KeyPilot

(EN) **OPERATING MANUAL**

KEYPILOT
PROFIBUS AL VARIANTS

Read carefully before use.
Keep for future reference.

Last revision: 17.07.2023

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1. Introduction

This manual describes the functions and characteristics of the KeyPilot variant PROFIBUS AL. KeyPilot is used to record and control access to machines and systems. KeyPilot is easy to use and easy to integrate into control systems.

Please read this manual carefully before start-up and keep it where it is easily accessible for future reference.

1.1   Contact to the manufacturer

Heckner Electronics GmbH

Address: Säntisstraße 25
             D-88079 Kressbronn am Bodensee

Telephone: +49 (0)7543 9620-600

E-Mail: info@KeyPilot.de

Internet: www.KeyPilot.de

1.2   Further information

Further information on KeyPilot PROFIBUS AL and other variants can be found on the Internet at:

www.KeyPilot.de

1.3   Symbols and warning notices

The following illustrations are used in this operating manual for important warning notices:

DANGER
⚠ **Hazard with a high degree of risk, which may result in death or serious injury.**

WARNING
⚠ **Hazard with medium degree of risk, which may result in death or serious injury.**

CAUTION
⚠ **Hazard with a low degree of risk, which may result in minor injuries.**

ATTENTION
🛈 **Hazard which may result in property damage.**

2. Safety Instructions

2.1   Target audience

This document is intended primarily for electricians, technicians and engineers with experience in the design, installation, start-up and maintenance of industrial control systems.

2.2   Intended use

KeyPilot can be used to control and record access to protected parts and functions on machinery and equipment. The customer is responsible for assigning authorizations to keys and assigning keys to persons.

⚠	**WARNING**
	KeyPilot is not a safety component within the meaning of the Machinery Directive.
	• Do not operate where failure or malfunction could jeopardize the safety or health of a person within the working range of the unit.
	• Please consult the manufacturer or your supplier if you are not sure whether KeyPilot is suitable for your application.

Observe national and international safety and accident prevention regulations when using KeyPilot.

The KeyPilot components are designed for installation in industrial switch cabinets and control panels.

Conversion or other modifications of the KeyPilot is not allowed.

2.3   Transport

🛈	**ATTENTION**
	Improper handling may damage the KeyPilot.
	• Use the enclosed packaging.
	• Handle the KeyPilot with care.
	• Avoid impacts, blows or falling.

2.4 Installation and Start-up

WARNING
Risk of injury, damage to the KeyPilot and damages to the environment of the KeyPilot due to improper electrical connection.
• The electrical connection must be made only by qualified specialist personnel.
• Electrical connections must be made only when de-energized.
• Please note the technical specifications of the device.
• Make sure the connections are made correctly and are tight.

ATTENTION
Reverse polarity electrical connection may damage the KeyPilot.
• Disconnect the power supply if the LED on the KeyPilot does not light up 5 seconds after switching on.
• Check the power supply.

ATTENTION
Exchanging components of the KeyPilot PROFIBUS AL with those of other variants of the KeyPilot may damage the components or other connected systems.
• Exchange components between different variants only after consultation with the manufacturer or your supplier.
• When replacing a component, check whether the type description of the new component matches the one to be replaced.

2.5 Repair

Damaged components of the KeyPilot may be repaired only by the manufacturer. Please contact your supplier if needed.

2.6   Warranty

- The warranty period for KeyPilot is 12 months from the date of purchase. Except for damage caused by improper use.

- Never open the device without proper authorization. The opening of the housing will void the warranty claim.

- There is no warranty claim for damage to the KeyPilot caused by improper operation resulting from non-compliance with the operating instructions or by disregarding the above instructions.

- In principle, there is no liability for consequential damages.

3. System description

3.1   Scope of application

KeyPilot system is used for access control and for identifying users and those using a machine or plant.

Typical application

- User login and authorization for control panels and input systems.

- Access authorization for plants or plant components.

KeyPilot can be used everywhere where previously passwords or mechanical key switches have been used.

3.2   General function

The KeyPilot system basically consists of two parts. These are the respective reading station and the keys.

A key is placed on the reading station and held in place magnetically. The key is read out using the built-in contacts in the reading station. Each key has an individual identifier (ID). This ID is unique worldwide, is provided by the manufacturer and cannot be changed.

