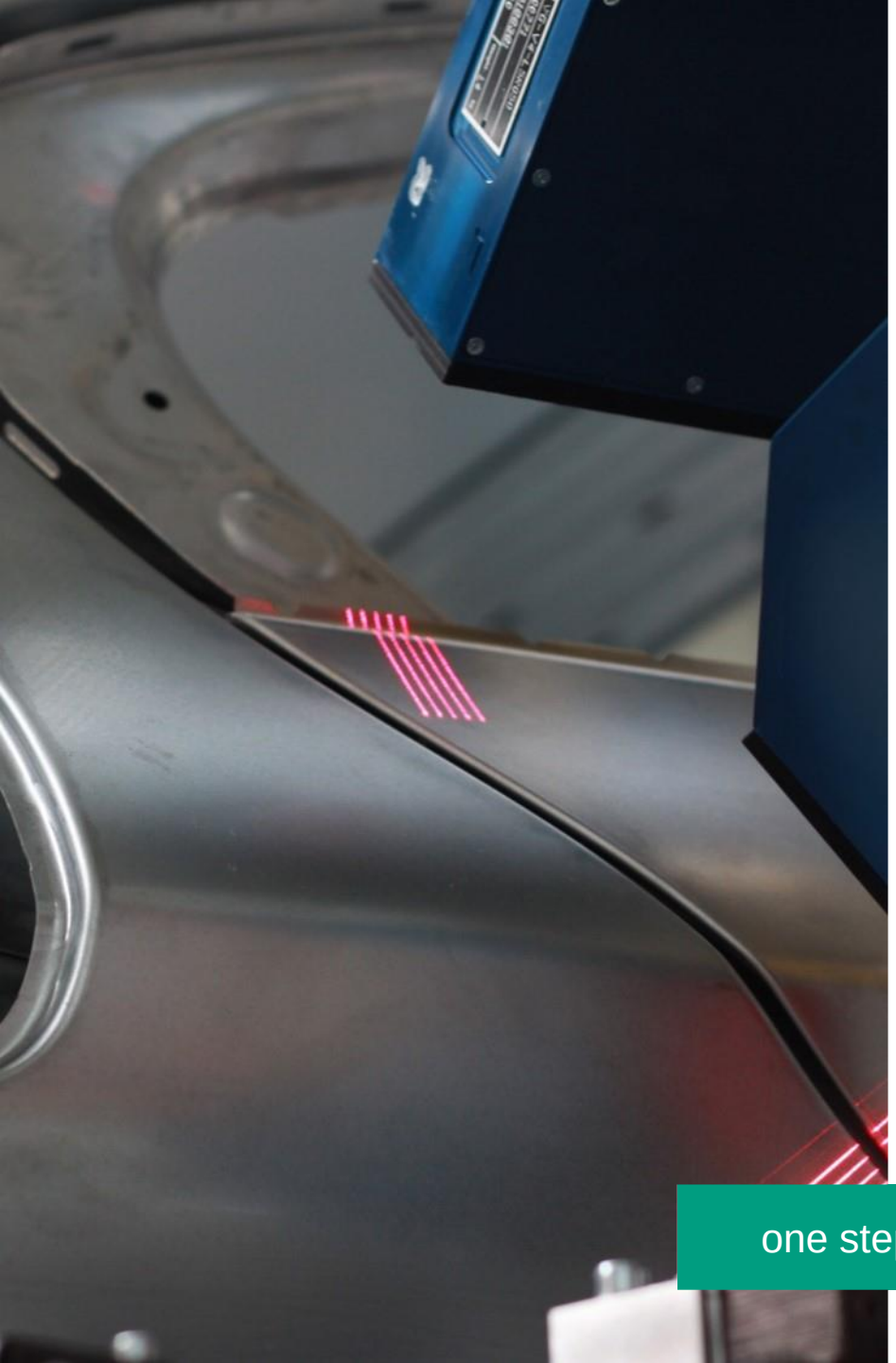


FFTplace BestFit

*„**FFT**place **BestFit** enables to find the best alignment of components next to each other for subsequent assembly steps, taking care of all environmental influences.”*

one step ahead in **INTELLIGENT** production systems

FFT*place* BestFit

Find the best possible position for your component.

1 FFT*place* **BestFit** Operation

Optimised alignment of components

one step ahead in **INTELLIGENT** production systems

FFT*place* **BestFit** - Operation

Introduction

- Target:
  - Optimised alignment of components to each other.

- Task:
  - Each component is affected with tolerances to be compensated.
  - This step eliminates further intervention in subsequent assembly steps

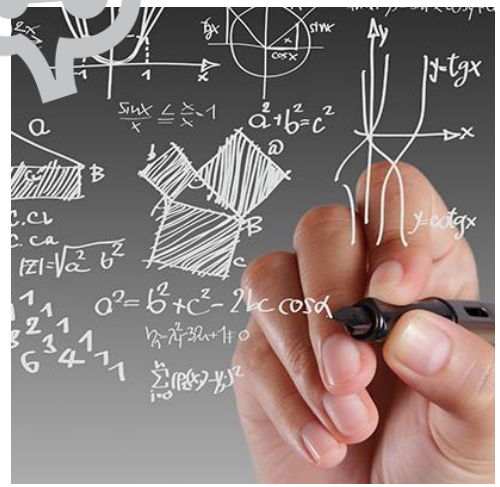
→Solution: **FFT**place **BestFit** Operation:

  - Constant calculation of aligned position
  - Visibility of inaccuracy is compensated

