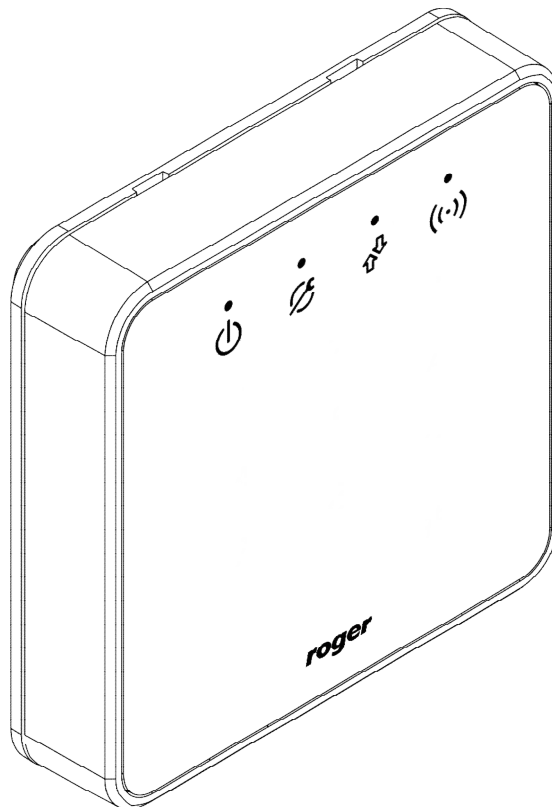*Roger Access Control System*

RWH-1 v1.x RACS AIR Wireless Hub

Operating Manual

Firmware version: 1.1

Document version: Rev. C

$C\epsilon$

Design and application

RWH-1 is a wireless hub dedicated to RACS 5 AIR system. The hub enables connection of wireless devices to RS485 bus and their control by MC16 access controller or other device which controls the bus (e.g. bus expander). The hub and connected wireless devices form radio network which operates in selected channel with specified network identifier. The hub can operate with up to 8 wireless devices of all available types such as RWL series lock (e.g. RWL-1, RWL-2) and RWX series expanders (e.g. RWX-1, RWX-2). Devices connected to the MC16 controller via RWH-1 are operated in the same way as wired devices connected to the MC16 and their functions can be freely configured with VISO management software. Multiple hubs can be connected to a single access controller forming multiple RACS 5 AIR radio networks. The maximal number of hubs connected to particular controller is limited by the number of unoccupied addresses on its RS485 bus while the maximal number of all devices operated by the MC16 results from its firmware and license. The same MC16 controller can operate with wireless and wired devices.

Creation of wireless networks

Prior to connection of wireless devices to access control system it is necessary to make low level configuration of these devices and then connect them within radio network. Both can be done with RogerVDM software.
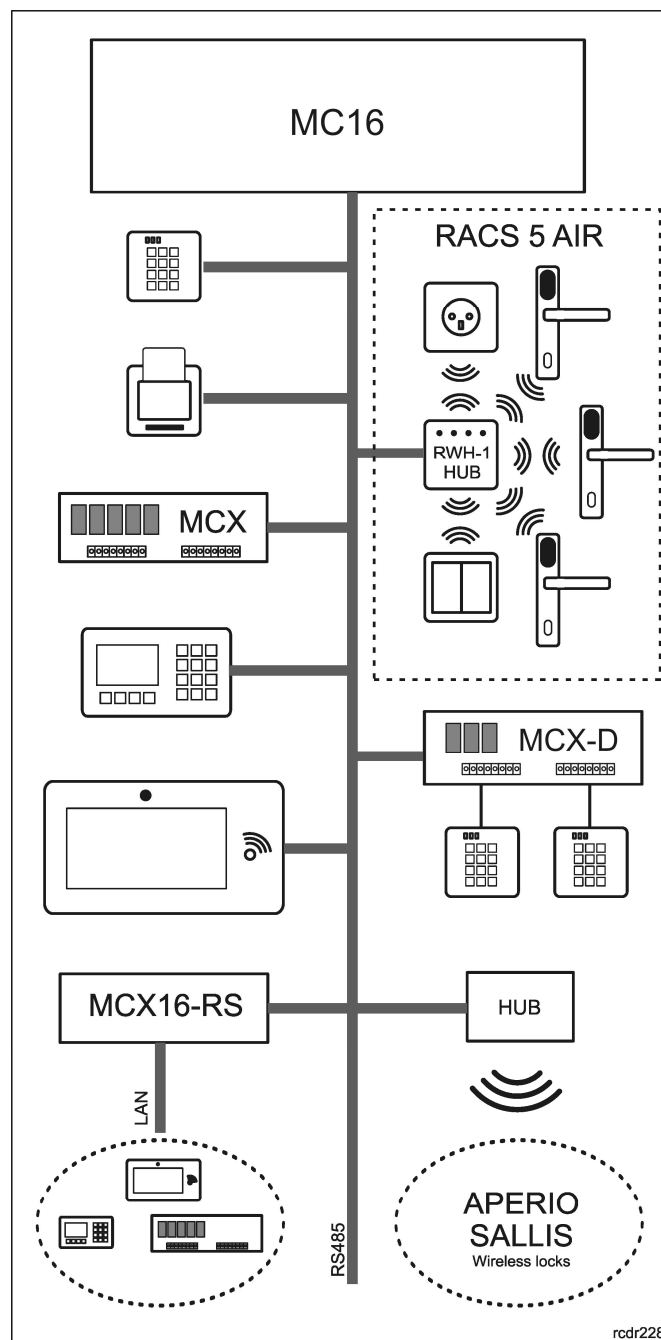