3.3   Reading stations

The reading stations are an essential part of the system. The key is held on the reading station by a magnet and is read out via the contacts.

Several variants are offered with different interfaces to the process. Depending on the interface to the process, the data is evaluated on the reading station or communicated to a higher-level controller via the communication interface.

The following sections provide an overview of all KeyPilot variants, including the KeyPilot PROFIBUS AL variant described in this manual.

3.3.1 Switch variants

The switch variants are particularly suitable for all applications where no system-side data communication is possible or necessary at the place of use.

The key information is read out when the key is set up. An authorization matching is then carried out in the reading station and the switching output is switched according to the specified authorization. The original switching state is restored when the key is removed.

The following switch variants are available:

Figure 1: Design of the level, RS232 and PROFIBUS variants

- **KeyPilot Level**
  7 different authorization levels can be identified through three digital outputs.

3.3.2 Communication variants

Instead of the switching outputs, these variants have a communication interface for direct integration into a machine control. The key information can be read into a control system via the respective communication interface and reused on a customer-specific basis. No authorization matching takes place in the device.

The communication variants are available in a compact design or with a remote reading head, depending on the communication interface. The key is held on the reading head using a magnet and is read out via the contacts. In case of devices with remote reading head this reading head is connected to the so-called electronics unit via a cable connection.

Figure 2: Design of the USB variant and the reading head of the PROFIBUS AL, PROFINET and EtherCAT variants

Following communication variants are available:

- **KeyPilot USB**
  The ID can be read out via the USB interface. Keys with memory can be written and deleted. Reading stations with a USB interface are also used as set-up stations to store authorizations on other reading stations using a setup key.

- **KeyPilot RS232**
  The ID can be read out via the RS232 interface. Keys with memory can be written and deleted.

- **KeyPilot PROFIBUS**
  The ID can be read out via the PROFIBUS DP interface.

- **KeyPilot PROFIBUS AL**
  Variants with remote reading head. The ID can be read out via the PROFIBUS DP interface.

- **KeyPilot PROFINET**
  Variants with remote reading head. The ID can be read out via the PROFINET IO interface.

- **KeyPilot EtherCAT**
  Variants with remote reading head. The ID can be read out via the EtherCAT interface.

3.4   Keys

Each key has a worldwide unique identifier (ID), which is provided by the manufacturer. This ID has 2^{48} different possibilities and cannot be manipulated. Using the ID the key is clearly identifiable. Thus, the owner of the key can be clearly determined and his actions can get logged.

Currently, the keys listed in the following table are supported:

Figure 3: Keys

Key type	Family code	Memory area
ID–only authorization key	01	–
Authorization key with memory area	14	256 B EEPROM
	23	4 kB EEPROM
Setup key with memory area	37	32 kB EEPROM
Evaluation key with memory area		

Table 1: Key types, family codes and memory areas

All key types can be used in the application and all different key types can be mixed.

The key type can be distinguished using the imprinted family code.

Figure 4: Meaning of lasered labeling of the key

4. Technical data

4.1   Type plate

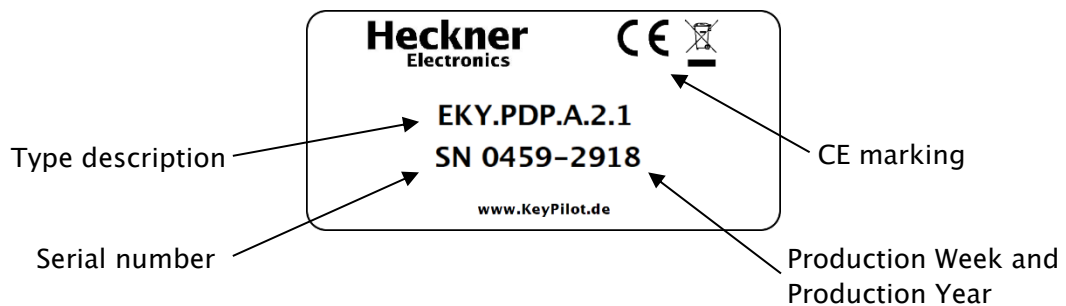The type plate can be found on the side of the electronics unit.

