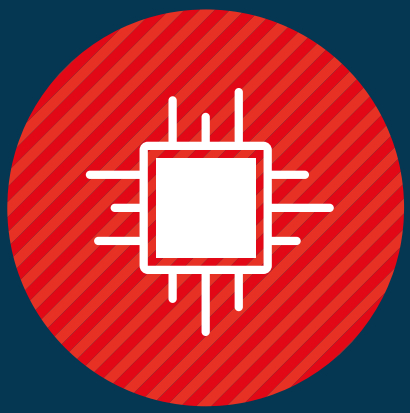
MICRO-HYBRID



# ELECTRONIC MICRO SYSTEMS

Micro-Hybrid | Product Catalog 2016 / 2017

Micro-Hybrid Electronic GmbH is a high-technology company for electronic micro systems and infrared components.
We develop customer specific innovative solutions and offer distinct product features for sophisticated applications.
Micro-Hybrid designs electronic and sensor systems for global markets of industrial automation, medical and environmental technology as well as aviation. Micro-Hybrid is part of the Micro-Epsilon Group.

*Dear readers,*

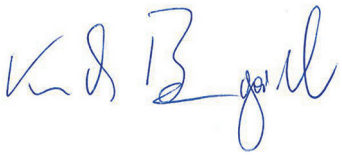
you are looking for a smart electronics solution? You are interested in individual options to build modules living up to high standards as to stability and reliability?

Readily-available standard technologies do not support the performance of your product? Our products and technologies will improve your system!

Together we will create technically innovative solutions that will result in tangible competitive advantages for you. Our services and products are highly performant and custom designed in every aspect.

**ONE-STOP-SHOP**
From consulting, development and component design all the way to series production we offer the entire supply chain management. It is entirely up to you to decide at which point of the value added chain you want to enter. It's your ONE-STOP-SHOP solution for your specific microsystem.

## Welcome at living microworlds.



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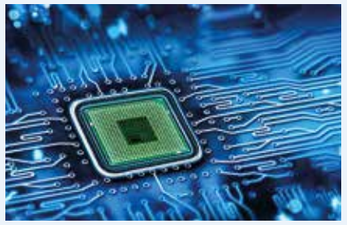
APPLICATIONS

# Efficient customized technology solutions

Micro-Hybrid develops and produces high-quality electronic micro systems and modules for measuring, control and testing applications:

- Medical technology
- Industry and Automation
- Semiconductors
- Power electronics
- Data and communications



As part of our qualification management, all components are subjected to stringent testing (standard / customer-specific), to guarantee the quality and reliability of our electronic micro systems.

## Quality processing by high standards

- Burn-in testing
- Lifespan testing
- Temperature cycle test
- Temperature humidity test
- High temperature storage (HTS)
- High temperature operating life (HTOL)
- Vibration & acceleration
- Drop testing
- Material testing lab (metallography, structural analysis, strengh determination, ...)
- 3d microscopic measurement methods for evaluation of micro mechanical components
- fine and broad leakage testing to determine hermetic sealing
- visual inspection according IPC610 by trained staff (ESA quality certifcation)
- 100% final inspection including test certificate

## Certifications

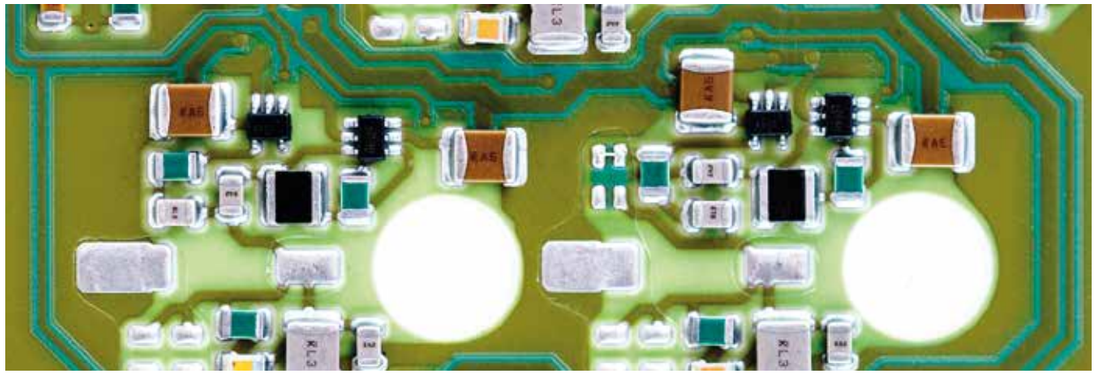
- ISO 9001:2008
- IPC 610
- HL3-ECSS-Q-ST-70-08C (High quality manual) soldering and in house training

*More information about our testing standards on page 20.*

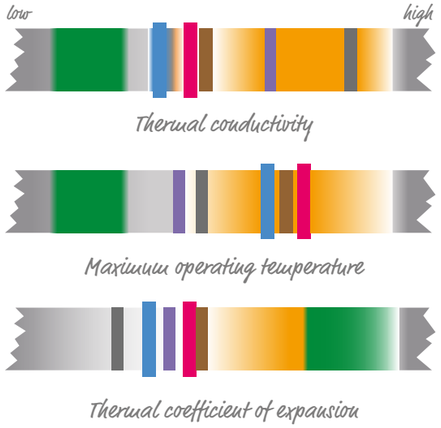
↗ PCBA

# Electronic micro system performance starts here

# Printed circuit board assembly



Using excellent characteristics of ceramic circuit boards we empower electronic micro systems to fullfill high-tech requirements.




