



coatmaster

**Noncontact coating thickness  
measurement on enameled parts**

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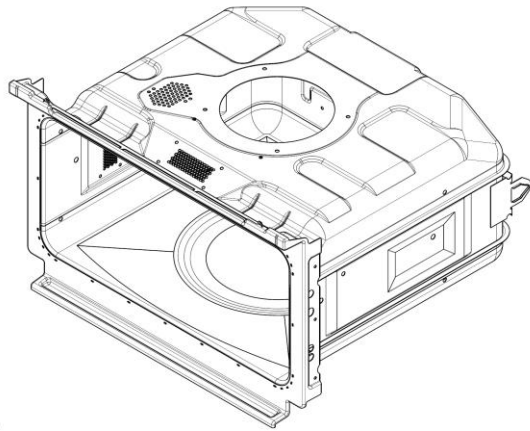
## Measurement setup

- coatmaster 3D system for imaging coating thickness measurement
- One measuring head and two excitation sources
- 382 x 288 measuring points (pixels) per measurement
- 0.5s measuring time + 4s evaluation per measurement
- Accuracy  $\pm 5\%$  /  $5\mu\text{m}$ , Deviation  $< 5\%$  /  $3\mu\text{m}$
- On both flat parts (trays) and formed parts (cavity)
- Export of measurement protocols and connection to external control (PLC)

