

Home energy management system

# flow

Charging, managing and saving energy intelligently



:hager

# What if everyone drove electric cars?

CO<sub>2</sub> emissions would fall ...

Fine dust pollution would decrease ...





**People  
would be able  
to breathe  
again ...**

**The world  
would  
be quieter  
and ...**

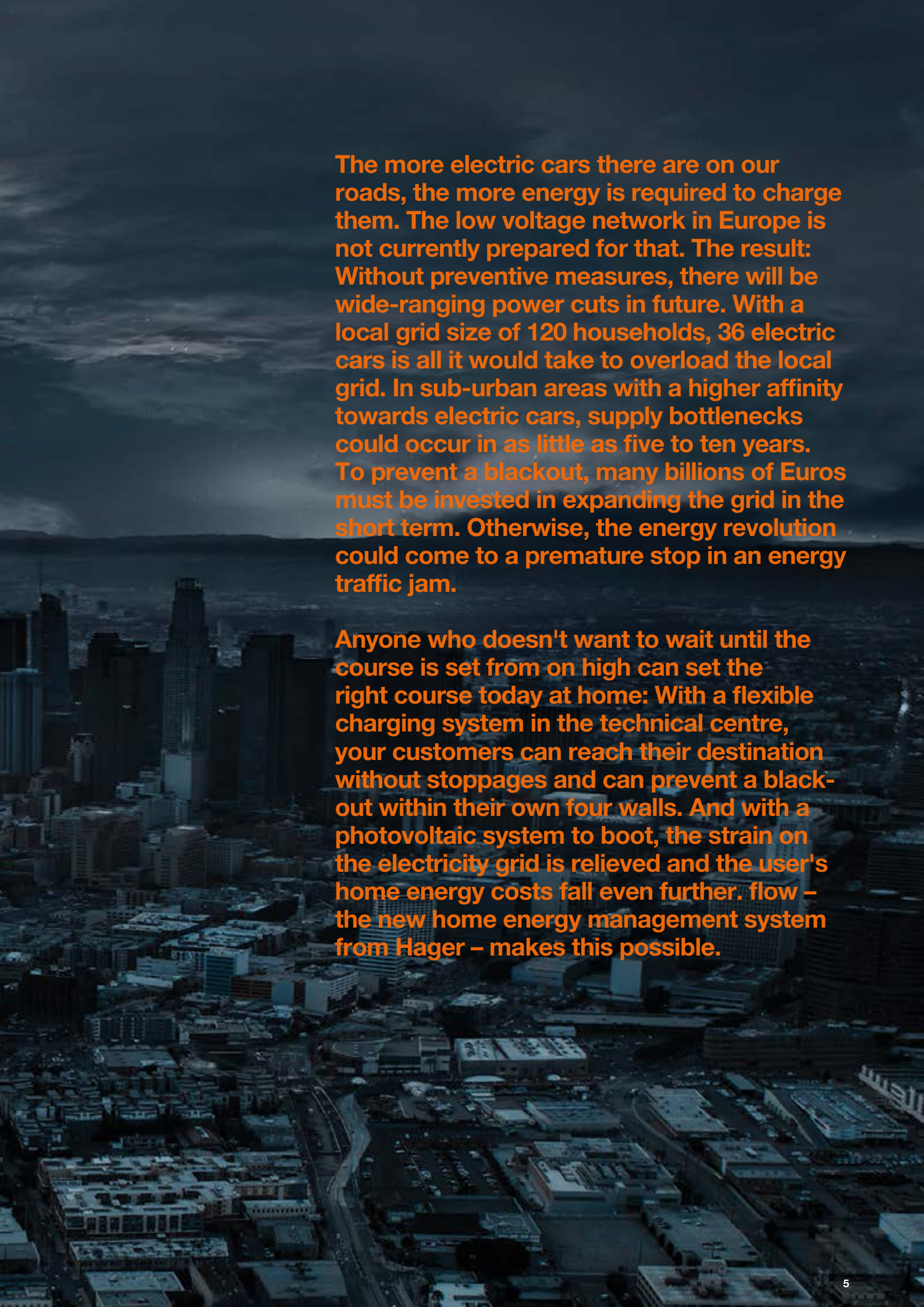
**Cars would  
run on self-  
generated  
electricity ...**



**... there would  
be power cuts!**







The more electric cars there are on our roads, the more energy is required to charge them. The low voltage network in Europe is not currently prepared for that. The result: Without preventive measures, there will be wide-ranging power cuts in future. With a local grid size of 120 households, 36 electric cars is all it would take to overload the local grid. In sub-urban areas with a higher affinity towards electric cars, supply bottlenecks could occur in as little as five to ten years. To prevent a blackout, many billions of Euros must be invested in expanding the grid in the short term. Otherwise, the energy revolution could come to a premature stop in an energy traffic jam.

Anyone who doesn't want to wait until the course is set from on high can set the right course today at home: With a flexible charging system in the technical centre, your customers can reach their destination without stoppages and can prevent a blackout within their own four walls. And with a photovoltaic system to boot, the strain on the electricity grid is relieved and the user's home energy costs fall even further. flow – the new home energy management system from Hager – makes this possible.

