# CONTINUOUS INNOVATION

## IT STARTS WITH INTECMA.

TRENDPAPER OCTOBER 2023

INTECMA

SIMPLY SMART POWER TECHNOLOGY

# FOREWORD

**Sustainable energy has become the new norm. The energy transition, also known as the shift from fossil fuels to renewable energy sources, is in full swing in the Netherlands and the rest of Europe. This shift is driven by a combination of environmental concerns, accelerating climate change, technological advancements, and international agreements such as the Paris Climate Accord.**

Heat pumps play a significant role in the energy transition in the Netherlands and worldwide. They contribute in various ways to reducing dependence on fossil fuels and lowering greenhouse gas emissions, which are the primary objectives of the energy transition. The main greenhouse gases are, by the way, CO2, the product of the combustion of organic substances with oxygen (O2). Methane, originating from livestock, oxidizing peatlands due to low water levels, and the petrochemical industry.

The increasing popularity of heat pumps, as well as solar panels and wind energy, however, also contributes to growing concerns about the capacity of our electricity grid. Network congestion, also known as grid congestion, is a challenge that arises in the Dutch energy grid and in many other countries worldwide. The increasing electrification of sectors like transportation, mobility, and heating raises electricity demand and can result in higher peaks in power consumption, leading to congestion and even power outages.

Implementing smart technologies, such as advanced meters, frequency controllers, demand response systems, and soft starters, can help manage electricity demand and reduce peak loads. At the same time, European regulations are imposing increasingly stringent certification requirements on heat pumps.

Intecma, an active player in power electronics for over 40 years and a Dutch manufacturer of soft starters, specializing in power controls for, among other things, heat pumps and air conditioning systems, offers a solution for a sustainable future without fear of overloading our electricity grid and already complies with the strictest European requirements.

In this trend paper, we delve deeper into the causes and consequences of the ongoing energy transition, its impact on our electrical grid, the increasingly stringent European requirements for electronic equipment, and the available solutions.

This trend paper has been compiled by a team of experts in the fields of technology, regulation, and the market, and it assists in making strategic decisions regarding energy-efficient solutions for heat pumps or air conditioning systems. Whether you are a manufacturer with an existing product range or actively engaged in its development.

Enjoy your reading!

*Marieke van Walsum-Peele*
*Matthijs Peele*

# THE ENERGY TRANSITION

**The energy transition in the Netherlands is driven by concerns about climate change, international obligations, and economic opportunities. The consequences of this transition are positive for the environment, the economy, and the energy independence of the Netherlands.**

One of the primary drivers behind the energy transition in the Netherlands is the growing concern about climate change and the human impact on the environment. Reducing the emissions of greenhouse gases, particularly CO2, is essential to limit global warming. This has necessitated the shift from fossil fuels to clean, renewable energy sources such as solar and wind energy.

By investing in renewable energy sources, the Netherlands can reduce its reliance on imported fossil fuels, enhancing energy supply security.

# CONSEQUENCES OF THE ENERGY TRANSITION

**One of the most immediate consequences of the energy transition is the reduction of CO2 emissions. The shift to renewable energy sources involves a transition from fossil fuels to solar and wind energy, as well as other sustainable sources like biomass and hydroelectric power. This necessitates large-scale investments in infrastructure and technology. Additionally, biomass is not as universally considered sustainable and is subject to criticism as a green and sustainable energy source.**

It also stimulates innovation in energy storage and energy efficiency technologies. The energy transition impacts the spatial planning and infrastructure of the Netherlands. The development of wind and solar parks and the expansion of the electricity grid are some of the spatial challenges.

# HEAT PUMPS

**Heat pumps play a significant role in the energy transition in the Netherlands and worldwide. They contribute in various ways to reducing dependence on fossil fuels and lowering greenhouse gas emissions, which are the primary objectives of the energy transition.**

### REDUCTION OF CO2 EMISSIONS

Heat pumps operate on electricity and extract heat from natural sources like outdoor air, the ground, or water. This makes them highly energy-efficient and less polluting than traditional heating systems based on fossil fuels, such as natural gas. By using heat pumps for heating and cooling, households and businesses can significantly reduce their CO2 emissions.

