KeTop

KeTop T150 & T155 Linux
Mobile handheld device
Project engineering manual V 1.15

Translation of the original manual

KEBA
Automation by innovation.

Document: V 1.15
Pages: 140

© KEBA 2021
Specifications are subject to change due to further technical developments. Details presented may be subject to correction.

All rights reserved.

KEBA Industrial Automation GmbH
Reindlstraße 51, 4040 Linz, Austria
+43 732 7090-0, +43 732 7309-10, keba@keba.com

For information about KEBA and our subsidiaries please look at www.keba.com.

Record of Revision

Version	Date	Change in chapter	Description	Changed by
1.00	04-2018	-	Newly created	sthm
1.01	11-2018	Various chapters	Carrying out changes to spelling, Update of transport conditions, Environmental conditions, Adjustment of status and crash report	hli
1.02	05-2019	Various chapters	Various changes	hli
1.03	07-2019	Various chapters	Various changes	hli
1.04	03-2021	Various chapters	Various changes	hasl
1.05	10-2021	Various chapters	Update to new company structure, UKCA, new structure of standards	hasl
1.06	03-2022	Robotic keypad, technical data, Accessories	New robotic keypad; new IP classification, updated extended memory; additional wall holder with cable holder; added bumper, added cable reel	rmr
1.07	01-2023	Introduction, General safety instructions, Accessories	Various changes, Changed safety notes, Added bumper horizontal format, Added data rates	rmr
1.08	04-2023	Accessories	Updated connection box CB211	rmr
1.09	10-2023	Displays and operating elements	Added note about burn-in effect on display	rmr
1.10	12-2023	Declaration of conformity	Updated declaration of conformity	rmr
1.11	01-2024	Technical data	Added new processor	rmr
1.12	11-2024	Displays and operating elements, Description of the handheld device	Added "x6211" as variant	hasl
1.13	03-2025	Maintenance	Maintenance updated	hasl
1.14	11-2025	Device configuration, Accessories	Host IP configuration updated, cables ea0 and Eb0 added, added carrying strap to bumper	ext_klapper
1.15	04-2026	Accessories	Correction of Eb0 designation, Processor core - Processor types expanded	ext_klapper, bebe

© KEBA 2021

KEBA © KEBA 2021

Table of contents

1 Introduction ... 11
1.1 Purpose of the document ... 11
1.2 Preconditions ... 11
1.3 Intended use ... 12
1.4 Notes on this document ... 13
1.4.1 Contents of document ... 14
1.4.2 Not contained in this document ... 14
1.5 Documentation for further reading ... 14
1.6 Information about MD 2006/42/EC ... 14
1.6.1 Quantitative safety relevant specifications for emergency stop-button and enabling device ... 14
1.6.2 Relationship between Performance Level and Safety Integrity Level 15
1.6.3 Abbreviations ... 16

2 Safety notes ... 17
2.1 Representation ... 17
2.2 General safety instructions ... 18
2.3 Personnel safety instructions ... 20

3 Description of the handheld device ... 22
3.1 Front view ... 22
3.2 Rear view ... 23
3.3 Handling ... 23
3.4 Type plate ... 24

4 Displays and operating elements ... 25
4.1 Membrane keyboard ... 25
4.1.1 Standard keyboard ... 25
4.1.2 Robotics keyboard ... 26
4.2 Status LEDs ... 28
4.3 Touchscreen ... 29

5 Connection and wiring ... 30
5.1 Cable entrance area ... 30
5.2 Assembling of the connection cable ... 30
5.2.1 Tools needed ... 30
5.2.2 Cable assembling ... 31
5.3 Cable routing in cable entrance area ... 32
5.4 Power supply ... 34

© KEBA 2021

5.5 Connecting the KeTop to a host computer 34
5.6 Emergency stop button 34
5.7 Gray stop button 35
5.8 Illuminated emergency stop 36
5.9 Enabling switch 36
5.9.1 Functionality 36
5.9.2 Connection example with control relay (PILZ PNOZ s6.1) 38
5.9.3 Example of connection with KEBA safety control 40
5.9.4 Foreseeable misuse of enabling switch 42
5.10 Ethernet 43
5.10.1 Pin assignment 43
5.11 USB port 44

6 Operating behaviour 45
6.1 Start-up 45
6.2 Trigger restart 45

7 Configuration 46
7.1 Device configuration 46
7.1.1 Diagnosis data 47
7.1.2 Display 47
7.1.3 Licenses 49
7.1.4 Network 49
7.1.5 Version info 52
7.1.6 Reboot 52
7.2 Access to the device 52
7.3 Detail configuration 54
7.3.1 Changing the start-up graphics & font color 54

8 Program development 56
8.1 Directory structure 56
8.2 Connectivity protocols 56
8.3 Keycodes 57

9 Maintenance 62
9.1 Cleaning the touchscreen 62
9.2 Creating a status report 62
9.3 Creating a service medium 63
9.4 Creating a backup 64
9.5 Restoring a backup / performing a software or firmware update 65

10 Disposal 68
10.1 Disposal of the module 68

KEBA © KEBA 2021

11 Technical data ... 69
11.1 General ... 69
11.2 Power supply ... 69
11.3 Environmental conditions ... 69
11.4 Processor ... 70
11.5 Interfaces ... 70
11.6 Emergency stop button / stop switch ... 71
11.7 Enabling switch ... 71
11.8 Mechanical properties ... 71
11.9 Dimensions, weight ... 71

12 Optional operating elements ... 73
12.1 Rotary Encoder Switch with 16 positions ... 73
12.2 Key-operated switch ... 73
12.3 Handwheel ... 75
12.4 Digital joystick ... 75
12.5 Illuminated push button ... 75
12.6 Gray stop button ... 76
12.7 Illuminated emergency stop button ... 76
12.8 RFID unit ... 76
12.8.1 Functionality ... 76

13 Accessories ... 78
13.1 Wall brackets KeTop WB150 ... 78
13.1.1 Dimensions ... 79
13.2 Handle and hand strap ... 80
13.2.1 Assembly ... 80
13.3 Bumper / carrying set ... 82
13.3.1 Attaching the bumper ... 84
13.3.2 Cleaning ... 85
13.3.3 Storage and transportation ... 86
13.4 Junction box JB001 ... 86
13.4.1 Views and basic dimensions ... 86
13.4.2 Connectors ... 87
13.4.3 Connection ... 87
13.4.4 Shielding inside the control cabinet ... 88
13.4.5 Mounting instructions ... 89
13.4.6 Technical data of junction box ... 89
13.5 Connection box JB002 ... 90
13.5.1 Views and basic dimensions ... 90
13.5.2 Connectors ... 91
13.5.3 Connection ... 91
13.5.4 Protective earthing ... 93

© KEBA 2021

13.5.5 Shielding within the switch cabinet 93
13.5.6 Installation information 94
13.5.7 Technical data of the JB002 connection box 94
13.6 Connection box KeTop CB211 95
13.6.1 Views and basic dimensions 95
13.6.2 Interior view 96
13.6.3 Drilling template for wall mounting 97
13.6.4 Use of connection box 98
13.6.5 Connection diagram 98
13.6.6 Minimum bending radius of cable 99
13.6.7 Accessories 99
13.6.8 Technical data of connection box 100
13.7 Connection box CB310 101
13.7.1 Views and basic dimensions 102
13.7.2 Technical data 102
13.8 Connection cable for Ethernet KeTop TTxxx-eaa 105
13.9 Connection cable KeTop Txx3-PP20 106
13.10 Connection cable KeTop TTxx3-PP22 107
13.11 Connection cable for Ethernet KeTop TTxxx-ea0 109
13.12 Connection cable for Ethernet KeTop TTxxx-Eb0 110
13.13 Intermediate cable KeTop IC2xx 112
13.13.1 Mounting instructions 113
13.14 Intermediate cable KeTop ICxx3-PP20 113
13.14.1 Mounting instructions 115
13.15 Download cable KeTop XD040 115
13.16 Cable reel KeTop Reel 116
13.16.1 Space requirement 117
13.16.2 Manufacturer's note 117
13.16.3 Technical data 118
13.17 Tempered Glass Screen Protector 119

14 Directives, standards and regulations 120
14.1 EU directives 120
14.2 Standards for checking the conformity 120
14.3 Other standards 120
14.4 Regulations 121
14.5 Standards for the American market 122

15 Declaration of conformity 123

16 Appendix: Machinery safety 125
16.1 Hazard and risk analysis 126
16.2 Principles for the integration of KeTop 126

KEBA © KEBA 2021

16.3 Technical construction file 127
16.4 State of the art 128
16.5 Recognition of conformity by means of harmonized standards 128
16.6 Selection of Performance Level and Safety Categories in accordance with EN ISO 13849-1 128
16.7 Application of handheld terminals in special operating modes 130
16.8 Information about the emergency stop button 130
16.9 Manual control of machines in special operating modes 131
16.10 Information about enabling switches 133

17 Appendix: Chemical resistance 135

Index 137

© KEBA 2021

KEBA © KEBA 2021

1 Introduction

1.1 Purpose of the document

This document describes the handheld terminal KeTop T15x.

This document contains all specifications required by machinery directive 2006/42/EC.

Information

The manual is written exclusively for the target groups listed in this manual. The machine manufacturer or system supplier must incorporate the safety information required for end customers into the operating manual for end customers in the applicable national language.

1.2 Preconditions

This document contains information for persons with the following skills:

Target group	Knowledge and skills pre-requirement
Project engineer	Basic technical training (University of Applied Science/University level, engineering degree or corresponding professional experience). Knowledge in: ● working mode of a PLC, ● current valid safety regulations, ● the application.
Electrician	Specialized training in the electro-technical field (in accordance with industrial training guidelines). Knowledge in: ● current valid safety regulations, ● wiring guidelines, ● circuit diagrams, ● system analysis and troubleshooting, ● correct installation of electrical connections according to national and international regulations.
Start-up technician	Basic technical training (Vocational high school, engineering degree or corresponding professional experience). Knowledge in: ● current valid safety regulations, ● working mode of machine or plant, ● principal functions of the application, ● system analysis and troubleshooting, ● setting options at the operating installations.

© KEBA 2021

Target group	Knowledge and skills pre-requirement
Service technician	Basic technical training (Vocational high school, engineering degree or corresponding professional experience). Knowledge in: ● working mode of a PLC, ● current valid safety regulations, ● working mode of machine or plant, ● diagnosis possibilities, ● systematic error analysis and rectification.

1.3 Intended use

The intended use of the KeTop T15x ranges from monitoring and parameterization to the operation of machines, such as:

- Injection molding machines
- Robots
- Textile machines
- Printing machines
- and similar

in the normal operating modes, such as

- Automatic

as well as in semi-automatic or manual special modes, such as

- Setup
- Teach
- Test run
- and similar.

The safety functions include an enabling switch and optionally a stop button, an emergency stop button or an illuminated emergency stop button.

Handheld terminals intended for temporary connection may not be equipped with a red-yellow emergency stop switch. For this application a handheld terminal with gray stop switch or illuminated emergency stop is available.

All safety functions are dual-circuited and allow the implementation of Category 4 PL e according to EN ISO 13849-1 taking into account the operating cycles with regard to the B_{10D} values of the safety components.

The machine manufacturer is responsible for selecting a handheld terminal that is suitable for the machine and designing any possible additional options that must be implemented in accordance with the legally required hazard and risk evaluation.

Please also observe the appendices relating to the intended use of the handheld terminal.

KEBA © KEBA 2021

The handheld terminal may only be used for the types of use described in the technical descriptions and in compliance with described technical general conditions. The handheld terminal may only be used in conjunction with recommended/ approved third-party equipment/installations.

The handheld terminal has been developed, manufactured, tested and documented in accordance with the appropriate directives and standards. Therefore, the products do not pose any danger to the health of persons or a risk of damage to other property or equipment under normal circumstances, provided that the instructions and safety precautions are properly observed.

The intended use also includes the attention of the notes and informations described in this document.

KEBA shall assume no liability or warranty for consequential losses, which may arise of:

- Disregard of directives and standards
- Illegal changes
- Improper use
- Disregard of instructions in this document

1.4 Notes on this document

This manual is an integral part of the product. It is to be retained over the entire life cycle of the product and should be forwarded to any subsequent owners or users of the product. For end users, necessary safety notes and information must be integrated in the instruction manual for end users in the specific national language by the mechanical engineer or the system provider.

This documentation must be legible and available to the specified persons and must be read and understood by them.

Information

This manual also applies to the customer variants that are identical in construction and function.

Because these types of customer variants occasionally differ from the KEBA standard variant in their appearance (e.g. due to a different front membrane), the devices pictured in this manual may differ in appearance from the devices you are using.

Information

In case of deviations of customer variants from the KEBA standard variant, a customer data sheet can be obtained from KEBA.

© KEBA 2021

1.4.1 Contents of document

- Safety notes and transport conditions
- General product description
- Display, operating elements and keypad
- Connection and wiring
- Configuration and operating instructions
- Options
- Accessories
- Technical data
- Declaration of conformity, directives and standards

1.4.2 Not contained in this document

- Mask description of the application
- Application-specific industry software

1.5 Documentation for further reading

Doc.no.	Designation	Target group
1007622	KeTop CB211 Drilling template	Start-up technician
1008866	KeTop CB310 Project engineering manual	Start-up technician
1008738	KeTop Reel installation manual	Start-up technician

Certificates (e.g. UL certificate) that may be required can be obtained from KEBA upon request and/or are listed in the UL product database.

1.6 Information about MD 2006/42/EC

This user's manual corresponds to machinery directive 2006/42/EC.

1.6.1 Quantitative safety relevant specifications for emergency stop-button and enabling device

Emergency stop

KEBA specifies a B_{10D} value. Other values (e.g. SIL, PL, Category) **cannot be** specified by KEBA.

KEBA © KEBA 2021

Explanation: KEBA solely delivers the control element, but no evaluation of the element. The customer has to connect and monitor the emergency stop to his application on his own. Depending on the connection of the emergency stop to the machine the SIL- or category with PL-value can be determined.

The B_{10D} value is declared in the manuals at chapter "Technical data" ("Emergency stop").

Electromechanical enabling switch

KEBA specifies a B_{10D}-value. Other values (e.g. SIL, PL, Category) **cannot** be specified by KEBA.

Explanation: KEBA solely delivers the control element, but no evaluation of the element. The customer has to connect and monitor the enabling switch to his application on his own. Depending on the connection of the enabling switch to the machine the SIL- or category and PL-value can be determined.

The B_{10D}-value is declared in the manuals at chapter "Technical data" ("Enabling switch").

1.6.2 Relationship between Performance Level and Safety Integrity Level

Table 3 (acc. to EN ISO 13849-1:2023) - Correlation of Performance Level (PL) and Safety Integrity Level (SIL)

Performance Level (PL) by EN ISO 13849-1	Safety Integrity Level (SIL) by EN 61508-1
a	no corresponding value
b	1
c	1
d	2
e	3

Table 2 (acc. to EN ISO 13849-1:2023) - Performance Level (PL)

Performance Level (PL)	Average probability of a dangerous breakdown per hour 1/h
a	$10^{-5} \leq PFH < 10^{-4}$
b	$3 \times 10^{-6} \leq PFH < 10^{-5}$
c	$10^{-6} \leq PFH < 3 \times 10^{-6}$
d	$10^{-7} \leq PFH < 10^{-6}$
e	$PFH < 10^{-7}$

© KEBA 2021

1.6.3 Abbreviations

Abbreviation	Term	Meaning
B_{10D}	Number of cycles until 10 % of the components fail dangerously (for components with mechanical wear)	Number of cycles until 10% of components have failed in a hazardous manner (for components subject to mechanical wear)
$MTTF_D$	Mean time to dangerous failure	Average duration to dangerous failure (per channel)
DC	Diagnostic Coverage	Diagnostic coverage
PL	Performance Level	Discrete level that specifies the capacity of safety devices to execute a safety function under foreseeable conditions.
PFH	Average frequency of a dangerous failure per hour	Average frequency of a hazardous failure per hour
SIL	Safety Integrity Level	Safety integrity level
t_{Cycle}	-	Average time between two consecutive cycles in seconds
h_{op}	-	Average operating time in hours per day (0 - 24 hours)
d_{op}	-	Average operating time in days per year (0 - 365 days)
n_{op}	-	Average number of switching cycles per year

KEBA © KEBA 2021

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 will result in death or serious bodily injury if the corresponding precautions are not taken.

WARNING!

indicates a potentially hazardous situation, which can result in death or serious bodily injury if the corresponding precautions are not taken.

CAUTION!

means that if the corresponding safety measures are not taken, a potentially hazardous situation can occur that may result in slight bodily injury.

Caution

means that damage to property can occur if the corresponding safety measures are not taken.

ESD

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

Safety information

Describes important safety-related requirements or informs about essential safety-related correlations.

Information

Identifies practical tips and useful information. No information that warns about potentially dangerous or harmful functions is contained.

© KEBA 2021

2.2 General safety instructions

The handheld terminal was developed, manufactured, tested and documented in accordance with ergonomic principles for design as well as the applicable safety standards. If you follow the instructions regarding safety and use as described in this manual, the product will, in the normal case, neither cause personal injury nor damage to machinery and equipment.

The instructions contained in this manual must be precisely followed in all circumstances. Failure to do so could result in the creation of potential sources of danger or the disabling of safety features integrated in the hand-held terminal.

Apart from the safety instructions given in this manual, the safety precautions and accident prevention measures appropriate to the situation in question must also be observed.

Handling of the hand-held terminal

You have chosen a high-quality handheld terminal that is equipped with highly sensitive state-of-the-art electronics. To avoid malfunctions or damage through improper handling, follow these instructions during operation.

WARNING!

The following application areas are expressly excluded for the KeTopwithout completing a special evaluation relating to the application and implementing the necessary measures in the installation relating to the operating conditions:

- Use in areas prone to explosion or fire
- Use in mining
- Outdoor use

For these applications, special products intended for the respective environments must be used!

WARNING!

Indoor use only.

WARNING!

Danger of personal injury due to loss of security!

Correct operation and safety of damaged components cannot be guaranteed. Damaged products must never be installed or put into operation. Defective products must be replaced immediately.

KEBA © KEBA 2021

Caution

Improper handling can cause damage to the handheld terminal!

To avoid damaging the KeTop T15x during further or return transport, the original packaging must be used for the transport.

Caution

- Make sure that nobody can fall over the cable to avoid that the device falls to ground.
- Take care not to squeeze and thus damage the cable with any object.
- Do not lay the cable over sharp edges to avoid damaging the cable sheath.
- Do not lay down the device with the operating side facing down to avoid damaging or unintentionally operating of the operating elements.
- Never lay the device onto unstable surfaces / storages. It could fall to ground and thus be damaged.
- Never lay the device close to heat sources or into direct sunlight.
- Avoid exposing the device to mechanical vibrations, excessive dust, humidity or to strong magnetic fields.
- Never clean the housing, operating panel and operating elements with solvents, scouring agent or scrubbing sponges. For cleaning the device, use a soft cloth and a bit of water or a mild cleaning agent.
- Make sure that no foreign objects or liquids can penetrate into the device. Check at regular intervals and especially after a hard hit (e.g. a fall) the protective covers of the device, if all housing screws are firmly tightened and if the housing or the cable entry is damaged.
- If the device shows any defect, please send it, including a detailed error description, to your supplier or the relevant after-sales service office.
- If available, lay / hang the device in the provided wall bracket, if you don't use it.
- If the KeTopis equipped with a touchscreen, then operate the touchscreen with fingers or use a touch-pen. Never use sharp objects (e.g. screwdriver,...) for operating the touchscreen. This could damage the touchscreen.
- If the KeTop is equipped with a connection slot, just open it if the power supply is switched off. Otherwise components could be damaged or undefined signals could appear.

ESD

The housing must not be opened, as the device is sensitive to electrostatic discharge.

© KEBA 2021

2.3 Personnel safety instructions

WARNING!

Danger of personal injury due to electric shock!

- Only supply the device with power from voltage sources having protective extra-low voltage (e.g. SELV or PELV acc. to EN 61010-2-201)
- Only connect voltages and circuits which are safely separated from dangerous voltages (e.g. by means of sufficient insulation) to connections, terminals or interfaces up to a rated voltage of 50 V.

WARNING!

- The machine manufacturer must ensure proper configuration of the handheld device based on the risk assessment. The following safety aspects must be considered for this purpose, among other aspects:
  - Proper restriction of the working area (using optional effective range module)
  - Emergency stop or stop switch needed or permitted
  - Category and performance level sufficient for the respective application
- Personnel must have a view into the hazard point from the operating point where they are standing.
- The device may only be operated when it is in a flawless condition and in compliance with the operating instructions.
- The operator must have the required level of training and know and understand the specific details of what constitutes the intended use in accordance with the operating instructions.
- The safety notes in the subsequent chapters must always be observed.
- Further important information about safety is included in the appendices.

KEBA © KEBA 2021

CAUTION!

Danger of fire in case of component failure!

In final application, make sure that the 24 V DC power supply to the operator panel and circuits of optional switching and operating elements are adequately fused or energy-limited!

For the power supply to the operator panel a UL 248 certified fuse rated maximum 3.15 A that fulfils the time-current breaking characteristics requirements of clause 9.4 of UL 61010-1 must be used.

Circuits of optional switching and operating elements must be energy-limited according to clause 9.4 of UL 61010-1.

When circuits are supplied from different fused power supplies (fused in accordance with clause 9.4 of UL 61010-1) with a common ground, the sum of current values determined by the fuses must not exceed the values specified in clause 9.4 of UL 61010-1.

© KEBA 2021

3 Description of the handheld device

The KeTop T15x is a wearable operating and display device with a robust design. The use of a powerful processor equipped with Ethernet makes the device optimal for a wide range of applications.

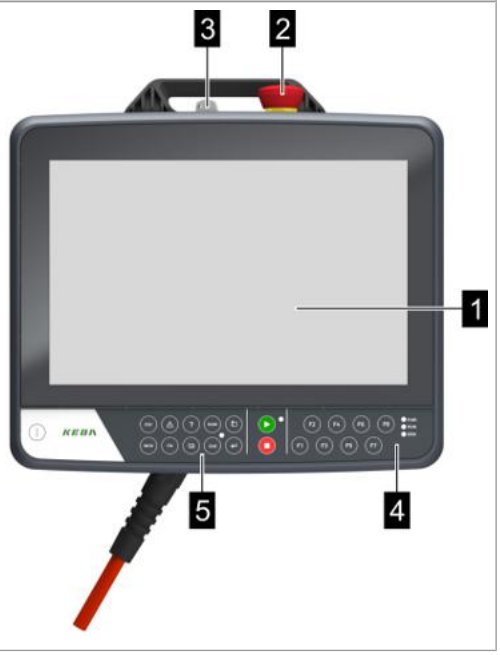
All tasks can be handled on the color display using the graphical interface. The touchscreen has an intuitive user interface.

Optional operating and control elements allow the device to be adapted to the respective application.

The KeTop T150 is available in the "ARM", "x86" and "x6211" variants.

The KeTop T155 is available in the "x86" and "x6211" variant.

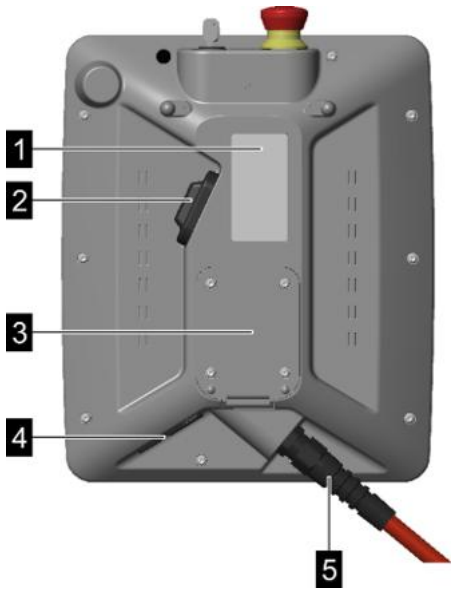
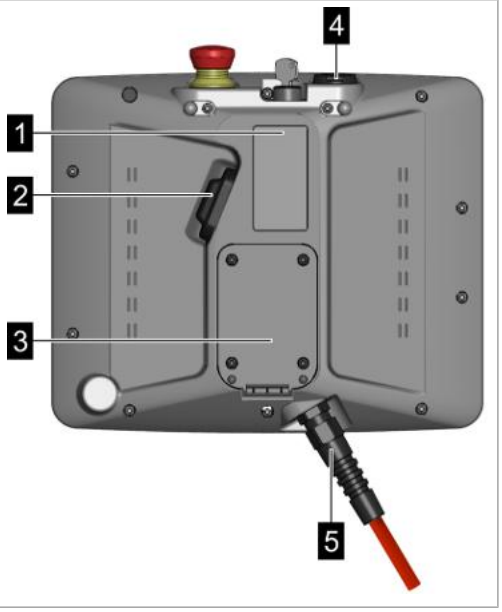
3.1 Front view

KeTop T150	KeTop T155
	

1 ...	TFT display with projective capacitive multi-touch screen	2 ...	Optional operating element (emergency stop button, stop switch or illuminated emergency stop)
3 ...	Slot for options	4 ...	Slot for options (if no options, covered by membrane keyboard)
5 ...	Membrane keyboard		

KEBA © KEBA 2021

3.2 Rear view

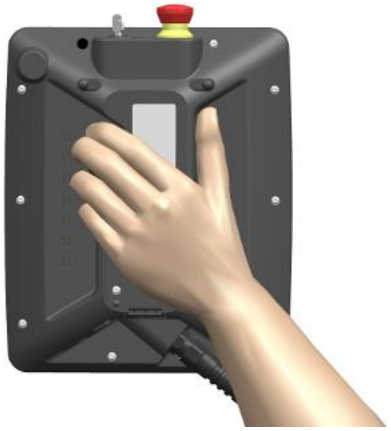
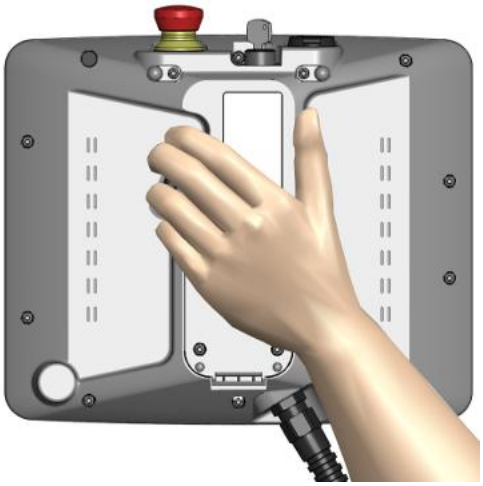
KeTop T150	KeTop T155
	

1 ...	Type plate	2 ...	Enabling switch
3 ...	Slot cover	4 ...	USB port
5 ...	Strain relief and kink protection for connection cable (optional: supplied with connection cable)		

3.3 Handling

The device is held with the left hand. Here, the enabling switch can be operated with the fingers. The touchscreen and the keyboard can then be operated with the other hand.

© KEBA 2021

KeTop T150	KeTop T155
	

3.4 Type plate

Information

The type plate shown is an example. The actual data on the type plate depends on the module.