# Intelligent charging



## flow from Hager

For the development of e-mobility to pick up speed, there's just one thing missing: A reliable charging station with an intelligent "attendant". And that's where flow and the e-tron connect charging system come in: The compact new home energy management system (HEMS) is installed in the technical centre and takes into account all connected consumers with all available energy sources. It compares the current electricity demand with the available electricity supply and recommends the cheapest tariff in each case. Only when all the parameters add up does the product light switch to green to start charging.



# Drive on electricity

## Switching up a gear for the future

The Audi e-tron is the first fully electric model from the distinctive four-ringed brand. This sporty SUV combines the space and comfort of a typical luxury-class vehicle with an operating range that's suitable for everyday purposes, catapulting the driver into a new age with its electric four-wheel drive. Forward-looking, innovative and electric – it's a change in gear that will propel us into the future.



# Contents

## charging



Preferably self-generated photovoltaic electricity from your own rooftop. At the best possible tariff, flow ensures that overload and power cuts are avoided.

**Page 10**

## managing



Intelligent systems demand intuitive operation. Our visualisation not only shows your customers what is happening, but also how many blackouts have been avoided in the home thanks to flow.

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## installation



flow is quick and easy to install in the technical centre and is configured in just a few steps.

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# charging





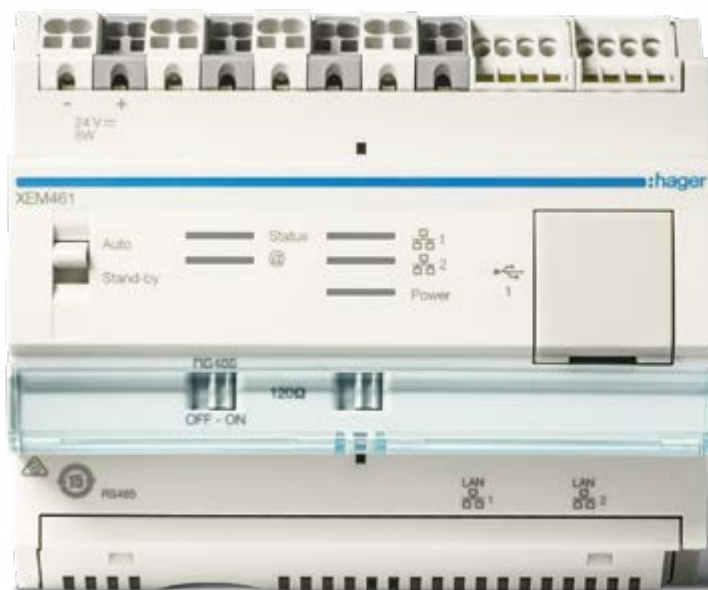


**The electromobility of the future is facing a challenge on three fronts: Extension of range, shortening of charging times and, at the same time, reducing the strain on local electricity grids. With the new system from Hager, you can obtain optimal technical performance and efficiency – and set the course for the energy revolution with your customers.**

charging

# Intelligent charging – with flow

The optional e-tron connect charging system supports a charging performance of up to 22 kW\*. The e-tron connect charging system develops its full charging intelligence in connection with flow, the home energy management system from Hager:



XEM461 energy management controller

\* The e-tron connect charging system will be available in 2019. Charging performance is dependent on the type of mains connector used and the voltage in the respective country, as well as the number of available phases of the electricity grid and of the home installation specific to the customer. On an individual basis, therefore, it is likely to be lower. The power supply cable with its industrial connector and the operating unit of the charging system are aligned to one another to enable a specific charging performance. Although subsequently replacing the power supply cable with another industrial connector is technically possible, it may reduce the charging performance.



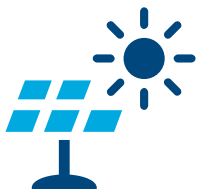


01

### **Blackout protection**

During initial installation, flow is configured to the maximum connected load in the home. The vehicle is therefore always charged using the maximum available power – while taking into consideration the other electrical consumers that are currently active in the home.

This minimises the charging time without overloading the house connection.



02

### **Solar energy usage**

flow knows how much power the customer's photovoltaic system is currently producing and what the weather forecast is. Based on this, it calculates the expected quantity of self-produced solar energy. If the required departure time and the target state of charge have been entered in the Audi e-tron, the charging is planned so that it prioritises the use of solar energy for charging the vehicle. It's a renewable solution at cost price.



03

### **Cost-optimised charging**

Some energy suppliers offer different tariffs. flow transfers these to the Audi e-tron. This function requires the electricity contract individually concluded between the customer and the energy supplier to include various electricity prices, e.g. day and night tariffs. Information about the various electricity prices is stored by the customer in their myAudi account or directly in flow.

Once the required departure time and the required state of charge have been entered in the vehicle, the Audi e-tron is charged to the most favourable conditions in each case.

# From electric mobility to the intelligent home

The home energy management system from Hager is installed in the technical centre as a compact server. An Internet router, also connected in the multimedia panel of the technical centre connects flow to the e-tron charging system connect – and as easily as that, the energy and data traffic can start. But flow doesn't only build a bridge towards electromobility, it also performs other important functions in the smart home of the future.