Fig. 1 Connection of peripheral devices to MC16 access controller

Radio channels

The wireless communication utilizes the IEEE 802.15.4/ 2.4GHz band which is shared with Wi-Fi networks. These networks can disturb the communication between lock and hub. Before the RACS AIR network is configured it is necessary to verify which channels are occupied by local Wi-Fi networks and to select a channel or group of channels which are the least used. Radio channel scanning can be done with commonly available apps.

Note: Due to their nature, wireless systems are exposed to all kinds of interferences. The communication can be affected by ambient electromagnetic radiation and periodic disturbances. Radio communication can also be intentionally suppressed. Therefore in RACS 5 system, the Emergency mode was introduced to enable lock operation when wireless connection is lost. If the Emergency mode is not configured in RACS 5 AIR system then there is a risk that mentioned disturbances will affect the system and hinder its operation.

Wi-Fi channels			
Channel	Frequency range [GHz]	Channel	Frequency range [GHz]
1	2,401 - 2,423 (2,412)	8	2,436 - 2,458 (2,447)
2	2,406 - 2,428 (2,417)	9	2,441 - 2,463 (2,452)
3	2,411 - 2,433 (2,422)	10	2,446 - 2,468 (2,457)
4	2,416 - 2,438 (2,427)	11	2,451 - 2,473 (2,462)
5	2,421 - 2,443 (2,432)	12	2,456 - 2,478 (2,467)
6	2,426 - 2,448 (2,437)	13	2,461 - 2,483 (2,472)
7	2,431 - 2,453 (2,442)	14	2,473 - 2,495 (2,484)

RACS AIR channels			
Channel	Frequency [GHz]	Channel	Frequency [GHz]
11	2,405	19	2,445
12	2,410	20	2,450
13	2,415	21	2,455
14	2,420	22	2,460
15	2,425	23	2,465
16	2,430	24	2,470
17	2,435	25	2,475
18	2,440	26	2,480

Low level configuration

Low level configuration is used to define device parameters for particular applications and conditions as opposed to high level configuration which is used to define logic of access control system. The low level configuration of RWH-1 hub and other wireless devices of RACS 5 AIR system is done with RogerVDM software and RUD-1 communication interface.

Programming with RogerVDM software:

- Place jumper on MEM pins.
- Connect RWH-1 hub to RUD-1 interface using dedicated cable with connector (fig. 2).

