



# AFRA

## Automatic Fuse and Relay Assembly

---

FOLLOW US:



**StoneShield**  
ENGINEERING

© 2020 StoneShield - Engineering, LDA.

All rights reserved. Trademark StoneShield - Engineering, LDA

Ref: 000518-64-002-R01

[WWW.STSHIELD.COM](http://WWW.STSHIELD.COM)



# AFRA

## Automatic Fuse and Relay Assembly

P/N: 01-05-0001



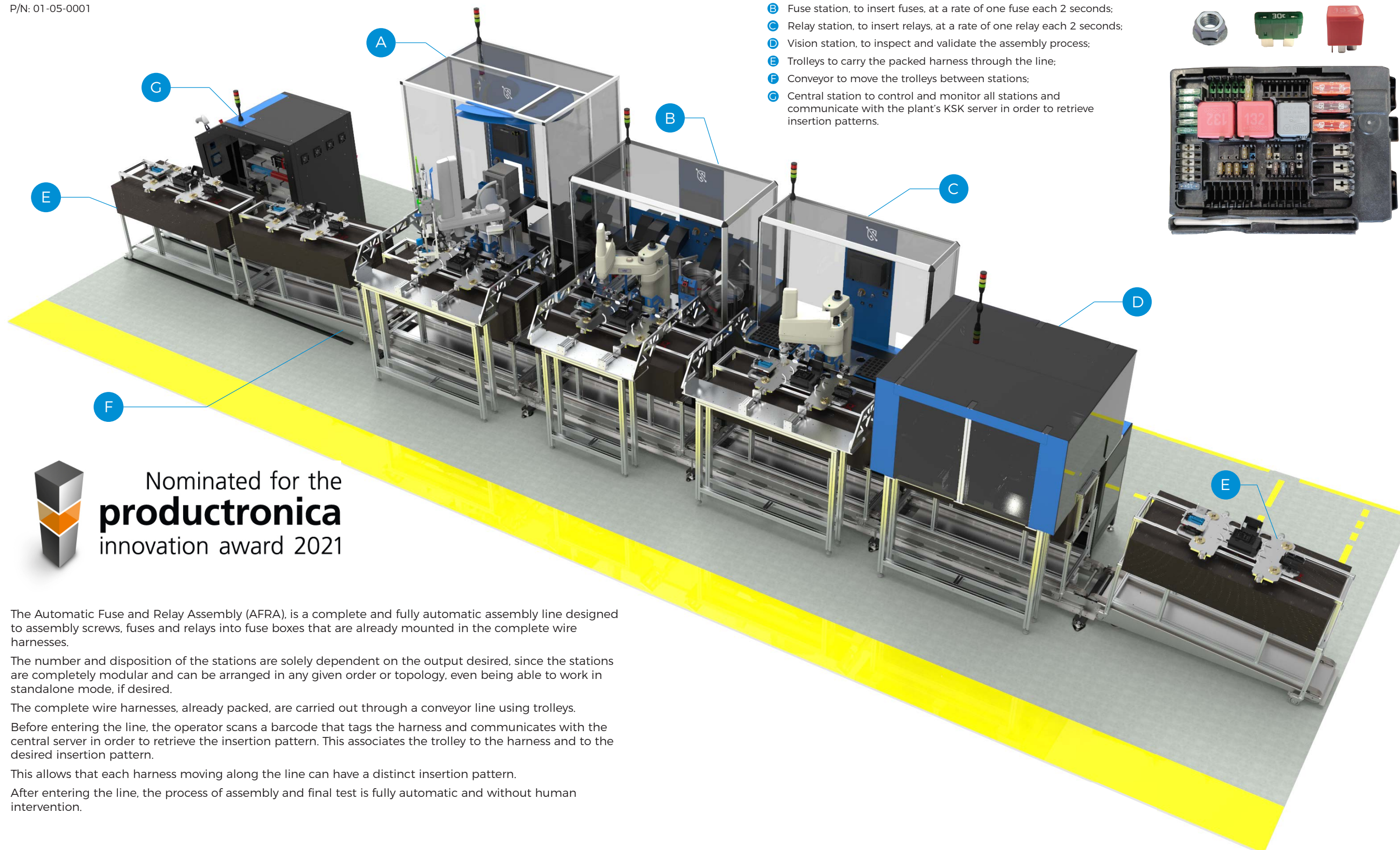
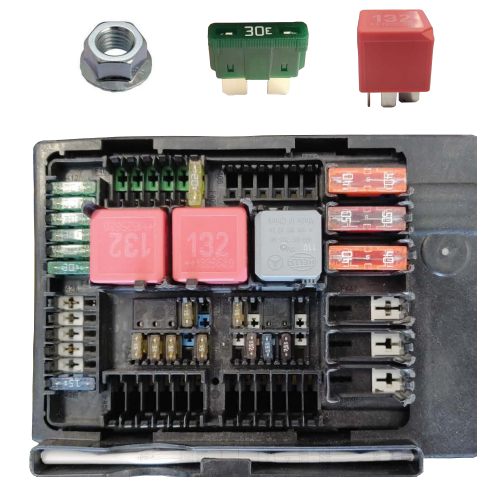
### Line Components:

The system has the following independent modules, which can be combined in a line or work in standalone mode:

- A Screw station, to screw nuts according to VDI2862 Category A norm;
- B Fuse station, to insert fuses, at a rate of one fuse each 2 seconds;
- C Relay station, to insert relays, at a rate of one relay each 2 seconds;
- D Vision station, to inspect and validate the assembly process;
- E Trolleys to carry the packed harness through the line;
- F Conveyor to move the trolleys between stations;
- G Central station to control and monitor all stations and communicate with the plant's KSK server in order to retrieve insertion patterns.

### Applications:

Fully automatic assembly line to screw nuts, insert fuses and relays into fuse boxes, in completely assembled harnesses.



Nominated for the  
**productronica**  
innovation award 2021

The Automatic Fuse and Relay Assembly (AFRA), is a complete and fully automatic assembly line designed to assembly screws, fuses and relays into fuse boxes that are already mounted in the complete wire harnesses.

The number and disposition of the stations are solely dependent on the output desired, since the stations are completely modular and can be arranged in any given order or topology, even being able to work in standalone mode, if desired.

The complete wire harnesses, already packed, are carried out through a conveyor line using trolleys.

Before entering the line, the operator scans a barcode that tags the harness and communicates with the central server in order to retrieve the insertion pattern. This associates the trolley to the harness and to the desired insertion pattern.

This allows that each harness moving along the line can have a distinct insertion pattern.

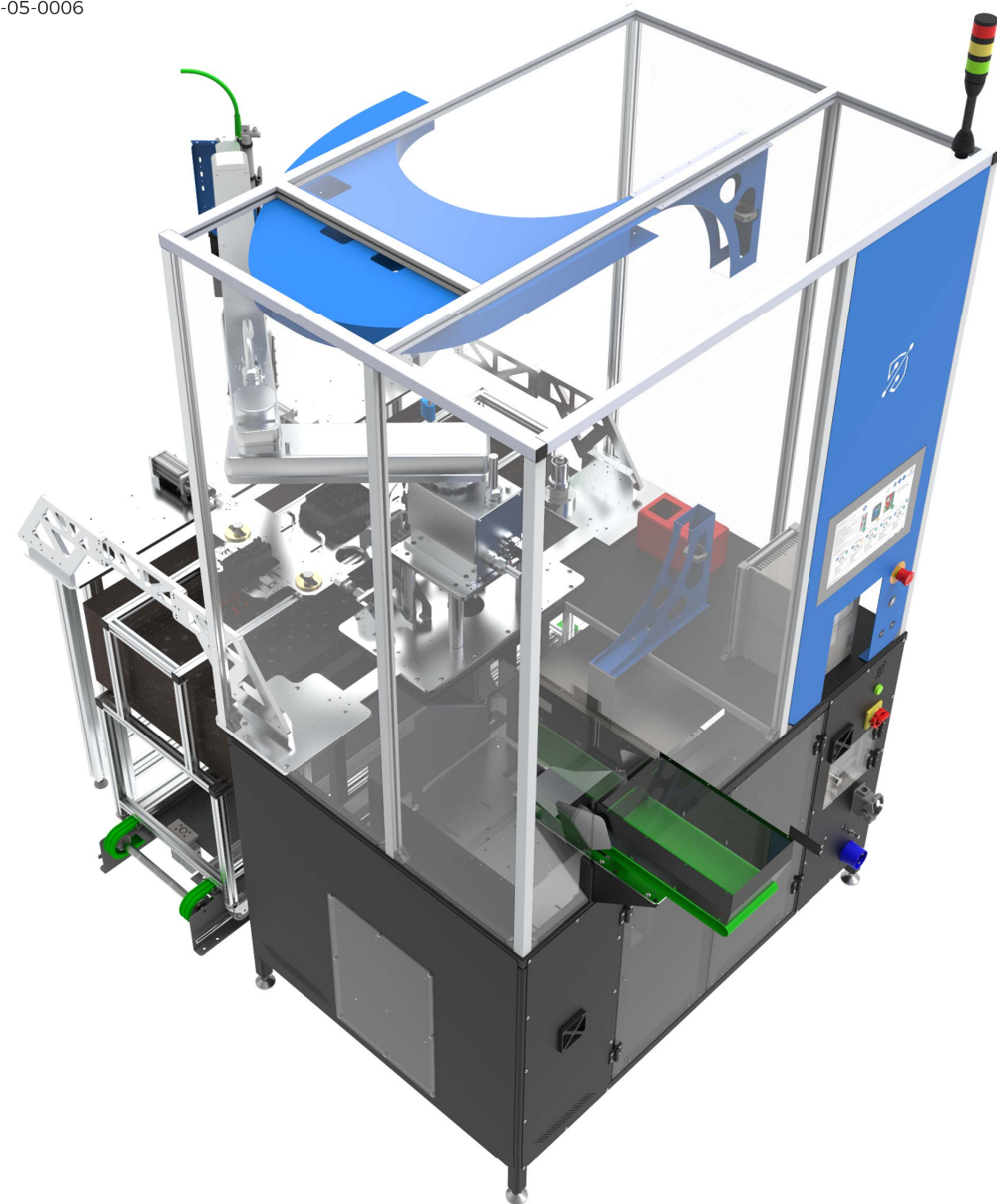
After entering the line, the process of assembly and final test is fully automatic and without human intervention.



