

## zelsius® C5-IUF



### Montage- und Bedienungsanleitung ..... 2

*Elektronischer, kompakter Wärme- und Kältezähler mit Ultraschall-Durchflusssensor IUF  
optional M-Bus, wM-Bus und 3 Ein-/Ausgänge  
 $q_p$  0,6/1,5/2,5/3,5/6/10 m³/h*

### Installation and operating manual ..... 18

*Electronic compact heat and cooling meter with ultrasonic flow sensor IUF  
M-Bus, wireless M-Bus and 3 inputs/outputs optional  
 $q_p$  0,6/1,5/2,5/3,5/6/10 m³/h*

### Manuel de montage et d'installation ..... 34

*Compteur électronique compact d'énergie thermique  
avec mesureur à ultrasons IUF  
M-Bus, wM-Bus et 3 entrées/sorties en option  
 $q_p$  0,6/1,5/2,5/3,5/6/10 m³/h*

### Manual de montaje e instrucciones ..... 50

*Contador electrónico compacto de calefacción  
con unidad volumétrica de ultrasonidos IUF  
opcionalmente con M-Bus, wM-Bus y 3 entradas/salidas  
 $q_p$  0,6/1,5/2,5/3,5/6/10 m³/h*

### Istruzioni di montaggio e d'uso ..... 66

*Contatore di calore compatto elettronico  
dotato di volumetrica a ultrasuoni disponibile nelle  
versioni M-Bus, wireless M-Bus e con 3 ingressi / uscite  
 $q_p$  0,6/1,5/2,5/3,5/6/10 m³/h*

## Contents

Purchased parts package.....	19
Technical data flow sensor type IUF.....	19
Technical data calculator.....	20
Technical data temperature sensors.....	21
Diameters.....	21
MID - Conformity declaration.....	22
Safety instructions.....	22
<i>Electro-magnetic interference</i> .....	22
<i>Care instructions</i> .....	22
Installation instructions.....	22
Safety instructions for installation.....	22
Mounting flow sensor (DFS).....	23
Notes to installation of the ball valve.....	23
Mounting heating-/cooling energy meter.....	24
Installation of the temperature sensors.....	24
Mounting in existing immersion sleeves.....	25
Putting into use.....	25
Pulse inputs and outputs (optional).....	26
M-Bus (optional).....	27
Programming of M-Bus address (optional).....	28
Radio (optional).....	28
<i>General information</i> .....	28
<i>Technical data radio interface</i> .....	29
<i>Content radio data protocol (Standard)</i> .....	29
Important Note.....	29
Simple example of the display menu.....	30
Legend.....	31
Status display / Error codes.....	32
Disposal.....	33

Be sure to read the installation and operating manual before installing. This allows you to protect yourself and prevent damage. Check the contents of the package before installation to be complete.

### Purchased parts package

- zelsius® C5 flow sensor with calculator
- O-Ring respectively gasket
- Seal material
- Wall holder with mounting accessories
- Installation and operating manual

### Technical data flow sensor type IUF

Nominal flow $q_p$	m³/h	0.6	1.5	2.5	3.5	6	10
Maximum flow $q_s$	m³/h	1.2	3	5	7	12	20
Minimum flow $q_i$	l/h	6 12	15 30	25 50	35 70	60 120	100 200
Pressure loss at $q_p$	bar	≤0.25					
Temperature range (*)	°C	0 ≤ Θ q ≤ 105 / 0 ≤ Θ q ≤ 130					
Minimum pressure (to avoid cavitation)	bar	1 bar at $q_p$ and 80 °C medium temperature					
Measurement accuracy class (*)		2 (optional 3)					
Nominal pressure							
■ Body with thread connection	PS/PN	16/16					
■ Body with flange/DN	PS/PN	25/25					
IP protection class		68					
Installation position		in any position					
Installation point		return pipe, optionally supply pipe					
Cable length up to calculator		1,2					
Installation place temperature sensors	m	M10 x 1					
Heat carrier (Medium)		Water					