- When RUD-1 is inserted into computer USB port, short RST pins and orange LED SYSTEM indicator on the hub shall pulsate frequently.
- Start RogerVDM software.
- Select type of device (RWH-1), RS232 communication channel and serial port with connected RUD-1 interface.
- Select required settings.
- Make backup by saving settings to file (button: *Send to File…*).
- Upload settings to the lock (button: *Send to device*).
- In RogerVDM select Device/Disconnect.
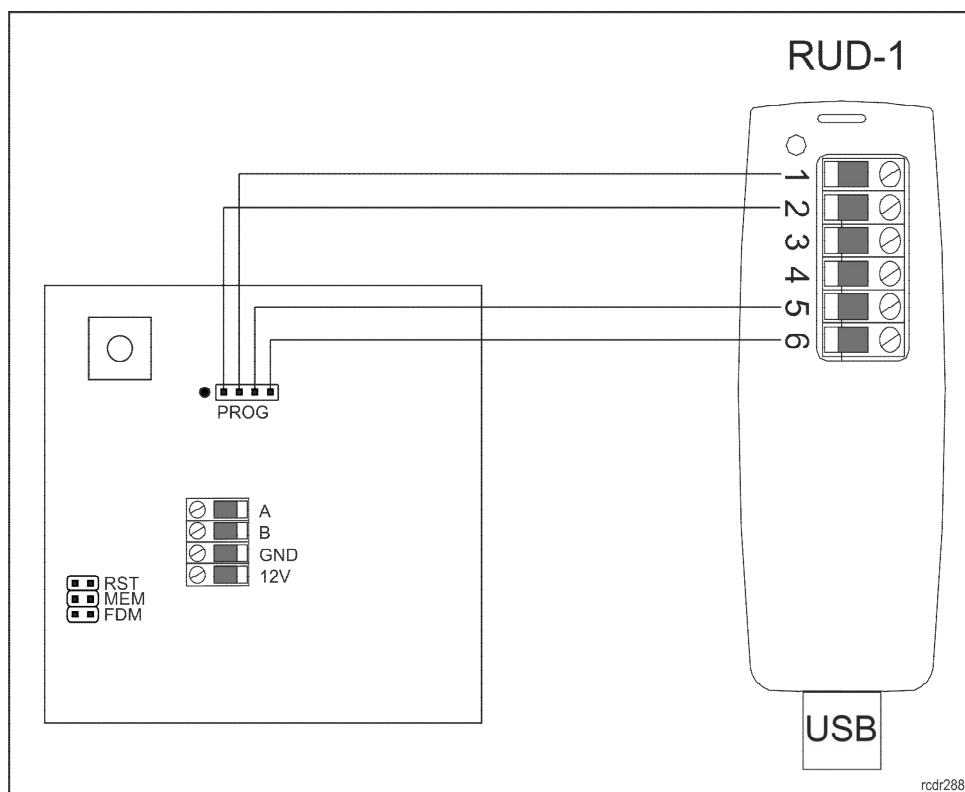- Short RST pins for a moment to restart device.

Fig. 2. Connection of RWH-1 to RUD-1 interface

Configuration parameters

The table below includes RWH-1 configuration parameters which can be modified using RogerVDM software within low level configuration of device.

Parameter	Function
RS485 address	The parameter defines device address on RS485 bus. Range: 100-115.
RS485 encryption	When the option is enabled then the communication between device and access controller is encrypted.
RS485 encryption key	The parameter defines key used for encryption of communication between device and access controller.
RS485 communication timeout	The parameter defines delay after which device will signal lost communication with controller. Range: 0-64s.
Radio channels	Parameter defines radio channels which are enabled for device. When radio network is created the hub automatically selects

	channel with the lowest level of interferences from the available pool. Range: 11-26.
Network identifier	The identification number of the wireless network created by hub. Each network working on the same radio channel should be assigned with unique PAN ID. Range: 0-16. Optionally the parameter can be set to AUTO. In such case the hub shall select PAN ID automatically.
Radio encryption key	The parameter defines key used for encryption of wireless communication. It is recommended not to define the key as it shall be specified automatically when wireless network is created.
LQI Low	The parameter defines low level of radio signal. When the actual signal falls below the parameter then low level radio signal is reported to access controller.
LQI Normal	The parameter defines normal level of radio signal. When the actual signal rises above the parameter then normal signal restoring is reported to access controller.
DEV comments	Any text to be displayed in VISO management software in order to facilitate object identification. DEV object represents the whole device (hub). Default value: RWH-1.
TAMPER comment	Any text to be displayed in VISO management software in order to facilitate object identification. TAMPER object represents alarm input which monitors hub tampering.
RTC comment	Any text to be displayed in VISO management software in order to facilitate object identification. RTC object represents real-time clock of the hub.

