Operating Manual
KS Robot Offroad

KS Robot 350 Offroad / 400 Offroad / 600 Offroad / 800 Offroad

Model: _____

Machine number: _____

Date manufactured: _____

Manufacturer: K. Schulten GmbH & Co. KG
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CE

Attention!
Please read the operating manual carefully before commissioning.
Please keep the operating manual in a safe place.

Table of Contents

APPENDIX:
- Circuit diagram
- Operating manual battery charger
- UVV [Accident Prevention Regulations] inspection certificate

- Operating manual for the remote control unit *

Preface

Dear Customer!

This operating manual should help you to become familiar with the KS Robot Offroad and to operate it in compliance with its designated use.

The operating manual contains important information about operating the KS Robot Offroad safely, properly and efficiently. Compliance with the manual will help to prevent risks, reduce repair costs and downtime, as well as increase the reliability and service life of the load lift.

In order to take full advantage of your newly acquired KS Robot Offroad, read and follow this operating manual carefully before commissioning the device.

Please make sure that all operators have read this manual before putting the machine into operation. Warranty claims due to operator error will be rejected by us.

The technical specifications, illustrations and dimensions in this manual are not binding. No claims can be derived from them.

We reserve the right to make improvements without changing this manual.

If you have any questions after reading this manual or if you discover any errors while reading it, please contact:

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We wish you much success!

1 General Information

1.1 Introduction

This operating manual is an essential tool for the successful and safe operation of the KS Robot. The operating manual contains important information for the safe, proper, and efficient operation of the KS Robot. Observing the information in this manual helps to prevent risks.

The operating manual must always be available on the KS Robot and must also be read, understood and used by anyone who works on/with the KS Robot. Such work may include:

- Operation and setup
- Troubleshooting, care, and handling of operating materials and supplies
- Servicing (maintenance, inspection, repair)

The KS Robot may only be controlled and operated by trained and instructed personnel who have been authorized to do so by the operating company in writing.
Pay special attention to the safety instructions in chapter 2.
This applies in particular if you only occasionally work with the KS Robot.

Attention!
Risk is avoided when the safety instructions are observed and complied with.

1.2 Information about the user manual

This operating manual describes the installation, operation and maintenance of the KS Robot. Compliance with all specified safety instructions and instructions for use is a prerequisite for safe work and proper handling of the KS Robot.

The operating manual is part of the product and must be kept in the immediate vicinity of the KS Robot for installation, operation, maintenance and cleaning purposes at all times.

In spite of our best efforts, we cannot guarantee the accuracy and completeness of the information in this manual.

Due to the continuous development and improvement of our products, we reserve the right to make changes related to engineering and technology, equipment and design. All descriptions, illustrations, weights and technical data are non-binding and are current as of the date this manual is printed.

The figures are only intended to illustrate certain aspects of the operation and maintenance of the KS Robot. The illustrations may differ in detail.

1.3 Notes regarding copyright and property rights

This operating manual is protected by copyright law. Any rights derived from the copyright, in particular those of translation, reproduction, extraction of illustrations, photo-mechanic or digital data processing remain reserved to the K. Schulten GmbH & Co. KG even if only extracts are used.

1.4 Information for the operating company

The operating manual is an integral part of the KS Robot. Since heavy use of the operating manual is expected at the location where the KS Robot is operated, the operating company is responsible for:

- Keeping the original copy safe
- Ensuring that a copy of the operating manual is always available on the KS Robot
- Making sure that every user reads the operating manual carefully as well as understands and complies with all of the specifications

Only allow instructed and trained personnel to operate the KS Robot. These persons must be authorized to do so by the operating company in writing. Make sure to clearly identify those persons qualified for the maintenance and repair of the device.

In addition to the operating manual and the applicable regulations for accident prevention in the country of use and at the place of use, the recognized technical rules for safe and professional work must also be observed.

The operating manual is intended to supplement the operating instructions and is based on existing national accident prevention and environmental protection regulations, including information on supervisory and

reporting obligations that take into account operational criteria, such as work organization, work processes and personnel.

After one year at most, the UVV test of all moving parts must be carried out by an expert in accordance with the respective national regulations. The test certificate must be documented in writing.

No alterations, attachments or modification to the KS Robot are allowed which could impair the safety of the device without the permission of K. Schulten GmbH & Co. KG. This also applies to the installation, adjustment and alteration of the safety devices and valves, and in particular to the welding of load-bearing components.

Replacement parts must meet the technical requirements specified by the K. Schulten GmbH & Co. KG. This is always guaranteed with the use of original spare parts.

1.5 Service and warranty

The K. Schulten GmbH & Co. KG makes every effort to answer your questions and orders as quickly as possible. We request you to state your name with the return address as well as the machine number of your KS Robot before each inquiry.

During the warranty period the warranty of KS Schulten GmbH & Co. KG for KS Robot covers damages that are demonstrably due to design, material and manufacturing defects, but not to wear parts, such as seals, and the suction discs, etc.

The warranty is 12 months after delivery.
A warranty claim is only accepted in full if:

- The KS Robot is only used as intended
- The inspection and maintenance requirements are strictly followed

In the event there is warranty claim, K. Schulten GmbH & Co. KG will bear the material and assembly costs directly incurred as a result of repairing the damage to KS Robot.
The replacement parts prices and remuneration rates of K. Schulten GmbH & Co. KG shall apply.

In addition, reference is made to the warranty provisions and the general terms and conditions of K. Schulten GmbH & Co. KG.

1.6 Intended use

The KS Robot is a motorized device with a wire connected or radio remote control unit. The KS Robot is used for lifting, lowering and turning loads (e.g. laminated safety glass) as well as for transporting and vitrifying windows and facades. The robot is equipped with an electric wheel drive for smooth, bounce-free, two-stage driving.

1.7 Improper use

The use of KS Robot is prohibited in particular for:

- Transporting and lifting persons
- Increasing the maximum counterweight
- The transport of loads exceeding the maximum permissible load
- The transport of loads which have not been picked up safely by the load handling attachment
- Driving and braking with extended telescopes, both with and without load
- Driving with a load at maximum/fast speed
- The transport of loads exceeding the maximum permissible dimensions
- Moving loads that are stuck
- Dragging loads
- Driving with raised loads

1.8 Obligations of the operating company

The operating company must ensure that:

- The operating manual is read by the operating personnel and that the contents are fully understood.
- The KS Robot is used only as intended and in compliance with the safety regulations of this operating manual.
- The KS Robot is operated, maintained or repaired only by persons who have reached the age of 18, are familiar with the equipment and have been informed of the risks involved.
- The KS Robot is only operated by persons whose mental and physical condition are commensurate to the given task.

1.9 Instructions for operation and use

All users and those working with the KS Robot must be provided with detailed instructions regarding:

- Designated use
- Wearing the necessary personal protective equipment
- Correct use of the controller
- The loading of the load handling attachment and possible restrictions on the arrangement and securing of the load, as well as consideration of the dead weight of the load handling attachment
- Consideration of influences that cause a significant increase in sensitivity to wind attack, environmental conditions such as the maximum wind speed
- Behavior in emergencies

1.10 Instructions for maintenance and inspection

- The maintenance and inspection tasks specified in the operating instructions as well as the dates including information on the replacement of parts and equipment components must be observed.
- Maintenance and inspection tasks may only be carried out when the system is switched off. The switch-on and switch-off procedures must be observed in accordance with the operating instructions. Deviations from this are only allowed if the work cannot be carried out without drive power.
- After maintenance work, any previously removed safety devices must be reinstalled properly.
- Repairs that are not described in this operating manual must be carried out by a specialist workshop authorized by the K. Schulten GmbH & Co. KG.

2 Safety

2.1 Information and symbols

In this manual, the following terms or symbols are used for safety instructions and in particular for important information:

	**Danger!** You will find this "Danger!" symbol in all safety instructions in this operating manual which represent imminent danger to the life and limb of persons.
	**Warning!** You will find this "Warning!" symbol in all safety instructions in this operating manual which represent potential danger to the life and limb of persons.
	**Caution!** This "Caution!" symbol can be found in all safety instructions in this manual, which include the risk of minor or non-serious injuries as well as the risk of property damage to the KS Robot or its surrounding area.
	**Note!** This "Information!" symbol indicates special circumstances, the observance of which ensures the safe, proper and efficient handling of the device. All instructions assume that the device is used as intended.
• -	• Bullet points identify working and / or operating steps. The steps must be performed in order from top to bottom. - Indentation marks are used to indicate listings.

2.2 General information on safety

- The KS Robot may only be used by persons who have reached the age of 18, have been properly instructed in handling the device and are assigned specifically to use it.
- The operator may only start to move a load after he is certain that the load is securely fastened and that no persons are in the danger zone!
- Installation, maintenance or independent operation may only be entrusted to persons who are familiar with the corresponding procedure. You must be assigned by the contractor to set up, maintain or operate the device!
- The operator must be familiar with the relevant accident prevention regulations and the operating manual and have been instructed accordingly!
- If repairs are necessary, they must be reported immediately and carried out by qualified personnel!
- Only original spare parts from K. Schulten GmbH Co. KG may be used.

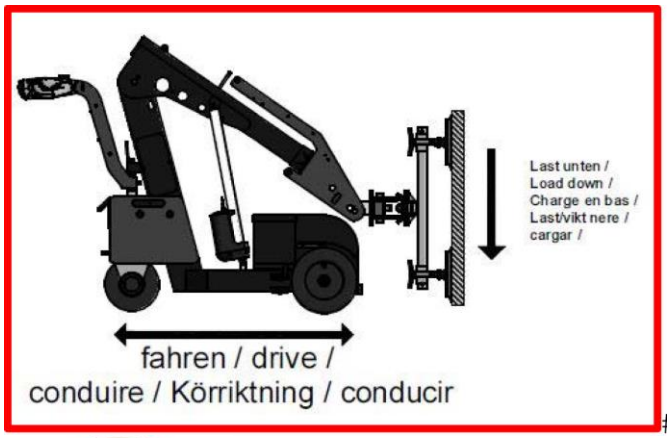
2.3 Safety information

- Always wear the prescribed protective equipment, such as safety shoes, safety helmet and protective goggles, especially when working with glass.
- Keep loose clothing, parts of clothing, jewelry, hair, etc. away from moving parts.
- Do not use the machine for transporting people or climbing.
  Do not stand on the parts intended for the transport of cargo (e.g. fork or similar). Do not climb onto the chassis or other components.

- No person may be present in the working area (danger zone) of the KS Robot.
  If a person enters the danger zone, immediately stop every movement of the KS Robot and direct the person to leave the area.
- Before extending the cylinders, make sure there are no objects in the movement range of the cylinders.
- Use on public roads is prohibited.
- When lifting and transporting loads across public areas, these areas must be cordoned off. If the work area cannot be cordoned off properly, then additional personnel must be positioned to secure the work area.
- Protect the KS Robot from becoming soiled. The device may not be exposed to snow or rain.

Danger!

Danger of tipping



- Loads may only be transported when the telescopes are retracted, and the load is lowered.
  Failure to comply may result in the device tipping over.

- The wind force must be taken into consideration when loading or unloading and driving to the installation site. The KS Robot may not be operated at wind forces greater than 5 (8.0 - 10.7 m/s).

- The KS Robot must be set up and operated on a horizontal, solid and stable surface. Make sure that all tires and the rollers on the safety supports are in firm contact with the ground.

- Lifting and lowering of the load is only allowed vertically up and down. Do not pull the load sideways, forwards or backwards. Do not use baffles or similar tools.

- Do not attach ladders or climb on them.
- Do not exceed the permissible load capacity of the KS Robot.
  Make sure to observe the load diagram.
- Adjust the driving speed to the local conditions, as well as the load being transported.

Danger!

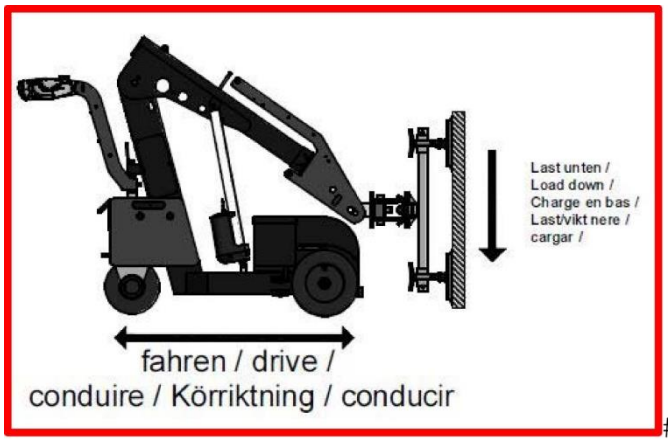
Danger of crushing

- Only lift the load after it is properly fixed, centered and secured.
- Never walk under loads while they are suspended. The operator must also make sure that no persons are standing in this area.

- Keep hands and fingers away from any parts where there is danger of crushing.

Danger!

Danger of slipping and tipping over on slopes



When driving on sloping terrain, there is a risk that the KS Robot may slip or tip over. This risk increases significantly in the event of abrupt braking or acceleration, cornering or crossing of the slope.

- Only drive on paths that are adequately paved. Make sure that the telescopes are retracted.
- Slopes may only be traveled on when there is no load.
- Do not drive the KS Robot over sloping or rising terrain that is out of the performance range of the machine. (See technical data)
- Only drive on slopes/inclines at reduced speed, with increased caution and with the load lowered.
- When driving on a slope/incline do not turn or drive diagonally.
- NEVER park the KS Robot unattended facing downhill.
  Should the KS Robot nevertheless be parked on a slope, it must be secured with chocks under the wheels.

Danger!

Danger of collision

- Avoid collision with people, stationary structures or moving objects. (e.g. vehicles, cranes etc.)
- The maximum dimensions of the load must not be exceeded.
- Make sure to observe the device dimensions at all times.
- Check the working area and the driving area for obstacles, even in areas above the device (overhead position).

Danger!

Danger of electrocution

- Touching live electrical overhead lines can have fatal consequences. Danger due to high-voltage power lines! (For example, in the case of power lines over 1000 volts, current may pass at a distance of less than one meter.)
- Never drive over power cables that are lying on the ground. This may damage the cables.

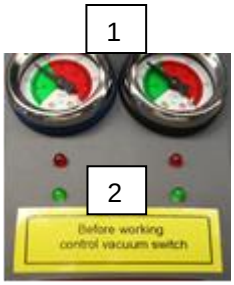
Danger!

Danger of injury from batteries

- Danger of explosion in the vicinity of the battery chargers.
- Open the battery cover with extreme caution.
- Touching bare metal parts is prohibited.
- Open fire and sources of ignition should be kept away from the battery.
- Never charge a frozen battery.
- Maintenance work on the battery should only be carried out by qualified personnel.
- Always first disconnect the negative pole then the plus pole.
  When connecting, proceed in reverse order. Touching live electrical overhead lines can have fatal consequences. Danger due to high-voltage power lines! (For example, in the case of power lines over 1000 volts, current may pass at a distance of less than one meter.)

Danger!

Risk of injury when working with vacuum pressure



- Work on the machine is dangerous if the various safety devices (1) (pressure gauge and signal transmitter) are defective.
- The lifting of workpieces is prohibited until the two light signals (2) go out.
- Damp and sticky workpieces should not be lifted with the suction discs. Workpieces with uneven and structured surfaces may not be lifted.
- Make sure that the air hoses are not bent when turning and tilting the suction system.

Danger!

Danger due to a damaged device

- Never operate a KS Robot device if it is damaged or if the KS Robot not functioning at 100% after inspection.
- If repairs are necessary, they must be carried out immediately by qualified personnel.

Warning!

Risk of injury due to improper repair work!

- Only carry out work on the KS Robot that is specifically mentioned in this operating manual. Improper inspection, maintenance and repair work may result in personal injury or property damage, either directly or as a consequence thereof.
- Comply with all inspection and maintenance information in this manual. If in doubt, always consult with the appropriate professionals.

Warning!

Risk of injury due to improper loading!

- All electronics must be disconnected at the main switch prior to transport.
- Only transport the KS Robot when in transport position, with the telescopes retracted and when there is no load.
- The KS Robot must be carefully secured in the truck/trailer during transport and protected against rain and snow.
- Always lift the KS Robot by lifting lugs intended for this purpose. NEVER lift the KS Robot with straps or forks.

Warning!

Danger to life due to hydraulic energy!

- Work on the hydraulic system may only be carried out by qualified personnel.
- Repair work that is not described in this operating manual must be carried out by an authorized specialist workshop.
- Always check the hydraulic system, especially the piping and hoses. Make sure that damaged and worn parts are replaced immediately. The replaced hoses must meet the technical requirements of the manufacturer.
  Hydraulic hoses must not be used for more than 6 years (including a maximum storage period of 2 years).
  Always have a qualified person inspect the hoses before commissioning and then at least once a year to make sure they are in proper working condition.
- When checking for leaks (leakage), make sure to take appropriate protective measures (wear protective goggles, gloves, protective clothing, etc.) due to the risk of injury.
- The hydraulic system must be completely free of pressure before working on it.
- If allowed to escape, high pressure hydraulic oil can cause serious injuries. Seek immediate medical attention in case of injury.

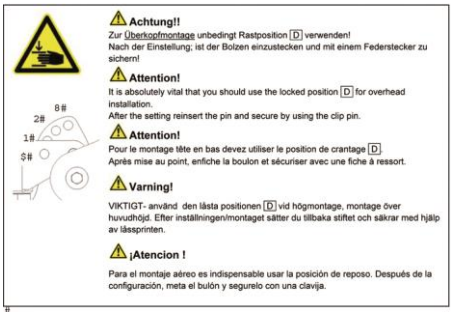
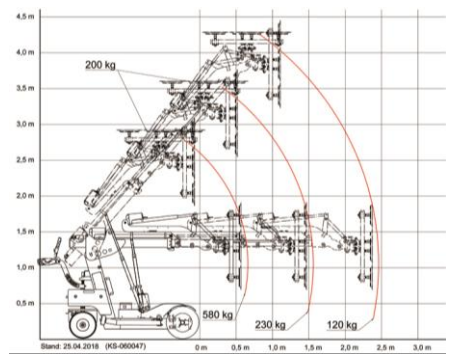
Caution!

