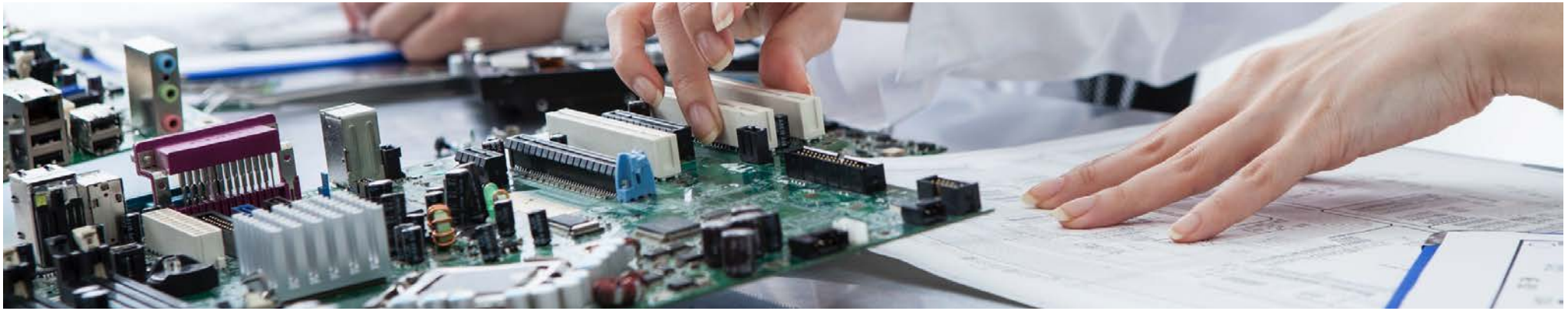
Art of Technology

Innovative Electronic Design and Development Services



Company Overview

- Established 1999
  - Spin-off, ETH Zurich
  - 100% privately owned
  - 16 employees
- Independent contract developer
  - Electronic design and development services
  - Development according to GAMP
- Certified to ISO9001 and ISO13485
  - including medical devices and active implants

QUALITY

ISO9001 / ISO13485

SQS

Certificate

SQS herewith certifies that the company named below has a management system which meets the requirements of the standard specified below.

Art of Technology AG
Technoparkstrasse 1
8005 Zürich
Switzerland

Scope of certification

Whole Company

Field of activity

Design and development of customer specific microelectronic solutions

Normative base

EN ISO 13485:2016 Medical devices – Quality Management System

Validity 15.09.2018 – 14.09.2021
Issue 15.09.2018

Reg. no. 44715

X. Edelmann, President SQS

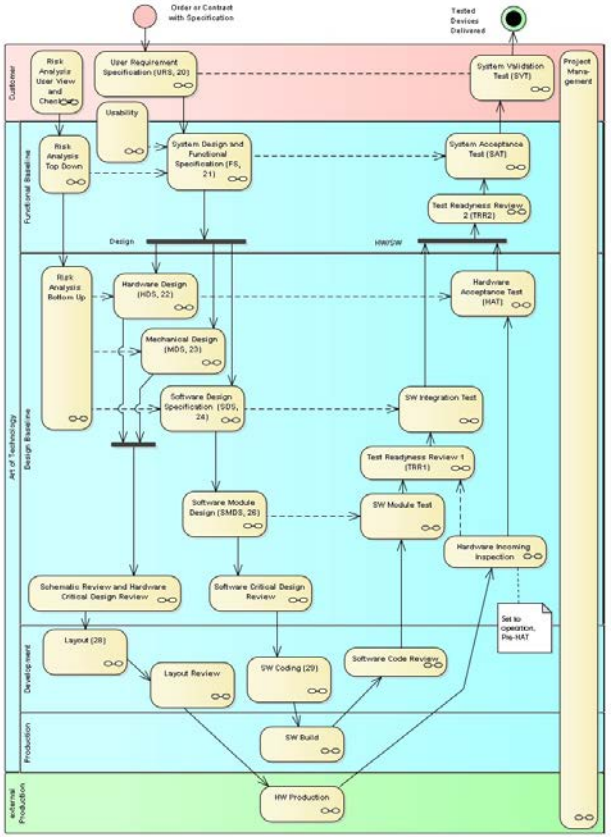
F. Müller, CEO SQS

Swiss Association for Quality and Management Systems SQS
Bernstrasse 103, 3052 Zollikofen, Switzerland