FFT*place* **BestFit** - Operation

Process flow

Scanning deviation



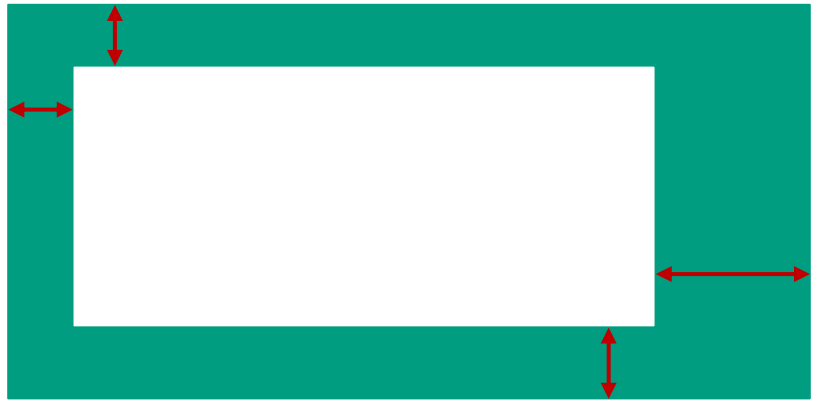
Calculation correction factor

BestFit correction e.g. by robots

Operating without **FFT**place **BestFit**

Position correction with the 3-2-1 method

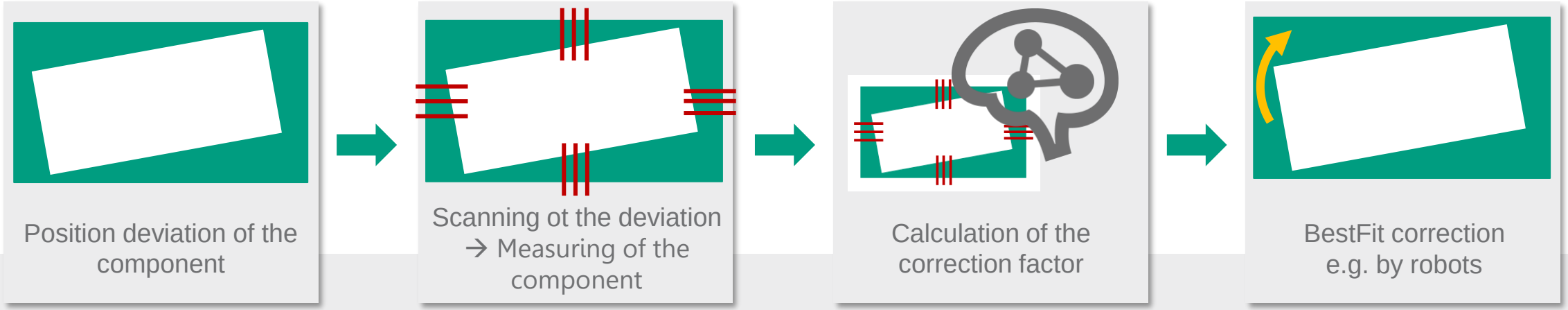
- Alignment of the component to 2 edges
  - Gaps on these two edges are correct
  - Deviation of the gaps to the remaining edges, as the component is not aligned in average to all edges.



→ No mediated alignment of the component

FFT*place* **BestFit** - Operation

Adjustment of the position with the BestFit Operation

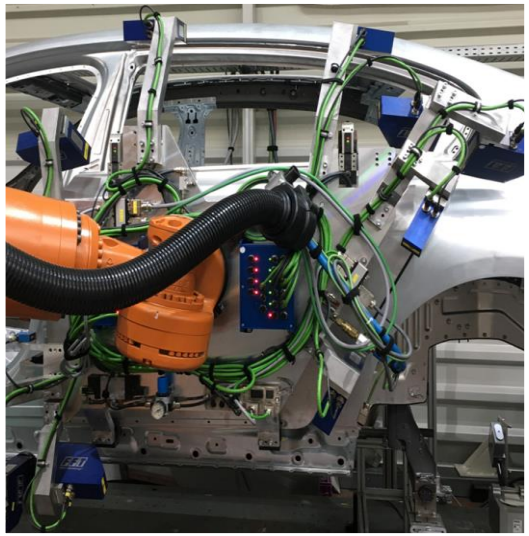


Component is precisely positioned with **FFTplace BestFit**

Statistical optimisation of the starting position

FFT*place* **BestFit** - Operation

Process flow

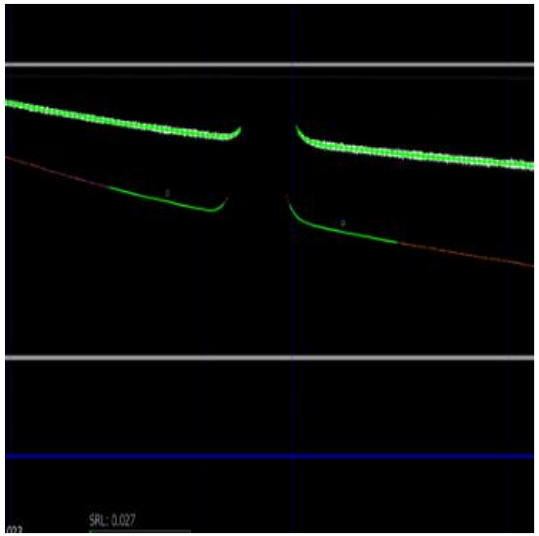


Scanning ot the deviation

- Component in measuring position
- Automatic optimisation of the measuring position

Data logging

- Sensors measure gap and transition of the components
- Punch measurement is also possible

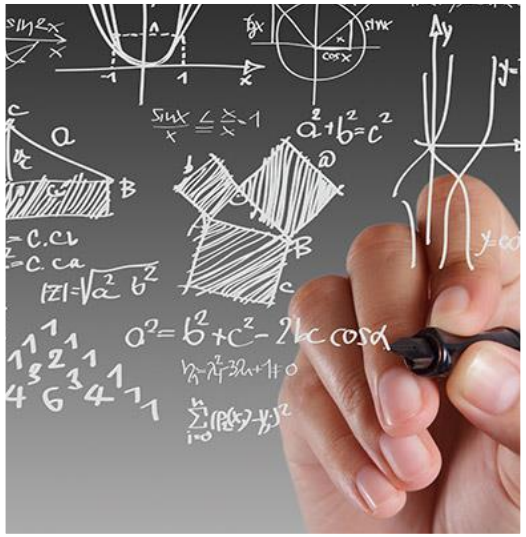


Data transfer

- Sensor data are transferred to FFT VarioInspector

FFT*place* **BestFit** - Operation

Process flow



Corrective calculation

- Calculation of the **FFT**place **BestFit** position

Transfer of data

- The calculated **FFT**place **BestFit** position is transferred
- Transfer of data via TCP/IP

Repositioning

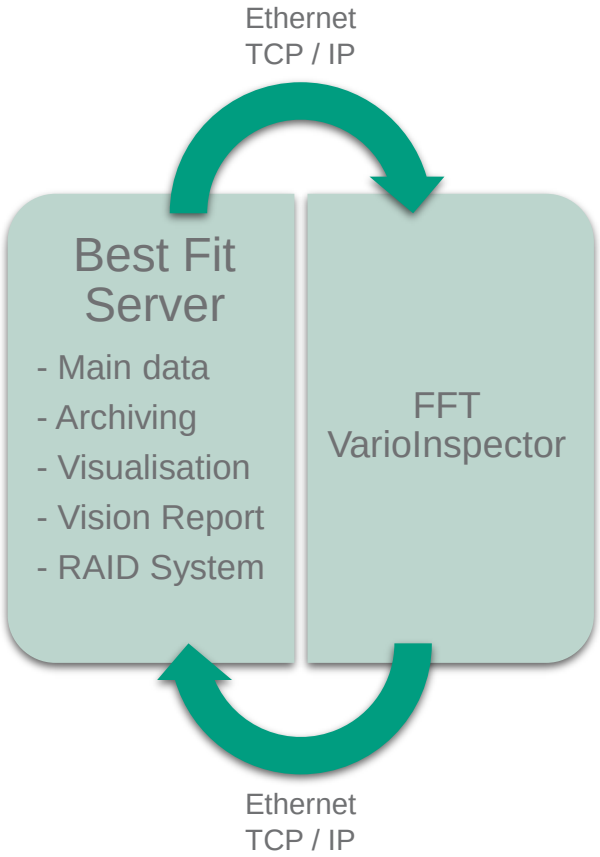
- The position of the component is optimised

FFT*place* **BestFit** - Operation

FFTplace **BestFit** Quality Assurance

- After assembly and release of the component, an actual status recording is carried out.