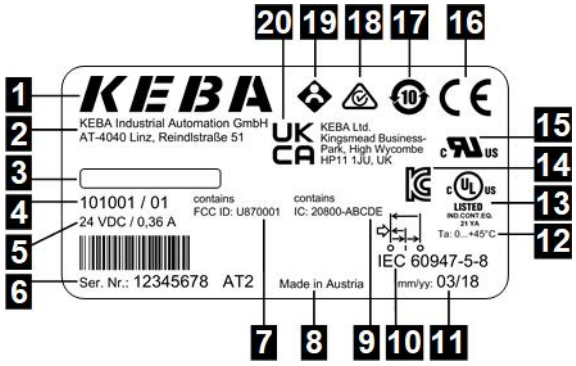


Fig. 3-1: Example type plate

1 ... Manufacturer	2 ... Manufacturer's address
3 ... Product designation	4 ... Material / revision number
5 ... Technical data (voltage / current)	6 ... Serial number
7 ... FCC approval number	8 ... Country of manufacture
9 ... IC approval number	10 ... IFA inspection number and icon for 3-stage enabling device
11 ... Production date	12 ... Ambient temperature
13 ... UL marking	14 ... KCC marking
15 ... UR marking	16 ... CE marking
17 ... China RoHS marking	18 ... RCM marking
19 ... SIBE marking	20 ... UKCA marking

© KEBA 2021

4 Displays and operating elements

- Membrane keys with tactile feedback
- Capacitive multi-touch screen, with finger operation
- Backlight color LED display
- Up to six status LEDs and up to one power LED

4.1 Membrane keyboard

Different membrane keyboards are available for the device, with up to 24 keys, up to six status LEDs and up to one power LED.

Caution

Damage to the keypad for improper handling!

- The keypad may not be operated with sharp, metallic objects or with ball point pens or pencils.
- Too much force when pressing can damage the keys.

4.1.1 Standard keyboard

The standard keyboard is available as the KeTop T150 and KeTop T155 and possible with the "x86" and "x6211" variants.

KeTop T150

Membrane keyboard, equipped with 21 keys, four status LEDs and one power LED.

© KEBA 2021

Fig. 4-2: Standard keyboard, front side

KeTop T155

Membrane keyboard, equipped with 21 keys, four status LEDs and one power LED.

Fig. 4-3: Standard keyboard, front side

4.1.2 Robotics keyboard

The standard keyboard is available as the KeTop T150 with the "x86", "x6211" and "ARM" variant and as the KeTop T155 with the "x86" and "x6211" variants.

KeTop T150, "ARM" variant

Membrane keyboard, equipped with 23 keys and four status LEDs.

© KEBA 2021

Fig. 4-4: Robotics keybaord, front side

KeTop T150, "x86" and "x6211" variant

Membrane keyboard, equipped with 24 keys, three status LEDs and one power LED.

© KEBA 2021

Fig. 4-5: Robotics keybaord, front side

KeTop T155, "x86" and "x6211" variant

Membrane keyboard, equipped with 20 keys, 2 status LEDs and 1 power LED.

Fig. 4-6: Robotics keybaord, front side

4.2 Status LEDs

Depending on the variant, the device is equipped with various LEDs.

LED	Color
PWR-LED	Green
RUN-LED	Green
ERR-LED	Red

© KEBA 2021

LED	Color
PRO-LED	Green
Play LED (only with "x86" variant)	Green
2nd LED (only with "x86" variant)	Green

4.3 Touchscreen

A projective-capacitive multi-touch screen is used.

Caution

Material damage due to overstressing the screen!

A burn-in effect can occur with LC displays when a static image or a constantly repeated graphic is displayed over a longer period of time.

The burn-in effect can and should be prevented by regularly changing the displayed image, using a screen saver and reducing the brightness and contrast of the display.

Operation

The touchscreen may be operated with one or more fingers (with or without glove). For long durability of the touch screen, the following points should be observed:

Caution

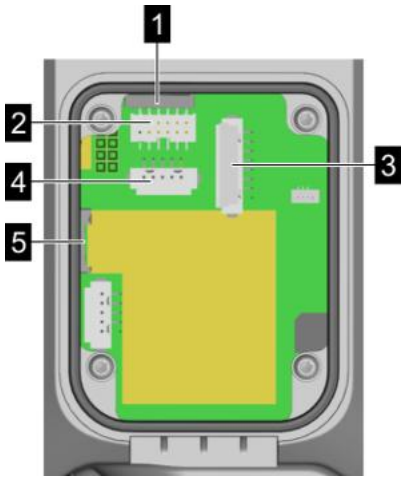
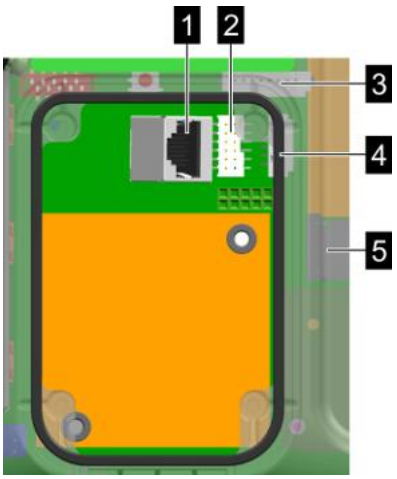
Damage to the touch screen for improper handling!

- Use only a soft cloth with mild detergent (e.g. soapsuds) to clean the touch screen, see 9.1 Cleaning the touchscreen.
- When operating with gloves, ensure that no metal filings or sharp objects (sand, grinding paste, etc.) are embedded in the surface of the glove.
- The touch screen may not be operated with sharp, metallic objects or with ball point pens or pencils.
- The touch screen my not be exposed to continuous direct sunlight.

© KEBA 2021

5 Connection and wiring

5.1 Cable entrance area

T150	T155
	

1 ...	Ethernet connector / communication interface	2 ...	Pin strip - main connector / supply and control lines
3 ...	Pin strip - connector for SCAP module	4 ...	Pin strip - connector for signals of the operating elements
5 ...	Micro SD card slot		

5.2 Assembling of the connection cable

This chapter describes how to install the connection cable on the KeTop. The available connection cables are listed under Accessories.

Caution

When removing the old connection cable, be sure to wrap the locking mechanism of the RJ45 connector with adhesive tape to protect it from breaking off before the cable is pulled out of the cable bushing.

Information

Please observe the information under 5.3 Cable routing in cable entrance area for the installation of the connection cable.

5.2.1 Tools needed

For assembling you need:

KEBA © KEBA 2021

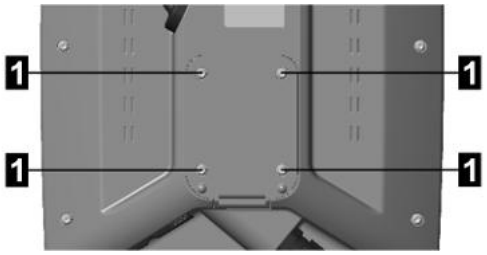
- Open-end wrench (size 19)
- Torx size 10

5.2.2 Cable assembling

Information

Place the KeTop with the display facing downwards on a level, clean and soft underground (preferably on an ESD mat) and make sure that the KeTop and the operating elements are not damaged.

1) Unscrew the Torx screws of the cover plate using a Torx size 10.



1 ... Torx screws	

2) Open the cover. Make sure that the cables of the enabling switch are not damaged.
3) Unscrew the gray nuts (1) and the strain relief (2) from the connection cable. The gray nuts are then no longer required.

Fig. 5-7: Nuts and strain relief of connection cable

4) Insert the connection cable through the provided opening into the KeTop T15x. There is a gray nut integrated in this opening for securing the connection cable.

Fig. 5-8: Inserting the connection cable

© KEBA 2021

5) Secure the insertion sleeve using a size 19 wrench and a torque of 3 Nm.

6) Insert the main plug and the RJ45 plug into the sockets provided.

Information

Make sure that the main plug and the RJ45 plug are correctly inserted.

7) Secure the strain relief using the wrench. Be sure that a portion of the cable sheathing is within the housing here. Make sure that the rubber ring for the strain relief lies correctly under the insertion sleeve.

8) Mount the cover using the Torx screws (torque: 0.8 to 1.0 Nm).

Information

- Check to make sure the seal is clean and not damaged.
- Check to make sure that the cables are not pinched or crushed.
- Check to make sure that all screws are screwed tight as otherwise the protection class can not be guaranteed.

To unplug cables:

Information

- Unplug the main connector by pulling the cable with your fingers. Do not use any sharp objects.
- Operate the locking mechanism to release the RJ45 connector.

5.3 Cable routing in cable entrance area

After opening the connection slot, the connection lines are be routed as shown in the following chapters. Before opening the handheld device, observe the following tips:

Information

Information for opening the connection slot:

- Place the device on a flat, clean and soft surface with the display facing down so that the device or its operating elements are not damaged (e.g. ESD mat).
- Use a "Torx size 10" type screwdriver to open and close the connection slot.

KEBA © KEBA 2021

Information

Information on changes in the connection slot:

- When disconnecting the main plug, it must be ensured that you use your fingers to unplug the connector from its wires (do not use sharp objects to help with this process).
- When disconnecting the RJ45 connectors, it must be ensured that the locking lever is activated during the process.

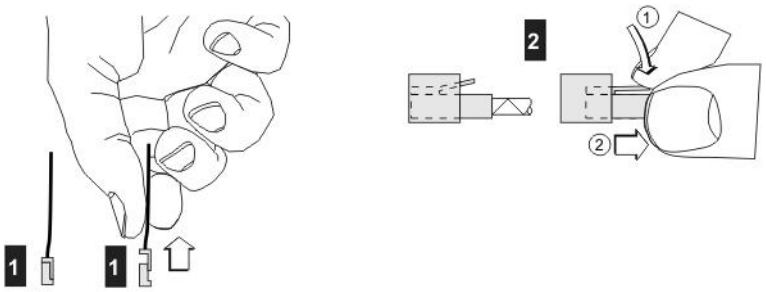


Fig. 5-9: Disconnecting the main plug and RJ45 connector

1 ... Main plug	2 ... RJ45 connector

WARNING!

- Make sure that the main plug snaps in correctly when connecting it. Otherwise, the emergency stop or enabling functions, for example, may no longer be available.
- Check the emergency stop and enabling functions before recommissioning the device.
- Check the emergency stop and enabling functions before commissioning the machine/system.

Caution

- Make sure that the RJ45 connector snaps in correctly when connecting it. Otherwise, there may no longer be correct shielding.
- Connecting when energized can destroy the device. The device must be de-energized before connecting.

© KEBA 2021

Information

Information on closing the connection slot:

- The seal must be clean, undamaged and in the correct position.
- Cables must not be trapped.
- The connection slot cover must be screwed together again using all screws (torque: 0.8 bis 1.0 Nm). This is the only way to ensure the corresponding protection class.

5.4 Power supply

WARNING!

Please observe the safety-relevant information in chapter Personnel safety instructions.

Specification of the supply lines in the connection cable:

Cross-section	AWG24 0.24 mm² (with screw connector) AWG26 0.26 mm² (with push-pull connector)
Material	Copper wire
Conductor resistance	≤ 90 Ω/km or ≤ 145 Ω/mile (AWG24) ≤ 143 Ω/km or ≤ 230 Ω/mile (AWG26)

Information

The supply characteristics specified in the technical data apply to the device. Voltage losses via the connecting cable must be considered depending on the cable length.

5.5 Connecting the KeTop to a host computer

The KeTop must be connected to the host computer via an Ethernet interface for commissioning and to enable serial operation. The connection is usually made via a junction box or a connection box, where the signal is split (Ethernet, power, security technology). As soon as the KeTop is provided with power the startup- routine begins.

5.6 Emergency stop button

The emergency stop button features two circuits. The contacts are normally closed.

KEBA © KEBA 2021

The red-yellow emergency stop button of the KeTop T15x meets the requirements of the EN ISO 13850. It must be designed as an emergency stop of category 0 or category 1 (see EN 60204-1) on the basis of the risk assessment for the machine. The connection of the positive-break contacts to an appropriate monitoring system must meet the safety category (in accordance with EN ISO 13849-1) which is defined by means of the risk assessment (in accordance with EN ISO 12100) of the machine.

WARNING!

- Not fully functional emergency stop devices may have fatal consequences! Emergency stop buttons which are red-yellow marked must be effective under all circumstances in all operating modes of a machine or plant.
  Store handheld terminals with not operational red-yellow emergency stop buttons on a place where the operator cannot see it, so that he can not mistake the device.
- Resetting an activated emergency stop facility must not result in uncontrolled start-up of machines or installations.
- The emergency stop button does not replace other safety facilities.
- The emergency stop button on the handheld terminal does not replace the emergency stop buttones to be mounted directly on the machine.
- Some mechanical errors in emergency stop buttons can be recognized at operation only.
  Test the function of the emergency stop button when the device had been exposed to mechanical shock (e.g. it had been fallen on the ground).
  Additionally the emergency stop button must be tested cyclic (6 monthly). Watch the machine stopping after the emergency stop button had been pushed.
- For further informations to emergency stop button observe chapter "Directives and Standards".

5.7 Gray stop button

As an option, the KeTop T15x is available with a gray stop switch instead of the red-yellow emergency stop. It is wired as a 2-circuit switch and the contacts are designed as N.C.

The gray stop switch has fundamentally the same function as the red-yellow emergency stop. Its color is intended to prevent, with the handheld terminal disconnected, the ineffective emergency stop from being used in case of danger. Detailed information on this topic can be found in the chapter "Directives, standards and regulations".

The gray stop switch also fulfills all mechanical aspects of EN ISO 13850 and is only different in terms of the color.

© KEBA 2021

WARNING!

- Manually operated devices, which are intended for a frequent temporary connection and disconnection on machines, must not feature a red-yellow emergency stop button. The gray stop switch or illuminated emergency-stop button must be used instead.

5.8 Illuminated emergency stop

KeTop variants with an illuminated emergency stop are developed and intended for applications in combination with a hot-plug connection box (CB310). Other uses must be considered and analyzed separately.

The illuminated emergency stop button has fundamentally the same functionality as the red-yellow emergency stop. It is wired as a 2-circuit switch and the contacts are designed as N.C. The difference is that due to the lighting, it is not red-yellow when unplugged, only when it is plugged in. For pluggable handheld devices, this function is used to prevent confusion between available and unavailable emergency stop switching elements. An illuminated emergency stop on the handheld device is not a replacement for an emergency stop on the machine.

Detailed information on this topic can be found in the chapter "Illuminated emergency stop button".

The illuminated emergency stop button also fulfills all mechanical aspects of EN ISO 13850.

WARNING!

- When using an illuminated emergency stop, the lighting function must be visually checked with every log on/off and cyclically every 6 months. If this LED fails, the handheld device must be replaced.
- In the final application, direct sunlight on the illuminated emergency stop button must be prevented.

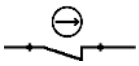
5.9 Enabling switch

The KeTop is equipped with one enabling switch. The enabling switch consists of a 3-position operating element. An essential feature are the two-channel circuits and the forced opening according to EN 60947-1 and EN 60947-2 to the third switch position.

5.9.1 Functionality

The enabling switch can be in the following three positions:

KEBA © KEBA 2021

Position	Function	Enabling switch	Contacts
1	home position	is not pressed	enabling outputs are open
2	enabling	is pressed	enabling outputs are closed
3	panic	is pressed strong	enabling outputs are open 

WARNING!

The enabling switch must be tested cyclic (6 monthly) by pressing the panic position. Watch the machine performing the panic function after pressing the enabling switch.

Enabling

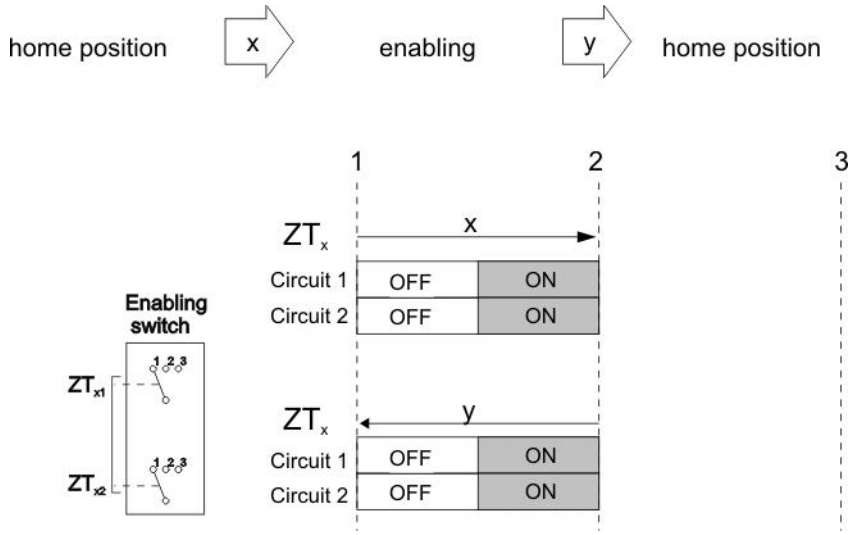


Fig. 5-10: Contact travel diagram for enabling

Panic

The switch element at pushing of the actuating elements into the panic position is mechanically constructed in a way that the enabling position is skipped when the actuating elements are released.

© KEBA 2021

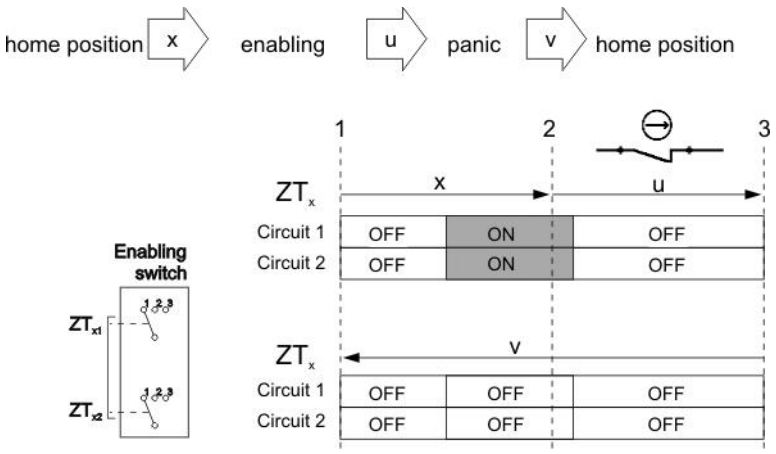


Fig. 5-11: Contact travel diagram for panic

Information

At the KeTop, the enabling switches always feature two circuits.

To meet the safety category 4 PL e in accordance with EN ISO 13849-1, the enabling switch must be realized with 2 circuits and these circuits have to be dynamically monitored under consideration of the cycle of operation with regard to the B_{10D} value of the safety components.

According to the EN 60204-1 the enabling switches shall be implemented in such a way, that at position 1 (Off function - the control element is activeted) and position 3 (Off function - the control element is pressed down to panic position) at least one of the stop categories 0, 1 or 2 is initialized.

For calculation of the PL for the safety function "enabling" the safety-related characteristic values (PL, PFH and B_{10D} values) of all involved components of the entire safety chain have to be included. For details for calculating the PL for the whole safety function see EN ISO 13849-1, chapter 6.3, appendix H and appendix I.

A simultaneity monitoring is neccessary, because otherwise it can cause an undetected error burst which can lead to the loss of safety. This simultaneity monitoring can be reached e.g. via connecting to a KEBA safety control or to a control relay PILZ PNOZ s6.1.

The following connection examples show how to reach an enabling function up to category 4 PL e with the KeTop enabling switch. Note that the whole concept of the machine must be construed to this.

5.9.2 Connection example with control relay (PILZ PNOZ s6.1)

The following example is a support for realizing the end application.

KEBA © KEBA 2021

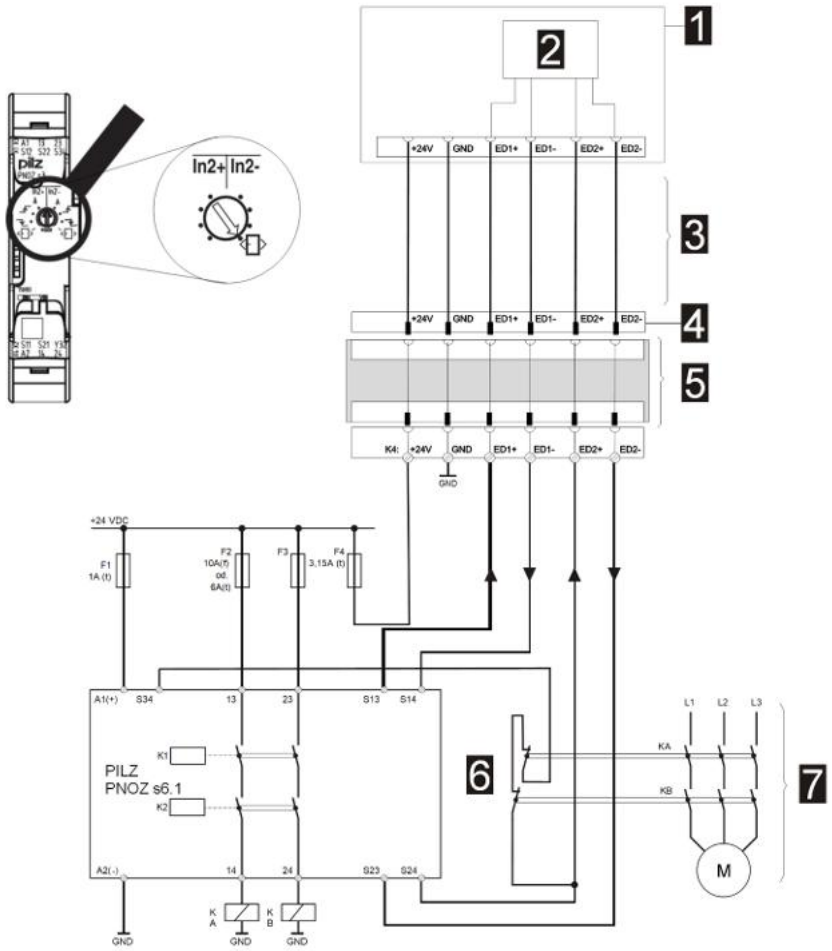


Fig. 5-12: Connection example for KeTop to a PILZ PNOZ s6.1 control relay

1 ... Handheld terminal	2 ... Enabling switch
3 ... Handheld terminal connection cable	4 ... Circular plug connection cable
5 ... Connection box or junction box	6 ... Start condition with control monitoring
7 ... Enabling of dangerous movement!	

The graphic shows a suggested wiring of enabling switches to fulfill safety category 4 PL e for the enabling function with PILZ control relay. Also follow the instructions described in the PILZ operating manual about the device PILZ PNOZ s6.1. Note that the PILZ PNOZ s6.1 has two admissions (specifications) (see "safety features" in the PILZ operating manual) depending on the application. For calculation of the whole safety function "enabling via enabling switch" the control relay and all subsequent components have to be considered.

Functional procedure

- Only if both channels are activated "simultaneously (≤0,5s)" (by pressing one of the enabling switches) both output relays K1 and K2 will energize and the output contacts 13-14 and 23-24 will close.

© KEBA 2021

- The output relays K1 and K2 will not energize if
  - only one enabling channel is activated (in case of a defect),
  - the tolerance value for the simultaneity period is exceeded,
  - the feedback control loop S34 is open.
- If one enabling channel is deactivated after being simultaneously activated (by releasing the enabling switch or in case of a defect), the output relays K1 and K2 will return to their initial position again.
  The forced-guided output contacts 13-14 and 23-24 will open. The output relays will energize again only after both enabling channels have been deactivated and simultaneously activated once again.

In this way the enabling switches avoid that one single error makes the safety function inoperational. A single error will be recognized at the next cycle at the latest, identifying that re-enabling is no longer possible. In case of short circuit the control relay switches to ERROR and has to be turned OFF and ON again after resolving the error.

5.9.3 Example of connection with KEBA safety control

When using a safety control from KEBA beside the enabling switch also an emergency stop can be connected.

The following example is a support for realizing the end application.

KEBA © KEBA 2021

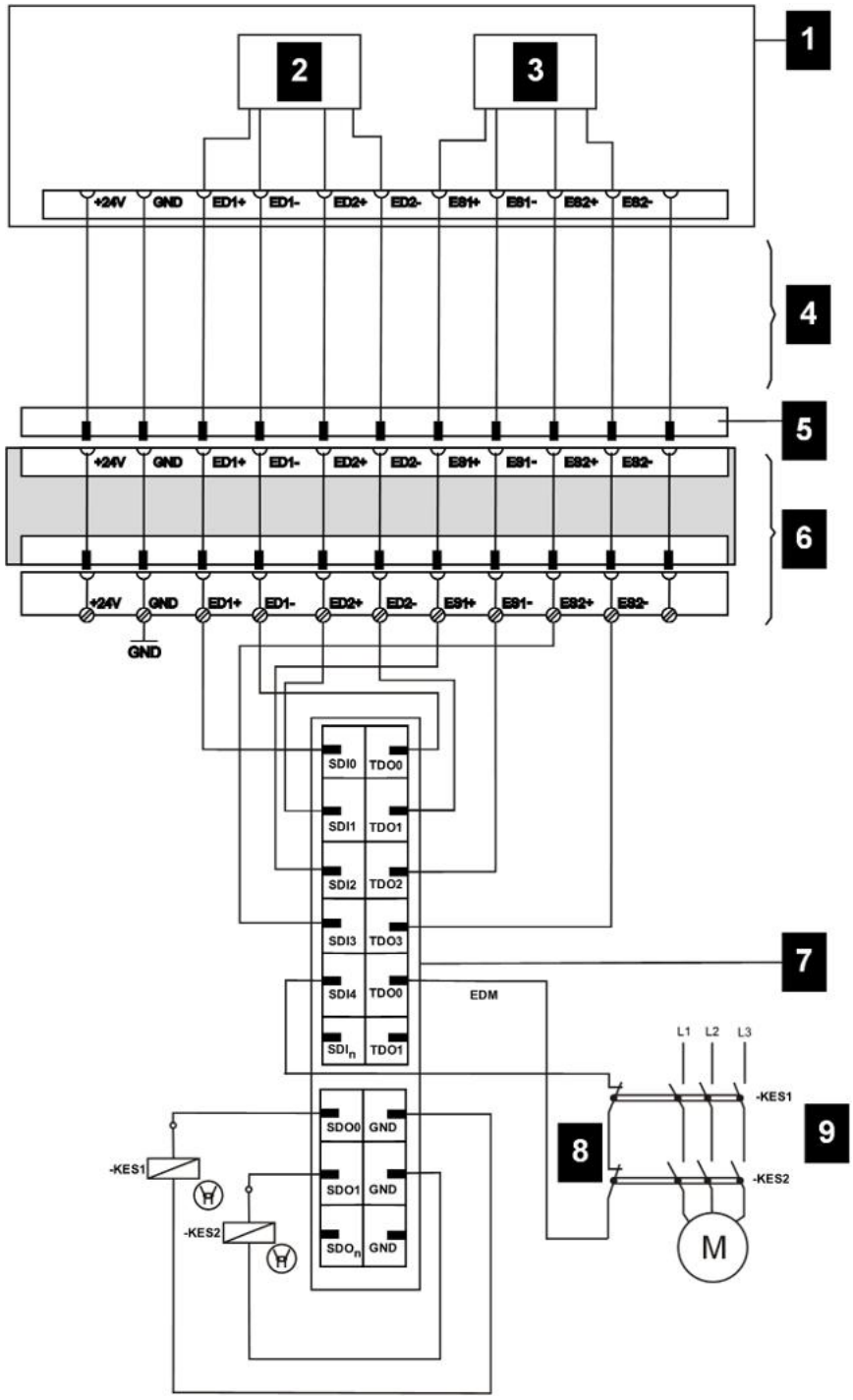


Fig. 5-13: Suggested wiring with KEBA safety control

1 ... Handheld terminal	2 ... Enabling switch
3 ... Emergency stop	4 ... Connection cable
5 ... Circular plug connection cable	6 ... Junction box or connection box
7 ... Safety control	8 ... EDM (External Device Monitoring)
9 ... Enabling of dangerous movement!	