Danger during operation of the device!

- Taking drugs or medicine and consuming alcohol will negatively affect responsiveness and interfere with the ability to drive the KS Robot. Persons under the influence of the aforementioned substances may not carry out any work with or on the KS Robot.
- Wearing headphones to listen to music and the use of mobile phones (cell phone), affects concentration, impairs acoustical perception and therefore increases the risk of accidents at work. Therefore, the wearing or the use of such devices while working is prohibited.

2.4 Symbol and hazard symbol descriptions

The symbols used in this manual and on the machine identify the following hazards and provide the following information:

	Warning of general danger zones		Read the operating manual
	Warning of hand injury (crushing danger)		Lifting point
	Do not stand under suspended loads		Check annual UVV expert inspection sticker
	Riding along is prohibited		Entering the area is prohibited
	Driving only with the load lowered		
	Type plate		
	Rotating joint / overhead mounting		
	Load diagram	Not-Halt / Emergency Stop / Nödstopp / parada de emergencia / arrêt d'urgence	Emergency stop switch on remote control unit

Information and symbols attached directly to the KS Robot, such as warning signs, operating signs, or similar. must be strictly observed. This information and these symbols may not be removed and must be kept in legible condition or replaced.

2.5 Protective devices

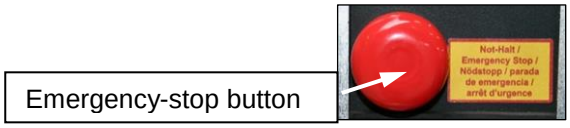
The KS Robot is equipped with protective devices to ensure that it does not endanger the safety and health of the operator or third parties.
The unauthorized removal or bypassing of the protective devices is a criminal offense.
All liability claims will be forfeited in the event of consequential damage.

Danger!

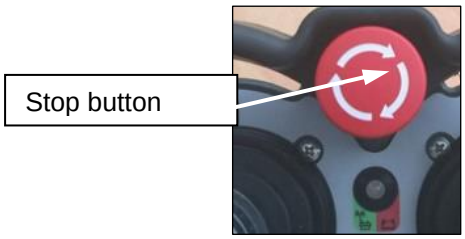
Maintenance work and settings on the protective devices should only be carried out by qualified personnel.

Emergency stop switch

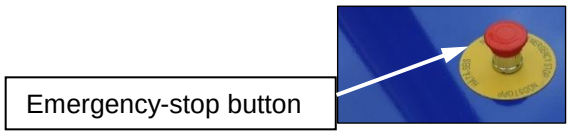
- For the electrically controlled models there is an emergency stop button on the remote control unit that switches off all functions when pressed.



- For the hydraulically controlled models there is a red stop button on the remote control unit that switches off all cylinder movements when pressed.



- For the hydraulically controlled models there is also an emergency stop button on the housing that switches off all functions as well as the travel drive when pressed.



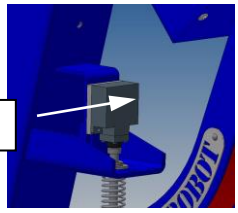
Signal light

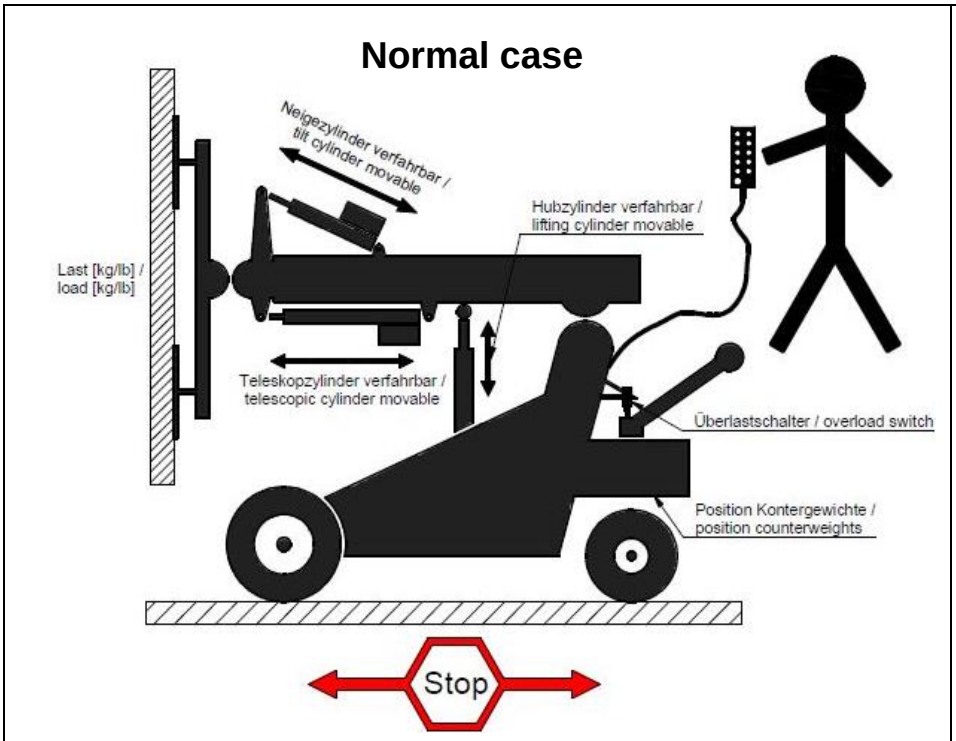
- As special equipment on customer request, the KS Robot is equipped with a signal light.
  This may indicate, for example, vacuum loss and/or overload.

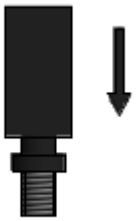
Circuit breaker

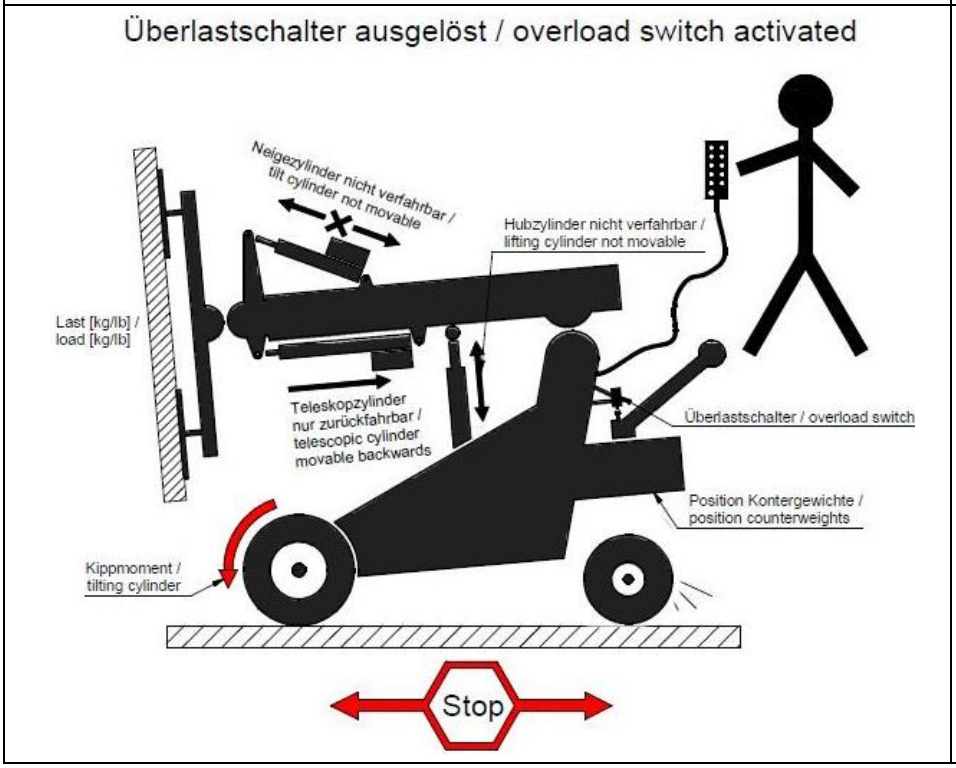
- There is an overload switch on the rotating drive joint. This is triggered if the load capacity is exceeded. Then all stroke motion is stopped except for the retraction of the telescopic cylinder.

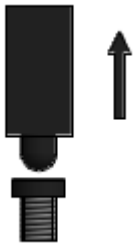
Circuit breaker











The tilting torque is greater than the static torque →

This trips the overload switch, which prevents the load from tilting or the rear wheel from lifting off the ground.

2.6 Regular safety inspections

The operator must ensure that the KS Robot is inspected by a qualified person at least once a year or after special occurrences.
A complete inspection of the technical condition of the KS Robot with respect to accident safety must be carried out at this time. In addition, the KS Robot must be thoroughly inspected for damage that may be caused by improper use. A test protocol must be created. A minimum of two successive test results must be maintained.

- The test date is indicated by a sticker on the KS Robot.

3 Product Description

The KS Robot Offroad is an electric motor-powered glazing device. The servomotors are controlled by the electric motor on the models KS Robot 350 to 600, whereas in the case of the KS Robot 800 they are electro-hydraulically controlled due to the higher payloads. Depending on the version, the KS Robot can handle payloads up to a max. of 350 kg, 400 kg, 600 kg or 800 kg.
Due to the wide, deep-tread tires with differential drive, the KS Robot Offroad is also suitable for rough terrain.
The vacuum suction system can be rotated and telescoped forward.
A synchronous control system ensures a constant angle of inclination when lifting and lowering the load.
The front axle can be adjusted laterally for exact positioning during assembly work.
All vacuum suction systems are battery operated and for safety reasons have two separate vacuum circuits and two independently operating pumps.
A 24V socket is located on the KS Robot, e.g. to connect battery chargers/power screwdrivers or LED spotlights. With the electric wheel drive continuous (shift-free) driving (forward/backward) with load is possible. The speed is adjustable in two positions.

Standard version:

An articulated joint allows lateral swiveling of the load to pass through narrow doors, as well as manual turning of the load, e.g. for insertion of glass panes into the window reveal. Here, working from vertical to horizontal or from vertical to overhead position is realized manually by a locking pin adjustment.
All movements such as lifting, tilting, telescoping and moving sideways are controlled by a wired remote control unit. A radio remote control unit is also available.

Electrical turning and swiveling:

Depending on the equipment, the rotational movement of the vacuum suction system or alternatively the lateral swiveling can be carried out electrically.

Equipment with HDS module:

When equipping the KS Robot 800 with an HDS module, the turning, swiveling and tilting movement is carried out in all directions electro-hydraulically through activation via the remote control unit.

3.1 Options

- Special rotary articulated joint (**SDKG**) for electrical swiveling from the horizontal to the overhead position. (Attention! Additional projection approx. 170 mm)
- Vacuum suction system with electrical rotary cylinder
- Electrical swivel unit allows lateral swiveling up to + / - 90°
- Hydraulic rotary and swivel head (**HDS module**)
  Equipment of the KS Robot 800 Offroad with a special head for hydraulic turning (270°) and swiveling (90° to the left and right) of the vacuum suction system
- Mechanical telescopic extension
  (allows manual telescopic extension in 5 stages by approx. 900 mm of additional projection)
- Electrically controlled telescopic extension (allows continuously variable extension) on models KS Robot 400 Offroad and KS Robot 600 Offroad
- Electro-hydraulic telescopic extension (allows continuously variable extension) on the KS Robot 800 Offroad
- Remote control unit

3.2 Accessories and transport units

By default, the KS Robot is equipped with a vacuum suction unit when delivered.
In addition, the following transport units are available:

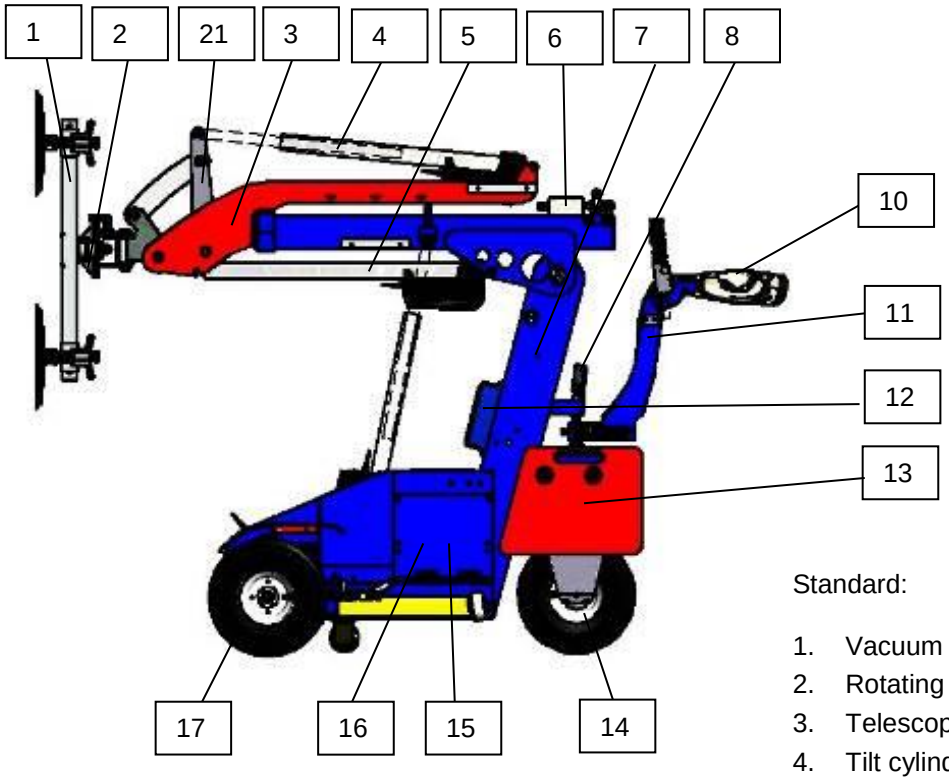
- Load hook
- Load fork
- Special solutions (e.g. additional arm, door holder, special gripper, etc.)

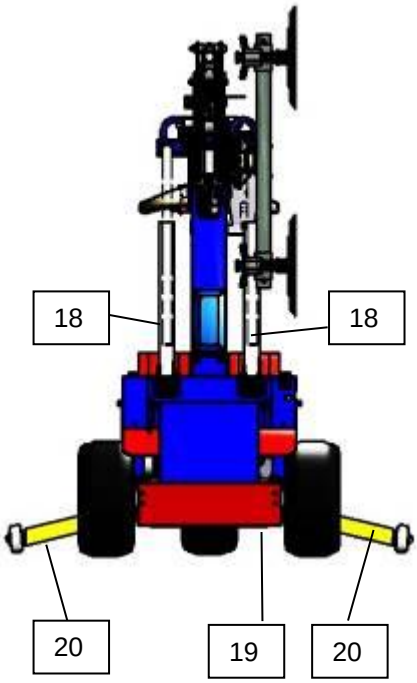
For the off-road series there are a variety of accessories but differ depending on the device type, for example:

- Spare wheels (solid rubber)
- LED lighting
- Quick-release closures as vacuum discs
- Loading ramp
- Cover hood

3.3 Overview

3.3.1 KS Robot 350 Offroad

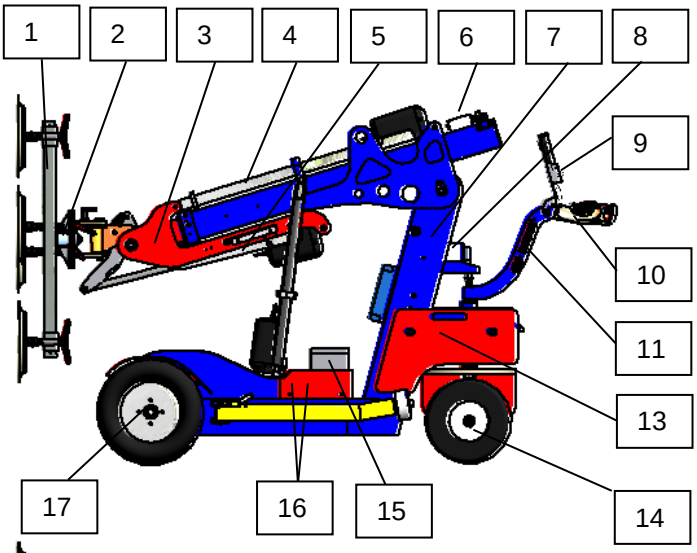


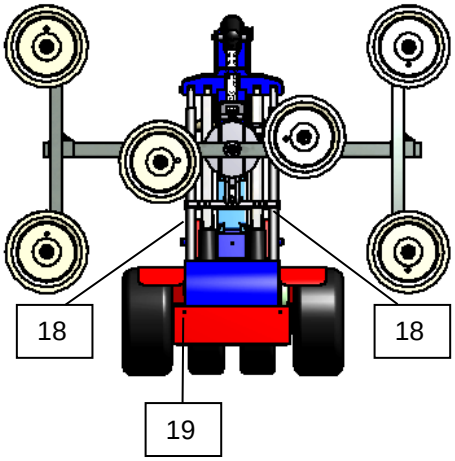


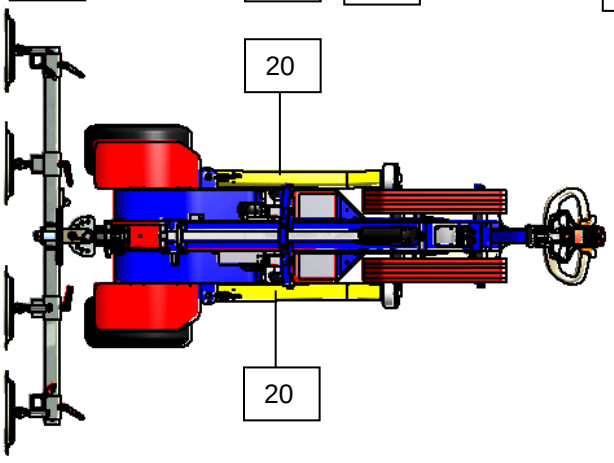
Standard:

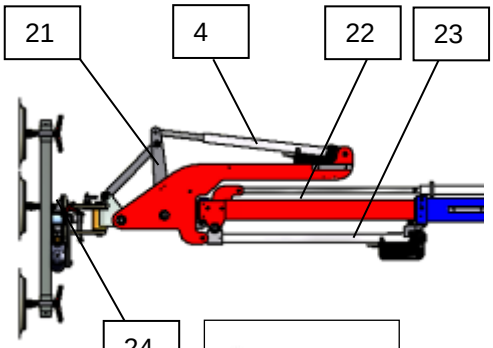
1. Vacuum suction system
2. Rotating joint
3. Telescopic boom 1
4. Tilt cylinder
5. Telescopic cylinder
6. Vacuum switch unit
7. Base chassis frame
8. Circuit breaker
9. Remote control unit
10. Handlebar with control button
11. Tiller head
12. Battery charger
13. Counterweights
14. Steering axle
15. Switchbox
16. Batteries
17. Drive wheels
18. Lifting cylinder
19. Lateral thrust cylinder
20. Safety supports
21. Special rotary articulated joint (SDKG)

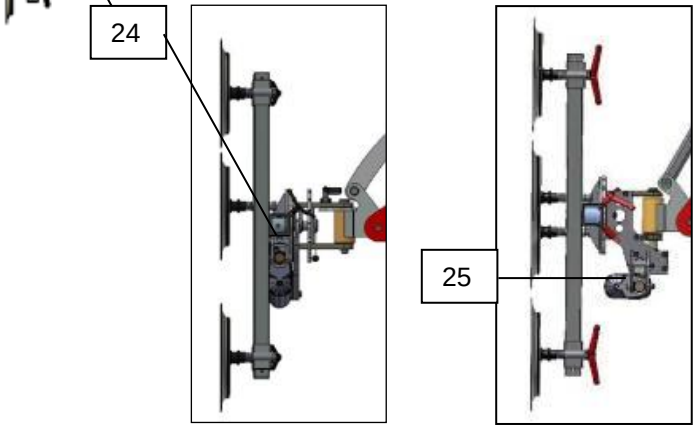
3.3.2 KS Robot 400/600 Offroad











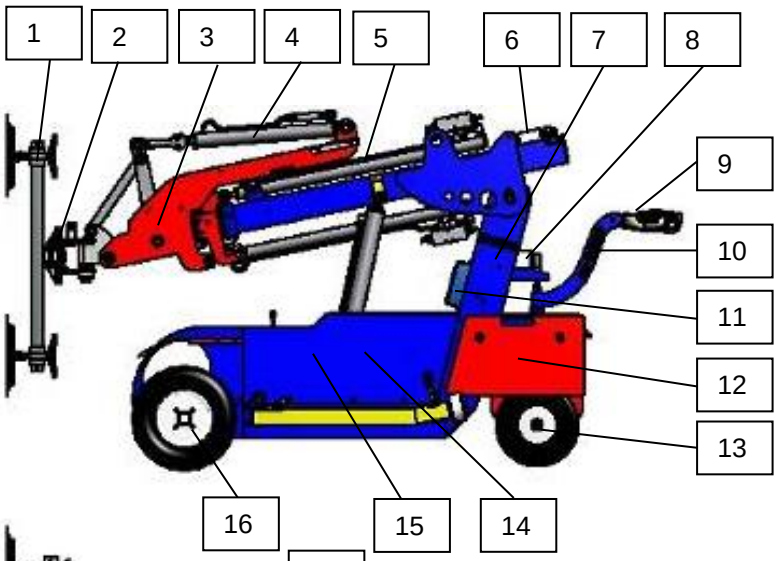
Standard:

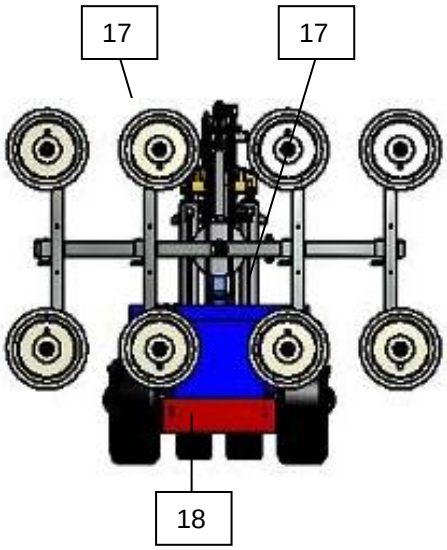
1. Vacuum suction system
2. Rotating joint
3. Telescopic boom 1
4. Telescopic cylinder
5. Tilt cylinder
6. Vacuum switch unit
7. Base chassis frame
8. Circuit breaker
9. Remote control unit
10. Handlebar with control button
11. Tiller head
12. Battery charger
13. Counterweights
14. Steering axle
15. Switchbox
16. Batteries
17. Drive wheels
18. Lifting cylinder
19. Lateral thrust cylinder
20. Safety supports

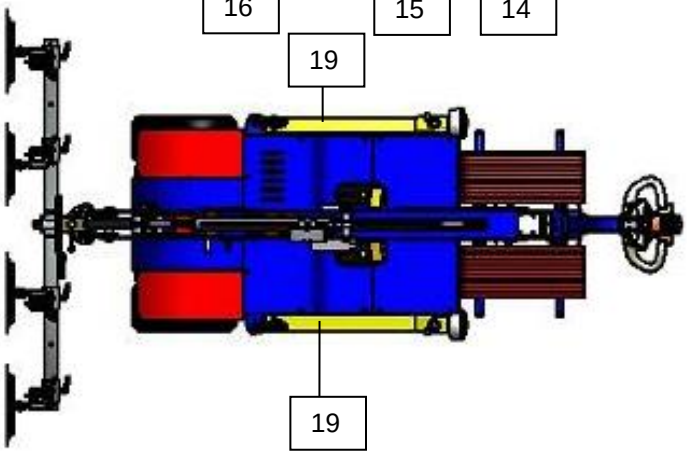
Options:

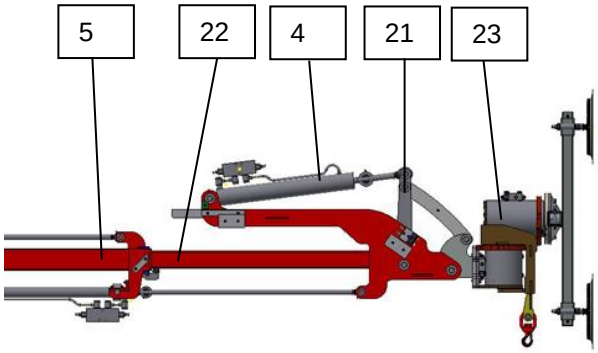
21. Special rotary articulated joint (SDKG)
22. Telescopic boom 2
23. Telescopic cylinder 2
24. Rotary cylinder for suction unit
25. Swivel cylinder (-90° sideways)

3.3.3 KS Robot 800 Offroad









Standard:

1. Vacuum suction system
2. Rotating joint
3. Telescopic boom 1
4. Tilt cylinder
5. Telescopic cylinder
6. Vacuum switch unit
7. Base chassis frame
8. Circuit breaker
9. Handlebar with control button
10. Tiller head
11. Battery charger
12. Counterweights
13. Steering axle
14. Hydraulic unit
15. Batteries
16. Drive wheels
17. Lifting cylinder
18. Lateral thrust cylinder
19. Safety supports

Options:

20. Special rotary articulated joint (SDKG)
21. Telescopic boom 2
22. Telescopic cylinder 2
23. HDS-module: hydraulic rotary and swivel head

3.4 Technical data

3.4.1 KS Robot 350 Offroad

		SDKG (Standard)	
Max. load capacity		350 kg	
Total weight [1] (including counterweights and suction unit)	approx.	530 kg	
Counterweights		4 x 26 kg and 6 x 17 kg	
Dead weight suction crossbar [1]:	approx.	25 kg	
Ambient temperature		0°C to +50°C	
Boom angle		125°	
Max. permissible slope		16°	
Cross feed		100 mm	
Transport dimensions [1]			
Width	approx.	775 mm	
Length	approx.	1600 mm	
Height	approx.	1410 mm	
Tires		Air pressure (bar)	Part No.
Front	410 x 170	3.5 bar	11021958
Rear	320 x 160	3.5 bar	11022474
Electrical system			
Drive		24 V	11022432
Electrical cylinders		Stroke	
Lifting cylinder 2 x		500 mm	11008095
Telescopic cylinder		600 mm	11008176
Tilt cylinder	with SDKG	500 mm	11008095
Cross feed		100 mm	11008093
Vacuum pumps			
2 x		24V DC	11008131
Vacuum suction system (standard)			
Suction disc		4 x d = 300 mm	11008156

[1] Due to manufacturing tolerances and continuous product improvement, weight and dimensional deviations may occur.

* Optional
SDKG (special rotary articulated joint)
d (diameter)
DC (direct current)

3.4.2 KS Robot 400 Offroad

			Standard	SDKG	Man. DH	Elec. DH
Max. load capacity			400 kg			
Total weight [1] (including counterweights and suction unit)		approx.	825 kg	835 kg	940 kg	900 kg
Counterweights			12 x 23 kg	14 x 23 kg		
Dead weight suction crossbar [1]:		approx.	40 kg			
Ambient temperature			0°C to +50°C			
Boom angle			125°			
Max. permissible slope			10°			
Cross feed			100 mm			
Transport dimensions without vacuum suction unit [1]						
Width		approx.	840 mm			
Length		approx.	2400 mm			
Height		approx.	1535 mm			
Tires			Air pressure (bar)	Part No.		
Front	* DH = PU filled	410 x 170	3.5 bar	11011072	11020469	
Rear		360 x 150	3.5 bar	11019210		
Electrical system						
Drive			24 V	11018514		
Electrical cylinders			Stroke			
Lifting cylinder 2 x			600 mm	11008176		
Telescopic cylinder			900 mm	11018535		
Tilt cylinder	Standard		400 mm	11008177		
	with SDKG		500 mm	11008095		
Cross feed			100 mm	11008153		
Vacuum pumps						
2 x			24V DC	11008130		
Vacuum suction system (standard)						
Suction disc			4 x d = 350 mm	11018538		
Rotary cylinder * (electrical turning)			Stroke 200 mm	11018229		

[1] Due to manufacturing tolerances and continuous product improvement, weight and dimensional deviations may occur.

* Optional
DH (telescope extension)
SDKG (special rotary articulated joint)
d (diameter)
DC (direct current)

3.4.3 KS Robot 600 Offroad

			Standard	SDKG *	Man. DH *	Elec. DH
Max. load capacity			600 kg			
Total weight [1] (including counterweights and suction unit)		approx.	865 kg	870 kg	900 kg	900 kg
Counterweights			12 x 23 kg	14 x 23 kg		
Dead weight suction crossbar [1]:			50 kg			
Ambient temperature			0°C to +50°C			
Boom angle			125°			
Max. permissible slope			10°			
Cross feed			100 mm			
Transport dimensions without vacuum suction unit [1]						
Width		approx.	940 mm			
Length		approx.	2500 mm			
Height		approx.	1530 mm			
Tires			Air pressure (bar)	Part No.		
Front	* DH = PU filled	450 x 210	3.5 bar	11011074	11020470	
Rear		360 x 150	3.5 bar	11019210		
Electrical system						
Drive			24 V	11018514		
Electrical cylinders			Stroke			
Lifting cylinder 2 x			600 mm	11008176		
Telescopic cylinder			900 mm	11018535		
Tilt cylinder		Standard	400 mm	11008177		
		with SDKG	500 mm	11008095		
Cross feed			100 mm	11008153		
Vacuum pumps						
2 x			24V DC	11008130		
Vacuum suction system (standard)						
Suction disc			6 x d = 350 mm	11018538		

Special version with electrical rotary cylinder *		
Max. load capacity	580 kg	
Total weight cpl. [1] (including counterweights and suction unit) approx.	with man. DH 935 kg	with electr. DH 970 kg
Counterweights	14 x 23 kg	
		Part No.
Rotary cylinder * (electrical turning)	Stroke 200 mm	11018229

[1] Due to manufacturing tolerances and continuous product improvement, weight and dimensional deviations may occur.

* Optional DH = (telescope extension) SDKG = (special rotary articulated joint) d = (diameter) DC = (DC)

3.4.4 KS Robot 800 Offroad

		Standard	Hydr. DH *	HDS *
Max. load capacity		800 kg		
Load capacity when swiveled to the side	max.	400 kg		
Total weight [1] (including counterweights and suction unit)	approx.		1340 kg	1525 kg
Counterweights			16 x 23 kg	12 x 23 kg / 6 x 30 kg
Ambient temperature		0°C - +50°C		
Boom angle		120°		
Max. permissible slope		14°		
Cross feed		100 mm		
Transport dimensions without vacuum suction unit [1]				
Width	approx.		1000 mm	1000 mm
Length	approx.		2700 mm	2900 mm
Height	approx.		1600 mm	1600 mm
Tires		Air pressure (bar)		Part No.
Front	450 x 215	5.5 bar		11020401
Rear	360 x 150	foamed		11019210
Electrical system				
Drive		24V / 2000W		11020327
Hydraulic system				
Operating pressure:	Max.	150 bar		
Oil tank capacity		8 liters		
Hydraulic oil type (Oils from different manufacturers may not be mixed together)		BP HLP-D46		
Hydraulic cylinders		Stroke		Part No.
Lifting cylinder 2 x		600 mm		11019767
Telescopic cylinder 2x		1000 mm		11019769
Tilt cylinder		500 mm		11019770
Cross feed		100 mm		11019768
HDS *				
Hydraulic swivel motor		180 °		11001083
		270 °		11020392
Vacuum pumps				
2 x		24V DC		11008130
Vacuum suction system (standard)				
Suction disc		8 x d = 350 mm		11018538

[1] Due to manufacturing tolerances and continuous product improvement, weight and dimensional deviations may occur.
* Optional
DH = (telescopic extension) d = (diameter) HDS = (hydraulic rotary and swivel head
DC = (direct current)

3.5 Noise emission values

The maximum measured emission sound pressure level is 76 dB (A) when the vacuum suction unit is actuated.

4 Delivery / Transport / Storage

The KS Robot is delivered by K. Schulten GmbH & Co. KG or by an authorized forwarding agent.

4.1 Transport of the KS Robot

The KS Robot can be transported on a truck. Depending on the circumstances, it can be loaded on a truck or trailer with a crane or driven onto the same truck or trailer.

Warning!

Incorrect handling during transport of the KS Robot can result in considerable personal injury and property damage!

- Transport may only be carried out by properly qualified and instructed personnel and in compliance with all safety instructions.
- The means of transport must have sufficient load-bearing capacity (see technical data, type plate).
- All electronics must be disconnected at the main switch prior to transport.
- The KS Robot must be carefully secured in the truck/trailer during transport and protected against rain and snow.
- Never transport the KS Robot when it is carrying a load.
- Make sure that the counterweights are adequately secured!
- Always transport the KS Robot in the transport position, i.e. with the cylinders retracted and the suction unit tilted sideways.

4.1.1 Lifting and lashing

Warning!

- The KS Robot may only be lifted and secured by properly qualified and instructed personnel.
- Remove loose materials or objects from the machine.
- Make sure that the counterweights are adequately secured!
- Only lift the KS Robot on the designated lifting points.
- Always use suitable slings.
  NEVER lift the KS Robot with straps, forks, or directly with ropes or hoisting belts.
- Place the slings so that damage to the machine is avoided.
- Make sure that the horizontal position of the machine is maintained.

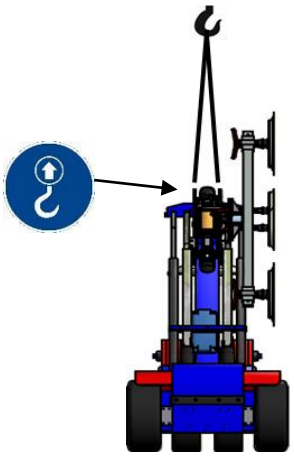
The following points are provided for lifting and lashing the KS robot:

Lifting points:

KS Robot 350 Offroad

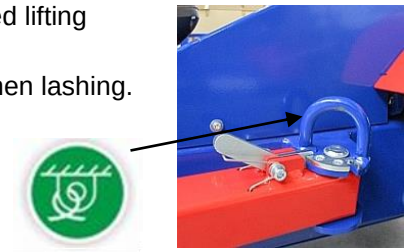
KS Robot 400/600 Offroad

KS Robot 800 Offroad



Lashing points:

- The KS Robot has lashing points on both sides in addition to the identified lifting points on the support feet.
- Make sure that the distances and lengths of the lashing are adequate when lashing.



4.1.2 Driving onto a transport vehicle

If necessary, the KS Robot can also be driven via a loading ramp onto a van, truck or trailer.

Warning!

- The KS Robot may only be loaded by properly qualified and instructed personnel.
- Remove loose materials or objects from the machine.
- Make sure that the counterweights are adequately secured!
- The KS Robot may NEVER be transported when it is carrying a load.
- When driving on slopes, the angle of incline may not be exceeded. (See technical data.)
- When driving on the transport vehicle always extend the support feet.