## The language of the future: EEBus

To enable flow and the charging station to “understand” each other, they must speak the same language: Here, Audi and the German automotive industry use the new EEBus standard, which is increasingly being used as a manufacturer-independent energy protocol. The new home energy management system from Hager also communicates in EEBus – and is therefore well prepared for the future of electromobility.

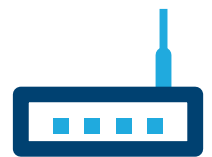


Audi e-tron

ISO 15118



e-tron connect charging system  
incl. premium wall mount,  
available as an optional extra



Wi-Fi  
PLC      EEBus  
TCP/IP

Router in the  
technical centre



**Full energy control**  
The energy meter and visualisation give the user an overview of all electricity consumption and purchases in the home at all times.



**Solar energy**  
Photovoltaic electricity from your own rooftop can be used to charge an electric vehicle and supply household consumption as well as – for payment – be fed into the regional electricity grid.



**Wind energy**  
The stronger the wind blows, the cheaper wind energy becomes. Significant surplus capacity even results in negative electricity prices, i.e., the purchaser gets money back. A real wind-win situation!



**Conventional energy**  
Gas and coal-fired power plants today cover the main burden of energy supply. But this should change, according to the climate targets.



**Batteries as energy accumulators**  
In future, it will also be possible to integrate energy storage into flow.



the intelligent home



**From consumer to producer**

In the technical centre, all energy and data highways come together. It is, to a certain extent, the heart of the house and, through intelligent energy management, also becomes the brain of the house. Through photovoltaic use, heat pumps or cogeneration plants, the home of the future also develops from electricity consumer to electricity producer. I.e., it becomes an electricity generator and consumer in one. And the Hager technical centre provides the required meter panels with intelligent electronic household meter for everything.

# From smart home to smart grid

The increasing “electrification” of society in the form of e-vehicles and electrical heat generation is placing unanticipated challenges on the electricity grid. Our electricity requirements will continue to rise and energy sources will multiply in their thousands. These decentralised generation systems are truly turning the hierarchically structured electricity grid we have developed over the course of more than a century on its head. With the new flow system from Hager, you’ll be able to get it back on its feet – and do your part in laying the foundations for the energy revolution.

## **Energy Roadmap 2050**

The long-term strategy of the European Union aims to make a greater contribution to climate protection and improve sustainability of energy supply. By 2050, the intention is to drastically reduce greenhouse gas emissions. To this end, the proportion of renewable energy sources needs to be expanded to meet gross energy consumption.

## **The role of e-mobility**

E-mobility also has an important part to play when it comes to meeting these climate preservation goals: In 2017, a total of 1.2 million new e-vehicles were approved worldwide. It is estimated that half of all vehicles will be e-vehicles by 2030, with this figure increasing to around 80% by 2050.

## **The smart grid of tomorrow**

The fluctuations in electricity production from solar and wind power plants need to be balanced out on a permanent basis. At the same time, the oscillation frequency of the main grid needs to be kept at around 50 hertz AC to minimise outages. In order to guarantee this, all generators and consumers need to be intelligently networked and dynamically controlled.