© KEBA 2021

The graphic shows a suggested connection of enabling switches and the emergency stop with the safety control from KEBA.

To fulfill category 4 PL e the following configuration of the safety control must be paremeterized:

- Cross circuit detection must be activated
- Time monitoring of the input element (enabling switch) must be configured
- EDM (External Device Monitoring) must be realized if a contactor has been chosen as actor
- Start test must be executed. With each start-up of the safety control a test to low signal level (= defined safe status) of the sensor must be executed, e.g. press the enabling switch.

Also read the project engineering manual of the safety control, the manual of the programming tool of the safe application (e.g. SafeEdit), as well as the manual for functional safety.

For calculation of the whole safety function "enabling via enabling switch" the KeTop, tha safety control and all following components must be considered.

5.9.4 Foreseeable misuse of enabling switch

An unpermitted fixing of the enabling switches in the approval position by means of mechanical aids is to be seen as foreseeable misuse, which can be prevented.

The following measures causing the stop of the machine in the manual mode are recommended:

- Inquiry of the enabling switch when turning on the machine/plant and inquiry of the enabling switch when changing the operating mode from automatic to manual (The enabling switch must not be in the enabling position.).
- The enabling switch must be released within a defined period and pushed into the enabling position again. The length of the period must be defined according to the activity.

KEBA © KEBA 2021

WARNING!

- The enabling switch is only suitable as a protective function, if the person, who operates the enabling switch, notices an endangerment of a person in a timely manner and is then able to immediately take appropriate measures to avoid hazards. A reduced speed of the movement may be required as an additional measure. The permissible speed must be determined based on a risk assessment.
- Solely with an enabling switch it is not permitted to initiate any commands for hazard triggering conditions. A second, intentional start command is required in this case (button on the handheld terminal).
- Only the person, who has activated the enabling switch, is allowed to be present in the hazardous area.
- For additional information about the enabling switch, the "Safety of machines" chapter must always be observed.

5.10 Ethernet

The Ethernet interface is available in the KeTop as standard. It is based on the 10BaseT specification and is suited for full duplex operation. (Operation with 100 Mbps (100BaseT specification) is only possible with a suitable connection cable.)

The following interface parameters are fixed:

- 10 Mbps / 100 Mbps
- TCP/IP protocol

5.10.1 Pin assignment

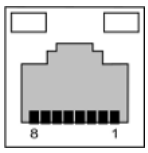


Fig. 5-14: RJ45 socket

Pin No.	Signal designation		Input/output
1	Tr. Data+	Transmit Data +	Output
2	Tr. Data-	Transmit Data -	Output
3	Re. Data+	Receive Data +	Input
4	n.c.	n.c.	---
5	n.c.	n.c.	---
6	Re. Data-	Receive Data -	Input
7	n.c.	n.c.	---

© KEBA 2021

Pin No.	Signal designation		Input/output
8	n.c.	n.c.	---

5.11 USB port

Information

The USB interface is not designed as an operational interface for ongoing operations. It is used exclusively in the service and startup event for connecting USB devices.

Information

Never remove a USB stick during the saving process! This may otherwise result in loss of data.

A detailed list of the recommended USB components is available from KEBA on request.

KEBA © KEBA 2021

6 Operating behaviour

Caution

A flash storage media permits a limited number of write cycles. Once this limit has been reached, there is the risk of a hardware fault. We therefore recommend that you use the temporary file system in RAM or a removable storage medium for cyclical writing procedures (e.g. logging).

6.1 Start-up

The start-up or starting procedure of the device after plug-in can be followed on the screen and proceeds in the following order:

1) Loading of the boot loader/BIOS.
2) Loading and starting of the firmware.
3) Query of whether to open the device configuration (`DeviceConfig`) (2 s).
4) Start of the visualization (optional).

6.2 Trigger restart

After pressing the "Power Button" key, a device restart can be triggered at runtime (only possible with the "x86" variant).

© KEBA 2021

7 Configuration

7.1 Device configuration

In the device configuration, you can configure the following basic settings for the device:

- Exporting diagnostic data
- Adjusting the display brightness
- Setting the time until the screen saver starts
- Display of the license conditions
- Setting the network address and host IP
- Information about the installed software version
- Triggering a restart

The device configuration can be opened only while the device is starting up. As soon as the device is supplied with power, the start-up begins. After a short time, the `Press touchscreen to enter setup...` message appears for two seconds. Tapping the touchscreen opens the device configuration.

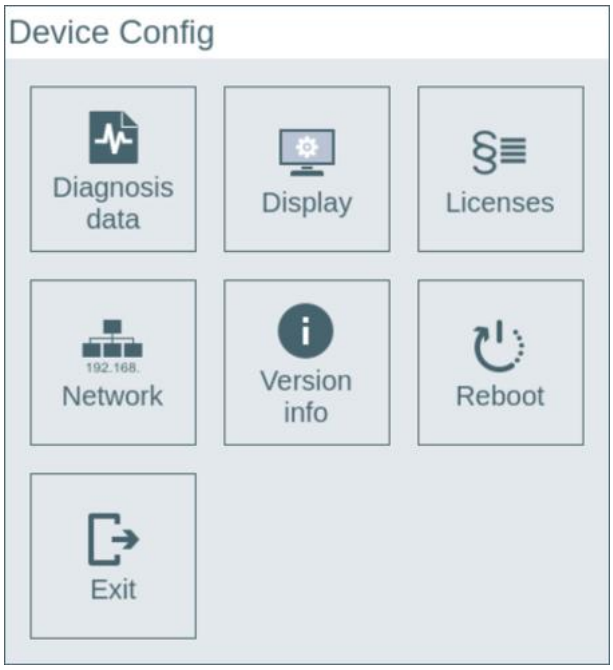


Fig. 7-15: Device configuration main screen

The menu screens **Diagnosis Data**, **Display**, **Licenses**, **Network**, **Version info** and **Reboot** are described in the following chapters.

Tap **Exit** to exit the device configuration menu.

KEBA © KEBA 2021

7.1.1 Diagnosis data

Diagnosis information of the KeTop can be collected with triggering a status report via "Diagnosis Data". Therefor, a USB stick (FAT 32 formatted, minimum 2 GB free memory) has to be pluged in the control unit.

To trigger a status report proceed as follows:

1) Choose **Diagnosis Data**.
2) Choose USB stick on which the status report should be saved.

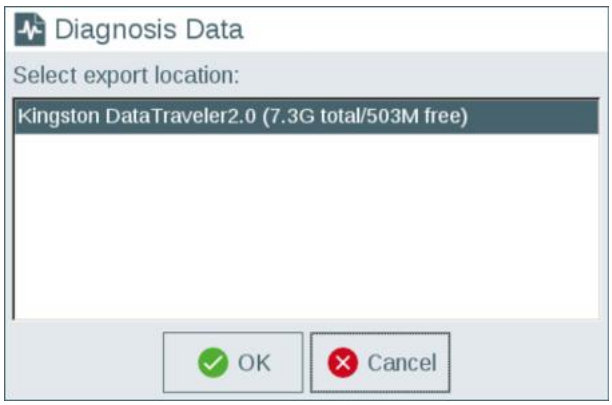


Fig. 7-16: Selecting USB stick for status report files

3) Confirm the dialog with **OK**. A *.tgz file is saved in the root directory of the USB stick.

4) Remove the USB stick from the device and send the *.tgz file to KEBA.

Information

The service medium must never be removed during the writing process.

7.1.2 Display

Pressing **Display** calls up the display screen. In this screen, the display settings **Brightness** and **Screen saver** can be changed via buttons.

© KEBA 2021

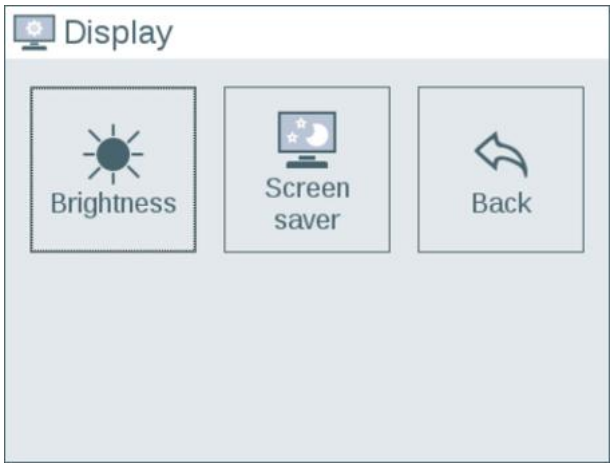


Fig. 7-17: Display screen

Press **Back** to navigate back to the main screen.

Brightness

Via **Brightness** the window for configuration of the brightness will be opened. By using the slider the brightness will be configured.

Fig. 7-18: Configuration of brightness

Via **OK** the configuration will be saved and the previous window will be opened. With **Cancel** the window will be closed without saving the configuration.

Screen saver

Set the time until the screen saver is switched on by pressing **Screen Saver**.

KEBA © KEBA 2021

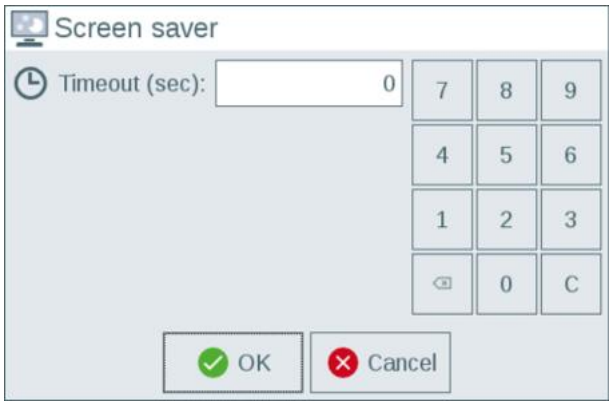


Fig. 7-19: Screensaver setting

In the **Timeout** field, the time can be entered in seconds using the number pad. Press **OK** to save the setting and exit the screen. Use **Cancel** to exit the screen without saving the changed settings.

7.1.3 Licenses

Pressing **Licenses** will display the license terms.

OK exits the menu again.

7.1.4 Network

Pressing "Network" calls up the network screen. In this screen, the network settings for available Ethernet interfaces and the Host IP address can be changed via buttons.

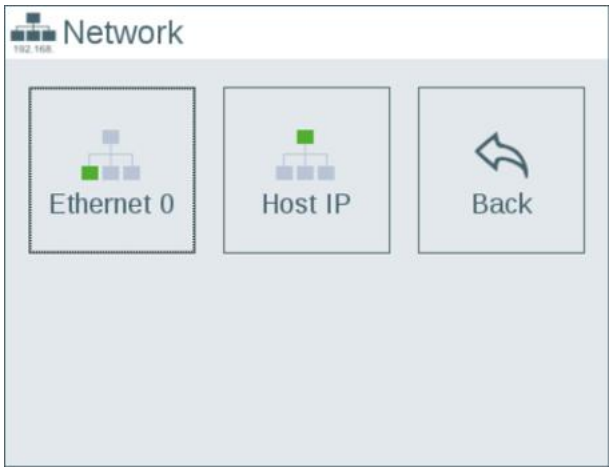


Fig. 7-20: Network screen

Press "Back" to navigate back to the main menu.

Ethernet 0

Pressing **Ethernet 0** switches to the configuration window.

© KEBA 2021

Information

To change the network address of the KeTop T15x, it must be in a network.

The network address can either be

- obtained via DHCP (this enables the automatic integration into an existing network without manual configuration)
- or specially defined. During this process, the individual four segments of the network addresses must be entered manually via the numeric input panel (simply select the corresponding segments).

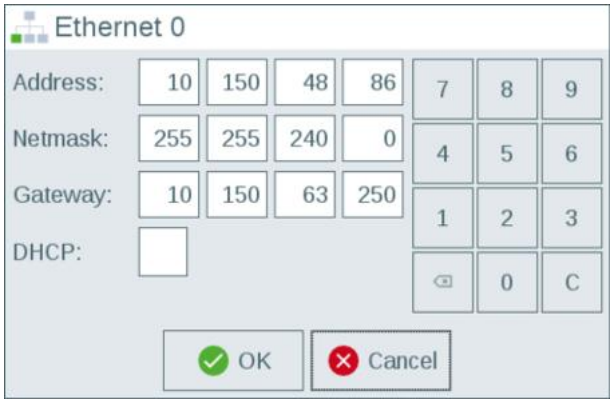


Fig. 7-21: IP Config settings window

Designation	Meaning
Address:	IP address of the KeTop
Net mask:	Associated subnet mask
Gateway:	Standard gateway
DHCP:	Through the activation of **DHCP**, the IP address will be automatically obtained via a DHCP server and the remaining input lines will be deactivated.

Press **OK** to save the settings and exit the window. **Cancel** leaves the window without saving the changed settings.

Host IP

Pressing **Host IP** switches to the host IP settings menu.

KEBA © KEBA 2021

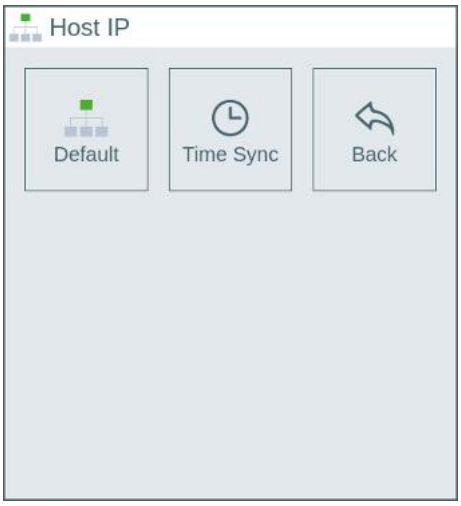


Fig. 7-22: Host IP settings menu

Here, the IP address of the control can be specified by pressing **Default**.

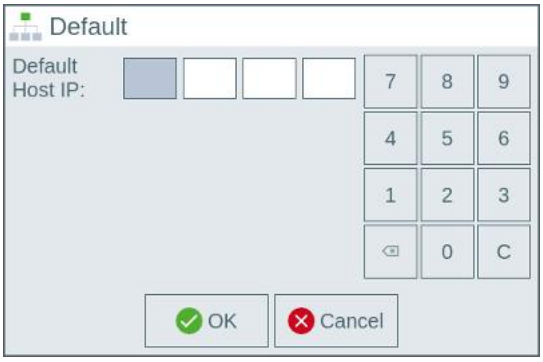


Fig. 7-23: Host IP default settings window

The address is entered using the numeric input panel. Press **OK** to save the settings and exit the window. **Cancel** leaves the window without saving the changed settings.

By pressing **Time Sync** in the host IP settings menu, a separate IP address for the time synchronization can be configured.

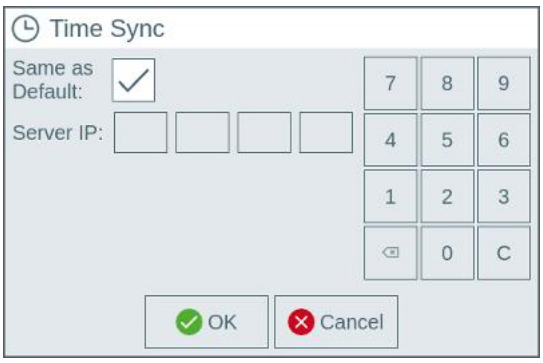


Fig. 7-24: Host IP time sync settings window

© KEBA 2021

If the checkbox **Same as Default** is activated, the same IP address is used for the control and the time synchronization. If the checkbox **Same as Default** is deactivated, the separate IP address is entered using the numeric input panel. Press **OK** to save the settings and exit the window. **Cancel** leaves the window without saving the changed settings.

7.1.5 Version info

Pressing **Version info** displays the software currently available on the device:

- Operating system version
- Bootloader/BIOS version
- Firmware version
- Touch settings

Use **Exit** to leave the window.

7.1.6 Reboot

Via **Reboot** a restart of the device will be triggered.

7.2 Access to the device

The access to the flash storage medium can only happen via a SSH encrypted SFTP connection. Therefore a FTP program ahich is installed on the PC is needed. FTP programs are offered for download in the internet.

To establish a connection to the KeTop with the FTP program the IP address of the KeTop with the port number must be input into the FTP program.

In addition the following data which must also be inserted into the FTP program is needed for the connection establishment:

- Login data
- SSH key

For a detailled description see the help of the FTP program.

Information

The selected FTP program must support an authentification via SSH encryption.

Login Data

The following user exists on the KeTop by default and can be used for the connection.

User name:	service

KEBA © KEBA 2021

Information

The user data cannot be changed.

SSH key

The SSH key is available upon request from KEBA support if needed.

Information

For safety resasons it is recommended to change the SSH key pair (private key and public key).

Changing the SSH key pair

To generate a new SSH key pair a program is needed. This program can be downloaded in the internet whereat KEBA recommend the program "PuTTY-gen".

To change the SSH key with the use of "PuTTYgen" proceed as follows:

1) Start the FTP program and connect to the KeTop.
2) Switch to the direction `ssh-key` and upload the file `authorized_keys` to the PC.
3) Start "PuTTYgen" on PC.

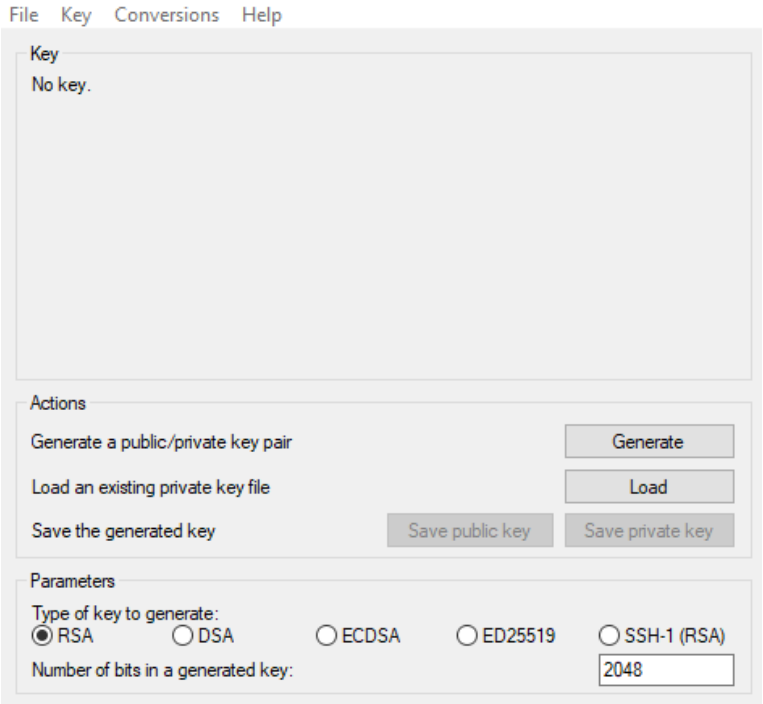
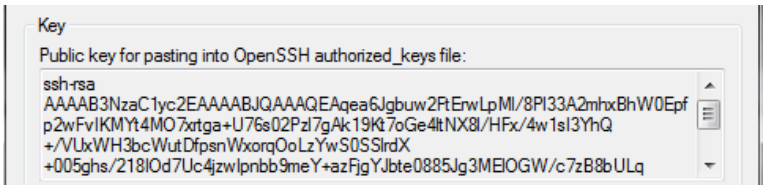


Fig. 7-25: PuTTYgen

© KEBA 2021

4) Select the type Typs "RSA" (selected by default) in the lower area of the dialog.
5) Generate key via "Generate".
6) Save the private key via "Save private key" (`[File name].ppk`) to a directory on the PC.
7) Mark and copy the whole text in the text field in the upper area of the download below "Public key for pasting into OpenSSH authorized_keys file:".



8) Open the file `authorized_keys` and overwrite its content with the copied text.
9) Save and close the file `authorized_keys`.
10) Switch to the FTP program and download the file `authorized_keys` to the directory `ssh-key` (old file gets overwritten).
11) Close all programs on the PC and restart the KeTops.

The SSH key has been changed. The new private key must be given when connecting now via SFTP connection to the KeTop.

7.3 Detail configuration

The following detail configurations can be executed:

- Start-up graphics & font color

Under `/appldisk/application/control/config`, any number of configuration files can be created. The files must be created as *.cfg. The file name can be freely selected.

7.3.1 Changing the start-up graphics & font color

Two graphics are displayed during start-up:

- `earlySplashImage`
- `splashImage`

To switch the start-up graphics, proceed as follows:

1) Create start-up graphic `earlySplashImage` with a resolution of 1,024 x 600 px in the *.png format.
2) Create start-up graphic `splashImage` with a resolution of 600 x 1,024 px in the *.png format.

KEBA © KEBA 2021

3) Store start-up graphics in the `/opt/kecontrolapplication/splash` directory.
4) Create *.cfg file.

While start-up graphic `splashImage` is being displayed, the text for opening the DeviceConfig is briefly shown. The font color can be changed by specifying the RGB color values.

Example of a *.cfg file:

```
[BootVis]
splashImage="/opt/kecontrolapplication/splash/kesplash.png"
earlySplashImage="/opt/kecontrolapplication/splash/boot-
splash.png"
userTextColorR=255
userTextColorG=0
userTextColorB=0
```


© KEBA 2021

8 Program development

8.1 Directory structure

On the KeTop T15x, the following directories are available for user-specific data:

Information

All directories not listed are system directories and must not be changed. Otherwise, proper operation is no longer ensured!

Directory	Description
`appldisk`	Root directory for applications (visualization application, etc.)
`masterdisk`	Root directory for the base system
`ssh-keys`	Directory of the public key, which can be exchanged.
`var`	Subdirectories for status reports and crash reports are located in this directory
`workspace`	Root directory for data that is created during operation.

8.2 Connectivity protocols

In order to transmit data between the handheld device and the control, a protocol must be defined. The following protocols are supported:

- KVC: Defined, proprietary protocol from KEBA integrated into the control.

By default, a protocol is not activated in delivery condition. More information can be found in the respective protocol descriptions.

The connection protocols make it possible to transmit the following content from the handheld device to the control:

- Transmission of state changes of keys on the keypad or of operating elements
- Setting and reading LED states
- Control of the handheld device or transfer of various parameters

For more information about each protocol, please contact KEBA.

KEBA © KEBA 2021

8.3 Keycodes

Information

The signal of the emergency stop button and stop switch cannot be read out using the application.

The following tables list the key codes as they are configured in the operating system. They allow the keys to be accessed using the visualization application.

Standard keyboard

KeTop T150

Symbol	Name	Scan code
F1	F1	32
F2	F2	33
F3	F3	36
F4	F4	38
F5	F5	25
F6	F6	19
F7	F7	47
F8	F8	45
▶	START	3
■	STOP	5
ESC	ESC	9
⚠	ALARM	11
?	HELP	15
2nd	2nd	12
↵	ENTER	43
NUM	Variable Monitor	39
MOD	Modules	52

© KEBA 2021

Symbol	Name	Scan code
FN	Function	58
	Project	62
	User mask	64
	Power button	-

KeTop T155

Symbol	Name	Scan code
	Power button	-
ESC	ESC	32
MOD	Modules	33
	ALARM	36
FN	Function	38
?	HELP	25
	User mask	19
NUM	Variable Monitor	47
2nd	2nd	45
	Project	3
	ENTER	5
	START	9
	STOP	11
F1	F1	12
F2	F2	15
F3	F3	39
F4	F4	43
F5	F5	58
F6	F6	52
F7	F7	64

KEBA © KEBA 2021

Symbol	Name	Scan code
	F8	62

Robotics keypad

"ARM" variant

Symbol	Name	Scan code
-	1	32
+	2	18
-	3	36
+	4	37
-	5	25
+	6	16
-	7	47
+	8	17
-	9	3
+	10	4
-	11	9
+	12	10
	Start	15
	Stop	57
	F1	43
	Jog	66
	F2	52
	Step	53
	V-	62
	V+	63

© KEBA 2021

Symbol	Name	Scan code
2nd	2nd	58
PWR	PWR	39
	MENU	33

"x86" variant

Symbol	Name	Scan code
	1	32
	2	18
	3	36
	4	37
	5	25
	6	16
	7	47
	8	17
	9	3
	10	4
	11	9
	12	10
	Start	15
	Stop	57
	F1	43
	Jog	66
	F2	52
	Step	53
	V-	62
	V+	63

KEBA © KEBA 2021

Symbol	Name	Scan code
	2nd	58
	PWR	39
	MENU	33
	Power button	-

© KEBA 2021

9 Maintenance

9.1 Cleaning the touchscreen

Caution

Never clean the touchscreen with solvents, scouring agent or scrubbing sponges. Otherwise the touch surface could be damaged!

For cleaning the device, use a soft cloth and a bit of water or a mild cleaning agent. The cleaning agent should be sprayed onto the cloth and not directly onto the surface.

9.2 Creating a status report

A status report can be triggered using one of the following options:

- Using the device configuration during start-up, see 7.1.1 Diagnosis data.
- Using a USB stick at runtime

Using a USB stick

In order to trigger a status report at runtime of the device, an FAT32-formatted USB stick with at least 2 GB of free space and a special configuration file are required.

The configuration file must be stored in the `settings` directory on the USB stick with the name `starep.cfg` and contains the following entries:

```
[General]
silentMode = 1
```

In order to trigger a status report using a USB stick, proceed as follows:

1) Connect the prepared USB stick to the ready-to-operate device. The status report is automatically triggered.

KEBA © KEBA 2021

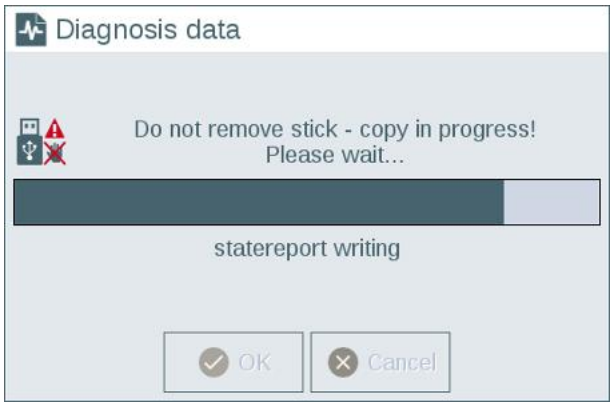


Fig. 9-26: Status report progress

2) Confirm the dialog with **OK**. A *.tgz file is stored in the root directory of the USB stick.

3) Unplug the USB stick from the device and send the *.tgz file to KEBA.

Information

The service medium must never be removed during the writing process.

9.3 Creating a service medium

A service medium with the Bootable Service System (BSS) program is required to create/restore a backup or to perform an update.

To create a service medium with an executable bootable service system (BSS), BSS can either be requested from KEBA support (e.g. as *.zip file) or created via KeStudio.

The following is required for creating a service medium:

- Empty USB drive with min. 32 GB free storage and formatted with FAT32.

© KEBA 2021

Creating via archive file

To create a service medium via an archive file, the archive (e.g. *.zip file) provided by KEBA must be extracted and copied into the `\boot` directory of the root directory of the service medium. Subsequently, the file `prepare.cmd` must be executed inside the `\boot` directory.

Creating via KeStudio

To create a service medium via KeStudio, see the online help.