Swiss Made

Partner of IQNet

DEVELOPMENT ACCORDING TO GAMP



Design and Consultancy Services

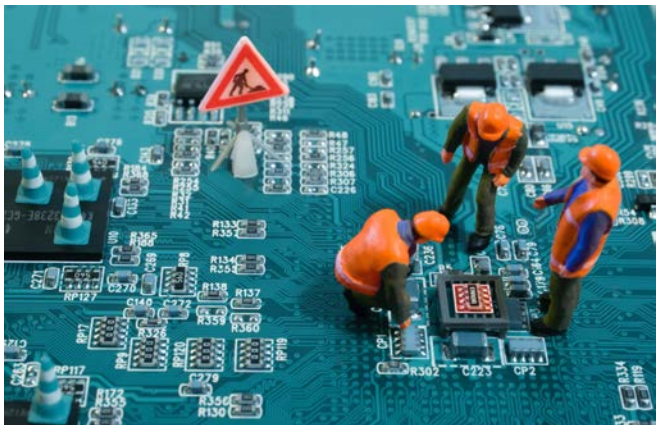
- Research and technology studies
- Design reviews and troubleshooting
- HW and SW system development
- Production set-up and support
- Support for start-up companies
- Support for universities

Core Expertise

- System miniaturisation and cost optimisation
- Low power electronics and power management
- Cryptography and data security
- Analogue and digital electronics
- High and low level embedded software
- Standard and special technologies
- Extreme and harsh environments where exceptional reliability is required e.g. ATEX, Medical and Space

Typical Applications

Data Communications & Data Security



Industrial

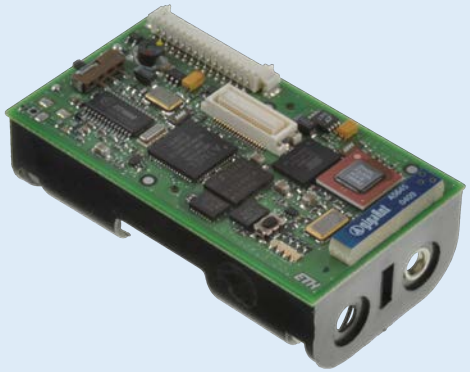
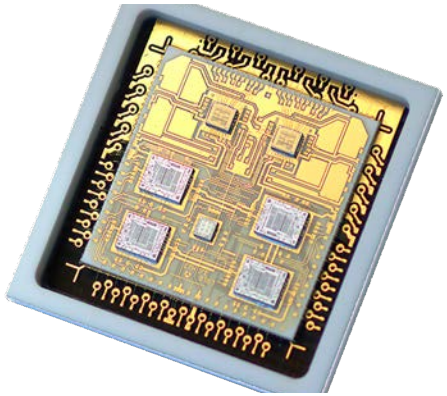
Medical Devices & Active Implants

Optical Systems

Space

Extreme & Harsh Environments

Data Communication

Project	Our Contribution
	■ BTnode (research project) ▫ Design and development of electronics module ▫ Wireless communication ▫ Wired and wireless interface to sensors and actuators ▫ Production and test of small series
	■ Direct Broadcast Satellite (DBS) Switch ▫ Design and development of switch module using wire-bond technology ▫ Increased functionality and efficiency ▫ Reduced complexity of motherboard ▫ Production and test of prototypes ▫ Reduced manufacturing costs (obviating need for ASIC design)

