Soldering is our Passion

Wave Soldering System MWS 2300
Innovative Details Reduce Manufacturing Costs

Complete Solutions for Soldering Processes and Automated Production Lines

Potential for a more Economical and Ecological Wave Soldering Process

TARGET

- reduction of waste
- reduction of resource consumption
- reduction of potential soldering defects

THROUGH

- improvement of efficiency
- increase in flexibility
- optimization of cycle time and throughput

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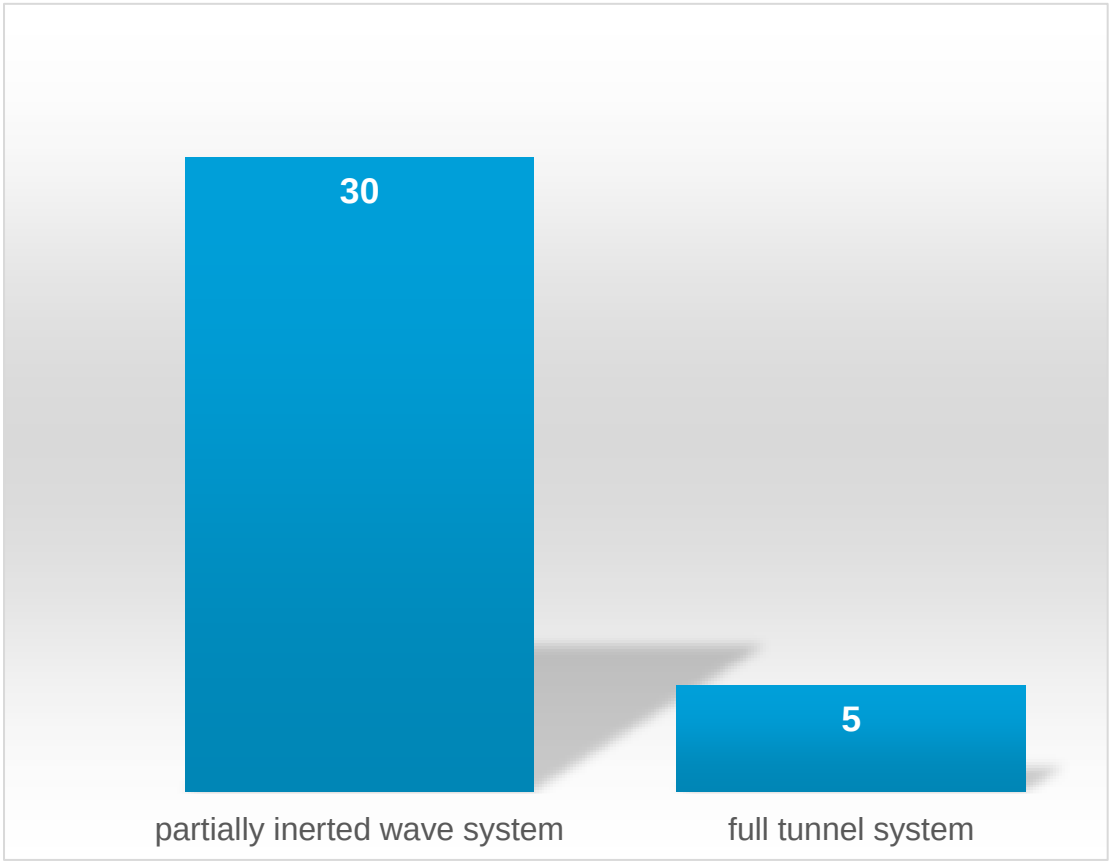
Reduction of Waste

Nitrogen Atmosphere

- significantly lower formation of oxides (dross)
  - lower solder consumption
  - less maintenance requirements
  - higher machine availability
- reduced flux consumption
- significantly fewer soldering defects due to improved wetting
- larger process window, especially when using no-clean fluxes



oxides in kg/week in 3 shift operation

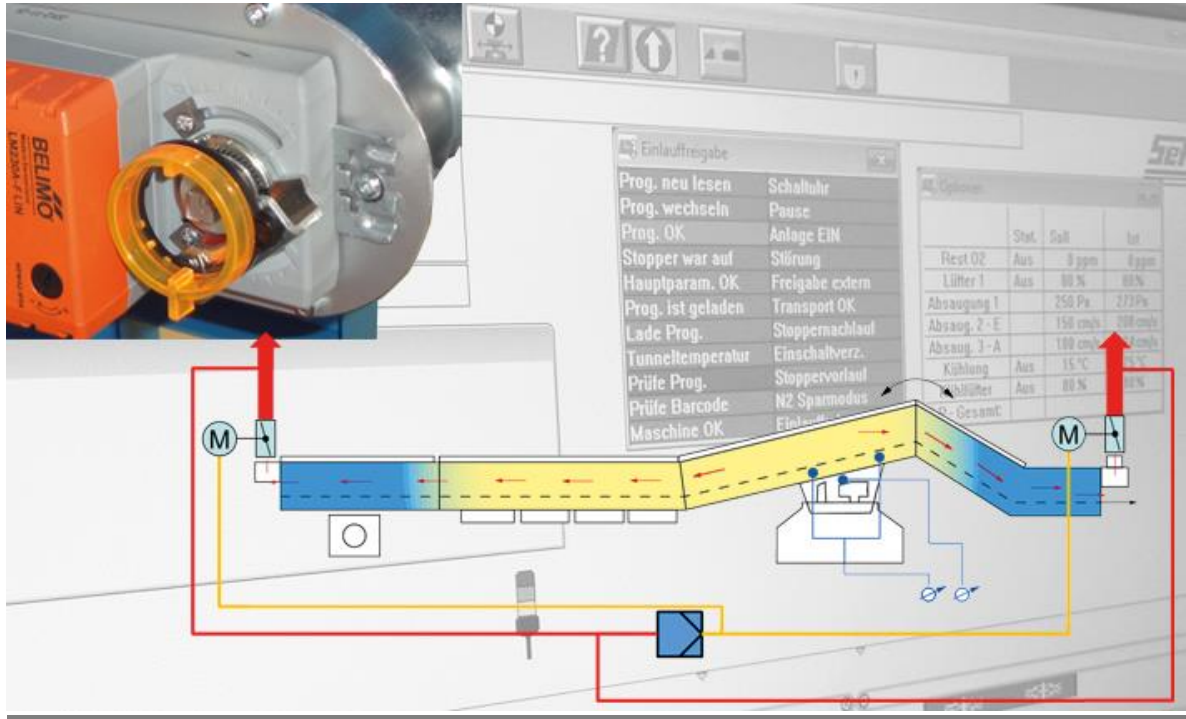
Reduction of Waste I Process Reliability

Control of the Nitrogen Atmosphere

Automatic Exhaust Control
Active control of the exhaust

- automatic compensation of asymmetrical air flow in the tunnel
- automatic reaction to external influences