4.2 Storage

The KS Robot must be stored in a clean and dry place. If possible, use protective covers to protect the vacuum suction discs on the vacuum suction unit from dust.

Secure the KS Robot against unauthorized use by removing the main switch key and the cable / radio remote control unit when you park it for extended periods of time on the construction site.

Protect the KS Robot from soiling, moisture and damage with a suitable cover. We recommend covering the KS Robot with a hood or tarpaulin during extended periods of storage.

5 Commissioning

5.1 Attaching lifting gear

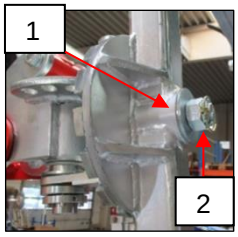
First attach the load handling unit to the KS Robot.

By default, the KS Robot is equipped with a vacuum suction unit when delivered.

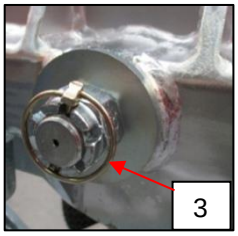
Additional transport units, such as load hooks, a fork or special solutions are available as options.
These have the same mounting as described below (points 1 to 2).

Procedure:

1. Place the load handling unit (e.g. vacuum suction unit) with the included washer (1) on the mounting of the KS Robot rotating assembly. Screw to the mounting with the nut (2).

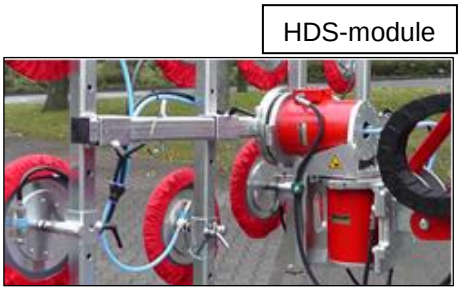


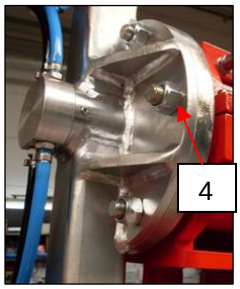
2. Then secure the nut with the linch pin (3) against twisting.



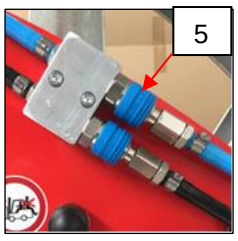
When equipped with HDS module (hydraulic rotary swivel unit)

3. The load handling unit (e.g. vacuum suction unit) is mounted on the rotating assembly with 6 threaded bolts (4). First loosen the 6 nuts, place the load handling unit on the mounting and then secure the load handling unit by screwing the nuts back on.



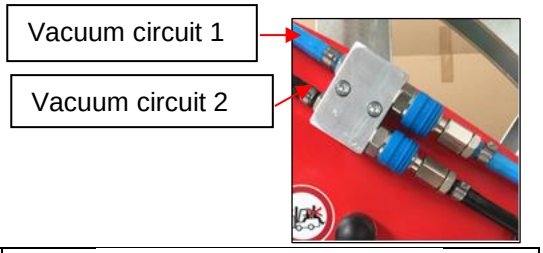


4. Now connect the two vacuum hoses of the suction unit via the quick couplings (5) to the telescopic boom of the KS Robot vacuum system.



5. When installing a vacuum suction unit, make sure that the vacuum hoses are connected to the same vacuum circuit.

Vacuum circuit 1 = blue hose lines
Vacuum circuit 2 = black hose lines



Note!
The suction discs are evenly arranged on the vacuum suction unit in the two-circuit system. (Suction disc arrangement see 11.7.2)

Please observe the respective vacuum plan of your vacuum suction unit.

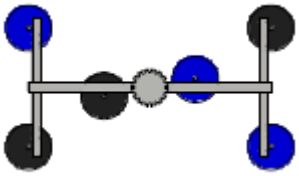


Fig. shows a 6-piece vacuum suction unit

If equipped with electrical turning unit or electrical swivel unit (90° laterally):

Fig. shows electrical rotary cylinder

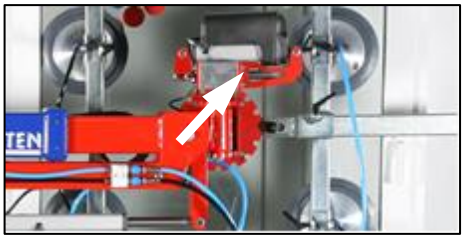


Fig. shows electrical swivel cylinder

1. First, proceed as described above. (Point 1 to 3)
2. In addition, the rotary or swivel cylinder must be electrically connected.

   Connect the plug with the handle of the cylinder to the connector on the telescopic boom.

5.2 Switching on and off

The KS Robot is switched on and off via the battery main switch.

KS Robot 350/400/600 Offroad

KS Robot 800 Offroad

The KS Robot is equipped with a battery monitoring system to protect the batteries. When switched on, the device performs a system test and briefly flashes several times and then goes out again. As soon as the charge state of the battery drops within a critical range, it flashes permanently. This is a signal to the machine operator indicating that the battery must soon be recharged.
("Charge the battery").

Caution!
Deep discharge shortens the life of the battery

5.3 Connecting the hand-held remote control unit

The hand-held remote control unit is equipped with a Harting Han-1® connector.
This is connected to the KS Robot on the battery box or control box (depending on the KS Robot model).

The locking device of the connector must engage properly.

KS Robot 350 Offroad

KS Robot 400 / 600 Offroad

Note!
The receiver of a radio remote control unit can be connected here as an alternative.

5.4 Leakage check

A leakage check must be carried out prior to commissioning the KS Robot and at weekly intervals thereafter.

Procedure:

- Place the suction unit with all suction discs onto a plate of a gas-impermeable, flat material.
- Make sure that all suction discs are cleanly positioned over the entire surface and press or align a suction disc until it is in the correct position if necessary.
- Activate the vacuum suction unit by pushing the vacuum switch on the KS Robot forward or by pressing the switch on the remote control unit.
- When the acoustic warning signal goes out, the two control lamps light up green, the hands on the two vacuum meters should show a value of approx. -0.72 bar (green area) and the vacuum pumps switch off.
- After the vacuum pumps for both vacuum circuits have shutdown, switch off the KS Robot at the main switch.
- Read the current level of vacuum on the vacuum meters and record the value in writing.
- Within the next fifteen minutes, the hands on the vacuum gauges may only change insignificantly, by no more than 5%.

If this test is positive, the vacuum suction unit has no leaks and it can be used safely.

Danger!

Should a leak also occur in a vacuum circuit, the leak must be sealed immediately.

6 Operation

6.1 Inspections before starting work

Carry out a visual inspection for externally visible damage and defects before starting work. If damage or safety-related defects have been detected, the KS Robot must be taken out of service immediately. Check the following components for function and damage:

- Cracks in welds or components
- Electrical components, cylinders, circuit breakers, wires and electrical cables
- Charge state of the batteries
- Vacuum system, signal alarm and pressure gauge
- Hydraulic hoses, connections, cylinders and control blocks (only KS Robot 800 Offroad)
- Tires and wheels, screws, nuts and other fasteners
- Load capacity labels and signs

6.2 Carrying out a reference run

Note!
This only affects the models with electrical lifting cylinders, such as the **KS Robot 350 Offroad and 400/600 Offroad** (not models with hydraulic cylinders, e.g. KS Robot 800 Offroad).

To ensure that the lifting cylinders operate in parallel during work, a reference run must be carried out each time before work is started and each time the KS robot is switched off and back on again. For this purpose, and to prevent fluctuations in the movement of the cylinder the lifting cylinders must be moved down to the stop each time the device is started.

Procedure:

- Press the "Lower" button (↓) on the remote control unit and keep the button pressed until the lifting cylinders have moved all the way down.

Caution!
Make sure that the suction crossbar does not touch the ground.

If there is a situational failure at the construction site, e.g. because the cylinders have come to a standstill and the downward movement cannot be carried out, you can bypass the reference run and start up the lifting cylinders first:

- Press the reset key "Reference run" on the housing (Fig. 1) or on the control box (Fig. 2) of the KS Robot and at the same time press the "Lift" key (↑) on the remote control unit.
  The lift function on the remote control unit is enabled again.

Figure 1 KS Robot 350 Offroad

Figure 2 KS Robot 400 / 600 Offroad

- Move the cylinders until you can perform a reference run.

6.3 Supporting and aligning the device

Warning!

	Life-threatening injuries and significant amounts of property damage can result if the device falls over. - Make sure the ground is stable before setting up the device. Rain and thaw can cause the ground to become soft. - Maintain a proper distance from embankments and slopes. - Do not set up the device on sand.

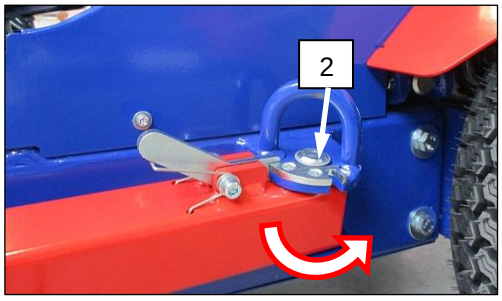
The KS Robot Offroad must be set up on a stable and flat surface before starting any work. For this purpose, the side supports must be pulled out **without** exception.
Larger slopes in the ground must be leveled with suitable means before setup.

Procedure:

- Check the degree of incline on the spirit level (1).
  The air bubbles must be inside the markings.

(Only for models with double telescope)

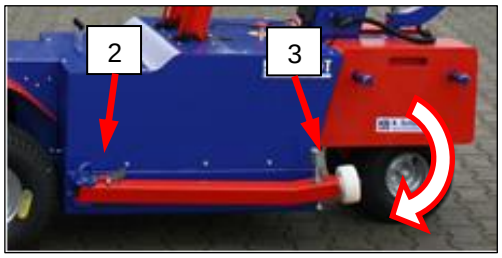
- Extend the lateral supports and ensure that the retaining lever (2) engages correctly when swiveling.



The KS Robot 800 Offroad model has additional jack shafts (3) in order to compensate for height when the distance between the support wheel and the ground is too great. They are only used for height compensation and may not support the machine.

- Screw down the jack shafts (3) until just before contact with the ground.
  Attention!
  Use a stable underlay when working on soft/sinking ground.

Jack shafts (3) only on KS Robot 800 Offroad

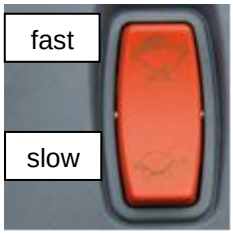


Example: KS Robot 800 Offroad

6.4 Wheel drive operation

The wheel drive is operated via the tiller head control unit.

Functions:
vorwärtsvor

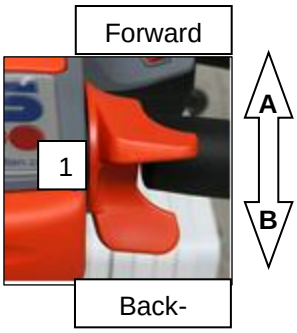
1	Drive direction button	Press in direction A: Press in direction B:	KS Robot drives forward. KS Robot moves backward.
2	Safety switch	KS Robot stops and drives forward.	
3	Drive speed		 Fast  Slow
4	Battery indicator	The battery charge level is indicated.	
5	Horn	Operation in the event of danger	

6.5 Travel

Warning!

- Use on public roads is prohibited.
- Only drive on paths that are adequately paved.
- Make sure that the telescopic cylinders of the boom are retracted.
- Only drive on slopes/inclines at reduced speed, with increased caution and with the load lowered.
- Only inclines up to max. of 10° and without load may be driven on.
- When driving on a slope/incline do not turn or drive diagonally.
- Never drive over power cables that are lying on the ground.
  These could become damaged or could be damaged and therefore cause damage to the KS Robot.

6.5.1 Selecting the direction of travel



Forward travel:
To move forward, press the direction button (1) with a light push of the thumb in the forward direction (A). The KS Robot now accelerates forward depending on the pressure applied to the direction switch.

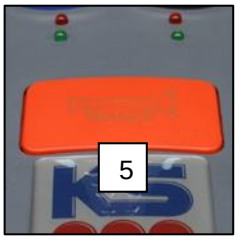
Backward travel:
To move backward, press the direction button (1) with a light push of the thumb in the backward direction (B). The KS Robot now accelerates backward depending on the pressure applied to the direction switch.

6.5.2 Safety switch

A safety switch (2) is located at the end of the tiller head control unit to protect the driver from getting caught between an object and the KS Robot.

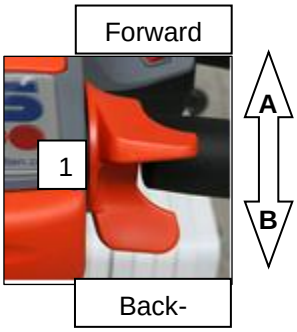
As soon as pressure is detected on the switch, the KS Robot stops immediately and moves forward slightly.

6.5.3 Horn



The horn (5) must be blown on poorly visible road sections and junctions or in cases of immediate danger.

6.5.4 Auto stop function



In order to prevent unnecessary discharging of the batteries, the travel drive switches off automatically after approx. 1 minute (becomes inactive).
To continue driving, press the drive switch 1x short **"Forward"** (press in direction A).

6.6 Emergency stop switch

There is an emergency stop button on the wired remote control unit. This must be pulled out during normal operation.

In case of emergency, press the switch to interrupt the power supply of the vehicle and bring the vehicle to a standstill.

The switch on the remote control units of the KS Robot with hydraulic control is a stop button that switches off all cylinder movements when actuated.

To bring the vehicle to a standstill in an emergency, press the emergency stop button on the KS Robot 800 vehicle.

6.7 Emergency drive mode (KS Robot 350 - 600 Offroad)

The KS Robot can only be moved in emergency drive mode if the remote control unit on the KS Robot no longer works due to cable damage.

The KS Robot can be transported and loaded with this emergency drive function.

- To do this, press the "Emergency travel mode" button on the battery box, this activates the electric travel drive.
  By simultaneously pressing the "forward" or "backward" button on the remote control unit, you can move the KS Robot short distances.

  The button "Emergency drive" must be pressed continuously.

6.8 Folding up the handlebar (KS Robot 350 Offroad)

The handlebar for the tiller head can be folded up to save space (e.g. for transport in elevators).
The tiller head can be easily adjusted to two positions by pulling the latch bolt.

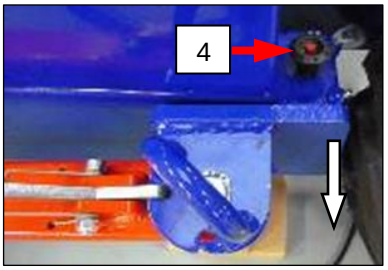

Travel position


Latch bolt


Transport position

6.8.1 Removing the side supports

- The supports can be easily pulled out by pulling the latching bolt (4).



Caution!
Make absolutely sure to attach the supports again!

6.9 Operating the boom

The telescopic boom is controlled by the remote control unit.

Caution!

The remote control unit must always remain in the possession of the KS Robot operator.
If the KS Robot is left unattended for a longer period of time, the remote control unit should be switched off and safely stowed so that it is not accessible to unauthorized persons.

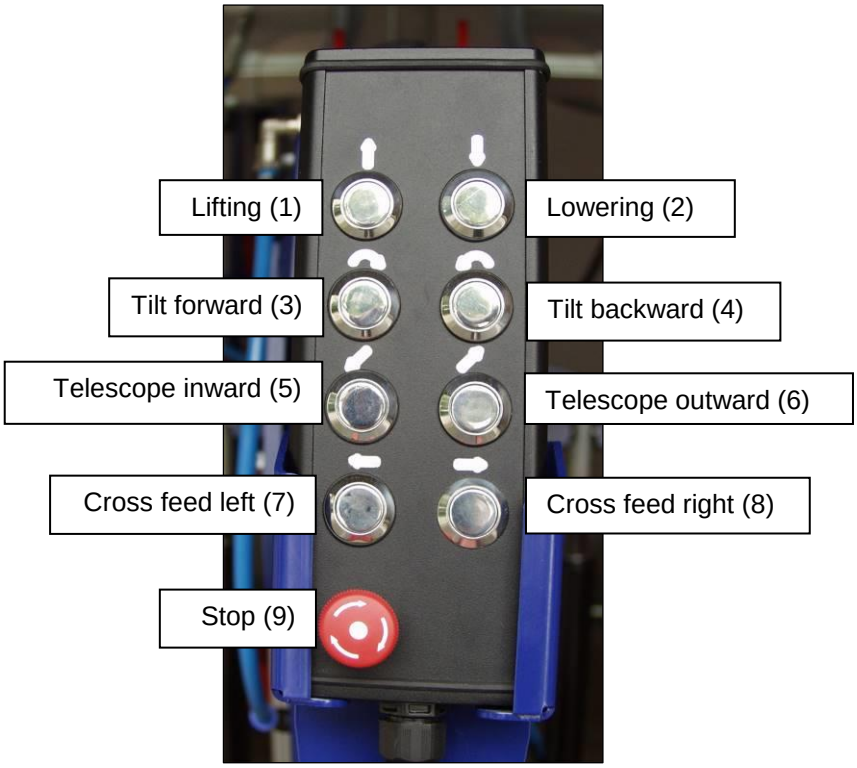
Warning!

Before extending the cylinders, make sure there are no objects in the movement range of the cylinders.