Figure 5: Type plate

4.2   Electrical specifications

Voltage power supply	12...36 V DC
Power consumption (typ.)	2 W
Operating temperature	–20...+70 °C
Galvanically isolated supply voltage	Yes
Short–circuit–proof reading contacts	Yes
Bus data rate	9,6 kBaud … 12 MBaud
DP–V0 slave	Yes
Auto–addressing by class 2 master	Yes
Switchable terminating resistor	Yes

4.3   Protection class

Reading head	IP67
Electronics unit	IP20

4.4   Mechanical specifications
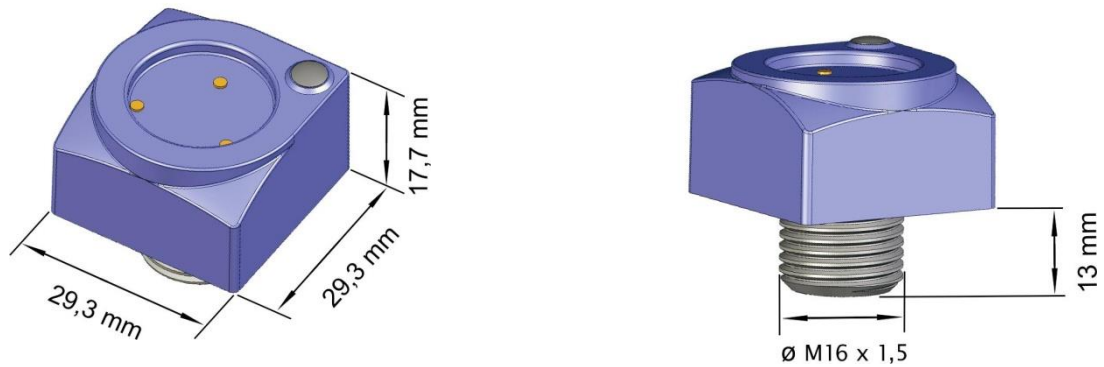
4.4.1 Reading head

Figure 6: Reading head dimensions

For mounting in installation openings with a diameter of 22.5 mm, a reducer ring is supplied for centering.

The reading head can be ordered with different lengths of the connection cable. The connection cable is permanently connected to the reading head and is max. 10 m long.
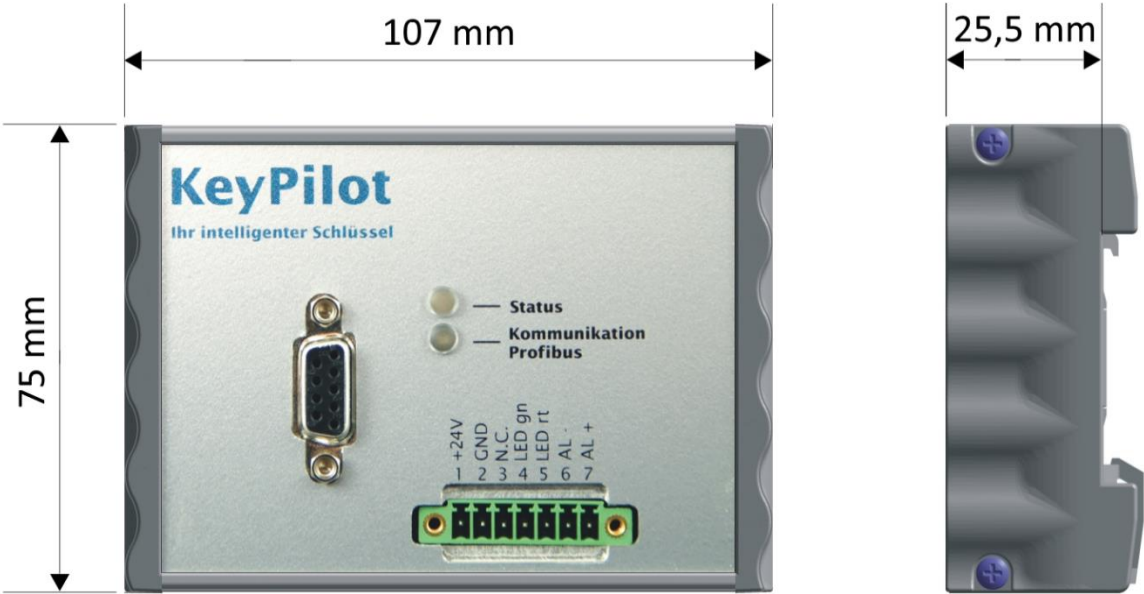
4.4.2 Electronics unit

Figure 7: Electronics unit dimensions

The electronics unit can be mounted on TH 35–15 and TH 35–7.5 DIN top–hat rails according to DIN EN 60715: 2001.