9.4 Creating a backup

The following is required for the backup procedure:

- Service medium (USB stick) with at least 32 GB free storage space

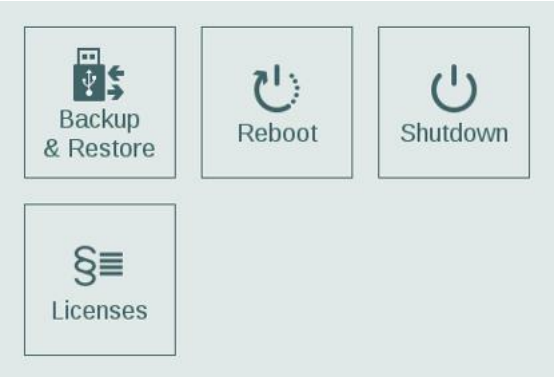
For more information about creating a service medium, see 9.3 Creating a service medium.

Information

It is recommended to copy the backup files to a secure EDP system since the data security on a USB stick cannot be guaranteed over longer periods of time.

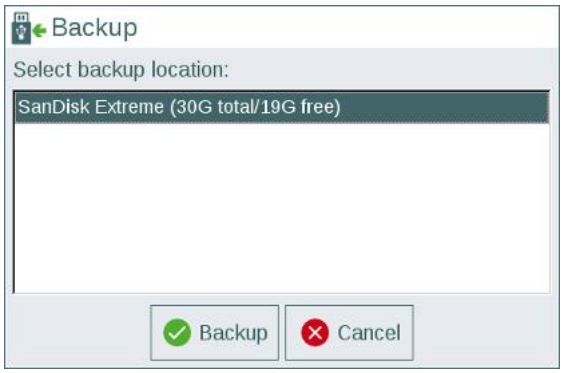
To create a backup, proceed as follows:

1) Plug the prepared service medium into the KeTop.
2) Perform a restart (disconnect power supply and reconnect).
3) Select the "Backup & Restore" menu item in the BSS.

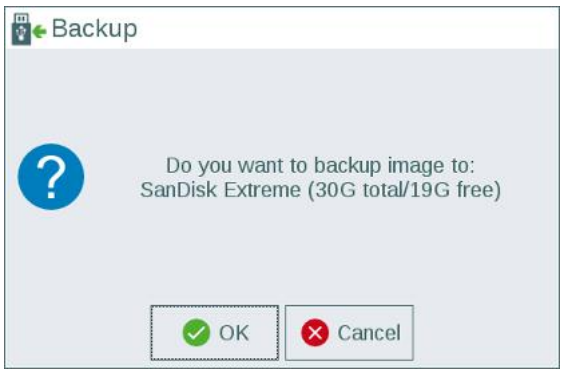


4) Select "Backup" from the displayed menu.
5) Select the target medium to save the backup on and confirm with "Backup."

KEBA © KEBA 2021



6) Confirm and start the backup with the "OK" button. A progress bar is displayed. The duration of the process depends on the USB stick used.



Information

The storage medium must never be pulled out during the writing process.

7) After a successful backup, confirm the dialog.

8) Unplug the service medium.

9) Select "Shutdown" to shut down or "Reboot" to reboot the handheld controller in the displayed menu.

The backup was created and stored in the `\images` directory on the USB stick. For each backup, a directory is created with the device designation, date and time.

9.5 Restoring a backup / performing a software or firmware update

The following is required to restore a backup or perform a software / firmware update:

- Service medium (USB stick) with at least 32 GB free storage space
- Backup or update files

For more information about creating a service medium, see 9.3 Creating a service medium.

© KEBA 2021

To restore a backup or to perform an update, create the `\images` directory in the root directory of the service medium. The backup or update files must be copied into this directory.

Caution

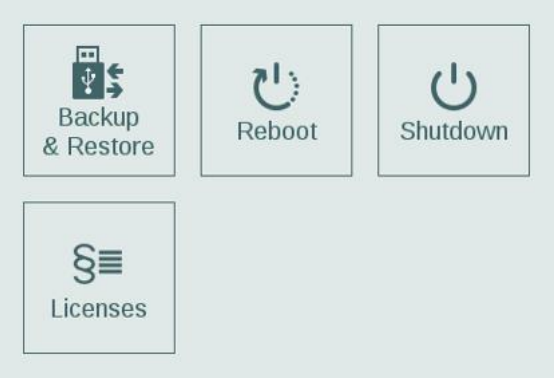
Never remove the service medium or interrupt the power supply of the operating panel during a firmware update. This can lead to destruction of the firmware on the components and thus make a further operation impossible.

Information

Before carrying out a restore, it is recommended that you create a backup of the current software version so that this state can be restored if problems arise. This backup must be performed by the user.

To restore a backup or to perform an update, proceed as follows:

1) Plug the prepared service medium into the device.
2) Perform a restart (disconnect power supply and reconnect).
3) Select the **Backup & Restore** menu item.



4) Select **Restore** from the displayed menu.
5) Select the desired service medium as a source for the restore or the update.

6) Confirm with the **Restore** button.

KEBA © KEBA 2021

7) Press **OK** in the confirmation dialog to start the restore/ update procedure; a progress bar is displayed. The process takes about 15 - 20 minutes for Windows images and about 5 minutes for firmware updates. Devitations in the loading process depending on the USB stick used.

Caution

The service medium must never be pulled out during the write operation.

8) Confirm the dialog after a successful restore procedure.
9) Unplug the service medium.
10) Select **Shutdown** to shut down or **Reboot** to reboot the device in the displayed menu.

The backup has been restored or the software / firmware has been updated.

© KEBA 2021

10 Disposal

10.1 Disposal of the module

Caution

Please observe the regulations regarding disposal of electric appliances and electronic devices!

Electrical and electronic devices including their accessories must be disposed properly. The materials are recyclable in accordance with their labeling. You can make an important contribution to protecting our environment by reusing, renewing and recycling materials and old appliances.

KEBA © KEBA 2021

11 Technical data

11.1 General

Display:	10.1" TFT (16:10) LED-backlight 1,280 x 800 Pixel (WXGA)
Touchscreen:	Projective capacitive
Keyboard:	Membrane keyboard with tactile feedback Max. 24 keys, up to 6 status LEDs and up to 1 power LED
Protection class:	III according to EN 61131-2 resp. EN 50178
Protection type:	IP65

11.2 Power supply

Nominal voltage:	24 V DC (rated voltage tolerance range 19.2 V DC to 30 V DC according to EN 61131-2)
Interruption time of the supply voltage:	Max. ≤ 10 ms (according to EN 61131-2)
Switch-on current:	Max. 5.6 A (current limitation available)
Power consumption:	up to 17 W (700 mA at 24 V DC)

11.3 Environmental conditions

Operating temperature:	
• "ARM" and "x86" variant:	0 °C to 45 °C
• "x6211" variant:	0 °C to 40 °C
Storage temperature:	-25 °C to +70 °C
Relative air humidity (non-condensing):	5 % to 95 % (non condensing)
Vibration resistance according to IEC 60068-2-6:	
• With 3.5 mm:	5 Hz ≤ f < 8.4 Hz
• With 1 g:	8.4 Hz ≤ f < 150 Hz
Shock resistance according to EN 61131-2 or EN 60068-2-27:	15 g / 11 ms
Installation altitude:	Max. 2.000 m above sea level

Information

The storage temperature for the KeTop T15x must also be fulfilled during transport.

© KEBA 2021

11.4 Processor

Processor:	
• ARM Cortex A9:	ARM Cortex A9 Dual Core 1 GHz
• KeTop Txx-xxx-x**P**x-xxx, KeTop Txx-xxx-x**R**x-xxx • KeTop Txx-xxx-x**S**x-xxx, KeTop Txx-xxx-x**T**x-xxx	Atom x6211 Dual Core 1,3 GHz
• KeTop Txx-xxx-x**N**x-xxx, KeTop Txx-xxx-x**f**x-xxx	Celeron N2807 Dual Core 1,58 GHz
RAM memory:	
• ARM Cortex A9:	2 GB
• Atom x6211:	4 GB (DDR4x) 8 GB (DDR4x)
• Celeron N2807:	4 GB (DDR3L)
FLASH memory:	
• ARM Cortex A9:	8 GB
• Celeron N2807:	8 GB eMMC
• Atom x6211:	-
SSD memory (extended memory)	64GB SSD 256 GB SSD
Operating system:	Linux

11.5 Interfaces

Ethernet interface

Quantity:	1
Data transfer rate:	10/100 Mbit/s LAN
Connection:	Modular plug, 8-pin (RJ45 plug)
Galvanic isolation:	Yes, signal lines

USB interface

Quantity:	1
Type:	USB 2.0 (Hi-Speed)
Output current:	Max. 500 mA

RFID interface (optional)

Quantity:	1
Range:	Min. 1 cm
Transponder chip:	I-Code SLI (according to ISO 15693)

Micro SD interface

Quantity:	1

KEBA © KEBA 2021

11.6 Emergency stop button / stop switch

Output type:	Electromechanical switching contact
Nominal voltage (Ue):	24 V DC
Minimum current (Ie):	10 mA (per contact)
Current carrying capacity:	Max. 1,000 mA (per contact)
Usage category:	DC-13 (in acc. With IEC 60947-5-1)
B_{10D}:	250,000
Design:	2-circuit, external wiring
Isolation:	500 V AC (1 min) to the rest

11.7 Enabling switch

Output type:	Electromechanical switching contact
Switchable nominal voltage (Ue):	24 V DC
Rated current (Ie):	500 mA (per contact)
Short circuit and overload protection:	No
B_{10D} (switch position 1-2-3-1):	1,000,000
Actuation forces:	
● From switch position 1 to 2:	3 N typical
● From switch position 2 to 3:	17 N typical
Isolation:	500 V AC (1 min) to the rest

11.8 Mechanical properties

Construction:	Housing made of PPE/PS
Flame retardance:	UL94-V0
Safe drop height (2 cases according to EN 61131-2):	1 m (on industrial floor), then at least protection class IP54 (not UL evaluated)

11.9 Dimensions, weight

Height (including emergency stop):	
● T150:	284 mm
● T155:	215 mm
Width:	
● T150:	215 mm
● T155:	284 mm
Depth:	
● Without handle:	69 mm
● With handle:	76 mm

© KEBA 2021

Weight (including emergency stop):	Approx. 1,200 g

KEBA © KEBA 2021

12 Optional operating elements

This chapter describes the options the KeTop T15x is available with.

12.1 Rotary Encoder Switch with 16 positions

The KeTop T15x can be equipped with an Rotary Encoder Switch (16 positions, 4 bit gray code) by default evaluated by software. For further details about the evaluation see onlin help of the programming environment HWApi-SDK. It can be obtained from KEBA upon request.

Connection to JB002

It is possible to connect the operating element external to the terminal X2 of the connection box JB002. The following table shows the wiring of the operating element:

Pin rotary encoder switch	Pin terminal X2
Bit 1	1
Bit 2	2
Common	3
Bit 3	4
Bit 4	5

Connection to intermediate cable ICxx3-PP20

It is possible to connect the operating element external to the leads of the intermediate cable ICxx3-PP20. The following table shows the wiring of the operating element:

Pin rotary encoder switch	Lead color intermediate cable
Bit 1	violet
Bit 2	white/pink
Common	white
Bit 3	blue
Bit 4	white/blue

12.2 Key-operated switch

The KeTop T15x can be equipped with a key-operated switch. This can either be evaluated by software or placed directly on the connection cable. When evaluated by software there can be incorrect state evaluations in case of a software error.

© KEBA 2021

Excerpt from the Machinery Directive 2006/42/EC (Annex I, chapter 1.2.5)

If machinery has been designed and constructed to allow its use in several control or operating modes requiring different protective measures and/or work procedures, it must be fitted with a mode selector which can be locked in each position. Each position of the selector must be clearly identifiable and must correspond to a single operating or control mode.

From this excerpt it is evident that a safety-related switching element, depending on the system/safety concept, may be relevant, but this is not required for each machine. On the basis of a risk analysis/risk assessment the customer must define whether a safety-related switching element is required or not.

WARNING!

When evaluated by software there can be incorrect state evaluations in case of a software error. If the position of the key switch is safety-related this electromechanical switching element must be wired directly (without electronical evaluation on the KeTop) into the safety logic.

Caution

The safety logic must check the position of the key witch on exclusivity to simulaneously detect multiple selected modes.

The key-operated switch is available with 2 or 3 positions.

Depending on the variant of the equipped key-operated switch it has one or more pull out positions.

Connection to JB002

It is possible to connect the operating element external to the terminal X2 of the connection box JB002. The following table shows the wiring of the operating element:

Pin key switch	Pin terminal X2
Position 1	1
Position 2	2
Common	3
Position 3	4

Connection to intermediate cable ICxx3-PP20

It is possible to connect the operating element external to the leads of the intermediate cable ICxx3-PP20. The following table shows the wiring of the operating element:

KEBA © KEBA 2021

Pins key switch	Lead color intermediate cable
Position 1	violet
Position 2	white/pink
Common	white
Position 3	blue

12.3 Handwheel

The KeTop T15x can be equipped with a handwheel. The handwheel pulses are evaluated in the processor and can be read out using software (via HWAPI or connection protocol).

50 pulses are counted per revolution. Rotating the handwheel clockwise increments the counter, while rotating it counterclockwise decrements the counter 0 to 65.535 (16-bit value).

Essential features:

- 50 notches/revolution
- 1 pulse/notch

Information

If the KeTop is dropped on the ground, check the mechanical fit of the adjusting knob. If necessary, the adjusting knob can be latched into place again by pressing it on from above.

12.4 Digital joystick

The handheld terminal can be equipped with a digital joystick. The digital joystick can be read out using software (via HWApi or connection protocol) on the handheld terminal. On the base station, the joystick is wired directly and can therefore not be evaluated via the software.

The digital joystick can be moved along 2 axes in 4 directions. The deflection of the joystick is detected with electrical normally open contacts and processed by logical operations of the 4 bits.

Key features:

- 2 directions / axis
- 1 Bit / deflection

12.5 Illuminated push button

The KeTop T15x can either be evaluated by software or placed directly on the connection cable.

© KEBA 2021

The illuminated push-buttons are available with impulse or click-stop function.

Connection to JB002

It is possible to connect the operating element external to the terminal X2 of the connection box JB002. The following table shows the wiring of the operating element:

Pin illuminated push button	Pin terminal X2
Position 1	1
Position 2	2
Common	3

Connection to intermediate cable ICxx3-PP20

It is possible to connect the operating element external to the leads of the intermediate cable ICxx3-PP20. The following table shows the wiring of the operating element:

Pin illuminated push button	Lead color intermediate cable
Position 1	violet
Position 2	white/pink
Common	white

12.6 Gray stop button

In place of the emergency stop button a gray stop button can be used. See "Emergency stop button" and "Gray stop button".

12.7 Illuminated emergency stop button

Instead of the emergency stop button an illuminated emergency stop button can be use. See "Emergency stop button" and "Illuminated emergency stop".

If this option is chosen a CB310 connection box has to be used.

12.8 RFID unit

The RFID unit is used for contact-free login and logout of a user via RFID card and is utilized for the user identification. This replaces the login of a user via the input of a username and password.

12.8.1 Functionality

For identification, the user of an RFID card needs to come near the area of the RFID antenna on the back side of the operating panel with their RFID card.

KEBA © KEBA 2021

The data recorded by the RFID unit can be processed for the user administration in the visualisation system.

Caution

Property damage due to improper handling of the RFID card!

Property damage may occur due to improper handling of the RFID card.

- Do not bend, scratch or cut the RFID card.

© KEBA 2021

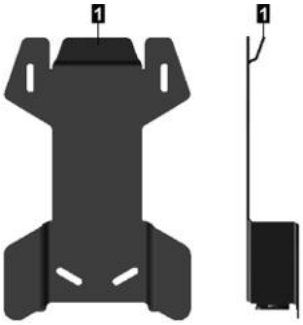
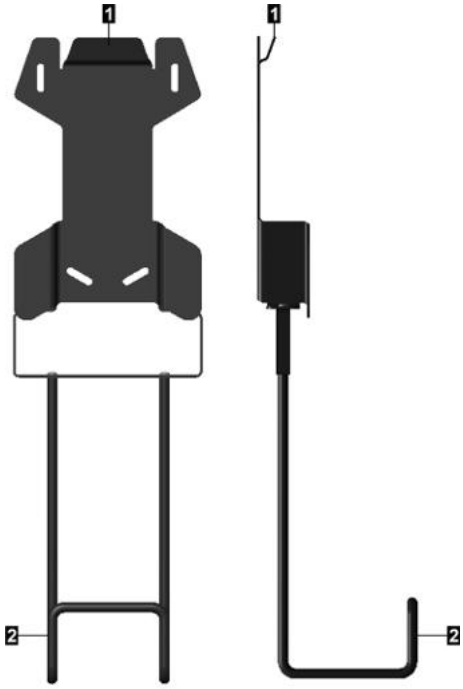
13 Accessories

13.1 Wall brackets KeTop WB150

> ***Information***
>
> *The wall brackets can only be used in conjunction with the accessory handle.*

The powder-coated, black wall bracket is used for stationary operation of for storing the KeTop T15x.

The wall brackets are available in the following variants:

KeTop WB 15X	KeTop WB T15K
Wall bracket without cable hanger	Wall bracket with cable hanger
	

1	Device carrier	2	Cable hanger

The KeTop wall brackets can be purchased from KEBA.

Designation	Description	Order number
KeTop WB 15X	Wall bracket without cable hanger	105052
KeTop WB T15K	Wall bracket with cable hanger	122109

KEBA © KEBA 2021

13.1.1 Dimensions

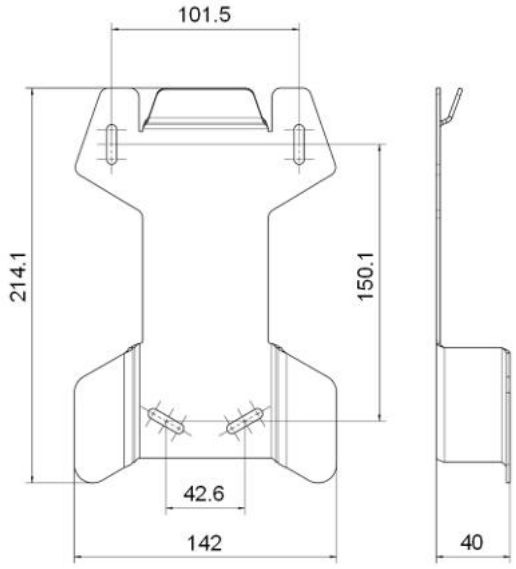


Fig. 13-27: Front and side view of wall holder KeTop WB 15X (dimensions in mm)

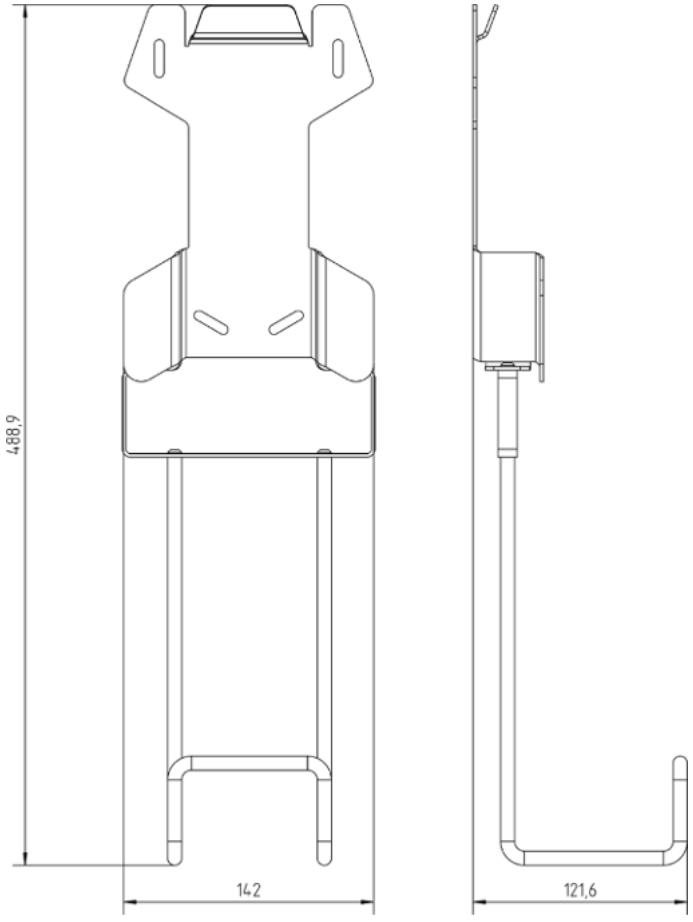


Fig. 13-28: Front and side view of wall holder KeTop WB T15K (dimensions in mm)

© KEBA 2021

13.2 Handle and hand strap

A handle, with or without hand strap, can be mounted on the KeTop T15x. The handle is attached with 3 Torx screws (size 10). The hand strap can only be used when the handle is mounted.

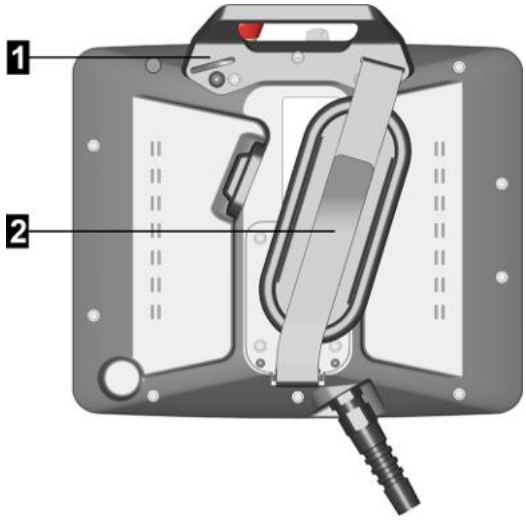


Fig. 13-29: KeTop T15x with handle and hand strap

1 ... Handle	2 ... Hand strap

13.2.1 Assembly

This chapter describes the assembly of the handle and hand strap. The following set is required for this:

Designation	Description	Order no.
Handle and hand strap T15x	Assembly set for handle and hand strap for KeTop T150 and KeTop T155	106420

Caution

- Incorrect handling can result in damage to the handheld device. Before starting assembly, installation and maintenance, switch off the power supply and disconnect interface cables.
- Make sure that the mounting surface is clean, level and stable. The surface should be free of dust and foreign matter.
- Use a pad to protect the glass front from being scratched.
- Only qualified, specialist personnel may perform the installation and commissioning of the product.

The following tool is required:

- Torx screwdriver size 10

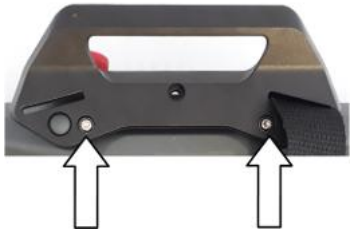
KEBA © KEBA 2021

In order to mount the handle and hand strap, proceed as follows:

1) Switch off the power supply.
2) Remove the handheld device.
3) Store the handheld controller on the mounting surface with the touch-screen facing down.
4) Insert the thin end of the hand strap (1) through the desired slot on the handle (2). When doing so, the hook and loop fastener must be facing upwards.

5) Pull through the entire hand loop from back to front up to the wide end.
6) Attach the padding (optional). When doing so, the hook and loop fastener must be facing upwards (1).

7) Tighten the handle using the screwdriver (torque: 0.8 - 1.0 Nm) on the upper end of the handheld device.

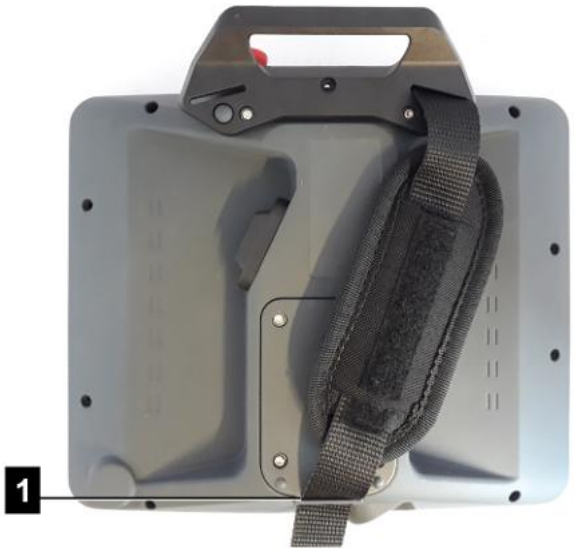


8) Insert the hand strap through the slot on the lower end of the handheld device (1).

Information

Do not twist the hand strap when threading it through.

© KEBA 2021



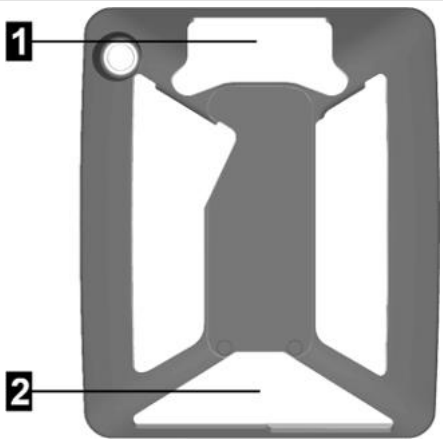
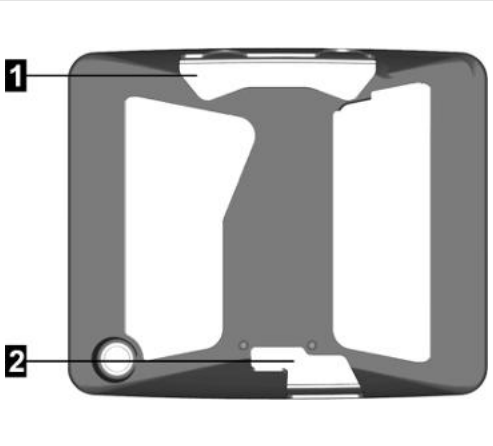
9) Pull the entire hand strap through.

10) Fasten the hook and loop fasteners together.

The handle and hand strap are now completely mounted and can be used.

13.3 Bumper / carrying set

The bumper serves as additional protection for the device against shocks or impacts and is available in the following variants:

Bumper vertical format	Bumper horizontal format
	

1	Handle recess	2	Cable recess

The bumper can be requested and purchased from KEBA.

Designation	Order number
Bumper vertical format (KeTop T150x)	125248
Bumper horizontal format (KeTop T155x)	122868

KEBA © KEBA 2021

Carrying set

The carrying set consists of the bumper and a carrying strap. The carrying set provides ergonomic relief and increased freedom of movement. It also increases safety and efficiency when handling the device.

WARNING!

Danger of personal injury due to strangulation or falling!

Improper use of the carrying set as a hoist for persons can lead to life-threatening injuries or death. Moving parts in the carrying set can lead to entanglement and strangulation.

- Never use the carrying set to lift or secure people.
- When handling the harness, watch out for moving parts and keep them away from body parts.

WARNING!

Danger of personal injury due to incorrect physical strain!

One-sided strain caused by additional attached accessories can lead to back pain and other muscle and joint injuries. Attaching unauthorized additional parts to the carrying set can impair safety and cause injuries.

- Avoid one-sided loading when using accessories such as the battery pack.
- Do not attach any other additional parts to the carrying set that are not expressly permitted.

WARNING!

Danger of personal injury due to hot surface or fire hazard!

Heated charging points can cause burns or trigger a fire in the carrying set if the charging contacts are not connected correctly.

