Module Device

WAL - Work Area Limitation Module

Internal Technical Documentation V 1.0.2

KEBA®
Automation by innovation.

Introduction

List of changes

Version changed from / to	Date	Description	Modified by
0.1	01-2022	Created	kma
0.2	02-2022	1st version of the document finished	kma
1.0	03-2022	Reviewed version	kma
1.0.1	05-2022	Minor update	kma
1.0.2	05-2022	Minor update	kma

Contents

1 Introduction

1.1 Purpose of the document

This manual describes the WAL module, which is already permanently installed in different KEBA products like the handheld terminal KeTop T15x Wireless and the corresponding CB4xx. The application and functionality of the WAL R1 module is the same for each KEBA product. It is used for wireless operation area monitoring.

1.2 Audience and prerequisites

The manual is geared towards those who are using or intend to deploy an KEBA product with the work area limitation WAL module.

Only electrical technicians who are qualified to the VDE 1000-10 standard are permitted to install and maintain it.

This means personnel who:

- can evaluate the work to be carried out and recognise the possible hazards based on their technical training, knowledge and experience plus their expertise in the applicable standards.
- have a level of knowledge equivalent to that obtained through professional training as a result of several years experience working in a similar field.

1.3 Intended use

The intended use of the WAL module includes deployment in KEBA products.

The WAL module (Work Area Limitation) is used to limit the area in which a wireless handheld terminal can be used. Therefore it has to be used in conjunction with a base station (e.g. CB4xx) which includes the counterpart WAL module.

The WAL module may not be used to fulfil protection requirements in the area of personal safety to prevent a malfunction compromising personal safety.

1.3.1 Contents of document

- WAL module description
- Assembly and installation notes
- Description of the connections and wiring including EMC measures
- Description of the configuration
- Description of the status LEDs
- Maintenance notes
- Accessories
- Technical specification

1.3.2 Not contained in this document

- Teaching pendants description
- Other KEBA products

1.4 Documentation for further reading

The following is a listing of manuals for components, which are equipped with a WAL module:

Doc. No.:	Planning manual	Description
2904965003	KeTop Safe Wireless System (T15xWL / CB4xx) – English	Describes the installation, assembly, connection and operation of the safe wireless system.
2904944651	KeTop Safe Wireless System (T15xWL / CB4xx) – German	Describes the installation, assembly, connection and operation of the safe wireless system.

2 Safety notes

2.1 Representation

At various points in this manual you will see notes and precautionary warnings regarding possible hazards. The symbols used have the following meaning:

DANGER!

- **indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

WARNING!

- **indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

CAUTION!

- **means that if the corresponding safety measures are not taken a potentially hazardous situation can occur which, if not avoided, may result in property damage or slight bodily injury.**

NOTICE

- **NOTICE used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.**

- **This symbol reminds you of the possible consequences of touching electrostatically sensitive components.**

Information

Informations on use of equipment and useful practical tips are identified by the symbol "Information". "Information" do not contain any information that draws attention to potentially dangerous or harmful functions.

3 Product overview

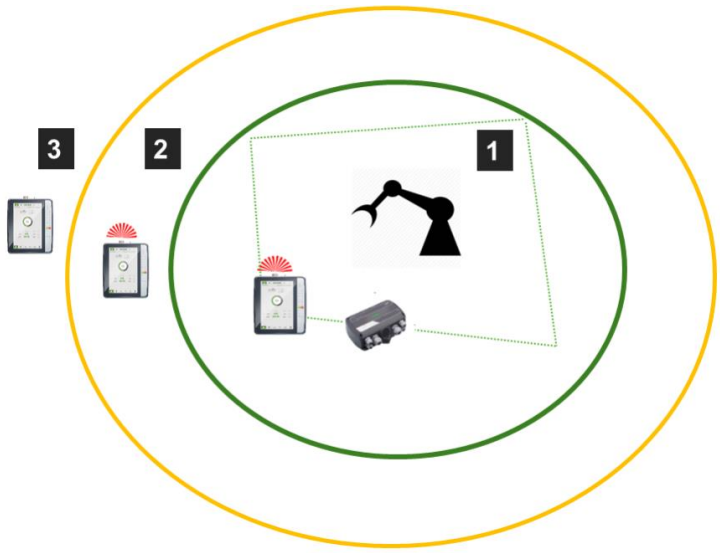
3.1 Summary

The functionality of the WAL R1 module is described by using the implementation in the KeTop Safe Wireless System (KeTop T15x WL + CB4xx) as an example. Both components contain the same WAL module and show how it can be utilized:

To ensure that no dangerous actions of the machine or of machine parts can be triggered outside of the visible area of the hazardous area, there is an option for restricting the effective range when using a WAL R1 module. The effective range restriction also offers the advantage of reducing the probability of connection interruptions.

Various tactile and optical measures (e.g. vibration in the handheld device, pulsation of the illuminated emergency stop) let the user know when the limit of the effective range has been reached. Depending on the direction, the frequency of these measures increases or slows down. If the user exits the effective range, the frequency increases. If the user moves into the effective range, the frequency is reduced.

The maximum permissible effective range is 20 m and can be configured on the base station (CB4xx containing WAL R1 module) using DIP switches.



Zones of effective range restriction

1 ... Effective range of action	2 ... Tolerance range
3 ... Area of infringement	

The solid green line represents the working area that is configured as the effective range. The furthermost point in the working range defines the effective range of action (comparable to the cable length for corded devices).

The yellow line represents the tolerance range. The radius is 5 m by default and cannot be configured. Even in the tolerance range, it must be possible to see into the hazard areas.

3.1.1 Effective range of action

In the effective range, the full range of functions is ensured when there is a connection. For the handheld device (KeTop T15x WL) this means that the emergency stop is illuminated and functional and the enabling switch is also functional.

3.1.2 Tolerance range

When someone enters the tolerance range, this is indicated by vibrations in the handheld device and optical signals. The emergency stop is no longer continuously illuminated, but rather the light pulsates. The emergency stop is still functional, however.

When the enabling switch is pressed, the output is deactivated after approx. 10 sec. The effective range is the only area where enabling can be ensured by releasing the enabling switch and pressing it again. An enable button that has not been actuated cannot be activated.

3.1.3 Area of infringement

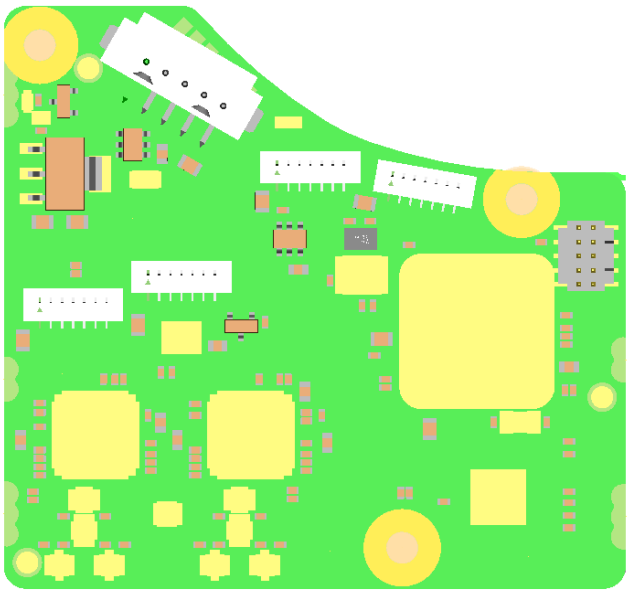
When someone enters the infringement area (i.e. exits the tolerance range), this is indicated right away by strong vibrations and optical signals of the handheld device (KeTop T15x WL). The emergency stop function is triggered after 1 sec and the illumination of the emergency stop is deactivated on the handheld device. The machine enters a safe state.

If the enabling switch is pressed, this is deactivated immediately when someone enters the infringement area. An enabling switch that has no been actuated can no longer be activated.