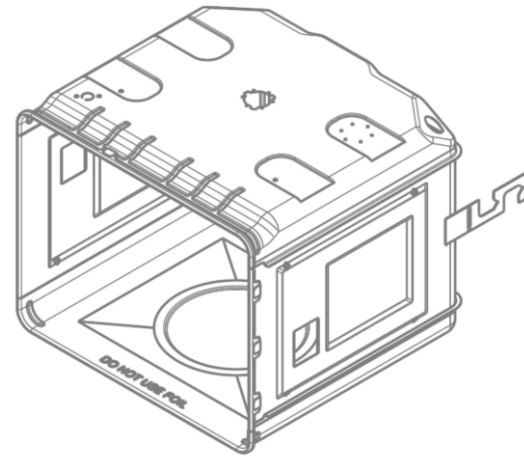




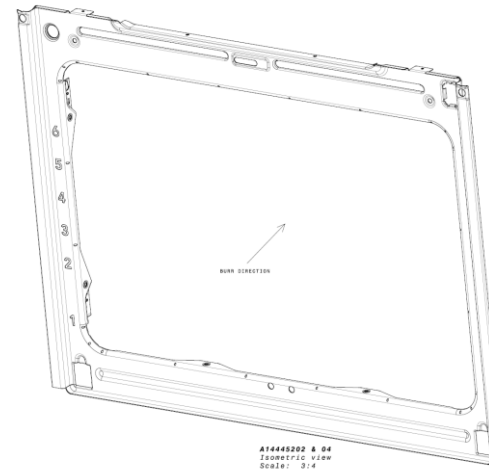
# Parts



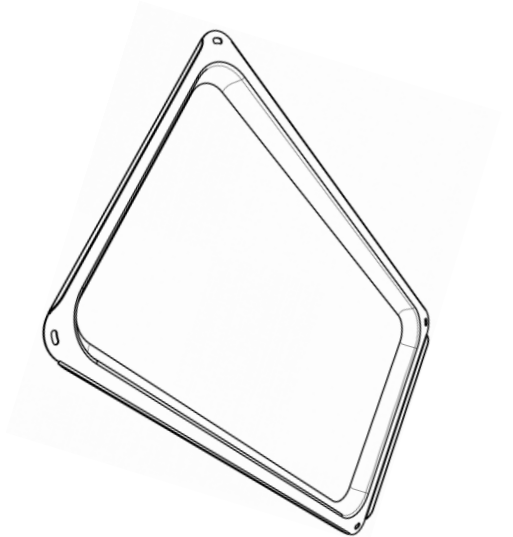
Cavity narrow  
with cured  
enamel



Cavity wide  
with cured  
enamel



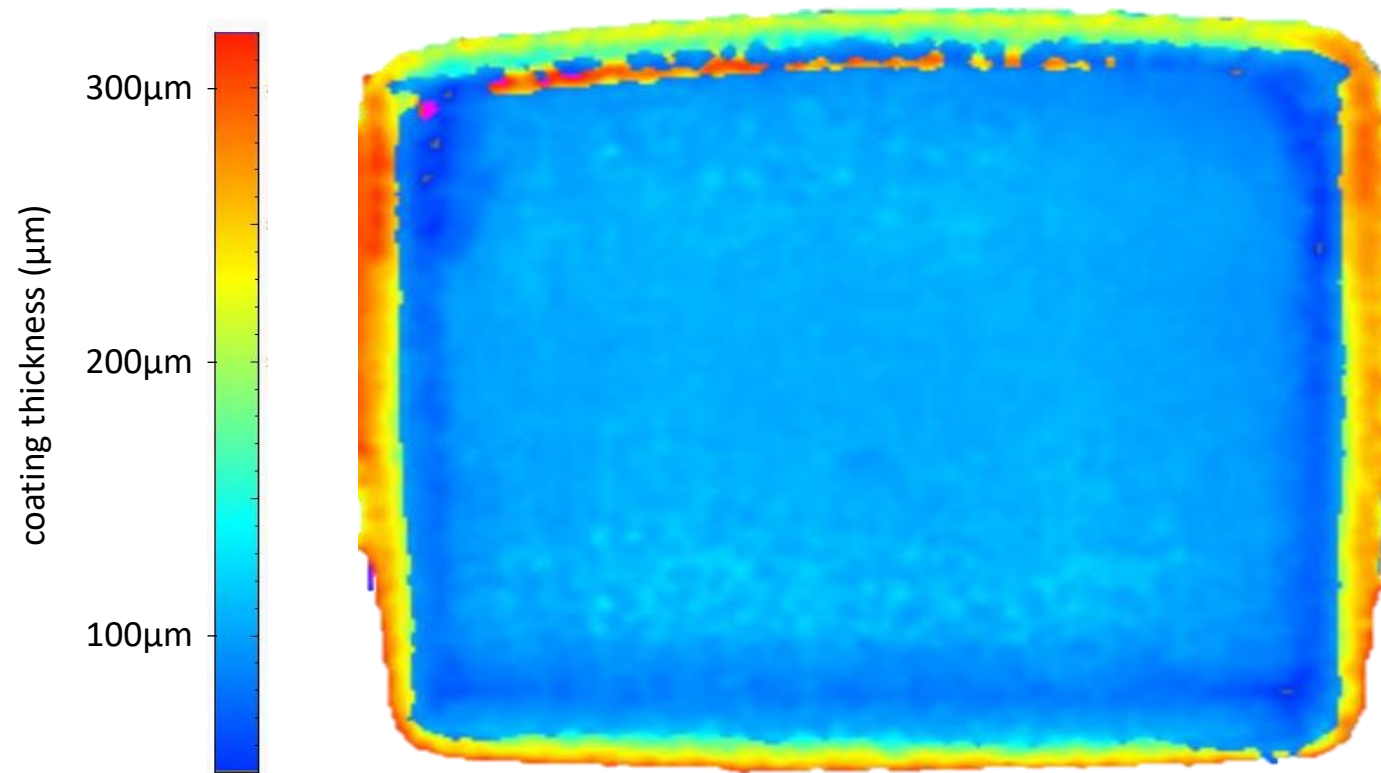
Frame with  
cured enamel



Tray with  
cured enamel



## Measurement results - Tray



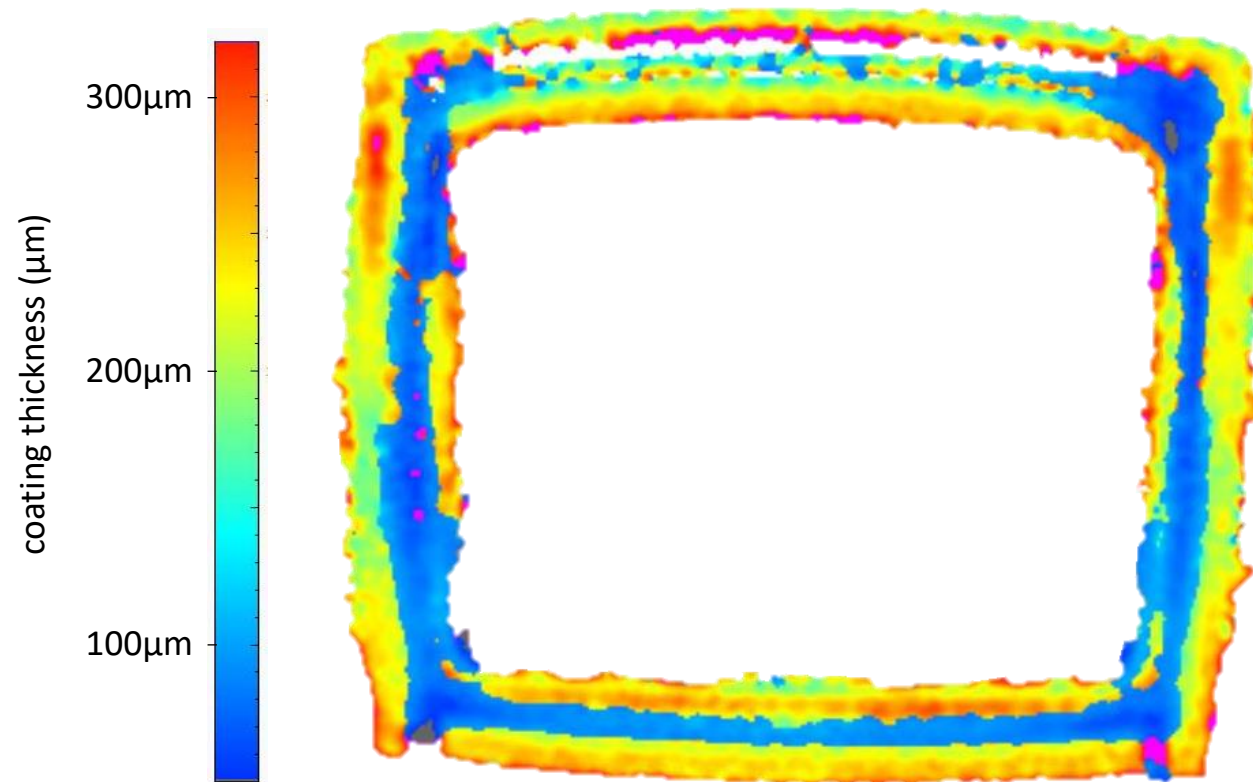
- High thickness on the sides (250 $\mu\text{m}$ )
- High thickness trace in the upper fold
- 100 $\mu\text{m}$  thickness in the tray area
- Low thickness (70 $\mu\text{m}$ ) in the side and lower folds