- ✓ no unrecognized drop of exhaust volume = no increased nitrogen consumption
- ✓ stable nitrogen atmosphere and continuously high-quality soldering results



exhaust control with air mass sensor and damper actuator

Reduction of Resource Consumption

Lower Solder Consumption in Nitrogen Atmosphere

less solder waste (dross) that has to be refilled as fresh solder

Reduction of Resource Consumption

Minimizing Nitrogen Consumption

ECO-Mode

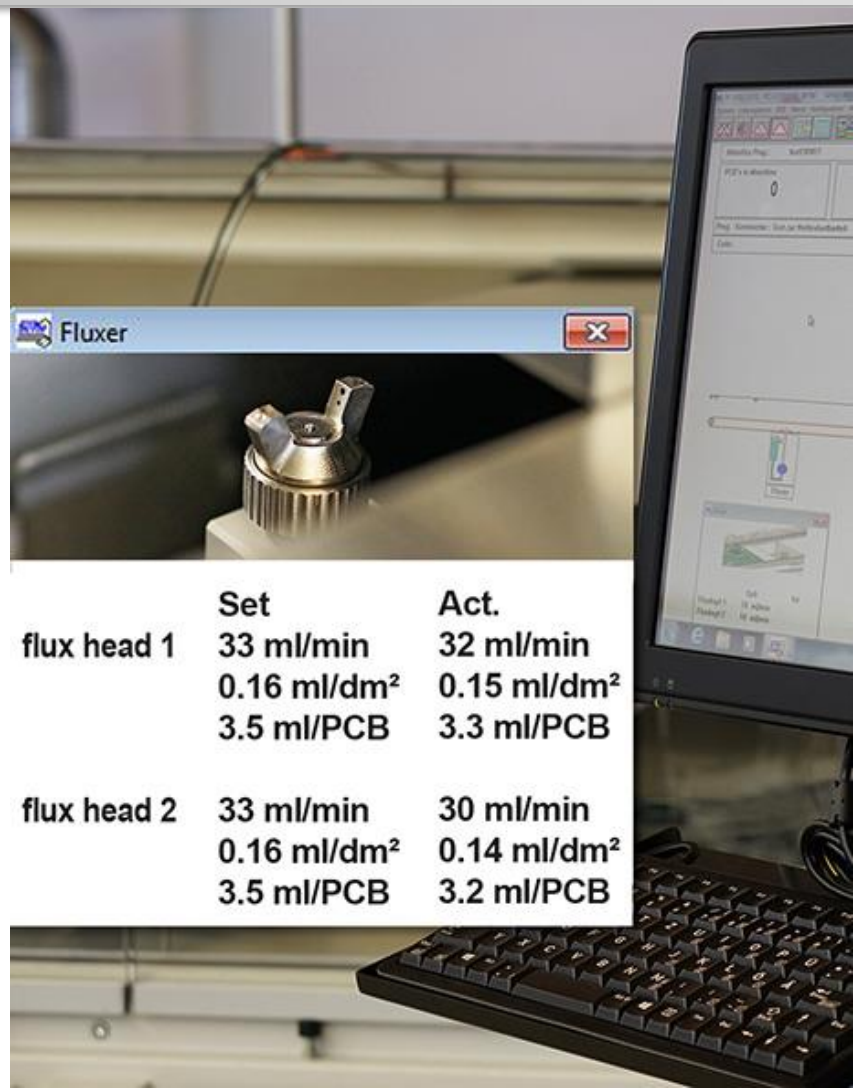
automatic reduction of nitrogen volume during inactivity

- automatically after x minutes of inactivity
- automatically during defined break times
- manually

Reduction of Resource Consumption

Lower Flux Consumption Flux Quantity Measurement

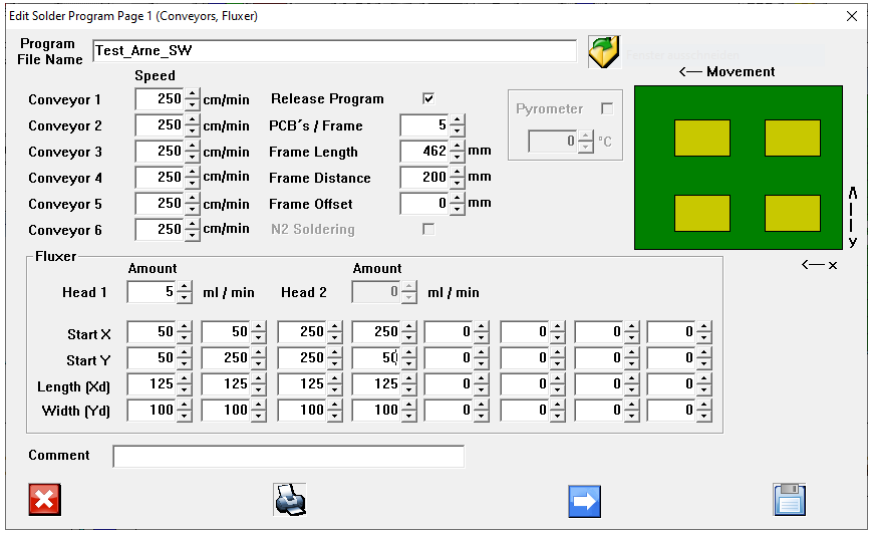
- up-to-date HVLP spray head
  - higher utilization of the flux
  - lower maintenance requirements
- flux quantity monitoring detects fluctuations in the amount of flux applied at an early stage



Reduction of Resource Consumption

Lower Flux Consumption Segmented Flux Application

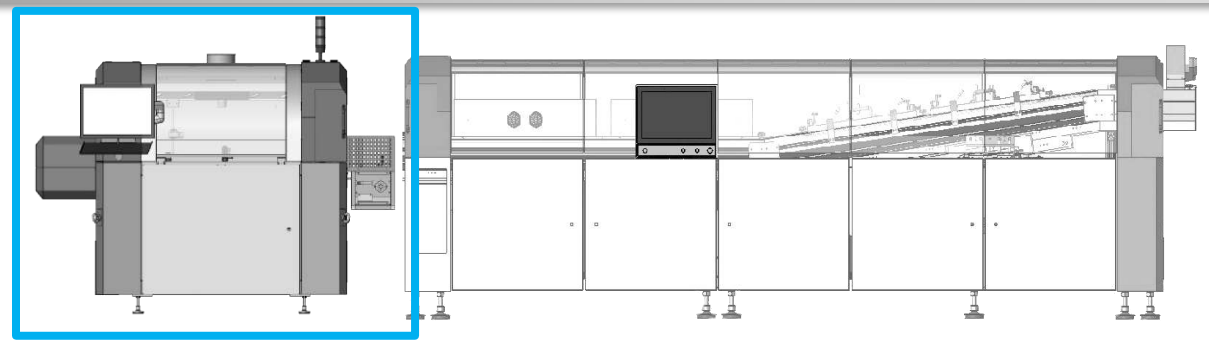
- enables flexible and programmable spraying of several areas
- up to 8 different areas within one assembly possible
- minimum segments of 50 x 50 mm
- no contamination with flux in all other board areas



