 1.5 g Butanox LPT-IN and 0.5 g Accelerator NL 49P added to 100 g of resin. After 24h at RT followed by post curing for 24 h at 80 °C. For HDT and Tg dyn post-curing 24 h at 120°C.

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## Electrical properties of cast unfilled resin (typical values)[1)]

| Property | Value | Unit | TM |
|---|---|---|---|
| Dielectric constant at 50 Hz/1 KHz/1 MHz | | | DIN 53483 IEC 60250 |
| Dry | 3.4/3.4/3.3 | - | |
| Wet[2)] | 3.5/3.5/3.4 | - | |
| Dissipation factor at 50 Hz/1 KHz/1 MHz | | | DIN 53483 IEC 60250 |
| Dry | 0.0025/0.0022/0.0016 | - | |
| Wet[2)] | 0.0037/0.0033/0.0023 | - | |
| Volume resistivity | | | DIN 53482 IEC 60093 |
| Dry | $>10^{16}$ | Ω.cm | |
| Wet[2)] | $>10^{16}$ | Ω.cm | |
| Surface resistivity | $>10^{13}$ | Ω | DIN 53482 IEC 60093 |
| Dielectric strength[3)] | 120 | KV/mm | DIN 53481 IEC 60243 |

**Remarks:**

1) Measured in a standard laboratory atmosphere 23℃ / 50% relative humidity according to DIN 50014 (23/50·2)

2) Specimens immersed in drinking water for 24 hours

3) Thickness of specimens: 0.7 mm

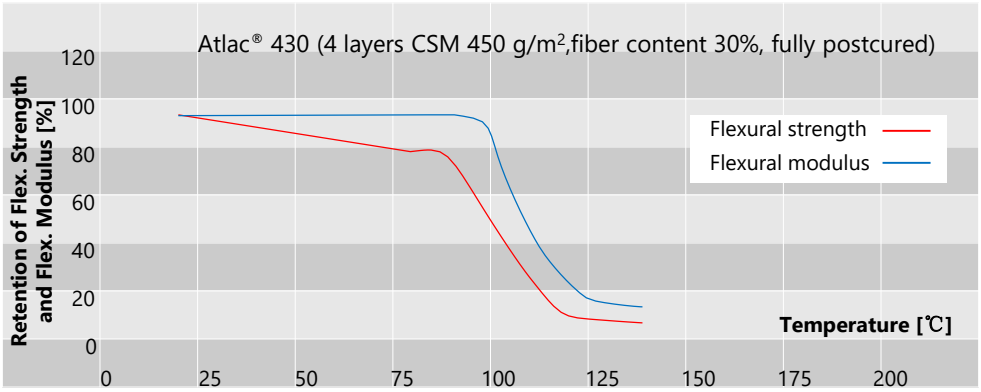
## Properties of glass reinforced resin (typical values)

| Property | Value | | Unit | TM |
|---|---|---|---|---|
| Laminate Composition | Ⅰ | Ⅱ | | |
| Density at 23 ° | 1,440 | - | $kg/m^3$ | - |
| Glass content | 38,6 | 39 | % | ASTM D 2584 |
| Tensile strength | 138 | 146 | MPa | ISO 527-2 |
| Tensile modulus | 10 | 10.4 | GPa | ISO 527-2 |
| Flexural strength | 210 | 216 | MPa | ISO 178 |
| Flexural modulus | 10 | 8.4 | GPa | ISO 178 |
| Outer fiber strain | 6,5 | - | % | ISO 178 |
| Linear themal expansion | $30\times10^{-6}$ | - | $K^{-1}$ | |
| Thermal conductivity | 0,2 | - | W/m.K | DIN 52612 |