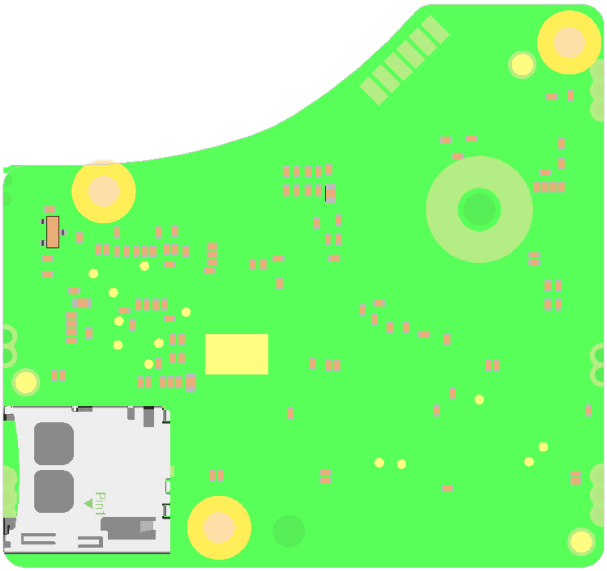
3.2 WAL module before installation

The illustrations below show the WAL R1 module PCB before it is installed.

Top view:



Bottom view:

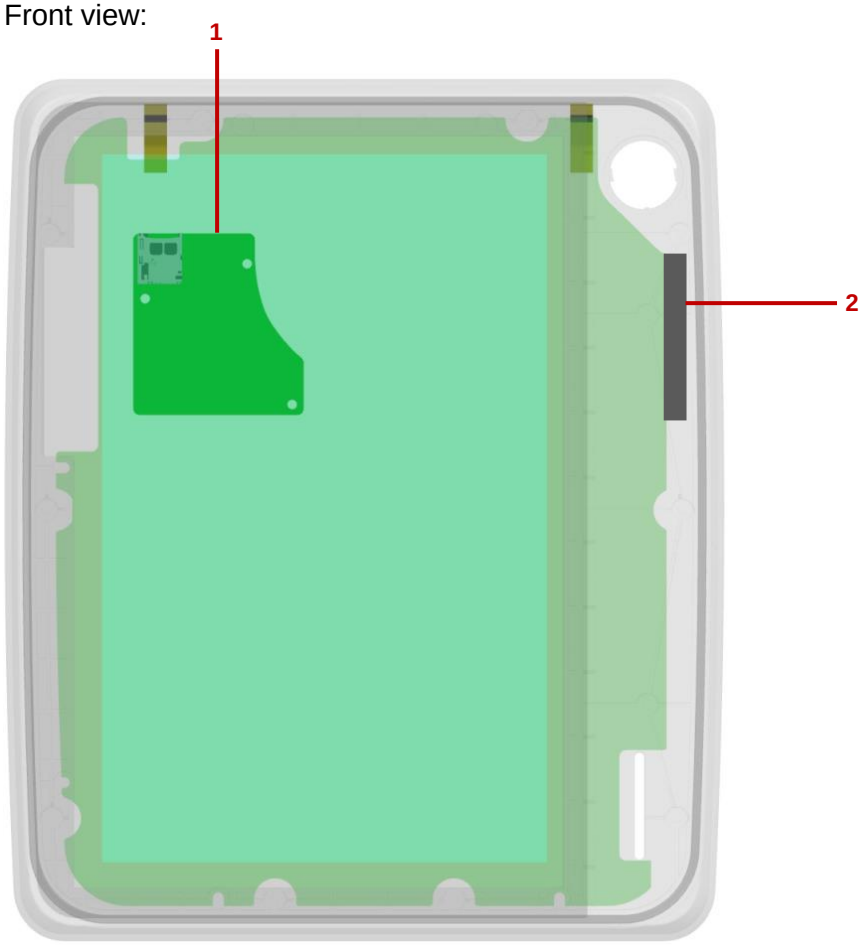


3.3 WAL module after installation

The following illustrations show the position of the module an the antenna in the base station (KeTop CB4xx) and the handheld device (KeTop T15x WL).

