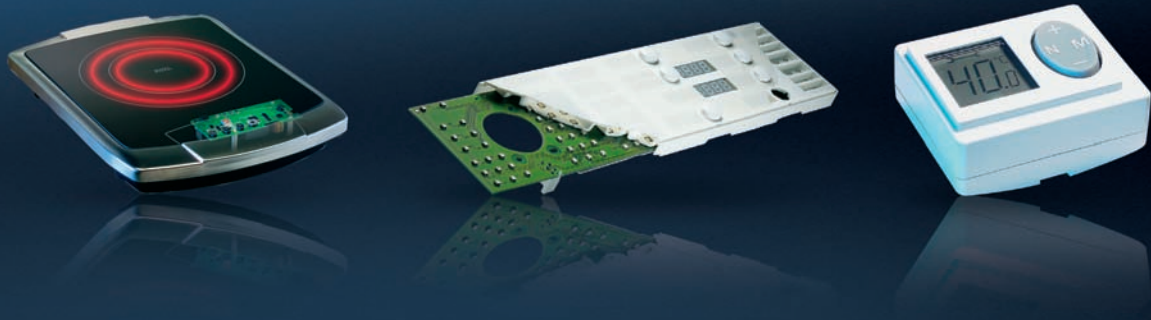


The Power Lies in the Details

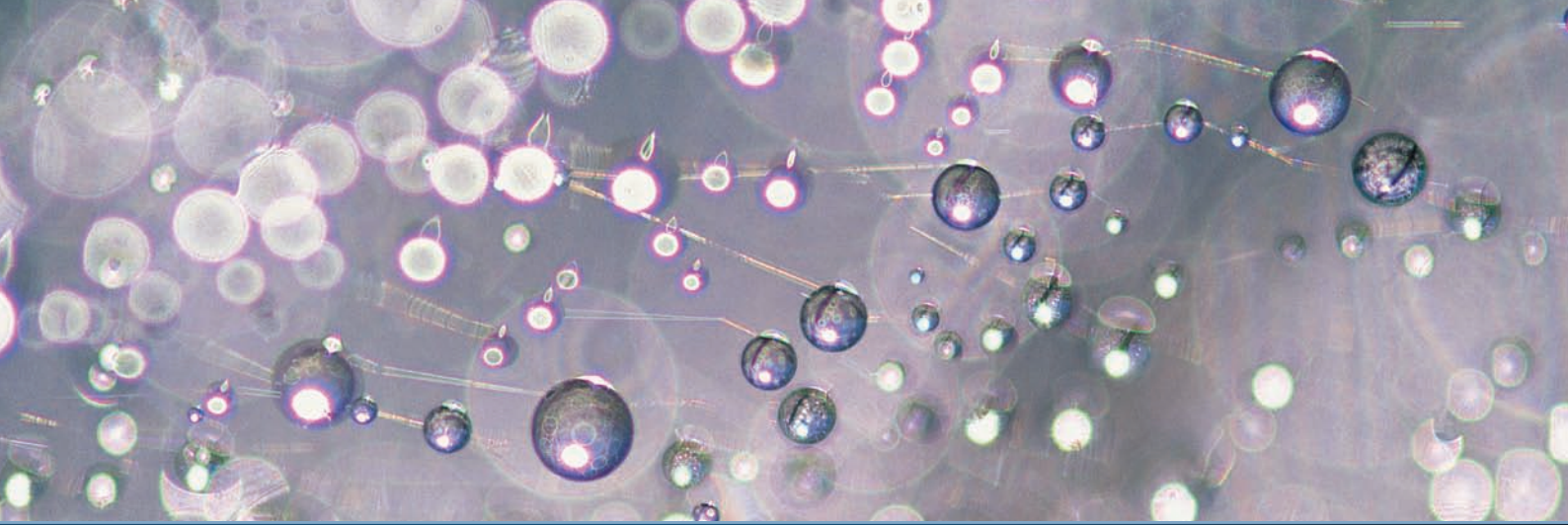
# Mechatronics – Expertise in Controls and Modules



**CHERRY** ®



For many years, Cherry micro-switches and keyboards have been synonymous with quality and reliability. Cherry is a brand name of ZF Friedrichshafen AG. Whether in household appliances, industrial applications, vehicles or input systems, electronic components ensure reliable operation as well as safety and comfort. Our Quality Assurance System is ISO 9001 and TS 16949-certified and our Environmental Management is ISO 14001-certified.



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Lean Production Award 2006



Bavarian Quality Award 2008



Kaizen 5S Award 2009



## Success is the result of ideas and foresight.

Growth and success across more than 50 years are no accident, but the result of a sustainable company strategy. A strategy which is applied equally to customers, employees, our own products and the environment. And this guarantees that our innovations will fall on fertile ground in the long and short term - and it will ensure growth for us and our partners.

What makes the difference between a good and an excellent technical solution? Reliability, the power of innovation, these are the foundations of success. But how can success be achieved? Is there a formula which can be transferred to all industries? We think there is.