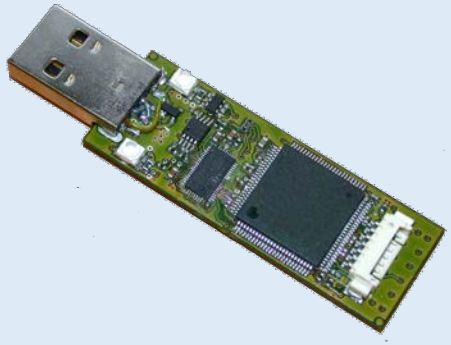
Data Communication

Project	Our Contribution
	■ PermaSense (research project) ▫ Design, development and industrialisation of wireless GPS-system (HW) ▫ Specialised sensors and electronics in a robust package ▫ Battery operated (3 year lifespan) ▫ Production of small batches of all product variants ▫ 6 months from concept to first production batch
	■ RFID-Reader ▫ Contactless system, card reader and key card ▫ Design and development of electronics, firmware and housing ▫ Production and test of prototypes (including CE certification)

Data Security

Project	Our Contribution
	■ Electronic Business Card ▫ Design and development of electronics and firmware ▫ Implementation of proprietary communication protocol ▫ Production and test of prototypes ▫ 200k / month for more than one year
	■ Ethernet Diode ▫ Design and development of hardware based unidirectional network link ▫ Development of ethernet protocol based communication software ▫ Authentication, Authorisation and Privacy encryption ▫ Production and test of commercially used devices ▫ Installation, commissioning and maintenance

Data Security

Project	Our Contribution
	■ Secure USB-Stick ▫ Data encryption on flash memory (Triple-DES or AES) ▫ Private key stored on smart card ▫ 3 partitions (boot, application software and encrypted data) ▫ User software (WIN and LINUX) ▫ Firmware, administrator and development tools

INDUSTRIAL

Project	Our Contribution
	■ General Purpose Voltage Amplifier ▫ System and detail electronic design ▫ Layout and production set-up ▫ Prototype production ▫ Software design ▫ Integration HW / SW
	■ Optical Temperature Measurement ▫ Contactless system, card reader and key card ▫ Design and development of electronics, firmware and housing ▫ Production and test of prototypes (including CE certification)

Medical Devices

Project	Our Contribution
	■ Dental Drill ▫ Design and development of electronics and firmware ▫ Production and test of prototypes ▫ Technical documentation and risk management
Under NDA	■ Stem Cell Injection System ▫ Design and development of electronics and firmware ▫ Production and test of prototypes ▫ Technical documentation and risk management

Medical Devices
In-Vitro Diagnostics

Project	Our Contribution
	■ Early Diagnosis of CVD ▫ Design and development of electronics and firmware ▫ Production and test of prototypes ▫ Development of concentrator electronics and optical readout system
	■ Ultra-Precise Single Cell Gel Electrophoresis ▫ Design and development of electronics and firmware ▫ Technical documentation ▫ Production and test of prototypes ▫ Volume production of devices

Medical Devices

Intelligent Implants

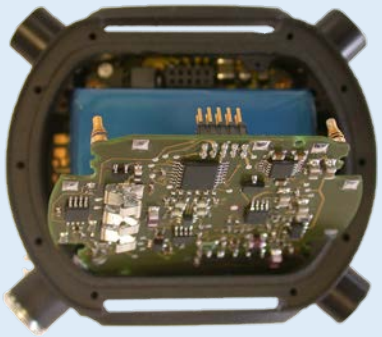
Project	Our Contribution
	■ Ascites Pump ▫ System analysis and specification, Risk Management analysis ▫ Re-design of hardware and firmware, improved functionality of hardware and software ▫ Optimisation of thermal management ▫ Adaptation of motor controller firmware ▫ Intelligent failure tolerant design (motor controller) ▫ Design optimised for production and test ▫ Technical support during clinical trials (remote and on-site) ▫ Support with documentation and CE certification
	■ Smart Charger (for Ascites pump) ▫ Design and development of smart charger and test equipment ▫ Wireless data transfer from implant to charger (during charging cycle) ▫ Data communication from charging station to doctor ▫ Technical documentation: electronics, software and testing (HW, Software, System and EMC)