# AFRA - Screw Station

## Automatic Fuse and Relay Assembly

P/N: 01-05-0006



The AFRA - Screw Station, is a fully automatic system designed to screw nuts into fuse boxes which are already mounted in the wire harnesses.

The screw station is one of the modular stations of the AFRA assembly line, but it can also work as a standalone station.

It has a SCARA robot, with an electric screwdriver, that screws a nut in a specific location of the fuse box.

It has a bowl feeder that automatically feeds and delivers the nuts into the head of the electric screwdriver.

The nut is supplied by a bowl feeder that shoots the nut into the head of the robot.

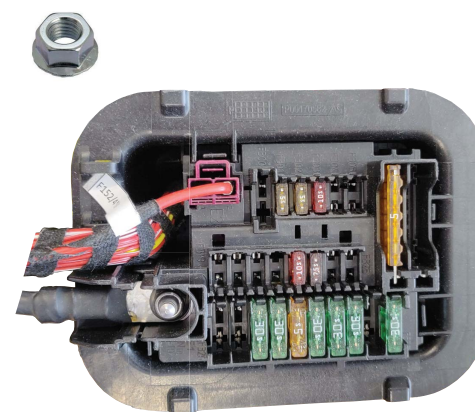
Before the screwing process, the machine detects if the cable shoe is present or not.

The screw process is fully compliant with the VDI2862 Category A norm, with double redundant check systems to monitor and verify the torque and angle of the screw spindle.

For each screw cycle, the tightening curve is recorded and stored for traceability.

### Applications:

Screw nuts into fuse boxes



### Technical Features:

- ▶ Fully automated process;
- ▶ Detection of cable shoe presence before process;
- ▶ VDI2862 Category A norm fully compliant;
- ▶ Controlled torque;
- ▶ Configurable tightening curve;
- ▶ Automatic generation and export of tightening quality report;
- ▶ Screwing process with XYZ continuous monitoring;
- ▶ Automatic self-checking of torque and angle;
- ▶ Up to 120 different programs;
- ▶ Communication interface PROFIBUS™;
- ▶ Tightening torque up to 15 Nm (or others on request);
- ▶ Integrated nut bowl feeder, with buffer;
- ▶ Automatic NOK parts rejection protocol;
- ▶ Nut supplied directly to the spindle's head;
- ▶ Automatic refill warning of bowl feeder;
- ▶ Fast process;
- ▶ Partial and global counters;
- ▶ Several system's languages, including English, German, Portuguese...
- ▶ Easy upgradeable software, via USB stick or remotely.



**Autonomous and Automatic:**  
Fully automatic process  
from start to finish



**Productivity:**  
Automatic supply of nuts into spindle  
head using a bowl feeder  
Automatic screw process



**Error-Proof:**  
Self-checking capability of  
screwing equipment  
Protocol to discard NOK parts



**Connectivity and Traceability:**  
Automatic generation and  
export of report for each tightening  
Network connection via Profibus to KSK servers



**Controlled Process:**  
VDI2862 Category A fully compliant  
Double redundant check systems to monitor  
and verify the torque and angle in the spindle.