- The result is used for:
  - Visualisation on screen
  - Transfer to higher-level QA systems
  - Generation of reports and statistics
  - Influences on further assembly steps are included



2 FFT*place* **BestFit** - Advantages

Consistant quality, fast measurement, reduced costs

one step ahead in **INTELLIGENT** production systems

FFT*place* **BestFit** - Advantages

Saving costs and increasing efficiency

- Cost cutting by reducing rework
- Enables Short cycle time
- Very high availability

Optimisation and assurance of quality

- Improvement of quality
- Radius-independent measurement
- Quality measurement result of each component is stored
- No influence of the operator

FFT*place* **BestFit** - Advantages

Advantages in detail..

Repeatability

Repeatability taking into account all tolerances of each single parts

100% of high-class documentation

100% quality documentation of each component
→ Quality data available for further processing

Direct, optimum alignment

Short, closed tolerance loop

→ direct response to each single part with its own tolerances

Elimination of environmental impacts

Elimination of environmental influences such as temperature, aging robots and changes in positioning behaviour

3 FFT*place* **BestFit** - System features

Easy to handle and efficient in maintaining quality

one step ahead in **INTELLIGENT** production systems

FFT*place* **BestFit** - System features

Technical characteristics of the system

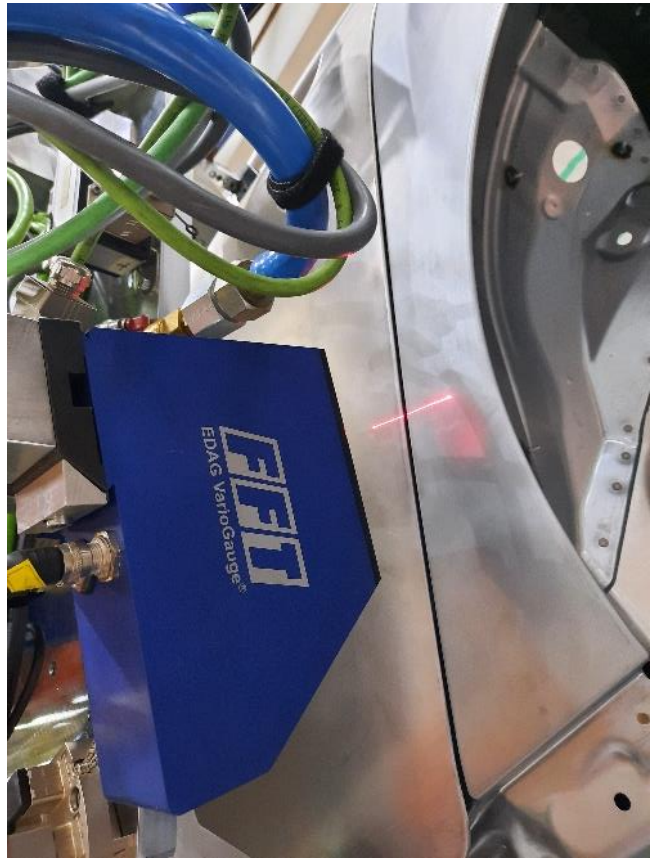
Flexibility	Serveral versions are handled by one system	
Resolution	Sensor	0,05mm
Availability	System	99,92%
Verfication of stability	cg - value (per sensor)	> 1.33 (static)
	cp - value (System with robot)	> 1.33 (dynamic)

FFT*place* **BestFit** - System features

Strategy in case of sensor failure

Emergency in case of sensor failure

- In event of a sensor failure, learned data will be applied
- Production can be continued until repairment is scheduled
- Any sensor can be replaced within 3 minutes
- Stored calibration data will enable the replaced sensor
- No calibrations on reference points necessary

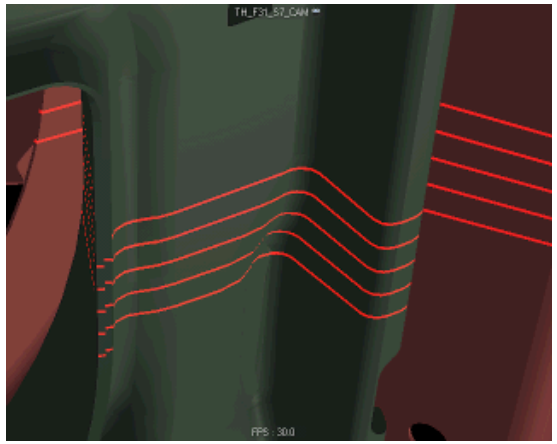


FFT*place* **BestFit** - System features

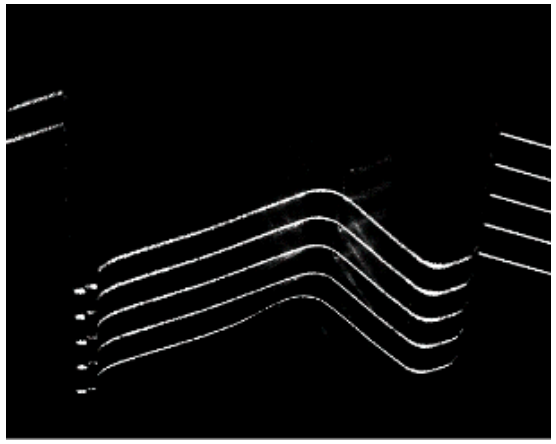
Fast implementation based on simulation technology

- Setup of sensor positions based on CAD data
- Sensor positions are verified by simulation
- Design of tools / simulation based on CAD models
- Adaption of the software parallel to the implementation phase (setup of the measuring point)
- No reference tool required