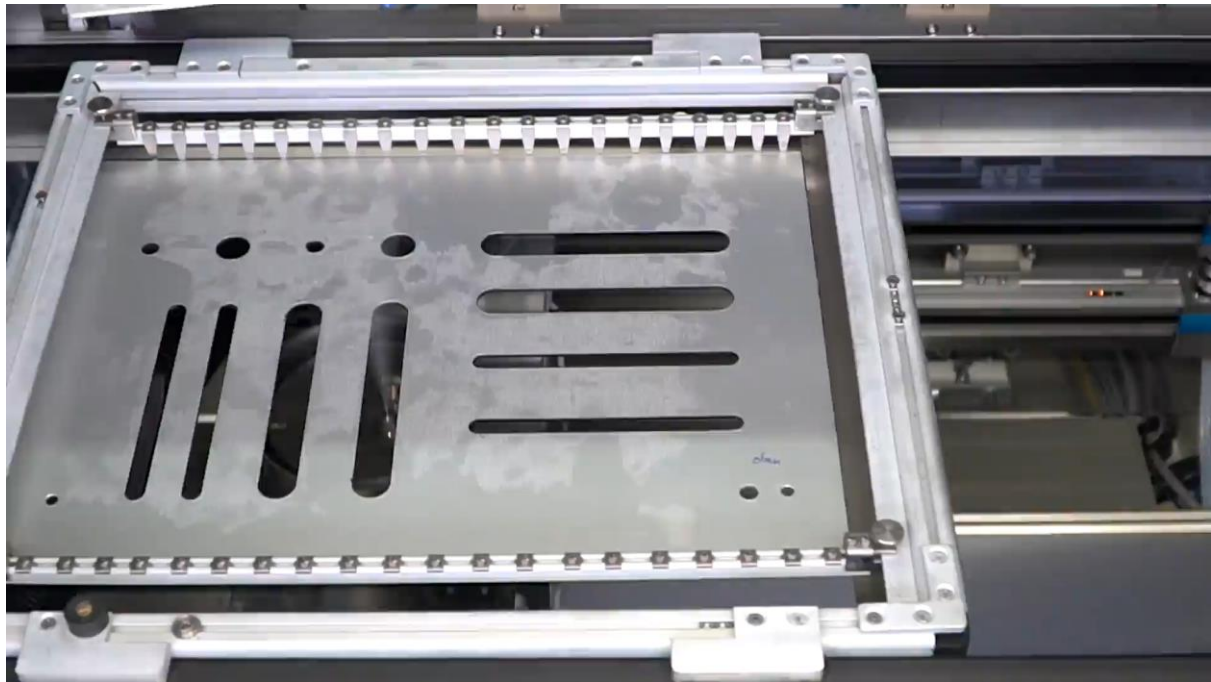
➡ remarkable saving potential

Reduction of Resource Consumption

Lower Flux Consumption Selective Flux Application with SEHO SelectFlux

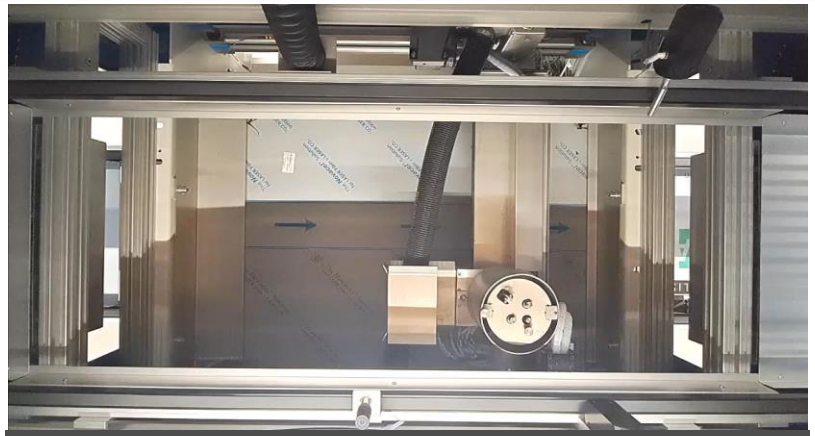


- individual, product-dependent and selective flux application
- significantly reduced flux consumption up to 80 %
- no residue on the assembly, no creeping under the mask
- lower mask cleaning cycles
- reduction of the cycle time by optimizing the process flow and eliminating waiting times



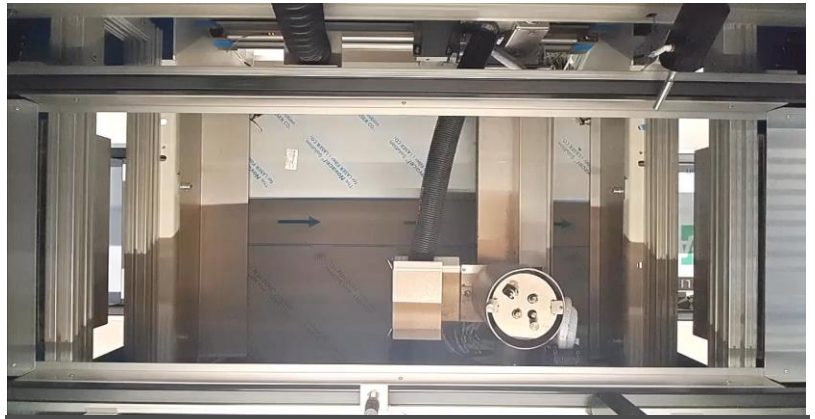
Reduction of Resource Consumption

Lower Flux Consumption SelectFlux I Cycle Time Optimization



parallel passing on I forward-looking transfer

parallel passing on I forward-looking transfer I fluxing on-the-fly



no option active

option	time per PCB
none active	approx. 62 sec
parallel passing on I forward-looking transfer	approx. 45 sec
parallel passing on I forward-looking transfer I fluxing on-the-fly	approx. 38 sec

Reduction of Resource Consumption

Lower Energy Consumption Peak Loads

ECO-Mode

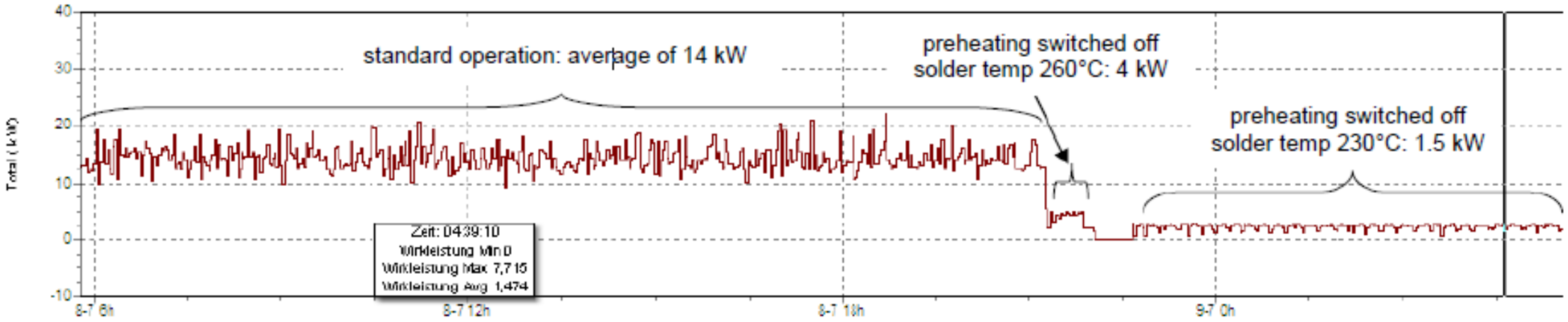
optimized heat-up process

- avoids load peaks when heating up the soldering system
- separate control of the preheaters

Reduction of Resource Consumption

Lower Energy Consumption Preheat Process

70 % of the energy required for wave soldering is used in the preheating process.