6.9.1 Wired remote control unit (KS Robot 350 / 400 / 600 Offroad)

Standard wired remote control unit with 8 functions

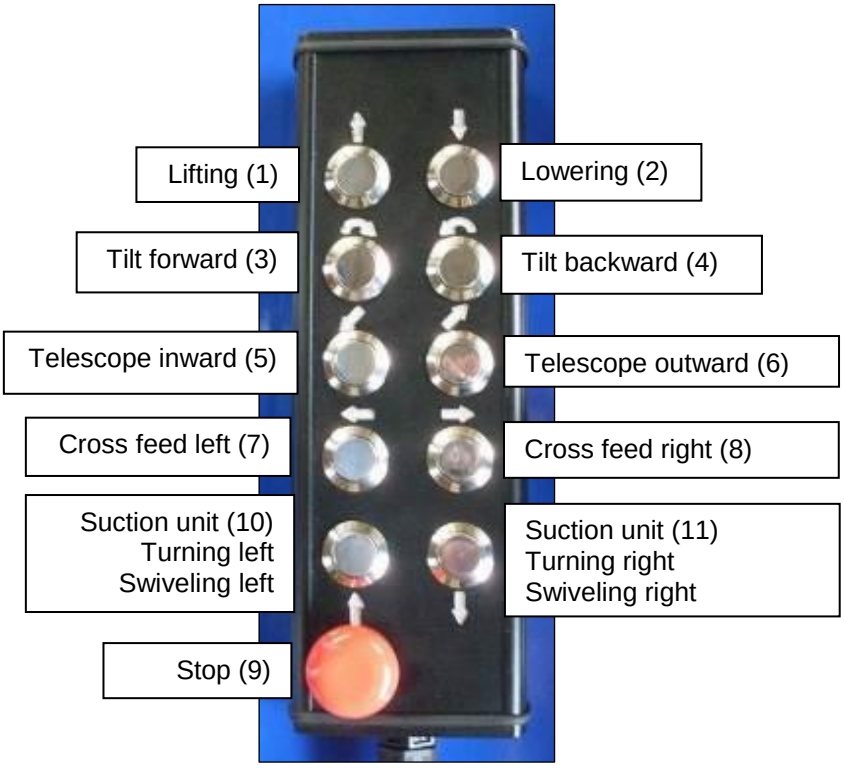
Boom lifting/lowering	
1	Lifting
2	Lowering
Tilt boom	
3	Tilt forward
4	Tilt backward
Telescope the boom	
5	Telescope inward
6	Telescope outward
Cross feed	
7	Axis moves to the left
8	Axis moves to the right
Stop	
9	Emergency-stop



Wired remote control unit with 10 functions

In this case, the KS Robot is equipped with electrical turning of the vacuum suction system or with electrical swiveling (90° sideways) in addition to the standard equipment.
For technical reasons, only one of the two functions (either turning or lateral swiveling of the vacuum suction system) is possible.

Boom lifting/lowering	
1	Lifting
2	Lowering
Tilt boom	
3	Tilt forward
4	Tilt backward
Telescope the boom	
5	Telescope inward
6	Telescope outward
Cross feed	
7	Axis moves to the left
8	Axis moves to the right
Stop	
9	Emergency-stop
Turning the suction unit or swiveling the suction unit depending on the equipment	
10	Electrically to the left
11	Electrically to the right



6.9.2 Radio remote control unit

Radio remote control units are also available in addition to the wired remote control unit.

Warning!

The control commands are also transmitted outside the range of vision:

- Switch off the transmitter when not in use and remove the battery.
- Safety devices may not be removed or altered.

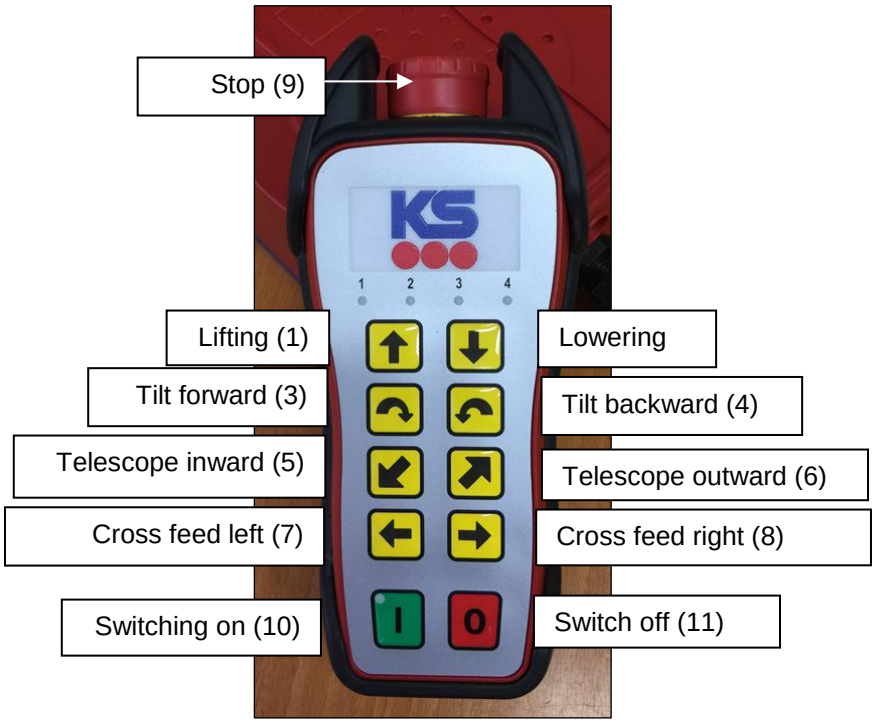
Summary

Types	Operation	Models	Telescope
1 	8 Functions	Indoor: KS Robot 280 /400 / 600 Offroad: KS Robot 350 /400 /600 Offroad	Electrical
2 	10 Functions (for devices with electrical turning and electrical swiveling)	Indoor: KS Robot 280 /400 / 600 Offroad: KS Robot 350 /400 / 600 Offroad and with all devices for the American market	
3 	8 Functions	KS Robot 1000 without HDS module KS Robot 800 Offroad without HDS module	Hydraulic
4 	10 Functions (for devices with electrical turning and electrical swiveling)	Indoor: KS Robot 1000 / 1400 With HDS module Offroad: KS Robot 800 Offroad with HDS module	

Radio remote control unit type 1 with 8 functions

As an option the **KS Robot** can be equipped with a wireless remote control unit (instead of a wired remote control unit as usual). For all KS Robots with electric telescope (KS Robot 350/400/600).

Boom lifting/lowering	
1	Lifting
2	Lowering
Tilt boom	
3	Tilt forward
4	Tilt backward
Telescope the boom	
5	Telescope inward
6	Telescope outward
Cross feed	
7	Axis moves to the left
8	Axis moves to the right
Stop	
9	Emergency-stop
Button functions	
10	Switch on
11	Switch off



Switching on the transmitter:
Press and hold down the "I" button (10, green) for two seconds.

Switching off the transmitter:
Press and hold down the "O" button (11, red) for one second.

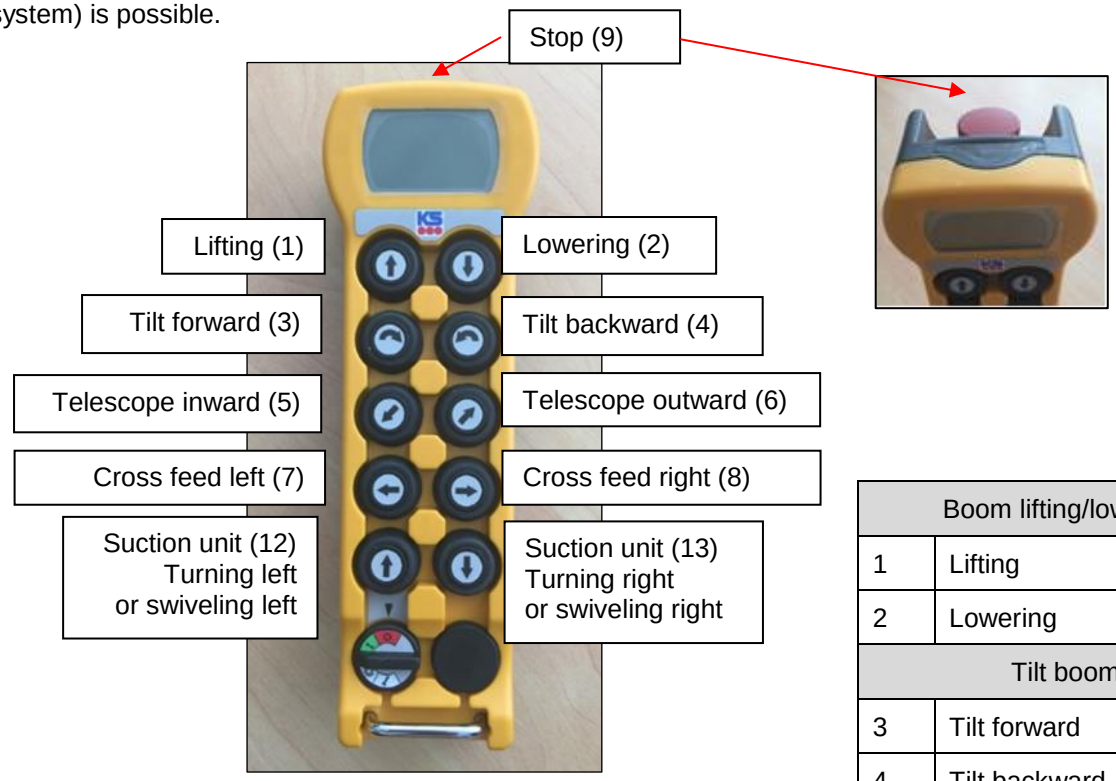
Switching the button illumination on and off:
Switch on the transmitter.
If you press and hold down the green button (10) for 5 seconds the button illumination will be activated.
If you press the green button (10) again for 5 seconds, the button illumination will be deactivated.

The remote control unit has a range protection device. The receiver constantly checks the radio path to see if the transmitter's signal is still there. If not, the system automatically switches into the safety mode.

Recharge the remote control unit daily if you are using it every day.
See also the separate operating manual for the remote control unit in the appendix.

Radio remote control unit type 2 with 10 functions
For all KS Robots with electric telescope.

The **KS Robot** is equipped with a wireless remote control unit (instead of a wired remote control unit as usual). This remote control unit is used on the models KS Robot 400 and 600 with electrical turning of the vacuum suction system or electrical lateral swiveling of the vacuum suction system.
For technical reasons, only one of the two functions (either turning or lateral swiveling of the vacuum suction system) is possible.



Boom lifting/lowering	
1	Lifting
2	Lowering
Tilt boom	
3	Tilt forward
4	Tilt backward
Telescope the boom	
5	Telescope inward
6	Telescope outward
Cross feed	
7	left
8	right
Stop	
9	Emergency-stop
Button functions	
10	Switch on
11	Switch off
Turn suction unit or Swivel suction unit depending on the equipment	
12	Electrically to the left
13	Electrically to the right

Radio remote control unit type 2 with 10 functions

Switching on the transmitter:

Make sure the stop button on the transmitter is not pressed.
Turn the rotary switch from the "0" (11-red) to the "I" (10-green) position.
A short beep will sound, and the display will show the startup screen.

Switching on the transmitter:

Turn the rotary switch from the "I" (10-green) to the "I" (11-red) position.

Stop button:

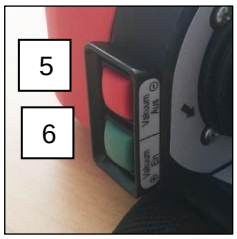
The radio remote control unit is equipped with a stop button.
The stop signal is transmitted as a digital command and the transmitter also switches off as soon as the stop button is pressed.

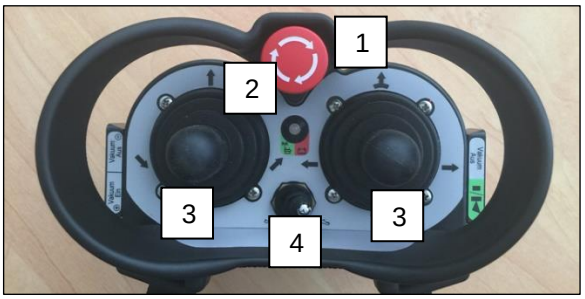
The stop button is the most important safety device of the radio remote control unit.
It ensures that the operator can stop the machine immediately during operation. As a safety-related component, the stop button is not intended to switch the transmitter on or off but should only be operated during the functional test or in emergency situations.

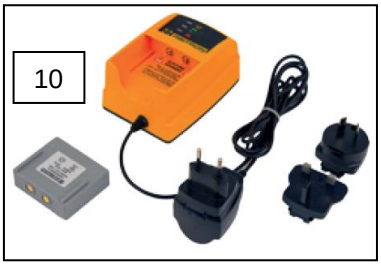
Radio remote control unit type 3 with 8 functions

For all KS Robots with **hydraulic** Telescope and **without** HDS module.
The radio remote control unit type 3 with 8 functions is part of the standard equipment in these models.

Controls and accessories





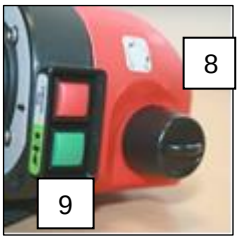


1. Stop button
2. Power indicator
3. Control joystick
4. Toggle switch
5. Pushbutton - vacuum off
6. Pushbutton - vacuum on
7. Pushbutton - vacuum off
8. Key switch on / off (black)
9. Green start button
10. Battery charger and battery

Note!
A red programming key is provided for controlling the programming mode.
This is for service purposes only.

Radio remote control unit on / off

- The transmitter is put into operation with the key switch (8).
- After that you will hear 2 short beeps.
- The green LED in the operating display (2) then flashes.
- Now press the green start button (9).



Applying/releasing suction to and from the load

The buttons for applying suction or releasing the load are located on the left and right side of the remote control unit.

- Pressing the green button (6) on the left of the remote control unit will create the vacuum (application of suction).
- By simultaneously pressing the red buttons (5 7), on the left and right of the remote control unit, the vacuum is released.

left

right

Switching off the vacuum pumps (KS Robot 800 Offroad)

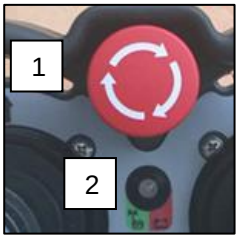
The vacuum valves on the KS Robot 800 Offroad are still open in the de-energized and switched off state.

Radio remote control unit type 3 with 8 functions

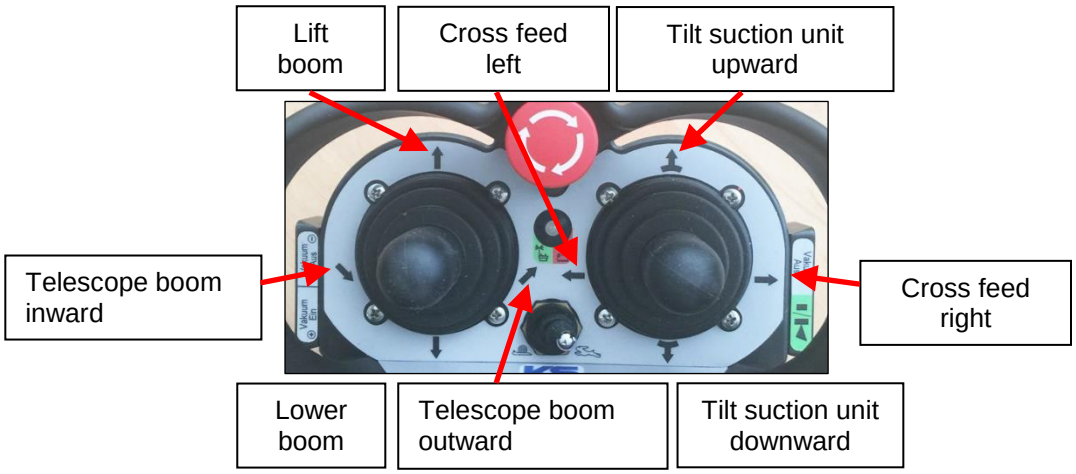
Stop button

Please check the function of the stop button (1) after each switch on.

- When you switch on the transmitter: LED flashes (2)
- When you press the stop button: LED flashes faster



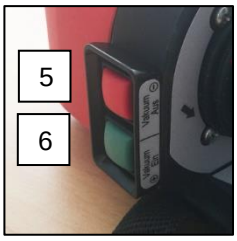
Operating functions

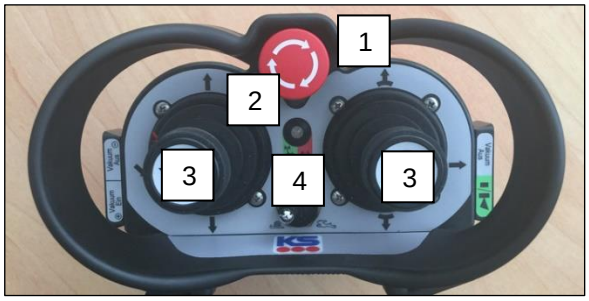


Radio remote control unit type 4 with 10 functions

For all KS Robots with **hydraulic** Telescope (KS Robot 800/1000/1400) and equipment **with** HDS module for hydraulic turning, swiveling and tilting of the vacuum suction system.
The radio remote control unit type 4 with 10 functions is part of the standard equipment in these models.

Controls and accessories





1. Stop button
2. Power indicator
3. Control joystick
4. Toggle switch
5. Pushbutton - vacuum off
6. Pushbutton - vacuum on
7. Pushbutton - vacuum off
8. Key switch on / off (red or black)
9. Green start button
10. Battery charger and battery

Note!
A red programming key is provided for controlling the programming mode.
This is for service purposes only.

Radio remote control unit type 4 with 10 functions

Switching on / off the radio remote control unit

- The transmitter is put into operation with the key switch (8).
- After that you will hear 2 short beeps.
- The green LED in the operating display (2) then flashes.
- Now press the green start button (9).

Applying/releasing suction to and from the load

The buttons for applying suction or releasing the load are located on the left and right side of the remote control unit.