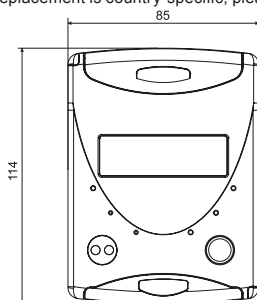
(\*) optionally

## Technical data calculator

Temperature range	°C	0...105 / 0...150
Temperature difference range	K	3...80 / 3...130
Display	LCD 8-digit + additional character	
Ambient temperature	°C	5...55
Storage temperature	°C	-20...+65
Resolution frequency	°C	0.01
Measurement frequency	s	flow rate = 4 temperatures = 4 / 32 (*)
Unit to read the heat consumption	Standard MWh; opt. kWh, GJ	
Data backup	1 x daily	
Due date values	Storage of all monthly values extensive storage of flow rate values	
Maximum value storage	extensive storage of flow rate, thermal output and other parameters	
Interface	Standard	optical interface (ZVEI, IrDA), 3 pulse output optional
	optional	3 pulse output, M-Bus, Radio
Supply	3.6 V lithium battery (different capacities)	
Battery lifetime	Years	> 6, opt. >11 (changeable during the operation time) (**)
Protection class	IP54	
EMC	A	
Ambient conditions/ climatic influencing  (valid for complete compact meter)	- climatic	Highest permissible ambient temp. 55 °C Lowest permissible ambient temp. 5 °C, Humidity class IP54
	- mechanical class	M1
	- electromagnetic class	E1

(\*) optionally

(\*) Possibility for battery replacement is country-specific, please check the relevant national regulations.



# Technical data temperature sensors

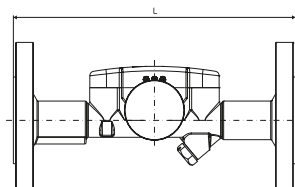
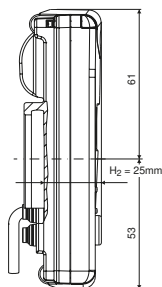
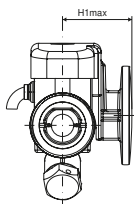
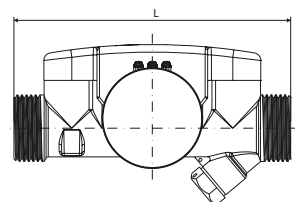
Platinum precision resistor		Pt 1000
Sensor type	mm	45 x 5.0 mm / 45 x 5.2 mm DS 27.5 / DS 38 Universal 6 - 150
Temperature range	°C	0 ... 105 / 0 ... 150 (*)
Cable length	m	q <sub>p</sub> 0.6 to 2.5: approx. 1.5 (optional: approx. 5) q <sub>p</sub> 3.5 to 10: approx. 5
Installation (*)	supply pipe	red
	return pipe	no marking or blue (according to the model)
		by direct immersion or by immersion sleeves (in case of existing measuring points)
		by direct immersion or by immersion sleeves (in case of existing measuring points)
		Integrated in the flow sensor, optionally external

(\*) Concerning existing immersion sleeves please observe the note in their chapter "mounting in existing immersion sleeves".

## Diameters [ \* ]

Nominal flow q <sub>p</sub> (m³/h)	L (mm)	Threaded connection	Flange
0.6	110	G¾B	
0.6	130	G1B	
0.6	190	G1B	DN20
1.5	110	G¾B	
1.5	130	G1B	
1.5	190	G1B	DN20
2.5	130	G1B	
2.5	190	G1B	DN20
3.5	150	G1¼B	
3.5	260	G1¼B	DN25
6	150	G1¼B	
6	260	G1¼B G1½B	DN25 DN32
10	200	G2B	
10	300	G2B	DN40

(\*) optionally



## MID - Conformity declaration

zelsius® C5-IUF is produced and tested in compliance with the European Measuring Instruments Directive 2014/32/EU (MID). According to this directive, devices are no longer carrying an initial verification stamp, but rather the year of the device's declaration of conformity (recognizable on the front of the device, for example: M16). The MID controls the use of heat meters up to the moment they are placed on the market resp. their first putting into use. After this, the national regulations for devices subject to compulsory verification apply within the EU. The duration of initial verification validity in Germany remains 5 years for heat meters. After this period has expired the measuring device may no longer be used for billing in commercial use. The regulations resp. validity period may vary in other countries of the EU.