### **It's not the size which determines the power, but rather each individual component.**

The quality of a total solution is determined by the quality of its components. Perfection down to the smallest detail is therefore a basis of our philosophy as a supplier of mechatronic components. Our record proves we are right. For many years, mechatronic elements by Cherry have been synonymous with the highest quality and reliability. This principle has also made us one of the leading suppliers of electronic components. Regardless of whether you use our products in household appliances, industrial applications, in the automobile industry or for input systems - you can rely on safety and comfort in addition to reliable performance.

### **Customer satisfaction grows with quality.**

With ever-shorter product cycles, the development time for new products is also being reduced. In order to guarantee maximum quality, close cooperation among all partners is important. We interpret the term "close cooperation" in an old-fashioned way - and insofar as possible, we prefer personal contact with our partners. Our flexible production network allows us to adapt to customer- and market-requirements.





## **Quality guideline**

### **Customer satisfaction**

In the context of a cooperation based on partnership and trust it is our major objective to fully live up to our customers' expectations.

### **Competitiveness**

We can ensure ZF's long-term corporate success by providing innovative, high quality, and cost-efficient solutions for a global market.

### **Sense of responsibility**

The prerequisites for achieving optimum working results are a distinct awareness of quality as well as assuming responsibility both for oneself and for the Group.

### **Employee satisfaction**

ZF's efficiency is determined by our highly motivated staff. By involving all stakeholders and continuous communication, our employees' satisfaction can be maintained on a permanent basis.

### **Process-oriented management approach**

Applying efficient processes with balanced interaction to achieve highest product and service quality – that is the basis for our management system.

### **Partner supplier**

Our suppliers make an essential contribution to the quality of our products. In order to achieve common quality objectives we cooperate with our suppliers as partners.

### **Permanent improvement**

The principle of continuous improvement is an important element of our actions and secures corporate success for the future.

### **Principles of environmental protection**

Cherry products are contributing to the technical progress on a global basis. However, this also means that the company has a responsibility to continuously improve the environmental compatibility of its products over their entire life cycle and to reduce the strains placed on natural resources.

The Environmental Policy is checked regularly and is binding for all employees. It is based on the following principles:

1. We design our products and production processes in as energy and resource-efficient a manner as possible. We use state-of-the-art environmentally friendly technologies whenever investments are made.
2. We put appropriate measures into place to ensure that environmentally damaging incidents are avoided wherever possible and properly contained in the event of any incident. We comply fully with all relevant environmental directives.
3. We involve our employees in the development and implementation of our environmental policy. We regularly train and motivate them so that they can actively assist in shaping our environmental protection policy.
4. We are continuously improving operational environmental protection. Our suppliers are taken into account during this process.
5. We implement the objectives we set ourselves right around the world with the assistance of appropriate management systems, we check the agreed performance levels on a regular basis and, if any discrepancy is detected, respond rapidly with appropriate remedial action.
6. In matters relating to environmental protection, we engage in dialogue with customers, suppliers, authorities, and all local interested parties. Furthermore, we regularly report on the consequences of our activities.





## Know-how in Electronics and Mechanics: Mechatronics made by Cherry

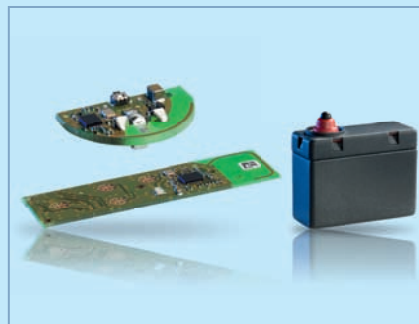
From high precision standard components to complex customer-specific mechatronic solutions or electronics controls - we are your electronics partner for tomorrow's developments. For everything our customers need, ranging from household appliances, electrical and mechanical engineering, computer input devices to automotive applications. That's why the challenges to OEMs of electrical and electronic products and devices are our profession.





## A lot of ideas for the future

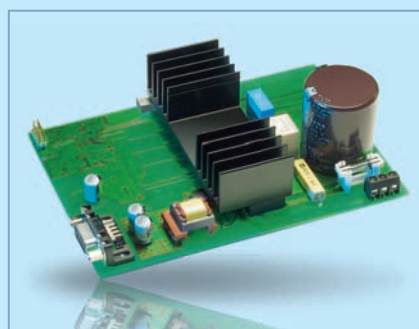
One of the challenges, among others, is increasing the efficiency of products. Therefore we are working for example on the reduction of the power consumption in stand-by mode. In answer to the question for optimising functional costs, we integrated a connector housing to our existing switches and assemblies. Moreover we develop sensors which help to improve products by additional features and functions. Furthermore we are introducing new product ideas and innovations to the market. Examples are a remote control switch to operate flap or a wireless remote control unit for instant water heaters. In short: We help to realize new ideas and to make existing concepts more economic and/or improve them.