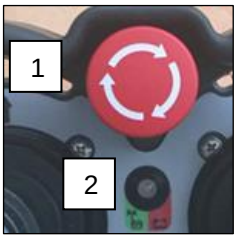
- Pressing the green button (6) on the left of the remote control unit will create the vacuum (application of suction).
- By simultaneously pressing the red buttons (5 7), on the left and right of the remote control unit, the vacuum is released.

left

right

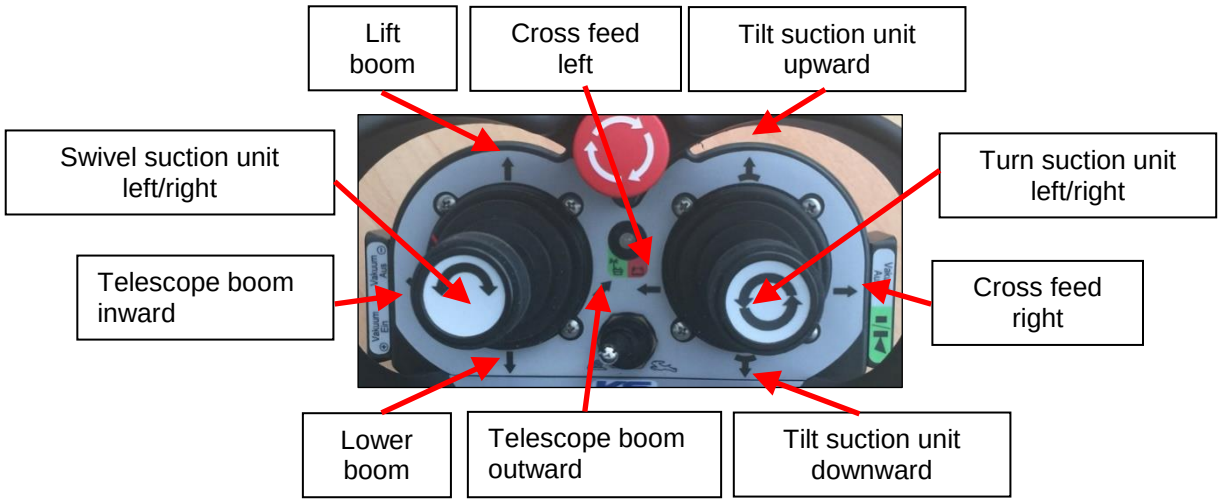
Stop button

Please check the function of the stop button (1) after each switch on.



- When you switch on the transmitter: LED flashes (2)
- When you press the stop button: LED flashes faster

Operating functions



6.9.3 Manual mode for operating the boom

(in case of failure of the radio remote control unit type 3 and type 4)

If the radio remote control unit fails, it is still possible to operate the boom in the manual mode.

- First, turn the key switch for the "manual mode cylinder" to the "On" position.

  The hydraulic unit is now switched on.

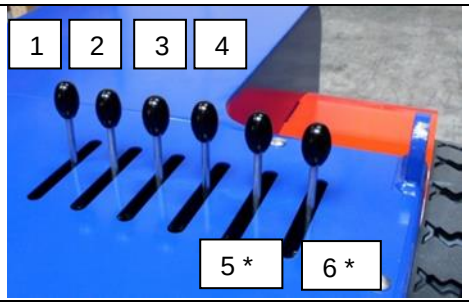
Caution!

The manual mode is intended only for emergency operation. To prevent overheating of the hydraulic unit, the unit shuts off automatically in manual mode after one minute. If you wish to continue working, switch the key switch off and then back on again.

Now you can manually use the shift levers as described below.
They assume the functions of the remote control unit.

For most hydraulic KS Robots, the shift levers are freely accessible on the chassis, others are protected under the hood. In this case, you must first unscrew the protective cover.

Pos. 1	Boom lifting / lowering
Pos. 2	Boom telescoping - retracting / extending
Pos. 3	Tilting the vacuum system - upward / downward
Pos. 4	Cross feed - axis movement right / left
Pos. 5 *	* Suction unit swiveling - right / left
Pos. 6 *	* Suction unit turning - right / left



* Optional
only when equipped with HDS module (hydraulic turning and swivel head)

6.10 Operating the vacuum suction unit

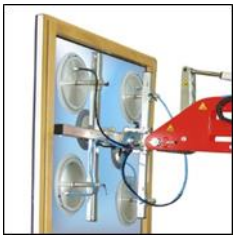
Warning!

- Observe the safety instructions in chapter 2.
- Working with the machine is dangerous, if the various safety devices such as the pressure gauge and the signal alarm are defective.
- The lifting of workpieces is prohibited until the two light signals on the vacuum display go out.
- Damp and sticky workpieces may not be lifted with the vacuum discs.
- Make sure that the air hoses are not bent when turning and tilting the suction system.
- Do not transport loads over persons or machines.
  Cordon off a wide area under the suspended cargo.
- If the vacuum drops below -0.62 bar in both or in just one vacuum circuit when transporting a load, the signal tone will sound off. Then you should try to remove the cargo as quickly as possible so that it does not fall.
- The device may NEVER be put into operation with only one functioning vacuum circuit.
- Make sure the load is distributed evenly. Always center the application of suction on the cargo. Improper suction of loads can result in serious accidents.

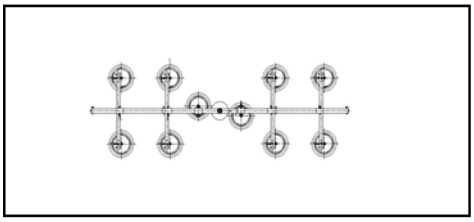
6.10.1 Picking up the load

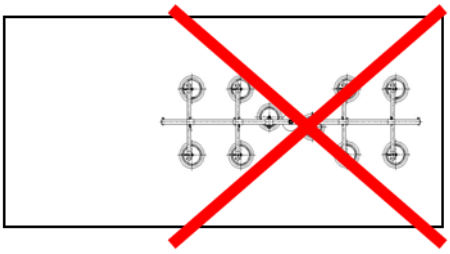
- Carefully position the vacuum suction unit in a suitable position on the cargo (e.g. window pane).

  Make sure that all suction discs lie flat on the smooth, clean surface so that the suction discs can seal completely.



- Always apply suction to the cargo symmetrically/centrally.

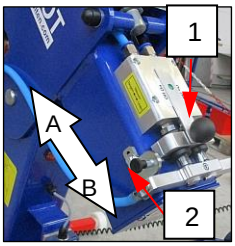




6.10.2 Vacuum suction / release (manual)

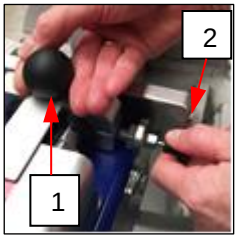
- The vacuum suction system is activated by pushing the vacuum switch (1) forward in direction (A).
  The adjusting screw (2) engages behind the switch.

  The vacuum pumps start, and a vacuum builds up.



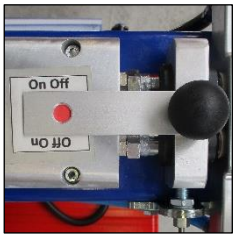
For safety reasons the release of the vacuum takes place in two-hand operation.

- The vacuum is released by pulling the adjusting screw (2) and by simultaneously pushing back the vacuum switch (1) in direction (B).



Caution!
Check the position of the vacuum switch before starting work.

Vacuum on



Vacuum off

6.10.3 Vacuum suction / release (radio remote control unit)

The buttons for applying vacuum and releasing the vacuum (A, B, C) are located on the left and right side of the remote control unit.

Type 3 for hydraulic KS Robots without HDS module

Type 4 for hydraulic KS Robots with HDS module

- The vacuum suction system is activated by pressing the button (A).

  The vacuum pumps start, and a vacuum builds up.

- The vacuum is released by pressing the two red buttons (B and C) at the same time.
  Keep the buttons pressed until the pumps switch off.

left

right

6.10.4 Vacuum indicators

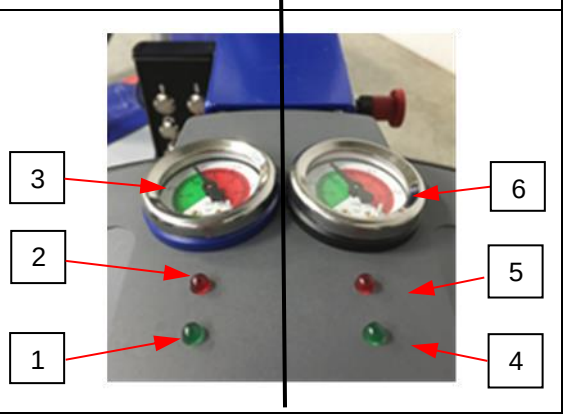
The KS Robot is equipped with a dual-circuit vacuum system. The two circuits are marked in color. Furthermore, different visual and acoustic control options are available.

Marking of the vacuum circuits:

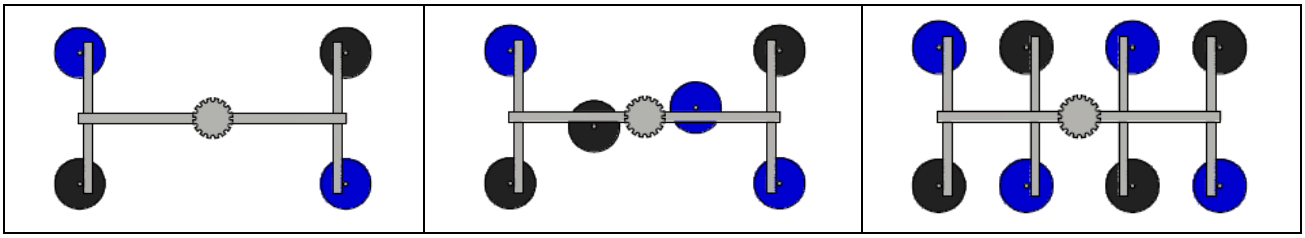
Vacuum circuit 1 = Blue hose lines
Vacuum circuit 2 = Black hose lines

Vacuum circuit function indicators:

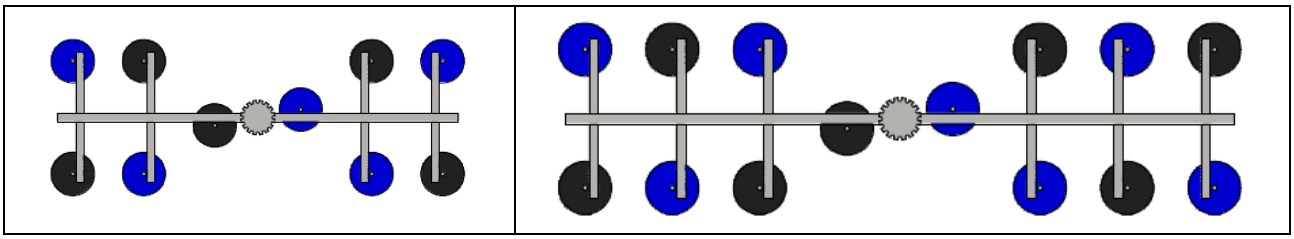
Vacuum circuit 1	
Pos. 1	Switched on
Pos. 2	Lights up during vacuum loss and during vacuum build-up
Pos. 3	Vacuum indicator
Vacuum circuit 2 (safety circuit)	
Pos. 4	Switched on
Pos. 5	Lights up during vacuum loss and during vacuum build-up
Pos. 6	Vacuum indicator



The vacuum suction discs of the suction unit are arranged evenly and crosswise in the two-circuit system.



4-piece suction unit | 6-piece suction unit | 8-piece suction unit



10-piece suction unit | 14-piece suction unit

Warning!

If the vacuum is lost, a warning signal sounds, LEDs light up red and the pressure gauge hands are in the red area.

- No loads may be picked up or transported.
- Any picked up loads must be lowered and set down immediately.

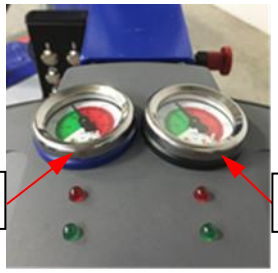
Caution!

Vacuum control:
The negative pressure of the two vacuum circuits is monitored by pressure switches. They switch the vacuum pumps on and off independently of each other. If the vacuum in one of the two circuits falls below -0.62 bar, a beep sounds and the vacuum pump or both vacuum pumps switch on.
Vacuum should be restored within a short period.

Control gauge:

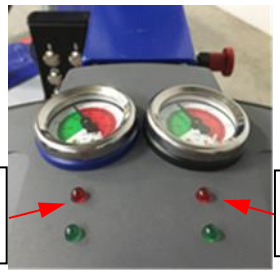
The current vacuum of the two vacuum circuits is displayed on the control gauges.
The vacuum circuit assignment is marked in color.

For transport readiness, the vacuum gauge must be between -0.6 and -0.7 bar (green field).



Warning devices:

Furthermore, visual and audible warning devices are available, which indicate if the vacuum is too low.
If vacuum is lost, a warning signal sounds and the LEDs light up red.



Signal light indicator (optional equipment):

The KS Robot can be equipped with a signal light as an option. This usually indicates the operating status. Depending on the programming, the signal lights assumes different functions.

Green	Green - Yellow	Yellow - Red	Red
The KS Robot is switched on	Vacuum build up	Vacuum loss	Emergency stop is activated
Special version:			
Green	Yellow	Red	
	Lights up shortly before overload	Emergency stop is activated	
		Overload - KS Robot switches off (only the telescopic arm can still retract)	
When the boom is lowered, the indicator lights up continuously		Green -	Yellow

6.10.5 Lateral swiveling of the vacuum suction unit

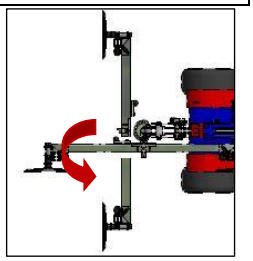
Caution!

Make sure that the air hoses are not bent when swiveling the suction system.

Danger!

Danger of tipping over:
- The load-bearing capacity may be limited if the load is swiveled sideways (+/- 90°) (see "load diagram").
- Only swivel a suction unit when in the vertical position (never swivel the unit when tilted).

The vacuum suction unit can be swiveled with the load up to 90° to the side of the unit.



Standard version: manual lateral swiveling

- To swivel the suction unit, first open the latch bolt (1) on the latching system.
- Swivel the suction unit by hand into the desired position.
- Then secure the latch bolt back in place to block the movement on the latching system.

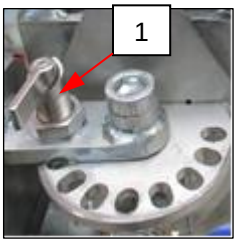


Fig. can vary depending on the model

When swiveling the suction unit, be sure to note the position of the latch bolt for swiveling the suction unit**!**
The latch bolt should always be located opposite the direction in which it is swiveled.

Optional version: electrical swiveling

Danger!

Danger of tipping over:
- The increased weight of the suction unit reduces the max. load of the overall device. Please observe the corresponding load diagram.
- Only swivel a suction unit when in the vertical position (never swivel the unit when tilted).

The KS Robot can be optionally equipped with an electrical swivel unit, which allows continuously variable sideways swiveling of the suction unit by the remote control unit (see chapter "Remote control units").

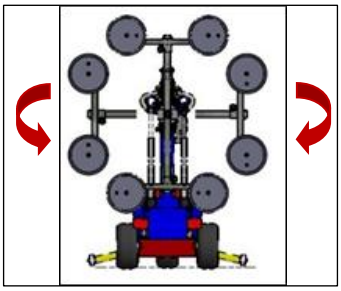
Fig. can vary depending on the model

6.10.6 Turning the vacuum suction unit

Caution!

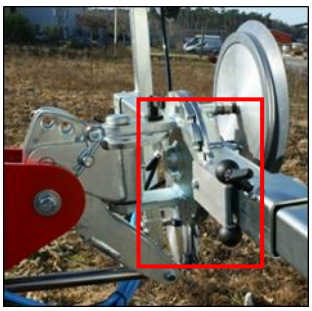
- Make sure that the air hoses are not bent when turning the suction system.
- Only turn a suction unit when in the vertical position (never turn the unit when tilted).

The suction unit can be turned manually, or optionally electrically, up to 180° to each side.



Standard version: manual turning

- Open the latch bolt (1) and turn the suction unit into the desired position.



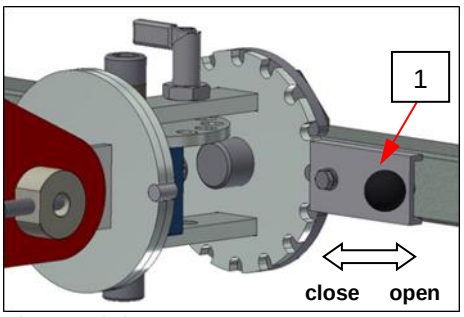


Fig. can vary depending on the model

Optional version: electrical turning

Danger!

Danger of tipping over:

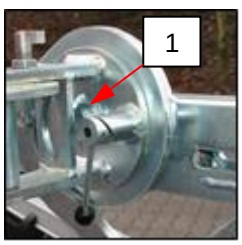
- The increased weight of the suction unit reduces the max. load of the overall device. Please observe the corresponding load diagram.
- Only turn a suction unit when in the vertical position (never turn the unit when tilted).

The KS Robot can be optionally equipped with an electrical turning unit. The rotary cylinder allows turning with the remote control unit up to 90° to each side (see chapter "Remote control units).

Fig. can vary depending on the model

The suction system can also be turned manually.
For this purpose, a latching system is provided for turning in 45 ° increments.

- Open the latch bolt (1) and turn the suction unit into the desired position.