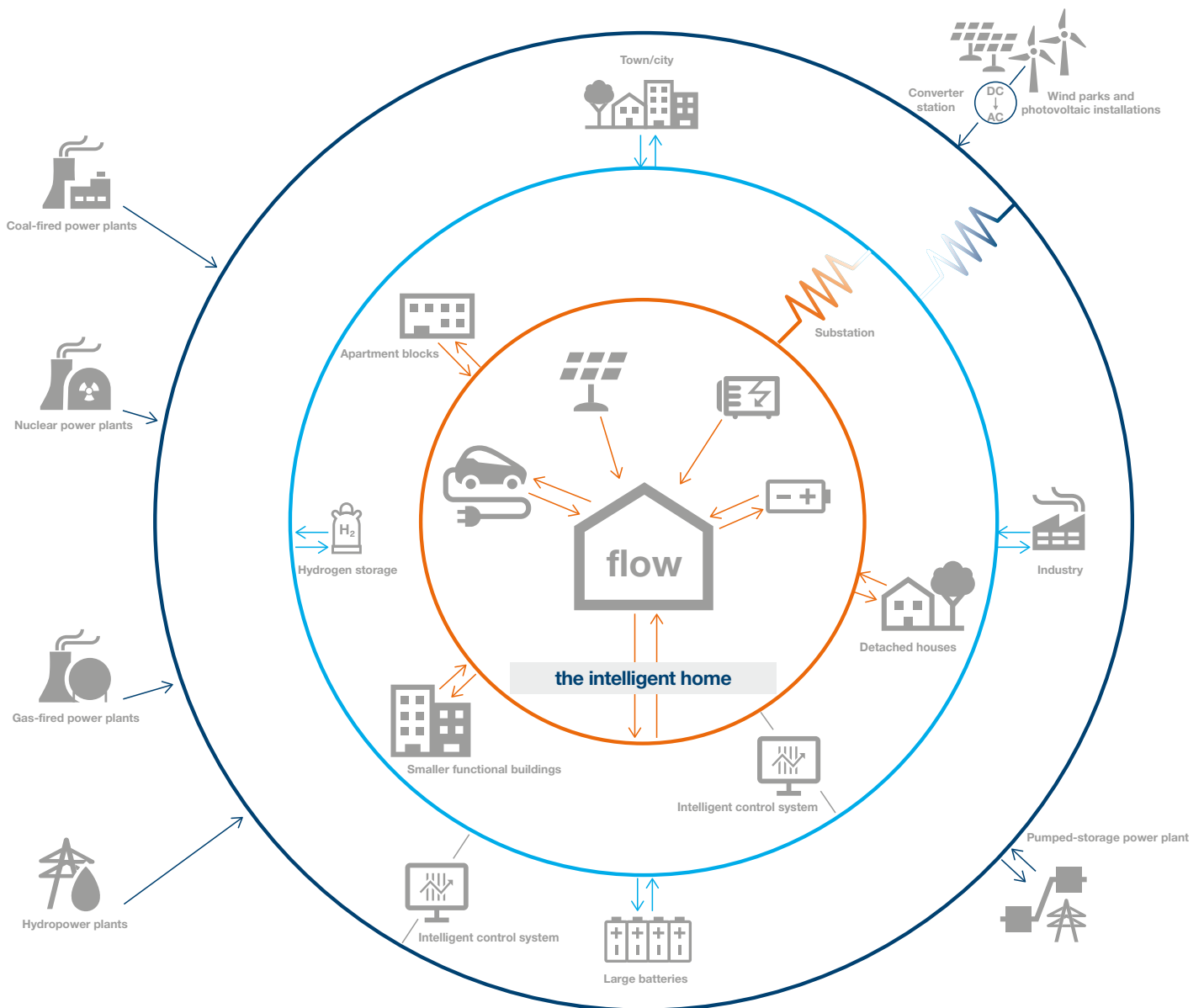
## **The key role of flow**

Since grid expansion is only occurring at a sluggish pace, the local distribution network plays a key role in balancing out power fluctuations at a regional level. The flexibilisation of the charging processes of e-vehicles consequently represents a highly attractive solution from an economic

perspective. According to one study\*, the critical peak loads at local network nodes could be significantly reduced if 30% of all e-vehicle drivers made use of flexible charging. Were this figure to rise to 50%, every second vehicle would be able to be an e-vehicle. And with upwards of 92.5% of drivers employing flexible charging, an e-mobility quota of 100% could be achieved – with no supply bottlenecks and no need for grid expansion. As a solution that is already available to implement today, flow allows you to make your customers completely self-sufficient from an energy perspective.

\*Oliver Wyman analysis “E-Mobility 2035”, July 2017.

# flow plays a key role in the intelligent electricity grid of the future.



— High and extra-high voltage: 60–380 thousand volts  
— Medium voltage: 1–60 thousand volts  
— Low voltage: up to 1000 volts

  
 Electricity production

  
 Electricity consumption



# managing



Handling for the end user must be just as intuitive as the charging control in the background is intelligent. The self-explanatory user interface informs your customers about all electricity supplies and consumption. This means you can make the intelligent home the cockpit for the energy revolution.



managing

# Everything on your screen



How much electricity am I currently consuming and how much am I generating? For how much longer does my electric car need to charge? And how much energy is currently stored in my vehicle battery? These and many other questions are answered at a glance on the web interface. It can be accessed at any time via a web browser on any PC, tablet or smartphone – at home or on the go.

## **Clear structuring into three areas**

The user interface is split into three areas: Live, Forecast and Performance. Live provides information about the current energy status of the home. Forecast predicts the expected solar values and PV electricity purchases. Performance continuously informs the user about the performance, savings and advantages of flow.

## **flow – the home energy management system**

In the Live area, all current electricity supplies and consumption are displayed:

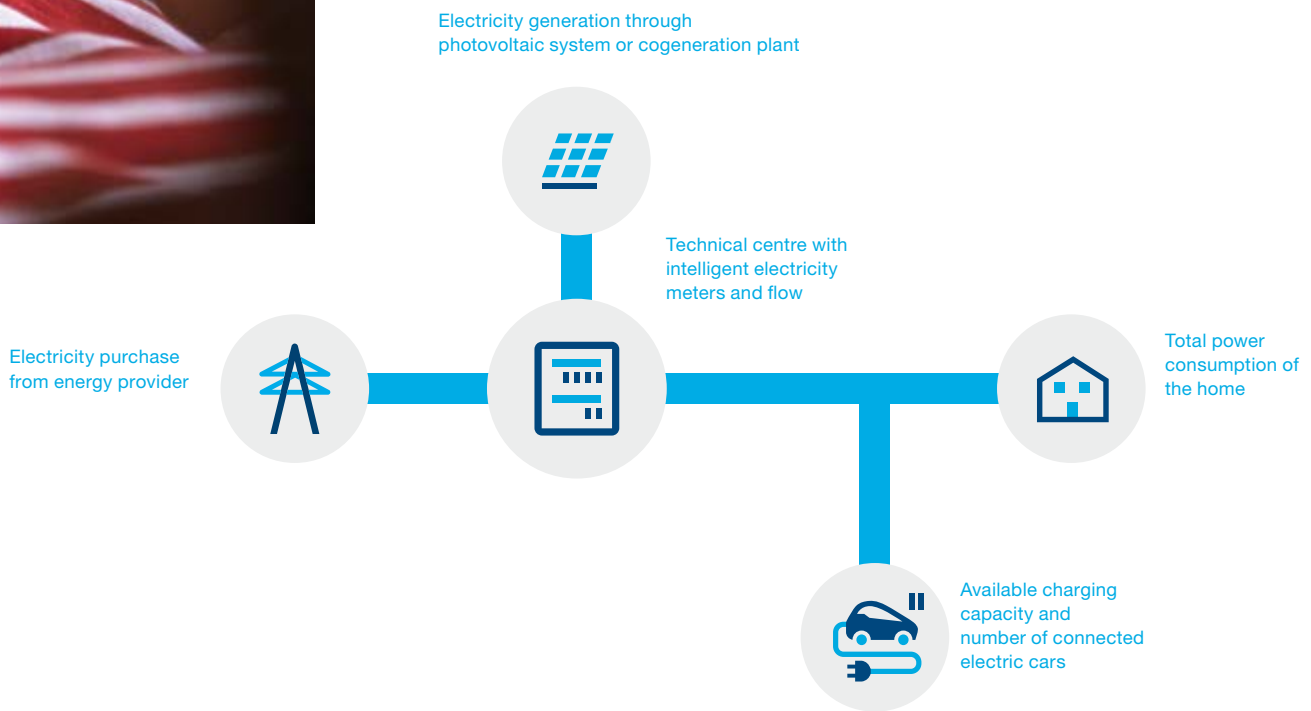
- Electricity generation through the household's PV system,
- Electricity purchased through the standard grid,
- Household energy consumption,
- Energy quantity available for charging electric cars. A number in the Auto field shows how many cars are currently being charged.

The energy flow and energy quantity are visualised by moving dots between the icons.

## **Charge up to three electric cars at the same time**

With flow, the charging cycles of up to three electric cars can be controlled at the same time and monitored to the second. The containers next to the tree diagram provide information about all connected electric vehicles, the respective charging status and the time required until charging is complete. This makes daily time management easier.





**Stay informed while you're on the go**  
Thanks to the responsive design, the interface automatically adapts to all mobile devices. Your customers can therefore always enjoy maximum operating comfort – on a PC as well as on a smartphone or tablet.



# Always up to date

What's the weather like? What solar yield is expected for tomorrow? How much money have I saved in the last week thanks to flow? And how many blackouts have I prevented? In interactive graphics, flow quickly and comprehensively brings the user up to date and helps with the responsible handling of energy.

## Forecast

flow continuously accesses the current regional weather forecast via the Internet. Based on this, the system calculates the expected solar energy yield and provides recommendations regarding the optimal charging time for the electric car – ideally whenever energy is being supplied from the user's own roof and is free of charge.

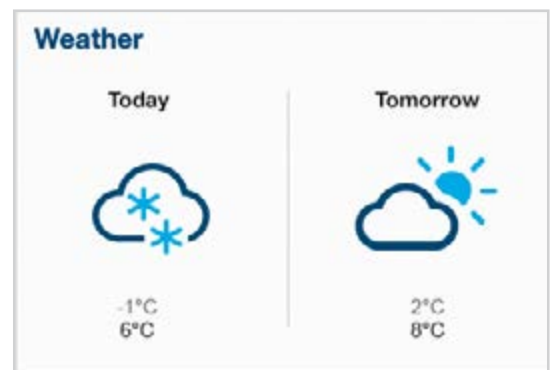
## Performance

flow keeps the customer constantly informed about all consumption and electricity flows. You not only find out how much cash you have saved when charging your electric car, but also how many potential blackouts were prevented through intelligent energy management. In this way, the system playfully helps its users to be responsible in their handling of energy.

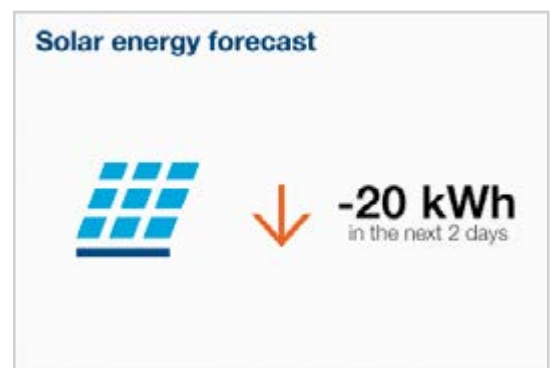
## Reports

Via the top menu bar, you can create and export different reports: For example, you can select different periods for the forecasts and display or hide different parameters. Clear bar charts show the electricity consumption and production. The energy history for the house can be recorded for any desired interval and can be shown in kilowatt hours or costs. Overviews of the photovoltaic yield can also be created, sent or printed quickly and easily using flow.

## Forecast



Weather forecast for today and tomorrow: The user's location is entered during initial configuration. flow obtains the information from a weather data provider.



Solar trend: Based on the weather data, flow creates a forecast of the expected photovoltaic yield.