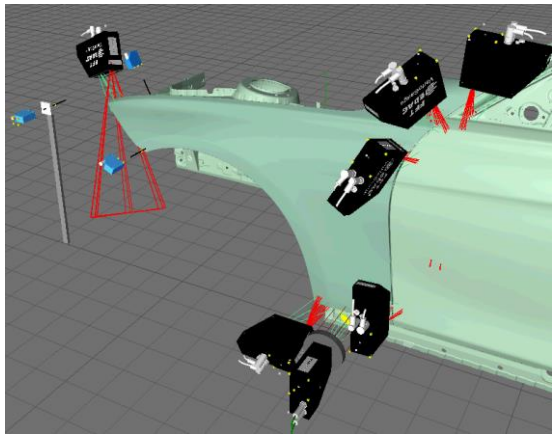
Simulation detail



Actual image

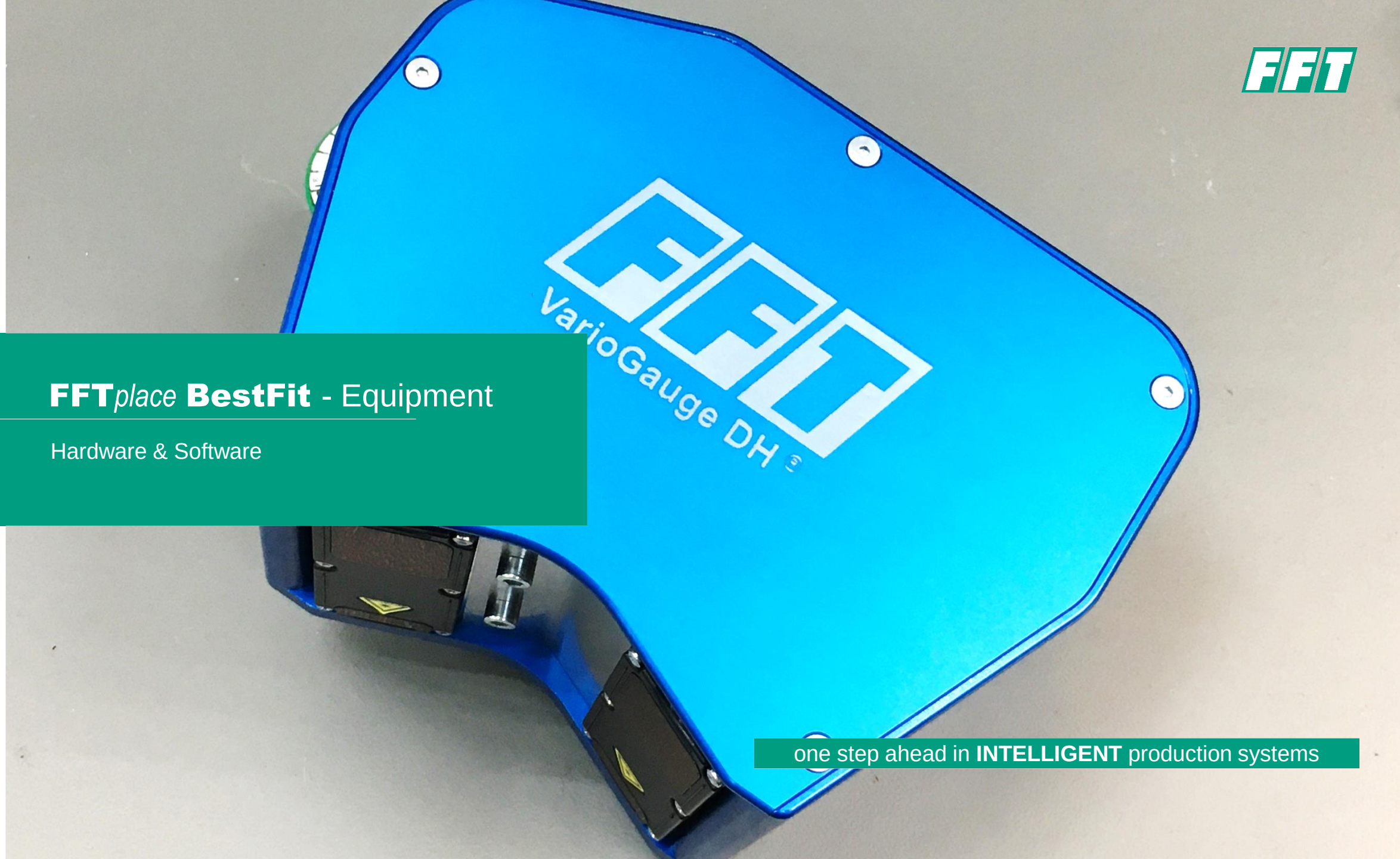


CAD detail



4 FFT*place* **BestFit** - Equipment

Hardware & Software



one step ahead in **INTELLIGENT** production systems

FFT*place* **BestFit** - Equipment

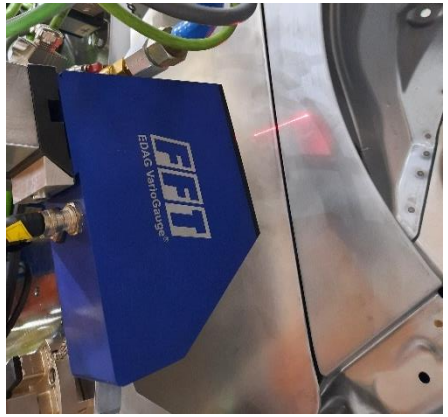
FFT Image processing - hardware

FFT VarioGauge DH (Twinsensor)

- Perfect for stable measurements of gaps with higher precision
- Fixing via quick release system plate
- Data transmission via Gigabit Ethernet
- Also usable on painted body

FFT VarioGauge V6 2.5D (Triangle sensor)

- Measurement of 2.5D applications (for gap and flush measurement)
- Implemented µC (calibration data are stored in sensor)
- adjustable resolutions and laser intensities
- Optional: Protection against dust/dirt & sunlight
- Also available as 2D – sensor (for round holes and rectangular holes)

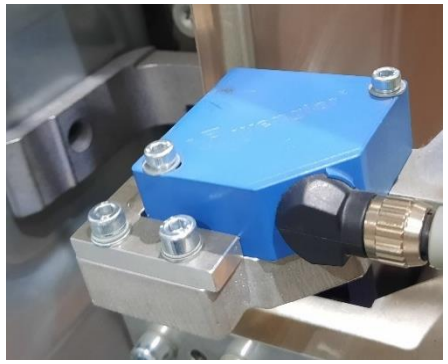


FFT*place* **BestFit** - Equipment

FFT Image processing – Hardware

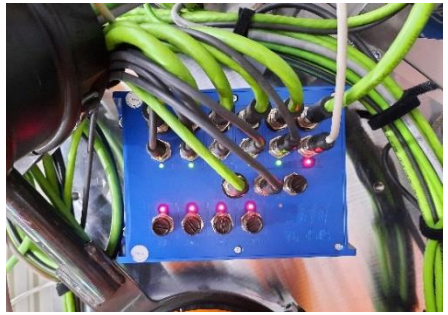
Wenglor Sensor

- 1-dimensional measurement of distance on flat surfaces
- Economic & good solution for measurement of shaft dimensions
- Works in FFT sensor network
- (Can be implemented in FFT sensor bus.)