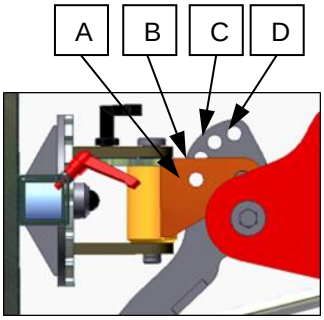


6.11 Operation rotary articulated joint

Rotating joint - standard

The models KS Robot 400/600 Offroad are equipped with an articulated joint including adjustable latching mechanism in order to enable overhead installation and the removal of loads on pallets.

4 latching positions are possible on the tilting joint.



Position A	For pick-up from the floor
Position B	Working in standard mode
Position C	
Position D	For overhead installation

Warning!

- After setting the latching position, always secure with a bolt and spring pin!
- Never adjust the tilting joint when carrying a load!

Caution!

Load-bearing capacity for overhead installation: Max. 200 kg!

Special rotary articulated joint

The models KS Robot 400 Offroad and 600 Offroad can be optionally equipped with a special rotary articulated joint (SDKG joint).
The KS Robot 350 Offroad and 800 Offroad models have the SDKG joint as standard equipment.

In addition to overhead mounting, the special rotary articulated joint allows for ground-level pick-up and more projection in front of the wheels.

With the special rotary articulated joint it is possible to move the suction unit into an overhead position without manual adjustment of the position on the ground.

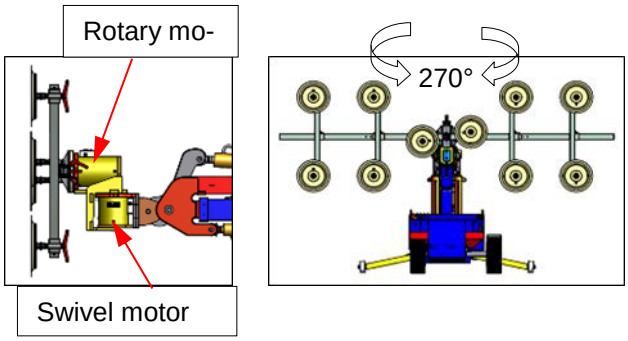
This function is controlled via the remote control unit.

HDS module (optional on the KS Robot 800 Offroad)

The KS Robot 800 Offroad can be optionally equipped with a hydraulic rotary swivel module (HDS module). The turning and lateral swiveling of the suction unit is controlled by two hydraulic motors.

This allows the suction unit to be turned by up to 270° and swiveled by 90° to the side.

The functions are controlled via the radio remote control unit.



6.12 Operation telescope extension

The KS Robot 400 Offroad and 600 Offroad models can optionally be equipped with a manual or electrical double telescopic lift. This allows additional outward telescoping and therefore further projection. The telescopic extension is only possible in combination with the special rotary articulated joint (SDKG).

Caution!

Load-bearing capacity for overhead installation: Max. 200 kg!

6.12.1 Mechanical telescopic extension (KS Robot 400/600 Offroad)

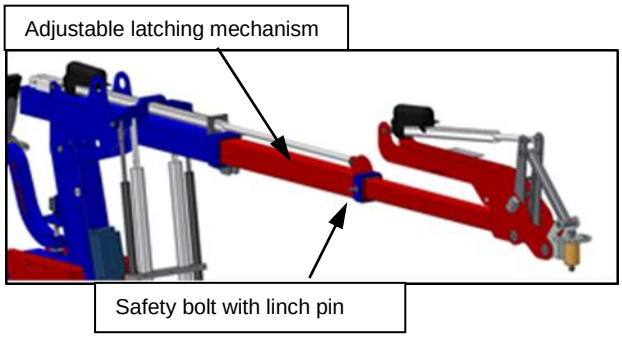
The manual double telescope is manually moved via an adjustable latching mechanism (holes with linch pin). The telescopic arm can be adjusted in 5 positions, with an extension of 225 mm per position.

Caution!

- **Never** adjust when suction is applied to a load!
- After adjusting, always secure with a bolt and a linch pin

Warning!

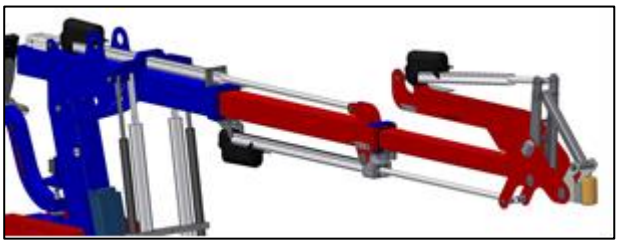
Always pay attention to the payloads! (Payloads with extended telescopic arm)		
	Robot 400 Offroad	Robot 600 Offroad
Pos. 1	200 kg	220 kg
Pos. 2	160 kg	180 kg
Pos. 3	140 kg	160 kg
Pos. 4	120 kg	130 kg
Pos. 5	100 kg	100 kg
Standard design		



6.12.2 Electrical / hydraulic telescopic extension

When equipped with an electrical or hydraulic telescopic extension, the telescopic arm can be infinitely telescoped inward and outward by the remote control unit.

Payloads see load diagram (chapter 11)



6.13 Finishing work

After finishing work the KS Robot must be parked and properly secured.

- **NEVER** park the KS Robot when loaded and unattended.
- **NEVER** park the KS Robot on slopes or with the handlebar pushed in!
- Only park the KS Robot in a safe place, i.e. on a firm flat horizontal surface without obstacles or traffic.
- Retract the telescopic arm and put it into the parking position.
- Switch off the KS Robot via the main switch and secure it against startup by unauthorized persons.

Caution!

- Never switch off the KS Robot when it has a load, or as in Fig. 2, with the suction unit lowered to the ground! **Always switch off as in Figure 1!**	

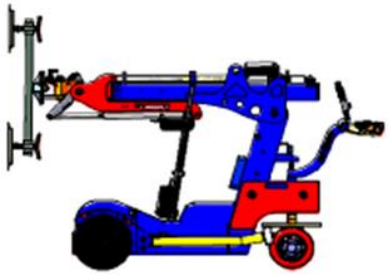
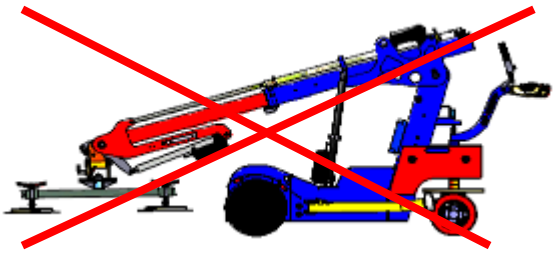

	

Figure 1	Figure 2

7 Servicing

7.1 General Information

A distinction must be made between maintenance work which may only be carried out by authorized dealers of K. Schulten GmbH & Co. KG for the preservation of warranty claims and maintenance work which must be carried out by the operating company or its authorized representative to maintain the proper operating condition of the device. The latter includes regular cleaning and performance of the most frequent maintenance work on the KS Robot.

Periodic maintenance by the operating company or its representative is a prerequisite for the preservation of warranty claims for damage to parts that require service and maintenance.

The operating company must ensure that:

- All performed maintenance work is recorded.
- The required inspections are carried out by an authorized specialist workshop and documented in writing.
- The annual UVV inspection is carried out by an expert and documented in the inspection book as well as with the inspection sticker on the KS Robot.

Otherwise, all warranty claims will be void.

The operating company or its authorized representative may only perform the maintenance tasks listed in this chapter. Otherwise, all warranty and warranty claims expire. If you have questions, please contact K. Schulten GmbH & Co. KG for further information.

No alterations, attachments or modification to the KS Robot may be made which could impair the safety of the device without the permission of K. Schulten GmbH & Co. KG! This also applies to the installation, adjustment and alteration of the safety devices and valves, and in particular to welding on load-bearing components.

Replacement parts must meet the technical requirements specified by the K. Schulten GmbH & Co. KG. This is always guaranteed with original spare parts.

Before starting work, the safety rules listed in chapter 2.0 Safety must be read, understood and implemented.

Trouble-free operation of the KS Robot is only guaranteed if the following information is observed and followed during regular maintenance work.

7.2 Basic information

Note!

- A UVV inspection must be carried out at least once a year, as well as after every safety-related change or repair.
- Service and periodic maintenance work may only be carried out by specially instructed and authorized persons who are informed of potential dangers.
- Before carrying out any maintenance work check again for defects, that were determined during the last maintenance interval (see maintenance records at the end of this chapter).
- All identification data must be provided for repairs and spare part (see entry form at the beginning of this manual).

7.3 Maintenance plan

The maintenance plan is listed below. It will help you to plan and carry out regular maintenance. Each inspection due date is also listed.

Pos	Task	Number of operating hours					
	Character explanation: **O = Check** **Y = Clean** **X = Replace**	**Daily**	**After the first month**	**Quarterly**	**Semiannually**	**Annually**	**Every 500 operating hours**
1	**General condition**	**o**	**o**	**o**	**o**	**o**	**o**
2	**Telescopic boom**						
	Check profiles for cracks, deformation Freedom of movement of guides, joints, telescope Wear on guides, slide rails	**o**	**o**	**o**	**o**	**o**	**o**
3	**Chassis**						
	Check fastening screws for cracks in load-bearing parts. Check tires for cracks	**o**	**o**	**o**	**o**	**o**	**o**
4	**Support**						
	Check the side supports (deformation corrosion, cracks, welds, support wheel)	**o**	**o**	**o**	**o**	**o**	**o**
5	**Control unit**						
	Check motor brake, check the operating lever, check the operating label for legibility	**o**	**o**	**o**	**o**	**o**	**o**
6	**Electronic equipment**						
	Check condition of connectors and fuses	**o**	**o**	**o**	**o**	**o**	**o**
	Check the battery and cable connections					o	
	Check the remote control unit (emergency stop) and connection cable	**o**	**o**	**o**	**o**	**o**	**o**
	Battery charger	**o**	**o**	**o**	**o**	**o**	**o**

7	**Hydraulics** (only for KS Robot 800 Offroad)						
	Check the oil level (when warm, with retracted cylinders)		**o**	**o**	**o**	**o**	
	Oil change with warm hydraulic oil		**x**				**x**
	Hydraulic hoses:						
	Brittleness, porosity, leaks, attachment, abrasions	**o**	**o**	**o**	**o**	**o**	**o**
	Cylinder:						
	Check the surface of the piston rod Check the tightness of the cuff, mechanical attachment, pipe and hose connections	**o**			**o**	**o**	**o**
8	**Vacuum system**						
	Check condition of suction discs and lines Check pumps and pressure gauge for proper function	**o**	**o**	**o**	**o**	**o**	**o**

7.4 UVV inspection according to DGUV [German Statutory Accident Insurance] principle 309-001

7.4.1 Preliminary remarks

According to the accident prevention regulations "Cranes" (DGUV regulation 52), cranes must be subjected to regular inspections at intervals not to exceed one year as well as special inspections after design changes and after major repairs to supporting parts; these inspections must be carried out by expert personnel (§26 paragraphs 1 and 2). Significant changes are, for example, increasing the load-bearing capacity and changes in the design.

7.4.2 Inspections by the expert for cranes (according to BGG [Occupational Health and Safety Regulations] 924)

Expert persons are persons who, due to their professional training and experience, have sufficient knowledge in the field of cranes and are familiar with the relevant and official occupational health and safety regulations, accident prevention regulations, guidelines and generally accepted rules of technology which allow them to assess the safe working condition of cranes.

7.4.3 Introductions of the inspections

The inspections must be planned by the operating company of the crane. It is the responsibility of the operating company to assign expert personnel to carry out the inspection. The operating company must ensure that the selected persons meet the aforementioned requirements. A special responsibility is incumbent on the operating company if he assigns persons working in his own company as expert personnel. Upon request, the inspections are carried out by us.

7.4.4 Inspection results

The results of the inspections according to DGUV regulation 52 §26 must be recorded in writing and retained until the next inspection.

Test results **KS Robot**

to the periodic testing

for attachment to the inspection log

Customer: _____ **Date manufactured:** _____

Type No.: _____ **Lifting capacity:** _____

		Completed				Completed	
Description	*	**on**	**by**	**Description**	*	**on**	**by**
1. Signs				**19. Remote control unit**			
2. Welding seams				**20. Emergency-stop**			
3. Bolted connections				**21. Switchbox**			
4. Lifting cylinder				**22. Brake, holder tests**			
5. Telescopic cylinder				22.1 Without weight			
6. Tilt cylinder				22.2 With weight			
7. Cross feed cylinder				**23. Drive**			
8. Chain				**24. Vacuum pumps**			
9. Chain wheel, large				**25. Valves**			
10. Chain wheel, small				**26. Pressure switch**			
11. Articulated joint				**27. Pressure indicator**			
12. Steering				**28. Filter block**			
13. Overload protection				**29. Suction disc**			
14. Batteries				**30. Vacuum hoses**			
15. Fuses				**31. Clamping sleeve vacuum valve**			
16. 24V socket				**32. Locking in place suction unit**			
17. Battery charger				**33. Support wheels**			
18. Horn				**34. Wheels**			
				35. Replacement fuses			

Remarks on the inspection findings:

Continued operation approved

Acknowledged:	Defects eliminated:	The expert:
Date:	Date:	Date:
For the operating company	For the operating company	Signature

Next inspection:

Explanations regarding the inspection findings in column *:

1. No visible defects
2. Readjustment/tightening
2a. Secure
3 Wear, still OK, please monitor
4. Defective
5. Wear, replacement recommended
'. 6 Urgent maintenance required
'7. Ineffective
'8. Incomplete
'9. Not present
10. Detailed examination necessary
11. Not inspected

7.5 Errors and troubleshooting

The following table lists the most common causes of errors.
Technical defects of assemblies were not taken into account.

Note!
- If you cannot locate or repair faults or errors that occur on your KS Robot then contact our service personnel immediately!
- Repair and maintenance work may only be carried out by qualified personnel.

Fault	Cause	Remedy
KS Robot does not drive	Emergency stop button pressed	Pull out the emergency stop button
	Main switch not switched on	Switch-on the main switch
	Batteries are empty	Charge batteries
	Fuses defective	Check/replace fuses
Lifting cylinders do not extend.	Overload switch is activated or defective	Retract telescopic cylinder
	Fuses defective	Check/replace fuses
	Reference run not executed	Run reference run
Cross feed does not move	Fuses defective	Check/replace fuses
Tilt cylinder does not move	Fuses defective	Check/replace fuses
Telescopic cylinder does not retract or extend	Fuses defective	Check/replace fuses
	Overload switch is activated or defective	Retract telescopic cylinder
Vacuum pumps do not start	Fuses defective	Check/replace fuses
	Pump defective	Have pumps checked by a qualified electrician, replace if necessary
Vacuum is not built up	Pump defective	Have pumps checked by a qualified electrician, replace if necessary
	Suction discs are not applied	Reposition suction discs
	Suction disc seal defective	Replace suction disc
	Control vacuum gauge defective	Replace vacuum meter
	Vacuum hose defective	Replace hose
Vacuum drops sharply	Pump defective	Have pumps checked by a qualified electrician, replace if necessary
	Suction discs are not applied	Reposition suction discs
	Suction disc seal defective	Replace suction disc
	Control vacuum gauge defective	Replace vacuum meter
	Vacuum hose defective	Replace hose
	Vacuum filter clogged	Replace vacuum filter
Remote control unit does not respond	Emergency stop button pressed	Pull out the emergency stop button
	Battery discharged	Charge the battery
	Range exceeded	Get closer to the machine

7.6 Checking the tire pressure

Warning!

Insufficient tire pressure shortens tire life and impairs the stability of the KS Robot

- Check the tires for damage and excessive wear.
- Remove any foreign objects from the profile.
- Check the tire pressure.
- Correct the tire pressure if necessary. If necessary, add air via the valves.

	Model	Size	Air pressure (bar)
Front:	KS Robot 350 Offroad:	360 x 150	3.5 bar
	KS Robot 400 Offroad:	410 x 170	
	KS Robot 600 Offroad:	450 x 210	
	KS Robot 800 Offroad:	450 x 215	5.5 bar
Rear:	KS Robot 350 Offroad:	410 x 170	3.5 bar
	KS Robot 400/600 Offroad:	360 x 150	

7.7 Retightening the wheel mounts

Before initial commissioning and after every wheel change or repair, the wheel mounts on the rear drive axle must be retightened.

Thereafter, no later than every 100 operating hours.

The wheel mounts must be tightened crosswise at a torque of:

Model	Size	Torque
KS Robot 350 Offroad	M8	24.6 Nm
KS Robot 400 / 600 / 800 Offroad	M12x1.5	85 Nm

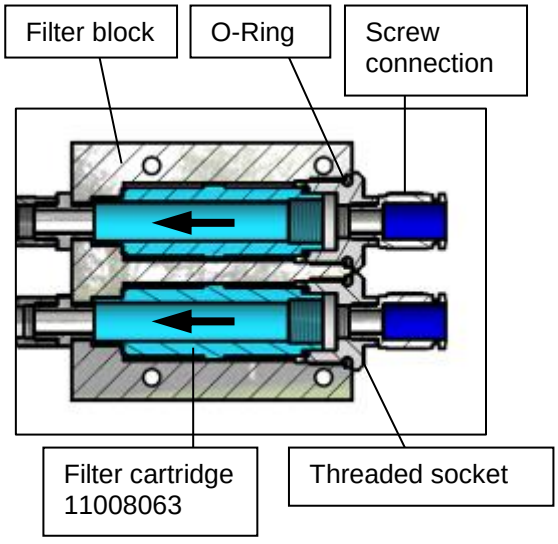
7.8 Replacing the vacuum filter

The filter cartridges in the vacuum switching unit may be clogged if the pressure drops.

If necessary, replace the filter cartridges.

Be careful not to damage the O-rings and gaskets during disassembly or assembly of the vacuum circuit unit.

When installing the filter cartridges, check the flow direction indicated on the cartridge.



7.9 Battery maintenance

7.9.1 Safety regulations

The following safety rules must be observed for maintenance, charging and changing the battery:

Warning!