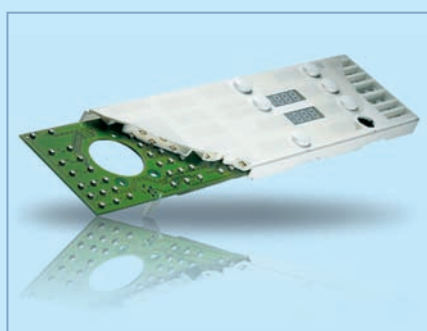
Radio switches, battery-operated or as energy-harvesting version



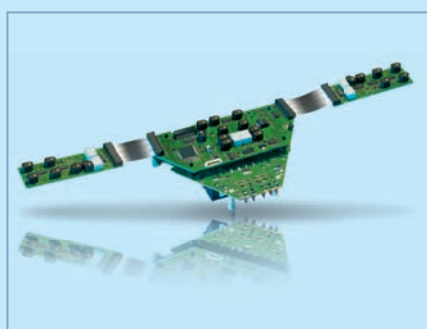
Radio remote control with temperature display for sink heater



Motor control for washing machine

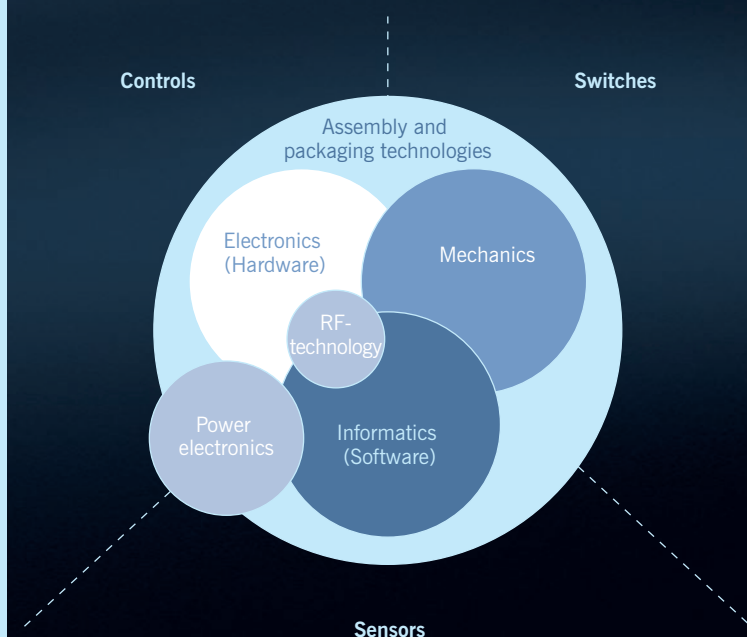


Backlit input and display unit for tumble-dryer



Customer-specific cooktop control with combinatorial circuit part

## Mechatronics made by Cherry





Comfort and safety, which can no longer be dismissed from your thoughts. In all areas of life.

Our electronic components enable not just more functionality, time, energy and resource efficiency in the household; they also contribute to greater comfort and security. In industry, data technology and in automobiles, our expertise is the basis for many innovative solutions.

Dynamic bus systems with distributed intelligence simplify the construction of flexible controls. Position control systems with memory function enable multi-axis control of comfort seats in automobiles, in the furniture industry and for adjustable sickbeds.

To replace circuit boards, proven, plastic-coated metallic lead frames are used for the three-dimensional construction of components. They integrate the function of the bearing housing parts with the electric connection of the components and the plug connections. Alternatively, we solder electro components such as sensors directly onto flexible printed circuits (FPC).

#### **Access to more safety**

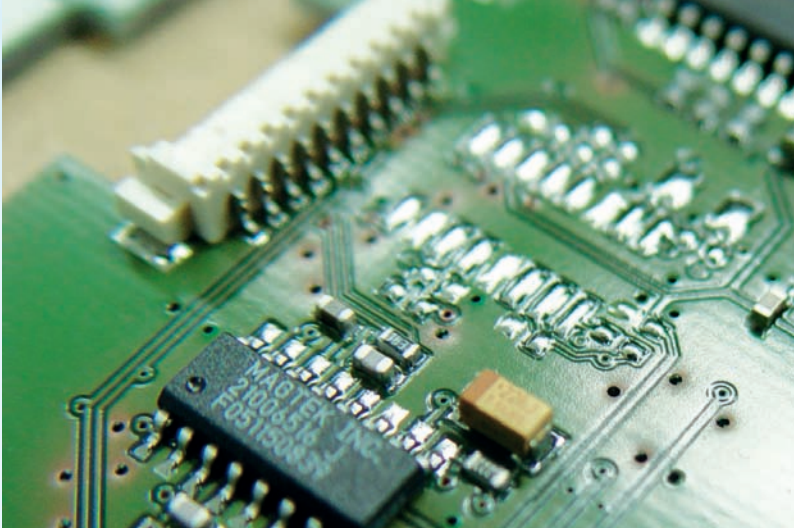
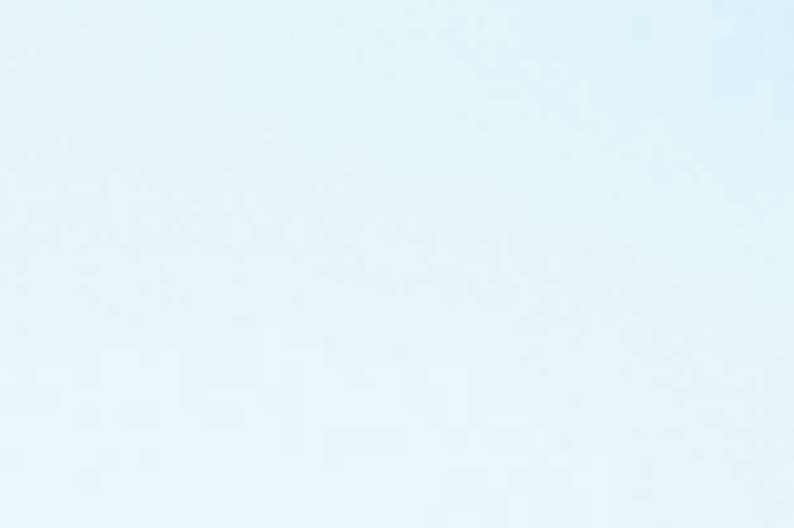
Intelligent access control systems prevent the unauthorised use of computer systems and access to rooms. Building blocks for the digital signature and thus the highest data security are magnetic and smart card readers and fingerprint recognition, which combine easy access with maximum security.