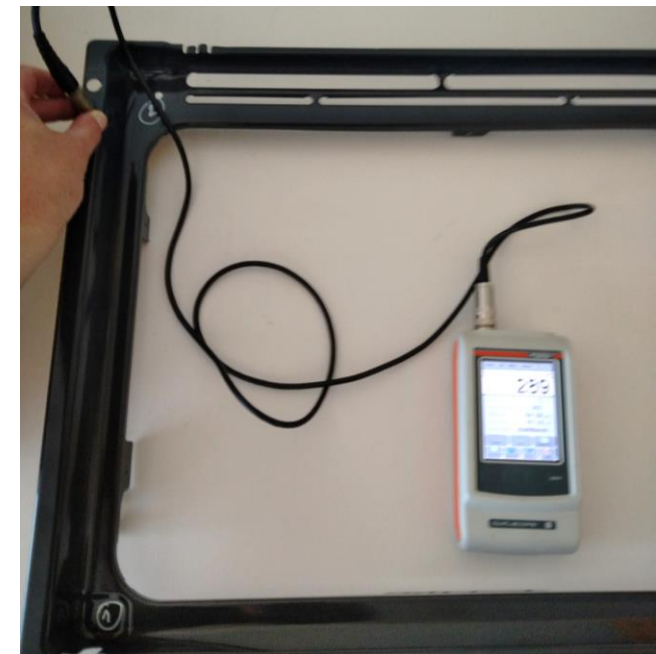




## Measurement results - Frame

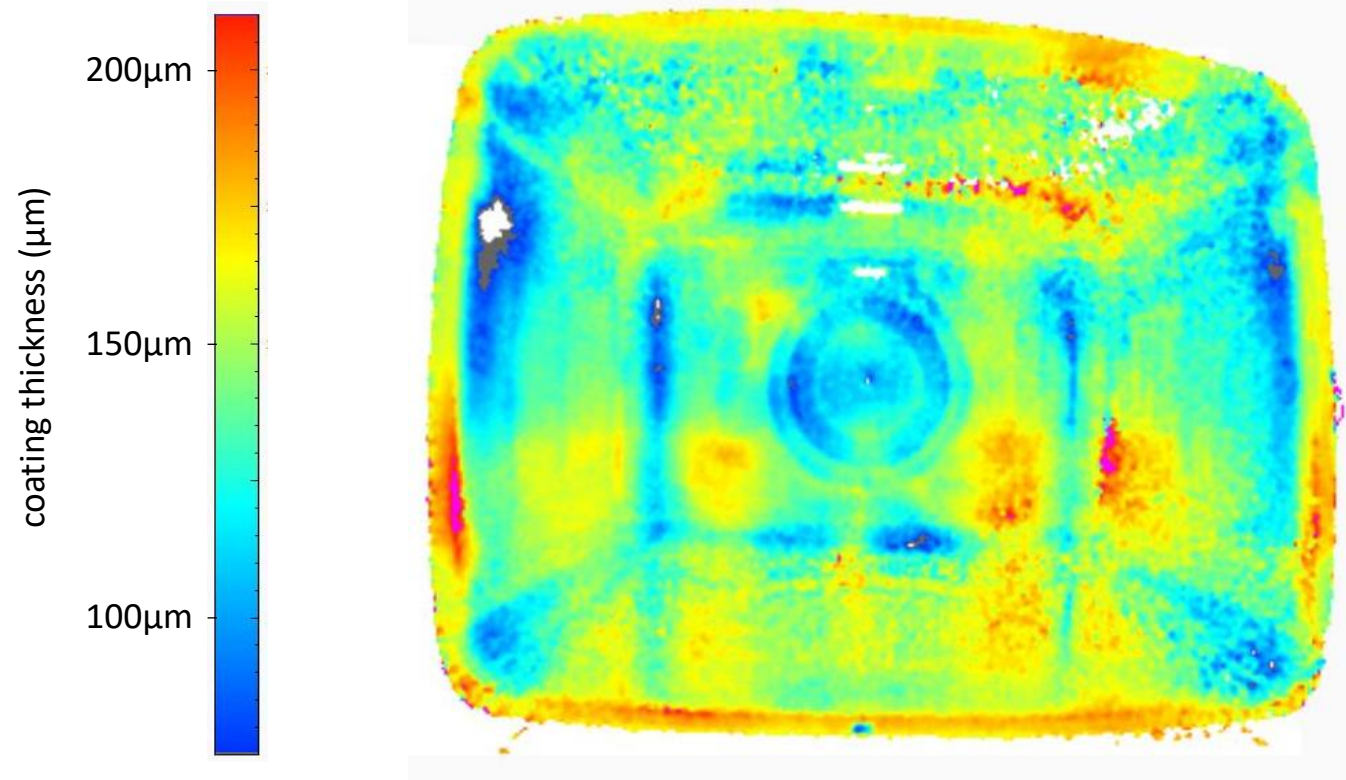


- High thickness on outer frame (250 – 300  $\mu\text{m}$ )
- Low thickness on inside of frame