Ceramic PCB exhibit advantageous properties compared to typical materials of microsystem technology.
In particular, thermal conductivity, thermal coefficient of expansion and operating temperature allow sophisticated micro systems for harsh environments.

- LTCC
- FR4
- HTCC
- $Al_2O_3$
- Si
- GaAs
- Metal

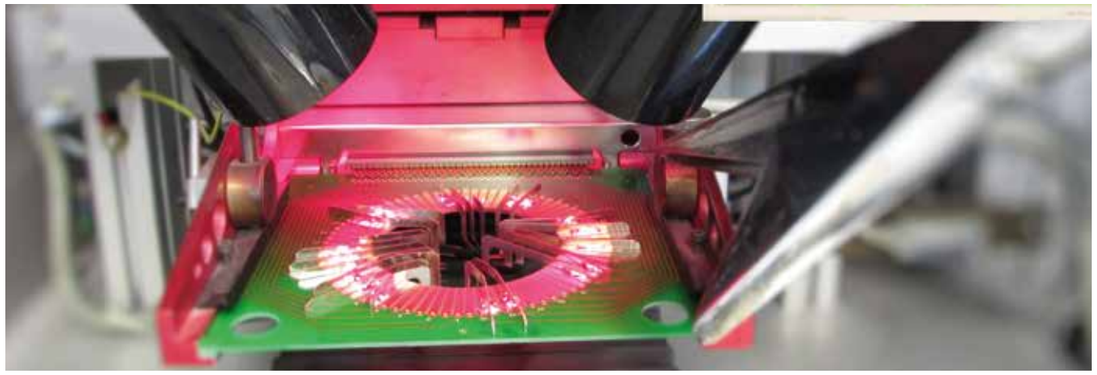
## Board Technologies

- $Al_2O_3$ thick film ceramic
- LTCC
- Multi layer for 3D functionality
- Organic PCB (FRx, PTFE, rigid-flex, ...)
- AIN
- Thin film

## Sinter furnace

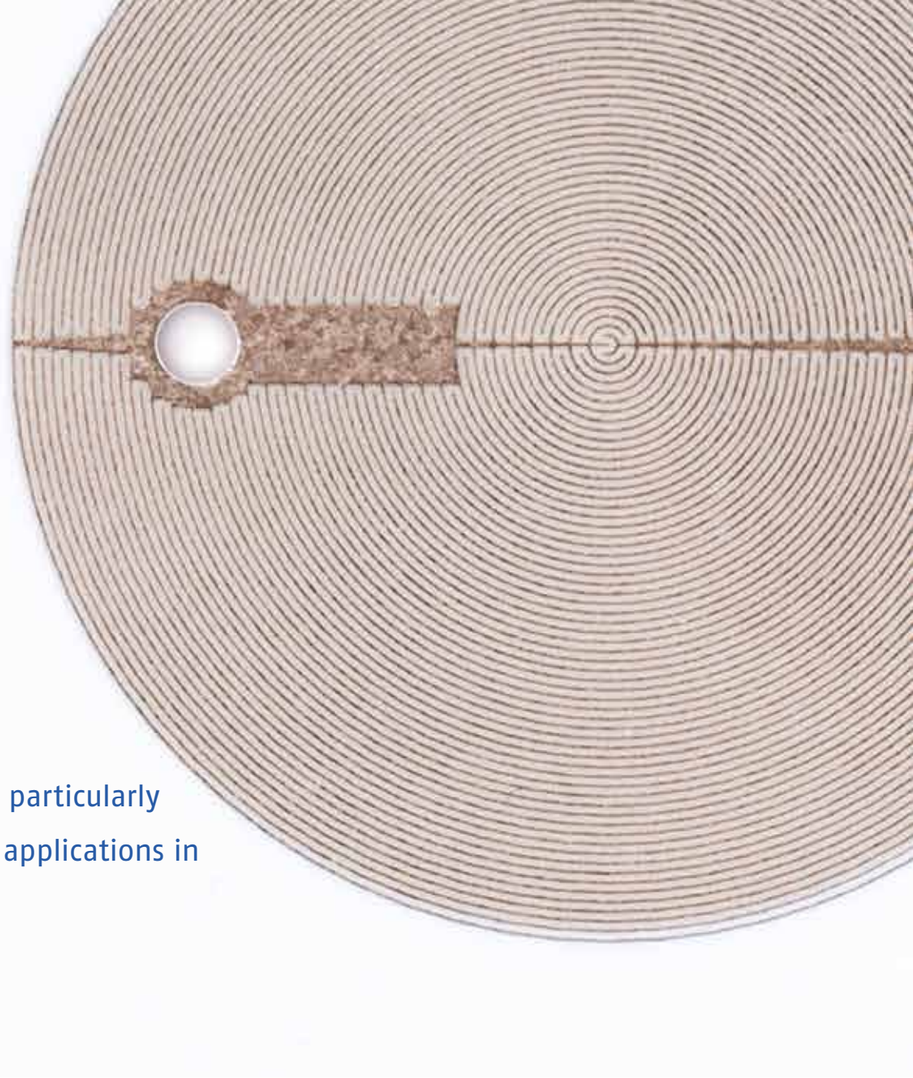
- Sirratherm 1500
- Ekra CPS (Fully automatic screen printing line)
- REHM (specially made for Micro-Hybrid: improved automation by drying magazines)