#### **Integrated comfort**

More comfort is also a feature of our newest keyboards, which in addition to ergonomically-optimised operation and new additional functions also offer other components, e. g. integrated solar cells or touch pads with which they can be equipped, and which stay in contact with the PC via radio (currently up to 2,4 GHz).







Mouse with capacitive fingerprint sensor



Sensor component for braking assistant



Orca wireless keyboard with wireless mouse



Injection-moulded lead frame in the side door handle for remote module of keyless entry system



## Innovative technology. For the innovations of tomorrow.

The basis for our product development is our developers and engineers' experience with mechanical engineering and electronics as well as their knowledge about the special requirements of the application. Project management and simultaneous engineering enable them to work quickly and effectively.

### Our strengths:

#### Input and contact technologies:

- Switches, contacts, foils, rubber mats

#### Contactless information transmission:

- Coded FM-
- Transponder-
- Bluetooth-

wireless transmission, e.g. for remote controls, systems for access authorisation or data exchange

#### Access control:

- Electronic fingerprint recognition

#### Bus systems:

- CAN-, FlexRay®, LIN-, I2C, Microwire-, Power Line-, Bluetooth- and individually-developed bus systems, e. g. for automobiles and household appliances

#### Display systems:

- Customer-specific LED displays
- Backlighting using reflectors and light conductors
- Fluorescent displays
- LCD graphic displays

#### Sensor systems:

- Hall sensors
- Inductive sensors
- Capacitive sensors
- Optical sensors

for the detection of positions, length and turning movements, but also for the recording of images, e. g. for fingerprint recognition.





#### Our resources:

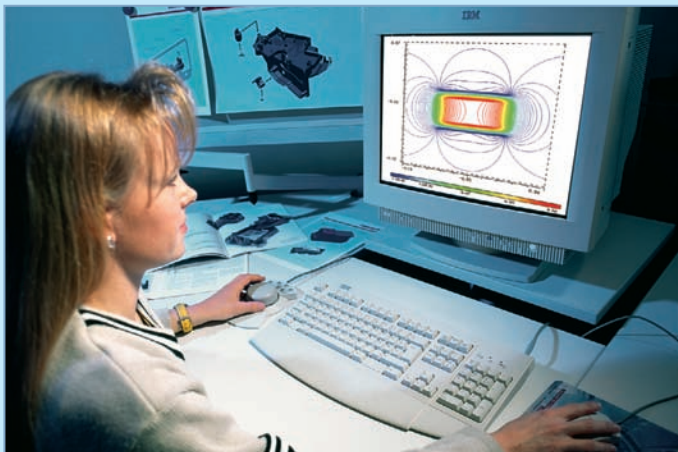
- 3-D CAD development with CATIA V4® and CATIA V5®
- Data exchange via OFTP/ENGDAT
- Finite element calculation
- Injection-moulding simulation for plastic components
- Computer-supported circuit simulation, magnetic field calculation and high-frequency simulation
- Layout development for SMD, Chip on board, Flip Chip and other micro-assembly technologies
- Development of cost-effective customer-specific circuits even in the highfrequency range, e.g. for wireless units
- Software development for 8, 16 and 32-bit micro-controller, also using operating systems such as RTOS and OSEK
- Lengthy experience in the development of mechatronic systems in mechanical engineering, hardware, firmware and software.
- Mechatronic development according to SPICE / ISO 15504



Computer-based layout development



Flexible measuring station for testing development samples



Magnetic field simulation



Product qualification under real operating conditions



Our products have already survived a lot.  
Especially in our test laboratory.

In a multitude of tests, our new developments must prove their reliability and long service life. In special test stations, we conduct qualifications of components and materials with respect to their suitability for our products as well as development-related measurements and tests of complete products.