Wireless network creation

Devices within the same radio network must work in the same channel and be assigned with the same identifier (PAN ID). The selection of channel and PAN ID can be done automatically when the network is created using RogeVDM software. Nevertheless it is recommended to select radio channel manually during low level configuration of the hub. In such case all devices within the same network must be assigned with the same channel and PAN ID. Prior to channel assignment it is necessary to determine which radio channel is unoccupied and if multiple RACS 5 AIR operate in the same channel then PAN IDs must be additionally specified.

The furthest lock should be located in maximal distance of 10 meters from RWH-1 hub. It is also recommended to avoid any obstacles, particularly metal ones in the straight line from hub to lock. The network creation with RogerVDM is described below. It is assumed that devices used for network creation are already configured in regard of their low level parameters using RogerVDM software.

Wireless network configuration

In order to configure new wireless network or reconfigure existing one establish connection with RWH-1 hub using RogerVDM software and select *RACS Air Network* tab. In the opened window the list of wireless devices within the network shall be displayed (up to 4). Each device can be clicked to obtain information including current radio signal level (LQI) for such device. If devices are connected to the hub then they shall be displayed on the list.

Device status indication in RogerVDM	
Indicator	**Description**
Green	Device operates normally
Orange	Device is being registered in the system

Red	No communication with device
Blue question mark	Device enrolled to network but not registered yet

In order to enrol new devices to wireless network:

- Click the button *Add devices* – new window for network scanning shall be opened
- Wait till all required devices are detected. The process can be finished quicker if any card is read at RWL locks.
- Select devices for enrolment into network.
- Finish detection with *Confirm* button.
- Wait till all new devices are registered (question marks shall disappear). The registration of new network devices is performed automatically but it can take few minutes. Optionally, in order to reduce this time, read any card on the each lock you want to add to the network.
- Select *Save configuration* button.

If it's necessary to remove the device from the RACS AIR network then select the lock and press *Remove device* button.

Note: The command removes the device from the RWH-1 configuration. To complete the process, you must delete the wireless network configuration or perform a factory reset of the wireless device in accordance with its instruction manual.

RACS AIR tab buttons	
Name	**Function**
New configuration	Deletes current configuration and creates new one
Save configuration	Uploads current configuration to hub
Add devices	Opens network scanning window
Remove device	Deletes chosen device

LED indicators

RWH-1 hub is equipped with 4 LED indicators, which are described below.

LED indicators			
Symbol	**Name**	**Colour**	**Description**
⏻	STATUS	Green	Device normal operation
⌀	SYSTEM	Orange	Quick pulsing signifies programming cable connection. Slow (2Hz) pulsing signifies configuration error – memory reset is necessary.
⇧	LINK	Red/Green	RS485 communication
((·))	AIR	Blue	Wireless communication

Memory reset

Memory reset erases wireless network configuration and restores factory configuration settings. In order to perform memory reset procedure proceed with following steps:

- Remove jumper from the MEM pins (if applicable).
- Short RST pins for a moment preferably by placing and removing jumper.

- When acoustic signalization is started place jumper on MEM pins and the devices shall perform memory reset.

Installation

The hub should be installed on vertical structural element (wall) far from heat, moisture and metal plates/elements. The RWH-1 enclosure consists of front panel and base which are factory assembled and they must be disassembled before installation using included tool. The enclosure opening requires inserting of the tool tip into each of four holes on both sides of the enclosure in order to release internal latches (fig. 5). Alternatively, flat head screwdriver can be used instead of included tool.

Note: Enclosure latches are released by insertion of included tool or flat head screwdriver. There is no need to lever or twist the tool. Damages of holes and latches resulting from unskilled opening are excluded from manufacture warranty.