# Thick film circuits



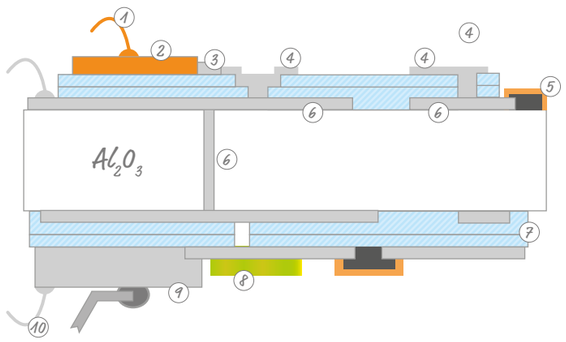
**Assembling electronic circuits on thick film substrates we use diverse processes:**

- Screen-printing technique for resistors, conductors, contact systems and multi layers
- Active and passive laser trimming
- Screen-printing of overglaze and protective lacquer



Thick film circuits are particularly suitable for eletronic applications in harsh environments.

## Standard hybrid double sided mixed metal

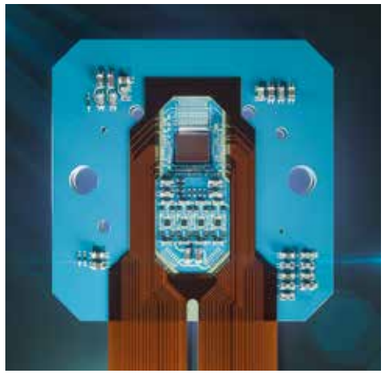


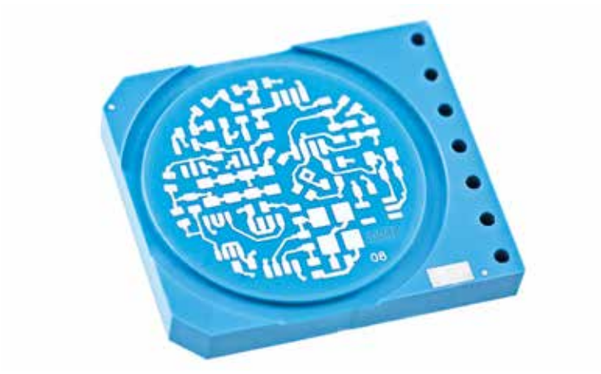

*1 – Au wire*
*2 – Au conductor (wire bonding)*
*3 – AgPd interface to Ag*
*4 – AgPt / AgPd solderable*
*5 – Overglaze to protect resistors*
*6 – Ag conductor for viafill and wiring*
*7 – Dielectric*
*8 – Overglaze as solder stop or protection*
*9 – AgPt for Al wire / heavy wire or soldering*
*10 – Al wire*

**Technical details**

| | |
|---|---|
| *Substrate:* | *$Al_2O_3$* |
| *Standard size:* | *4“ × 4“* |
| *Standard substrate thickness:* | *0,25 – 1 mm* |
| *Screen-printing:* | *typical thickness ca. 5 ... 50 µm* |
| *Paste systems:* | *AgPd, AgPt, Au, resistor pastes, dielectrics, overglaze* |
| *Construction:* | *Monolayer<br>Multilayer, typically: 4 layers<br>duplex print<br>metallized through-holes / vias / interlayer connection* |
| *Resistors:* | *Thick film pastes, trimmable, also PTC for sensor applications* |

# LTCC – Low temperature cofired ceramics



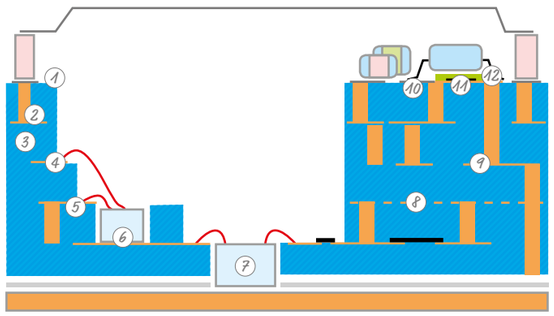


In case of applications with especially demanding nature, wether in space or harsh environments on earth, LTCC multilayer circuits master the mission.

