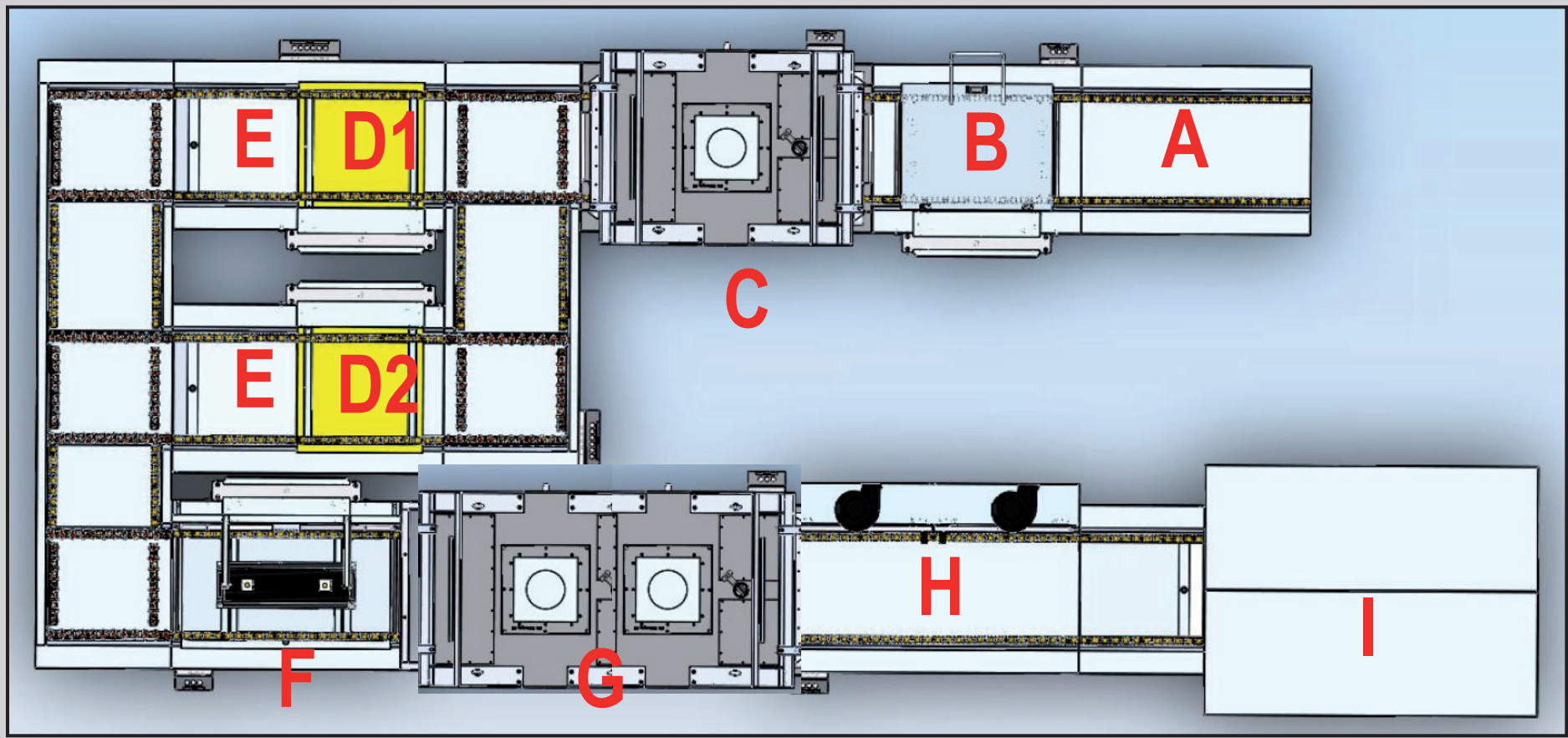


Automated Liquid Penetrant Inspection with high Throughput and high Process Reliability