- Ensure that the charging contacts of the charging station are not covered by a strap of the carrying set.
- The charging contacts of the hand-held device and the charging station must be in full contact to prevent overheating and the risk of fire.

© KEBA 2021

CAUTION!

Risk of tripping and obstruction of traffic routes!

Improperly placed or positioned devices and carrying sets can lead to tripping accidents and obstructions, which can cause minor to moderate injuries.

- Only attach the device including carrying set to the wall bracket or charging station.
- When not in use, store the carrying set safely away from traffic and danger areas.

The carrying set can be requested and purchased from KEBA.

Bezeichnung	Bestellnummer
Carrying set with bumper vertical format (KeTop T150)	136171
Carrying set with bumper horizontal format (KeTop T155)	136160

13.3.1 Attaching the bumper

The bumper can be attached without tools.

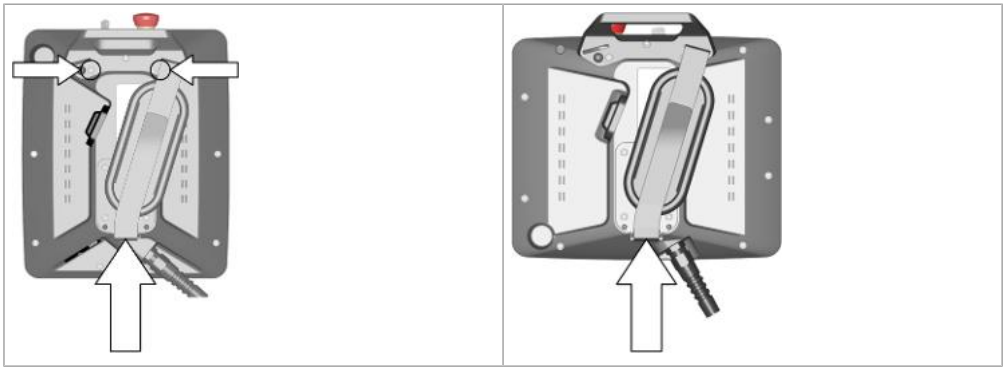
Before attaching the bumper, switch off the power supply and unplug the connection cable.

Information

Place the KeTop with the display facing downwards on a level, clean and soft underground (preferably on an ESD mat) and make sure that the KeTop and the operating elements are not damaged.

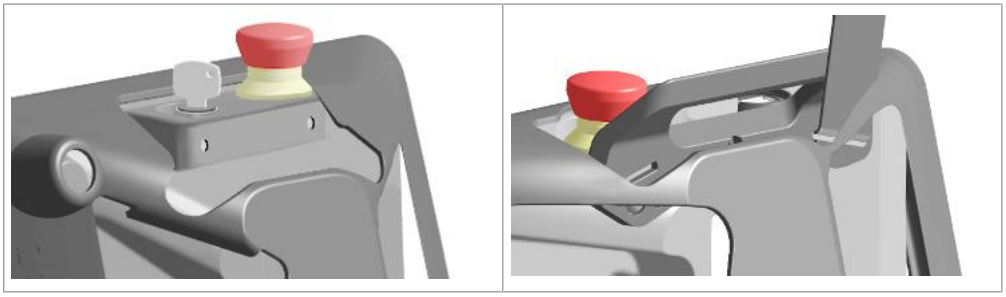
To attach the bumper, proceed as follows:

1) Switch off the handheld device.
2) If available: Unplug the connection cable.
3) Loosen the hand strap at the lower end and remove the handle (Torx10).



© KEBA 2021

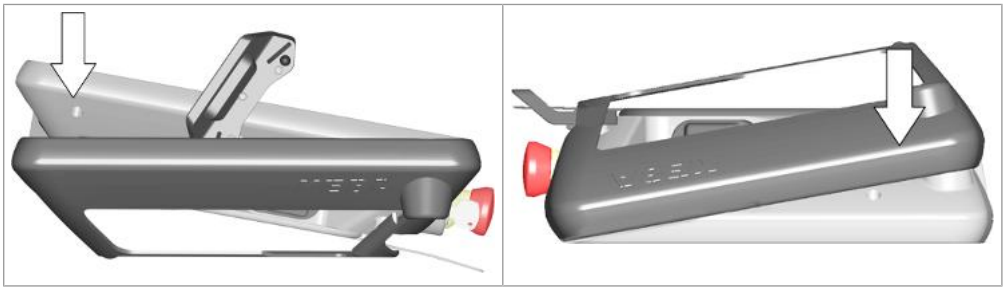
4) Hang the bumper on the emergency stop switch through the handle recess.



5) If available: Pull the connection cable through the cable recess of the bumper.

6) Clip the bumper over the upper edges.

7) Clip the bumper over the lower edges. The removed handle can be used as a mounting aid.



8) Mount the handle and the hand strap on the device.

The bumper is now completely mounted.

13.3.2 Cleaning

Caution

Damage to property due to improper cleaning or drying!

Improper cleaning or drying can damage the carrying set.

Only clean and dry the bumper and carrying strap in accordance with the instructions given here.

To clean the bumper and carrying strap, proceed as follows:

1) Remove the hand-held device from the bumper.

2) Clean the bumper with a soft brush (dry or damp). Make sure that no labels are damaged or rendered illegible.

3) Cleaning the carrying strap by hand: Clean the straps and ropes with lukewarm water or mild lukewarm soapy water (max. 40 °C). Do not use chemicals.

4) Rinse with clear lukewarm water.

© KEBA 2021

5) Leave to dry in an airy, dry and shady place. Do not expose the bumper and carrying strap to unnecessary UV radiation.

13.3.3 Storage and transportation

Caution

Damage to property due to improper storage or improper transportation!

Improper storage or transportation can damage the carrying set.

Only store and transport the bumper and carrying set in accordance with the instructions given here.

Always protect the bumper and carrying set from UV radiation and heat and ensure adequate ventilation during storage and transportation. Avoid airtight containers. It is recommended to use a UV-resistant material bag.

13.4 Junction box JB001

The junction box JB001 is used to connect a KeTop with the connection cable KeTop TTxxx-eaa to a PLC via Ethernet.

This product can be used for data rates up to max. 10 Mbit/s.

13.4.1 Views and basic dimensions

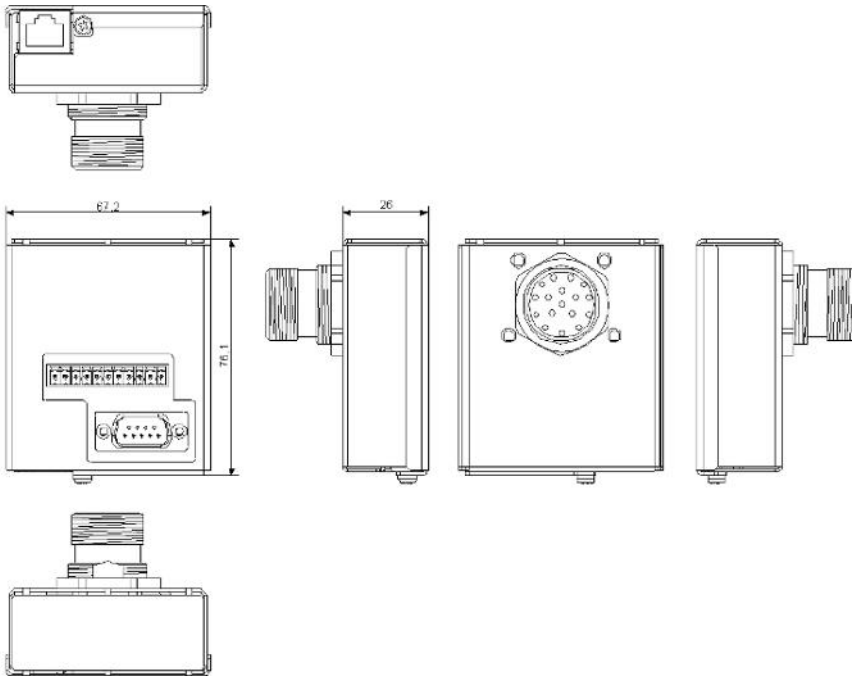


Fig. 13-30: Views and basic dimensions (in mm) of the JB001

KEBA © KEBA 2021

13.4.2 Connectors

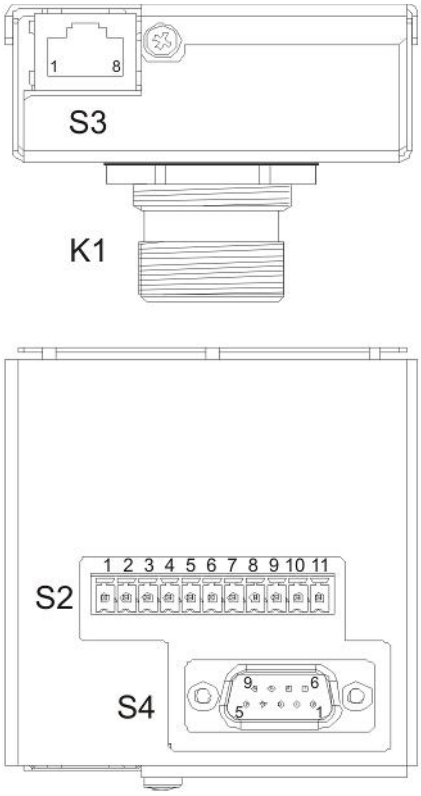


Fig. 13-31: Connectors of the JB001

K1 ... 17-pin Hummel female connector for the KeTop connection cable	S2 ... 11-pin terminal block for power supply and control line (emergency stop button, enabling switch). For this terminal block a plug will be needed.*)
S3 ... RJ45 female connector for connection to a PLC **)	S4 ... 9-pin D-sub male connector for CAN connection

*) The requiered mating plug for terminal block S2 can be orderd from Co. "Phoenix" with material number FMC 1,5/11-ST-3,5.

**) via Ethernet

13.4.3 Connection

This chapter describes the connection of the control lines (power supply, emergency stop, and enabling circuit) and the data lines to the interface box.

© KEBA 2021

WARNING!

Danger of personal injury due to electric shock!

- Only supply the device with power from voltage sources having protective extra-low voltage (e.g. SELV or PELV acc. to EN 61010-2-201)
- Only connect voltages and circuits which are safely separated from dangerous voltages (e.g. by means of sufficient insulation) to connections, terminals or interfaces up to a rated voltage of 50 V.

Ethernet connection

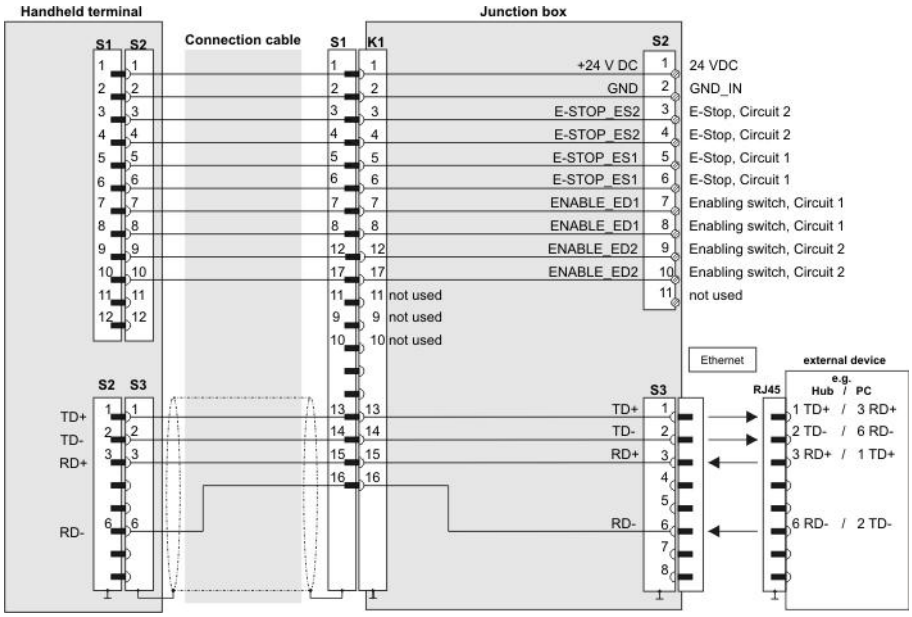


Fig. 13-32: Connection plan: KeTop T15x to interface box via Ethernet

Information

A crossover cable is required for a point-to-point operation via the Ethernet interface between KeTop and controller.

13.4.4 Shielding inside the control cabinet

In many cases, several interference sources exist in the control cabinet, such as servo drive modules, transformers, contactors and relays. Therefore it is necessary to continue the cable shield from the connector shell (control cabinet) up to the PLC (continuous connection from handheld terminal up to PLC). The supplied cable ensures a shielded connection from the KeTop to the junction box. The user is responsible for ensuring adequate shielding between the connection box and the control.

KEBA © KEBA 2021

13.4.5 Mounting instructions

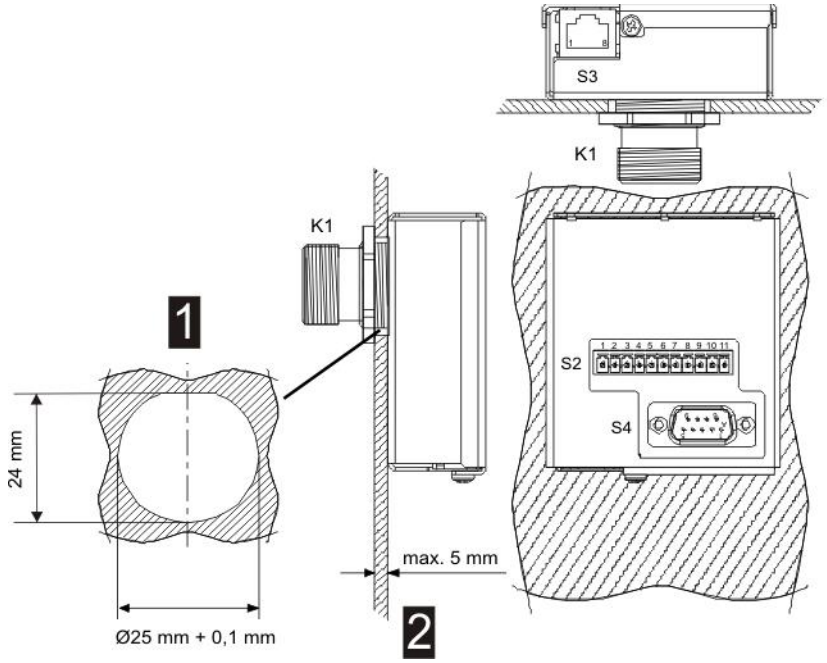


Fig. 13-33: Zoom view of the mounting opening JB001

1 ... Detailed view of the mounting aperture	2 ... Control cabinet wall (max. 5 mm wall thickness)

13.4.6 Technical data of junction box

General

Rated voltage (KeTop):	24 V DC
Power consumption:	
• Without KeTop:	None
• With KeTop:	See technical data of the handheld terminal
Switch-on current (KeTop):	See technical data of the handheld terminal
Protection class.	III according to EN 61131-2 resp. EN 50178
Protection type:	IP20

Ambient conditions

Operating temperature:	+5 °C to +55 °C
Storage temperature:	-25 °C to +70 °C
Relative air humidity (non-condensing):	5 % to 95 %
Vibration resistance:	IEC 60068-2-6: • 5 Hz ≤ f < 9 Hz with 7 mm • 9 Hz ≤ f < 150 Hz with 2 g
Shock resistance:	15 g / 11 ms (IEC 60068-2-27)

© KEBA 2021

Mechanical properties

Construction:	Housing made of galvanized blue sheet steel

Dimensions, weight

Width:	67.2 mm
Height:	76.1 mm
Depth:	26 mm
Weight:	220 g

13.5 Connection box JB002

The JB002 connection box is used for connecting a KeTop with the 20-pole connection cable KeTop TTxx3-PP20 to a controller via Ethernet.

This product can be used for data rates up to max. 100 Mbit/s.

13.5.1 Views and basic dimensions

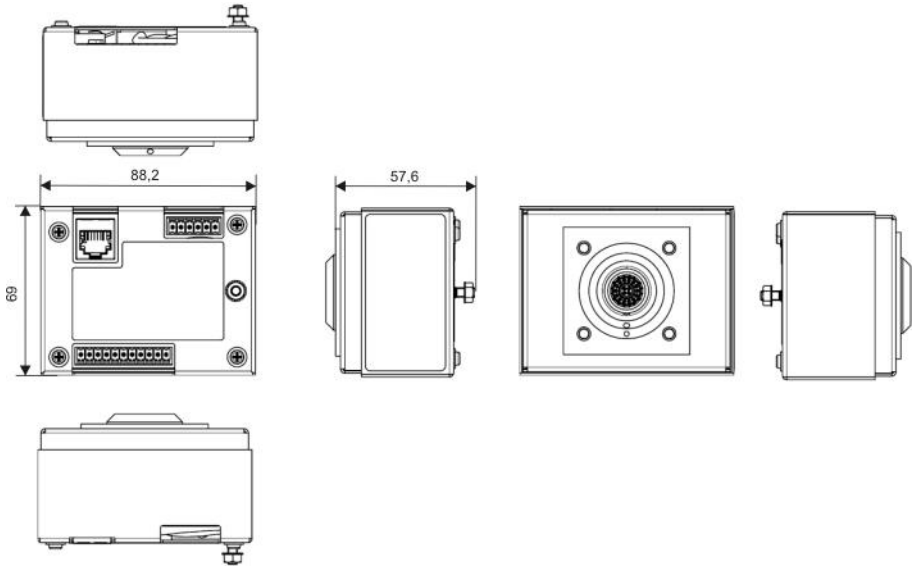


Fig. 13-34: Views and basic dimensions (in mm) of JB002

KEBA © KEBA 2021

13.5.2 Connectors

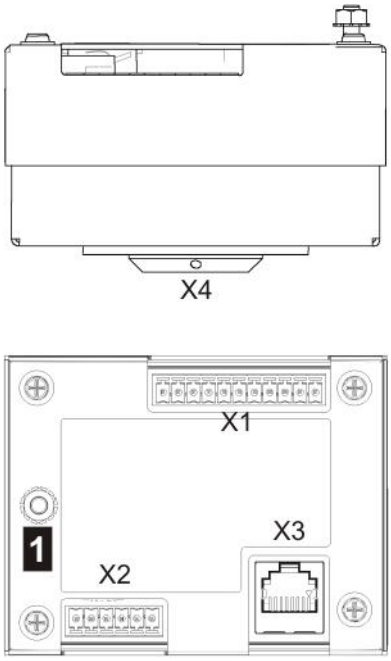


Fig. 13-35: Connections of the JB002

1 ... Ground bolt	X1 ... 11-pin terminal block for power supply and control line (emergency stop button, enabling switch). For this terminal block a plug will be needed *)
X2 ... 6-pin terminal block for operating elements, mating plug is delivered **)	X3 ... RJ45 female connector for connection to a PLC
X4 ... 20 pol female connector for KeTop Txx3-PP20	

*) The requiered mating plug for the terminal block X1 can be ordered from Co. "Phoenix" with material number FMC 1,5/11-ST-3,5.

**) The requiered mating plug for the terminal block X2 can be ordered from Co. "Phoenix" with material number FMC 1,5/06-ST-3,5.

13.5.3 Connection

This chapter describes the connection of the control lines (power supply, Emergency Stop, and enabling circuit) and the data lines to the connection box.

© KEBA 2021

WARNING!

Danger of personal injury due to electric shock!

- Only supply the device with power from voltage sources having protective extra-low voltage (e.g. SELV or PELV acc. to EN 61010-2-201)
- Only connect voltages and circuits which are safely separated from dangerous voltages (e.g. by means of sufficient insulation) to connections, terminals or interfaces up to a rated voltage of 50 V.

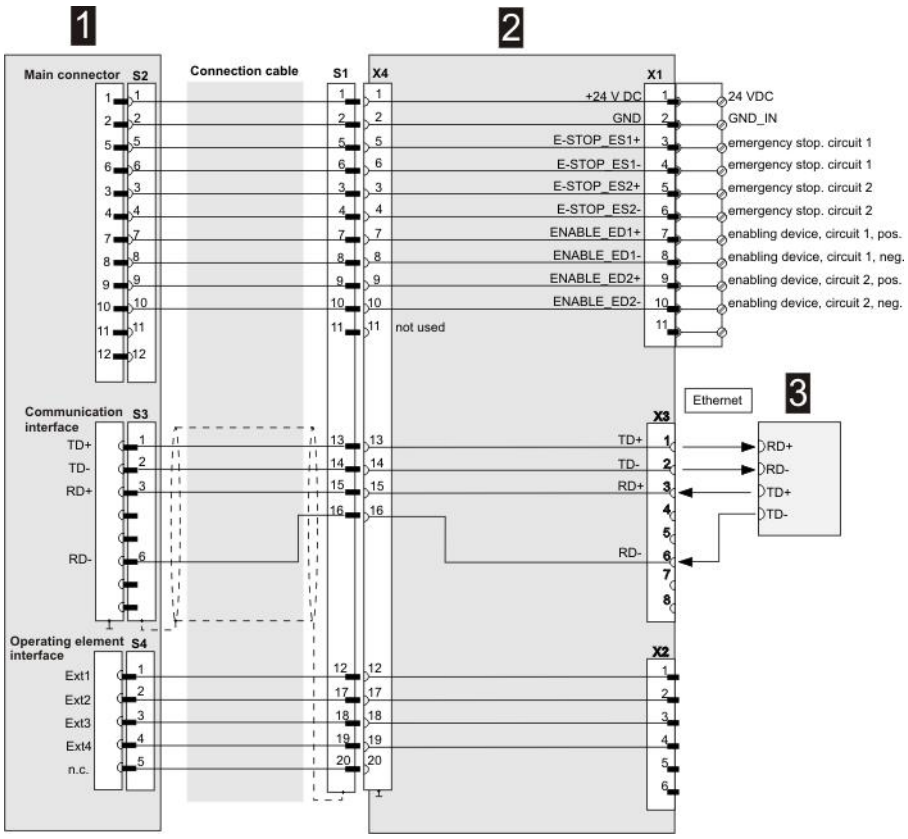


Fig. 13-36: Connection: KeTop T15x to connection box JB002 via Ethernet

1 ... Handheld terminal	2 ... Junction box
3 ... External device	

Information

A crossover cable is required for a point-to-point operation via the Ethernet interface between KeTop and controller.

KEBA © KEBA 2021

13.5.4 Protective earthing

If required for reasons of electrical safety for the end usage, the metal parts of the device must be grounded via the grounding bolt (M4) that is located on the rear side of the device (gray-black grounding point).

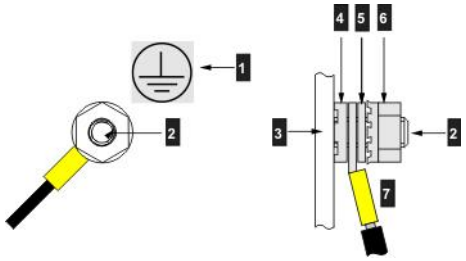


Fig. 13-37: Ground bolt on the rear side of the device

1 ... Grounding point (adhesive label)	2 ... Ground bolt
3 ... Device rear side	4 ... Grounding washer
5 ... Washer	6 ... Hexagon nut with toothed washer
7 ... Cable lug with protective ground cable	

Caution

Damage for improper handling!

- The hexagon nut with toothed washer may be tightened with a maximum torque of 2 Nm.
- The ground bolt may not be subjected to pressure or tensile load.

Material

Ground bolt: Stainless steel 18/8 (AISI 300) passivated.

13.5.5 Shielding within the switch cabinet

In many cases, there are a number of sources of interference in the switch cabinet, such as servo-drive modules, transformers, contactors, and relays. It is therefore necessary to run the cable shielding from the connector housing (switch cabinet) all the way up to the controller (continuous connection from the hand-heldterminal up to the controller, see Appendix: Electromagnetic Compatibility).

© KEBA 2021

13.5.6 Installation information

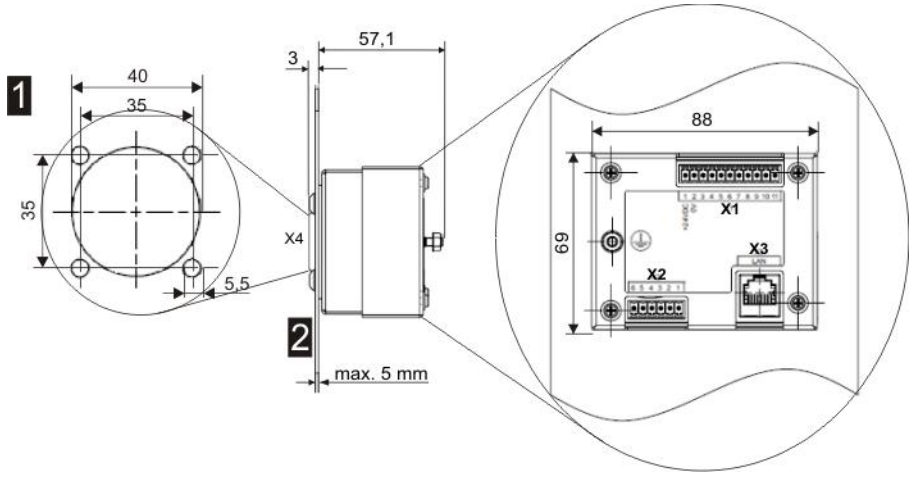


Fig. 13-38: Dimension drawing of the attachment opening for the JB002

1 ... Detail view of the attachment opening	2 ... Switch cabinet wall (max. 5 mm wall thickness)

13.5.7 Technical data of the JB002 connection box

General

Rated voltage (KeTop):	24 V DC
Power consumption:	
• Without KeTop:	None
• With KeTop:	See technical data of the handheld terminal
Inrush current (KeTop):	See technical data of the handheld terminal
Protection class:	III according to EN 61131-2 resp. EN 50178
IP code:	IP20

Environmental conditions

Operating temperature:	0 °C to +55 °C
Storage temperature:	-25 °C to +70 °C
Relative air humidity (non-condensing):	10 % to 95 %
Vibration resistance:	IEC 60068-2-6: • 5 Hz ≤ f < 9 Hz with 7 mm • 9 Hz ≤ f < 150 Hz with 2 g
Shock resistance:	15 g / 11 ms (IEC 60068-2-27)

Mechanical properties

Construction:	Sheet steel housing, blue galvanized

Dimensions, weight

Width:	88 mm

KEBA © KEBA 2021

Height:	69 mm
Depth:	57.1 mm
Weight:	352 g

13.6 Connection box KeTop CB211

The junction box is used to connect a KeTop with the connection cable KeTop TTxxx-eaa to a PLC via Ethernet.

This product can be used for data rates up to max. 10 Mbit/s.

It is used for integration of the KeTop in the machine/system and is suitable for wall mounting.

