Assembly station with test equipment

The workstation used to assemble vehicle air-conditioning systems also tests the 40 LIN and CAN network connections.

In production enterprises, assembly, and testing are often two completely separate processes. The resulting disadvantages are unnecessary displacements and a lack of feedback to the assembly workers. It is also unsatisfying for the workers to assemble a product without the certainty that it is functioning correctly. However, there is an alternative – as demonstrated by the fully integrated concept of a combined assembly and testing station in which panels and control units for truck air conditioning systems are fitted and tested at the same time. The station is built for use by one employee and can be easily integrated into any assembly line. This modern workstation solution is the brainchild of measurement and test engineering specialists at MCD Elektronik from Birkenfeld near Pforzheim, Germany. The enterprise mainly supplies test systems to the automotive industry throughout the world.

Good working climate

Vehicle air-conditioning systems generally consist of a control unit and the operating panel. Here the drivers use buttons and a rotary knob to set their “feel-good parameters” for the cab. The settings can be viewed on an LCD display. The control unit communicates with the panel via an LIN interface. Another LIN interface, two CAN interfaces, and several analog inputs provide the connections with the sensors and actuators.

There is one station each for the assembly of the operating panel and the control unit. Roller conveyors deliver all necessary components to be assembled. At one station the worker presses in the pin headers and displays of the operating panel using a manually operated press with integrated measuring function. At the second station the control equipment is assembled. Here the housing, the pre-assembled circuit board and housing cover are screwed into place. A pneumatic screwdriver is provided for this work step. The feeding device automatically transports the required screws to the screwdriver head.

Simply by turning around, the worker now faces the test cell. The test cell is equipped with workpiece holders both for the panels and the control units. Numerous tests are carried out on the panels. After placing them in the module tray they are supplied with current through their three connection pins and connected up to the LIN network. First the EEPROM of the panel with the customer-specific data is described and relayed to the control unit. The worker’s instructions appear on the screen, and he activates the buttons and the rotary knob in succession. The test station analyzes the signals via the LIN network.

Then the module tray is closed and automatic tests are performed. Haptic tests include values for force, stroke, path and snap ratio. To perform these, an XY-table approaches the individual switches, which are activated...
Interconnect your CAN devices and systems

- Save costs due to simple wiring
- Increase your system reliability and protect devices by galvanic isolation (up to 4 kV)
- Backbone bus to set up multi-channel solutions
- Filter/conversion functionality – no programming!
- Bridging of large distances and easy system access using Bluetooth, Ethernet...

Nothing gets past this testing station

Igor Gerdt guided the development of the assembly and test station. He explained: “We can identify errors and scratches on the symbols, illumination failures and wrongly placed LEDs. We also detect missing light conductors in the LEDs and missing segments in the LCD pattern.” The operator is informed about the test results. NOK parts are

Equipment of the assembly and test station

Components by MCD Elektronik:
- ULc rack with comprehensive measuring technology and bus interfaces
- Testmanager CE software and Cognex Vision Toolmonitor
- Electronic control and coordination of test procedures

Products of partner enterprises:
- Hand-operated press
- Screwing equipment with feed and sorting device
- Gravity-actuated roller conveyors
- Platform-actuated roller conveyors
- Integrated weighing machine for NOK parts

Discover more:
www.all4CAN.com

HMS Industrial Networks GmbH
Emmy-Noether-Str. 17 · 76131 Karlsruhe
+49 721 989777-000 · info@hms-networks.de
www.anybus.com · www.ixxat.com · www.ewon.biz
Questions to Igor Gerdt

Q: When designing an interactive testing station, what criteria are important to you?
A: Ergonomic work, so that the operator feels comfortable in the working environment; short paths, to save time for test personnel; instructing the operator, safe retrieval of NOK parts; close coordination with the customer's needs and requirements; and last but not least space requirements as well as adjustment to the manufacturing/production conditions.

Q: Do you take cultural characteristics into account?
A: Depending on the location, there are specific cultural aspects that have to be taken into account, like the physical size of operating personnel, or specific language requirements in the user prompt.

Q: Do you have the possibility of gathering feedback from operators on the acceptance of your test stations? (or in plain English: how popular are your developments with employees?)
A: They are very well received and have been in use for years in our customers' production. This is ensured by close coordination and training. Initial training ensured a high degree of satisfaction.

Q: Model changeovers in the automotive sector are increasingly rapid. How easy is it to adapt a test station to new, changed components?
A: Our software and systems have a modular structure. This means that adaptations and refitting are fast, easy and uncomplicated.

Q: What contribution do MCD test stations make to increase productivity?
A: The rise in productivity is enormous; this is due to the combining and bundling of many individual work steps in an integrated overall concept. Thus the operator's activities are varied and productivity increases at the same time.

Figure 4: The green field shows the test cell operator that the DUT is one hundred percent in order (Photo: MCD)

set-aside safely by transferring them to platform scales situated next to the test cell.

In the testing of the control unit, the functions of the module are checked by activating and testing all signals. The 40 connections, including two CAN and two LIN connections, are automatically contacted after being placed in the testing station. The control unit reads simulated values for temperatures (air, water, cooling temperature), humidity and pressure via its analog inputs. The test apparatus stimulates the inputs with the corresponding analog voltages and frequencies.

The control unit communicates via the CAN network with valves, the compressor, water pumps, and ventilation motors. The test cell program checks the correct functioning, and measures and evaluates the currents and the PWM (pulse-wide modulation). The feedback of the simulated air-conditioning components via LIN completes the test sequence.

If the test has been positive throughout, a label-printing device prints a corresponding label which is applied by a test cell operator and signifies that the tested components are “OK”. The panel and the control unit are transferred by rolling conveyor from the assembly station to Production Logistics.

The assembly and testing process is supported by “stop – go” lights and monitor displays. Ingenious interlocking of the individual processing steps ensures that nothing is overlooked, and that the testing sequence is adhered to.

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INTREPID CONTROL SYSTEMS GMBH
USA  Germany  Japan  Korea  China  India  Australia
+49 (0)721 6633703 -4  icsgermany@intrepidcs.com