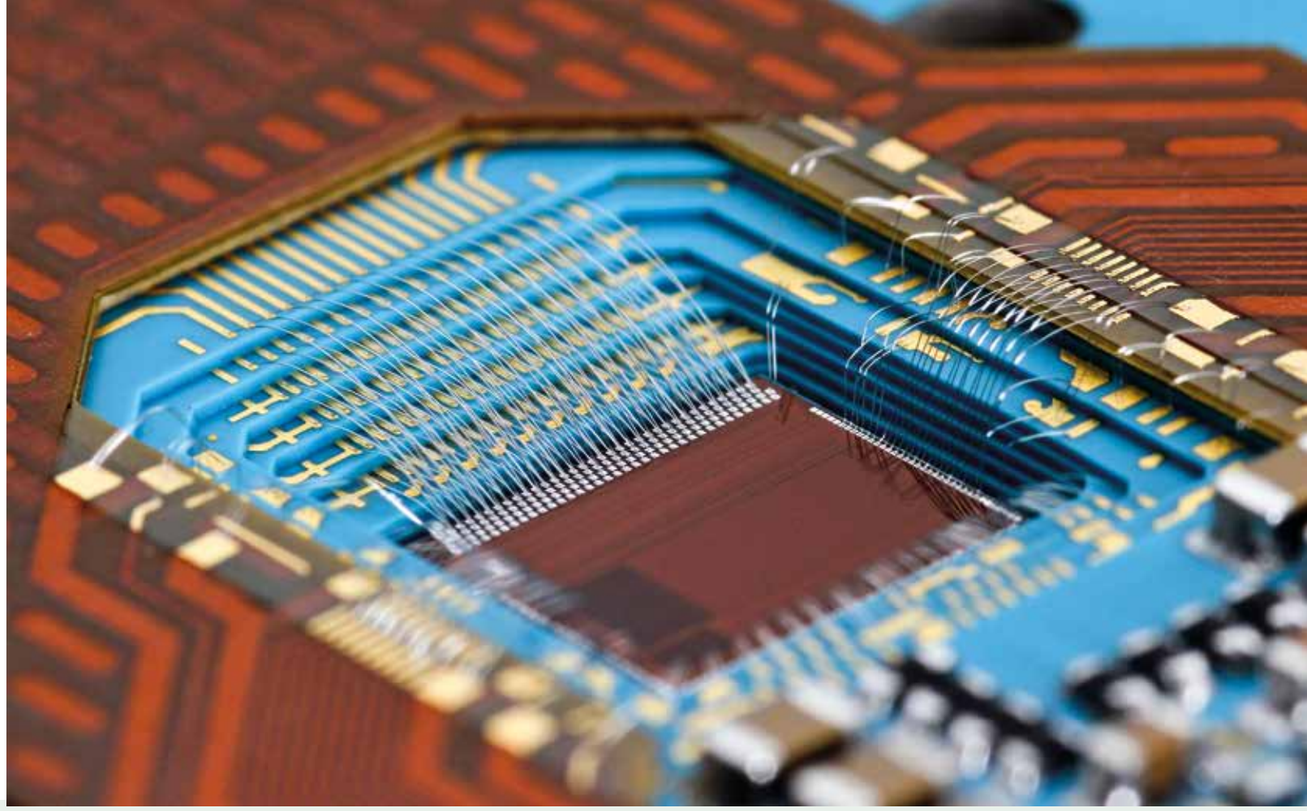
**Fields of application for LTCC**

- **High frequency circuits** – highest possible system integration
- **Medical technology** – request for sterilisation
- **Harsh environment** – for example vacuum, high temperature lacquer
- **High degree of integration** – realisation in stepped cavities
- **Special application for thermal decoupling** – infrared detectors and emitter

## Typical setup of a LTCC assembly



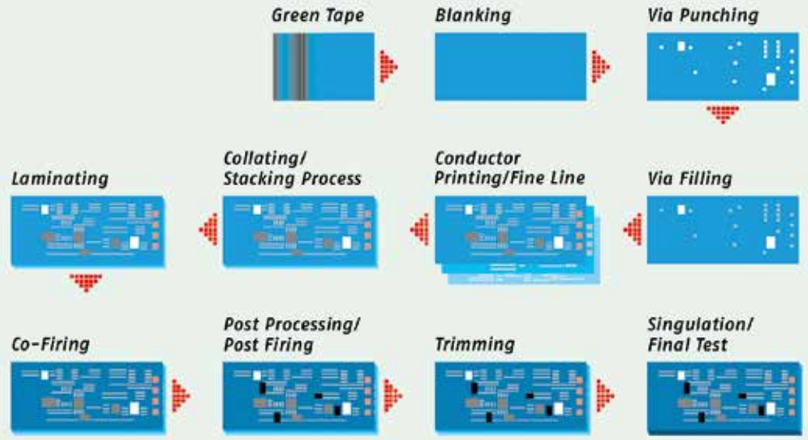

*1 – Metallization for brazing*
*2 – Vias*
*3 – Structured ceramic layers*
*4 – Boudpads*
*5 – Stepped bouding planes*
*6 – Cavity for chip element*
*7 – Cutout fo assembly on heat sink*
*8 – GND-planes*
*9 – Inner layer metallization*
*10 – Solderable metallization*
*11 – Resistors*
*12 – Solder stop / overglaze*



