

Common mistakes in wire harness assembly and how to prevent them

Cable harnesses are essential components of (electric) cars, HVAC applications, medical devices, and more. WAAK specialises in the assembly of wire harnesses for the HVAC-R industry. Assembling a cable harness is a critical process that requires know-how, precision, accuracy, and thorough quality control. In many sectors, a zero-defect standard applies due to safety regulations. This makes the implementation of stringent and systematic quality controls in the production process imperative. This article highlights the most common mistakes in wire harness assembly and explains how they can be prevented through proper design validation, tool selection, production monitoring, and systematic quality control.

What is a cable or wire harness?

A wire or cable harness is an assembly of electrical cables or wires that are bundled together into an integrated unit. It organises and secures the cables and components, enabling the efficient transmission of electrical power and signals. In this way, a cable harness connects the various electrical parts and components within a device or system. Wire harnesses are commonly used in (electric) cars, HVAC systems, airplanes, medical devices, etc. WAAK is specialised in cable assembly for the HVAC-R industry (heating, ventilation, air conditioning, cooling and refrigeration).



Feasibility check of component combinations

At WAAK, before we approve a new wire harness design, we always perform a feasibility check to ensure that all the component combinations will work well together. It is not uncommon to discover incompatible cables and connectors, which can lead to potential design flaws.



To avoid these risks, WAAK always:

- Evaluates all new component combinations before production.
- Creates samples and submits them to its quality department for thorough testing
- Performs a feasibility check of the assembly process to identify possible issues, such as:
 - Overcrowding of grommets with too many cables
 - Inadequate pulling force due to poor material compatibility.

If we detect potential issues, we will propose alternatives to ensure the best possible outcome for the customer.

Using correct tools

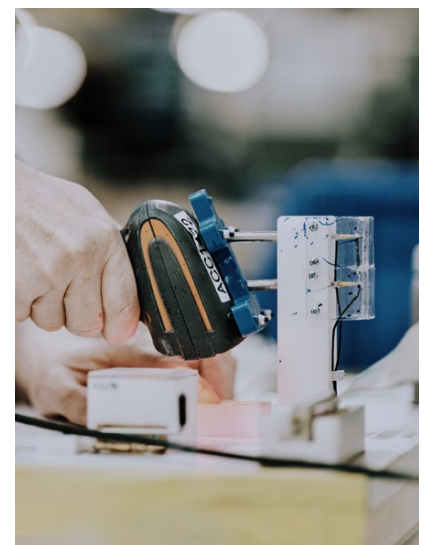
Each component in a wire harness requires specific handling. To maintain consistency and quality, WAAK prescribes which tools should be used for each operation. We avoid hand tools to reduce human error and ensure repeatability:

- We use machines or semi-automated processes for maximum precision.
- We use tools that integrate multiple processes into one – for example: we use Komax Zeta machines, which combine wire cutting, stripping, crimping, and assembling.

Correct production combinations

Cable harness designs evolve over time. To ensure that production follows the most up-to-date design specifications, you need a structured verification system that consistently checks and confirms that the correct version is being used. At WAAK, we use several validations steps before we start production:

- Each order has to be scanned before the assembly can begin.
 - Checking the nail board to verify the correct layout.
 - Checking the workstation setup to make sure it meets production standards.
 - Evaluating the operator's skills to ensure that they can handle the specific assembly order.
- We only start with production once all these elements have been successfully validated.



Final inspection and quality control

In many sectors, a zero-defect standard applies due to safety regulations. This is certainly the case for the automotive and HVAC industry in which we mainly operate. These quality standards make the implementation of stringent and systematic quality controls imperative.

At WAAK, a thorough final quality check is included in the production process. To achieve this, we use electrical nail boards, powerful Poka-Yoke tools, designed to eliminate errors. These systems provide the operator with clear instructions, while verifying multiple quality parameters.

1. Length verification

After the wire harness are put on the nail board, all wire lengths are verified to ensure they meet the allowable tolerances, confirming dimensional accuracy.

2. Connection integrity

A reliable wire harness requires secure and correct connections. To ensure this:

- CNC counterparts with spring contacts are used to prevent incorrectly placed terminals.
- The test system evaluates each contact point, confirming the connectivity and component presence.

If the assembled cable harness passes all tests, a lock is released, which signals approval. However, if the wire harness fails the test, the lock remains engaged until the fault is resolved.

3. Bonding and component positioning

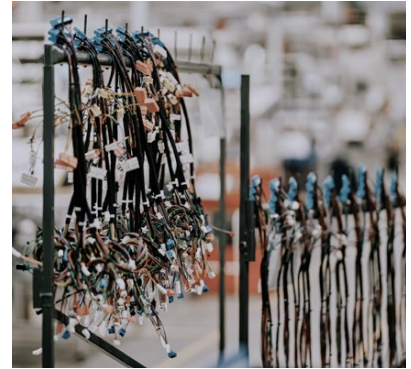
The correct placement of connectors and components is crucial. Since the nail board is a representation of the finished cable harness, it allows us to verify:

- The relative position of each component.
- Whether the cable ties are properly secured once alignment is confirmed.

4. Protection measures

Depending on their application, wire harnesses require various forms of cable protection. WAAK employs many different protective elements, such as: Tape, tubing, isolation hose, shrink hose and grommets.

To ensure that these protective elements are correctly positioned, WAAK uses so-called negative CNC test pieces or clearly marks components for manual verification.



5. Label accuracy

Labels are crucial for traceability and identification. WAAK verifies their presence and accuracy through:

- Scanning and electronic validation
- Logging essential data for record-keeping and quality assurance.

Conclusion

We use electrical nail boards as testing and verification tools. This allows us to ensure that each cable harness is correctly assembled, thoroughly verified, and free of defects. Thanks to this meticulous approach, we deliver high-quality wire harnesses that meet industry standards and customer expectations. By adhering to these best practices, we prevent mistakes, ensuring reliability, functionality, and efficiency.



More info/contact:

Kristof Hots
Marketing & Sales Director

T: +32 56 36 34 34
E: kristof.hots@waak.be