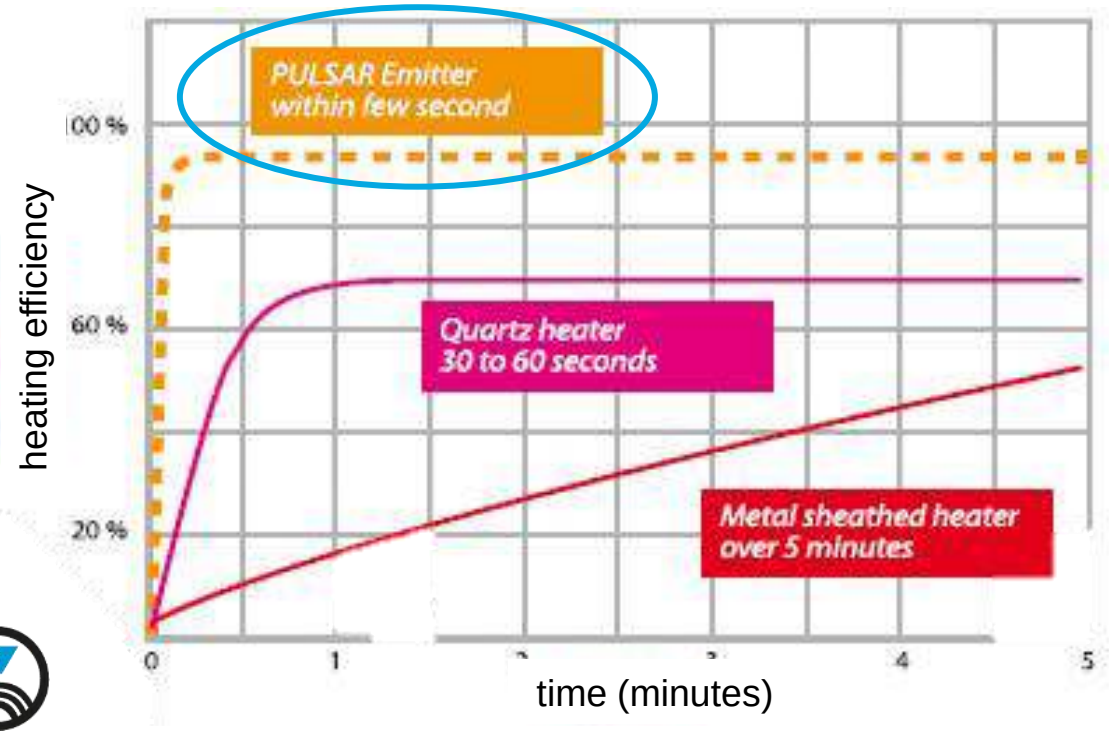
Example: connected load 38 kW, preheat: infrared and quartz

Reduction of Resource Consumption

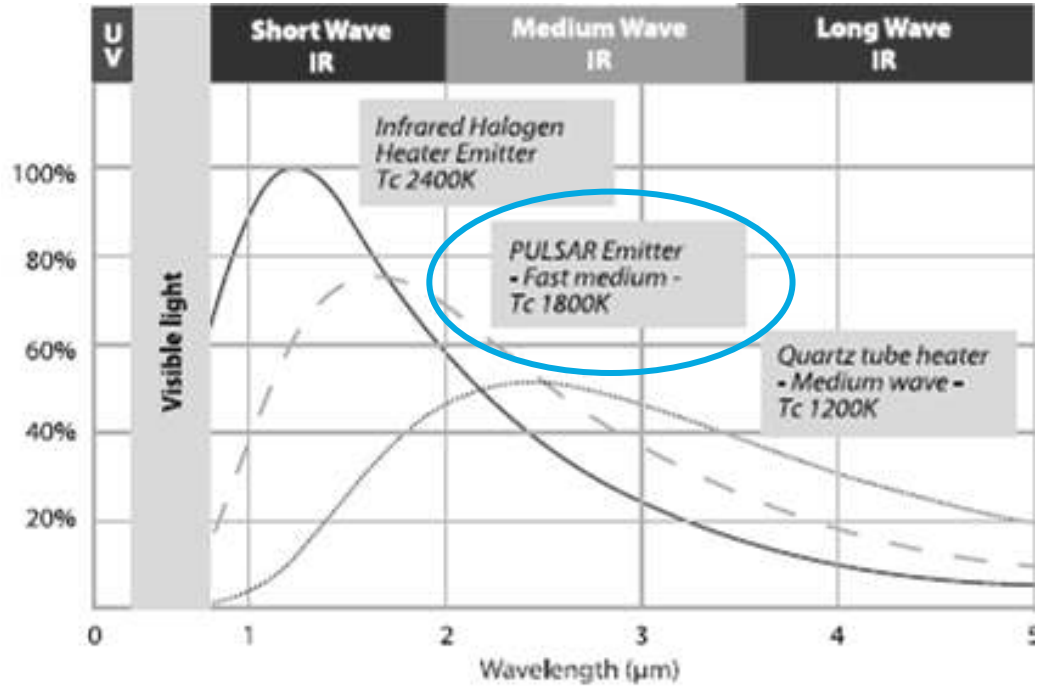
Lower Energy Consumption Preheat Process

Comparison three different heater types in the preheating

efficiency vs time for 3 different emitters



penetration efficiency vs wavelength for 3 different emitters



Reduction of Resource Consumption

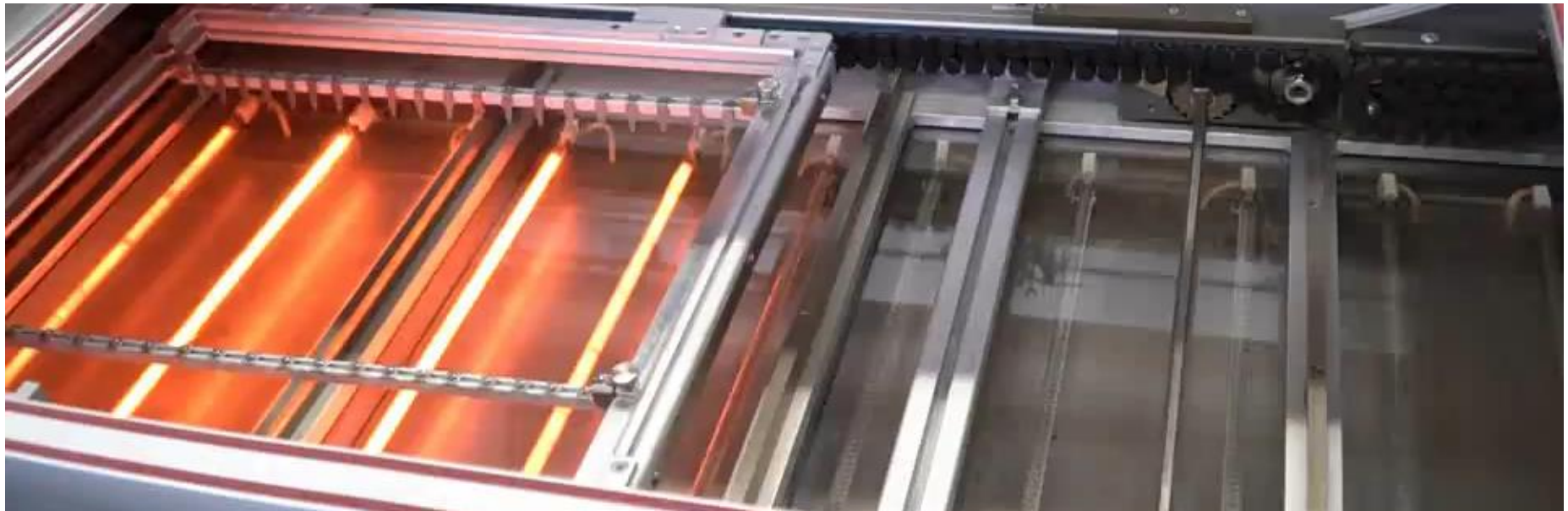
Lower Energy Consumption Preheat Process with Pulsar Emitters