**+ Advantages**

*High integration density (3D-ceramic multilayers – down to 50 µm)*
*Long lifetime*
*High temperature capability*
*Temperature change resilience*
*Dielectric strength*
*Highly reliable metals*
*Excellent RF behaviour*
*TCE matching to silicon*
*Chemical and vacuum resistance*

## Processflow LTCC



# Skills and technologies

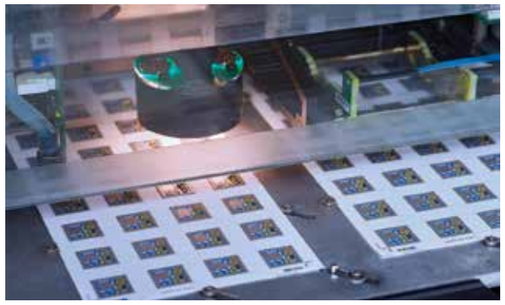


## SMD / THT Assembly

To manufacture high complex circuits we use the lates assembling technologies and invest regularly in machinery and equipment.

### Machine park PCB

- SMT Quattropeak M + Nitro
- Soldering Paste Yamaha YSP10
- Soldering Paste Printing DEK Horizon03i
- Mycronic TP9, TP9U
- Mycronic MY-12 1,  MY-12-2
- AOI OptiCon AdvencedLine, BasicLine



### Automated assembly

### Manual assembly
Components, unsuitable for automated assembly

- Circuit board size up to: 450 mm x 500 mm
- Chip (from 01005), SOIC, SOT, SOD, TSOP, MELF, CSP, QFP, BGA
- Leadframes for SIL / DIL with pitches 1,27 mm and 2,54 mm

### Cleaning of components / devices

- Automated process flow
- With or without ultrasonic
- Solvent-based or water-based

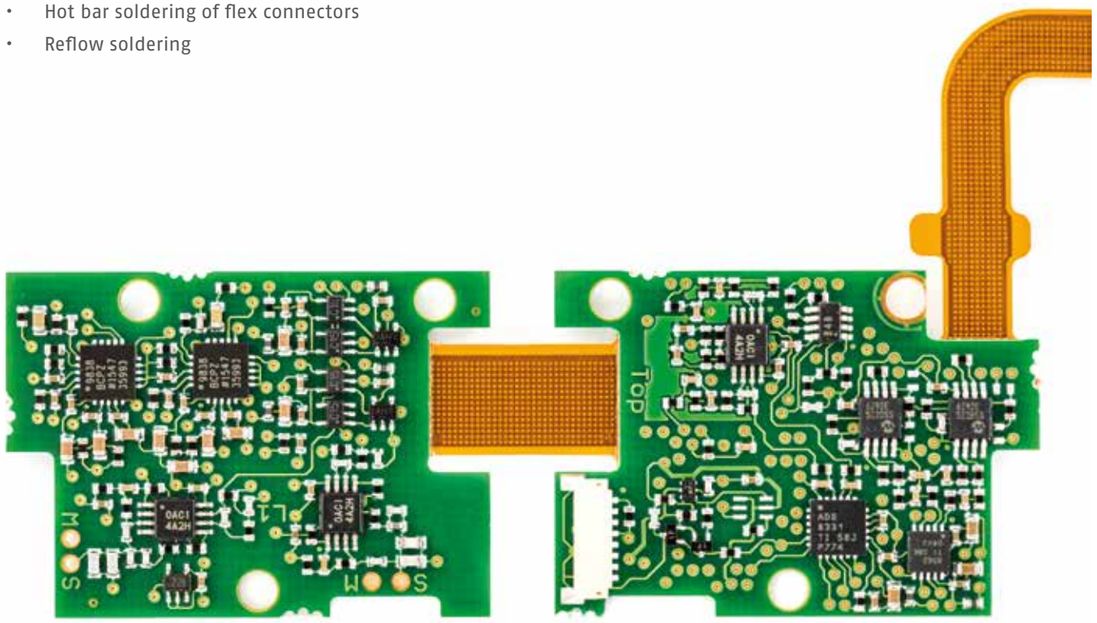
# Soldering assembly

### Process controlled soldering

- Selective soldering
- Vapour-phase soldering
- Vacuum soldering
- Inert gas soldering
- Protective gas soldering
- Hot bar soldering of flex connectors
- Reflow soldering

### Manual soldering

- Manual assembly of SMD and THT components
- Soldering of non SMD components, special components or connectors according to IPC 610
- Production according to ESA standard (Aerospace)





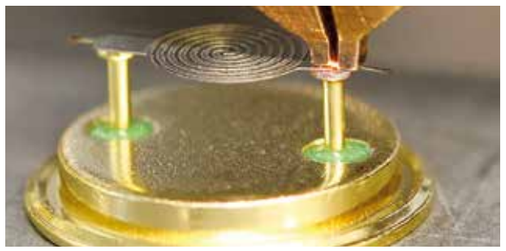

# Micro assembly

Construction of complex miniaturized systems with various technologies and materials in our own production.