FFT VarioGauge - Hub

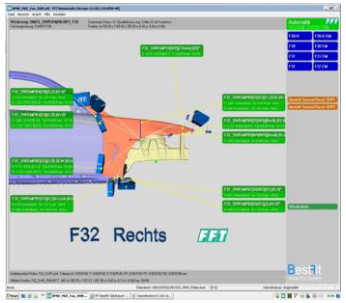
- Connection of up to 6 sensors
- Connection of up to 4 Wenglor sensors
- Several hubs can be used in series



FFT*place* **BestFit** - Equipment

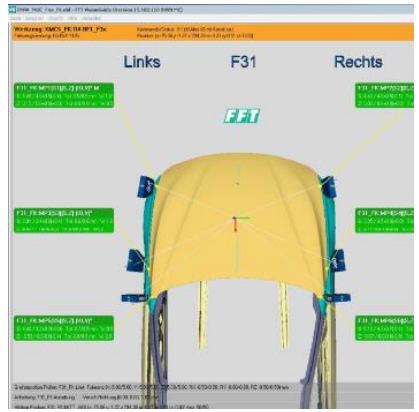
FFT Image Processing – Software

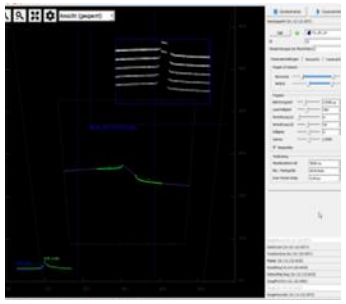
The FFT VisionGuide and VisionAnalyser software combine the various modules of the image processing system into one software with convenient user interface



FFT VisionGuide

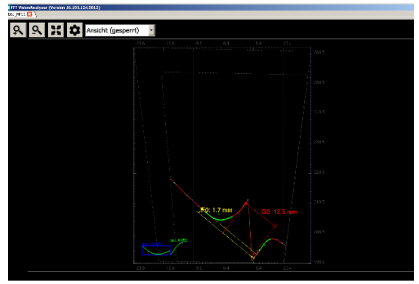
- BestFit calculation algorithm
- Exchange of data (PC - Roboter; PC - PLC)
  - Interbus-S, Profibus-DP, Ethernet / Profinet
  - KUKA KRC1 - KRC4 (incl. VKRCx)
- Logging / saving of all process-relevant data and quality features into database





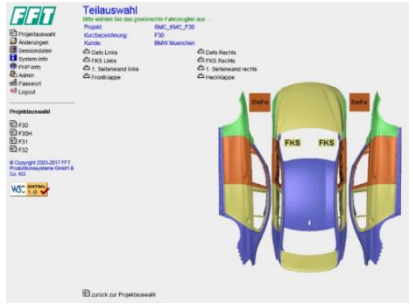
FFT VisionAnalyser

- Image processing
- Sensor communication
- Definition & setup of the measurement characteristic



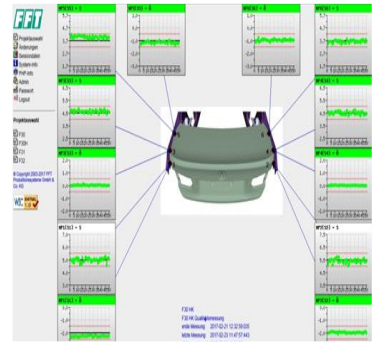
FFT*place* **BestFit** - Equipment

FFT Image processing – Software



FFT VisionReport

- The web-based VisionReport runs on a separate server
- The software is designed for processing data of several FFT BestFit production lines for visualization
- Worldwide access to the quality database