### INCREASED ENERGY EFFICIENCY

Heat pumps can produce more heat than the electricity they consume, which is expressed in a coefficient called the "COP" (Coefficient of Performance). In some cases, the COP of heat pumps can be 4 or higher, meaning they deliver four times more heat than the electricity they consume. This high efficiency makes heat pumps a sustainable choice for heating and cooling.

### REDUCTION OF NATURAL GAS USAGE

A key objective of the energy transition in the Netherlands is to reduce the use of natural gas for heating. Heat pumps provide an environmentally friendly alternative that can help make households and businesses less dependent on fossil fuels.

In the Netherlands and the EU, we are witnessing a strong growth in the adoption of heat pumps in both residential and commercial buildings. Driving factors include subsidies, stricter building regulations, and an increased awareness of sustainability. However, these market developments have also led to an increased strain on the electricity grid, particularly during cold periods when the demand for heat is at its highest.

### FLEXIBILITY IN THE ELECTRICITY GRID

Heat pumps can be used to take advantage of periods with low electricity prices or abundant renewable energy. They can use electricity during the night to store heat and release it during the day, reducing the load on the electricity grid and optimizing the use of renewable energy sources.

### DECENTRALIZED ENERGY PRODUCTION

decentralized energy production, meaning they can locally generate heat from renewable sources. This is particularly useful in combination with solar energy or wind energy, allowing homes and buildings to become self-sufficient in terms of their heating and cooling needs.

# GRID CONGESTION

**Grid congestion is a challenge that requires ongoing attention and investment, especially with the continuous growth of renewable energy sources and the evolving energy landscape in the Netherlands. It is crucial for policymakers, grid operators, and energy companies to collaborate in finding appropriate solutions to ensure a reliable and sustainable electricity supply.**

Grid congestion, also known as network congestion, refers to a situation in which the demand for electricity at specific times and locations exceeds the capacity of the electricity grid to meet that demand.
This can lead to various problems and constraints in electricity supply. Here are some key aspects related to grid congestion in the Netherlands:

## 1. CAUSES OF GRID CONGESTION

- **Renewable Energy Sources:** A significant cause of grid congestion in the Netherlands is the growing capacity of renewable energy sources such as wind and solar energy. These sources can be unpredictable, and electricity production can vary depending on weather conditions. During periods of high production, local electricity grids can become overloaded, leading to shutdowns of solar panels and wind turbines.

- **Regional Discrepancy:** There is often a discrepancy between where electricity is generated and where it is consumed. Wind farms and solar panels are sometimes located in remote areas with high generation capacity, while the demand for electricity is in different places, such as urban areas. This can result in congestion on the transmission lines that transport electricity from one location to another.

- **Increasing Electrification:** The increasing electrification of sectors such as transportation and heating raises electricity demand and can lead to higher peaks in power consumption, causing congestion.

## 2. CONSEQUENCES OF GRID CONGESTION

- **Power Outages:** Grid congestion can lead to power outages and blackouts, which are disruptive for households, businesses, and public services.
- **Limited Growth of Renewable Energy:** Grid congestion can hinder the further growth of renewable energy projects because they may sometimes be unable to connect to the electricity grid or face high connection costs.
- **Costs:** Grid congestion can result in higher costs for managing the electricity grid and higher electricity prices on the wholesale market.