#### Environmental simulation

Functional tests and lifespan tests for heat, cooling and humidity as well as vibration and shock tests.

#### Tests of the electromagnetic compatibility (EMC)

Whether line-related or externally-produced fields and impulses, our components must work surely and reliably even under the influence of electromagnetic interference. Therefore, we conduct ESD, burst and surge tests as well as power failure tests in-house. On the other hand, our components may not interfere with other devices. Therefore, we make exact emission measurements.

#### Reliability and lifespan tests

Electrical and mechanical durability tests under normal and increased operational requirements also with ageing simulation, e. g. due to temperature loads, monitor adherence of the calculated values for reliability and lifespan (MCBF -> MTBF).

#### Authorisations and certifications

Test for approval by the global testing stations and for customer-specific certifications (VDE, KEMA, UL, CSA, etc.) Creation of the prerequisites for applying the CE seal of approval.



Lifespan and reliability tests under adverse environmental conditions



Series-accompanying lifespan and reliability tests of electronic components for tumble-dryers



## As flexible and efficient as our products: our production

### Economical by automation

The high degree of automation is the basis for economical production and thus for a competitive price-level. Linked assembly lines with integrated material handling systems, laser labeling equipment, testing and measurement stations deliver outstanding, consistent results. 100 % performance testing extended to include in-circuit testing, helps to guarantee the quality of the delivered product.

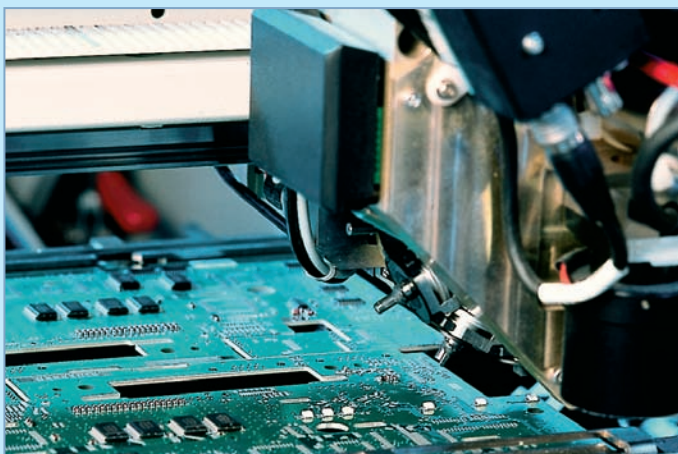
### Successful by employees

The most important success factors are, now as before, our employees, who work in self-guided, autonomous manufacturing groups. Our employees are themselves entirely responsible for the quality of their work, they optimise the process flows individually and they always strive to improve. Ongoing training ensures that we always work according to the most modern methods and knowledge.

In our mechatronics production

the modules are manufactured

by modern, linked assembly lines.



SMD circuit board assembly with automatic visual control



SMD assembly line with automatic PCB separation

## Controls for household appliances

### IR touch controls

With many years of experience, Cherry develops and manufactures IR touch controls as electronic switch solutions for the household appliance industry. We count all famous manufacturers among our customers. Areas of application for our touch controls in the hot sector are all types of vitroceramic cooktops and ovens for which the greatest degree of comfort and safety is offered. Applications are offered standard and customer-specifically. All of our company's services are secured by a DIN ISO 9001-certified quality management system.

### IR sensor technology

Cherry's patented sensor system for the touch controls sends infrared light through the vitroceramic surface. During operation, the infrared light is reflected, a microcontroller evaluates the reflection. Software detects whether the operation is intentional. Faulty operation, e. g. caused by cleaning, children, pots which have boiled over, pets or foreign light is excluded by intelligent software. Based on the optical principle, the controls are not sensitive to humidity, electromagnetic or other influences. Cherry IR touch controls calibrate themselves automatically after they are connected to the mains supply. During operation, the sensors adjust independently to changed light conditions, and thus remain operable at all times.

### Slider technology

To make the operation of cooktops still easier and more comfortable, Cherry has developed a completely new generation of operating sensors for cooktops based on infrared technology. With the slider technology, a new type of IR sensor line enables both, the selection of the heater and the choice of the heat setting with the single touch of a finger. By sliding a finger on the operating line, the heat setting can be varied constantly without having to enter repeated commands to turn the heat up or down. The patented technology is thus not just easy but self-explanatory for the user. It was just as important to the developers to ensure the robustness with respect to foreign light and temperature and the excellent sensitivity of the sensors for which Cherry is known. Our standard comfort modules were developed for the contactless operation of vitroceramic cooktops based on infrared technology. The differences among the various modules consists in the number of heaters, the functions available and the operating philosophy. Thus there is an optimal module for each use case.