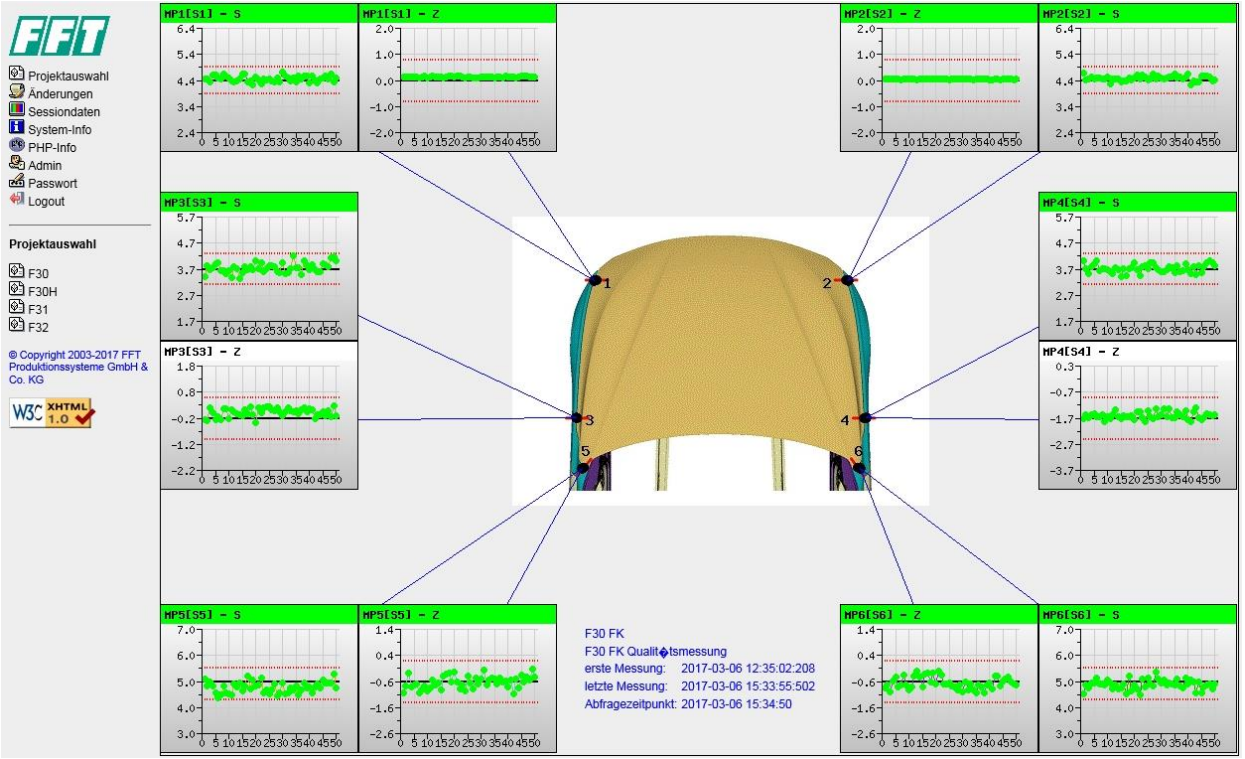


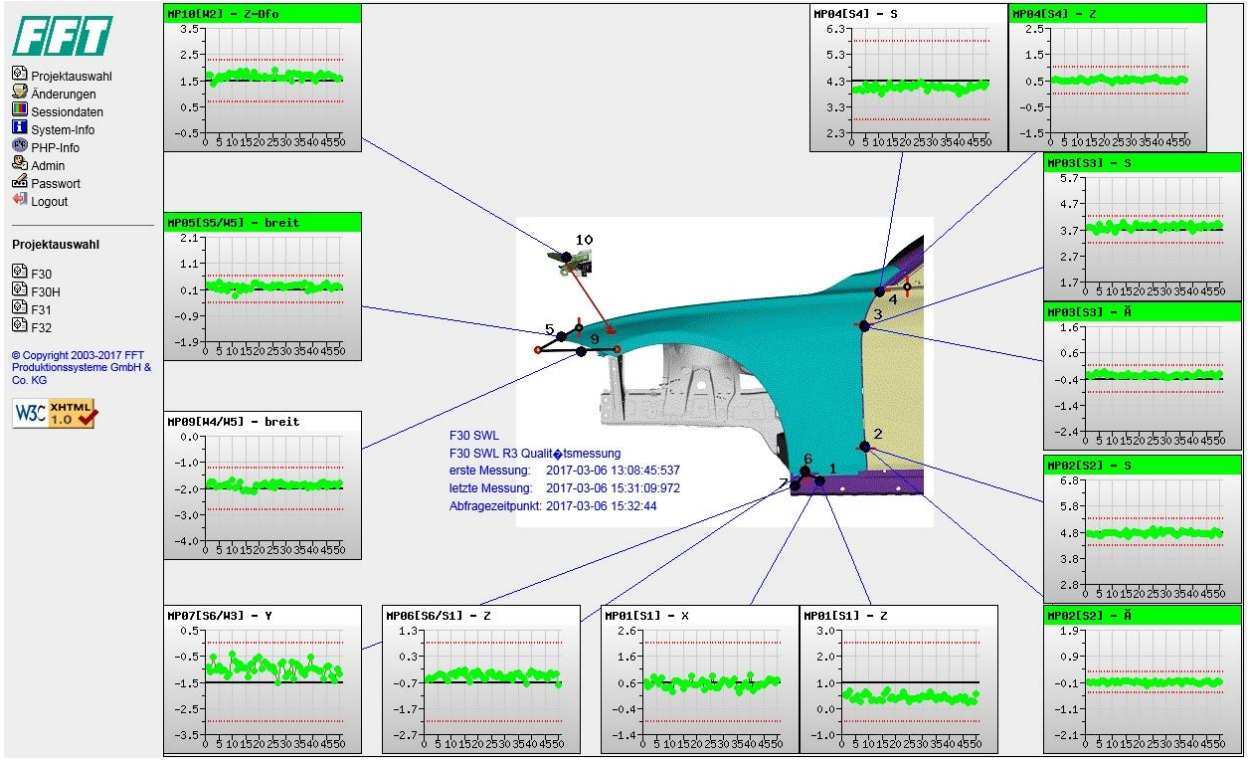
Database server

- Designed as RAID - System
  - RAID = Redundand Array of Independent Disks
- Secure data archiving
- Secure storage of the setups of all FFT BestFit "slaves”
- MySQL, MSSQL & MariaDB

FFT*place* **BestFit** - Equipment

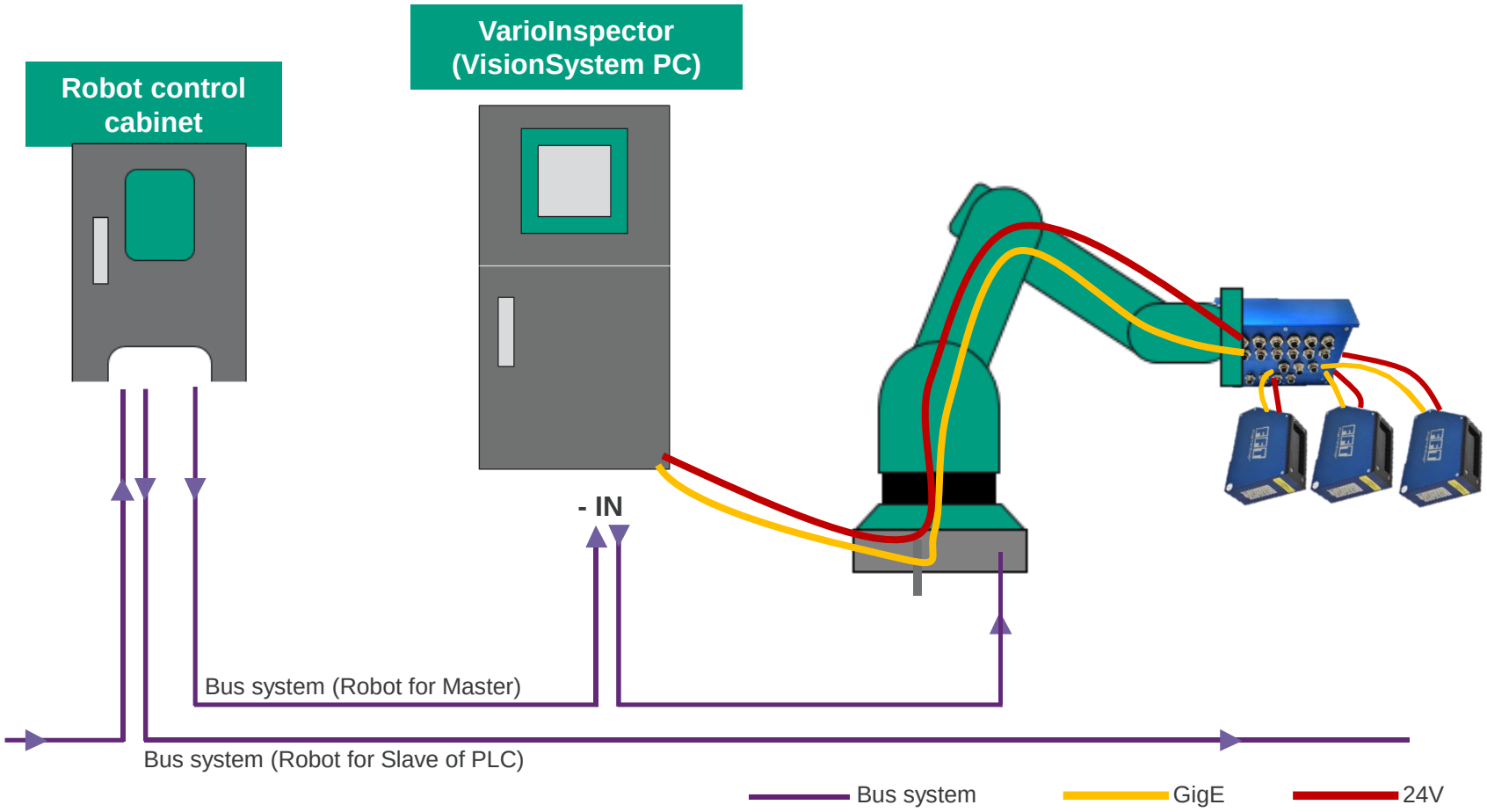
FFT Image proccessing– Software (VisionReport)





FFT*place* **BestFit** - Equipment

FFT Image Processing – Hardware & Software, System connections



SERVICE OPTIONS

We support your project from the idea to the realization and gladly beyond.

We take into account quality and deadline requirements and we assume the responsibility for the project until turnkey handover.