3.3.1 KeTop T150 WL (example)

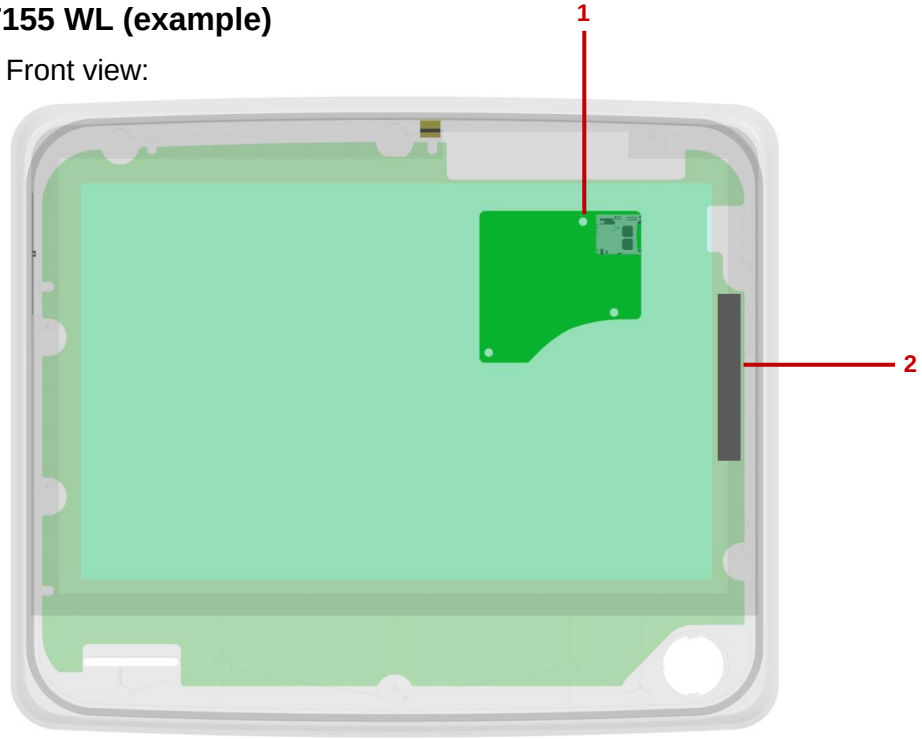
Front view:



1 … Position of the WAL R1 module
2 … Position of the 2.4 GHz antenna connected to the WAL R1 module

3.3.2 KeTop T155 WL (example)

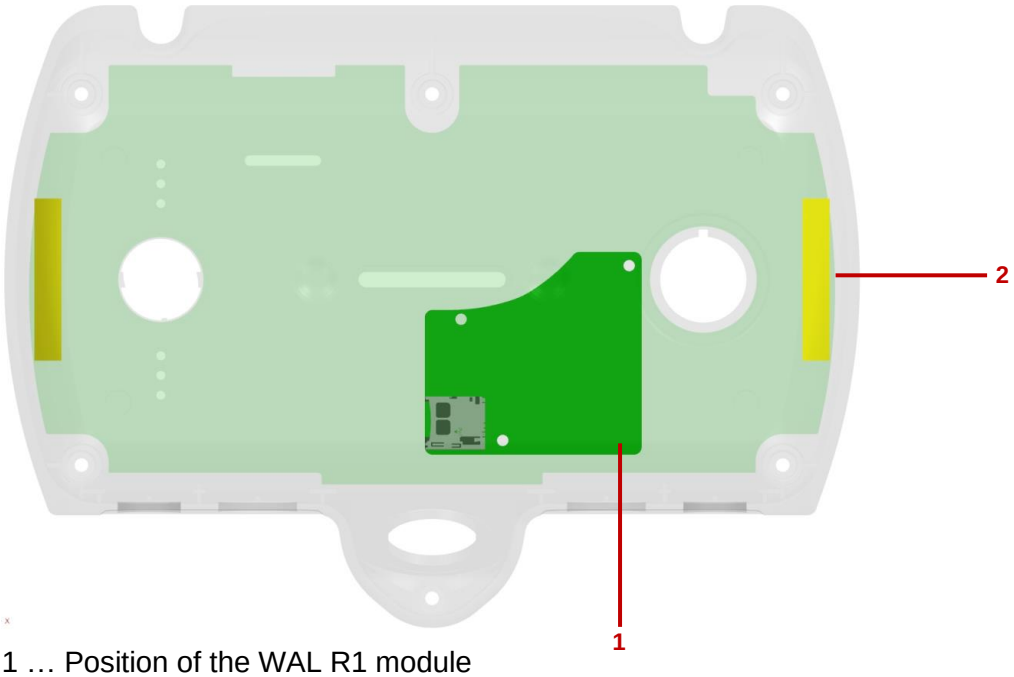
Front view:



1 … Position of the WAL R1 module
2 … Position of the 2.4 GHz antenna connected to the WAL R1 module

3.3.3 KeTop CB4xx (example)

Front view:



1 … Position of the WAL R1 module
2 … Position of the 2.4 GHz antenna connected to the WAL R1 module

4 Assembly and installation notes

To guarantee the specified antenna range the minimum clearance between antenna and base material (e.g. aluminium) must be respected.

Suitable precautions must be taken to prevent any cables located behind the antenna from causing antenna detuning, e.g. providing a cover.

4.1 MIC requirements (Japan)

In order to comply with MIC RF Exposure requirements, this device must be installed to provide at least 5 mm separation from the human body at all times. Please consider that only external antennas listed in chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** "**Fehler! Verweisquelle konnte nicht gefunden werden.**" are allowed.

5 Connections and wiring

5.1 EMC and wiring guidelines

5.1.1 Personal safety and exposure

Safety extra-low voltage

The module is powered by safety extra-low voltage.

Radiated power

The EIRP value of the WAL R1 module is -1.21 dBm at maximum and therefore far below the applicable limit.

5.1.2 Why EMC-aware wiring?

The immunity of an electrical system depends essentially on wiring and shielding that is designed to overcome any EMC problems. Servicing experience has shown that inadequate wiring and shielding is a common cause of system interference and failure.

Electromagnetic interference is far more troublesome than "conventional" faults:

- It is not normally recognised as such from the symptoms displayed and can often be mistaken for a fault in an assembly, which is basically sound.
- They mainly occur sporadically and are difficult to duplicate.

As a consequence fault-finding is time-consuming and expensive.

Therefore ensure from the start that the wiring and shielding conforms to the guidelines documented below.

5.1.3 Which EMC measures must be taken?

The EMC measures for the WAL module concentrate on shielding the connecting cable of the module.