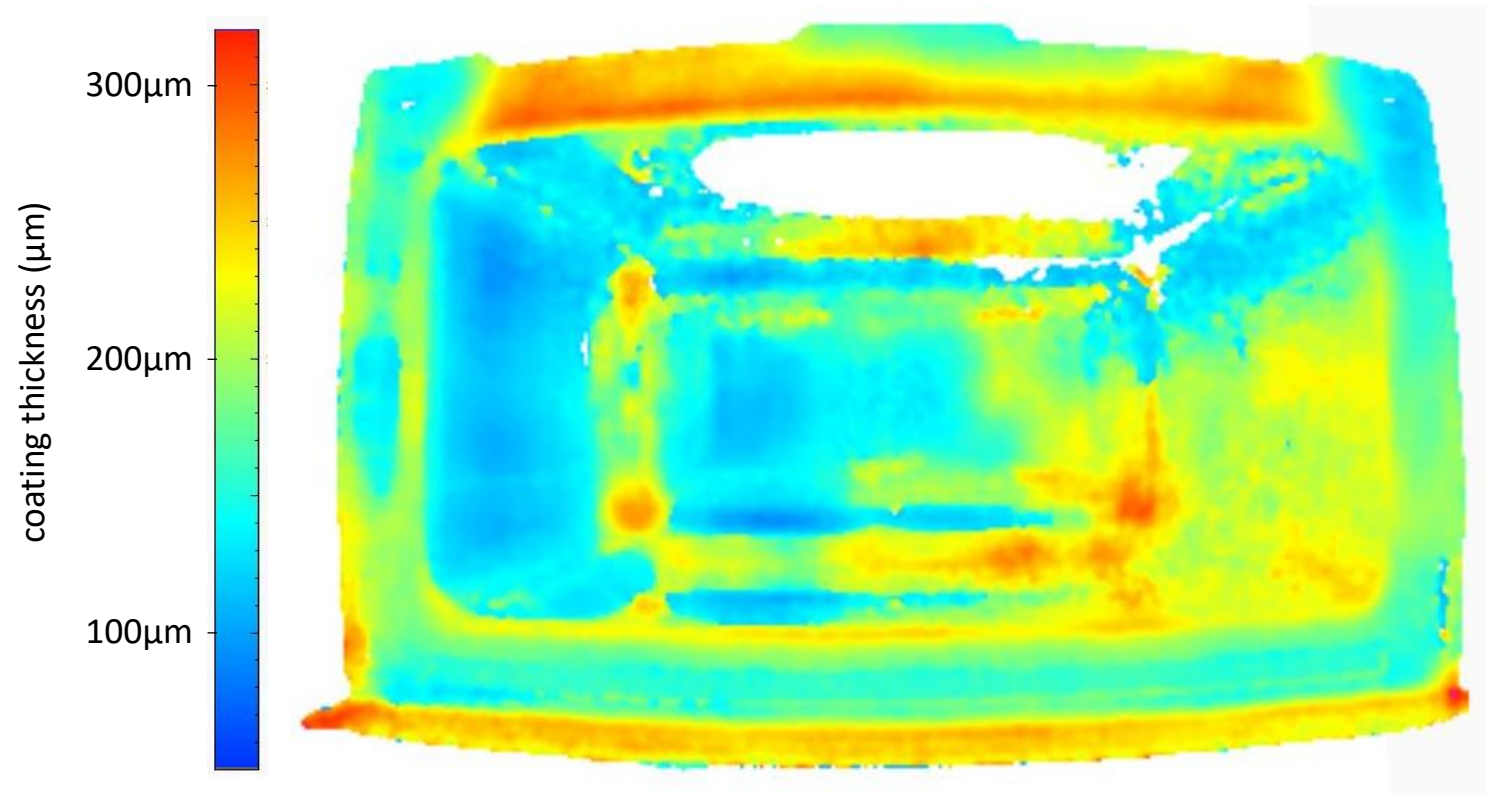
## Measurement results – Cavity wide



- High thickness front frame
- Lower thickness on the sides



## Measurement results – Cavity narrow

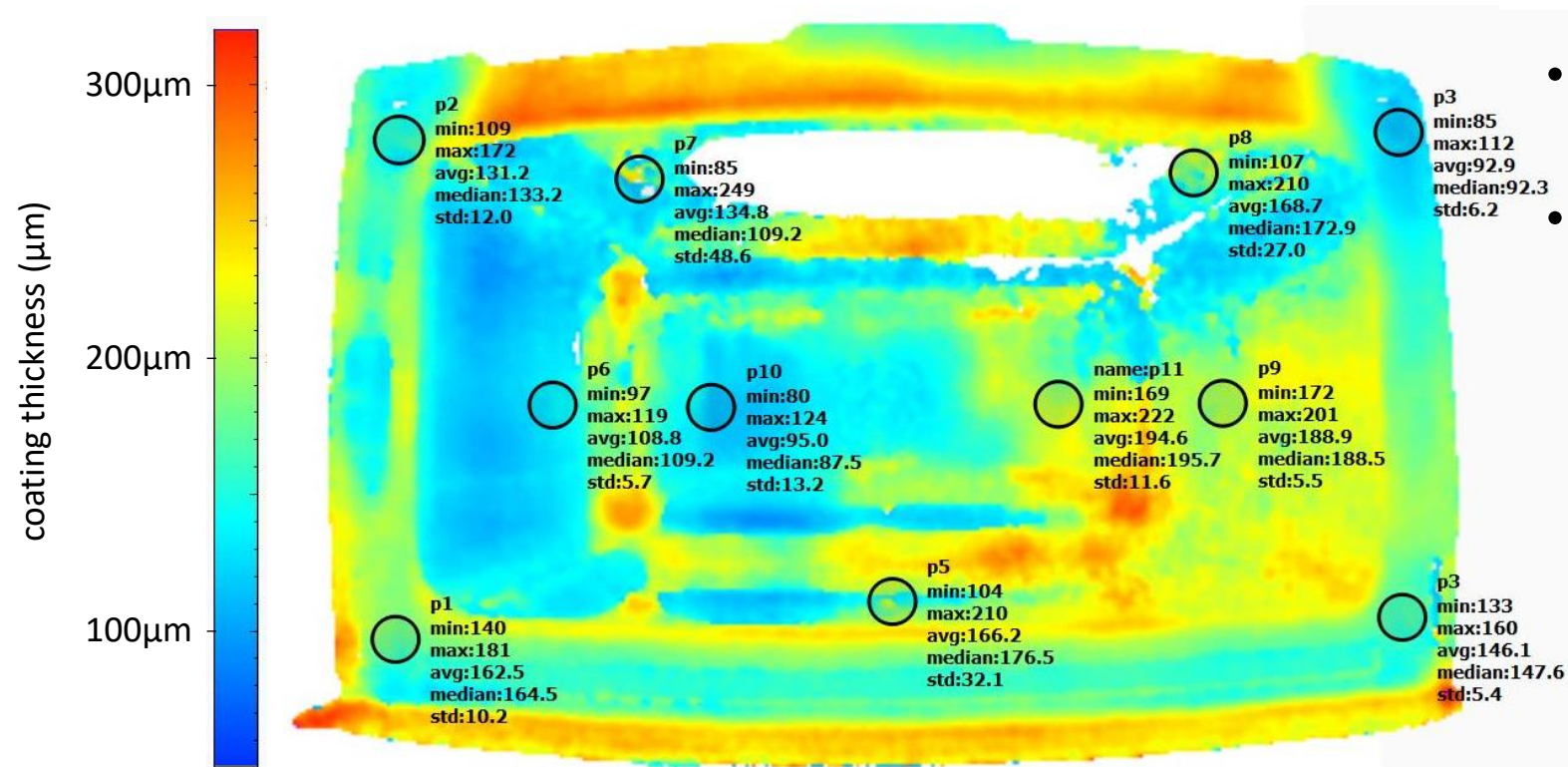


- High on upper front (250 – 300 $\mu\text{m}$ )
- High thickness on lower horizontal ledge
