

We help ideas meet the real world 

## Safety in wireless system design

Würth / DELTA seminar *Designing a safe, high quality product*

- Quality = Reliably fulfilling the user's functionality expectations.
- Design maturity = defining ones demands, implementing them and testing compliance.
- Safety = No harm to products or personnel, even at product malfunction.

- Wireless for safe applications
  - Motor control, boiler control, turbine control
  - Crane operation
  - Power tool control
  - Virtual operating room
  - Patient monitoring for correct medication
  - People location on a power plant
  - Leak / emission detection



Jacob Sparfven  
Wireless Specialist, DELTA  
November 2009  
Safety elements in wireless product design

---

---

---

---


---

---


---

---

Quality  
Reliably fulfilling the user's functionality expectations

We help ideas meet the real world 

- Robust wireless design and technology for optimizing up-time and minimizing harmful, yet unwanted malfunctions
  - A generous link budget (range)
  - Frequency hopping
  - Mesh networking
  - Non interferent to other wireless communication links
  - Immunity to EMC / ESD
  - Redundant circuitry (dual transmitters)
  - Rigid buttons, antennas, casings...
  - Extended temperature range




---

---

---

---


---

---

---

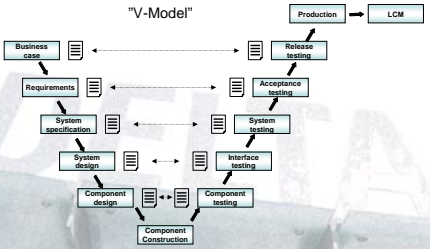
---

Design maturity  
Defining ones demands, implementing them and testing compliance

We help ideas meet the real world 

- Intrinsically safe electronics, designed to specifications and verified by corner testing and HALT.

"V-Model"




---

---

---

---


---

---

---


---

**Safety**  
No harm to products or personnel, even at product malfunction

We help ideas meet the real world 

- Handling considerations for all hazards:
  - EMC disturbance
  - Loss of link
  - Misinterpretation of data
  - Incorrect user operation (tool proof)

**Remember this in the design spec!**



- Malfunctions must cause the machinery to taking the appropriate action
  - Shutting off (good for a power drill but not for a helicopter)
  - Stopping / breaking
  - Going into idle
  - Retrieving
  - Reducing speed or volume
  - Sounding an alarm
  - Sending an sms

**Hazard mapping + Risk analysis**

↓

**Action planning**

---

---

---

---

---

---

---

---