minimizing energy consumption

- stand-by 3.5 kW
- active 11 kW (comparable to conventional emitters)

virtually immediate change between (different) products

- **higher flexibility**
- **higher throughput**



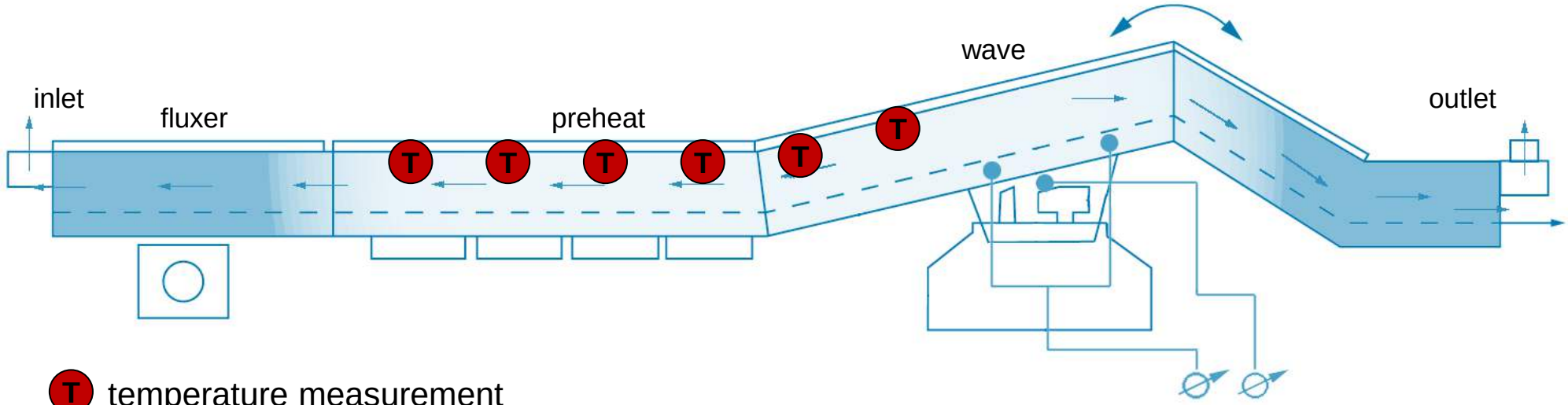
video: switching behavior pulsar emitters

Reduction of Resource Consumption

Lower Energy Consumption Preheat Process with Pulsar Emitters

- potential risk for overheating of low-mass products:
  raised tunnel temperature due to products with high energy demands
- additional temperature sensors installed in the tunnel: regulation of the heater performance

Stable Preheat Temperature Profile for a Wide Range of Products



T temperature measurement

Reduction of Potential Soldering Defects I Cycle Time

Automatic Nozzle Height Adjustment

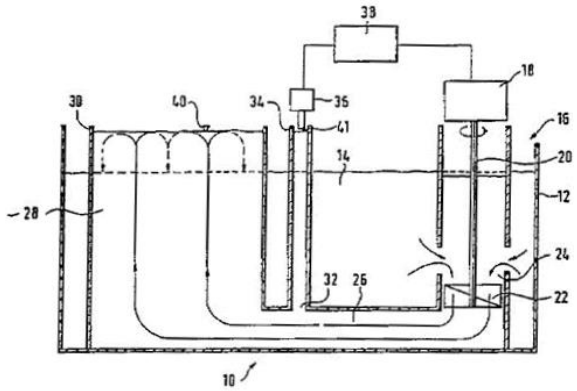
video: nozzle height adjustment

- individual nozzle height in up to 16 different sectors of a PCB
- independence from assembly or carrier design
- no influence on cycle time
- reliable wetting
- higher flexibility
- larger process window

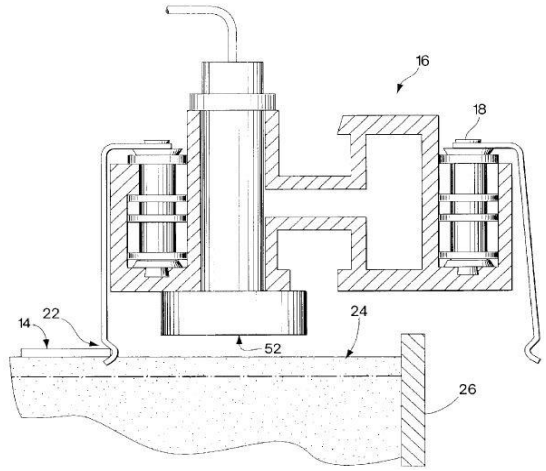
Reduction of Potential Soldering Defects I Cycle Time

Wave Height Measurement Existing Methods

pressure/bypass measurement	locally and inside the nozzle
ultrasonic	complex structure and measuring range relatively large
eddy current	locally and small measuring range
laser micrometer	complete recording only makes sense for miniwaves
measuring shuttle	not connected to the machine and only a certain number of runs possible



