

# 20 years of PV inverter technology: achievements and challenges



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Leader R&D Large Inverters



# Sputnik Engineering

**Swiss PV Inverter Manufacturer,  
located in Biel**

**Sells PV inverters from 2kW to  
1.3MW under the brand SolarMax**

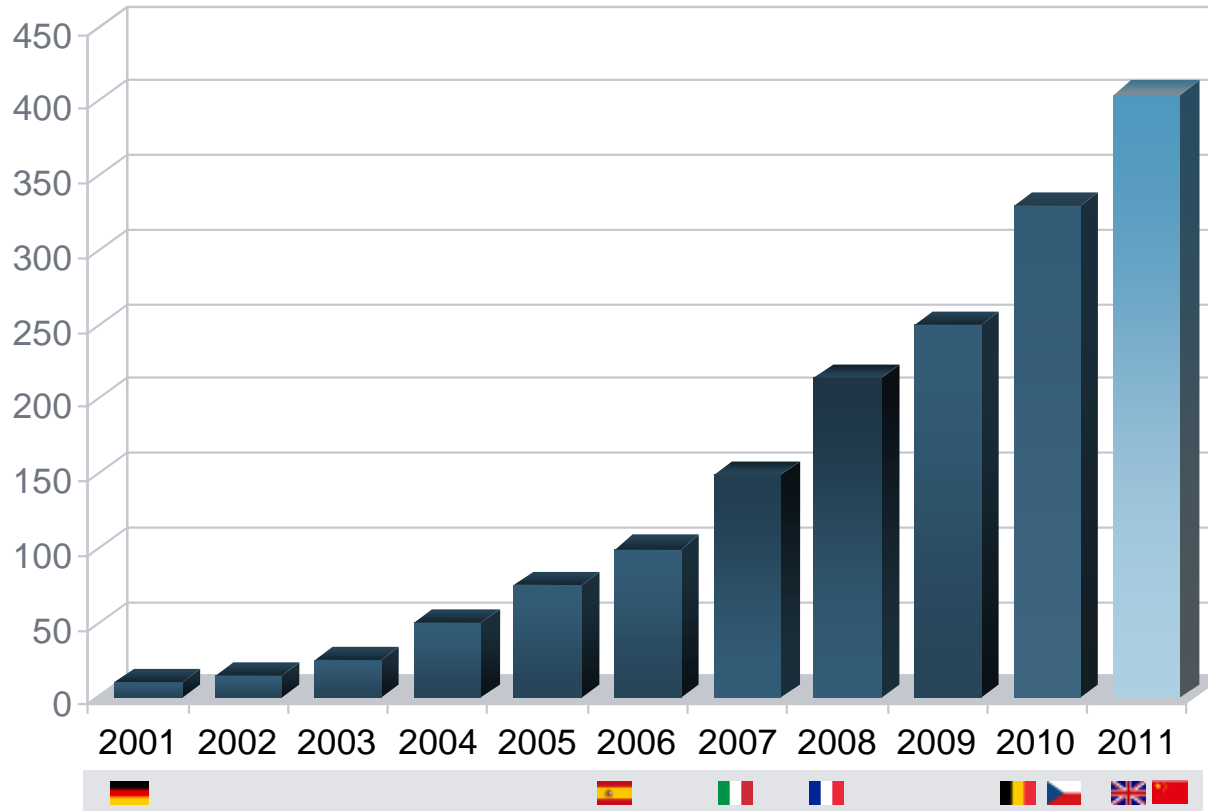
**Founded in 1991, spin-off from the  
Biel School of Engineering**