## 3. SOLUTIONS FOR GRID CONGESTION

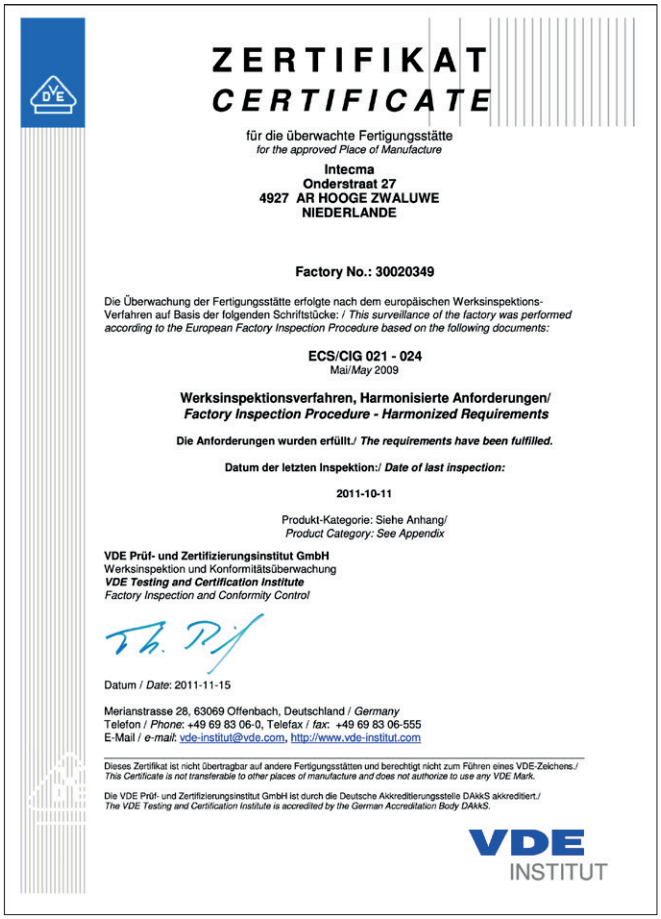
- **Network Expansion:** One of the most obvious solutions for grid congestion is expanding and upgrading the electricity grid. This includes constructing new transmission lines, transformer stations, and underground cables to increase capacity.
- **Grid operators introduce management and balancing costs for solar panel owners.**
- **Smart Technologies:** Implementing smart technologies such as advanced meters and demand response systems can help manage electricity demand and reduce peak loads.
- **Storage Solutions:** Battery storage and other forms of energy storage can help control the variability of renewable energy sources and reduce congestion.
- **Local Energy Management:** Encouraging local energy management and sharing electricity between neighboring communities can reduce congestion by consuming electricity closer to the source.

# TIGHTER EUROPEAN STANDARDS

As the energy transition progresses, stricter requirements are being imposed on energy-related equipment to ensure safety, quality, and efficiency. This applies to heat pumps and their components as well. The VDE household standard EN60336-1-2 and the European RoHS and REACH regulations are important standards that are increasingly applied in the Netherlands and the EU to ensure the quality and safety of equipment. Kiwa is also now demanding more standards for the design and implementation of new types of heat pumps for the start-up procedures, which must be regulated according to EN 60335-1 and EN 60335-2-40 (VDE household standard) and underlying standards.

The VDE household standard is a German standard used to ensure the safety of household appliances. The standard was developed by the Verband der Elektrotechnik, Elektronik und Informationstechnik e.V. (VDE) and sets requirements for the safety of household appliances such as washing machines, refrigerators, and vacuum cleaners.
The standard covers various aspects of safety, including insulation, grounding, protection against electric shocks, and fire protection.

The VDE household standard EN60336-1-2 is a specific standard related to the measurement of the sound level of household appliances. It is an important standard for manufacturers of household appliances to comply with European RoHS and REACH regulations.



ZERTIFIKAT
CERTIFICATE

für die überwachte Fertigungsstätte
*for the approved Place of Manufacture*

**Intecma**
**Onderstraat 27**
**4927 AR HOOGE ZWALUWE**
**NIEDERLANDE**

**Factory No.: 30020349**

Die Überwachung der Fertigungsstätte erfolgte nach dem europäischen Werksinspektions-Verfahren auf Basis der folgenden Schriftstücke: / *This surveillance of the factory was performed according to the European Factory Inspection Procedure based on the following documents:*