- Around 100 $\mu\text{m}$  on left inside
- Around 200 $\mu\text{m}$  on right inside
- Between 150 - 200 $\mu\text{m}$  on rear
- Accumulation in corners





# Measurement results – Regions-Of-Interest (ROI)

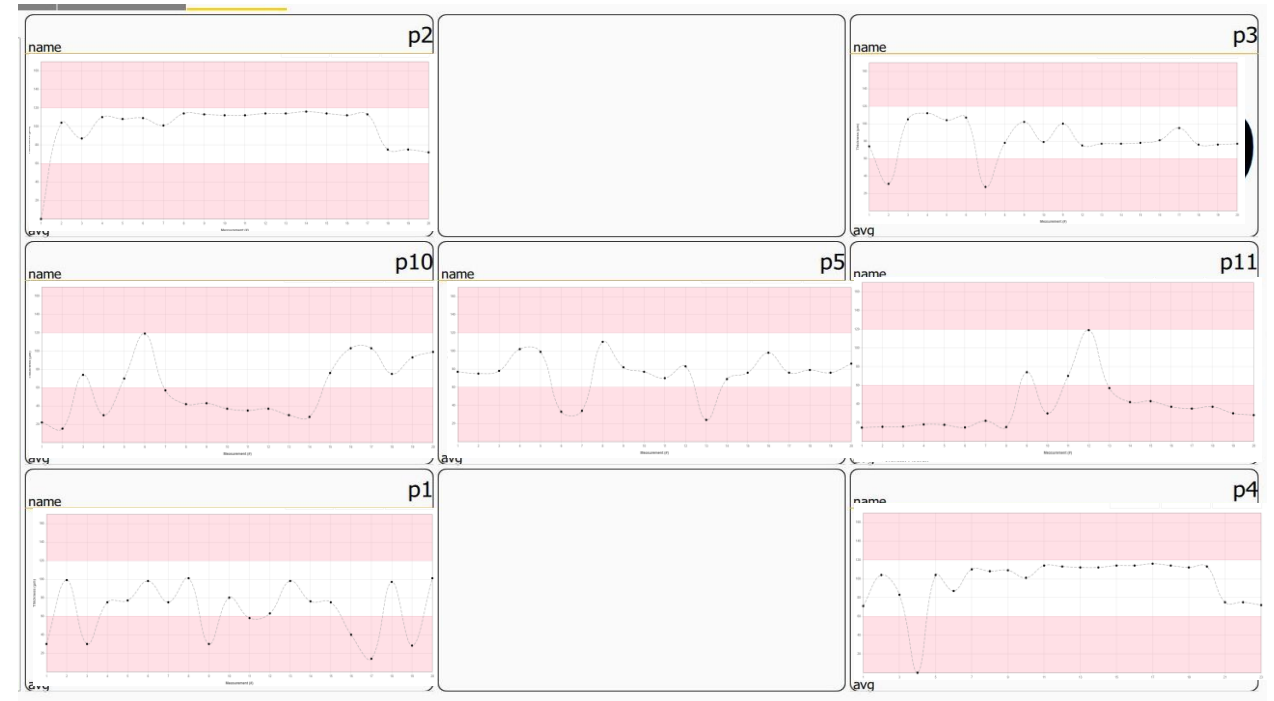
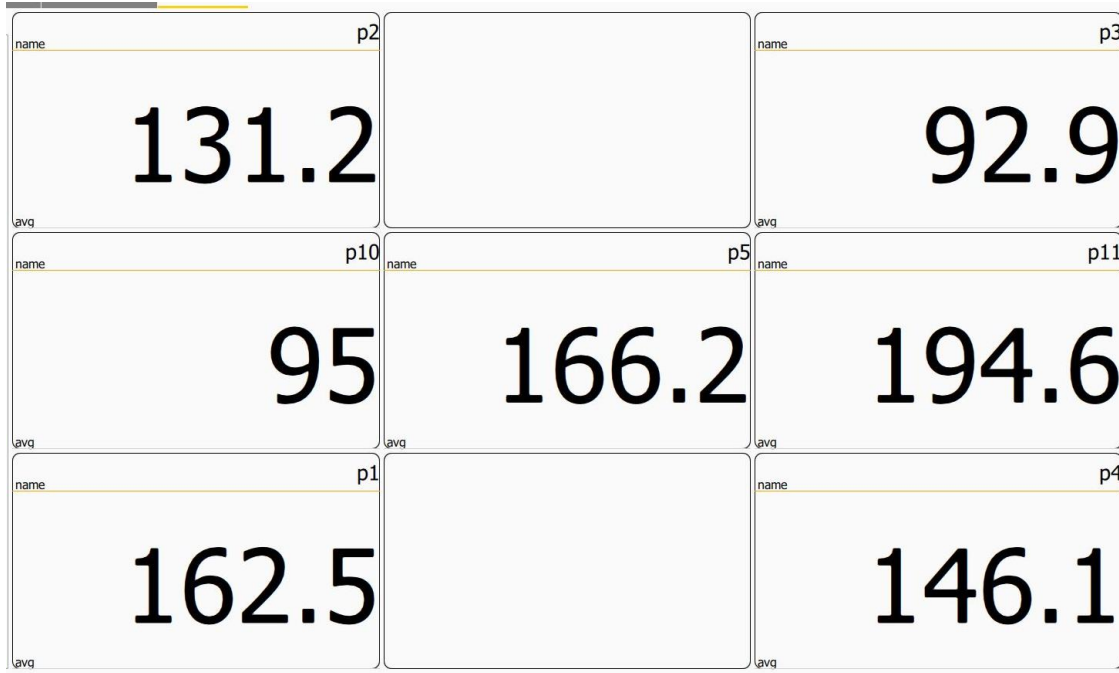