If you have questions, please direct them to [support@zenner.com](mailto:support@zenner.com)

The declaration of conformity is attached to each measuring instrument. The latest information about this product can be accessed or downloaded from [www.zenner.com](http://www.zenner.com)

## Safety instructions

### *Electro-magnetic interference*

zelsius® C5-IUF fulfils the national and international requirements for interference resistance. To avoid malfunctions due to other interferences, do not install fluorescent lamps, switch cabinets or electric devices such as motors or pumps in the immediate vicinity of the meter. Cables leaving the meter should not be laid parallel to live cables (230V) (minimum distance 0.2m).

### *Care instructions*

Clean plastic surfaces with a damp cloth only. Do not use any scouring or aggressive cleaning agents! The device is maintenance-free during the service life. Repairs can only be made by the manufacturer.

## Installation instructions

### *Safety instructions for installation*

Read these instructions carefully right up to the end before starting to mount the device! The installation has to be done by qualified professional personnel. The current laws and regulations have to be observed, especially the PTB technical guidelines K8 und K9, EN1434 part 1+6, (in Germany also AGFW directive FW202, FW510, FW218 and DIN4713 part 4 and the initial verification directive). At devices with M-Bus the general rules of technology and the respective regulations

for electrical installations have to be followed. Make sure no heating water escapes during installation – **this can cause burns! Do not carry the meter by the cables.**

The maximum heating water temperature at the flow sensor may not exceed 105°C or 130°C. For heating systems with a lack of temperature mixing resp. with temperature stratification a straight pipeline of min. 10xDN has to be provided upstream of the meter. It is important to ensure adequate system pressure to avoid cavitation. To mount the heat computer of the C5-IUF in combi version on the wall, the supplied mounting adapter has to be used.

**With heating water temperatures with 90°C and more as soon as combined heat and cooling measuring or only cooling measuring the calculator have to mount on the wall for protection of external condensation. The supplied mounting adapter has to be used** (In the case of refrigeration and combined heat / cold metering devices, the cash registers are not calibrated and may not be used for billing purposes in commercial transactions. For this purpose, devices with a separate type-examination certificate are currently required)

### Mounting flow sensor (DFS)

- Mount ball valves up- and downstream of the DFS.
- Consider the correct installation point (supply or return). Normally this is the return pipe (cooler pipe at heating systems). Please note the type plate information.
- Consider the correct flow direction. This is indicated by an arrow on the side of the VMT.
- The flow sensor can be installed in any position (also „overhead“).
- Do not install at highest point of piping to avoid air inside the flow sensor.
- Consider the dimensions of the heat meter.

### Notes to installation of the ball valve

- Mount ball valves up- and downstream of the meter.
- Mount a ball valve with bore M10x1 for direct sensors in the supply. This is required for the installation of the supply sensor.
- For symmetrical temperature sensor installation, mount an identical ball valve in the return. This one is used for mounting the return sensor.

## Mounting heating-/cooling energy meter

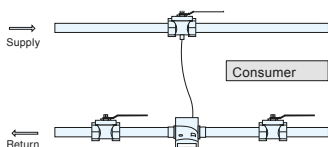
- Flush the system thoroughly before installing the heating-/cooling energy meter.
- Close valves and release pressure.
- Dismount the existing flow sensor or meter blank.
- Use only new and flawless sealing material and check the seal face for damage.
- Install the new flow sensor according to the correct flow direction and installation position.
- Turn heat computer to desired reading position.

## Installation of the temperature sensors

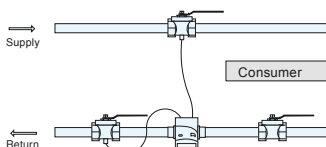
- The installation of the temperature sensors should be preferably symmetrical and direct installation.
- Do not remove the return sensor if already mounted on the VMU. This is also valid for all the safety seals which are mounted on the device as a standard.
- Sensors are colour-coded (according to the model): red= Supply (the hot side in

„Heating“ mode and the cold side in in „Cooling“ mode); blue= Return (the cold side in „Heating“ mode and the hot side in „Cooling“ mode).