Medical Devices

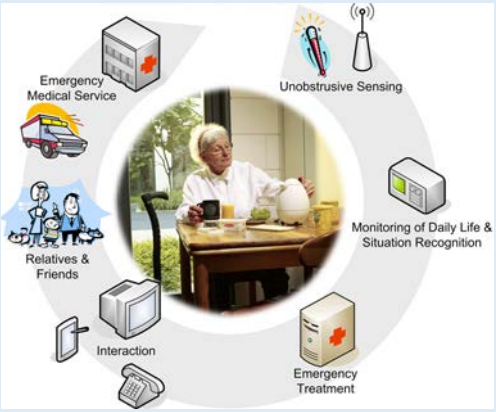
Intelligent Implants

Project	Our Contribution
Under NDA	■ Artificial Urinary Sphincter ▫ Design and development of electronics and firmware ▫ Production and test of prototypes ▫ Technical documentation for electronics and firmware ▫ Data communication from manipulating device to implant
	■ Intramedullary Lengthening Device ▫ Design and development of electronics and firmware ▫ Production and test of prototypes ▫ Battery-less system ▫ Wireless communication and energy transfer during charging cycle ▫ Technical documentation for electronics and firmware

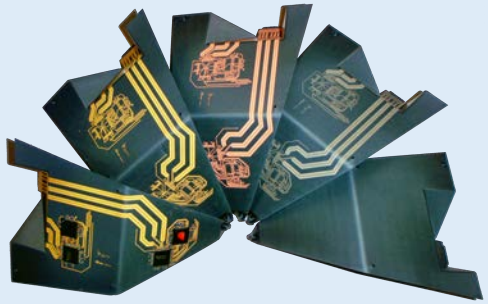
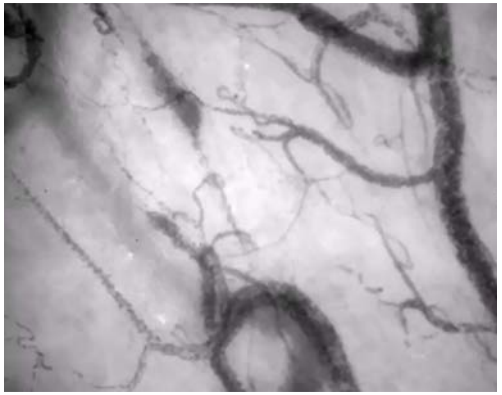
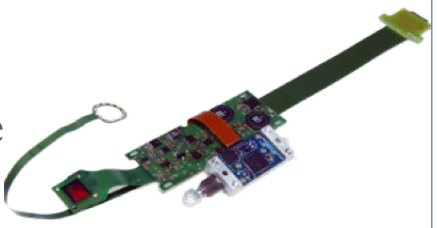
Medical Devices
Wrist Worn Devices (WWD)

Project	Our Contribution
	■ Blood Glucose Monitor (non-invasive) ▫ Design and development of electronics and firmware (incl. risk management) ▫ Production and test of prototypes ▫ Device calibration for clinical trials and support during certification audits ▫ Technical documentation: electronics, software and testing (HW, SW, System, EMC)
	■ Blood Pressure Monitor (non-invasive) ▫ Design and development of electronics and firmware ▫ Production and test of prototypes ▫ Documentation for ethics commission and technical documentation ▫ Risk analysis of clinical trial for national authority ▫ Technical support during clinical trials and data evaluation

Medical Devices
Wrist Worn Devices (WWD)

Project	Our Contribution
	▪ EMERGE (research project) ▫ Definition of requirements specification ▫ Medical application modelling ▫ System design and implementation ▫ Sensors and communication ▪ Environmental, location and vital data sensors ▪ Development of power monitor (monitoring behaviour)
	▪ EMERGE Senso-Watch (research project) ▫ Design and development of electronics and firmware ▫ Vital data measured ▪ Pulse and Skin-temperature ▪ Acceleration (in case of impact) and Movement (or lack of movement) ▫ Design features ▪ Low-power communication and low-battery alarm ▪ Integrated algorithm for data analysis ▪ Wireless communication (ZigBee)