### Construction

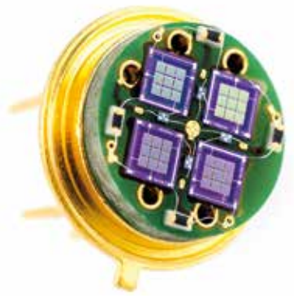
- **Plasma surface treatment**
  semiconductors, optical and structural elements

- **Chip assembly of**
  semiconductor chips, LED, MMIC with adhesives, sintering materials, soldering materials on rigid and flexible substrates:
  - MEMS chips (IR emitter, thermopile, pyroelectric, ...)
  - Optical elements (IR filter, lenses, ...)
  - Gap welding
  - optional: UV curable adhesives



### Wire bonding

- Aluminium wire, gold wire
- Wedge-wedge ultrasonic bonding
- Bonding in cavities
- Fine-pitch, ribbon, high frequency applications
  - Series production of small to medium volumes
  - Serial production of up to 1 million units per year



# CIRCUIT PROTECTION

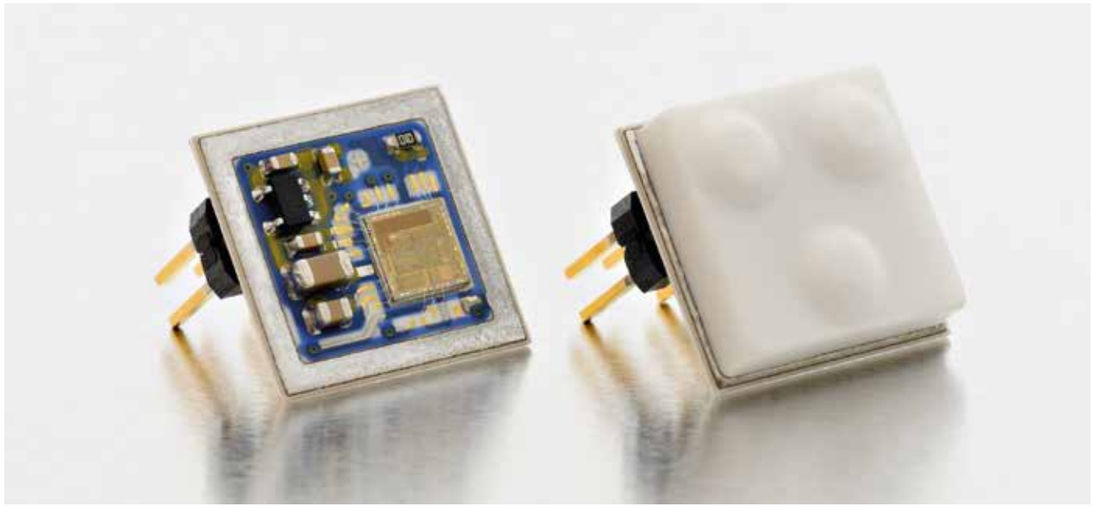
## Up market micro systems for harsh environments

**Passivation / Glob Top**

Protective lacquering, Glob Top, component casting



# Circuit protection technologies



We offer suitable technologies to protect circuits against environmental and chemically agressive influences by coating or housing.

### Hermetic sealing

- Metal–glass packages
- Ceramic–metal, ceramic–ceramic packages
- Bake out and evacuation for vacuum applications
- Inert gas backfilling
- Welding process, soldering process

### Leakage test

- Gross leak test
- Helium fine leak test

### Vacuum and inert gas soldering

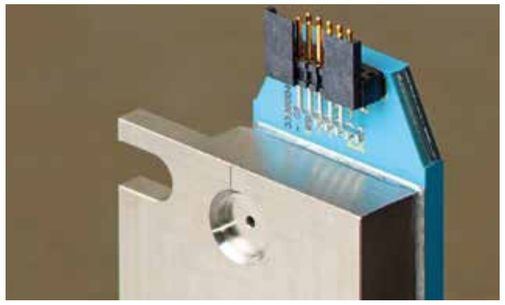
- Metal package, ceramic package, IR filter, with and without flux

### Parylen coating

- Typ N, C, F

### Welding techniques

- Laser welding
- Resistance projection welding



# PACKAGING APPLICATION

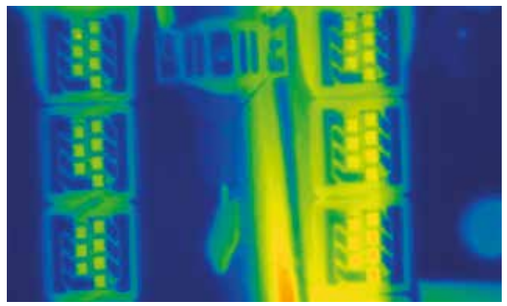
# High performance LED modules



We developed LED packaging technologies to achieve optimal performance and perfect integration at once. Due to their efficient performance power LED emitters are used in various industrial fields.