### Technical Data:

#### Dimensions:

Length:	1500 mm
Width:	1400 mm
Height:	1900 mm
Weight:	400 kg

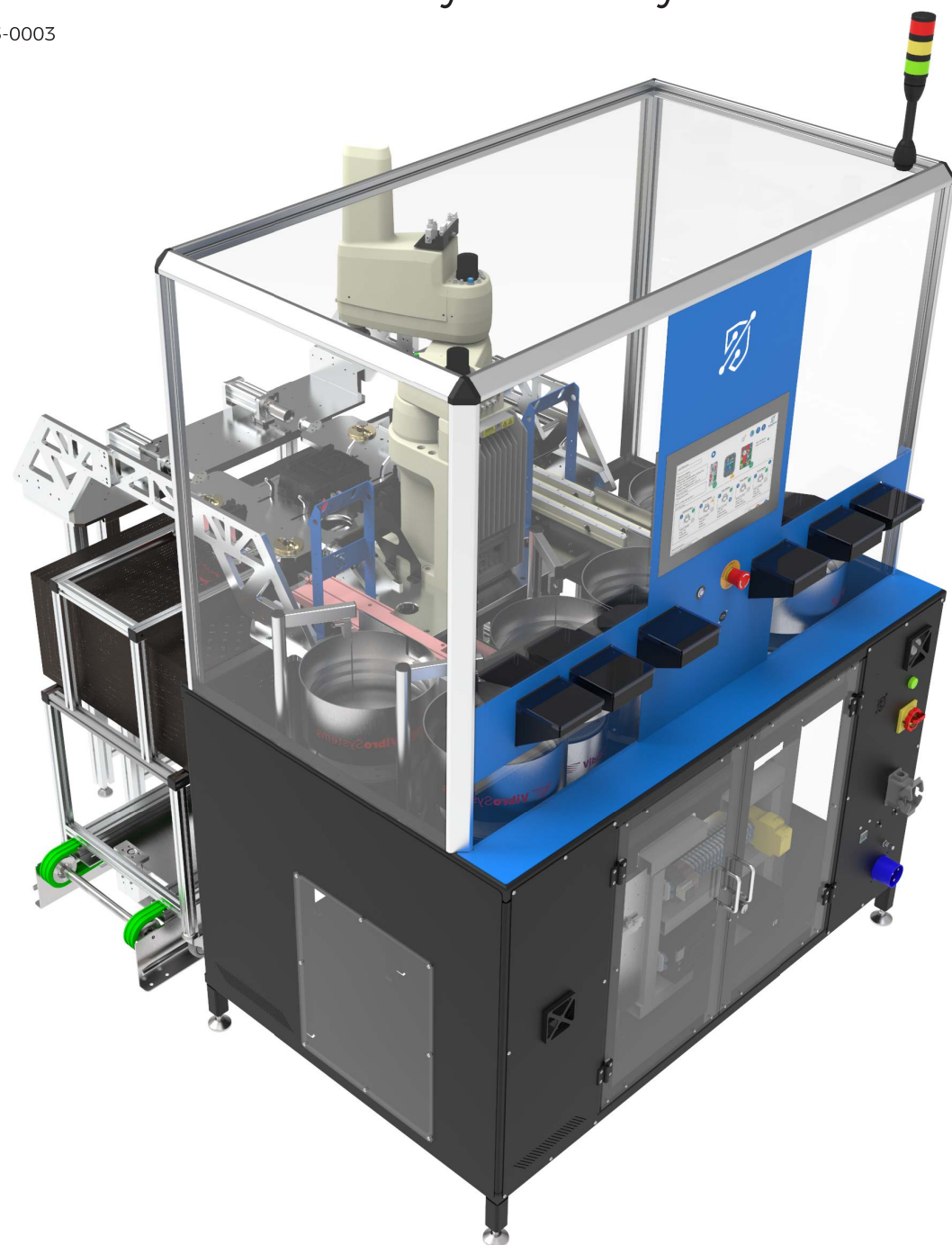
#### Connections:

Electrical:	230 VAC @ 50 Hz - 1 IEC standard male socket
Consumption:	1.5 kW (peak)
Air pressure:	5 to 7 Bar - quick-coupler socket - Ø 8 mm
Interface:	Touchscreen, barcode, 2x USB, Ethernet and tower light.

# AFRA - Fuse Station

## Automatic Fuse and Relay Assembly

P/N: 01-05-0003



The AFRA - Fuse Station, is a fully automatic system designed to insert fuses into fuse boxes that are already mounted in the wire harnesses.

The fuse station is one of the modular stations of the AFRA assembly line, but it can also work as a standalone station.

The fuses are inserted by a SCARA robot, at a rate of one fuse each 2 seconds, using a clamp with a load cell.