5.2 Power supply

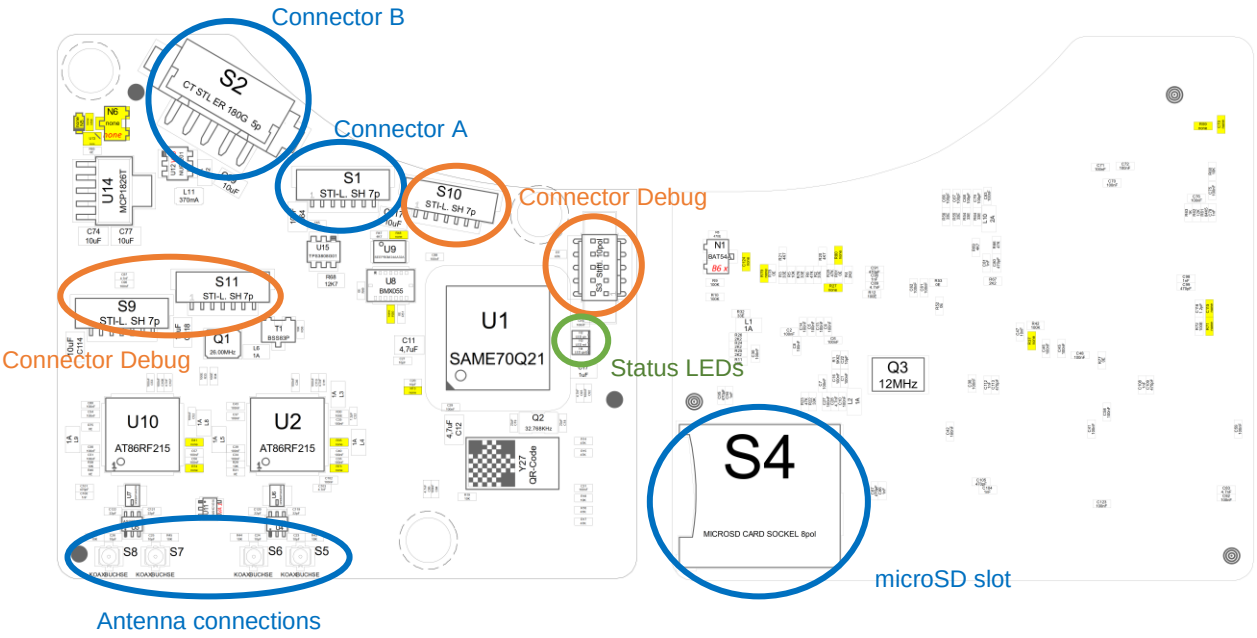
The power to the WAL R1 module is supplied via the connectors for communication (3.3V or 5V).

The high-frequency area (U2, U10: AT86RF215) generates the voltages it uses by itself.

5.3 Module interfaces

5.3.1 Assembly

Side A: Side B:



Description	Component No. according to assembly diagram
Connector A	S1
Connector B	S2
Connector Debug	S3, S9, S10, S11
microSD slot	S4
Antenna connections	S5, S6, S7, S8
Status LEDs	N2, N3, N4

5.3.2 Connector A

This 7-pin connector is used for serial communication (UART) and the 3.3V power supply.

5.3.3 Connector B

This 5-pin connector can be populated for USB communication and debug purposed.
It is possible to use 5V from the USB cable as power supply. WAL R1 does currently not use this possibility. The necessary components are not populated on WAL R1.

5.3.4 Connector Debug

These connectors are just used for debug purposed and serve no purpose in normal operation.

5.3.5 microSD Slot

The microSD slot is just used for debug purposes and serves no purpose in normal operation.

5.3.6 Antenna connections

Using these coaxial connectors the external dipol antennas can be connected. Two connectors each build a pair for one antenna to connect: S5+S6 and S7+S8. It is not allowed to mix these connections for one antenna.
Only the usage of an antenna mentioned in chapter 8 (‘Accessories and spares’) is allowed and certified.

5.3.7 Status LEDs

The functionality of the three status LEDs is explained in chapter 6 (‘Status LEDs’)

5.4 Cables

5.4.1 Connector cable for serial communication (Connector A, S1)

The connection cable for the WAL R1 module to a baseboard for serial communication must be no longer than 10 cm. It does not have to be shielded.

5.4.2 Connector cable to the antennas (S5 – S8)

Only the connection cable included with the antenna listed in chapter 8 (‘Accessories and spares’) is allowed and certified. Modifications of this 20 cm long cable are not permitted.
One antenna is connected to S5 and S6 and the second antenna to S7 and S8. Intermixing of these connections between the antennas is not allowed.

6 Status LEDs

6.1 WAL R1 status LEDs

The module contains three status LEDs (red, yellow and green) directly on the PCB located on side A between U1 and S3.

WAL R1 status LEDs	Permanently on	Blinking	Short flash
Red	-	-	-
Yellow	USB connected	-	-
Green	USB error	USB activity	Sleep mode
All LEDs on	-	System error (Watchdog, Interfaces ,…)	-

7 Maintenance and repair notes

7.1 Maintenance

This device does not require regular maintenance.

7.2 Repair

Only KEBA technicians may repair faulty devices, otherwise the warranty becomes void.