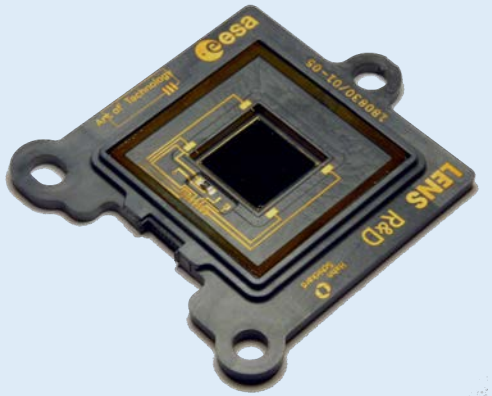
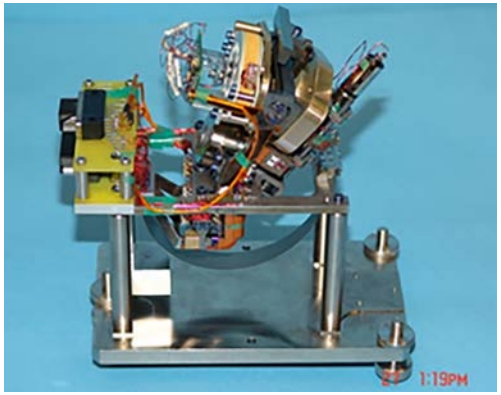
Optical Systems

Project	Our Contribution
	■ 3D-MID Camera System ▫ Design and develop technology demonstrator ▫ Optical path design, image processing and viewer ▫ Definition of FPGA programming requirements ▫ Production support and test of technology demonstrator ▫ Reliability testing ▫ System demonstration
	■ Microscope Video System ▫ Design and development of electronics and firmware ▫ Development of PC software with picture analysis ▫ Production and test of prototypes ▫ Technical documentation for electronics and firmware 

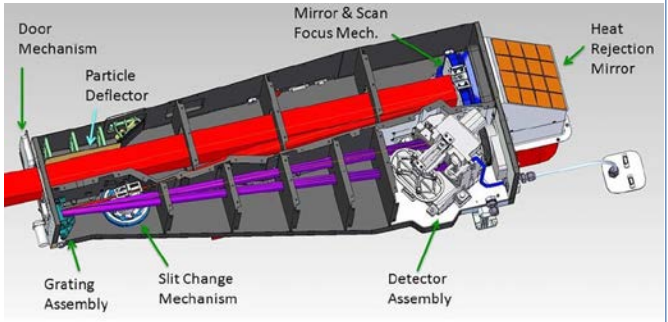
Optical Systems

Project	Our Contribution
	■ Omnidirectional Ball Camera ▫ Design study and system analysis ▫ Hardware design and development ▫ Design and development of micro-controller software ▫ Design and development of embedded Linux software ▫ Prototype development ▫ Industrialisation
	■ Optical Reader ▫ IP65 water meter with 2 cameras ▫ RFID-Reader for Label Data ▫ Design and development of electronics and firmware ▫ Production and test of prototypes