patent drawing
bypass measurement

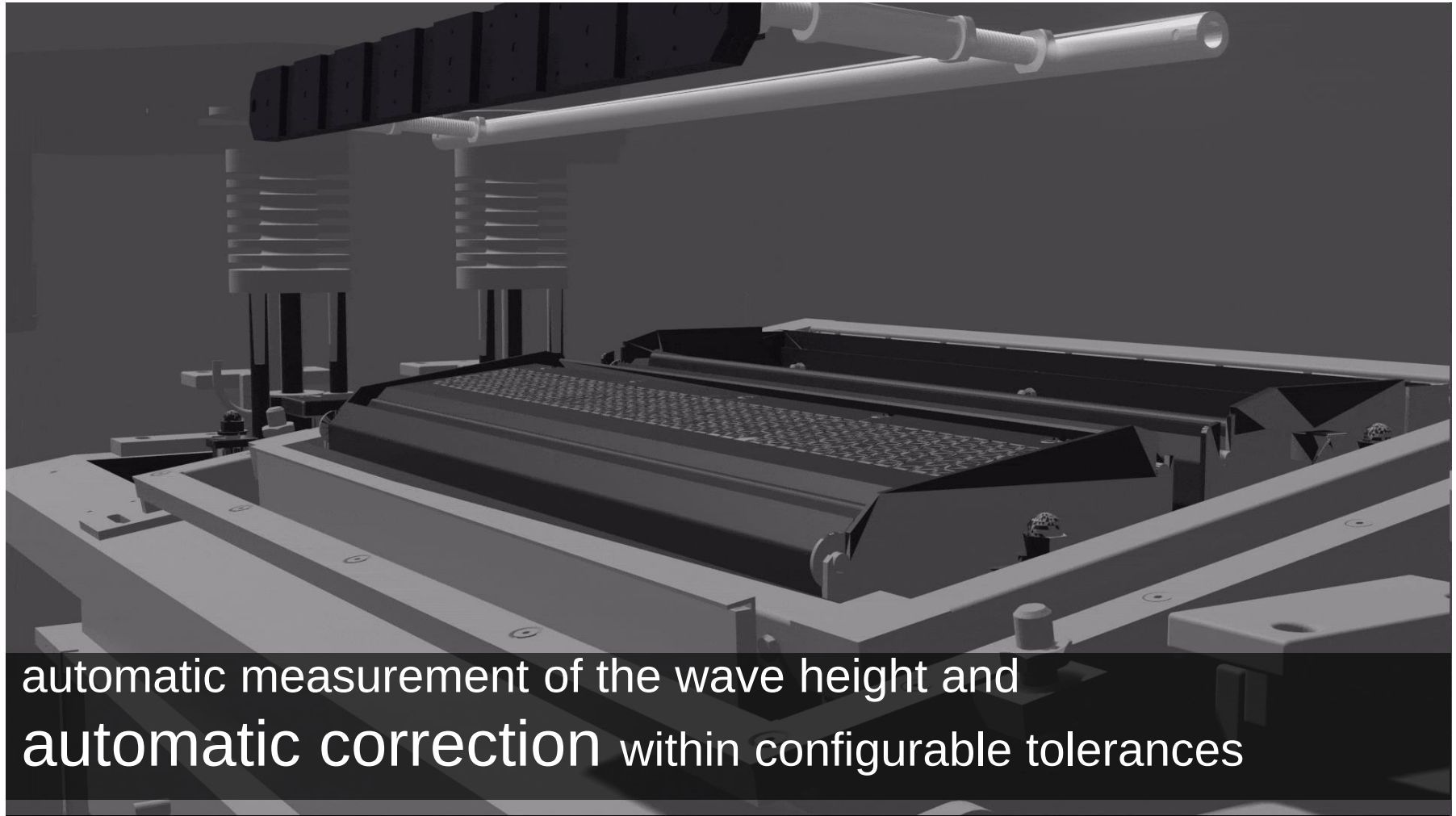


patent drawing
eddy current measurement

Reduction of Potential Soldering Defects I Cycle Time

Automatic Wave Height Measurement

animation of the reference wave height measurement



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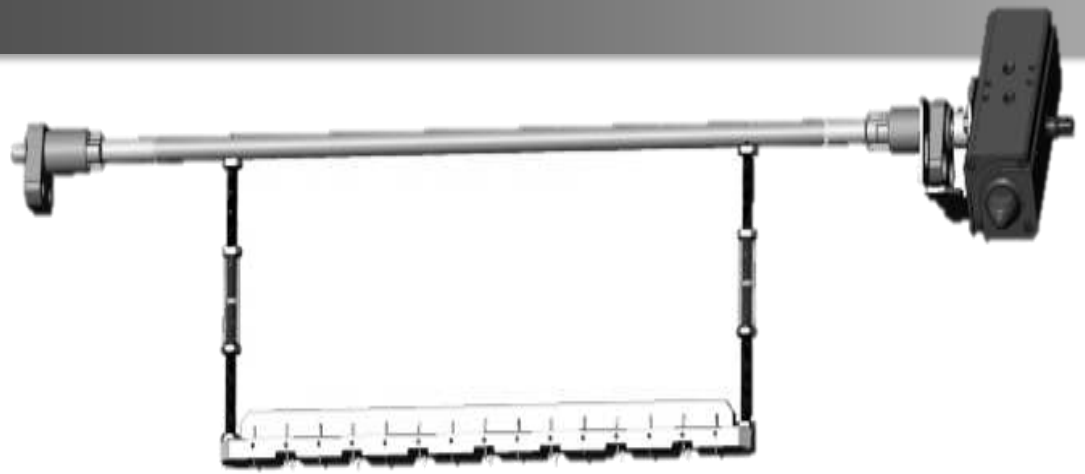
Reduction of Potential Soldering Defects I Cycle Time

Automatic Wave Height Measurement



contact measuring strip for a soldering wave in measuring position (with spindle and pneumatic cylinder)

1. measurement in „good“ condition = reference
2. timed measurements (comparison to reference)
3. recognition of deviations, if any, and adjustment to a reference value in the tolerance window

section of a generated matrix with pin 1-8, standardized wetting per second

t	Pin 1	P 2	P 3	P 4	P 5	P 6	P 7	P 8
t0	0,20	0,21	0,22	0,22	0,23	0,24	0,21	0,19
t+1	0,21	0,28	0,29	0,28	0,27	0,29	0,26	0,25
t+2	0,31	0,35	0,37	0,37	0,38	0,34	0,38	0,34
t+3	0,40	0,43	0,48	0,45	0,47	0,45	0,42	0,40

$$X = \frac{1}{m * n} \sum_{y=1}^{m} \sum_{x=1}^{n} a_{x,y}$$

X – parameter of the measured wave is used for evaluation

Reduction of Potential Soldering Defects I Cycle Time

Automatic Wave Height Measurement Conclusion

- measuring range small enough to detect turbulence
- the entire wave is captured
- integrated in the machine
- temperature stable
- independent of the wave form
- deviations are recognized and corrected automatically
- proof of process stability

Potential Savings Summary in Numbers

Nitrogen

up to

20 %

- ECO mode

Flux

up to

20 %

- monitoring of the quantity applied
- several defined spray areas (segmented flux application)
- SelectFlux

Load Peak

up to

30 %

- optimized heat-up process

Energy

up to

30 %

- pulsar emitters only switched on when required
- ECO mode

Cycle Time

up to

50 %

- optimization of cycle time with pulsar emitters
- optimized nozzle height

Soldering Defects/Rework

priceless

- flux quantity monitoring
- autom. nozzle height adjustment
- autom. wave height control