The enclosure base must be installed according to orientation shown in fig. 3 so the tamper lever could press the contact. It is recommended to mount the hub on flush mounting box but it can also mounted directly on the wall with included screws. Connection cable should be led through the hole in the base and connected to the screw terminals at hub front panel. Connection diagram with access controller is shown in fig. 4.
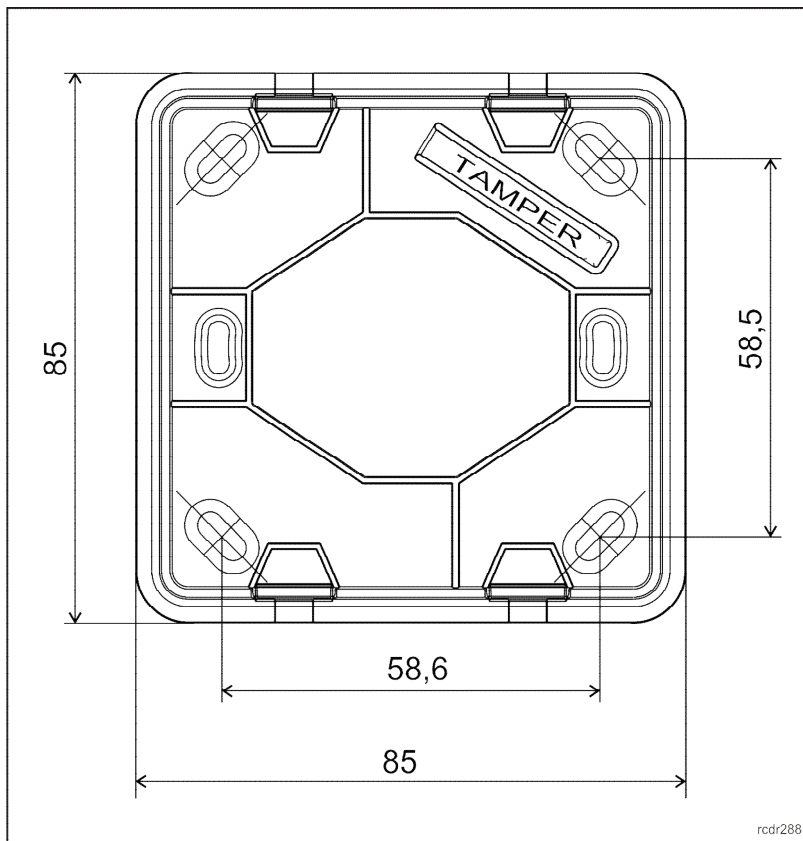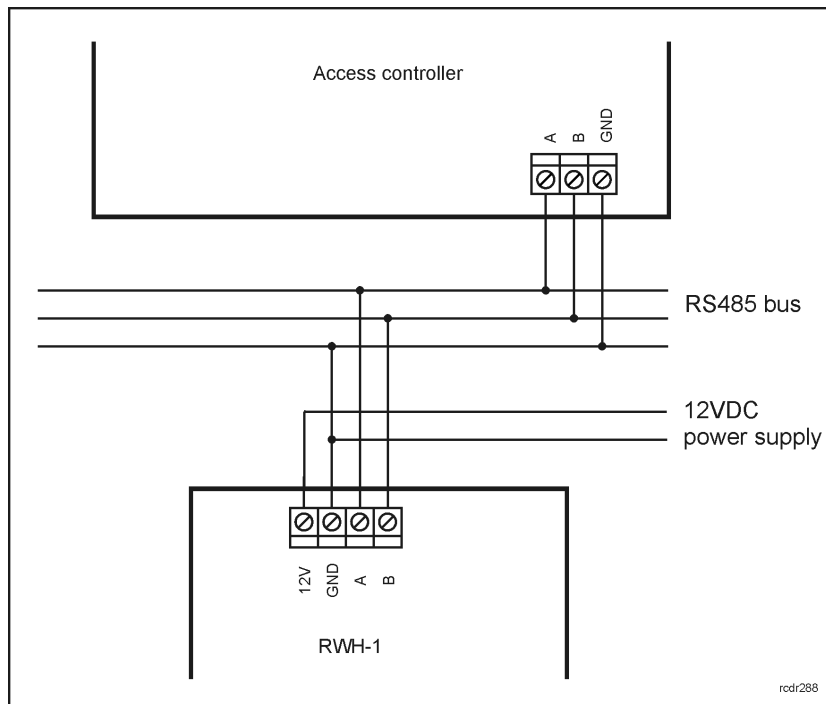