**Among the top 10 of PV inverter  
manufacturers worldwide**

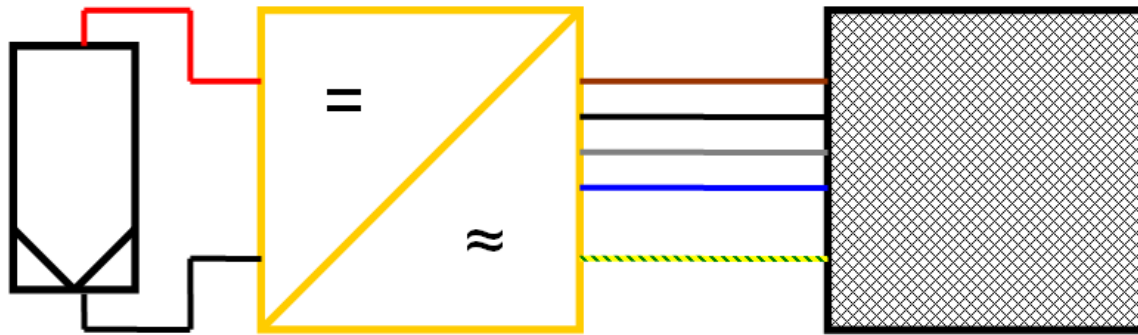


# Company development

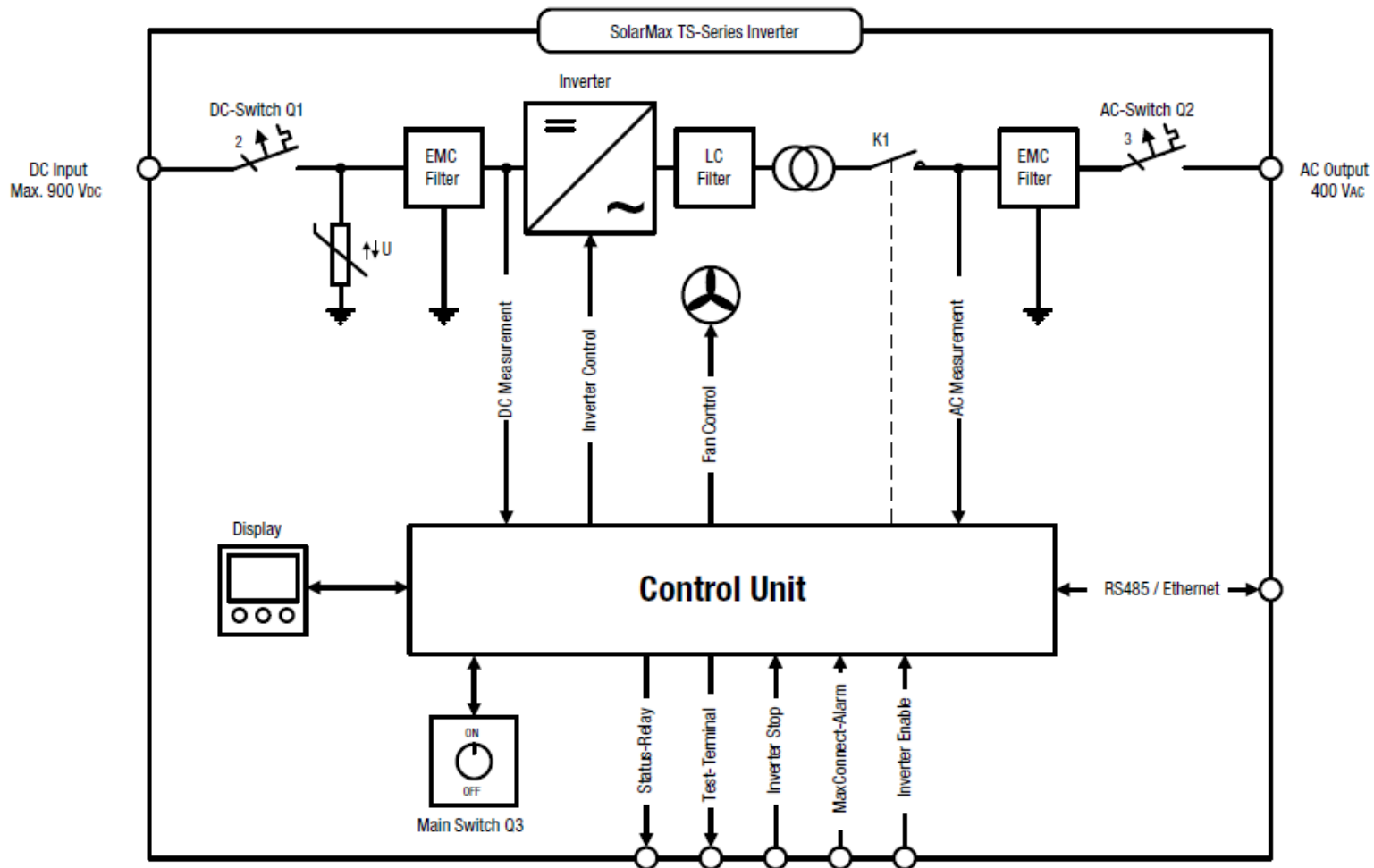
## Employees



# Technology

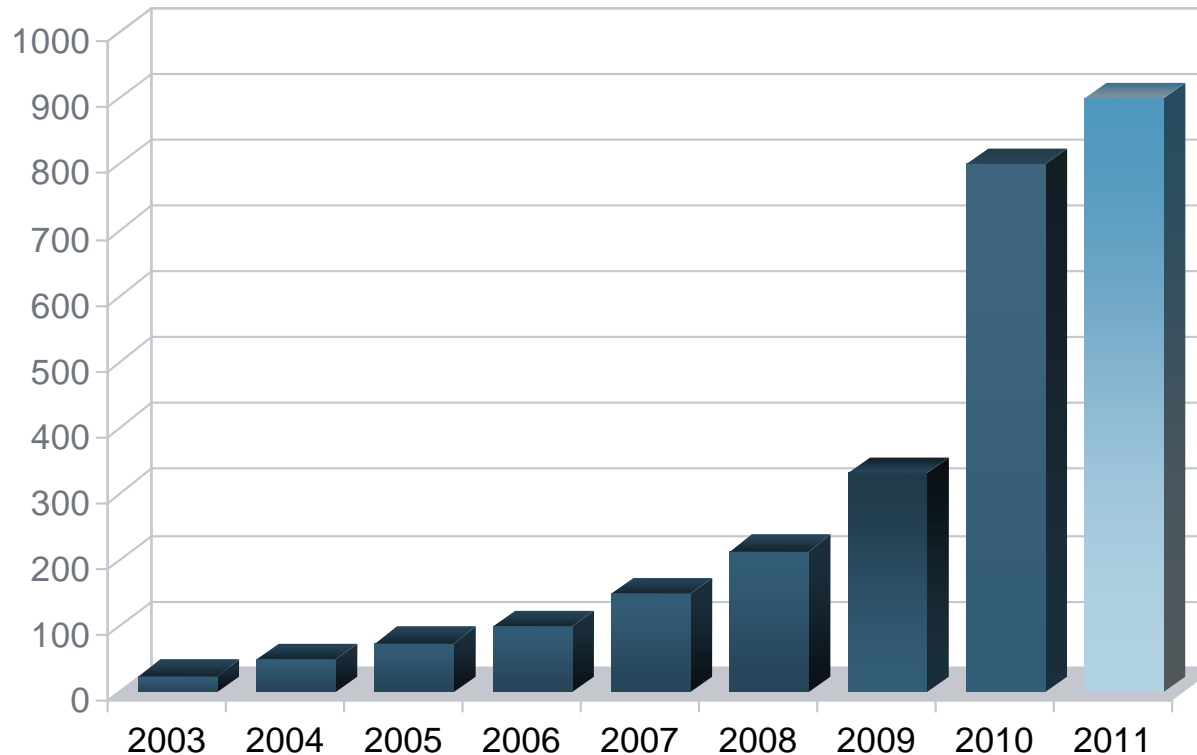


# Technology



# Mass Production and Swiss Quality

## Output produced in megawatts MWac



- Annual increase in MWac
- Expected annual increase in MWac



# Efficiency

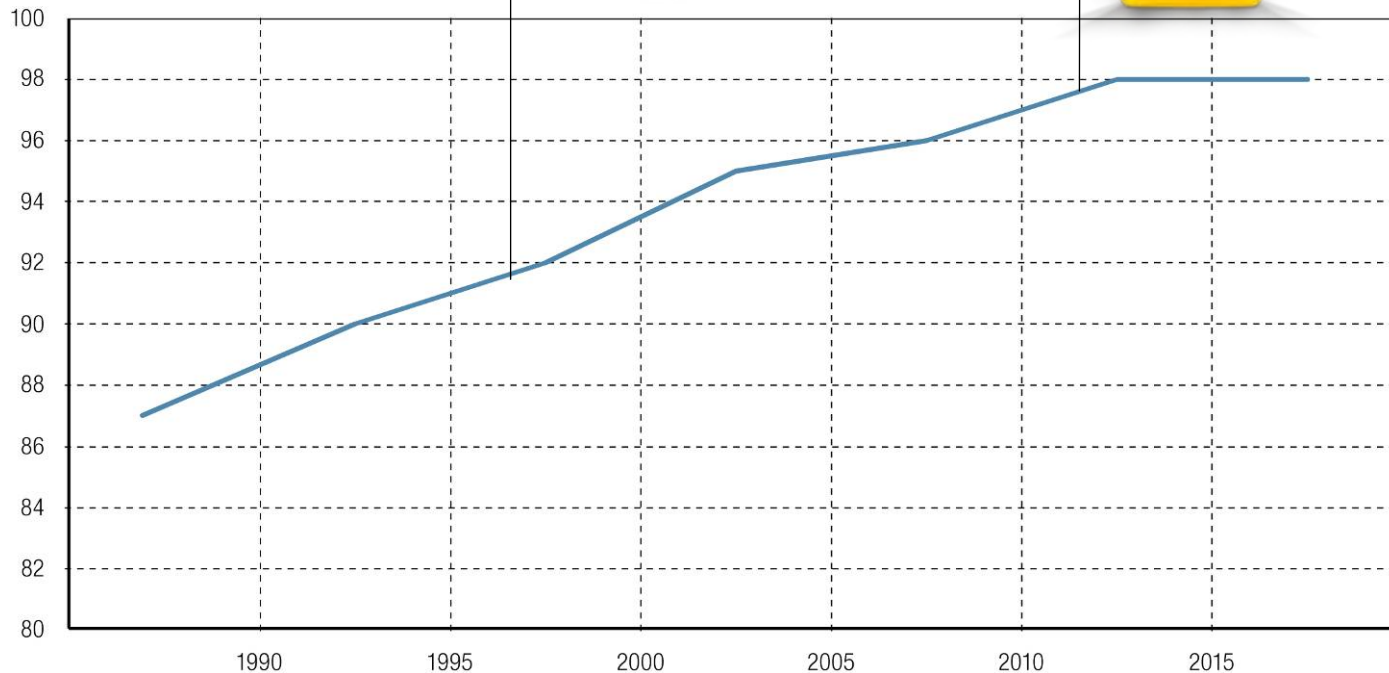
**SolarMax S,**  
1994: first commercial  
transformerless string inverter



**SolarMax E-Series,**  
increased efficiency



**SolarMax MT Serie,**  
3-Level, SiC Diodes



# Main Achievements

- Complete portfolio solution for all PV power plants
- Industrialized products, high Quality
- Increased efficiency
- Customer Services: Hotline, After Sales etc