**ECS/CIG 021 - 024**
Mai/*May* 2009

**Werksinspektionsverfahren, Harmonisierte Anforderungen/**
***Factory Inspection Procedure - Harmonized Requirements***

**Die Anforderungen wurden erfüllt./** ***The requirements have been fulfilled.***

**Datum der letzten Inspektion:/** ***Date of last inspection:***

**2011-10-11**

Produkt-Kategorie: Siehe Anhang/
*Product Category: See Appendix*

**VDE Prüf- und Zertifizierungsinstitut GmbH**
Werksinspektion und Konformitätsüberwachung
***VDE Testing and Certification Institute***
*Factory Inspection and Conformity Control*

Datum / *Date*: 2011-11-15

Merianstrasse 28, 63069 Offenbach, Deutschland / *Germany*
Telefon / *Phone*: +49 69 83 06-0, Telefax / *fax*: +49 69 83 06-555
E-Mail / *e-mail*: vde-institut@vde.com, http://www.vde-institut.com

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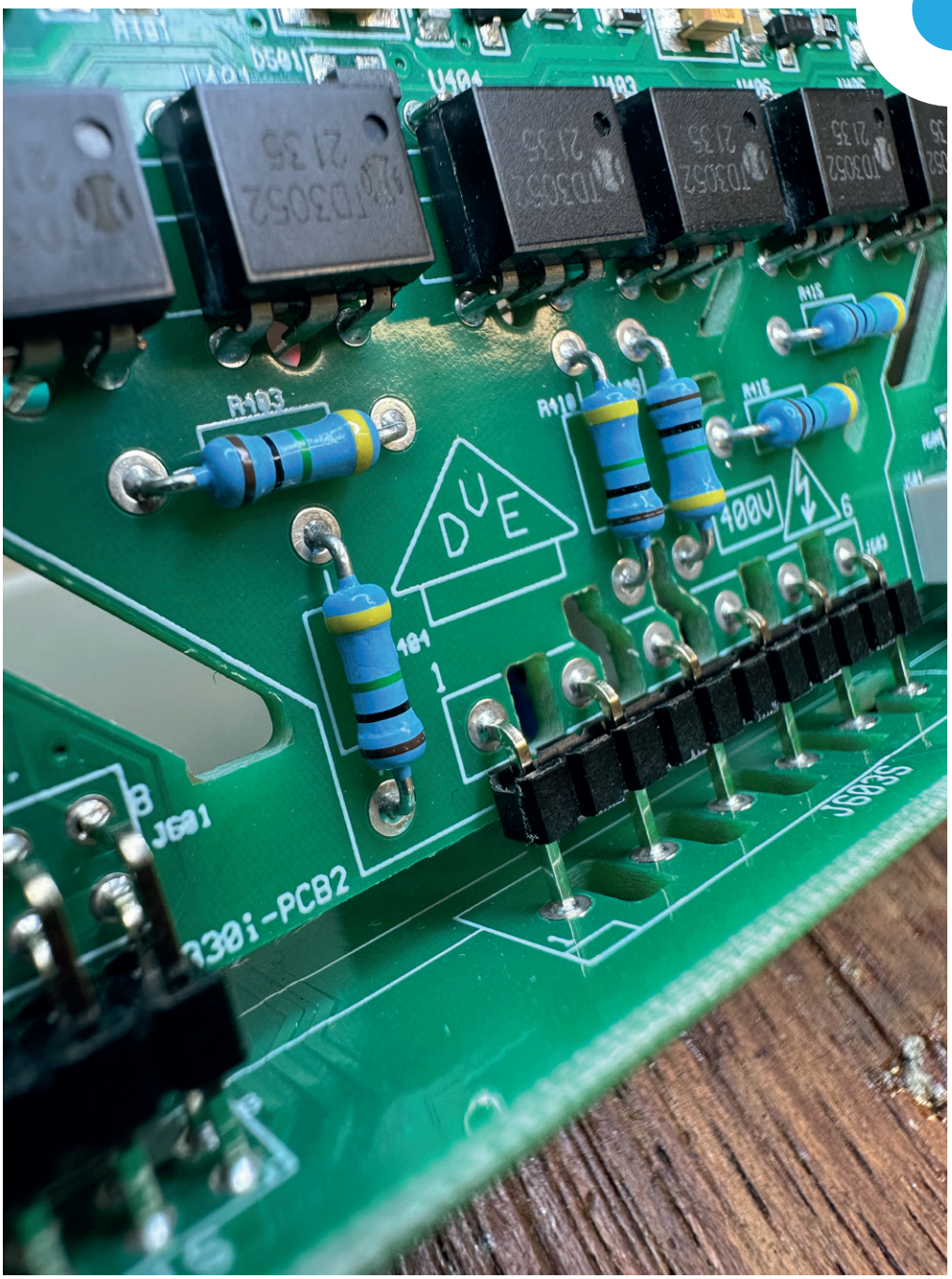
VDE INSTITUT