7.2.1 Packaging and shipping

The module is placed in protective packing for shipping. Please return the packaging since KEBA tries to reuse it to minimise the environmental impact.

This protective packaging is not transport packaging and as such it is unsuitable for transport by carrier or air. Suitable, extra transport packaging must be used for this purpose.

7.3 Waste disposal

Comply with your national regulations for the disposal of electronic components!

8 Accessories and spares

Component	Order number
WAL_R1	108639
Taoglas FXP830.24.0200B (2.4 GHz dipole antenna incl. 20cm cable)	110488

9 Technical specification

General

Maximum distance:	20 m between two WAL modules
Antenna type:	Taoglas FXP830.24.0200B (20cm cable)
Communication protocol:	proprietary
Signalling:	No LEDs for signalling on the PCB

Interfaces

Data interface:	Serial, USB (debug only)
Supply voltage:	3.3 VDC (serial) or 5 VDC (USB) (+/- 5%)
Connector plug:	7-pin (Serial) + 5-pin (USB)

RF signal

Frequency range:	2400 – 2483.5 MHz
Transmission power (EIRP):	< -1.21 dBm

Dimensions

Module	width:	53 mm
	length:	56 mm
	height:	10 mm

Environmental condition

Operating temperature:	0 °C to +50 °C
Storage temperature:	-25 °C to +50 °C
Relative humidity:	5 to 95% (non-condensing)
Vibration resistance:	as per IEC 60068-2-6
Shock resistance:	as per IEC 61131-2 / EN 60068-2-27

10 Certifications and relevant statements

10.1 EC directives (European Union)

2014/53/EU	Radio Equipment Directive (RED)

10.1.1 Standards

The following non-legally binding European standards are used to validate the WAL module's conformance to the directives.

10.1.1.1 Validating conformance

Personal safety:	EN IEC 62311:2020 EN 62311:2008 EN 62479:2010 EN 50364:2018
Radio sector:	ETSI EN 300 328 V2.2.2
EMC sector:	ETSI EN 301 489-1 V1.9.2 ETSI EN 301 489-17 V3.2.4 EN 12895:2015 + A1:2019
Electrical safety:	EN 62368-1:2014 + AC:2015 + A11:2017

10.1.1.2 Other standards

In addition the following non-legally binding standards provide advice in some areas:

Environmental conditions

EN 61131-2:2007	Programmable logic controller - part 2 Equipment requirements and tests

10.2 FCC statement (USA)

FCC Part 15	Radio Frequency Devices

The device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

In order to comply with FCC RF Exposure requirements, this device must be installed to provide at least 15 mm separation from the human body at all times.

Additional testing, Part 15 Subpart B disclaimer:

The final host product still requires Part 15B compliance testing with the modular transmitter installed.

This device is labelled with an FCC ID number.
If this label is not visible when installed in an end device, the outside of the device MUST also display a label referring to the enclosed module.

e.g.

"Contains FCC ID: U870009"
(KEBA Product WAL R1 Module)

10.3 RSS/CNR statement (Canada)

This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

In order to comply with ISED RF Exposure requirements, this device must be installed to provide at least 15 mm separation from the human body at all times.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage;
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonc tionnement.

Afin de se conformer aux exigences d'exposition RF ISED, cet appareil doit etre installe pour fournir au moins 15 mm de separation du corps humain en tout temps.

This device is labelled with an IC identification number.
If this label is not visible when installed in an end device, the outside of the device MUST also display a label referring to the enclosed module.

e.g.

"IC: 20800-WALR1MOD"
(KEBA Product WAL R1 Module)

10.4 MIC statement (Japan)

This device is labelled with an MIC marking and identification number.
If this label is not visible when installed in an end device, the outside of the device MUST also display a label referring to the enclosed module.

e.g.

The final MIC identification number is currently pending and will be provided in an updated manual.

In order to comply with MIC RF Exposure requirements, this device must be installed to provide at least 15 mm separation from the human body at all times.

Information
Changes or modifications not expressly approved by KEBA could void the user's authority to operate the equipment.