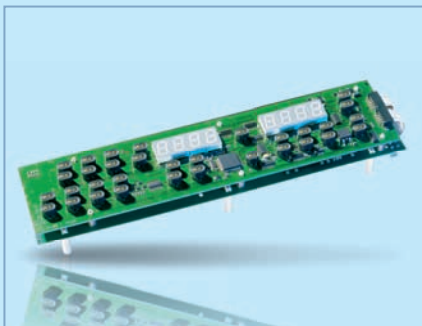
# Oven control

## Product description:

- Main sensor for switching the oven on/off
- Lock sensor for locking the selected settings or as a child safety measure
- Time display with the functions realtime clock, interval timer, cooking time and stop time display
- Switch-off functions
- Time controlled at the end of a defined cooking time or on reaching of a defined stop time and temperature controlled after reaching a defined temperature inside the food being cooked
- Temperature display for displaying the set and actual temperatures for the oven and the food being cooked (food thermometer temperature)
- Main relay for full isolation of the loads from the mains
- Fan relay for the temperature-dependent control of a cooling fan
- Function sensors for seven configurable operating modes
- Switch relay for seven selectable loads
- Faults and incorrect operation evaluation with safety cut-off
- Acoustic signals

## Options:

- Reduction in functionality by lower fitment levels possible (e. g. no food thermometer function or individual function sensors)
- Selectable locking of any relays with respect to one another
- Multiple control of relays
- Maximum temperature and suggested temperature selectable
- Switch-on and off temperature of the cooling fan for the oven area selectable
- Ambient temperature monitoring/safety



Touch control  
oven control

Modern ovens are increasingly becoming a key design element in the kitchen. The use of touch control technology enables a completely smooth surface without holes for rotary knobs or push buttons.

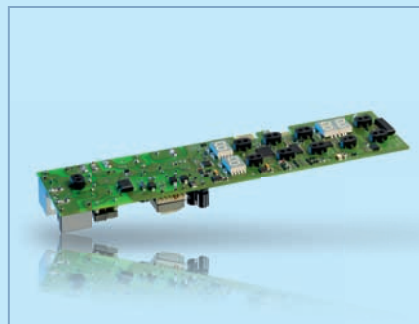
## Cooktop Controls

### Application

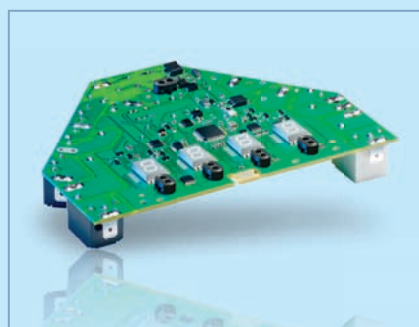
Our standard comfort modules were developed for the contactless operation of vitroceramic cooktops based on infrared technology. The differences among the various modules consists in the number of heaters, the functions available and the operating philosophy. Thus there is an optimal module for each use case.

### Mechanical and electronic construction

Cherry cooktop controls distinguish themselves especially through their modular, freely-configurable construction. The hardware and firmware equipment of each module can be adjusted to suit customer requirements. This individual programming permits, e.g. instead of the control of a heater, the realisation of a two-zone switch or a timer. Another innovation is the new fastening concept. With snap-in technology, the Cherry controls can be fastened into the cooktop easily and without screws.



MM4

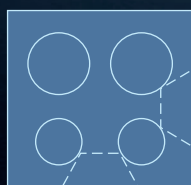


SCM LC  
"Low cost"

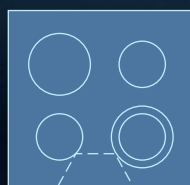
## Cooktop control Mounting positions



MM4



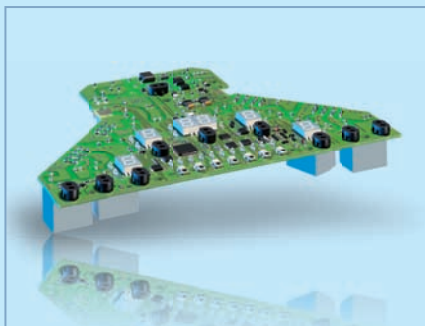
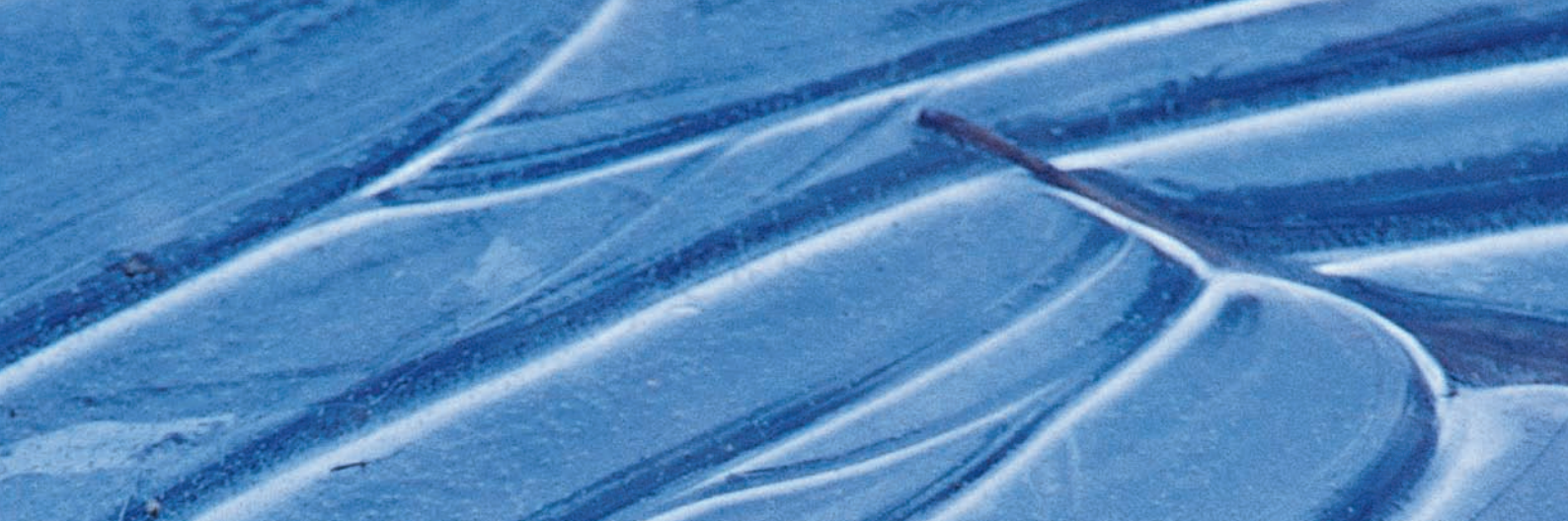
SCM LC