### Curing conditions and Laminate Composition

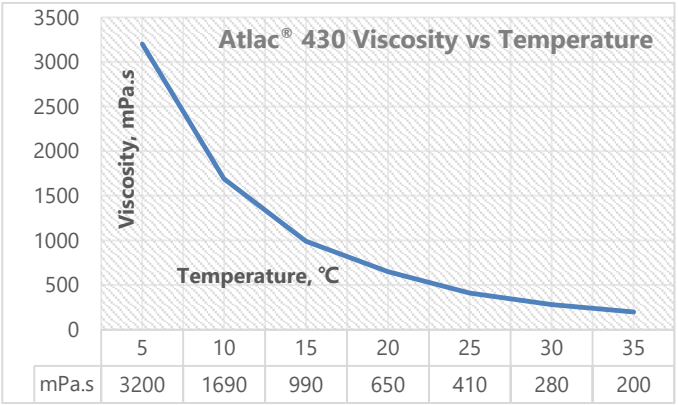
Cured with 1.5 g Butanox LPT-IN and 0.5 g Accelerator NL 49P added to 100 g of resin. After 24h at RT followed by post curing for 24 h at 80 °C. Laminates Ⅰ were based on 4 layers of CSM (450 $g/m^2$). Laminates Ⅱ were based on CSM+WR (800$g/m^2$) +CSM+WR+CSM+WR .

## High temperature properties of glass reinforced resin (typical values)




The flexural moduli and strengths of the resin over a temperature range of 20-180 ℃ were measured according to ISO-178. The laminates were based on 4 layers of 450 $g/m^2$ chopped strand mat with a fibre content of 30% w/w. Standard cure systems have been used and all specimen have been fully postcured.

## Atlac® 430 Viscosity vs Temperature (typical values)




| | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
|---|---|---|---|---|---|---|---|
| mPa.s | 3200 | 1690 | 990 | 650 | 410 | 280 | 200 |

## Atlac® 430 Thixotropy

Atlac® 430 can be made thixotropic by using the hydrofobe fumed silica types: Wacker HDK 20, Cab-O-Sil TS 720 and Aerosil R202 (1% - 2%). They should be blended into the resin using a high-shear stirrer (Cowless type). To improve a maximum thixotropic effect, it is recommended to use a wetting agent (e.g. Byk R605 – Byk Chemie). Thixotropic agents should not be used in laminates intended for service with hypochlorite solutions or fluorine. In this case, sagging can only be reduced to a minimum by very short gel times (20-25 min).

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## Curing System of Atlac® 430 at room temperature: Peroxide/Cobalt salt

Methyl ethyl ketone peroxide (MEKP) with a high dimer content, for example, Butanox® LPT–IN (Nouryon) or NOROX®MEKP-925 (United Initiators) is the preferred initiator for less gassing during initiating vinyl ester resin Atlac® 430. Cumene hydroperoxide as initiator can eliminate the foaming in Atlac® 430, results in lower exotherms, less shrinkage and less warpage. Cobalt octoate or naphthenate in styrene solutions as promotor are blue or purple liquids and are available on the market with 1% or 6% of active cobalt that can be used with MEKP and CuHP curing systems. For optimum results and consistent product color , it is the recommended ratio of peroxide to cobalt from 2:1 to 20:1. N,N-dimethylaniline and N,N-diethylaniline are amines used as accelerator in small quantities to shorten gel time and accelerate cure, however increase the exothermic temperature. The retarder 2,4-Pentanedione (2,4-P) can be incorporated into the curing systems of peroxide/cobalt to retard the gelling of vinyl resins. In order to obtain the optimum final parts, please refer to the recommended dosage by weight of resin in the right table to set up the suitable curing system.

| Peroxide/Cobalt | Addition Level % of resin weight | Preferred Level % of resin weight |
|---|---|---|
| MEKP or CuHP | 1.00-2.00 | 1.25-1.60 |
| Cobalt solution, 6% | 0.05–0.50 | 0.20-0.50 |
| N,N-Dimethylaniline | 0–0.25 | 0.085-0.15 |
| N,N-Diethylaniline | 0–0.25 | 0.085-0.15 |
| 2,4-Pentanedione | 0–0.30 | 0.05-0.25 |

## Top Coats

A top coat of 0.05-0.1 mm is used to protect the glass fiber content below. Paraffin wax is often added to improve cure on the air-exposed surface. A 10% solution of 5% paraffin wax solution (MP 46-48° C) in styrene may be added to the last resin layer to provide a tack free surface. Achieving the optimal coating thickness is important. A thinner coat usually cures poorly; a thicker coat is more prone to cracking.