## Performance



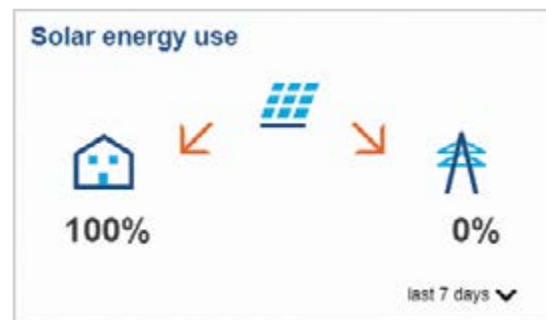
Payment for the PV energy fed into the grid is continuously compared against the costs of the purchased energy.



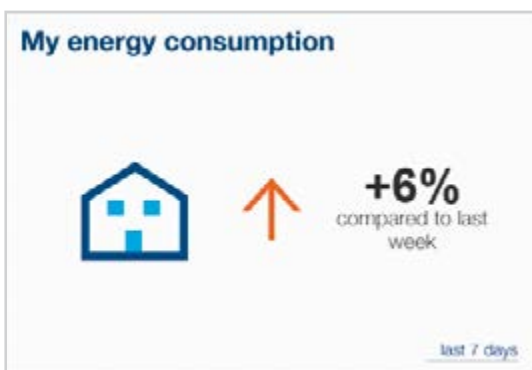
Good to know: How often has flow protected me against a blackout? And for how long was the charging speed adapted to prevent a blackout?



On request, the user can find out how much electricity costs were saved by charging through flow and PV.



Here, the user can find out how much PV energy was consumed, how much was fed into the grid and how much of their own consumption was covered by solar energy.