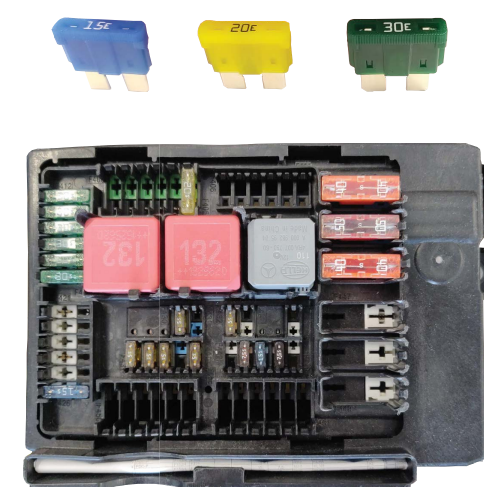
The fuses are picked up in a fixed position at the end of a linear guide, delivered through several different bowl feeders, one per each fuse type.

The load cell monitors continuously the insertion process and is also used to detect any problem that might occur during insertion, namely: no insertion force, closed contacts or rear plugging.

For all positions, the insertion force is recorded and stored. The positions that originate an error are automatically marked and signaled to the central station, to mark the harness for rework.

### Applications:

Fuse insertion into fuse boxes



### Technical Features:

- ▶ Up to 6 different fuses, each with a dedicated bowl feeder;
- ▶ Possibility of condensing more bowl feeders into a standalone station;
- ▶ Capable of processing 4 different fuse types: ATO, Mini, Multi and Maxi;
- ▶ One fuse inserted each 2 seconds;
- ▶ Robot with load cell to monitor insertion force and process;
- ▶ Fully configurable height and insertion force, for each component;
- ▶ Detection and report of no insertion force, closed contacts or rear plugging;
- ▶ Ensured correct value and orientation of insertion, with use of vision system pre-checks before insertion;
- ▶ Highly accurate, using docking system to fixate fuse boxes;
- ▶ Automatic refill warning of bowl feeders;
- ▶ Complete traceability of each component's insertion parameters, by exporting production reports;
- ▶ Possibility to define insertion patterns locally or remotely;
- ▶ Selection of references using barcode readers or through KSK servers.

### Industry 4.0 Features:

- ▶ Analysis of production data and statistics via dashboard;
- ▶ Remote assistance and troubleshooting;
- ▶ Network connectivity and remote configuration;
- ▶ Saving of KPIs to USB and/or remote location;
- ▶ Automatic and immediate error reporting.



#### Flexibility:

Local setup of new templates  
Up to 6 different fuses per station  
Configuration of height and insertion force for each position



#### Productivity:

One insertion each 2 seconds  
Bowl feeders with high capacity  
(at least 1 hour without refill per feeder)



#### Error-Proof:

Vision system to pre-check fuse inscription, colour and orientation  
Load cell to detect correct insertion



#### Connectivity and Traceability:

Network connection via OPC-UA to KSK servers  
Production reports for each insertion  
Interface with touchscreen and barcode



#### Controlled Process:

Controlled insertion depth, with constant monitoring of the insertion force  
Protocol to discard NOK parts  
Vision system with auto focus

### Technical Data:

#### Dimensions:

Length: 1500 mm  
Width: 1600 mm  
Height: 1900 mm  
Weight: 800 kg

#### Connections:

Electrical: 230 VAC @ 50 Hz - 1 IEC standard male socket  
Consumption: 1.5 kW (peak)  
Air pressure: 5 to 7 Bar - quick-coupler socket - Ø 8 mm  
Interface: Touchscreen, barcode, 2x USB, Ethernet and tower light.