- Freely definable **regions-of-interest (ROI)**
- Statistics of coating thickness in ROIs are transferable to PLC and can be displayed on screen





# Measurement results – Display of statistics and time series

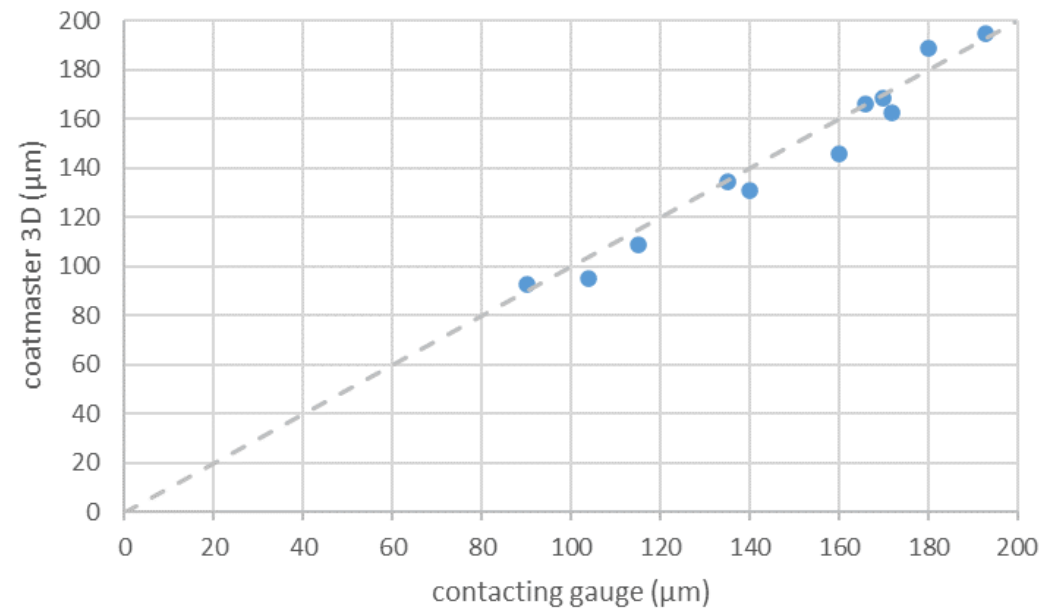




## Measurement results – Cavity narrow

Compare noncontact 3D with contacting inductive gauge:

- Good correspondence of coating thickness measurement with coatmaster 3D and contacting gauge ( $R^2 = 0.96$ )
- Mean deviation  $5\mu\text{m}$  (3.8%)