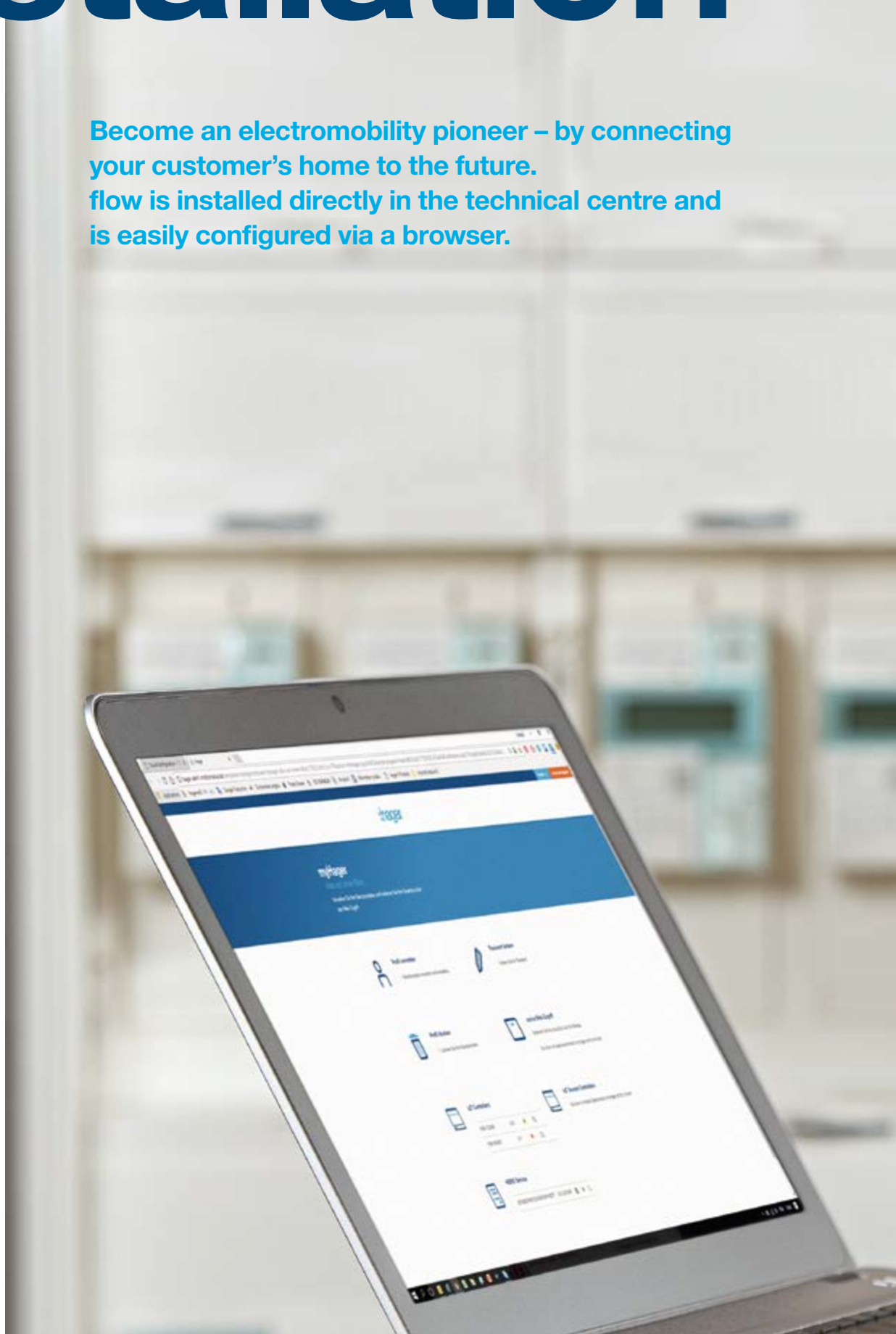


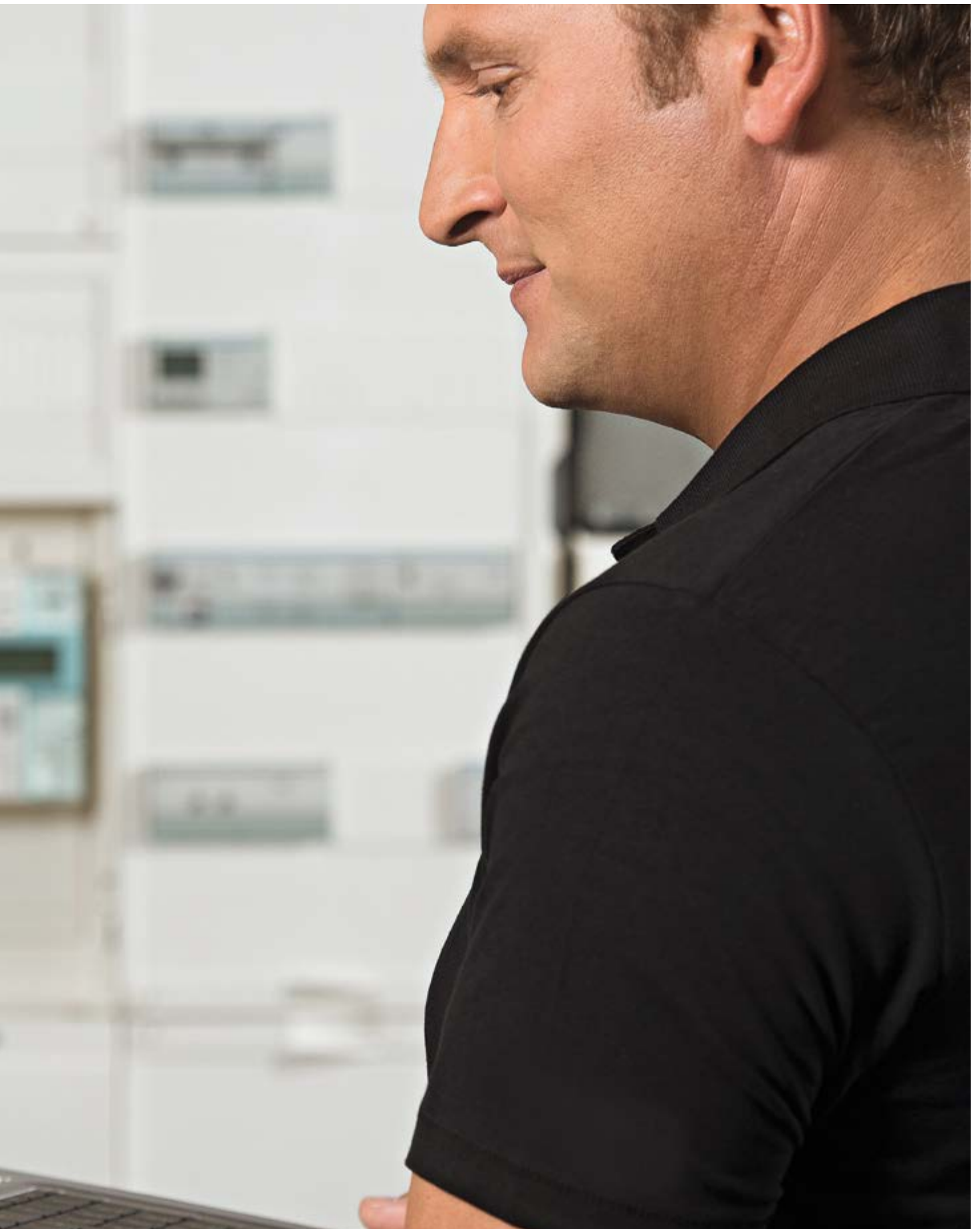
The consumption trend analysis records energy consumption in weekly intervals.



# installation

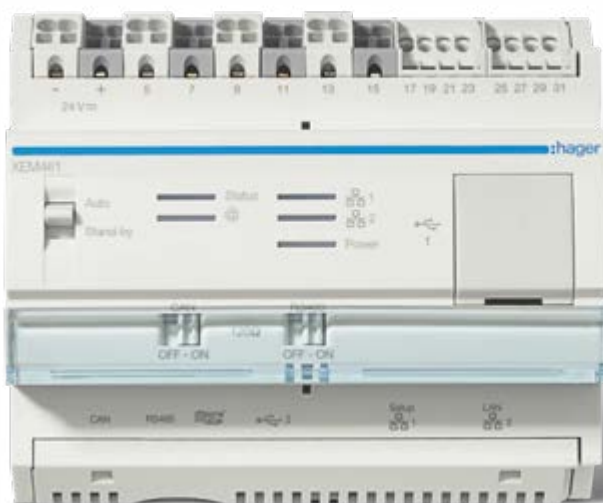
Become an electromobility pioneer – by connecting your customer's home to the future. flow is installed directly in the technical centre and is easily configured via a browser.