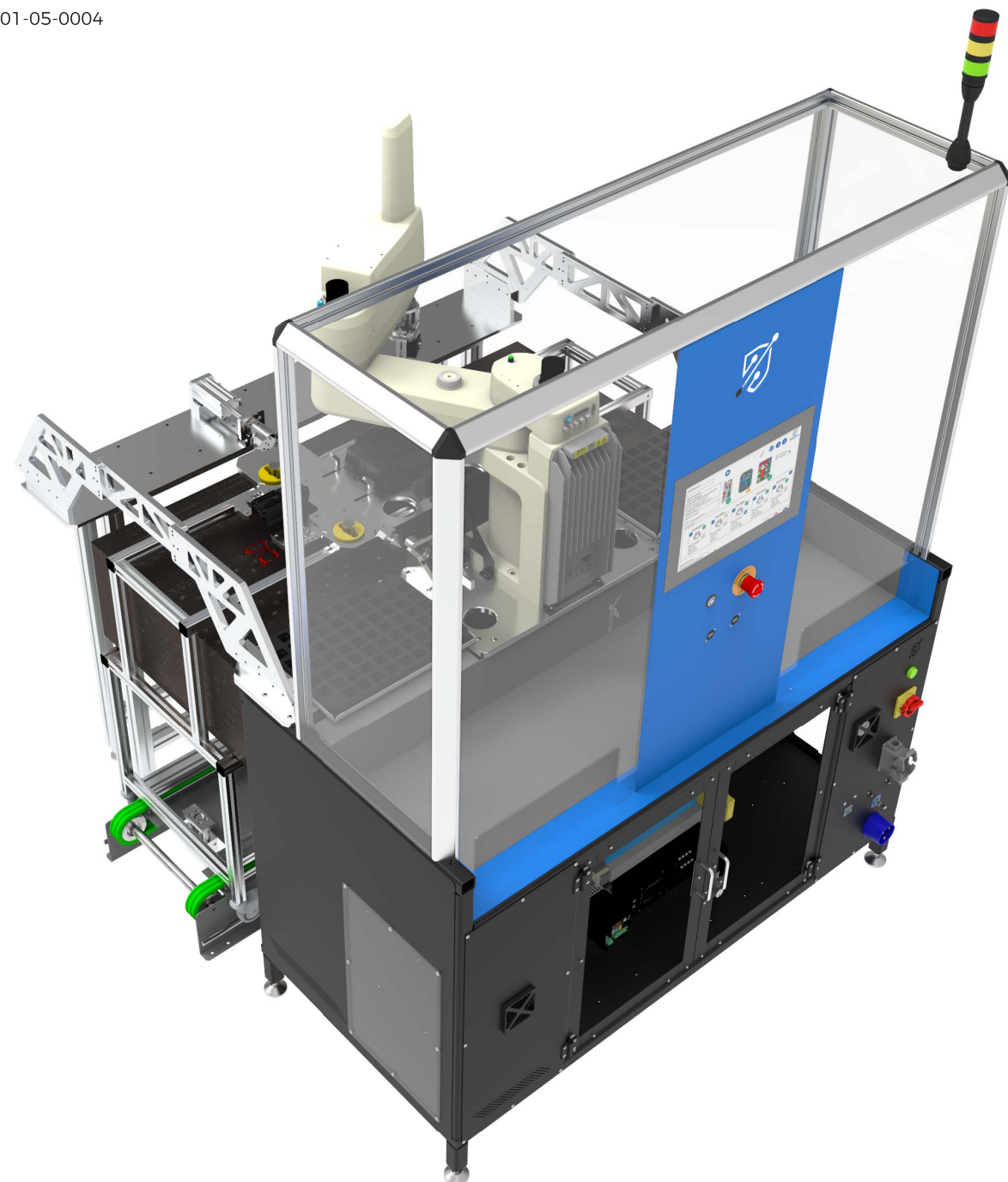
### Options:



# AFRA - Relay Station

## Automatic Fuse and Relay Assembly

P/N: 01-05-0004



The AFRA - Relay Station, is a fully automatic system designed to insert relays into fuse boxes that are already mounted in the wire harnesses.

The relay station is one of the modular stations of the AFRA assembly line, but it can also work as a standalone station.

The relays can be supplied in trays or tubes, depending on how they are delivered by the manufacturer.

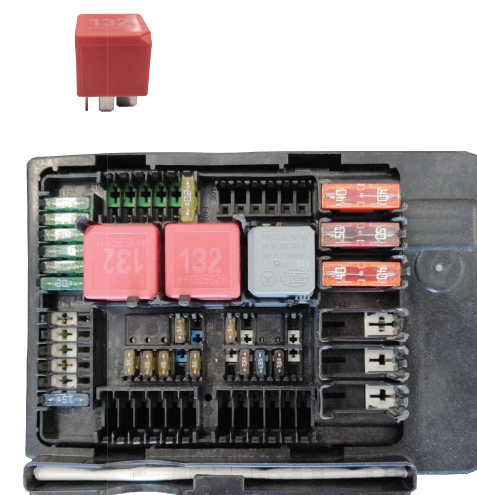
A SCARA robot will pick up the relays one by one and insert them into the desired position, at a rate of one relay each 2 seconds.

The robot has a clamp, equipped with a load cell that monitors continuously the insertion process and is used to detect any problem that might occur during insertion, like: no insertion force, closed contacts or rear plugging.

For all positions, the insertion force is recorded and stored. The positions that originate an error are automatically marked and signaled to the central station, to mark the harness for rework.