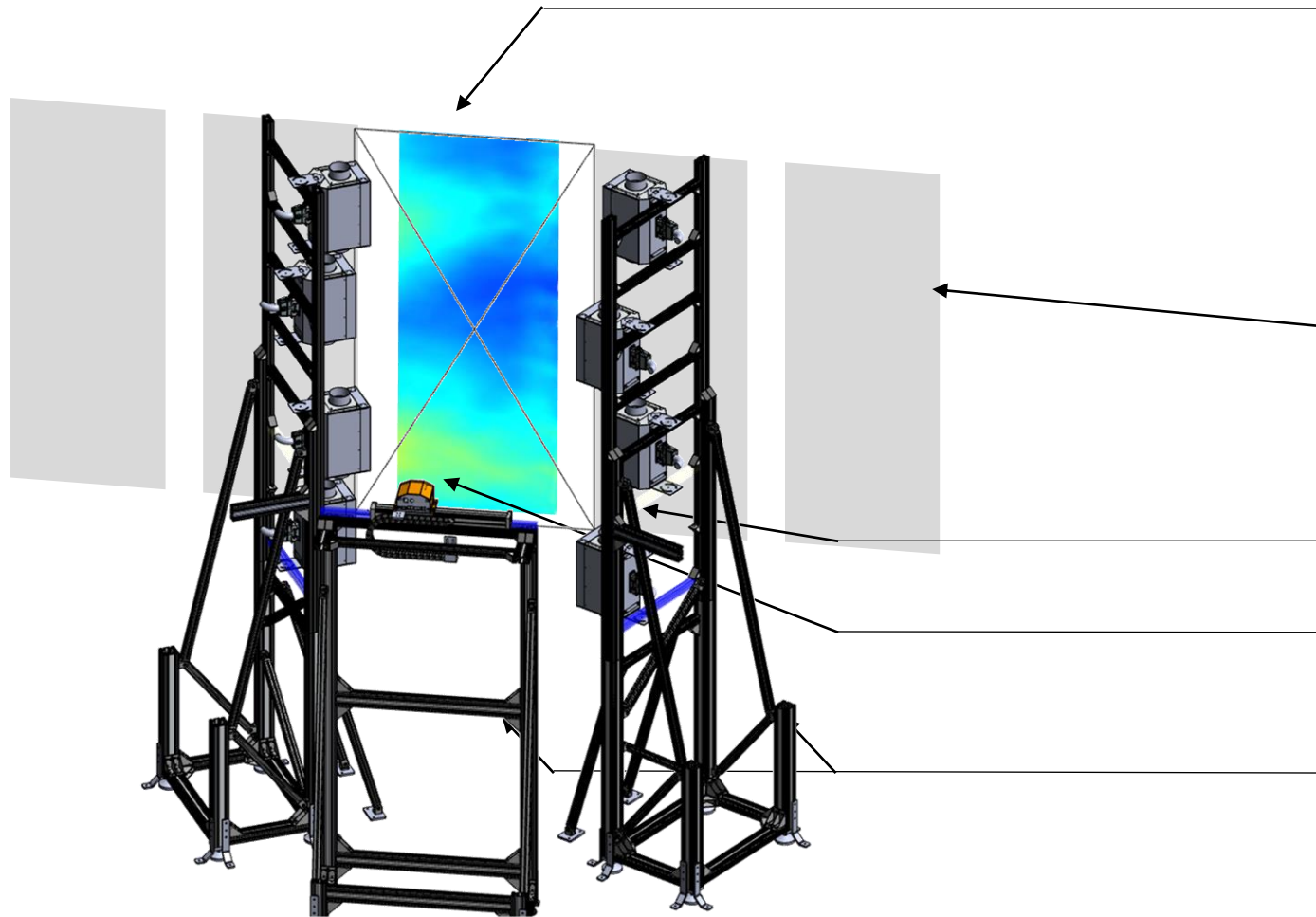
## coatmaster 3D for inline measurement







# coatmaster 3D for horizontal panel measurement



Measuring area: 0.8m x 2m  
(0.4m x 0.5m per excitation source)

