



FULLALX SAFE

# Full AluXsafe

## from Nissens Cooling Solutions

### The X-series from Nissens Cooling Solutions

The X-series from Nissens Cooling Solutions is a range of unique products, which are each designed and manufactured on the basis of proven technologies and Nissens Cooling Solutions' excellence in handling aluminum processes. Our products are developed with customized features individually matching every customer's need. Common to all of them: They are renowned for their high quality and proven performance. The X-series from Nissens Cooling Solutions aims at taking the market to the next level.

### The X-series portfolio includes:

- AluXchanger
- AluXsafe
- AluXair
- AluXstream
- Full AluXstream
- **Full AluXsafe** NEW

### Nissens Cooling Solutions' product offer for the wind turbine industry

| Application                             | Product  | Onshore Wind | Offshore Wind |
|---|--|--------------|---------------|
| <b>Mechanical Drive Train Cooling</b>   | Plate & Bar Cooler  | ■            | ■             |
|   | Cooler Module       | ■            | ■             |
|   | Pump Station        | ■            | ■             |
|   | AluXstream          | ■            | ■             |
|   | AluXchanger         | ■            | ■             |
|   | Full AluXstream     | ■            | ■             |
|   | AluXair             | ■            | ■             |
| <b>Converter &amp; Inverter Cooling</b> | Plate & Bar Cooler  | ■            | ■             |
|   | Shell Cooler        | ■            | ■             |
|   | AluXstream          | ■            | ■             |
|   | Pump Station        | ■            | ■             |
|   | AluXair             | ■            | ■             |
|   | Full AluXstream     | ■            | ■             |
| <b>Transformer Cooling</b>              | Plate & Bar Cooler  | ■            | ■             |
|   | Pump Station        | ■            | ■             |
|   | AluXchanger         | ■            | ■             |
|   | AluXsafe            | ■            | ■             |
|   | Full AluXsafe       | ■            | ■             |
| <b>Climate Control</b>                  | Plate & Bar Cooler  | ■            | ■             |
|   | AluXstream          | ■            | ■             |
|   | Pump Station        | ■            | ■             |
|   | AluXair             | ■            | ■             |
|   | Full AluXstream     | ■            | ■             |

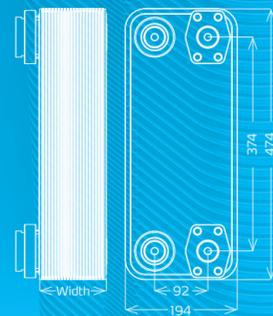
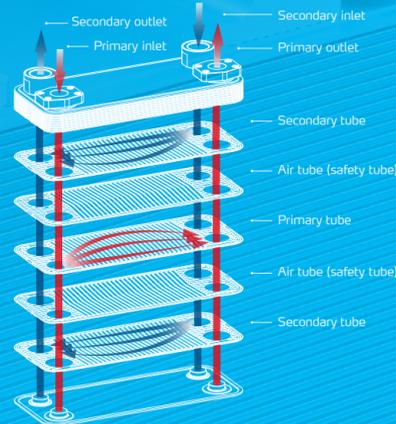
# Full AluXsafe: One-shot Brazed Plate Heat Exchanger

Based on demands from the leading players in the wind turbine industry, Nissens Cooling Solutions presents a remarkable evolution of the renowned AluXsafe plate heat exchanger combined with the proven technology of the AluXchanger product.

The result is Full AluXsafe – a reliable and compact one-shot-brazed double-wall plate heat exchanger.

## Full AluXsafe product features

- One-shot brazing
- Specially designed safety tubes
- Simple design with fewer parts
- Compact double-wall construction
- Light-weight component
- Strong performance features



## Full AluXsafe performance features for reliability and stability

Product specifications:

|                            | Primary side (hot side)  | Secondary side (cold side)                                     |
|----------------------------|--|--|
| Primary fluid              | Oil / transformer oil  |  |
| Secondary fluid            |  | Water / glycol (min. 30% glycol) – approved coolant usage only |
| Max. operating pressure    | 7 bar  | 7 bar  |
| Max. operating temperature | 130 °C   | 90 °C  |
| Min. operating temperature | -40 °C   | -40 °C   |
| Cleanliness                | Can be flushed with a thin mineral oil (Shell Morlina HS2 or similar) to cleanliness class ISO 4406 - 16/14/11 |  |

## Full AluXsafe: The preferred choice for transformer applications

The development and erection of larger and more powerful wind turbines have redefined the need for cooling in on- and offshore wind turbines. Demands from the transformer suppliers to the wind turbine industry, Full AluXsafe has been developed and designed to meet the defined needs of the transformer applications.