Consulting

Use our experience for your tasks

Project Management

Support from the idea to the start of production

Risk Analysis

Identification of risks in the process

Custom design

Creation of individual solutions

Manufacturing

Successful manufacturing with modern technologies

Documentation

Clear and logical

Conformity

Compliance with standards and regulations

After Sales

Competent service through FFT

5 FFT*place* **BestFit** - References

More than 20 reference projects

one step ahead in **INTELLIGENT** production systems

FFT*place* **BestFit** - References

Some references from the Automotive Industry

Projekt: BMW F45, F40

Rear doors,
Front doors,
Fender-Brackets,
Fenders, Trunk-lid,
Bonnet-hinges &
bonnet

Projekt: VW Tiguan

BestFit trunk lid,
hang in doors

Projekt: VW ID.3

BestFit trunk lid

Highlight:
Final assembly
painted body

Projekt: BMW G26

Rear doors,
front doors,
fender-brackets,
fenders,
bonnet &
bonnet-hinges

6 FFT*place* **BestFit** - Light

Concept description

one step ahead in **INTELLIGENT** production systems

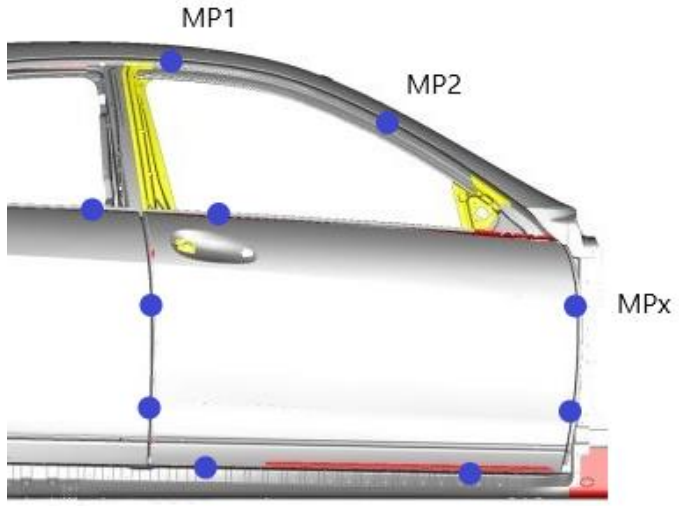
FFT*place* **BestFit** - Light

principle

Instead of the originally used robot with sensors on the gripper, a measuring robot is used, e.g. an UR10, which guides only **one** sensor.

flexibility

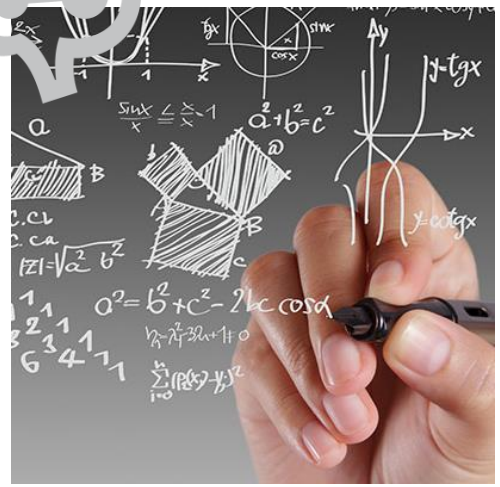
By decision to use a measuring robot, **flexibility** is given in terms of part, shape, measuring positions, number of measuring points.



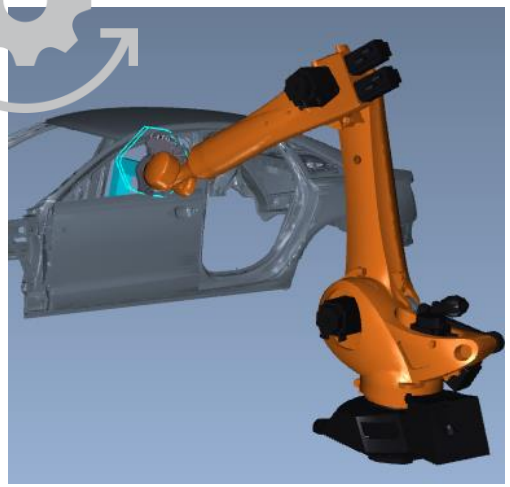
FFT*place* **BestFit** - Light

the interaction of measuring robot and joining robot

Measuring deviation (with measuring robot)