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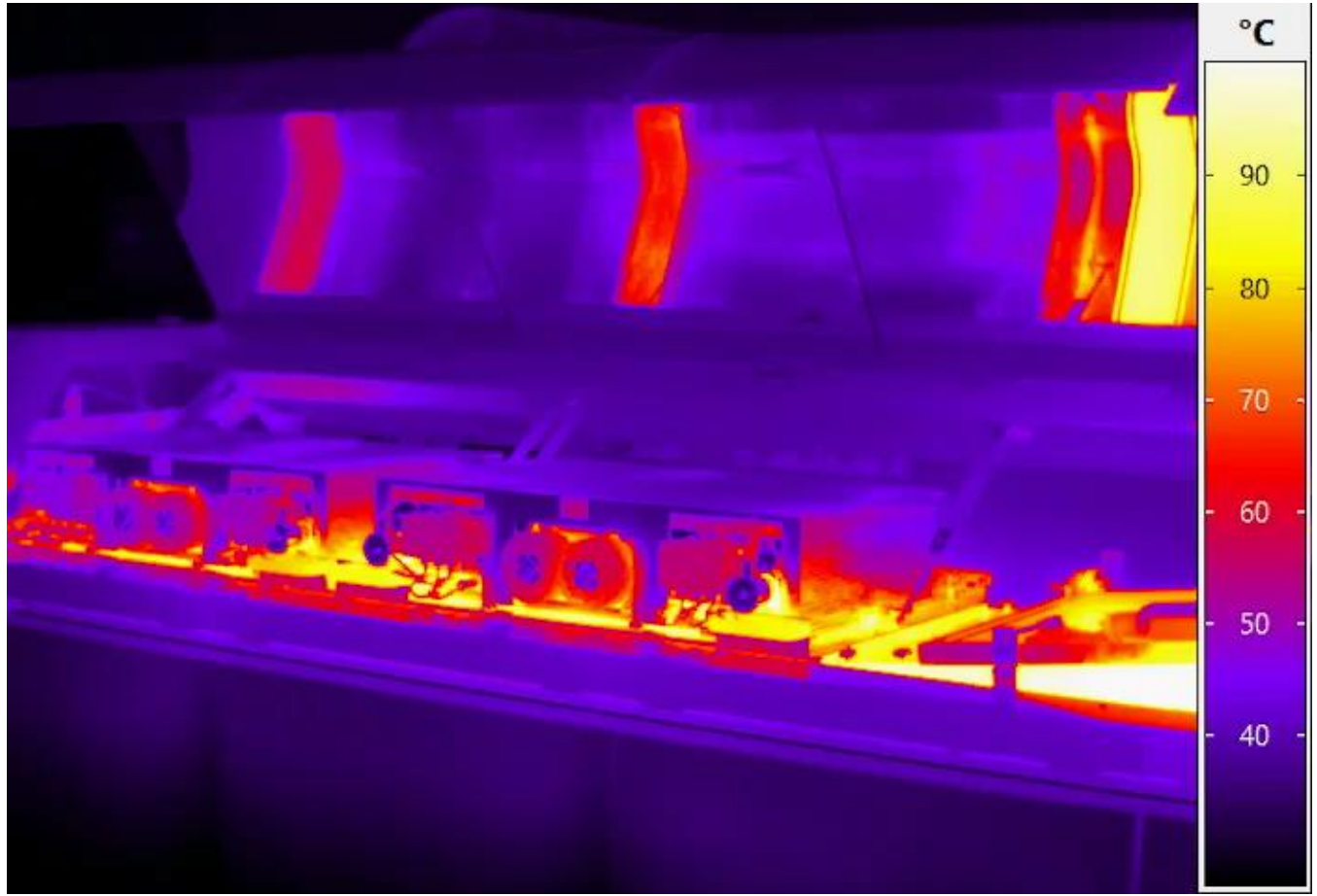
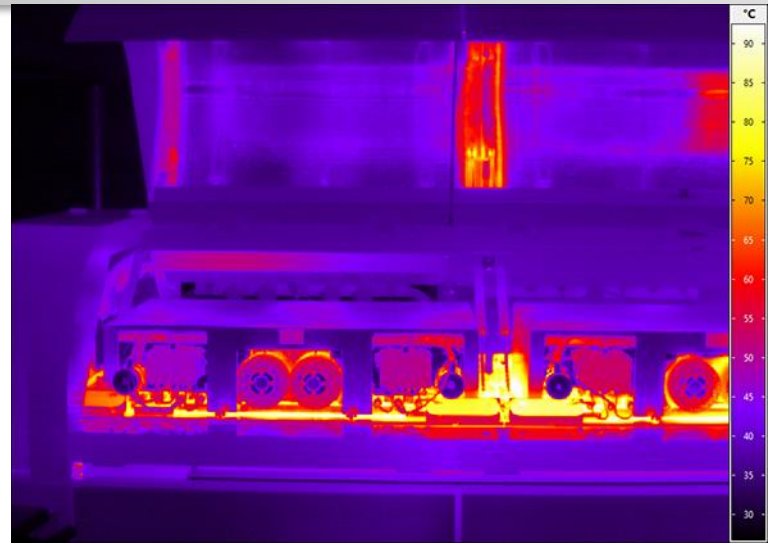
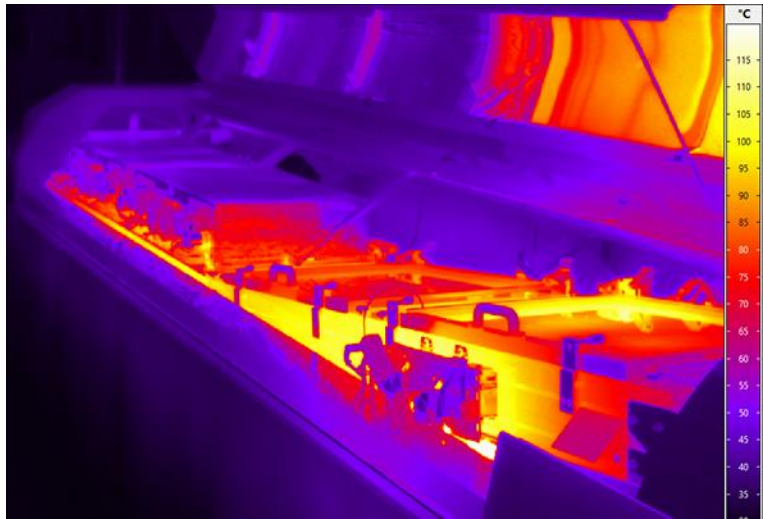
There‘s more to come: Roadmap