## + Advantages of Micro-Hybrid LED modules:

- *Particularly high luminance of light sources*
- *Intelligent heat management by using ceramic substrates*
- *Long lifetime of LED components*
- *Integration of optical elements*
- *Individual adaption of CoB technology*



*IR thermo optical test*

## Applications

- Surface coating
- Curing of laquer surface and adhesives
- Chemical, medical and biotechnological applications

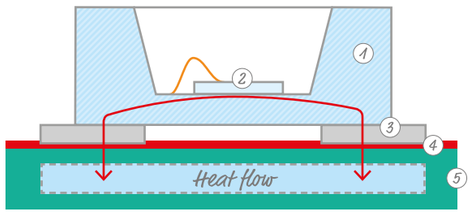
## Quality management

- SPC of individual processes
- 100% IR thermo optical control of mounted LED

## Standard process LED packaging:

SMD assembly of LED components on PCB

- \+ *Cost effective*
- − *Limited degree of integration and limited max. optical performance*

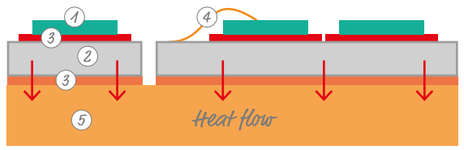



*1 – SMD housing*
*2 – LED chip*
*3 – Solder*
*4 – Conductor track*
*5 – PCB*

## Micro-Hybrid advanced LED Packaging:

Chip and wire process on ceramic substrates as subcarrier and for heat storage
Substrate assembly on metallic heat sink

- \+ *High degree of integration*
- \+ *High attainable optical performance*




*1 – LED (bare die or flip chip)*
*2 – Substrate*
*3 – 2 x TIM (LED, substrate)*
*4 – Boud wire*
*5 – Heat sink*

Optimizing the packaging by considering the thermal path from the LED to the cooling medium, we maximize the attainable optical power.

- *Using carrier substrates and jointing materials*
- *Electrical controlability by complying current carrier capacities of conducting track materials*
- *Maximum integration level by using LED in chip or flip chip forms*
- *AIN ceramic substrates as subcarrier and heat storage (thermal conductivity...)*
- *Special qualified jointing materials for LED and substrate assembly*
- *System reliabilty by 100 % IR thermo optical control of mounted LED*

# Customized development

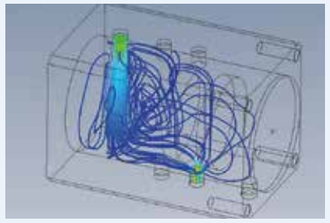
## High-level electronic micro systems

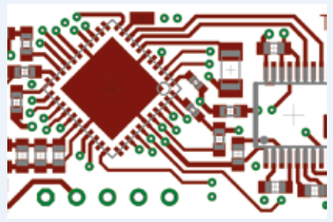
Within our application consulting we closely cooperate with you to find the perfect combination of technological options to realize the ideal electronic micro system. In this way even such projects come true that cannot be realized on the basis of conventional production standards. Even harsh environments won´t stop us.

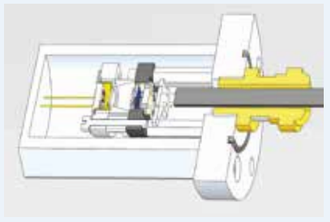
Whether at the idea-finding, concept or product development phase – you can access the project at any stage of the development process. We synergistically combine our technological competencies in electronic and mechanical design, software engineering, optics, microelectronic packaging as well as simulation and test to perform the optimal customized solution.

For you to reach your goals, we are also able to adapt and further develop our existing technologies and processes as part of our process development.

Joint and cooperative projects with renown universities and institutes regularly provide us with new impulses to extend our portfolio. A powerful team consisting of physics, technologists, design engineers, hard- and software developers is awaiting your challenge!









### Technology development

- Ceramic board technologies: development of new material systems and combinations for thick film, LTCC, AIN, tape on substrate, SiC, isolated metal support, thick film on metal
- Assembling and soldering technologies
- Chip on board
- Hermetic sealing technologies

### Product development

- Mechanical 3D design and construction
- Flow and thermal simulation
- Analog and digital electronic hardware design and simulation
- Microcontroller and PC based software design and simulation
- Measurement systems for optical characterization and calibration
- Durability and reliability verification
- Statistical evaluation of all measurement results
- Customized housing and packaging
- Micro system CAD
- Layout for PCB, thickfilm and LTCC circuits

### Test and measurement equipment

- Pyrometers and infrared cameras
- FTIR spectrometer with external input for IR sources
- Calibration black body up to 1200 °C
- Calibration systems for gas measurement
- Measurement equipment for electrical characterization and calibration
- Surface and 3D analysis
- Geometrical measurement / test
- AOI tests, optical measurements
- He leakage test for hermetically sealed components
- Burn-in-test