BestFit calculation

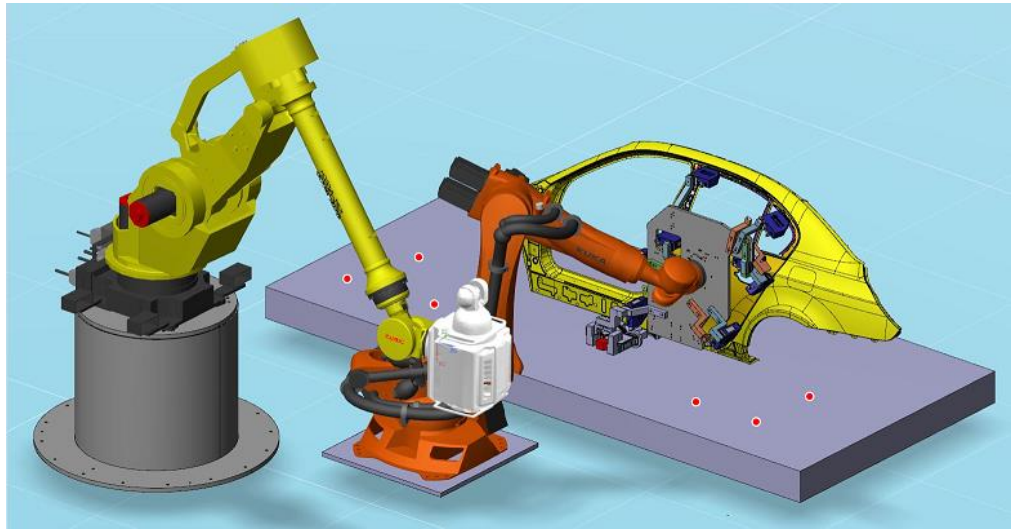


BestFit correction by the handling robot

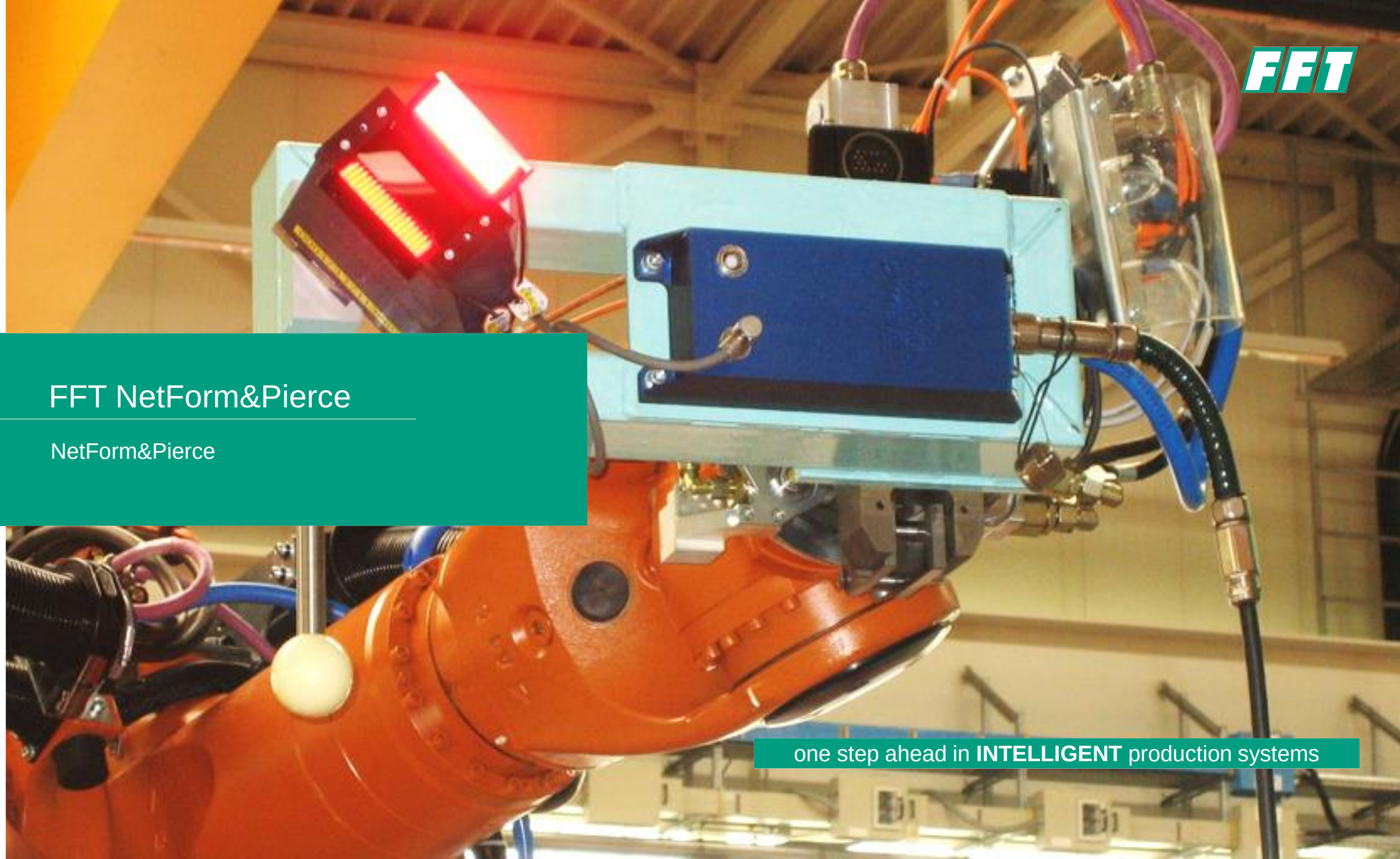
FFT*place* **BestFit** - Light

example with LaserRadar Sensor

Test setup with the Nikon LaserRadar in the BestFit cell in Fulda.



- The joining robot is KUKA
- Measuring robot is FANUC
- LaserRadar was used instead of the FFT Doublehead



7 FFT NetForm&Pierce

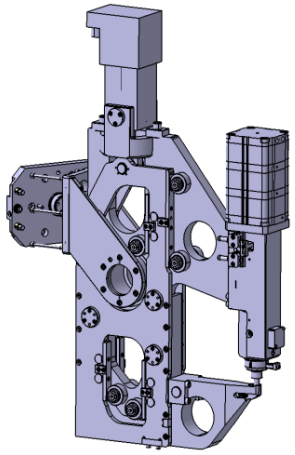
NetForm&Pierce

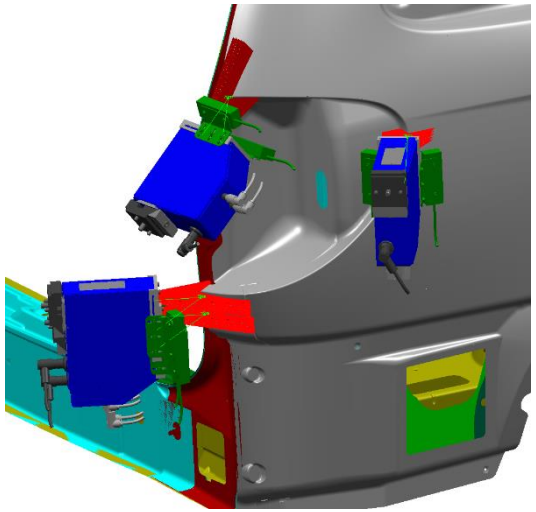
one step ahead in **INTELLIGENT** production systems

FFT NetForm&Pierce

What is FFT´s Vision Controlled NetForm&Pierce?

It is a powerful system-solution that allows the creation of quality-relevant surfaces and holes best fitting to the tolerances of each body i.e. form and pierce taillamp area using FFT BestFit Light



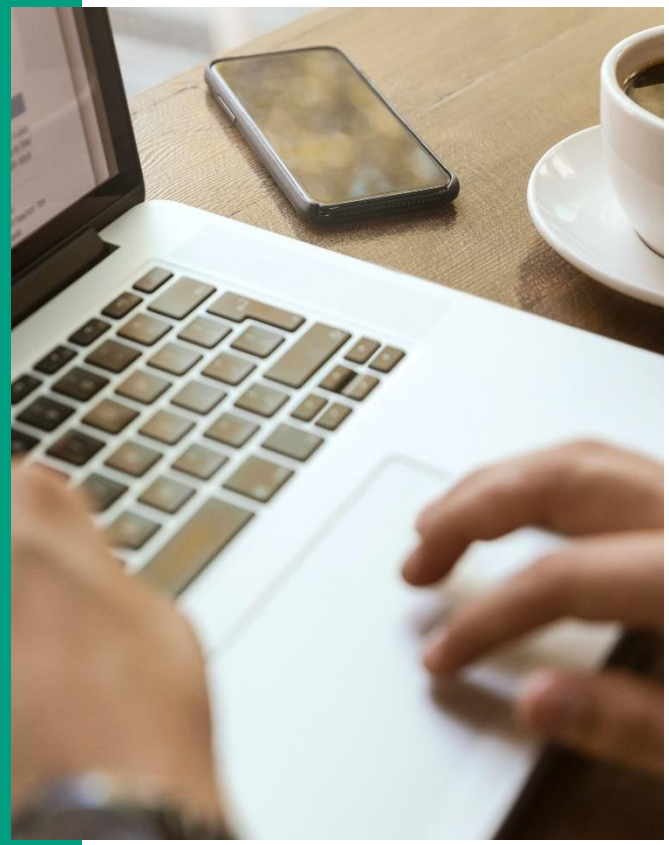


FFT – NF&P References

- SEM China, Chrysler Voyager
- Valmet Finland, Mercedes A-Klasse
- Compas Mexiko

We support our customers in efficiently implementing their production systems according to their specifications.

DO YOU NEED AN INDIVIDUAL SOLUTION FOR YOUR TASK?



CONTACT

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THANK YOU

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