13.6.1 Views and basic dimensions

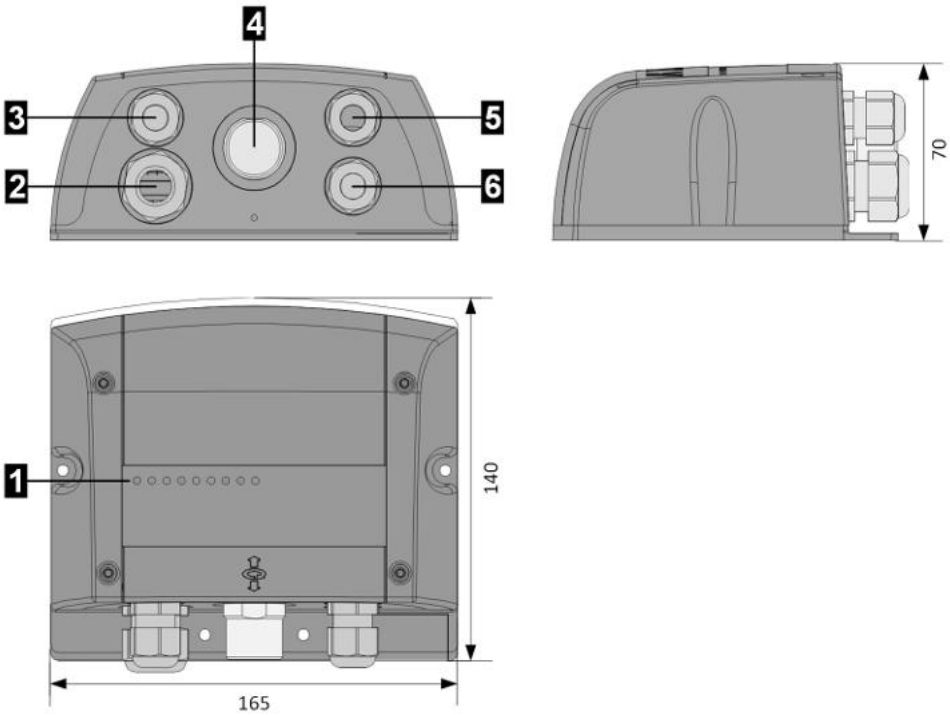


Fig. 13-39: Views and basic dimensions (in mm) of the CB211

1 ... Status and error LEDs	2 ... Cable gland (M20) for power supply, enabling switch and emergency stop
3 ... Cable gland (M16) for separate functional earth (delivery state with blind plug)	4 ... Coninvers jack for KeTop connection cable
5 ... Cable gland (M16) for connection to data cable	6 ... Cable gland (M16) - reserve (delivery condition with blind plug)

© KEBA 2021

13.6.2 Interior view

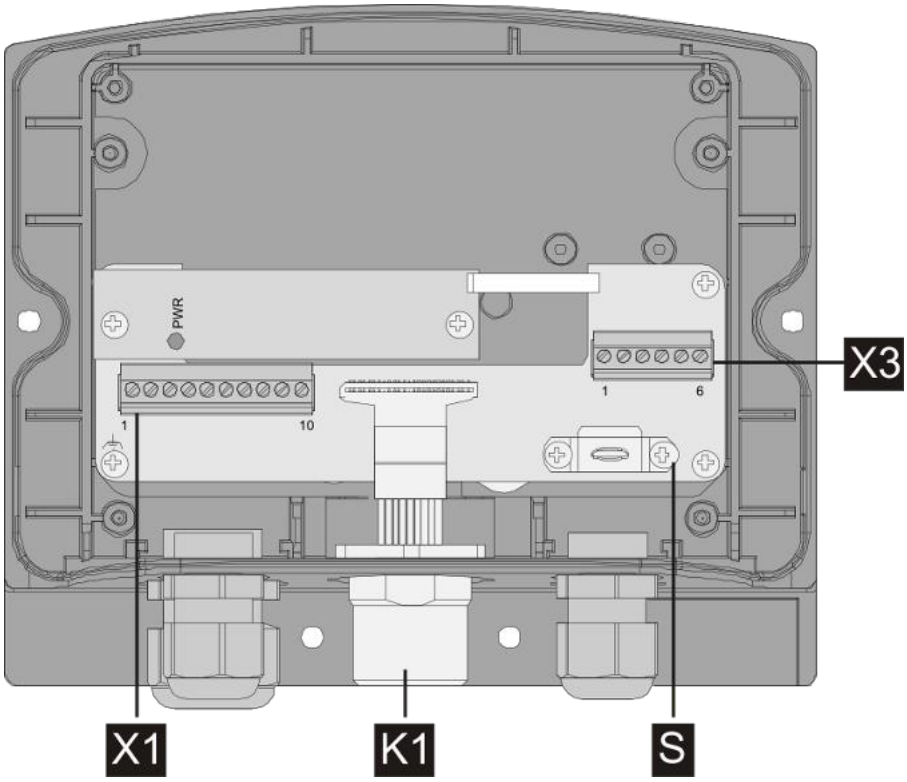


Fig. 13-40: Interior view of connection box

K1 ... 17-pin female connector (Conin-vers) for KeTop connection cable	X1 ... Terminal block for power and con-trol lines (emergency stop and en-abling switch)
X3 ... Terminal block for data lines	S ... Cable shield clamp with connection surface for cable shield of data lines (not used for strain-relief of the ca-ble!)

The connectors for the terminal strips can be obtained from PHOENIX.

Ordering information

Gateway terminal stripe	Connector type	Order number
X1	MCVR 1,5/10-ST-3,81	1827208
X3	MCVR 1,5/6-ST-3,81	1827169

KEBA © KEBA 2021

13.6.3 Drilling template for wall mounting

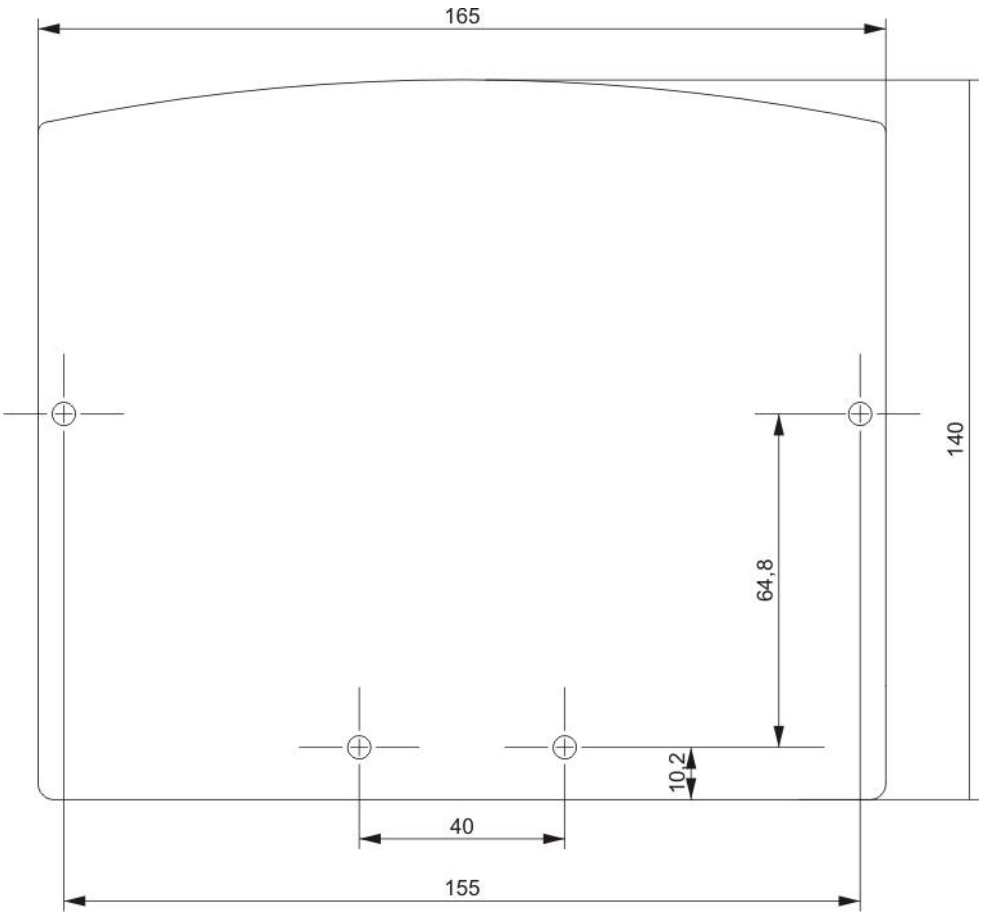


Fig. 13-41: Drilling template for the Gateway box (specifications in mm)

Information

A scaled drilling template (scale 1:1) can be downloaded from www.keba.com → Login (under "Accessories") using your login data.

For wall mounting, we recommend the following screws and materials:

- Chipboard screw: Ø 4 mm x 40mm
  Head form: flat head
  Max. head diameter: Ø 9 mm
- Recommended rawlplug: Ø 6 mm x 30mm

The drilling diameter must be adapted to the screw material used.

© KEBA 2021

13.6.4 Use of connection box

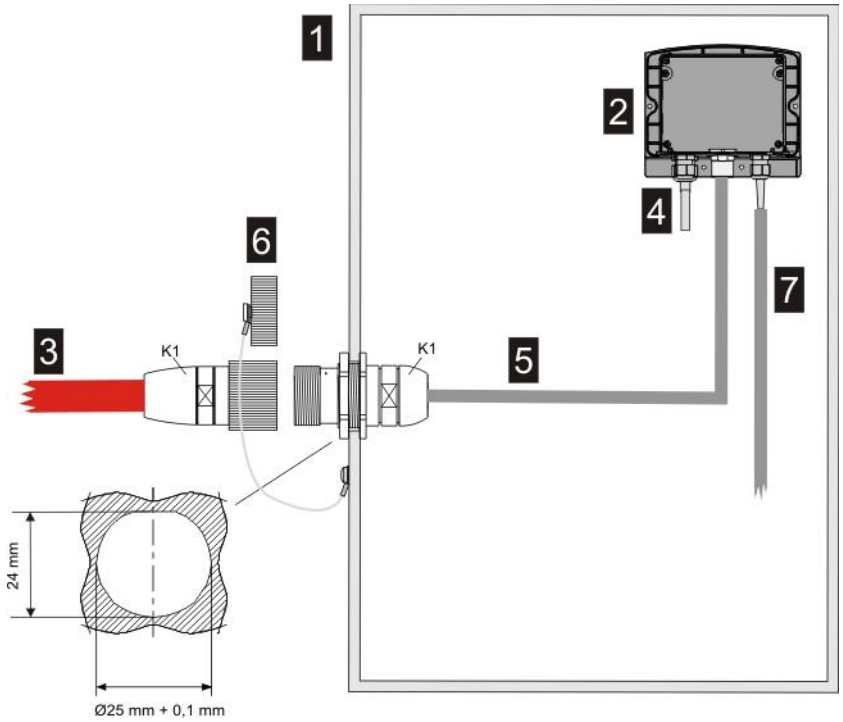


Fig. 13-42: Connection box KeTop in the control cabinet

1 ... Control cabinet (max. 5 mm wall thickness)	2 ... Connection box
3 ... Connection cable to the handheld device	4 ... Power supply, emergency stop, enabling switch
5 ... KeTop IC224 or KeTop IC220	6 ... Dust protection cap
7 ... Data line	

13.6.5 Connection diagram

The connection diagram shows the connection of power supply, control lines (emergency stop button and enabling control device) and data lines via the connection box.

WARNING!

Danger of personal injury due to electric shock!

- Only supply the device with power from voltage sources having protective extra-low voltage (e.g. SELV or PELV acc. to EN 61010-2-201)
- Only connect voltages and circuits which are safely separated from dangerous voltages (e.g. by means of sufficient insulation) to connections, terminals or interfaces up to a rated voltage of 50 V.

KEBA © KEBA 2021

Ethernet

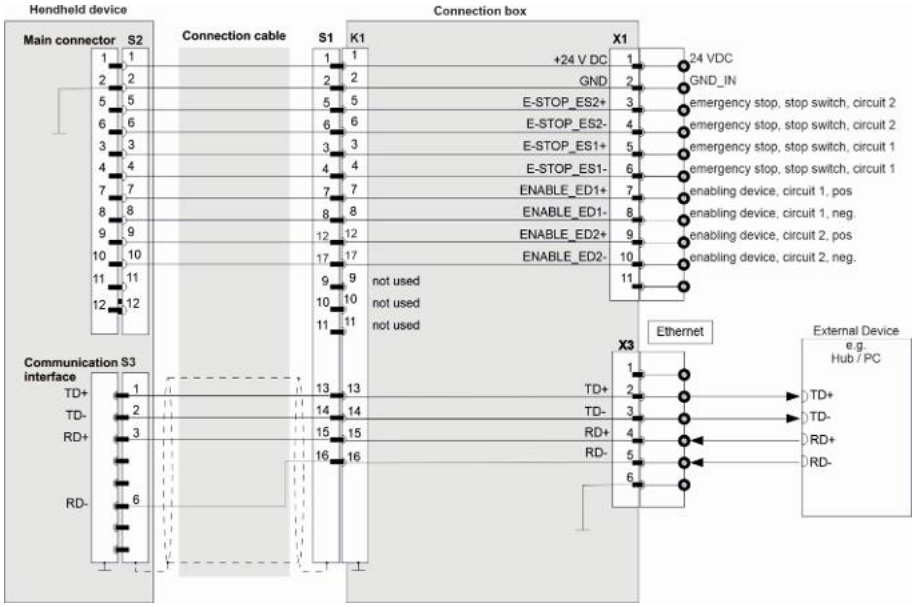


Fig. 13-43: Connection diagram: KeTop to connection box via Ethernet

Information

Point-to-point connections between KeTop and PLC require a crossed cable.

13.6.6 Minimum bending radius of cable

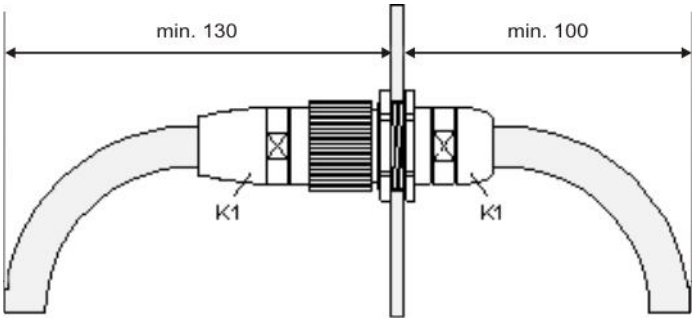


Fig. 13-44: Required minimum distance (in mm) outside and inside the control cabinet

13.6.7 Accessories

The following accessoires are available for the connection box.

© KEBA 2021

Accessories	Usable for	Description
Intermediate cable	KeTop IC220 (2 m) KeTop IC240 (4 m)	Connection box to connection cable
Strapping plug	KeTop BC001	Serves for bridging the emergency stop circuits if the KeTop is unplugged

Caution

At a wire cross-section AWG26 the cable length may not exceed 20 m.

13.6.8 Technical data of connection box

General data

Rated supply voltage:	24 V DC
Power consumption:	12 W
Max. inrush current:	5 A (for about 2 ms)
Protection class:	III in accordance EN 61131-2 resp. EN 50178
Protection type:	IP54

Ambient conditions

Operating temperature:	0 °C to +50 °C
Storage temperature:	-20 °C to +70 °C
Relative humidity (non-condensing):	5 % to 95 %
Vibration resistance (operation):	IEC 60068-2-6: ● 5 Hz ≤ f < 9 Hz with 7 mm ● 9 Hz ≤ f < 150 Hz with 2 g ● 15 g / 11 ms (IEC 60068-2-27)
Shock resistance (operation):	15 g / 11 ms (IEC 60068-2-27)

Mechanical properties

Construction:	PPE/PS housing
Flammability class:	UL94-V0

Terminal strips X1 / X3

Connection capacity:	
● rigid / flexible / wire gages:	0,14-1,5 mm^2 / 0,14-1,5 mm^2 / 28-16 AWG
● flexible wire sleeves with / without plastic sleeve :	0,25-1,5 mm^2 / 0,25-0,5 mm^2
Grid dimension:	3,81
Insulation stripping length:	7 mm^2
Tightening torque:	0,22-0,25 Nm

KEBA © KEBA 2021

Information

- When selecting the connection cable, observe the connection capacity of the terminal strips.
- Use the following screwdriver for the terminal strips to clamp the wires: Blade: 0.4 x 2.5 x 80 mm, Length: 160 mm
- No multi-conductor connection (2 conductors in one terminal) is permitted.

Dimensions, weight

Width:	160 mm
Height:	140 mm
Depth:	70 mm
Weight:	500 g

13.7 Connection box CB310

The connection box CB310 is used for connecting a KeTop with the connection cable KeTop TTxx3-PP22 to a controller via Ethernet.

This product can be used for data rates up to max. 100 Mbit/s.

© KEBA 2021

13.7.1 Views and basic dimensions

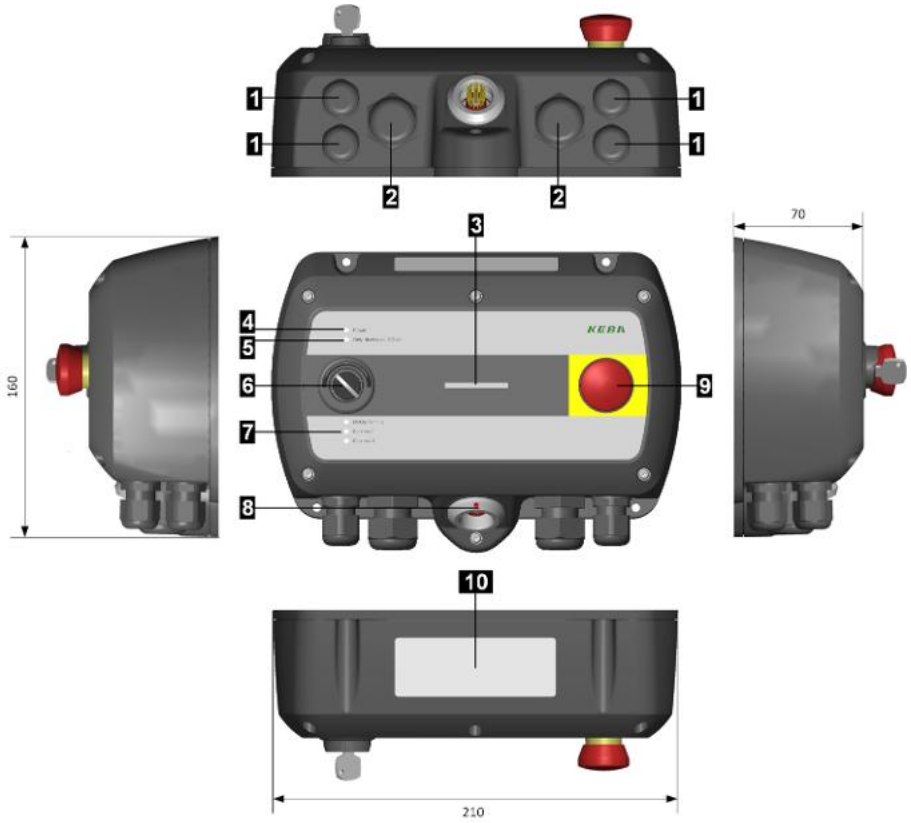


Fig. 13-45: Views and basic dimensions (in mm) of the CB310

1 ... Standard cables outlets	2 ... Ethernet cable outlets
3 ... Status LED bar	4 ... Power-LED
5 ... LED to indicate that only handheld terminals with illuminated emergency stop may be used	6 ... Key-operated switch (optional)
7 ... Ethernet status LEDs	8 ... Main connection
9 ... Emergency stop (optional)	10 ... Type plate

Further information can be found in the configuration manual of the CB310.

13.7.2 Technical data

General

Protection class:	IP65
Connection cycles connector for handheld device:	5,000

KEBA © KEBA 2021

Information

The connection locking mechanism for the handheld device must be tested regularly (every month). The box must be removed from operation once the number of connection cycles has been exceeded.

Power supply

Power supply:	24 V DC SELV/PELV (rated voltage tolerance 19.2 V DC to 30 V DC according to EN 61131-2)
Power consumption (without handheld device):	Approx. 500 mA at 24 V DC

Ambient conditions

Operating temperature:	0 °C to 50 °C
Storage temperature:	-25 °C to 70 °C
Relative air humidity (non-condensing):	5 % to 95 %
Vibration resistance:	
• With 3.5 mm:	5 Hz ≤ f ≤ 8.4 Hz
• With 1 g:	8.4 Hz ≤ f ≤ 150 Hz
Shock resistance:	15 g / 11 ms
Altitude:	Max. 3,000 m sea level

Interfaces

Ethernet interfaces

Quantity:	3
Data transmission rate:	100 Mbit/s

Emergency stop functions on the connection box

Nominal voltage (Ue):	24 V DC
Minimum voltage:	5 V (per contact)
Minimum current (Ie):	10 mA (per contact)
Maximum current carrying capacity:	1,000 mA (per contact)
Usage category:	DC-13 (in acc. With IEC 60947-5-1)
Schlegel FRVKOO:	
• B_{10D}:	250,000
Design:	Two circuits
Reaction time until emergency stop is triggered:	Max. 19 ms (opening the contacts)
Isolation:	500 V AC to rest
Proof-test interval:	20 years

© KEBA 2021

Category according to EN ISO 13849-1:	4
Performance level according to EN ISO 13849-1:	e
Safety integrity level according to EN 61508:	SIL 3
Relay switching operations:	10 x 10^5
PFH_D of emergency stop inputs:	4.87 x 10^{-12}
PFD of emergency stop inputs:	4.26 x 10^{-7}
PFH_D of safety relay outputs:	1.07 x 10^{-11}
PFD of safety relay outputs:	9.33 x 10^{-7}
Total PFH_D:	9.79 x 10^{-10} [1/h]

WARNING!

To ensure the safety parameters specified above, the safety function should be decommissioned once the emergency stop has been activated 250,000 times or at the latest after twenty years.

For the calculation of the overall safety function, the specified total PFH_D of the safety electronics is to be used. The emergency stop on the handheld device and the optional emergency stop on the KeTop T15x must also be considered. This is based on the specified B_{10D} value. From this, the $MTTF_D$ value must be calculated as follows:

$$MTTF_D = \frac{B_{10D}}{0{,}1 * n_{op}} \qquad n_{op} = \frac{d_{op} * h_{op} * 3600}{t_{Cycle}} \qquad MTTF_D = \frac{B_{10D} * t_{Cycle}}{360 * d_{op} * h_{op}}$$

For details on the abbreviations, see chapter 1.6.3 Abbreviations. This $MTTF_D$ value can only be transferred to a PFH_D (x = number of hours per year):

$$MTTF_D = \frac{1}{x * PFH_D} = \frac{1}{8760 * PFH_D}$$

Then, the PFH_D values must be added to the overall safety function in acc. with EN ISO 13849-1:

$PFH_D = PFH_{D\ electronics} + PFH_{D2\ switching\ element} + ... + PFH_{DN}$

Dimensions, Weight

Height:	160 mm
Width:	210 mm
Depth:	70 mm
Weight:	Ca. 500 g

KEBA © KEBA 2021

13.8 Connection cable for Ethernet KeTop TTxxx-eaa

The standard KeTop handheld terminals are available with the following cables:

- KeTop TT050-eaa: 5 m
- KeTop TT070-eaa: 7 m
- KeTop TT100-eaa: 10 m
- KeTop TT150-eaa: 15 m
- KeTop TT200-eaa: 20 m

This product can be used for data rates up to max. 10 Mbit/s.

The connection cable withstands water, cleaning agents (alcohol and tensides), oil, grease and lubricants.

Caution

If KeTop connection cables are equipped with an user specific connector and not with KEBA proposed connector, reduced electromagnetic immunity is possible. In this case the user has to ensure that the requirements of the EMCdirective 2014/30/EU are met.

Pin assignment

Description of signal	S2, 12-pin female connector	S3, 8-pin RJ45 jack		S1, 17-pin male connector, pin No.:
24 V DC	1	-	→	1
GND_IN	2	-	→	2
E-Stop, circuit 2	3	-	→	3
E-Stop, circuit 2	4	-	→	4
E-Stop, circuit 1	5	-	→	5
E-Stop, circuit 1	6	-	→	6
enabling control, circuit 1, pos.	7	-	→	7
enabling control, circuit 1, neg.	8	-	→	8
enabling control, circuit 2, pos.	9	-	→	12
enabling control, circuit 2, neg.	10	-	→	17
not used	11	-	→	9
not used	12	-	→	10
not used	-	-	→	11
TD+ (Ethernet)	-	1	→	13
TD- (Ethernet)	-	2	→	14
RD+ (Ethernet)	-	3	→	15
RD- (Ethernet)	-	6	→	16

© KEBA 2021

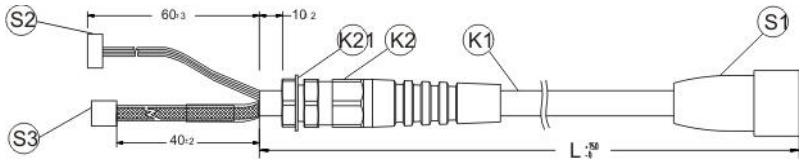


Fig. 13-46: Connection cable KeTop TTxxx-eaa

S1 ... 17-pin male connector	S2 ... 12-pin female connector
S3 ... 8-pin RJ45 jack	K1 ... connection cable
K2 ... cable bushing	K21 ... mounting nut for cable bushing
L ... length (acc. to product variant)	

13.9 Connection cable KeTop Txx3-PP20

The KeTop T15x is available with the following connection cables with 20-pin push-pull pin connector:

- KeTop TT033-PP20: 3 m
- KeTop TT053-PP20: 5 m
- KeTop TT103-PP20: 10 m
- KeTop TT153-PP20: 15 m

This product can be used for data rates up to max. 100 Mbit/s.

The connection cable is resistant to water, cleaning agents (alcohol and surfactants), oils, cutting oils (drilling oils), greases and lubricants.

Further cabel lengths may be requested from KEBA.

Caution

There may be a reduction in the interference resistance on connection cables of the KeTop products KEBA if the suggested connector is replaced by a customer-specific connector. In this case, the operating company must ensure that the requirements of the EMC directive 2004/108/EG are fulfilled.

Signal description	S2, 12-pin female connector strip	S3, 8-pin RJ45 connector	S4, 5-pin female connector strip		S1, 20-pin push-pull male connector
24 VDC	1	-	-	→	1
GND	2	-	-	→	2
Emergency Stop, Circuit 2	3	-	-	→	3
Emergency Stop, Circuit 2	4	-	-	→	4
Emergency Stop, Circuit 1	5	-	-	→	5
Emergency Stop, Circuit 1	6	-	-	→	6
Enabling control, Circuit 1, pos.	7	-	-	→	7

KEBA © KEBA 2021

Signal description	S2, 12-pin female connector strip	S3, 8-pin RJ45 connector	S4, 5-pin female connector strip		S1, 20-pin push-pull male connector
Enabling control, Circuit 1, neg.	8	-	-	→	8
Enabling control, Circuit 2, pos.	9	-	-	→	9
Enabling control, Circuit 2, neg.	10	-	-	→	10
Not used	11, 12	-	-	→	11
External operating element 1	-	-	1	→	12
External operating element 2	-	-	2	→	17
External operating element 3	-	-	3	→	18
External operating element 4	-	-	4	→	19
External operating element 5	-	-	5	→	20
TD+	-	1	-	→	13
TD-	-	2	-	→	14
RD+	-	3	-	→	15
RD-	-	6	-	→	16

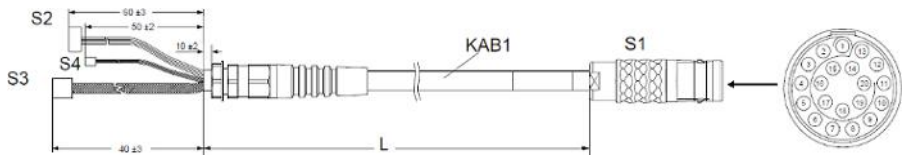


Fig. 13-47: Connection cable KeTop Txx3-PP20

S1 ... 20-pin push-pull connector	S2 ... 12-pin female connector strip
S3 ... 8-pin RJ45 connector	S4 ... 5-pin female connector strip
KAB1 ... Connection cables	L ... Length according to product version

13.10 Connection cable KeTop TTxx3-PP22

The KeTop T15x is available with the following connection cables with 22-pin push-pull pin connector which are only developed for the connection to a CB310:

- KeTop TT033-PP22: 3 m
- KeTop TT053-PP22: 5 m
- KeTop TT103-PP22: 10 m
- KeTop TT153-PP22: 15 m

© KEBA 2021

This product can be used for data rates up to max. 100 Mbit/s.