### Applications:

Relay insertion into fuse boxes



### Technical Features:

- ▶ Up to 4 different relays, each with a dedicated tray or tube feeding system;
- ▶ One relay inserted each 2 seconds;
- ▶ Robot with load cell to monitor insertion force and process;
- ▶ Fully configurable height and insertion force, for each component;
- ▶ Vision system to detect relay orientation and colour (pre-check before insertion);
- ▶ Highly accurate, using docking system to fixate fuse boxes;
- ▶ Automatic refill warning of relay feeders;
- ▶ Complete traceability of each component's insertion parameters, by exporting production reports;
- ▶ Possibility to define insertion patterns locally or remotely;
- ▶ Selection of references using barcode readers or through KSK servers.

### Industry 4.0 Features:

- ▶ Analysis of production data and statistics via dashboard;
- ▶ Remote assistance and troubleshooting;
- ▶ Network connectivity and remote configuration;
- ▶ Saving of KPIs to USB and/or remote location;
- ▶ Automatic and immediate error reporting.



#### Flexibility:

Local setup of new templates  
Up to 4 different relays per station  
Configuration of height and insertion force for each position



#### Productivity:

One insertion each 2 seconds  
Trays and tube feeders with high capacity  
(at least 1 hour without refill per feeder)



#### Error-Proof:

Vision system to pre-check relay inscription, colour and orientation  
Load cell to detect correct insertion



#### Connectivity and Traceability:

Network connection via OPC-UA to KSK servers  
Production reports for each insertion  
Interface with touchscreen and barcode



#### Controlled Process:

Controlled insertion depth, with constant monitoring of the insertion force  
Vision system to pre-check correct components  
Protocol to discard NOK parts  
Calibration of vision system

### Technical Data:

#### Dimensions:

**Length:** 1500 mm  
**Width:** 1600 mm  
**Height:** 1900 mm  
**Weight:** 600 kg

#### Connections:

**Electrical:** 230 VAC @ 50 Hz - 1 IEC standard male socket  
**Consumption:** 1.5 kW (peak)  
**Air pressure:** 5 to 7 Bar - quick-coupler socket - Ø 8 mm  
**Interface:** Touchscreen, barcode, 2x USB, Ethernet and tower light.

### Options:

# AFRA - Vision Station

## Automatic Fuse and Relay Assembly

P/N: 01-05-0005



The AFRA - Vision Station, is a vision inspection system designed to verify if the fuses and relays assembled in the fuse boxes are in accordance with the desired.

The vision station is one of the modular stations of the AFRA assembly line, but it can also work as a standalone station.

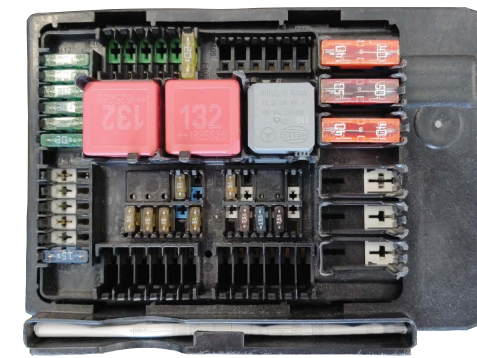
The fuse boxes are already mounted in the wire harnesses. So, the full harness is brought in its bag to the vision station through trolleys by an operator (in standalone mode) or by the AFRA conveyor (in production line mode).

The vision station not only verifies if the components are present or missing, but it also verifies if they are on the right position, if they are the correct ones and also their correct orientation and height.

After the test, the vision station will inform if all components are well assembled or, in case of an error, identify which positions are incorrect.

### Applications:

Vision inspection of fuse boxes



### Technical Features:

- ▶ Detection of missing components (fuses and relays);
- ▶ Detection of over equipped components (fuses and relays);
- ▶ Detection of correct position through colour recognition (fuses and relays);
- ▶ Detection of components orientation (OCR recognition);
- ▶ Detection of correct insertion through height detection;
- ▶ Intuitive software that visually indicates which positions require rework;
- ▶ Definition of new templates locally or remotely;
- ▶ Selection of templates using barcode readers or remotely by KSK servers, via OPC-UA protocol;
- ▶ Configuration and maintenance mode password protected;
- ▶ Partial and global connector's counters;
- ▶ Working time counter;
- ▶ Several system's languages, including English, German, Portuguese...
- ▶ Easy upgradeable software, via USB stick or remotely.