### Laboratory

- Metallographic analyses
- Environmental tests
- Fast temperature change – thermocycling
- High and low temperature storage (+300 °C; -70 °C)
- High humidity storage
- Mechanical vibration and acceleration
- Rapid prototyping of electronic and mechanical development samples
- Development of customized optical and electrical test equipment
- Strength tests (shear, pull, peel, ...)
- Microsystem / quality / clime tests

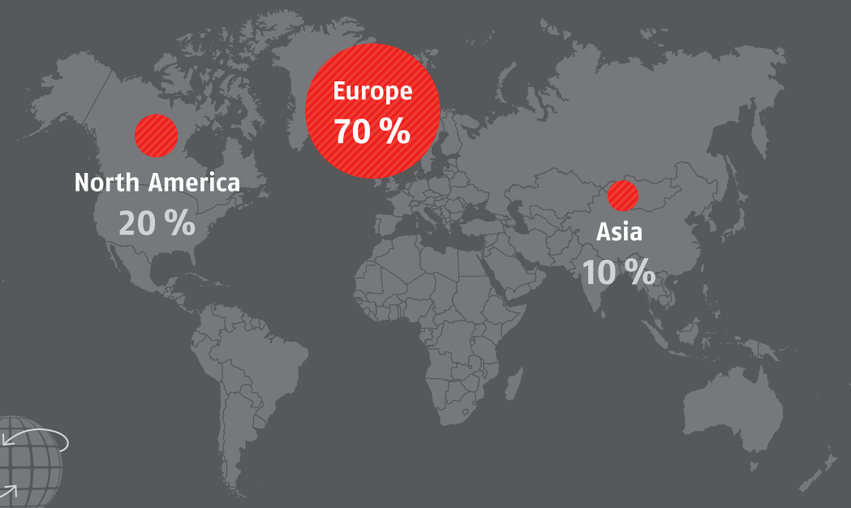
# FACTS & FIGURES

**3 manufacturing sites in Germany**
*Headquarter – Hermsdorf*

**130 employees**
*A powerful team is awaiting your challenge!*

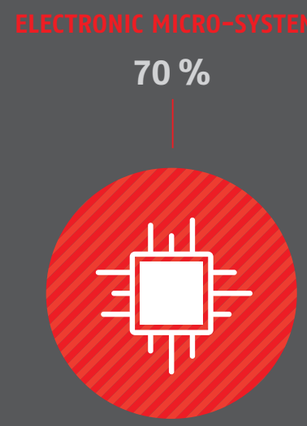
**International sales**
*Individual micro electronic solutions world wide*

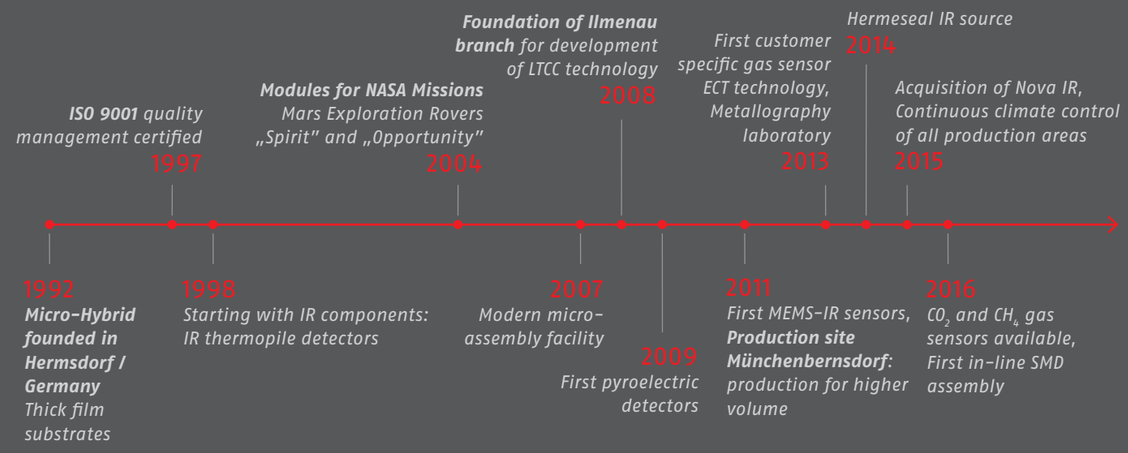
**International sales** *2015 – Over 15 mill. dollar worldwide*




*International distribution*

**Business segments** *(2015)*

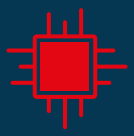



- 5,000 qm production area
- 5 mill. investment in innovation and growth
- Majority owner of NOVA IR MEMS fab, Tucson USA
- Micro-Hybrid is part of Micro-Epsilon Group

*www.micro-epsilon.de*

*All technical data are based on simulations and tests and subject to change without notice.*



Enter New Space.

MICRO-HYBRID

# ELECTRONIC
# MICRO SYSTEMS

**International Sales**

*Worldwide availability of product portfolio*

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