Nissens Cooling Solutions supplies a complete cooling system for transformer applications with a Full AluXsafe plate heat exchanger, pump, valves and pipes and/or flexible hoses. All parts are mounted on a customized, galvanized steel frame to perfectly fit on the transformer tank, and Nissens Cooling Solutions recommends flexible hoses between the cooling system and the transformer tank to ensure mounting interface compliance.

A plug-and-play solution for easy installation.

The requirements for cooling of transformers have changed in a transition from air cooling to water cooling. Full AluXsafe is the innovative plate heat exchanger for transformer applications combining important features like cost optimization, reliability, safety, performance, stability and product lifetime.



## Product Compliance

The design of the Full AluXsafe cooler is in full compliance with the Pressure Equipment Directive PED 97/23/EC article 3.3.

## IPR

The new Full AluXsafe product from Nissens Cooling Solutions enjoys Intellectual Property Right Protection and is international patent pending thanks to its unique features.

## Light weight – Strong performance

Compared to Nissens Cooling Solutions' original AluXsafe plate heat exchanger, Full AluXsafe is a next generation invention and builds on a more compact and yet simple construction. The Full AluXsafe design enables a weight reduction of up to 50% of the cooling performance when comparing the original AluXsafe plate heat exchanger with Full AluXsafe. The specially designed safety tubes of Full AluXsafe contribute to the creation of a more compact solution, since the individual tube is reduced from 3.0 mm to 1.2 mm, and the safety tubes are combined in perfect harmony with a remarkable air channel design.

## The safe choice

The Full AluXsafe double-wall design eliminates the risk of water and oil getting mixed in case of an internal leakage inside the heat exchanger. A mix that in worst case scenario can lead to an explosion of the transformer.

Putting performance and safety first, Nissens Cooling Solutions carries out thorough testing and validation in the advanced in-house Test Lab to document the safety, reliability and performance of the Full AluXsafe plate heat exchanger. Meticulous testing also validates the requirement for minimum 25-year life time of Full AluXsafe in transformer applications.

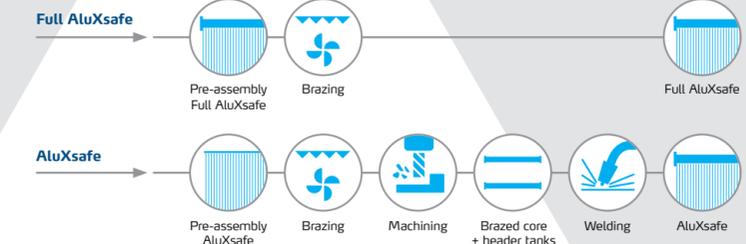


## Unique one-shot brazing solution

Full AluXsafe is a unique and reliable cooling solution, which is the optimal plate heat exchanger in the market thanks to the one-shot brazing technology that paves the way for cost competitiveness thanks to shorter production time, limitation of required production processes and reduction of applied components. When manufacturing Full AluXsafe, the demanding welding process is eliminated, and a number of traditional production processes linked to manufacturing of traditional plate heat exchangers may be fully left out in Nissens Cooling Solutions' one-shot-brazing manufacturing process.

## Production Process

Full AluXsafe vs. AluXsafe



# Experience Know-how Innovation

## Experience

With decades of **experience** from the global wind turbine industry, Nissens Cooling Solutions serves as a development partner to a number of the leading players in the wind turbine industry around the world.

## Know-how

More advanced turbines have taken Nissens Cooling Solutions on a journey from a mere cooling component supplier to a solutions provider of advanced cooling systems and modules. We have built our in-depth **know-how** of wind turbine applications through design and manufacturing involvement in constant series of next generation turbines for both on- and offshore wind applications.

## Innovation

As cooling pioneers in the wind turbine industry, we have now gained a position as a technology leader within cooling for modern wind turbines. The size, the technology and the complexity of today's wind turbines have put up new demands for the installation of complete cooling solutions. In close co-operation with our customers, we serve as a development partner, who provides a strong combination of design, test, manufacturing, distribution and services. **Innovation** and product novelties reside in Nissens Cooling Solutions' DNA.

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