# SOLUTIONS

Intecma, as a Dutch manufacturer of OEM soft starters, offers an innovative solution to the challenges of an overloaded power grid in relation to the use of heat pumps. Intecma's soft starters regulate power demand and manage peak loads, minimizing power fluctuations. These soft starters facilitate a gradual start-up of electric motors, such as those in heat pumps, to optimize the load on the electricity grid. This enables grid operators to better handle the growing demand for electricity over time and ensures the stability and reliability of the electricity grid.



# REDUCING POWER SURGES

**A soft starter is an electronic device used in electrical systems, including heat pumps, to reduce the starting current and lessen the mechanical and electrical load on motors when they are turned on. This is especially useful in heat pumps, as these devices often contain compressors that can cause significant power surges when starting. Here are some key aspects of soft starters in heat pumps:**

## FUNCTION OF A SOFT STARTER

**Limiting Power Surges:** When a compressor in a heat pump is turned on, it can result in a brief power surge that is much higher than the normal operating current. This can lead to overloading the electrical system and the motor. A soft starter reduces this peak current by gradually increasing the voltage, allowing the motor to start smoothly.

**Reducing Mechanical Stress:** Gradually ramping up the voltage also reduces mechanical stress on the motor and connected mechanical components, such as pipes, which can extend the equipment's lifespan.

## BENEFITS OF SOFT STARTERS IN HEAT PUMPS

**Energy Efficiency:** Soft starters reduce the impact of startup on the electrical grid, which can lead to more efficient energy usage and lower energy costs.

**Reliability:** By reducing mechanical stress on the motor and other components, soft starters can enhance the reliability and durability of the heat pump.

**Less Wear and Tear:** Soft starters help decrease wear and tear on the motor and other mechanical parts, potentially reducing maintenance needs and extending the equipment's lifespan.

**Electrical Network Stability:** Soft starters can contribute to a stable electrical network by preventing significant power surges that could destabilize the voltage.


### APPLICATIONS OF SOFT STARTERS

Soft starters are used in various applications, not only in heat pumps but also in other equipment with electric motors, such as air conditioners, pumps, conveyors, and industrial machinery.The main difference between a soft starter and a variable frequency drive lies in their function and application. Soft starters reduce the peak current during motor startup and are generally simpler, more cost-effective, and more reliable than variable frequency drives.

In heat pumps, soft starters play a significant role in smoothly starting the compressor, which improves not only reliability and efficiency but can also extend the heat pump's lifespan. They contribute to the stable and efficient operation of heat pumps, which is important in the context of the energy transition and the shift towards more energy-efficient heating and cooling systems.

# CONCLUSION

**The energy transition and sustainability ambitions are essential efforts to ensure a sustainable future. However, the growing market for heat pumps has posed challenges for the electricity grid, including overloading and power fluctuations. Reducing energy consumption and meeting stricter Kiwa and VDE requirements are important steps in addressing these issues.**

Intecma's OEM soft starters provide an effective solution to regulate the load on the power grid, thereby ensuring a stable and reliable energy supply during the energy transition.

# WANT TO KNOW MORE?

Please feel free to call or email one of Intecma's specialists.

**INTECMA B.V.**
Thijssenweg 26
4927 PC  Hooge Zwaluwe (NL)

tel. +31 76 53 22 670 info@intecma.nl

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