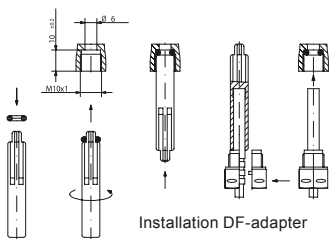
- The connecting cables may not be buckled, extended or shortened.
- The seal at the sensor installation point on the measuring capsule may not be damaged.
- Remove locking screw and seal at the ball valve completely, if existing.
- Attach the O-ring to the installation aid (the 2nd O-ring is only a spare O-ring). Using the installation aid, insert the O-ring into the installation point according to DIN EN 1434 with a slight circular motion.
- Using the other end of the installation aid bring the O-ring into the correct position.
- Insert the 2 halves of the plastic connector into the sensor's three notches (crimps) and press them together.
- Use the installation aid as positioning aid.
- Insert the temperature sensor into the installation point and



Symmetrical sensor installation for zelsius® C5-IUF with the return sensor integrated in the measuring capsule.



Symmetrical sensor installation for zelsius® C5-IUF.



screw it in tightly until the dead stop of the seal on the 12-point is reached (mounting torque 3-5 Nm).

- The temperature sensor installation point which is optionally integrated in the flow sensor must be secured.
- Secure the sensor after installation against unauthorised removal with appropriate sealing (available as a sealing set)!
- **Attention!** At the versions with temperature Installation DF-adapter sensor type TS-45-5 (see type plate at the sensor cable) both sensors must be always immersed directly in contact with the heat conducting fluid. The installation in sensor pockets is not allowed.

## Mounting in existing immersion sleeves

In Germany the C5 can be put into use in connection with existing immersion sleeves in accordance with the article "Putting into use of MID homologated temperature sensors" released in the PTB notifications 119 (2009), vol.9. Based on current information, the regulation has a period of validity until 30.10.2026. For the identification and marking of the usable existing immersion sleeves in connection with the C5 meter, an identification and marking set can be delivered from our company (order number 137382).

## Putting into use

- Open valves carefully and check installation for leakage.
- If the sleep mode of the counter is enabled (Display: SLEEP 1), then it must be deactivated by longer pressing the button (>5s).
- While the system is operating, check whether the volume display advances and the temperatures displayed correspond with the actual temperatures (see the display overview).
- Wait for the temperature display to be updated.
- Secure meter with the enclosed sealing material against unauthorised removal.
- Fill in the putting into use report in accordance with PTB-Directive TR K9.

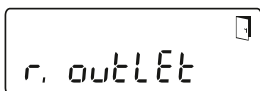
**Important notes:****Only for special version with programmable place of installation of the flow sensor.**

The meter is in the delivery status in sleep mode (SLEEP 1). If the meter is being awakened from the sleep mode, the place of installation on the following two display screens can be selected.

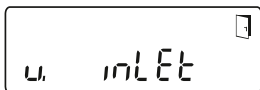
**The choice of the place of installation can be carried out only once. A subsequent change is not possible.**

With a short button press you can choose between the following two displays.

Installation return:



Installation flow:

**!! IMPORTANT !!**

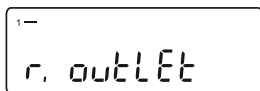
If this indicator appears on the display, the counter is still in sleep mode. Only when the installation position has been selected, the device is fully awakened.

The selection is being activated with the door symbol (top right of the display):

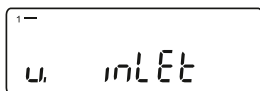
1. Press and hold the button.
2. Then release the button immediately.
3. The door icon disappears and appears after about 2 seconds again.

The selected setting is accepted and the unit is configured for the chosen place of installation.

The chosen place of installation is displayed as the final display position in the main display level (without the door icon) and can be checked again.



or

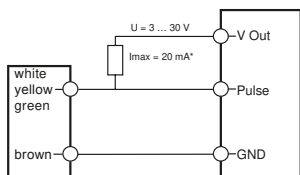


The meter is now ready for operation.

**Pulse inputs and outputs (optional)**

By meters with pulse inputs, the pulse value can be called up in the display (see the display overview, Level 4). The pulse value of the outputs is permanently set and corresponds with the last position of the associated display value.

## Typical connection (\*)



(\*) The connection of the external resistor could be necessary to ensure an integrated current limiter.