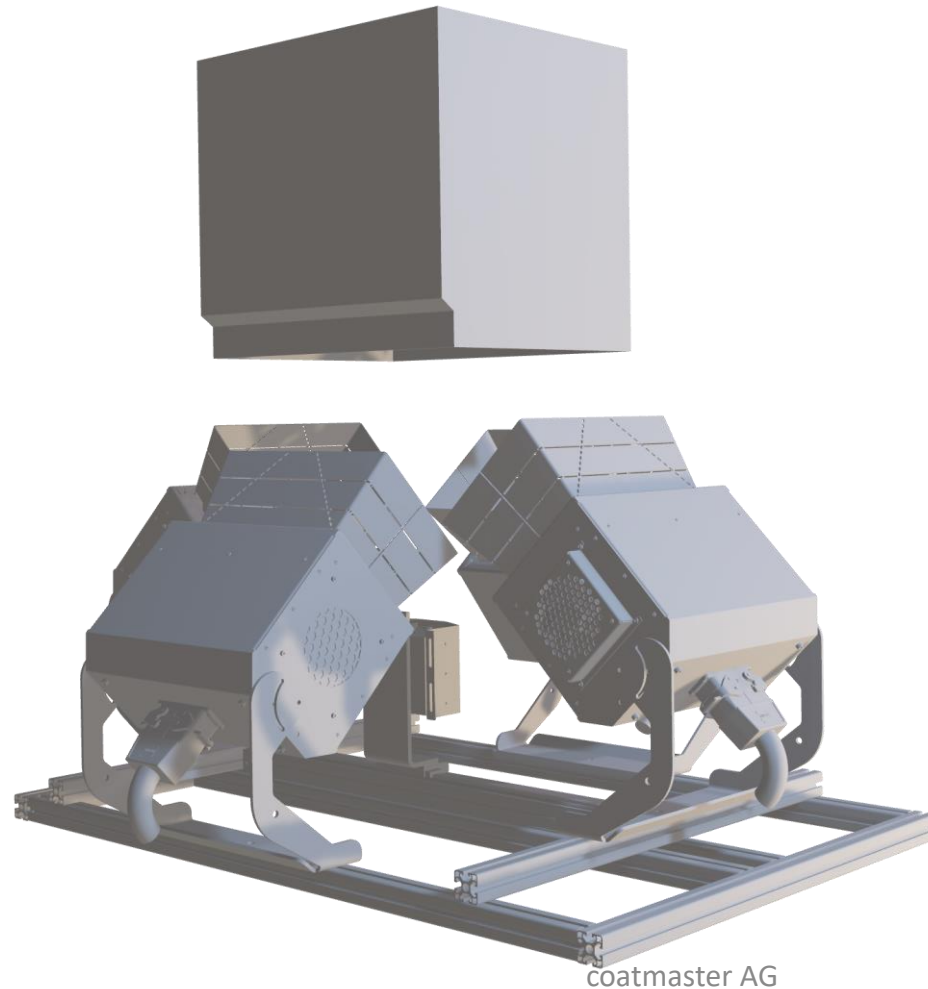
Objects hanging free and moving

Excitation sources

Measuring optics on follower automation  
static frame



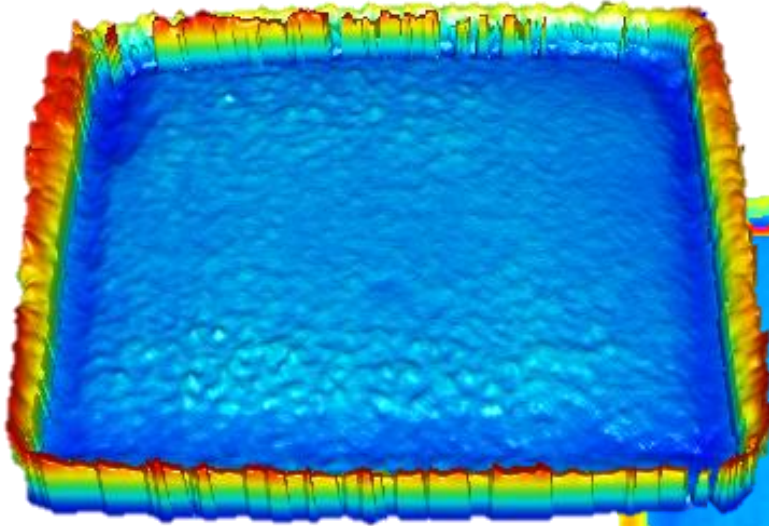
## coatmaster 3D vertical cavity measurement



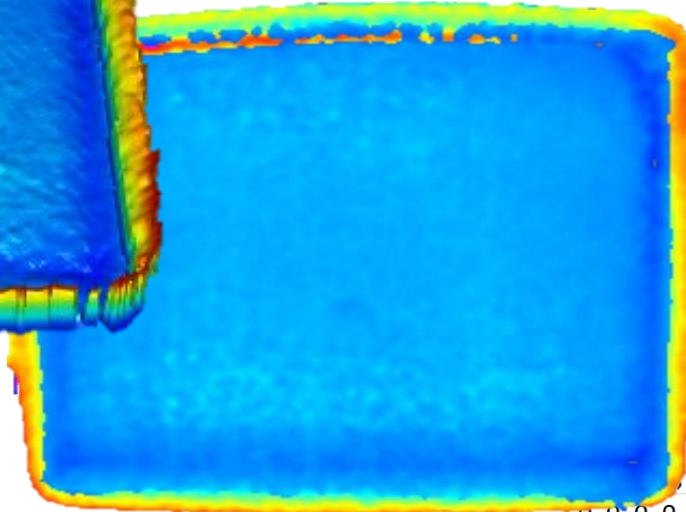
- Camera tracker for Inline measurement on moving cavity (5m/min)
- Footprint 1.3m x 0.9m
- Height below cavity 0.8m
- Clearance 0.1m



# coatmaster 3D data formats



3D land scape



Color map

```
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,171.4,173.8,184.7,194.3,
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0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,165.4,172.6,175.0,181.1,188.3,189.5,185.9,179.8,177.4
```

Numeric

Ave.: 185.1µm  
Std.: 8.5µm  
Min.: 170.2µm  
Max.: 194.3µm

Statistics from arbitrary regions-of-interest





## coatmaster 3D benefits

- Quick measurement on moving parts (0.5s)
- Measuring complete cavities and trays with one single measurement without robot positioning
- 100% quality control
- Automated and connected to ERP





## coatmaster 3D budget for cavity

### Quantitative benefits :

- Savings of human resources for manual quality control: ½ hour per shift
- Savings in quality control procedures (documentation, training, supervision)

### Qualitative benefits

- 100% quality documentation
- No transcription or measurement errors due to full automation of measurement process

### Invest (budgetary):

- coatmaster 3D base system (optics, control unit, software): 56k€
- 4 coatmaster 3D excitation units: 24k€
- Follower automation for coatmaster 3D optics, including PLC: 12k€
- Mounting and protection housing (as required)
- Shipping, Installation, Training and Commissioning (depending on location and integration options)



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