KD-Check Liquid Penetrant Inspection Systems

Semi-Automated System for Castings



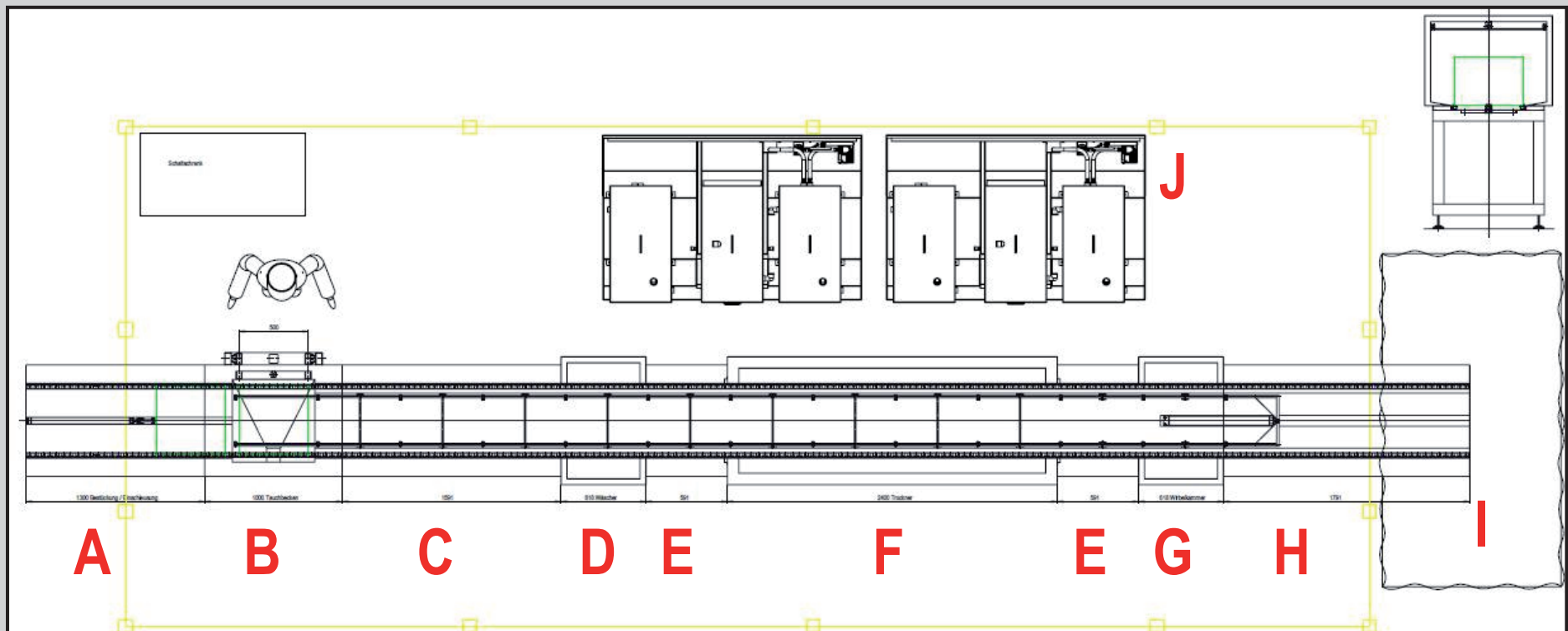
- Stations of the system**
- A: Component feeding
 - B: Pre-cleaning (waterbath with additional water nozzles)
 - C: Dryer 1
 - D1: Penetrant dip tank (level 2, medium sensitivity)
 - D2: Penetrant dip tank (level 3, high sensitivity)
 - E: Draining station (one tank per way, penetrant recirculation to the original tank)
 - F: Penetrant removal with water and hand-gun (after lowering into stainless steel tank and expanding the lateral protection doors)
 - G: Dryer 2
 - H: Electrostatic developer application (with exhaust in rear, lateral protection doors)
 - I: Visual examination under UV light in a testing cabin



U-shaped testing system, component transport in stainless steel baskets

- Characteristics:**
- Fluorescent inspection of automotive and power generation components made of stainless steel and titanium, a wide variety of components is testable
 - Modular system concept
 - Components transport in baskets (0.5 m x 0.5 m), max. 30 kg per basket, manual basket transportation on rollers
 - Method according to EN ISO 3452: Type I, Method A, Form a
 - Sensitivity level 2 or level 3 (two optional ways through the system)
 - Electrostatic unit for dry developer application
 - Examination cabin with 2 positions, evaluation with UV-LED large area lamp
 - Optional used wash water recycling via active carbon filter columns
 - Siemens control of process parameters with order-related data storage