## Example:

Output 1 = energy output

Energy display = XXXXX.XXX

Last position = 0.001 MWh = 1 kWh

Output pulse = 1 kWh

colour	connection	signification
white	I/O 1	In-/Output 1
yellow	I/O 2	In-/Output 2
green	I/O 3	In-/Output 3
brown	GND	common ground for I/O 1-3

Technical data I/O	
Load max.	max. 30V DC/ 20 mA
I/O 1, 2, 3	Open Drain, n-channel FET
Cable	D = 3,8 mm, 4-core
Pulse-duty factor	1:1 (out); 1:5 (in)
Cable length	1,5m
Input frequency	max 1 Hz

## M-Bus (optional)

The optional M-Bus interface complies with the norm 1434-3 and operates with 2400 baud fixed. The two conductors can be connected in any order to the M-Bus network.

A firmly attached cable is included: external wiring must be done by oneself.

### Technical data M-Bus

Cable length	1.5m
Cable	D=3.8 mm, 2-core

colour	connection	signification
brown	M-Bus 1	M-Bus-Leitung 1
white	M-Bus 2	M-Bus-Leitung 2

## Programming of M-Bus address (optional)

- Select of the display „Adr0 000“ in level 3 (same for the additional inputs „Adr1“ to „Adr3“).
- Press the button for about 2 seconds (until the door symbol reappears) and then release. The right digit starts flashing. With one short push the value of the digit is incremented.
- With each long press, the selected value will take over and change to next digit (as soon as desired character blink, release the button). The new value is now programmed.
- If the desired value is reached you have to press the button until the number stops flashing and the return to the menu is completed.
- The programming process can be repeated if necessary.

**Note:** If the editor is not terminated, maybe changed values are being saved when automatically return to the main display.

## Radio (optional)

### *General information*

zelsius®-energy meters which have an integrated radio interface are marked for better visibility on the upper cover with the following symbol:



The radio interface is always deactivated on delivery. To activate the device, no software is required. Only the activated sleep mode has to be finished: Devices that are in sleep mode (Display: SLEEP 1) must be activated by at least five second press of the button until the energy display appears. The radio energy meters are equipped with an internal antenna.

**Technical data radio interface****Frequency band:** 868 MHz**Radio protocol:** Wireless M-Bus (EN 13757-4) and according to the Open Metering Standard.(OMS) different radio telegram contents are possible.**Data transmission:** unidirectional, Standard T1-Mode (bidirectional devices and other modes upon request)128-bit AES encryption.**Transmission interval:** depending on the used lithium battery and depending on whether the meter has additional inputs whose data will be transferred with. For example: zelsius C5 with C-cell, no additional inputs: Standard 20 seconds; other configurations are possible.**Transmitting power:** up to 25 mW**Content radio data protocol (Standard)**

Example	Heat Meter	Unit
Medium	Thermal energy	
Producer	ZRI	
Serial number	12345678	
Version	12	
Main energy meter	123456	kWh
Main volume meter	123456	L
Energy meter (consumption) on deadline	23456	kWh
Date of deadline	2013.12.31	
Volume flow	127	l/h
Performance	329.7	W
Supply temperature	44.3	°C
Return temperature	25.1	°C
Error Code	0	
Last previous month value	3456	kWh

other protocol values on request


**Important Note**

Devices, which are in sleep mode (Display: SLEEP 1) have to be activated through keypress until the energy display shows up.

The optical interface has to be activated by means of the OptoHead through keypress before reading out of the device.

## Simple example of the display menu

## Level 1



1468375 MWh

Heat energy  
(Main display)

468375 MWh

Cooling energy

00000000 MJ/h  
00000000 MKWh

Segment test

dd 01.12

Date last due date

1025.399 MWh

Energy  
Last due date

4154.365 MWh

Due date cooling energy

2376.429 m<sup>3</sup>

Volume

1.370 m<sup>3</sup>/h

Flow rate

87.20°C

Supply temperature

35.48°C

Return temperature


51.72°C

Temperature difference

28.3 kW

Current output

## Level 2



8.207 MWh

Heat energy difference  
from last due date to now

11088 MWh

Cooling energy difference  
from last due date to now

4036 MWh

Heat energy difference  
from 1. this month to now

6.048 MWh

Cooling energy difference  
from 1. this month to now

0.000 m<sup>3</sup>

Volume difference  
from 1. this month to now

3.418 m<sup>3</sup>/h

Maximal Flow

1.238 m<sup>3</sup>/h

Date month maximal flow

586.2 kW

Maximum power, Average value  
since commissioning

25.003 kW

Maximum heat energy power  
month

586.2 kW

Maximum cooling energy power,  
average value since commissioning

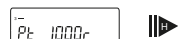
25.003 kW

Maximum cooling energy power  
month



Depending on you meter's model its displays can differ in number and order from those shown here.