4.5   Pin assignment

4.5.1 Power supply and Interface to the reading head

Power is supplied to the KeyPilot via the pluggable screw contacts of the electronics unit. This plug connector is also used to connect the reading head.
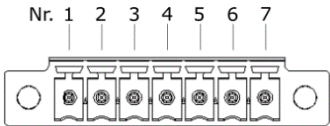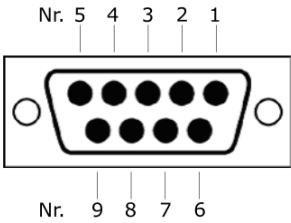
No.	Assignment	Wire color
1	Supply voltage +12…36V	
2	Supply voltage GND	
3		–
4	Reading head LED green	🟩 green
5	Reading head LED red	🟥 red
6	Reading head –	⬛ black
7	Reading head +	white

Table 2: Plug connector assignment

4.5.2 PROFIBUS Interface

The connection to PROFIBUS is made via the D–Sub connector of the electronics unit. Please use a common PROFIBUS bus connector.

No.	Assignment	Wire color
1		–
2		–
3	PROFIBUS line B	🟥 red
4		–
5	GND for terminating resistors	–
6	+5V for terminating resistors	–
7		–
8	PROFIBUS line A	🟩 green
9		–

Table 3: PROFIBUS assignment

5. Preparation

5.1 Scope of Delivery

Description	Figure
Electronics unit	
Reading head with connecting cable Type EKY.C16.Q.1.0	
Plastic nut M16x1.5	
Reducer ring 16.2 mm to 22.2 mm	
Pluggable screw contacts 7 pole	
Quick Reference Guide	

Table 4: Scope of Delivery

5.2   Packaging

The packaging has been designed to protect the KeyPilot during transport by freight carrier or parcel delivery service. Nevertheless, please check all supplied components for damage after unpacking.

The packaging must be disposed of separately according to the applicable rules for cardboard and plastic.

5.3   Installation

5.3.1 Reading head

A mounting hole with a diameter of 16.2 mm is sufficient for mounting the reading head. The mounting in holes with 22.3 mm diameter is possible with the enclosed reducer ring.

Procedure:

1. Pull the connection cable completely from the front through the mounting hole.

2. Insert the reading head into the mounting hole from the front. The thread of the reading head must protrude on the back of the mounting hole.

3. If necessary, slide the reducer ring over the connection cable to the mounting hole.

4. Slide the plastic nut over the connection cable and screw the reading head into the plastic nut.

5.3.2 Electronics unit

To mount the electronics unit, simply snap them into place on a TH 35 DIN top-hat rail.

5.4   Connection

5.4.1 Connect reading head to the electronics unit

The reading head is supplied with a pre-assembled cable. This cable must be connected to the pluggable screw contacts on the front of the electronics unit.

5.4.2 Connection to the PROFIBUS DP

The connection to PROFIBUS DP is made via the D-Sub connector of the electronics unit. It is recommended to use a common PROFIBUS bus connector with integrated bus termination. Please note the following points:

- When installing as the last device at the end of the bus installation, the bus termination must be activated in the bus connector used.

- If the bus cable is continued, deactivate the bus termination.

- Make sure that bus termination is activated in only two places in the entire bus. Avoid stub lines.

Details on permissible cables and possible topologies of the cabling can be obtained from the PROFIBUS User Organization (see chapter 5.5.1).

5.4.3 Power supply

	WARNING
⚡	**Risk of injury, damage to the KeyPilot and damages to the environment of the KeyPilot due to improper electrical connection.**
	• The electrical connection must be made only by qualified specialist personnel.
	• Electrical connections must be made only when de-energized.
	• Please note the technical specifications of the device.
	• Make sure the connections are made correctly and are tight.

Power is supplied to the KeyPilot via the pluggable screw contacts of the electronics unit with 12 to 36 V DC.