Fully Automated Testing System for Automotive Forgings



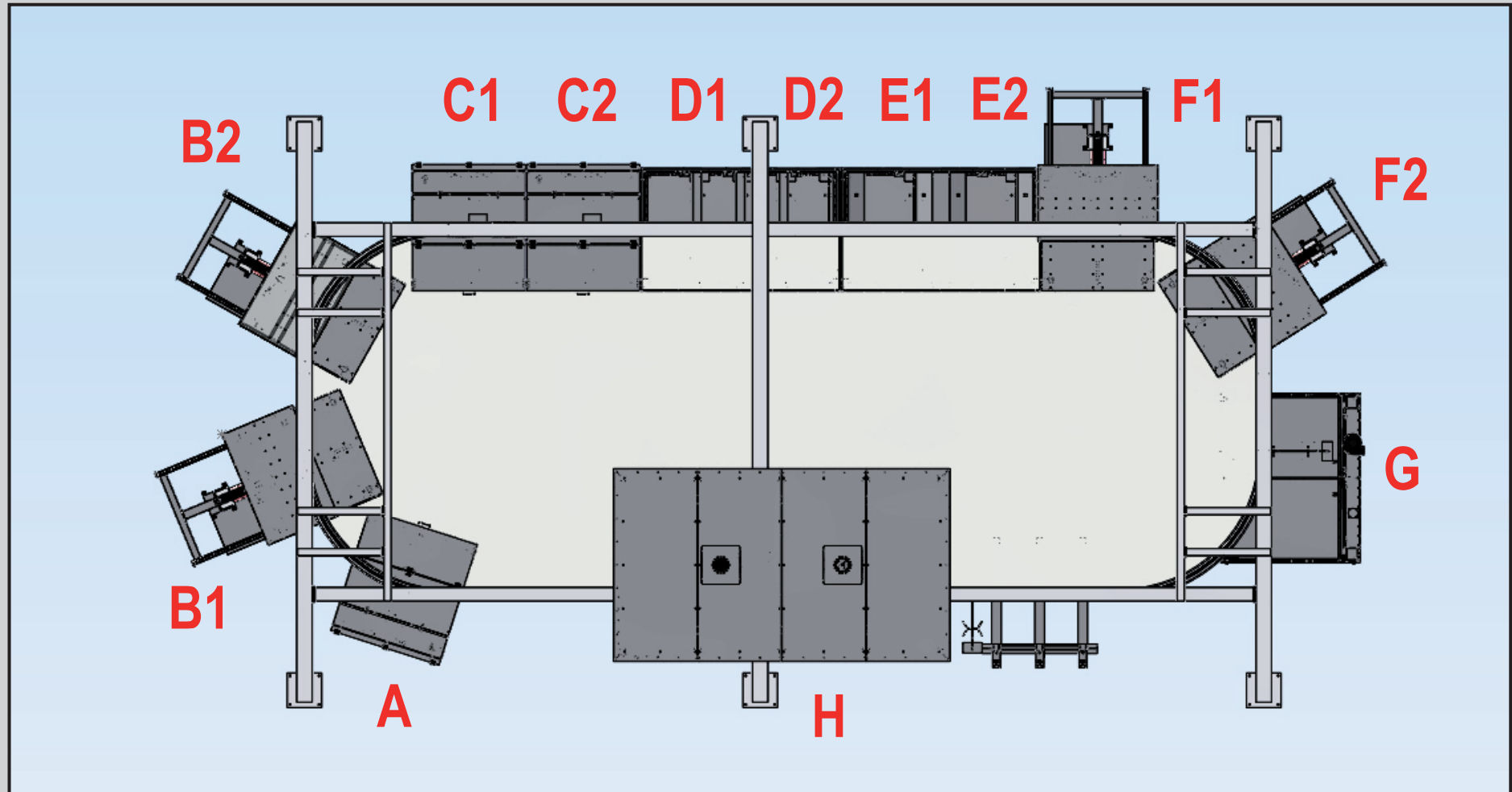
- Stations of the testing system**
- A: Component feeding
 - B: Penetrant application (pneumatic lowering into dip tank)
 - C: Draining station and recirculation of excess penetrant
 - D: Penetrant removal via water-jet tunnel
 - E: Buffer
 - F: Dryer (circulated warm air)
 - G: Dry developer application in a vortex chamber
 - H: Developing line
 - I: Visual examination
 - J: Used wash water recycling (doubly active carbon filtering column)



Linear component transport in workpiece holders with 3 minute cycle time

- Characteristics:**
- Fluorescent liquid penetrant testing of forged automotive motor components
 - Method acc. to EN ISO 3452: Type I, Method A, Form a
 - 10 components in one workpiece holder
 - Transport via roller tables
 - Pneumatic movement of the workpiece holders
 - Simple linear transport concept (almost no lifting or lowering of components)
 - 3 minutes cycle time with buffering of longer lasting process steps
 - PLC process control and parameter documentation
 - Optional automated re-dosage of testing agent
 - Wash water recycling via filtering columns (cost reduction) and energy efficient dryers
 - Inspection with UV-LED large area lamps

Semi-Automated Testing System for Aluminium Forgings with oval Crane Runway



- Stations of the testing system**
- A: Pre-cleaning
 - B: Dryer
 - C: Penetrant application
 - D: Penetrant drainage
 - E: Penetrant removal
 - F: Dryer
 - G: Electrostatic application of dry developer
 - H: Visual examination under UV light in darkroom (cabin)



Oval crane runway for workpiece holder transportation, right: examination in cabin

- Characteristics**
- Testing system for 4500 parts per day
 - Most stations in duplicated design
 - Fluorescent testing
 - Component transport in suspended workpiece holders, each for 24 parts
 - Electrostatic dry developer application
 - Visual examination with mobile UV-LED lamp
- Process control**
- SIEMENS electrical control with touchpanel
 - Penetrant level measurement
 - Temperature control of the penetrant tanks
 - Temperature regulation for the four ovens
 - Time-controlled process steps via stop watches, process sequence visualization with signal lights
 - Position monitoring of workpiece holders for each station
 - Doubly active carbon filter columns

Authors Paper P33: Stephan Robens, Dr. Ralf Wagner, Dr. Oliver Goerz, Dr. Wolfram Deutsch, DACH-Conference Salzburg, Austria, May 2015