The connection cable is resistant to water, cleaning agents (alcohol and surfactants), oils, cutting oils (drilling oils), greases and lubricants.

Caution

There may be a reduction in the interference resistance on connection cables of the KeTop products KEBA if the suggested connector is replaced by a customer-specific connector. In this case, the operating company must ensure that the requirements of the EMC directive 2004/108/EG are fulfilled.

Signal description	S2, 12-pin female connector strip	S3, 8-pin RJ45 connector	S4, 5-pin female connector strip		S1, 22-pin push-pull male connector
24 VDC	1	-	-	→	10
GND	2	-	-	→	9
Emergency Stop, Circuit 2	3	-	-	→	7
Emergency Stop, Circuit 2	4	-	-	→	22
Emergency Stop, Circuit 1	5	-	-	→	6
Emergency Stop, Circuit 1	6	-	-	→	19
Enabling control, Circuit 1, pos.	7	-	-	→	18
Enabling control, Circuit 1, neg.	8	-	-	→	20
Enabling control, Circuit 2, pos.	9	-	-	→	8
Enabling control, Circuit 2, neg.	10	-	-	→	21
Supply illuminated emergency stop +	-	-	2	→	11
Supply illuminated emergency stop -	-	-	4	→	12
Reserved	-	-	1	→	5
Reserved	-	-	3	→	14
Box ID	-	-	5	→	13
Connected with S1 Pin 16	-	-	-	→	15
Connected with S1 Pin 15	-	-	-	→	16
Not used	-	-	-	→	17
TD+	-	1	-	→	1
TD-	-	2	-	→	2
RD+	-	3	-	→	3
RD-	-	6	-	→	4

KEBA © KEBA 2021

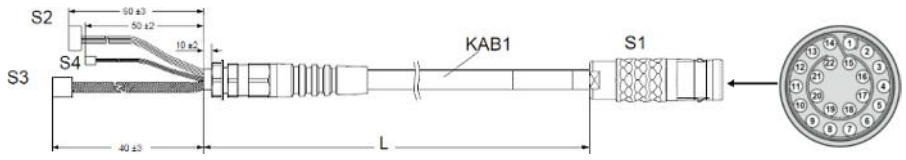


Fig. 13-48: Connection cable KeTop TTxx3-PP22

S1 ... 22-pin push-pull connector	S2 ... 12-pin female connector strip
S3 ... 8-pin RJ45 connector	S4 ... 5-pin female connector strip
KAB1 ... Connection cables	L ... Length according to product version

13.11 Connection cable for Ethernet KeTop TTxxx-ea0

The KeTop handheld terminals are available with the following cables by default:

- KeTop TT050-ea0: 5 m
- KeTop TT070-ea0: 7 m
- KeTop TT100-ea0: 10 m
- KeTop TT150-ea0: 15 m
- KeTop TT200-ea0: 20 m

This product can be used for data rates up to max. 10 Mbit/s.

The connection cable withstands water, cleaning agents (alcohol and tensides), oil, grease and lubricants.

Caution

KeTop connection cables are equipped with an user specific connector and not with KEBA proposed connector, reduced electromagnetic immunity is possible. In this case the user has to ensure that the requirements of the EMC directive 2014/30/EU are met.

Pin assignment

Description of signal	S2, 10 pin female connector	S3, 8 pin RJ45 jack		S1, 8 pin RJ45 jack
24 V DC	1	-	→	-
GND_IN	2	-	→	-
Not-Halt, Kreis 2	3	-	→	-
Not-Halt, Kreis 2	4	-	→	-
Not-Halt, Kreis 1	5	-	→	-
Not-Halt, Kreis 1	6	-	→	-
Freigabesteuerung, Kreis 1, pos.	7	-	→	-

© KEBA 2021

Description of signal	S2, 10 pin female connector	S3, 8 pin RJ45 jack		S1, 8 pin RJ45 jack
Freigabesteuerung, Kreis 1, neg.	8	-	→	-
Freigabesteuerung, Kreis 2, pos.	9	-	→	-
Freigabesteuerung, Kreis 2, neg.	10	-	→	-
TD+ (Ethernet)	-	1	→	1
TD- (Ethernet)	-	2	→	2
RD+ (Ethernet)	-	3	→	3
RD- (Ethernet)	-	6	→	6

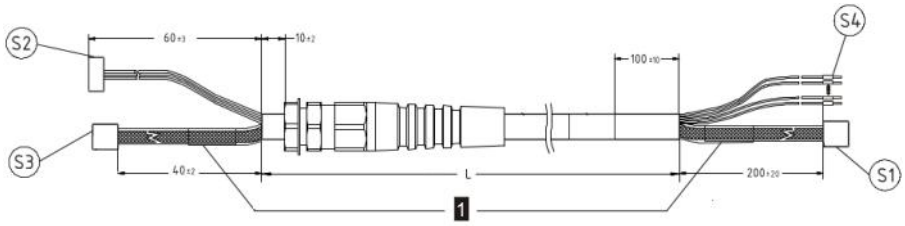


Fig. 13-49: Connection cable KeTop TTxxx-ea0

S1 ... 8 pin RJ45 jack	S2 ... 10 pin female connector
S3 ... 8 pin RJ45 jack	S4 ... Open strands of the cable
1 ... Shielding and insulating at the open area	L ... Length according to product version

13.12 Connection cable for Ethernet KeTop TTxxx-Eb0

The KeTop handheld terminals are available with the following cables by default:

- KeTop TT050-Eb0: 5 m
- KeTop TT100-Eb0: 10 m

This product can be used for data rates up to max. 10 Mbit/s.

The connection cable withstands water, cleaning agents (alcohol and tensides), oil, grease and lubricants.

Caution

KeTop connection cables are equipped with an user specific connector and not with KEBA proposed connector, reduced electromagnetic immunity is possible. In this case the user has to ensure that the requirements of the EMC directive 2014/30/EU are met.

KEBA © KEBA 2021

Pin assignment

Description of signal	S2, 10 pin female connector	S4, 5 pin blade terminal	S3, 8 pin RJ45 jack		S1, 8 pin RJ45 jack
24 V DC	1	-	-	→	-
GND_IN	2	-	-	→	-
Not-Halt, Kreis 2	3	-	-	→	-
Not-Halt, Kreis 2	4	-	-	→	-
Not-Halt, Kreis 1	5	-	-	→	-
Not-Halt, Kreis 1	6	-	-	→	-
Freigabesteuerung, Kreis 1, pos.	7	-	-	→	-
Freigabesteuerung, Kreis 1, neg.	8	-	-	→	-
Freigabesteuerung, Kreis 2, pos.	9	-	-	→	-
Freigabesteuerung, Kreis 2, neg.	10	-	-	→	-
Handwheel B' (RS422), Pos. 1	-	1	-	→	-
Handwheel B (RS422), Pos. 2	-	2	-	→	-
Common	-	3	-	→	-
Handwheel A' (RS422)	-	4	-	→	-
Handwheel A (RS422)	-	5	-	→	-
TD+ (Ethernet)	-	-	1	→	1
TD- (Ethernet)	-	-	2	→	2
RD+ (Ethernet)	-	-	3	→	3
RD- (Ethernet)	-	-	6	→	6

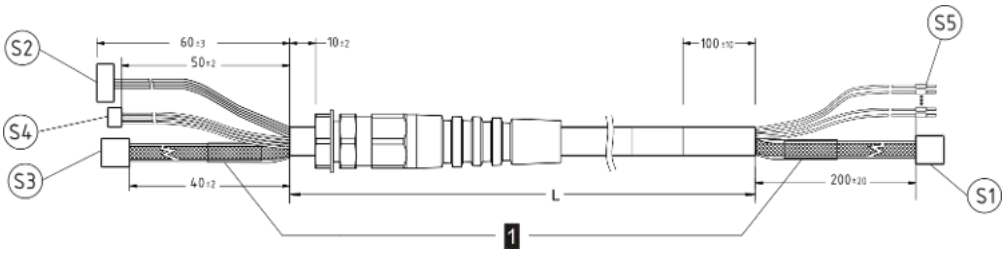


Fig. 13-50: Connection cable KeTop TTxxx-Eb0

S1 ... 8 pin RJ45 jack	S2 ... 10 pin female connector
S3 ... 8 pin RJ45 jack	S4 ... 5 pin blade terminal

© KEBA 2021

S5 ... Open wires	1 ... Shielding and insulating at the open area
L ... Length according to product version	

13.13 Intermediate cable KeTop IC2xx

The following intermediate cables are available for the KeTop handheld terminals with a connection cable with 17-pin male connector:

- KeTop IC260: 6 m
- KeTop IC240: 4 m
- KeTop IC220: 2 m

This product can be used for data rates up to max. 10 Mbit/s.

The KeTop intermediate cable withstands water, cleaning agents (alcohol and tensides), oil, drilling oils, grease and lubricants.

Description of signal	K1, 17-pin female connector, pin No.:		K2, 17-pin male connector, pin No.:
Enabling switch, circuit 1, pos.	7	→	7
Enabling switch, circuit 1, neg.	8	→	8
Enabling switch, circuit 2, pos.	12	→	12
Enabling switch, circuit 2, neg.	17	→	17
n.c.	10	→	10
24 V DC	1	→	1
n.c.	9	→	9
Emergency stop, circuit 1	3	→	3
Emergency stop, circuit 1 GND	4	→	4
Emergency stop, circuit 2	5	→	5
Emergency stop, circuit 2 GND	6	→	6
GND_IN	2	→	2
TD+ (Transmit) *)	13	→	13
TD- (Transmit) *)	14	→	14
RD+ (Receive) *)	15	→	15
RD- (Receive) *)	16	→	16
GND	11	→	11

*) Shielded signals

KEBA © KEBA 2021

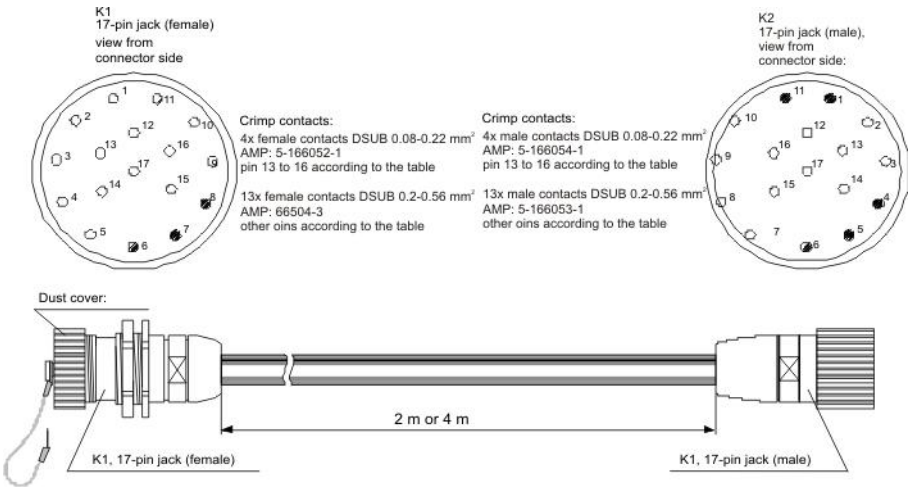


Fig. 13-51: Intermediate cable KeTop IC2xx

13.13.1 Mounting instructions

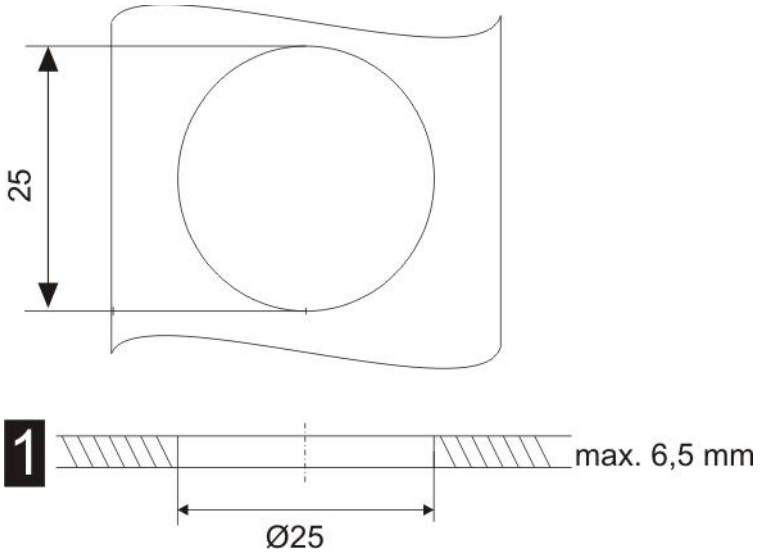


Fig. 13-52: Zoom view of the mounting opening IC 2xx (dimensions in mm)

1	... Control cabinet wall (max. 6.5 mm)		...

13.14 Intermediate cable KeTop ICxx3-PP20

The following intermediate cables are available for KeTop handheld terminals with a 20-pole connection cable with a push pull connector:

- KeTop IC013-PP20: 1 m
- KeTop IC033-PP20: 3 m

This product can be used for data rates up to max. 100 Mbit/s.

© KEBA 2021

The intermediate cable is resistant to water, cleaning agents (alcohol and surfactants), oils, cutting oils (drilling oils), greases and lubricants.

Signal description	S1, 20-pin push-pull female connector		S3, 8-pin RJ45 connector	Wire colors open end in-between cable 15 pin
24 V DC	1	→	-	Pink
GND	2	→	-	Black
Emergency Stop, Circuit 2	3	→	-	Green/brown
Emergency Stop, Circuit 2	4	→	-	White/green
Emergency Stop, Circuit 1	5	→	-	Gray/pink
Emergency Stop, Circuit 1	6	→	-	Red/blue
Enabling switch, Circuit 1, pos.	7	→	-	Brown
Enabling switch, Circuit 1, neg.	8	→	-	Yellow
Enabling switch, Circuit 2, pos.	9	→	-	Green
Enabling switch, Circuit 2, neg.	10	→	-	Gray
n.c.	11	→	-	n.c.
External operating element 1	12	→	-	Violet
External operating element 2	17	→	-	White/pink
External operating element 3	18	→	-	White
External operating element 4	19	→	-	Blue
External operating element 5	20	→	-	White/blue
TD+	13	→	1 *)	-
TD-	14	→	2 *)	-
RD+	15	→	3 *)	-
RD-	16	→	6 *)	-

*) Signals are shielded.

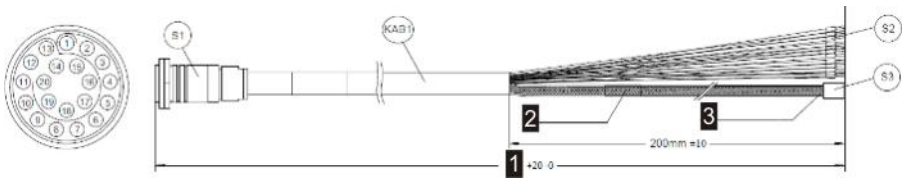


Fig. 13-53: Intermediate cable KeTop ICxx3-PP20

1 ... Length as variant	2 ... Insulating the open shielding area

KEBA © KEBA 2021

3 ... Shielding	S1 ... 20 pin push-pull female connector
KAB1 ... Connection cables	S2 ... Open cable end 15 pin
S3 ... 8 pin RJ45 connector	

13.14.1 Mounting instructions

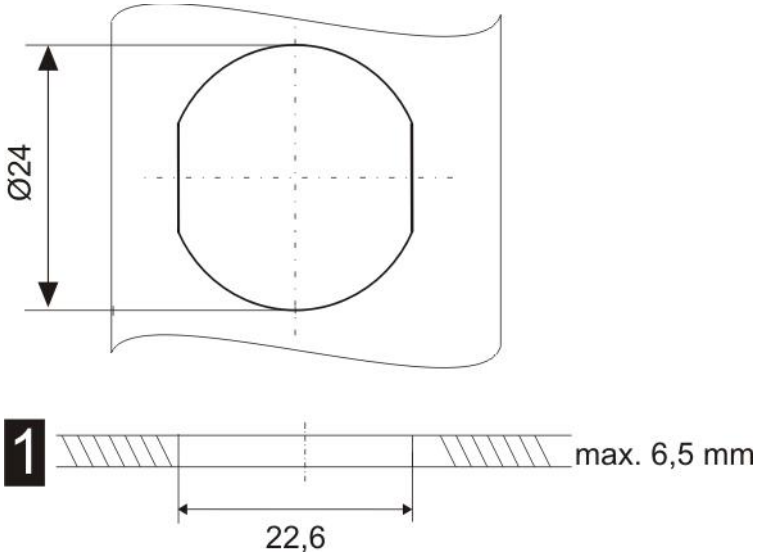


Fig. 13-54: Zoom view of the mounting opening IC xx3-PP20 (dimensions in mm)

1 ... Control cabinet wall (max. 6.5 mm)	...

13.15 Download cable KeTop XD040

The download cable KeTop XD040 is available with a length of 4 m (13.12 ft) and plugged into the serial port connector in the cable entrance area of the KeTop or into the X6 of the KeTop CB23x Gatewaybox.

The cable is used for downloading software and for debugging.

Handheld terminal KeTop xxxx		Gateway box KeTop CB23x		Download cable KeTop XD040			PC
Signals	**Serial port connector**	**Signals**	**X6 Serial port connector**	**S1 male connector**	**Description of signals**	**S2, 9-pin D-sub female connector**	**Signals (COMx)**
-	1*)	n.c.	1	1	↔	1	(ActiveSync)
-	3*)	n.c.	2	2	↔	6	(ActiveSync)
TXD	3	TXD	3	3	↔	2	RXD
CTS	4	n.c.	47	4**)	↔	-	-
RXD	5	RXD	5	5	↔	3	TXD

© KEBA 2021

Handheld terminal KeTop xxxx		Gateway box KeTop CB23x		Download cable KeTop XD040			PC
RTS	6	n.c.	6	6	↔	-	-
-	7*)	n.c.	7	7	↔	4	(ActiveSync)
n.c.	8	n.c.	8	8**)	↔	9	-
GND	9	GND	9	9	↔	5	GND
GND	10	b.c.	10	10	↔	-	not used
						7	not used
						8	not used

*) The pins 1, 2 and 7 of the serial port connector S2 are short circuited directly on the CPU board of the KeTop. If you produce the serial download cable yourself you will need these three wires in the cable for the ActiveSync signal.

**) One pin has been removed from the male connector (prevents from incorrect plugging in).

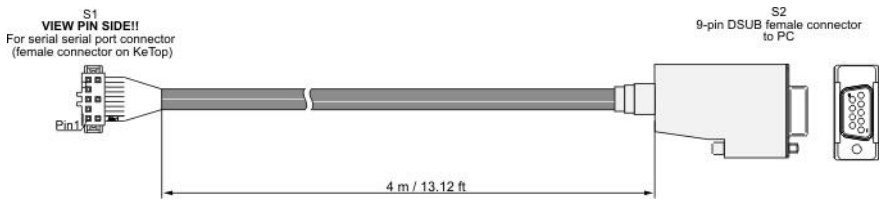
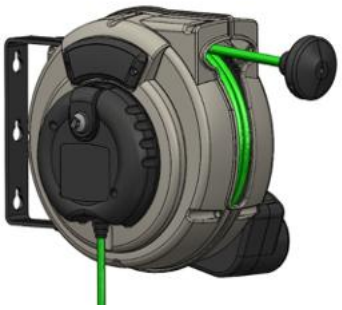


Fig. 13-55: Download cable XD040

13.16 Cable reel KeTop Reel

The KeTop Reel (cable reel) is used to store the connection cable when the device is not in use.

The following variants of the cable reel are available:

K box	M box
	

KEBA © KEBA 2021

Information

The cable reel must not be used for runtime critical application because the shielding of the data lines within the cable is not completely suitable for high frequencies. Because of that data loss during transmission can happen due to EMC interference.

Both variants can be purchased from KEBA.

Designation	Order number
KeTop Reel TT183-PP20	97901
KeTop Reel TT103-PP20	99795

For further information see respective installation manual.

13.16.1 Space requirement

For the mounting holes of the cable reel the following dimensions are recommended:

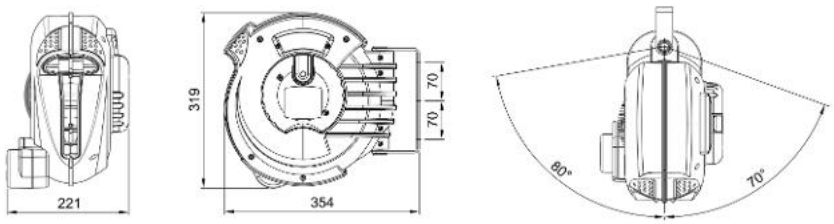


Fig. 13-56: Space requirement and drill holes for the KeTop T15x K Box (extension length 18 m)

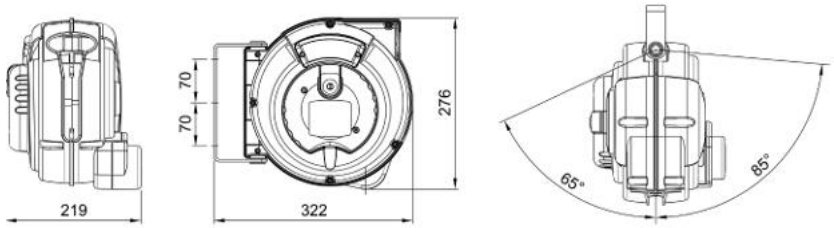


Fig. 13-57: Space requirement and drill holes for the KeTop T15x M Box (extension length 10 or 15 m)

13.16.2 Manufacturer's note

MTPReel™ Multi Teach Pendant Reel	The manufacturer of the product is: MTPReel GmbH Allmendstraße 5/1 74629 Pfedelbach

© KEBA 2021

This product is exclusively sold by KEBA. The compatibility with KeTop handheld devices is verified by KEBA. Any changes which are not agreed with KEBA cause the loss of compatibility.

13.16.3 Technical data

General

Max. actuation cycles cable pullout:	10,000 according to IEC 61242:1995+A1:2008
Protection class:	IP20

Environmental conditions

Operating temperature:	+5 °C to +55 °C
Storage temperature:	-15 °C to +70 °C
Relative air humidity (non-condensing):	5 % to 95 % (not condensing)
Shock resistance:	According to IEC 61242:1995+A1:2008
Altitude:	Max. 2,000 m sea level

Cable

Cable length on device side:	
• KeTop T15x TT100-xxx:	10.0 m Other cable length on request.
• KeTop T15x TT180-xxx:	18.0 m Other cable length on request.
Cable length on control side:	2.5 m
Max. bending radius:	Ø 125 mm

Mechanical properties

Drop-tested:	According to IEC 61242:1995+A1:2008

Dimensions, weight

Height:	
• K Box:	319 mm
• M Box:	276 mm
Width:	
• K Box:	221 mm
• M Box:	219 mm
Depth:	
• K Box:	354 mm
• M Box:	322 mm
Weight:	
• K Box:	Approx. 6 kg
• M Box:	Approx. 5.5 kg

KEBA © KEBA 2021

13.17 Tempered Glass Screen Protector

The following optional accessory is available for the handheld device to protect the display against scratches and damage:

Order Number	Description
140761	Premium Screen Protector Glass T15x

© KEBA 2021

14 Directives, standards and regulations

14.1 EU directives

2014/30/EU	EMC Directive
2011/65/EU	RoHS Directive
2006/42/EG	Machinery Directive

14.2 Standards for checking the conformity

The following legally non-binding European standards were applied to checking conformity with the directives.

Check of the conformity with the EMC Directive

EN 61131-2:2007	Programmable controllers - Part 2: Equipment requirements and tests

Check of the conformity with the RoHS Directive

EN IEC 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Check of the conformity with the Machinery Directive

EN ISO 13850:2015	Safety of machinery - Emergency stop function - Principles for design
EN 60204-1:2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN ISO 10218-1:2011	Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots

14.3 Other standards

In addition, the following legally non-binding European standards were consulted in partial aspects during the development of the safety concept.

General procedure and safety principles

EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction

Stop or emergency stop execution

EN ISO 13850:2015	Safety of machinery - Emergency stop function - Principles for design

KEBA © KEBA 2021

EN 60204-1:2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Design of the enabling switch

EN 60204-1:2018	Safety of Machinery - Electrical Equipment of Machines - Part 1: General Requirements
EN ISO 10218-1:2011	Robots and Robotic Devices – Safety Requirements – Part 1: Robots
EN 60947-1:2007	Low-voltage switchgear and controlgear - Part 1: General rules
EN 60947-5-1:2017	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices
EN 60947-5-8:2021	Low-voltage switchgear and controlgear - Part 5-8: Control circuit devices and switching elements - Three-position enabling switches

Ergonomics

EN 614-1:2006	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles

Stability and impermeability of casing

EN 60529:1991	Degrees of protection provided by enclosures
EN 61131-2:2007	Programmable controllers - Part 2: Equipment requirements and tests

Other relevant standards and principles

EN 61131-2:2007	Programmable controllers - Part 2: Equipment requirements and tests
EN 61010-1:2010	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
EN IEC 61010-2-201:2018	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-201: Particular requirements for control equipment

14.4 Regulations

Regulation (EG) No. 1907/2006	REACH EU chemicals regulation

© KEBA 2021

Information

Information obligation from REACH regulation

To meet the information obligation according to article 33 of REACH regulation, detailed information to substances / SVHC are provided on our homepage. You can download the document directly from https://support.keba.com under "Regulations".

14.5 Standards for the American market

For the American market, the following standards were taken into account.

UL test for industrial control equipment

UL/IEC 61010-2-201	Requirements for Control Equipment, including Programmable Logic Controllers (PLC's) and applicable requirements from UL/ IEC61010-1

UL examination for robotic applications

UL 1740	Industrial Robots and Robotic Equipment E216950 (TETZ2, TETZ8)

KEBA © KEBA 2021

15 Declaration of conformity

Automation by innovation.