Fig. 3. RWH-1 base

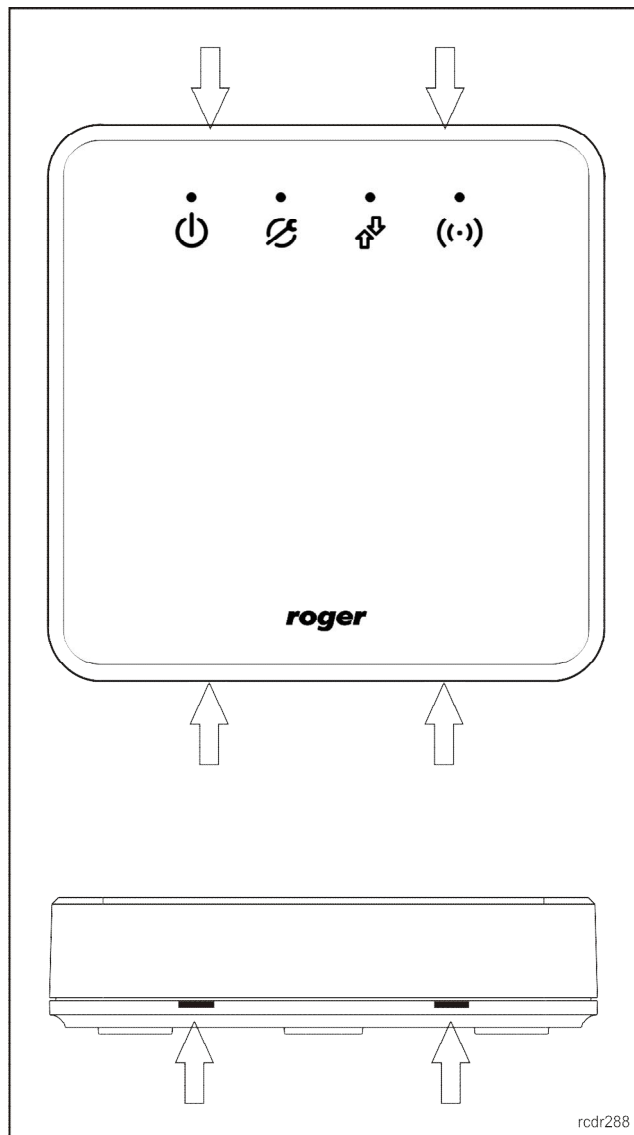Fig. 4. Connection between hub and controller

Fig. 5. Enclosure opening hole

RWH-1 screw terminals	
Terminal	**Description**
12V	Power supply
GND	Ground
A	RS485 communication bus; line A
B	RS485 communication bus; line B

Use/installation guidelines

- All electric cables must be connected to devices with disconnected power supply.
- Installation near metal elements decreases wireless range.
- If hub and access controller are not supplied from the same PSU then GND terminals of both devices should be connected.
- Clean front panel regularly with wet cloth and mild detergent. Do not clean by means of abrasive materials and such strong cleaners as alcohols, solvents, benzenes, etc.

Damages resulting from improper maintenance and use are excluded from manufacturer warranty.
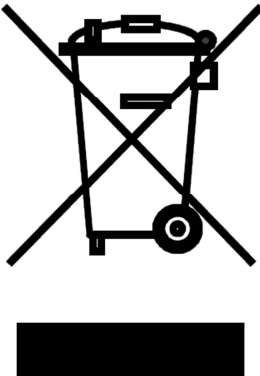
Specification

Parameter	Value
Supply voltage	Nominal 12VDC, min./max. range 10-15VDC
Current consumption	40mA
Communication interface with controller	RS485; maximal cable length: 1200m
Communication interface with wireless devices	IEEE 802.15.4/ 2.4GHz wireless communication; range: 4m (in free space)
Environmental class (according to EN 50131-1)	Class II; indoor general conditions, temperature: -10°C to +40°C, relative humidity: 10 to 95% (no condensation)
IP code	IP40
Dimensions (H x W x D)	85 x 85 x 22 mm
Weight	100g
Certificates	CE mark

Ordering information

Product	Description
RWH-1	RS485 interface to RACS 5 AIR devices
RWL-1	Wireless door lock with escutcheon
RWL-2	Wireless door lock with escutcheon
RWL-3	Wireless cabinet lock

Product history

Product version	Released	Description
1.0	09/2017	The first commercial version of the product

roger

This symbol placed on a product or packaging indicates that the product should not be disposed of with other wastes as this may have a negative impact on the environment and health. The user is obliged to deliver equipment to the designated collection points of electric and electronic waste. For detailed information on recycling, contact your local authorities, waste disposal company or point of purchase. Separate collection and recycling of this type of waste contributes to the protection of the natural resources and is safe to health and the environment. Weight of the equipment is specified in the document.

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