**Flexibility:**  
Local or remote setup  
of new templates



**Productivity:**  
Complete test of 3 fuse boxes  
under 12 seconds



**Error-Proof:**  
Vision system to detect position,  
presence and absence of components  
Vision system to detect  
colour of components



**Connectivity and Traceability:**  
Network connection via OPC-UA to KSK servers  
Production reports and dash board analysis  
Interface with touchscreen and barcode



**Controlled Process:**  
Detection of insertion depth,  
Detection of correct orientation via OCR

### Technical Data:

#### Dimensions:

**Length:** 1500 mm  
**Width:** 1200 mm  
**Height:** 2000 mm  
**Weight:** 300 kg

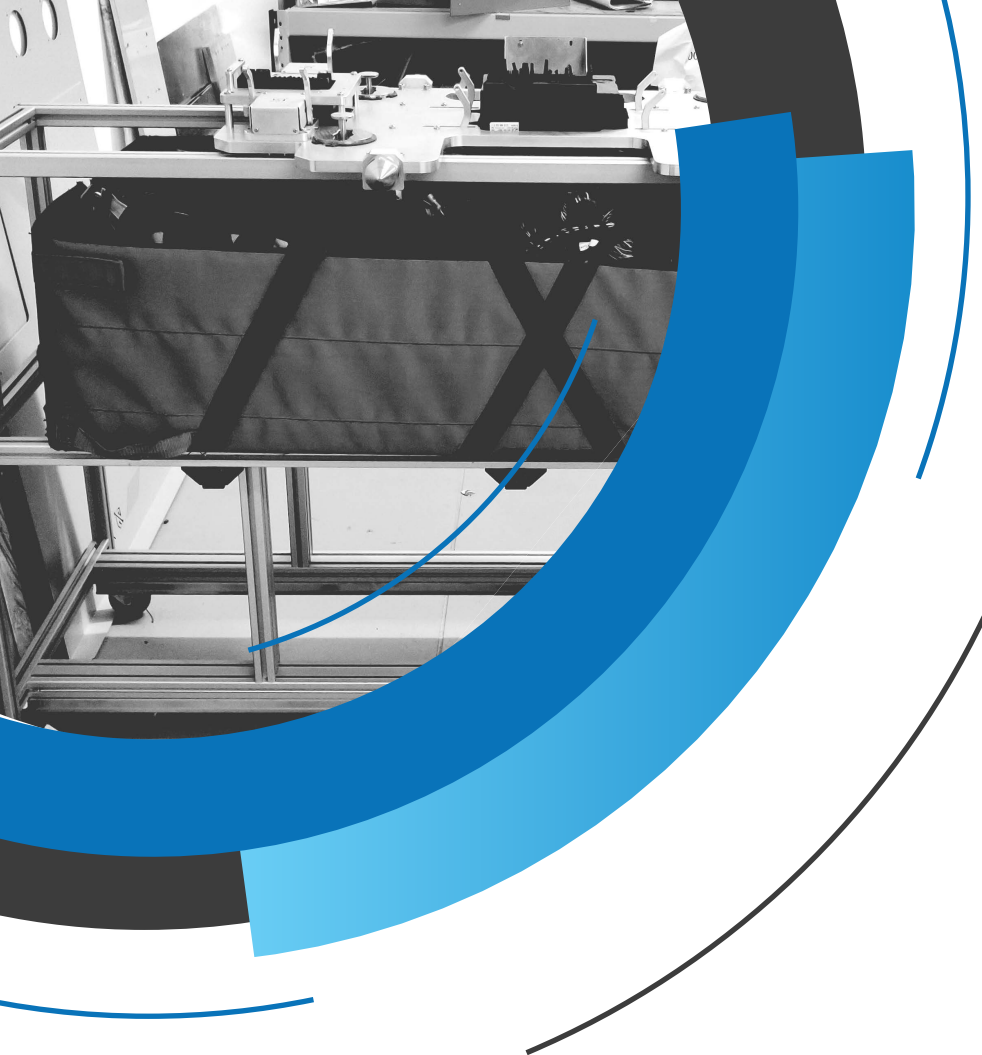
#### Connections:

**Electrical:** 230 VAC @ 50 Hz - 1 IEC standard male socket  
**Consumption:** 1.5 kW (peak)  
**Air pressure:** 5 to 7 Bar - quick-coupler socket - Ø 8 mm  
**Interface:** Touchscreen, barcode, 2x USB, Ethernet and tower light.

### Options:

#### Height Detection System

P/N: 08-13-0001



© 2020 StoneShield - Engineering, LDA.

All rights reserved. StoneShield reserves the right to make modifications, improvements, corrections and any other changes without prior notice.

All StoneShield's products names and logos are service marks, trademarks or registered trademarks of StoneShield - Engineering, LDA.



**StoneShield**  
ENGINEERING



**Operations Center:**

StoneShield - Engineering, LDA  
Zona Industrial de Castelo Branco  
Rua D, Lt. 120, Mod. A1  
6000-790 - Castelo Branco - Portugal



info@stshield.com



+351 272 327 253



N 39.801913, W 7.533327



www.stshield.com



Mod: 03.01.014-B  
Ref: 000518-64-002-R01