EG-/EU-Konformitätserklärung
EC/EU Declaration of Conformity

CE

KEBA Industrial Automation GmbH
Reindlstraße 51
A- 4040 Linz
AUSTRIA

Wir bestätigen, dass das (die) nachfolgend bezeichnete(n) Produkt(e)
We declare that the following product(s)

Type: **KeTop T15x / C15x**

Beschreibung: Handterminal mit 3-stufigen Zustimmtaster und Not-Halt
Description: Teach Pendant with 3-position Enabling Device and E-Stop

Variante(n): **Mat.Nr.:**
Variant(s):

103493	**103542**	**104085**
104243	**104894**	**104911**
104912	**106366**	**106582**
107686	**107722**	**107723**
107724	**109054**	**109055**
109866	**109914**	**110403**
110437	**110448**	**110460**
110964	**111126**	**111129**
111579	**111853**	**111854**
111933	**111934**	**111935**
112705	**112563**	**113412**
113551	**113557**	**113558**
119617	**120573**	**120645**
120745	**120896**	**121253**
122272	**122507**	**123416**
123435	**123770**	**124031**
124219	**124349**	**125147**
125264	**125859**	**125863**
125891	**125976**	**126488**
126501	**126567**	**127594**
128506	**128710**	**128987**
129404	**129724**	**129869**
129972	**131764**	

den Schutzbestimmungen folgender europäischer Richtlinie/n entspricht/entsprechen:
is (are) in conformity with the following relevant Union harmonization legislation(s):

- **2006/42/EC**
- **2014/30/EU**
- **2011/65/EU**

KeTop_T15x-C15x_KEBA_withoutZT08_dt-en31.docx

© KEBA 2021

Folgende einschlägige harmonisierte Norm(en) wurde(n) der Konformitätsvermutung zur Richtlinie 2006/42/EG für die Sicherheitsfunktionen zugrunde gelegt:

Following relevant harmonized standard(s) has/have been used to give presumption of conformity to the directive 2006/42/EC for the safety functions:

- **EN ISO 13850:2015** (wenn Not-Halt verbaut / *if emergency stop is installed*)
- **EN ISO 10218-1:2011** (wenn Not-Halt und Zustimmeinrichtung verbaut / *if emergency stop and enabling device are installed)*
- **EN 60204-1:2018**

Folgende einschlägige harmonisierte Norm/en wurde/n für die Konformiätsvermutung mit der Richtlinie 2014/30/EU zugrunde gelegt:

Following relevant harmonized standard was used as the basis for the presumption of conformity with the directive 2014/30/EU:

- **EN 61131-2:2007**

Folgende einschlägige harmonisierte Norm/en wurde/n für die Konformiätsvermutung mit der Richtlinie 2011/65/EU zugrunde gelegt:

Following relevant harmonized standard/s was/were used as the basis for the presumption of conformity with the directive 2011/65/EU:

- **EN IEC 63000:2018**

Wichtige Hinweise:

Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt KEBA.

Bei einer nicht mit KEBA abgestimmten Änderung des Produkts verliert das Produkt die Konformitätsvermutung.

Die deutschsprachige Teil dieses Dokumentes ist die Originalversion, alle anderssprachigen Teile wurden aus dem Original-Text übersetzt.

Bevollmächtigt für die Zusammenstellung der technischen Unterlagen ist: KEBA Industrial Automation GmbH, Reindlstraße 51, A-4040 Linz.

***Important notes**:*

This declaration of conformity is issued under the sole responsibility of KEBA.

The product loses the presumption of conformity in case of any modification on the product without KEBA's consent.

The German-language part of this document is the original version, all other language parts have been translated from the original text.

Authorised to compile the technical file is: KEBA Industrial Automation GmbH, Reindlstraße 51, A-4040 Linz.

Linz, 2023-11-10
Ort, Datum
Place, Date

Bernhard Lehner
Head of Product Compliance

KeTop_T15x-C15x_KEBA_withoutZT08_dt-en31.docx

© KEBA 2021

16 Appendix: Machinery safety

Guidelines of the European Union

An essential goal of the European Union is the realization of a single European market and thus free trade. This means that quantitative import limitations of goods between the member states are prohibited.

Goods that endanger the safety of persons or the environment are an exemption. Member states can prohibit such products on their country's territory. To ensure free trade for these products, the national safety regulations of the member states are standardized via guidelines set forth by the European Union.

These guidelines apply for a number of product classes, such as for example machines, medical products, as well as toys. However, corresponding guidelines were also developed for additional common safety aspects of products, such as protection against electricity, explosion protection or electro-magnetic compatibility. The guidelines are directed towards member states, who must implement them into the respective national laws. The guidelines therefore have legally binding effects.

With the CE label the manufacturer certifies to have met all obligations of the EC guidelines applicable for the product. The CE symbol, which is affixed to the products by the manufacturer himself, is the "passport" within the EU and intended for the overseeing authorities.

In addition, independent, accredited certification organizations can verify the conformity with the EU guidelines and confirm this with a EU design sample certification.

Both the Electromagnetic Compatibility Directive (EMC 2014/30/EU) and the Machinery Directive (MD 2006/42/EC) are applicable to the handheld terminals.

Machinery Safety

Additional measures must be taken wherever faults arising in the machinery may cause personal injury or significant material damage. These measures must also guarantee a safe operating condition for the whole system in the event of a fault. According to the Machinery Directive (MD) a machine is considered to be "a totality of components or appliances linked together, of which at least one can move". The directive also implies, that " Machinery must be designed and constructed so that it can be operated, adjusted and maintained without putting persons at risk when these operations are carried out under the conditions foreseen".

Although the handheld terminal is not, strictly speaking, a machine, it does, however, perform important tasks to guarantee the safety functions of a machinery to which it is attached.

The handheld terminal has, for example, the "Emergency Stop" safety function and an enabling switch for use in special operating modes. It is, as a result, a “Safety Component" in the sense of the Machinery Directive.

© KEBA 2021

Safety components, or parts whose failure or faulty operation put the safety of people within the hazard area of the machine in danger, fall expressly within the range of application of the Machinery Directive. The fundamental requirements that the Machinery Directive places on the manufacturer are as follows:

- To carry out a hazard and risk analysis
- To comply with the integration of safety principles
- To compile and keep a technical construction file
- To provide solutions in accordance with the latest state of the art
- To recognize conformity by means of harmonized Standards
- To apply CE marking

The same basic requirements apply to safety components. In their particular case, it must be proven that failure or malfunction are not possible, or that malfunction does not lead to a hazardous situation.

16.1 Hazard and risk analysis

The manufacturer of a machine is required to analyze its machine throughout its operating life and in all modes of operation, and to document all hazards that may possibly arise. This has to be done without taking into account possible protection devices.

The next step is to formulate a goal for protection against each identified hazard and subsequently to define one or more protective measures to achieve the protection goal.

Further details about the procedure for carrying out the hazard and risk analysis and lists of commonly occurring hazards can be found in the following Standards:

- EN ISO 12100:2010 "Safety for machinery - General principles for design - Risk assessment and risk reduction "

16.2 Principles for the integration of KeTop

In Appendix I, Chapter 1.1.2 of the Machinery Directive 2006/42/EC there is a clear procedure and sequence for the selection of protective measures:

Eliminating or minimizing the hazards

This takes place at the design stage of the machine. These measures include, for example:

- A reduction in the use of energy (power, revolutions, voltages etc.) as far as this is possible
- The avoidance of unnecessary sharp points or edges
- The avoidance of human errors by means of the ergonomic and logical design of operating devices

KEBA © KEBA 2021

- The avoidance of hazardous materials and commodities

Taking protective measures against hazards that cannot be eliminated

These measures include, for example:

- Separating safeguard (guards, housings, railings)
- Non-separating safeguard (light barrier for hazard elemination)
- Protective control equipment (enabling switches, two-hand controls, speed monitoring etc.)

User information about residual hazards

This last of the three options is used if residual hazards remain after the first two options have been applied. These measures include, for example:

- Warning notices
- Training and organizational measures
- The use of personal protective equipment

16.3 Technical construction file

The technical construction file contains all the documents that are required to prove the safety of the machinery / safety component. These are, for example:

- A complete drawing of the machinery or safety component including control circuit diagrams
- Hazard and risk analysis
- Calculations
- Research and test results
- A list of the basic safety requirements of the Machinery Directive applicable to the machine and a description of the solutions
- Applied Standards
- Operating instructions
- A list of the quality assurance measures in the procedure

The technical construction file must be retained for a minimum of 10 years after the supply of the last product, and must be presented within a period of a few days in the event of a claim for damages.

© KEBA 2021

16.4 State of the art

This means technical possibilities at a certain point of time that are based on certain scientific and technical knowledge. The state of the art also means something that is commercially viable, that is it can be realized by the majority in the industrial sector concerned.

The state of the art is defined as the state of development of advanced procedures, equipment or operating methods, that makes the practical applicability of the measure appear assured overall in respect of the targeted goals (e.g. the goals of protection of work, protection of the environment, safety of third parties and operating efficiency: namely to achieve a generally high level overall in relation to the aspects under consideration).

The state of the art can develop further irrespective of the Standards.

16.5 Recognition of conformity by means of harmonized standards

The European Directives mainly contain general requirements for the safety of products; however they do not contain details of how to carry them out.

The European Standards Institutes are responsible for this. They provide implementation proposals for real safety problems or specific product classes. Standards that are assumed to meet and correctly interpret the requirements of the Directives are known as “Harmonized Standards”. Most of the available Standards, however, are not harmonized.

By applying and implementing harmonized Standards, a manufacturer can claim conformity for the respective product. However, the Standards, in contrast to the Directives, are not legally binding. This means that the manufacturer may also take into consideration other solutions that are not described in the Standards; but these solutions must attain at least the same safety level as the relevant Standards and satisfy the requirements of the appropriate Directives.

16.6 Selection of Performance Level and Safety Categories in accordance with EN ISO 13849-1

The Machinery Directive demands that a fault in control circuit logic, or interference or damage thereto, shall not lead to a hazardous situation.

This general approach is substantiated in EN ISO 13849-1 "Safety of machinery - Safety related parts of control systems", which defines Performance Levels (PL a to e) for control parts that are relevant to safety. The PL depends on the safety category, the $MTTF_D$-value and the degree of coverage of diagnosis (DC_{avg}) of the corresponding safety circuit.

As in the preceding standard EN 954-1, the safety category describes the structure of the safety function. The Performance Level (PL), which describes the conditional probability of failure and the defect discernibility of the safety function, has been added.

KEBA © KEBA 2021

The selection of the PL has to be done by the manufacturer of a machine depending on the real risk potential. The risk potential will be determined from a hazard and risk analysis. In case of hazards that can cause irreversible injury or death usually a Performance Level not less than PL d is required.

The category of the Performance Level determines if

- the system has been built in single circuit technology, which means that a failure will lead to a loss of safety, although the availability of components and parts is high (category 1)
- the system has been built in single circuit technology, which means that a failure will lead to a loss of safety, but the failure will be detected by the system and will be displayed somehow or other (category 2)
- the system has been built in multiple (2) circuit technology and that a fault will not lead to loss of safety (category 3) or
- the system has been built in multiple (2) circuit technology and a buildup of multiple faults will not lead to loss of safety (category 4).

Starting from category 3 it is also important in this context that individual faults are detected in time to avoid a buildup of faults, which may finally lead to loss of safety.

Faults that have to be detected in electric and electronic systems are for example short circuits between multiple circuits, interrupts, short circuits or contacts that are stuck together. Special certified safety control devices are often used to detect faults in the individual safety circuits, which have a certain PL. The PL quoted for these devices is only attained, however, if also the whole machine circuit under review lies within the scope of the respective PL and the PL of all components supporting the safety functions has to be considered. The PL must always be considered in relation to a complete safety function and not as applied to individual components or parts.

A guide for easily calculating the PL for a safety function consisting of several individual components can be found in standard EN ISO 13849-1 chapter 6.3 and appendix H and I.

If safety components are being connected in series, the individual component with the least PL determines the PL of the whole safety function. For example a safety function consisting of 3 components, one with category 4 PL e, another one with category 3 PL d and a third component with category 2 PL c will have a PL c for the whole safety function. This means that a fault will lead to loss of safety, although components with category 4 PL e are integrated into the safety function, as one of the components being used has category 2.

When chaining several PLs the overall PL can decrease. For more information read EN 13849-1 chapter 6.3..

The proof of attainment of a safety category can take place with the aid of an FMEA (Failure Mode and Effects Analysis), in which all the faults that could possibly arise are simulated, either theoretically or in practice, and it is demonstrated that the requirements of the category are fulfilled.

© KEBA 2021

16.7 Application of handheld terminals in special operating modes

For the manual control of machines in special operating modes, where safety depends on the timely reaction of the operating staff, it is absolutely essential that the operator can overlook the operating area. The handheld terminal has the advantage that the operator can get very close to the control panel. At the same time, the danger of misuse increases with mobility since, in remote locations where it is not possible to observe the operating area, machine movements can also be set in motion with the handheld terminal, knowingly or unknowingly. The machine operator, therefore, has to find the right compromise between necessary flexibility and a reasonable limitation of the working range when selecting the corresponding cable length for the handheld terminals. It is not possible for the working range of radio-operated handheld terminals to be limited by means of the cable; therefore additional technical solutions are required for these handheld terminals.

If the machine or equipment is operated with the handheld terminal, care must be taken at this time to ensure that operation can only be controlled by the handheld terminal and cannot be operated from any other point on the equipment. The hazard zone may only be entered by the person who is operating the handheld terminal. If it should be necessary for more than one person to work in the hazard zone at the same time, each person present requires an enabling switch and machinery movement may only be allowed after all the enabling switches have been activated.

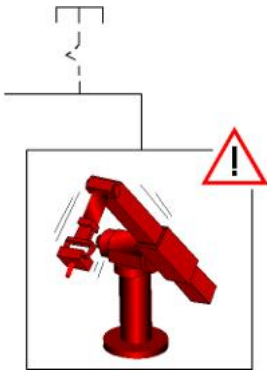
16.8 Information about the emergency stop button

In theory, a perfectly designed machine should not require an emergency stop button, since the Machinery Directive demands that a machine must be safe throughout its lifetime and in all operating modes.

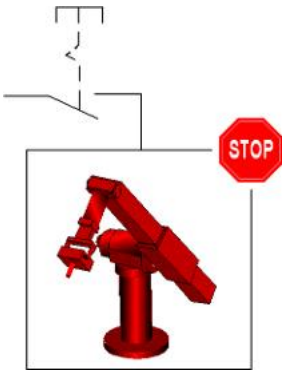
In practice, however, one is aware that unforeseen situations arise, in spite of all precautions. In order to enable fast shutdown of the machine in these cases, or to avert danger, an emergency stop button is provided on most machines.

As can be seen from the following illustration, a machine is permanently in the hazard state from the viewpoint of the emergency stop button, for as long as this is not activated.

KEBA © KEBA 2021



Neutral position (not activated)



Emergency stop button pressed

The emergency stop button may not, therefore, serve as the primary safety device but is provided exclusively to cover any residual risks.

Instead of this and depending on the mode of operation, other methods should be employed as the primary safety device, for example guards, light barriers and two-hand control devices or enabling switches.

When the emergency stop button is activated, the entire machine or all of the machines that are switched together in a plant must be lead to a safe state e.g. by stopping and switching off the power to the endangering drive mechanisms (stop categories 0 or 1 in accordance with EN 60204-1).

The release of the emergency stop button must not cause any uncontrolled restart of the machine.

Irrespective of whether a handheld terminal has an emergency stop button or not, permanently installed, universally identifiable and easily accessible emergency stop buttons must be provided at selected points around the machine in every case.

16.9 Manual control of machines in special operating modes

The machinery directive does not place any detailed requirements on the coloring of the operating elements for stopping in an emergency. The requirement is as follows: "The emergency switch must have easily recognizable, clearly visible and rapidly accessible control devices".

Normally, "emergency stop" buttons are marked red-yellow. The special design has the meaning of a signal and is intended to enable everyone, but especially untrained persons, to quickly recognize the operating element as the device used to eliminate a danger in an emergency.

Therefore, an absolute requirement is that devices marked in this way can be used to initiate a safe state at all times and in any operating mode, without further knowledge of the machine (see also EN ISO 13850). Changing operating readiness of an emergency stop button is not permitted, since this can lead to misuse and life-threatening loss of time in panic situations.

© KEBA 2021

Permanently installed handheld devices: Emergency stop buttons

These are equipped with a cable with which the handheld device is connected with the defined machine. The handheld device is usually connected and disconnected with the machine when the machine is switched off. This happens during the installation or uninstallation process. The handheld devices are not intended to be connected or disconnected during operation of the machine.

In many simple machines, the handheld device is also the only operating option, meaning that the machine cannot be commissioned at all without the handheld device. If the connector is disconnected during machine operation, however, the emergency stop lines are interrupted and the emergency stop function of the machine is activated, causing the machine to stop.

If a handheld device of a machine is uninstalled and not installed again immediately, the device must be locked away in order to avoid mixing it up with a functioning handheld device. The machine can only be recommissioned if a new handheld device is installed. This must be described in the operating instructions of the machine and is the responsibility of the operator. Because connection and disconnection only occur very infrequently, and because the machine is decommissioned in the disconnected state, the risk of accidents due to emergency stop buttons that cannot be operated is considered very low and the application of the red-yellow marking is permitted. The red-yellow emergency stop button must always be wired in the emergency stop circuit of the machine and cause an energy shutdown of the machine or all machines wired together into a system (stop categories 0 or 1 in acc. with EN 60204-1).

Temporary plug-in handheld terminals: Stop button or illuminated emergency stop

Some cabled equipment is provided with a quick-release connector (e.g. bayonet) that makes it possible to plug in and unplug the handheld terminal quickly and ergonomically whilst the machine is in operation. Such handheld terminals are provided for frequent alternation of operation between one or more machines and are needed there on a temporary basis, for commissioning or setting up purposes.

By means of several measures, such as connection box CB310, the emergency stop circuits of the machine are bridged when the handheld terminal is unplugged so that the machine can also continue to run in normal operation without the handheld terminal. Start-up and operation of the machine can then take place using an independent operating device.

These handheld terminals share the same problems as the radio terminals, since due to frequent plugging and unplugging it cannot be ruled out that disconnected handheld terminals with ineffective stop buttons may be left lying or hanging temporarily in a machine shop or factory in the neighborhood of working machines and may be mistaken for functional units in an emergency situation.

KEBA © KEBA 2021

This special case is not clearly treated in the corresponding Standards. However, in the Product Standards for presses (EN 692:2004, EN 693:2001, EN12622:2001, EN 13736:2003) one finds the following clear statement:

"Any disconnectable control station shall not incorporate an emergency stop button if the press can be operated while this controls station is disconnected."

Further Product Standards are currently under review.

In several discussions with external notified bodies and technical committees it was also determined that temporary, plug-in handheld terminals should be treated as radio handheld terminals.

For this reason, temporary plug-in handheld terminals may likewise only be equipped with a grey stop button.

Another permissible measure (EN ISO 13850 Chap. 4.3.8) is a control element which avoids confusion between active and inactive emergency stop devices by changing the color by illuminating the active emergency stop device.

Information

If emergency stop devices are attached to unpluggable or cableless operating stations (e.g. pluggable, portable programming devices), then at least one emergency stop device must always be hardwired to the machine (stationary).

16.10 Information about enabling switches

Many machines have both a normal and special operating modes.

The machine fulfills its primary mission in normal (automatic) operation. In this mode of operation, safety is guaranteed by closed, guards and/or with protective devices.

A machine's special operating modes serve to maintain normal operation. In doing so, safety must be guaranteed in a way that is different to normal operation, since hazardous areas of the machine can now be entered and targeted machine movements have to be possible. The enabling switch plays a primary role here.

This application requires the enabling switch to eliminate the hazards that are to be controlled in a timely manner, before any personal injury occurs. Additional safety measures may be necessary for this purpose, such as safely reducing the speed of drive mechanisms.

In contrast to the emergency stop button respectively the stop button, a machine in special operating mode with an enabling switch is in a safe state as long as this enabling switch is not activated (see illustration).

© KEBA 2021

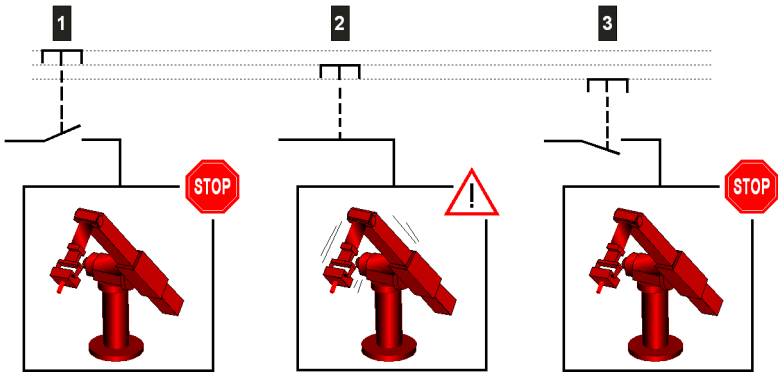


Fig. 16-58: Enabling functions

1 ... "Neutral position" not activated	2 ... "Enabling" pressed
3 ... "Panic" pressed heavily	

The enabling function is also described in EN 60204-1 and corresponds to the state of the art.

The panic position on 3 stage enabling switch was introduced because limbs often become cramped when a person is in a state of shock and as a result is not able to release the enabling switch. For this reason, firmly pushing down on the enabling switch also leads to switch off.

The controller must be designed in such a way that machine movement is not initiated directly when the enabling switch is activated but only as a result of the additional activation of a control button. This may be via the handheld terminal's membrane keyboard or graphical software buttons on the touch screen.

An optionally available joystick can also be used to trigger the machine movement signal.

According to EN 60204, only stop categories 0 or 1 are allowed for the enabling function, i.e. stopping the machine with the enabling switch must always be combined with switching off the power supply to the drive mechanisms.

In order to prevent incorrect, permanent activation of the enabling switch by mechanical fixing devices, it is recommended to limit the maximum duration of an accepted enablement. This must be achieved by means of a controller located downstream to the handheld terminal.

An enabling switch is not a replacement for a two-hand control device, which is specified for some machines (e.g. presses) and must therefore not be confused.

In contrast to the enabling switch, the two-hand control device forces the endangered limbs of the operator into a safe position whilst the machine is in motion.

KEBA © KEBA 2021

17 Appendix: Chemical resistance

The following table shows an overview of the general chemical resistance of the materials used in the KeTop T15x. The list is eventually not exhaustive.

Due to the strong creep characteristics of some substances those can get harmfully into the device and into components. This kond of resistance is not assessed.

The given values refer exclusively to laboratory tests. The used materials are often subjected to influences which can not be detected in laboratory tests (temperature, pressure, humidity, etc). The given values only serves as guideline. In cases of doubt, it is recommended to perform a test.

In the subsequent table the materials are abbreviated as follows:

G/S:	Housing + slot cover
T:	Keyboard
AB:	Hanging bracket
TS:	Touchscreen
H:	Hand strap
NH:	Emergency stop
ZT:	Enabling switch
USB:	USB
AK:	Connection cable

The resistance of the materials are distributed into the following classification:

\+ Good resistance o Limited resistance - Bad resistance

Medium	G/S	T	AB	TS	H	NH	ZT	USB	AK
Acetone CAS no.: 000067-64-1 Concentration: -	o	+	+	+	+	+	+	o	+
Ammonia CAS no.: 001336-21-6 Concentration: 10%	+	+	+	+	+	+	+	+	+
Gasoline CAS no.: 086290-81-5 Concentration: -	+	+	+	+	+	+	+	+	+
Diesel CAS no.: - Concentration: -	+	+	+	+	+	+	+	-	+
Acetic acid CAS no.: 000064-19-7 Concentration: 10%	+	+	+	+	+	+	+	-	+
Ethanol CAS no.: 000064-17-5 Concentration: 95%	+	+	+	+	+	+	+	+	+

© KEBA 2021

Medium	G/S	T	AB	TS	H	NH	ZT	USB	AK
Hydraulic oil (mineral oil-based) CAS no.: - Concentration: -	+	+	+	+	+	+	+	o	+
Potassium hydroxide CAS no.: 001310-58-3 Concentration: 10%	+	+	+	+	+	+	+	o	+
Linseed oil CAS no.: 008001-26-1 Concentration: -	+	o	+	+	+	+	o	o	+
Cutting/Grinding oil CAS no.: - Concentration: -	+	o	+	+	+	+	o	o	+
Methanol CAS no.: 000067-56-1 Concentration: -	+	+	+	+	+	+	+	+	+
Methylbenzene (toluene) CAS no.: 000108-88-3 Concentration: -	+	+	+	+	+	+	o	-	+
Methyl ethyl ketone (butanone) CAS no.: 000078-93-3 Concentration: -	o	o	o	+	+	+	o	-	o
Motor oil CAS no.: - Concentration: -	+	o	+	+	+	+	+	o	+
Sodium hydroxide CAS no.: 001310-73-2 Concentration: 10%	o	-	+	o	+	+	+	+	o
Petroleum ether (light gasoline) CAS no.: 008032-32-4 Concentration: -	+	+	+	+	+	+	+	+	+
Hydrochloric acid CAS no.: 007647-01-0 Concentration: 10%	+	+	+	+	+	-	+	-	o
Grease CAS no.: - Concentration: -	+	o	+	+	+	+	+	+	+
Sulfuric acid CAS no.: 007664-93-9 Concentration: 10%	+	+	+	+	+	+	o	o	+
Silicone oil CAS no.: - Concentration: -	+	+	+	+	+	+	+	+	+
Ethyl alcohol CAS no.: - Concentration: -	+	+	+	+	+	+	+	o	+
Turpentine CAS no.: - Concentration: -	+	+	+	+	+	+	+	-	+

KEBA © KEBA 2021

Index

A
ARM 22

B
Bumper
- Order number 82

C
Cable
- Technical data 118

Communication interface 30
Connection cable
- Installation 30
- Position 23

Connection protocol 56
Control line 30

D
Detail configuration 54
Device Config 46
Device configuration 46
Dimensions 71, 117
- Technical data 118

Directory 56
Display size 69
Drill holes 117

E
Emergency stop button
- Position 22
- Technical data 71

Emergency stop function
- Technical data 103

Enabling control
- Enabling 37
- Panic 37

Enabling switch
- Position 23
- Technical data 71

Environmental conditions
- Technical data 118

Ethernet
- Technical data 103

Ethernet connector
- Position 30

Ethernet interface
- Technical data 70

F
Flash storage medium 45
Font color 54

G
General
- Technical data 118

Graphic configuration 54
Gray stop switch
- Connection 35
- Position 22

© KEBA 2021

H
Handling 23

I
Interfaces
- Technical data 70

K
Key code 57
Keyboard
- Robotic keyboard 26
- Standard keyboard 25

Kink protection 23
KVC
- Connection protocol 56
- Detail configuration 54

L
LED
- Power LED 28
- Status LED 28

M
Mechanical properties 71
- Technical data 118

Membrane keyboard
- Description 25
- Key code 57
- Position 22
- Robotic keyboard 26
- Standard keyboard 25

Micro SD card slot 30
Micro SD interface
- Technical data 70

Mounting bracket 23
Mounting holes 117

O
Options 22

P
Pin strip 30
Power LED 28
Power supply
- Connection 34
- Line 30
- Main plug 30
- Technical data 69, 103

Processor 70
Protection class 69
Protection type 69
Protocol
- KVC 56

R
Report 62
Restart 45
RFID
- Technical data 70

Robotic keyboard
- Description 26

Robotics keypad
- Key code 59

KEBA © KEBA 2021

S

Scan code 57
SCAP module 30
Signals of the operating elements 30
Slot
Connections 30
Position 23
Standard keyboard
Description 25
Key code 57
Starting procedure 45
Start-up 45
Start-up graphics 54
Status LED 28
Status report 62
Stop switch
Connection 35
Position 22
Technical data 71
Strain relief 23

T

TFT display 22
Touchscreen 69
Trageset
Bestellnummer 84
Type plate
Position 23

U

Umgebungsbedingungen 69
USB interface
Technical data 70
USB port 23

V

Variant
ARM 22
x86 22
Version info 52

W

Wall bracket
Order number 78
Weight 71
Technical data 118

X

x86
Description 22
Restart 45

© KEBA 2021

KEBA © KEBA 2021