## Ultraviolet Protection

If an ultraviolet absorber is deemed to be necessary, either an additional level of 0.2% throughout the laminating resin or 0.2% to 0.5% in the topcoat is effective. Recommended UV absorbers are Tinuvin® 326 (BASF) or Cyanosorb® UV-9 (Solvay).

## Curing System of Atlac® 430 at room temperature: Benzoyl Peroxide/Amine

When the chemical medium is hypochlorite or peroxide in AOC Chemical Resistance Guide, benzoyl peroxide/amine is recommended as the curing system. In these cases, cobalt (metals) do have a detrimental effect on the chemical resistance performance. BPO is in general accelerated with dimethylaniline. Diethylaniline can also be used when longer gel times are required. Tertiary butyl catechol (TBC) is used to retard the gel time of BPO/amine systems. Additions of TBC above 250 ppm can lead to undercure, and at workshop temperatures below 15℃ TBC is not recommended. The retarder 2,4-Pentanedione is not effective with BPO/amine systems. For optimum results, the ratio of BPO/DMA is preferably from 8:1 to 16:1, the ratio of BPO/DEA is preferably from 4:1 to 10:1. When curing has to take place at low temperatures (outdoor jointing or repairing, lining, etc.) and or high humidity BPO/amine curing is recommended. please refer to the recommended dosage by weight of resin in the table to set up the suitable curing system. The surface of curing parts with BPO/amine curing system is usually a little tacky.

| BPO/Amine | Addition Level % of resin weight | Preferred Level % of resin weight |
|---|---|---|
| BPO | 1.00-2.00 | 1.00-1.60 |
| N,N-Dimethylaniline | 0–0.25 | 0.08-0.15 |
| N,N-Diethylaniline | 0–0.25 | 0.08-0.15 |
| 10% TBC in styrene | 0–0.30 | 0.05-0.25 |

## Postcuring

Postcuring is mandatory for food contact applications to reduce residual styrene to the range of 0.01-0.2%, and for some of the chemical mediums in AOC Chemical Resistance Guide to obtain the optimum chemical resistance and the longest service life of the Atlac® 430. Post curing is required to achieve complete cure with BPO/DMA within one week of lamination . Recommended postcure conditions are 2 hours at 95 ℃ or 4 hours at 82 ℃ – longer times and adjusted postcure schedules being required for thicker laminates and/or more complex shapes. Lower temperatures are ineffective; higher temperatures can lead to embrittlement.

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## Storage Guidelines

The resin should be stored in a dark and dry place at temperatures between 5 °C and 30 °C. Shelf life is reduced when resin is stored at higher temperatures and the properties of the resin might change during storage. The shelf life of styrene containing Vinyl ester will be significantly reduced when exposed to light. Therefor, store in dark and in 100% light tight containers only. Exposure to direct sunlight should be avoided.

## Material Safety

A Material Safety Data Sheet of this product is available on request.

## Test Methods

Test methods (TM) referred to in the table(s) are available on request.

## ISO 9001:2015 Certified

The Quality Management Systems at every AOC manufacturing facility have been certified as meeting ISO 9001:2015 standards. This certification recognizes that each AOC facility has an internationally accepted model in place for managing and assuring quality. We follow the practices set forth in this model to add value to the resins we make for our customers.

## About AOC

AOC is the leading global supplier of resins and specialty materials which enable customers to create robust, durable and versatile products and components. With strong capabilities around the world in manufacturing and science, the company works closely with customers to deliver unrivaled quality, service and reliability for today, and create innovative solutions for tomorrow. Partner with AOC and we will work together to find the right solutions for your business.

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## Brochures

You can find additional information through the Atlac® Product Guide. For detailed information on the chemical resistance of Atlac® resins, please consult our Chemical Resistance Guide. Both brochures are available for download from the AOC web site: **aocresins.com**


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