# Challenge Costs

## reducing the product costs

- Key factor for the success of new renewable energy
- In the last years more than 50 new Chinese inverter manufacturers entered the market
- A large part of the world market will be in Asia
- We expect the prices to fall to 50% in 5 years

... the task in R&D is clear



# Challenge Grid Connection Requirements

- **PV became system relevant in electrical energy grids**
- **Grid operator needed to change the grid connection requirements fast**
  - Yesterday: PV disturbs the grid → in case of grid problems, disconnect
  - Now: PV helps to stabilize the grid
- **Requirements are (little) different for every country (or grid operator)**
- **Certification required**
  - complex, time consuming, inefficient



# Challenge Grid Connection Requirements

## Functions

- Remote power reduction
- Frequency depended power reduction
- Voltage control via reactive power feed in
- Low voltage ride trough

## Technical Challenge

- Headroom in the power electronics for reactive power
- Dynamic behave / controller
- Data communication / SCADA

# Conclusion

- **Sputnik Engineering as a Swiss owner managed medium sized enterprise is very successfully competing against large international companies**
- **We are one of the main local drivers in building new jobs for highly qualified engineers**
- **We are entering a new era with new challenges in costs and system complexity**
- **We need strong local universities to support our further growth and success**



20 years Swiss Quality  
and Experience



New HQ in 2013