SCM EL

	Configuration		
	Basic	Standard	Comfort
1-2	MM 4		
3-4	SCM LC	SCM EL	SCM EL
	SCM EL		





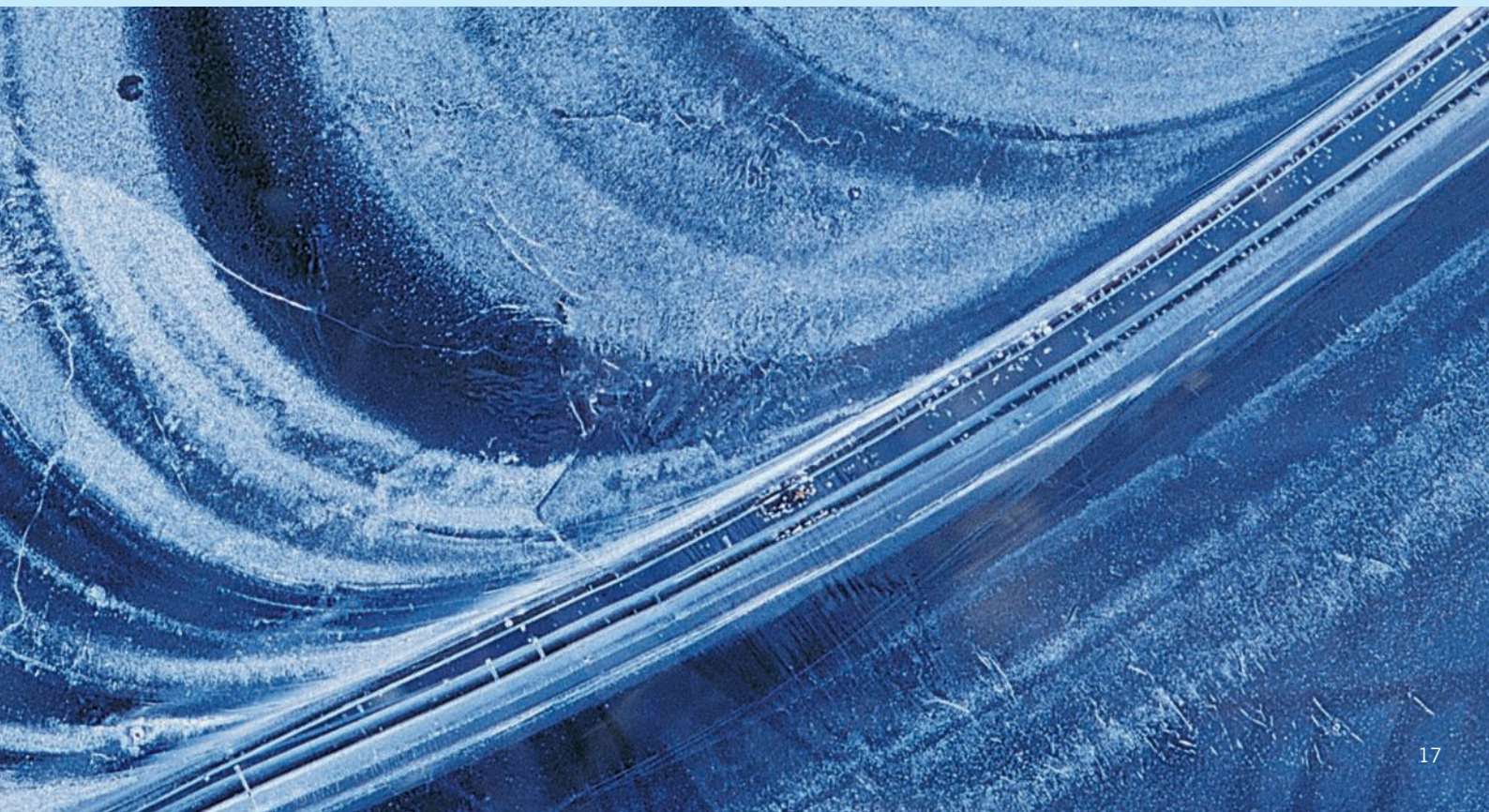
SCM EL  
"Entry Level"