There‘s more to come: Roadmap Wave Soldering

Tunnel Insulation Thermal Images without Insulation





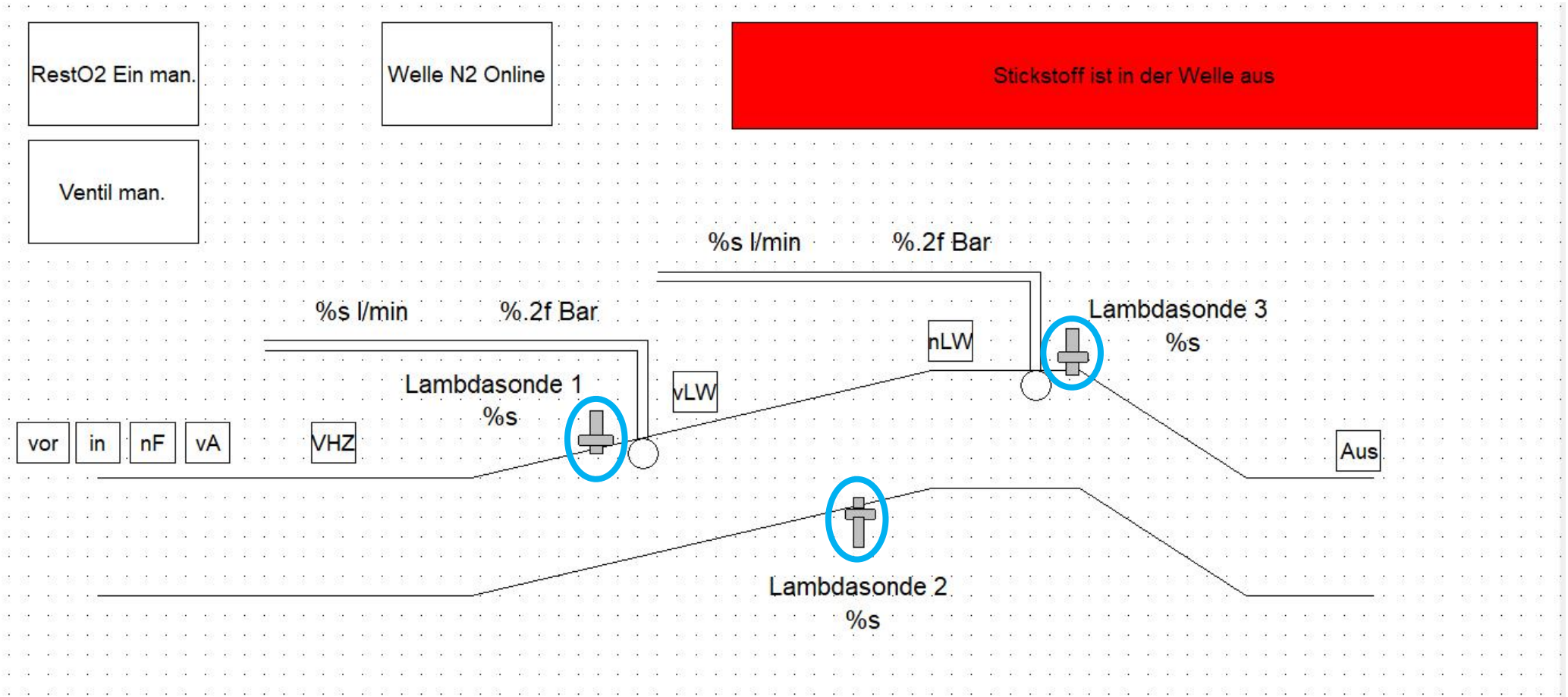


There‘s more to come: Roadmap Wave Soldering

Tunnel Insulation Insulation in Practical Test Phase

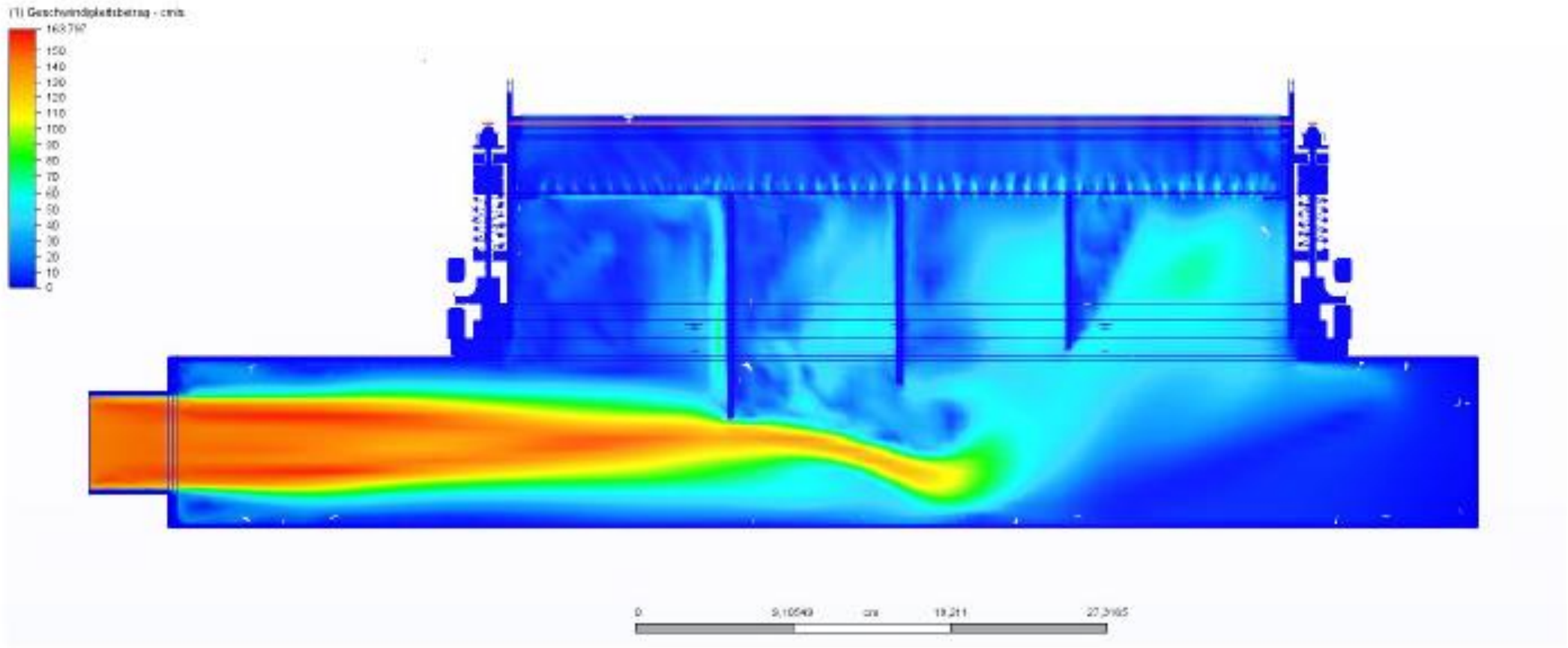
There‘s more to come: Roadmap Wave Soldering

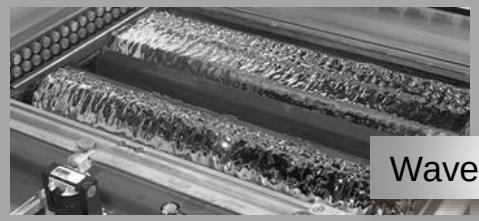
Nitrogen Control



There‘s more to come: Roadmap Wave Soldering

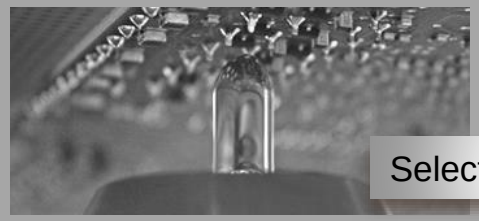
Current Solder Nozzle Tests





Wave Soldering

Reflow Soldering



Selective Soldering

THT-AOI

Automation

Know How

Thank You!

We look forward to getting in touch with you.