SPACE

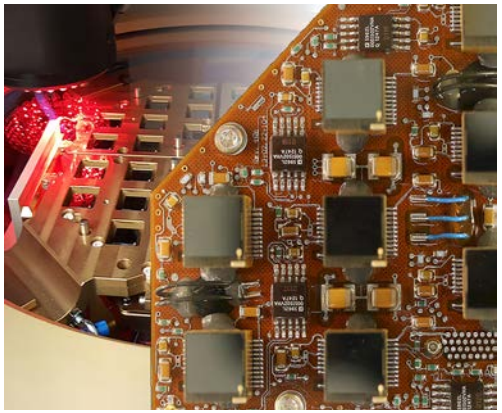
Project	Our Contribution
	■ Characterisation of 3D-MID technologies for Space applications ESA Contract No. 4000117360/16/UK/ND (ARTES-5.1, Activity Reference 4A.056) ▫ Technology review and selection of demonstrators & space applications ▫ Evaluation of manufacturing processes and selection of materials ▫ Design, prototype definition and test planning ▫ Manufacturing and assembly of of 2 technology demonstrators ▫ Environmental testing of the technology demonstrators ▫ Results analysis, identification of critical issues and future developments ▫ Weight reduction achieved with both technology demonstrators -75%
	■ NETLANDER™ (Mars landing probe) ▫ System analysis, feasibility study and technology evaluation of PCB technologies ▫ Seismometer Main Controller Electronics (SEIS-MC) ▫ Seismometer Acquisition Controller (SEIS-AC) ▫ Critical properties review ▫ Evaluation of High Density Packaging (HDP) technologies ▫ Identifying IC (ASIC) technology for implementing (digital) circuits ▫ Review miniaturisation potential and component availability ▫ Identify achievable mass volume and power for FM circuits ▫ Analysis of development and qualification costs for FM models

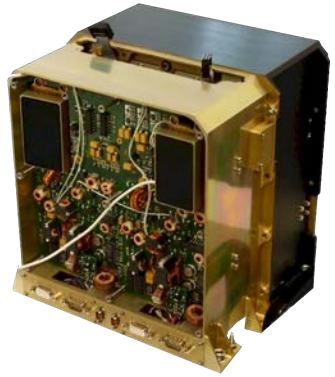
SPACE

Project	Our Contribution
	■ **POLAR** (Gamma Ray Burst Polarimeter) On-board Chinese Space Laboratory Tiangong-2, launched 15 September 2016, de-commissioned 19 July 2019 ▫ Feasibility Study ▫ High Voltage Power Supply (HVPS) ▫ Low Voltage Power Supply (LVPS) ▫ Component procurement and production ▫ Support qualification and acceptance tests including EMC
	■ **SPICE** (Spectral Imaging of Coronal Environment) On-board Solar Orbiter, launched 10 February 2020 ▫ Design review ▫ Production and test of electronics ▫ EMC safety check and testing 

SPACE

Project





Our Contribution

- **STIX-DEM** (Spectrometer Telescope for Imaging X-rays)
  On-board Solar Orbiter, launched 10 February 2020
  - Design, development, production, integration and test
    - Detector, High-Voltage and Back-End Electronics (DeE, HVE and BEE)
  - System design support
    - Interface to Instrument Data Processing Unit (IDPU)
    - Power Supply Unit (PSU)
  - Support instrument integration and testing
    - Power Supply Unit (PSU)
    - Instrument Data Processing Unit (IDPU)
    - Supervise functional testing during production and integration
    - Supervise EMC testing, Qualification and acceptance testing
  - Electronic Ground Support Equipment (EGSE)
    - Production and test of electronics and test adaptors
  - Power Supply Unit (PSU)
    - Support and review of flight design layout

Extreme & Harsh Environments

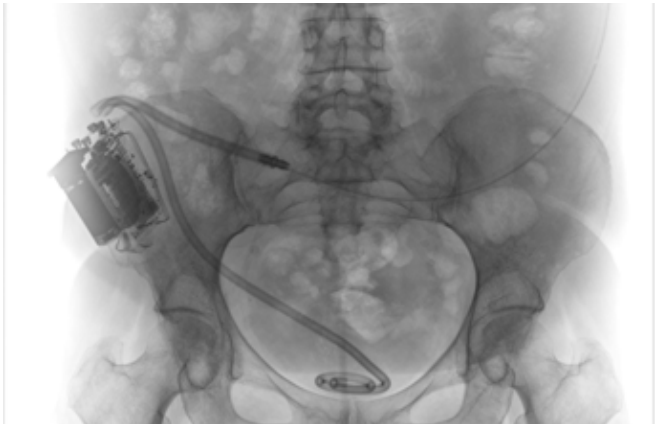
Wherever exceptional reliability is required

… underwater

… on top of mountains

ATEX (ATmosphere Explosible)

… in Space



… inside the human body

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