5.5   Configuration of the PROFIBUS communication

5.5.1 Contact details for the PROFIBUS User Organization

Further information on the PROFIBUS DP basics and protocols can be found at the PROFIBUS User Organization (PNO).

PROFIBUS User Organization

Address: Geschäftsstelle Haid–und–Neu–Straße 7
                     D–76131 Karlsruhe Germany

Telephone: +49 (0)721 96 58 590

Fax: +49 (0)721 96 58 589

E–Mail: info@profibus.com

Internet: www.profibus.com

5.5.2 Supported functions

KeyPilot can be integrated into a PROFIBUS DP network as a PROFIBUS slave. The standard is supported according to IEC 61158 and IEC 61784. KeyPilot supports the functional scope of the version DP–V0.

5.5.3 General Station Description (GSD)

The GSD device description file required for configuring and operating the KeyPilot can be obtained on the Internet via the address www.KeyPilot.de.

5.5.4 Configuring the device address via setup key

The device address is configured using the KeyPilot Manager software. This can be downloaded free of charge from manufacturer's website at www.KeyPilot.de. Using a KeyPilot setup station and a setup key, the configuration created with the KeyPilot Manager can be transferred to the reading station and read out.

Please contact the manufacturer or your supplier if you need help with the configuration.

5.5.5 Configuring the device address via auto-addressing

The prerequisite for auto-addressing is a class 2 PROFIBUS master (DPM2). These masters can assign the device address automatically via the PROFIBUS telegram Set_Slave_Add (SAP55).

Auto-addressing is initiated by the master if the reading station has the device address 126. This is the default device address as long as no other device address has been set. Changing the device address via SAP55 is only possible once. Another change of the device address (such as reset to 126) is only possible with a corresponding setup key (see chapter 5.5.4).

The auto-addressing allows direct commissioning of a reading station without prior device configuration. This is especially helpful when replacing a device. Usually, the master recognizes the absence of a known slave and assigns the corresponding device address to the new, not yet configured slave.

6. Operation

6.1 Function description

The KeyPilot PROFIBUS AL function can be summarized as follows:

- On the reading head of the KeyPilot the key is held by a magnet. The key ID is read out via the contacts.

- The electronics unit works as a PROFIBUS DP slave and transmits the read ID over the bus. The ID therefore appears in the input process image of the PROFIBUS DP master.

- ID can be used arbitrarily in the master.

- Optionally, the master can control the status LED on the reading head via the output process data.

The ID is permanently transmitted as long as a key rests on the reading station. If there is no key, the ID is set to zero.

As with all communication variants of the KeyPilot, there is no authorization matching in the device. This must be implemented customer-specific in the master.

6.2 PROFIBUS DP process data

The following section describes the KeyPilot user data available in the input/output process image of the PROFIBUS DP master.

Offset	Description	Data type	Length
0	FC	Byte	8 Bit
1	ID1	Byte	8 Bit
2	ID2	Byte	8 Bit
3	ID3	Byte	8 Bit
4	ID4	Byte	8 Bit
5	ID5	Byte	8 Bit
6	ID6	Byte	8 Bit
7	CRC	Byte	8 Bit

Table 5: Input process data

Offset	Description	Data type	Length
0	LED	Byte	8 Bit

Table 6: Output process data

6.2.1 Key ID

The ID of the issued key is completely transferred via the input signals "FC", "ID1" to "ID6" and "CRC". If all values are zero, then either there is no key or there is an error.

6.2.2 Controlling status LED

The output "LED" can be used to control the status LED of the reading head (see chapter 6.3.1).

Value	Meaning
0x00	Status LED shows the operating status of the KeyPilot.
0x01	Status LED is permanently red.
0x02	Status LED is permanently green.
0x03…0xFF	Status LED shows the operating status of the KeyPilot.

Table 7: LED control values

6.3   Status display

The status of the KeyPilot is signaled through several LEDs on the electronics unit and on the reading head.

6.3.1 Status LEDs

The two-colored LED on the reading head and the LED "Status" on the front of the electronics unit indicate the operating status of the KeyPilot. In addition, the LEDs can also be controlled from the PRFOIBUS DP master, unless this is prevented by a fault condition.