# Quick to install

flow



## XEM461 energy management controller

The energy management controller is the heart of flow. It establishes the connection to the charging station, the energy meter and the Internet and ensures continuous data communication between all components.

- **Transfer protocol:** EEBus (supported by the German automotive industry, VDA)
- **ISO 15118:** International communication standard between charging station and charging control unit
- **Connection type:** quickconnect plug terminals
- **Interface:** Modbus
- **LAN-Port 1 and 2:** For local and global configuration



## Power supply 24 V DC, TGA200

The power supply provides the required voltage for the energy management controller.

- **Operating voltage:** 230 V AC
- **Frequency:** 50/60 Hz
- **Output current:** Max. 1 A
- **Connection type:** quickconnect plug terminals

The flow System XEM600 consists of three components: The central energy management controller (6 Modules), a power supply (4 Modules) and an energy meter (4 Modules). All modular devices are mounted on the DIN rail in the technical centre, wired via quickconnect and connected with each other via Modbus. Before you install flow and the charging station, however, you should carry out a home check. To do this, determine the current condition of the electrical installation and the maximum available charging performance.



## Energy meter ECR380D

The three-phase Modbus meter measures the energy after the meter connection. With an additional energy meter, the photovoltaic current can be measured if required.

- **Number of poles:** 3
- **Type of measurement device:**

Electronic

- **Direct measurement:** 80 A

- **Modbus interface:**

Connection to the XEM461 energy management controller via Modbus cable HTG465H





# Quick to configure

After installation of the hardware, initial configuration begins. You then hand the project over to your customer, who completes the configuration and can make changes to their home energy management system at any time, e.g. to enter a new electricity provider or to change the charging priority of their electric cars.

### 01

#### Start project

Under the “Dashboard” menu option, start the configuration. Ensure that the sliding switch on the device is set to “Standby”. With this status, the configuration is enabled and can be implemented or changed. Here, all functions that you will configure successively are displayed.

### 03

#### Select grid and energy meter

Here, you can set up the local electricity grid (three-phase in Germany) and define the rated current of the main fuse. Then select the energy meter (ECR380D by default for flow).



Dashboard



Optimisation



Grid

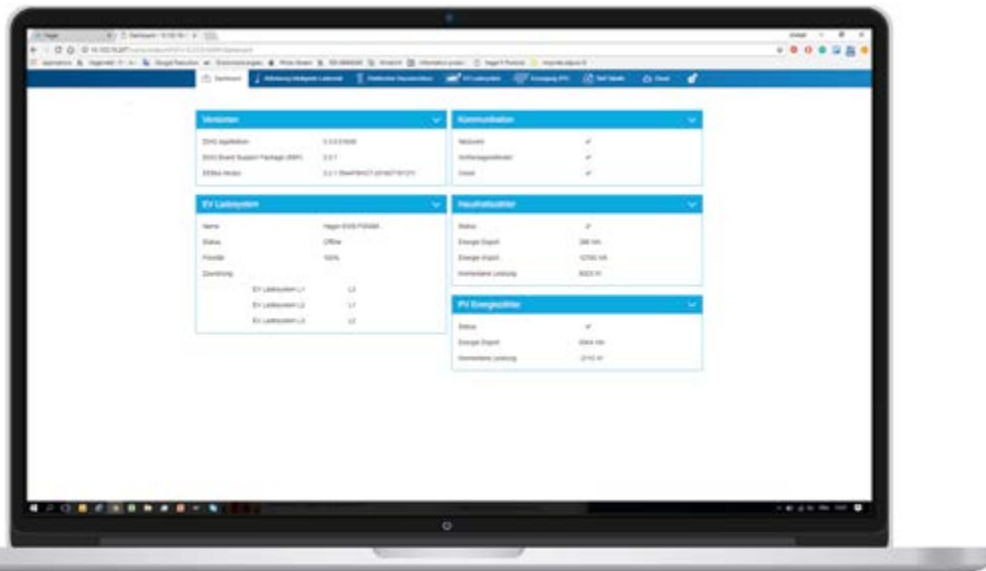


EVSE

### 02

#### Intelligent charging

Now choose your customer’s desired charging functions: Coordinated and/or cost-optimised charging. The required overload protection is automatically activated.



## 05 Connect PV system

If available, set up the PV system here and select the relevant energy meter.

## 07 Hand over project

After all parameters have been entered, you need to log in with your myHager account, or create an account if you do not yet have one. Once this is done, you can now also enable remote access. Transfer the project to the customer by entering the customer's email address. Then set the flow FRONT switch to "Auto". From this point on, the configuration can no longer be modified: The system is online and backed up via the Hager cloud. Your customer receives an e-mail and completes the configuration on the **hager-flow.com** website.



Storage



Production



Tariff



Users



## 04 Setting up charging stations

Under "EVSE", you can register up to three charging stations and prioritise which should charge first. Under "EEBus Information", you can start the process of pairing the charging station and flow: Both devices connect to each other automatically.

## 06 Defining tariffs

In the tariff overview, you can enter as many electricity tariffs and special tariffs of the energy provider as desired, based on delivery intervals. flow then uses this as a guide for intelligent charging coordination.









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