### Level 3



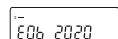
Sensor type and installation point DFS



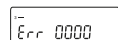
Serial number



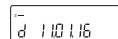
Model number



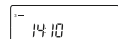
End of the battery



Error status



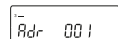
System Date



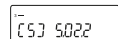
System Time



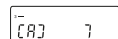
Operation hours



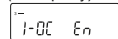
Primary M-Bus address



Firmware version (exemplary)



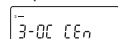
Revision of the approval (exemplary)



Function Output 1



Function Output 2



Function Output 3

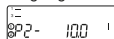


Opto readout energy

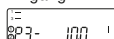
### Level 4



Impulswertigkeit Eingang 1



Impulswertigkeit Eingang 2



Impulswertigkeit Eingang 3



### Legend



Press the button briefly (S) to switch through the display from top to bottom. When you have reached the last menu item the device automatically jumps back to the menu item at the top (loop).



Press the button for about 2 seconds (L), wait for the door symbol to appear (upper right corner of the display) and then release the button. The menu is then updated resp. Switches to the sub-menu.



Hold down the button (H) until the device switches to another level or switches back from the submenu.

### Recall of software version number






The software version of the firmware can be accessed from the display level 3 (display level "firmware version").

A detailed display overview including sub-menu is available upon request.



## Status display / Error codes

The symbols in the table below show the meter's operational status. The status messages only appear in the main display (energy)! The temporary display of the warning triangle can be caused by special operating states and does not always mean that the device is malfunctioning. However, should the symbol be displayed over a longer period of time, you should contact the service company.

Symbol	Status	Measure
	External voltage	-
	Flow existent	-
	Attention!	Check system /device for errors
	■ SSymbol flashing: Data transmission	-
	■ Symbol constantly displayer: optical interface active	-
 	Emergency operation	Exchange device

Code	Error	Measure
1	Temperature out of measuring range	Check sensors
2	Temperature out of measuring range	Check sensors
3	Short circuit return sensor	Check sensors
4	Interruption return sensor	Check sensors
5	Short circuit supply sensor	Check sensors
6	Interruption supply sensor	Check sensors
7	Battery voltage	Exchange device
8	Hardware error	Exchange device
9	Hardware error	Exchange device
10	Error in the measuring system	Exchange device (**)
20	No water in the measuring tube	Check operating pressure (**)
30	Reverse water flow detected	Check installation position (**)
40	Air inside the medium	Vent system (**)
50	Measured value outside overload range	Check dimensioning (**)
100	Hardware error	Exchange device
800	Wireless interface	Exchange device
1000	Status end of the battery	Exchange device respectively battery
2000	Status Initial verification expired	Exchange device

(\*\*) only by zelsius® C5-IUF

Error codes show faults detected by zelsius® C5-IUF. If more than one error appears, the sum of the error codes is displayed: Error 1005 = error 1000 and error 5.

## Disposal

**Attention:** This device contains a **non-removable and non-rechargeable lithium battery**.

Batteries contain substances, which could harm the environment and might endanger human health if not disposed of properly. To reduce the disposal quantity so as unavoidable pollutants from electrical and electronic equipment in waste, old equipment should be reused prior or materials recycled or reused as another form. This is only possible if old equipment, which contains batteries or other accessories are disposed. Therefore please contact the department of your local authority which is responsible for waste disposal. Alternatively a waste disposal via ZENNER is possible. Your local or municipal authority or the local waste disposal company can give you information relating the collection points for your used equipments.

## Attention:

**Do not dispose of the devices with domestic waste.**

In this way, you will help to protect natural resources and to promote the sustainable reuse of material resources.



For any question, please contact [info@zenner.com](mailto:info@zenner.com)

The latest information about this product and of our installation notice can be accessed or downloaded from [www.zenner.com](http://www.zenner.com).

## ZENNER International GmbH & Co. KG

Römerstadt 6  
D - 66121 Saarbrücken

Telephone +49 681 99 676-30  
Telefax +49 681 99 676-3100

E-Mail [info@zenner.com](mailto:info@zenner.com)  
Internet [www.zenner.com](http://www.zenner.com)