Display		Meaning
◯	Permanently off	No or faulty power supply or device is defective.
🟢	Single flash GREEN	Normal operation and no key detected.
🟢	Blinking GREEN (5 Hz)	Key is read out.
🟢	Blinking GREEN (1 Hz)	Key read out successfully.
🟢	Steady GREEN light	LED status controlled via the PROFIBUS.
🔴	Single flash RED	Device not in operating state: • no configuration available • incorrect configuration data • incomplete setup process
🔴	Blinking RED (1 Hz)	Error when reading a key. Absence of an issued key indicates a non-specific error, e.g. through short-circuiting of the contact surfaces.
🔴	Steady RED light	LED status controlled via the PROFIBUS.
🟢🔴	Blinking GREEN/RED (5 Hz)	Key is written, e.g. when reading the reading station with an evaluation key.
🟢🔴	Blinking GREEN/RED (1 Hz)	Key written successfully.
🟠	Blinking ORANGE (5 Hz)	Takeover of the new data, reset.
🟠	Blinking ORANGE (1 Hz)	PROFIBUS communication error.

Table 8: Status LED

6.3.2 Communication Profibus

The "Communication Profibus" LED on the front of the electronics unit signals the functional state of the KeyPilot as a PROFIBUS DP slave.

RDY/BF display		Meaning
⚪	Permanently off	No bus error
🔴	Steady RED light	A bus error was detected. This can be both a physical error (for example cables, plugs) as well as a configuration error (for example slave not configured in master, wrong slave address configured).

Table 9: LED Communication Profibus

7. Maintenance

7.1   Cleaning

For reliable operation of the KeyPilot, the contact surfaces of the reading head and the key must be kept clean. Remove any soiling if you experience problems reading the key. Reading head and key can be cleaned using common cleaning agents. Avoid using corrosive detergents.

7.2   Maintenance

The components of the KeyPilot do not require any special maintenance.

7.3   Repair

Damaged components of the KeyPilot may be repaired only by the manufacturer. Please contact your supplier if needed.

8. Decommissioning and disposal

8.1   Disassembly

	WARNING
⚠	**Risk of injury and damage in the environment of the KeyPilot due to unconnected electrical wiring.** • The electrical connection may be changed only by qualified personnel. • Electrical connections must be made only when de-energized. • Make sure that disconnected connecting cables do not remain unprotected (insulate).

In case you want to remove the KeyPilot from your system, proceed as follows:

1. Switch off the power supply.

2. Disconnect the power supply and the connection to the reading head to the screw terminals of the electronics unit.

3. Remove the bus connector of the PROFIBUS cable.

4. To disassemble the electronics unit, pull the latch on the underside with a screwdriver. The electronics unit can then be swung upwards.

5. To disassemble the reading head unscrew the plastic nut. The reading head can then be pulled out of the mounting hole.

8.2   Disposal

All components of the KeyPilot (electronics unit, reading head and key) must be disposed of in accordance with the statutory regulations for electronic devices.

The packaging must be disposed of separately according to the applicable rules for cardboard and plastic.

9. CE declaration of conformity

EU-Konformitätserklärung

Produktbezeichnung:	**KeyPilot**
Typen:	**EKY.PDP.T, EKY.PDP.A** **EKY.RS2.T, EKY.RS2.E** **EKY.SWI.T** **EKY.LVL.T** **EKY.USB.T, EKY.USB.E**
Hersteller:	**Heckner Electronics** **Säntisstrasse 25** **88079 Kressbronn am Bodensee**

Die hier genannten Baugruppen sind entwickelt, konstruiert und gefertigt in Übereinstimmung mit der

RICHTLINIE 2014/30/EU DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit.

und erfüllen die Vorschriften der

Richtlinie 2011/65/EU des Europäischen Parlaments und des Rates vom 8. Juni 2011 zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten.

Folgende Normen wurden angewandt:

DIN EN 55022; VDE 0878-22:2011-12, (CISPR 22:2008, modifiziert);Deutsche Fassung EN 55022:2010

DIN EN 55024; VDE 0878-24:2011-09, (CISPR 24:2010); Deutsche Fassung EN 55024:2010

Kressbronn, den 27.01.2015

Unterzeichnet:

(Franz Kleiner, Geschäftsführer)

Figure 8: CE declaration of conformity

Heckner Electronics GmbH

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