## Configuration

Possible scope of feature

Basic	Standard	Comfort
	same as basic level plus	same as standard level plus
Residual heat display	Zone switch (2-zone)	Zone switch (2-/3-zone)
Operating time limit	Keylock	One timer per heater
Locking function (child proof feature)	Warming zone function	Slider operation
Start-to-boil		
Fully automatic sensor calibration		
Buzzer		

The indicated features characterize only exemplary the possible equipment levels of products in the indicated segments. The final selection and configuration of the best suited product, based on the individual requirements, will be only made after consultation with the customer.





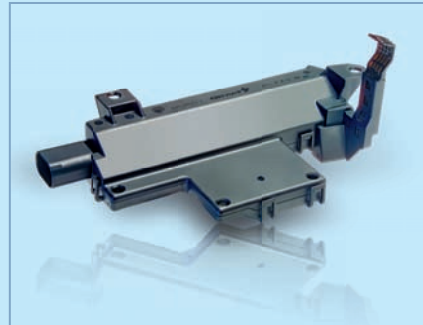
ZF Friedrichshafen AG is developing and manufacturing under the Cherry brand customer-specific controls and complex mechatronic modules for most applications. With our extensive, in-house expertise in mechanical engineering, electronics, software and hardware and plastic technology, Cherry can offer its customers complete mechatronic solutions from one source. Below are a few examples of the most various solutions which we have produced. ZF Friedrichshafen AG is as Cherry available to you as a development supplier for customer-specific products.



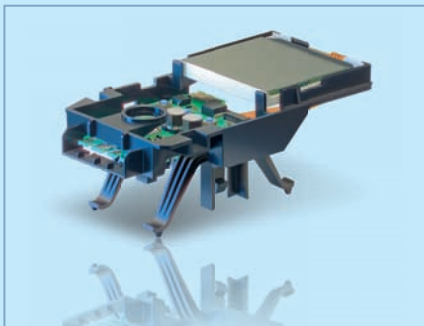




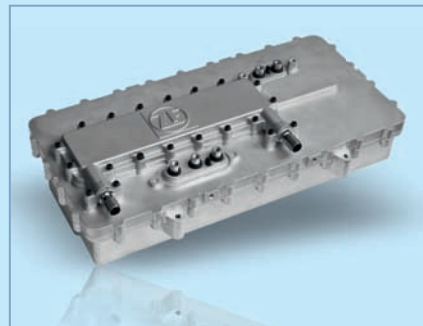
Wireless keyboard with mouse and integrated charging function via USB cable



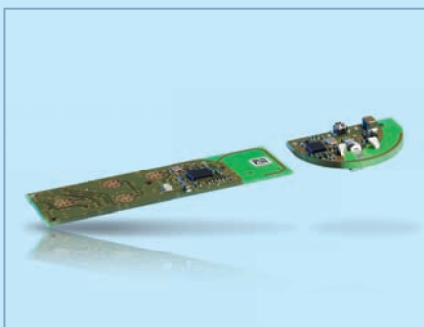
Completely sealed electronic control unit with sensors for keyless entry system. Mounted in side door of cars



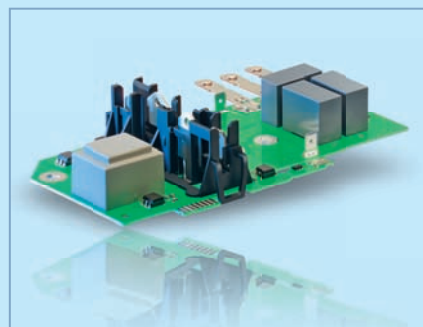
Display and control unit for instant water heater



Power electronics for hybrid systems of commercial vehicles



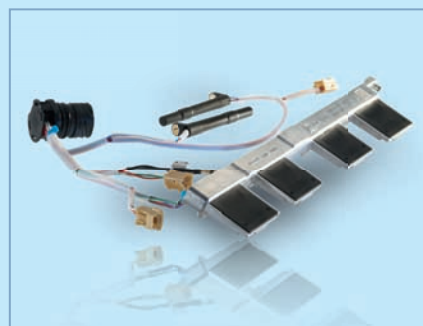
Compact wireless remote switch with sender and receiver module



Power unit for instant water heater



Integrated system-solution, keyboard with card-reader for electronic health insurance card



Sensor cluster consisting of inductive position sensors, speed sensors and a temperature sensor. Operating under harsh environmental conditions in automotive transmissions.

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