- Maintenance work on the battery should only be carried out by qualified personnel.
- Follow the operating manual for the charging station or charger and battery.

Damaged cables may cause a short circuit.

- Be careful not to damage the battery cables when removing and installing the battery. (The battery cable may not be pinched when closing the battery door/cover.)

Risk of crushing and shearing!

- Always wear safety shoes when changing the battery.
- Only close the battery door/cover if there are no limbs between the battery door and edge of the frame.

Caution!

Explosion hazard due to flammable gases!

- Do not place metal objects or tools on the battery.
- Stay away from flames and do not smoke.
- Disconnect the battery connector before charging and only when the device and the charger are switched off.

Danger!

Risk of tipping over:

- Only change the battery in a no-load state.
- Pay attention to the weight of the battery! The weight of the battery has an influence on the stability of the device.

7.9.2 Changing the battery

Note!

- The battery is maintenance-free and is located in the housing of the base frame.
- Park the KS Robot in a safe area and switch it off via the main switch.

Warning!

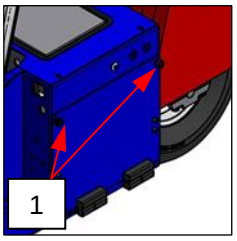
- Maintenance work on the battery should only be carried out by qualified personnel.
- **Always first disconnect the negative pole then the plus pole.**
  When connecting, proceed in reverse order.

KS Robot 400/600/800 Offroad

- Remove the housing cover.
- Remove the protective mat over the battery.
- Then disconnect the terminal posts from the battery, **(Attention! always first disconnect the negative pole then the plus pole)** remove the battery and replace it with a new one.

KS Robot 350 Offroad

- Open the battery box cover.
  To do this, loosen the two top knurled screws (1).
  The cover can now be pulled outward.
- Now pull out the battery toward the front and disconnect the battery connector (2).
- Remove the battery and replace it with a new one.
  Reconnect the battery connector (2), insert the battery, close the battery box cover and screw it on with the knurled screws.



7.9.3 Checking the battery charge status

Caution!
Deep discharge shortens the life of the battery

- A deep discharge of the KS Robot must be avoided at all cost. Therefore, connect the KS Robot immediately to the battery charger via the power cord and an electrical outlet.
- If the battery voltage is too low, it will be indicated on the tiller head control unit and the battery monitor lights up permanently.

7.9.4 Charging the battery

Note!
Charge the batteries after each shift or more frequently when the battery charge is low.

Procedure:

Park the KS Robot in a well-ventilated area where it is not exposed to condensation or soiling (see "finishing work"). In the models **KS Robot 350/400/600 Offroad** the charger is attached to the base frame.

- Connect the charging cable of the charger to the KS Robot and to a grounded power outlet.

Two LEDs indicate the charge status:

- Yellow LED: battery is charging
- Yellow LED and Green LED: battery is charging and is in the constant voltage phase
- Green LED: Trickle charge, battery is charged

The model **KS Robot 800 Offroad** is delivered with a separate charger, which is configured for the battery.

- First connect the charger to a grounded power outlet.
- Now connect the KS Robot to the connector on the charger.

The battery charge level is indicated on the charger by a charging characteristic curve.

Note!
See also separate operating manual for the charger!

7.10 Maintenance of the hydraulic system (KS Robot 800 Offroad)

Note!
It is forbidden to drain oil on the ground or into waterways.
Never mix oil of different types or brands in the system.

Recommended hydraulic oil:

	Type	Part number
Hydraulic and machine tool oil with cleaning effect	BP HPL-46	11014364

7.10.1 Checking the oil level

To operate the KS Robot, it is essential that the hydraulic oil is maintained at an appropriate level. The wrong hydraulic oil level can lead to damage of hydraulic system components.
Therefore, check the hydraulic oil level on the tank of your KS Robot regularly.

Procedure:

- Make sure the cylinders are fully retracted.
- Open the cover.
- Then check the oil level on the tank. The container should be filled up to the mark.
- If necessary, add oil.

7.10.2 Changing the hydraulic oil filter

The hydraulic oil filter is located in the return line. It is equipped with an indicator that shows the degree of soiling. If the red field is in the indication range, the filter is soiled and must be replaced.

Procedure:

- Make sure the cylinders are fully retracted.
- Open the cover.
- Remove the oil filter by turning it counter-clockwise.
- Now screw on a new filter.
- Then check the oil level on the tank and top off if necessary.

7.10.3 Checking the hydraulic hoses

Check the hydraulic hoses:

- Are there any leaks in the hydraulic hoses?
- Is damage to the outer jacket (such as kinks, chafing, cuts, brittleness) visible?
- Are the hoses properly attached in the fittings?
- Are there leaks between fittings and hose?

If damage has occurred, replace the damaged hoses.

Attention:
All hydraulic hoses must be replaced after 6 years at the latest, even if no damage or wear is visible on the outside!

8 Disposal

Operating the KS Robot results in waste and replacement parts that must be disposed of properly and in compliance with the legal regulations.

8.1 Environmental protection

Caution!

Environmental damage due to improper disposal!

Oils and solvent-containing operating and auxiliary materials have a high risk potential for the environment.
During all work on and with the KS Robot, the legal obligations for waste prevention and proper recycling / disposal must be observed.
In particular, during repair and maintenance work, water polluting substances such as greases, solvent-based cleaning fluids may not pollute the soil or enter the sewage system.
These substances must be collected and stored in suitable containers, transported and disposed of properly.

8.2 Decommissioning

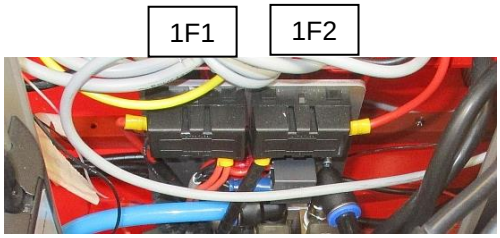
If the KS Robot is permanently decommissioned, the disposal of the components must comply with the laws and regulations for disposal at that time.

9 Individual Parts

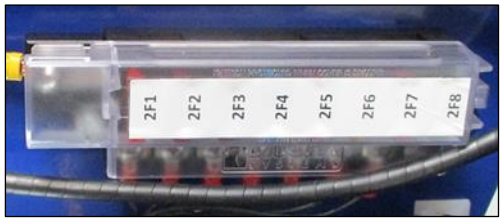
9.1 Fuse assignment

9.1.1 KS Robot 350 Offroad

Des.	Function	Size
1F0	Battery charger	15A
1F1	Drive	50A
1F2	Control unit	30A

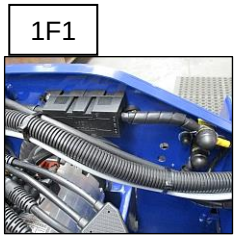


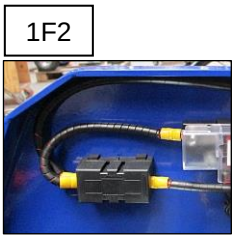
Des.	Function	Size
2F1	Circuit board	10A
2F2	Power outlet	3A
2F3	Remote control unit	3A
2F4	Add-on board	15A
2F4 *	Electrical turning	15A
2F5	Travel drive	3A
2F6	Horn	5A
2F7	Battery monitoring	3A
2F8	Reserve	



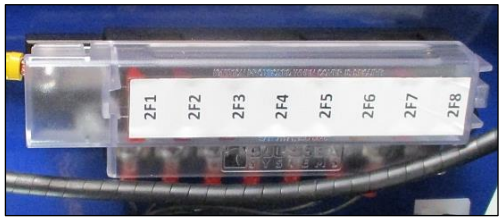
9.1.2 KS Robot 400 Offroad

Des.	Function	Size
1F0	Battery charger	15A
1F1	Drive	50A
1F2	Control unit	30A



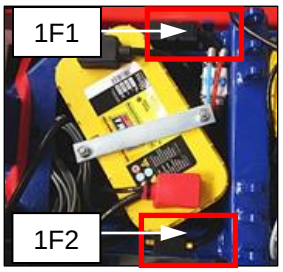


Des.	Function	Size
2F1	Circuit board	10A
2F2	Power outlet	3A
2F3	Remote control unit	3A
2F4	Add-on board	15A
2F4 *	Electrical turning	15A
2F5	Travel drive	3A
2F6	Horn	5A
2F7	Battery monitoring	3A
2F8	Reserve	

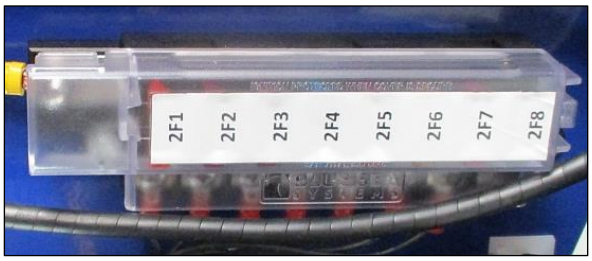


9.1.3 KS Robot 600 Offroad:

Des.	Function	Size
1F0	Battery charger	15A
1F1	Drive	50A
1F2	Control unit	30A

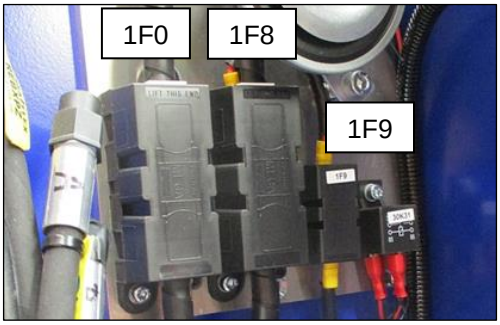


Des.	Function	Size
2F1	Circuit board	10A
2F2	Power outlet	3A
2F3	Remote control unit	3A
2F4	Add-on board	15A
2F4 *	Electrical turning	15A
2F5	Travel drive	3A
2F6	Horn	5A
2F7	Battery monitoring	3A
2F8	Reserve	

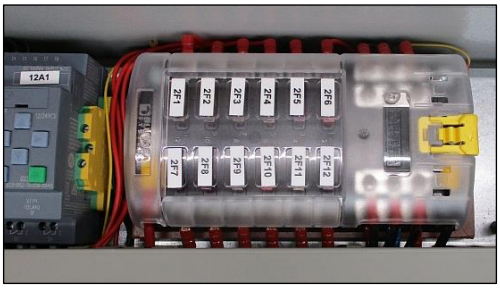


9.1.4 KS Robot 800 Offroad

Des.	Function	Size
1F0	Control unit	300A
1F8	Hydraulic pump	200A
1F9	Terminal box	30A



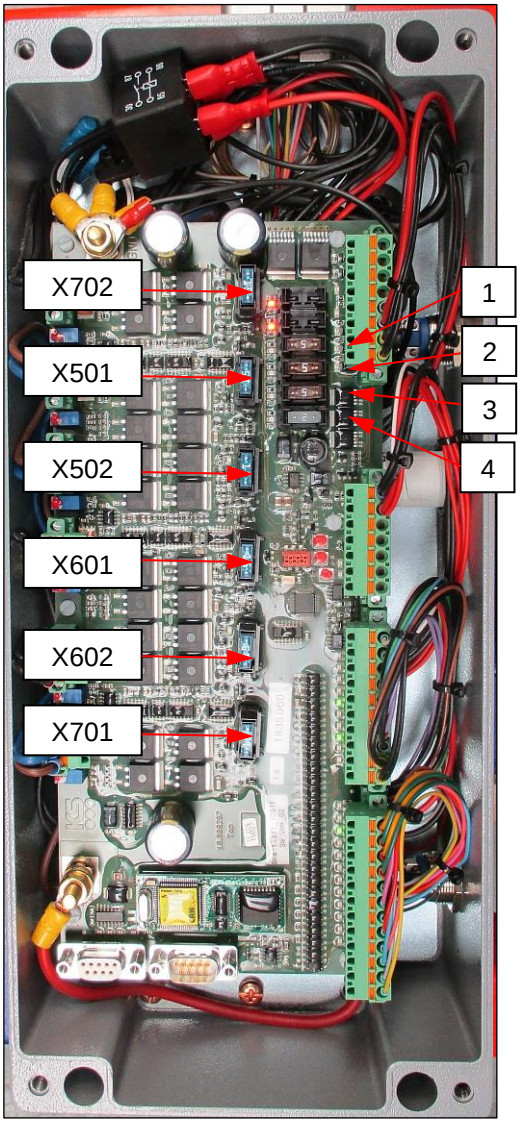
Des.	Function	Size
2F1	Vacuum pump 1	5A
2F2	Vacuum pump 2	5A
2F3	Reserve	5A
2F4	Horn	5A
2F5	Overload	3A
2F6	Logo	10A
2F7	Pressure switch vacuum	3A
2F8	Battery monitoring	3A
2F9	Fans / sockets	3A
2F10	Radio remote control unit	10A
2F11	Drive / motor	5A
2F12	Buzzer / signal light	3A

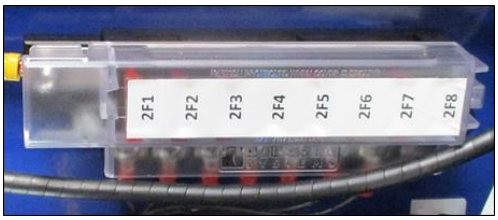


9.1.5 Fuse protection for electrical cylinders

The fuse protection for the electrical cylinders is located on the circuit board in the control box.

Des.	Function			Size
	Standard	Elec. double stroke *	Elec. turning *	
X702	Reserve	Telescope-cylinder 2	Rotary cylinder	15A
X501	Lifting cylinder 1			
X502	Lifting cylinder 2			
X601	Telescopic cylinder 1			
X602	Tilt cylinder			
X701	Lateral thrust cylinder		Rotary cylinder *	
1	Buzzer			5A
2	Vacuum pump 2 (black)			5A
3	Vacuum pump 1 (blue)			5A
4	Backup fuse 24V DC			2A
2F4 ²	Lateral thrust cylinder / add-on board			15A

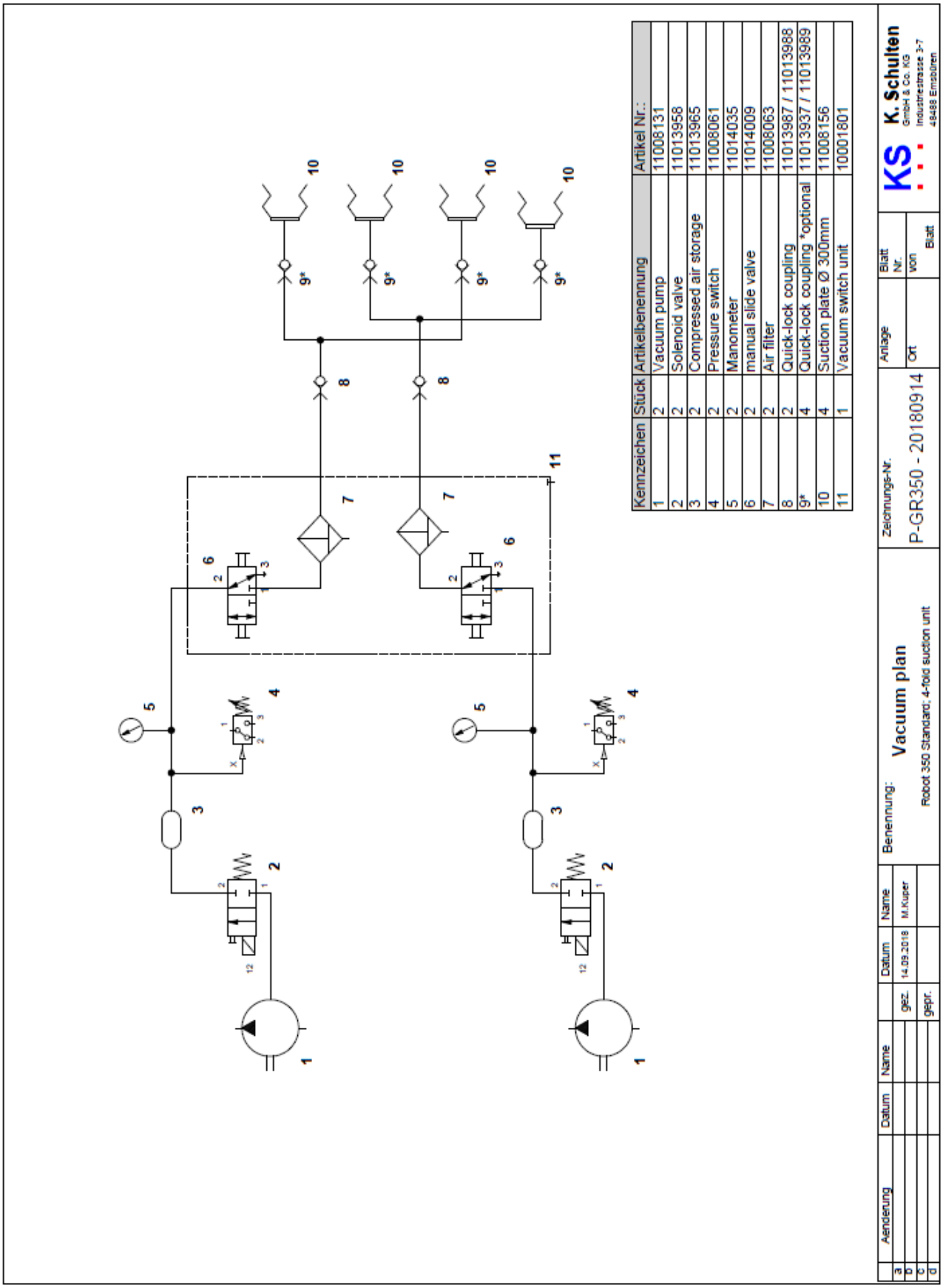




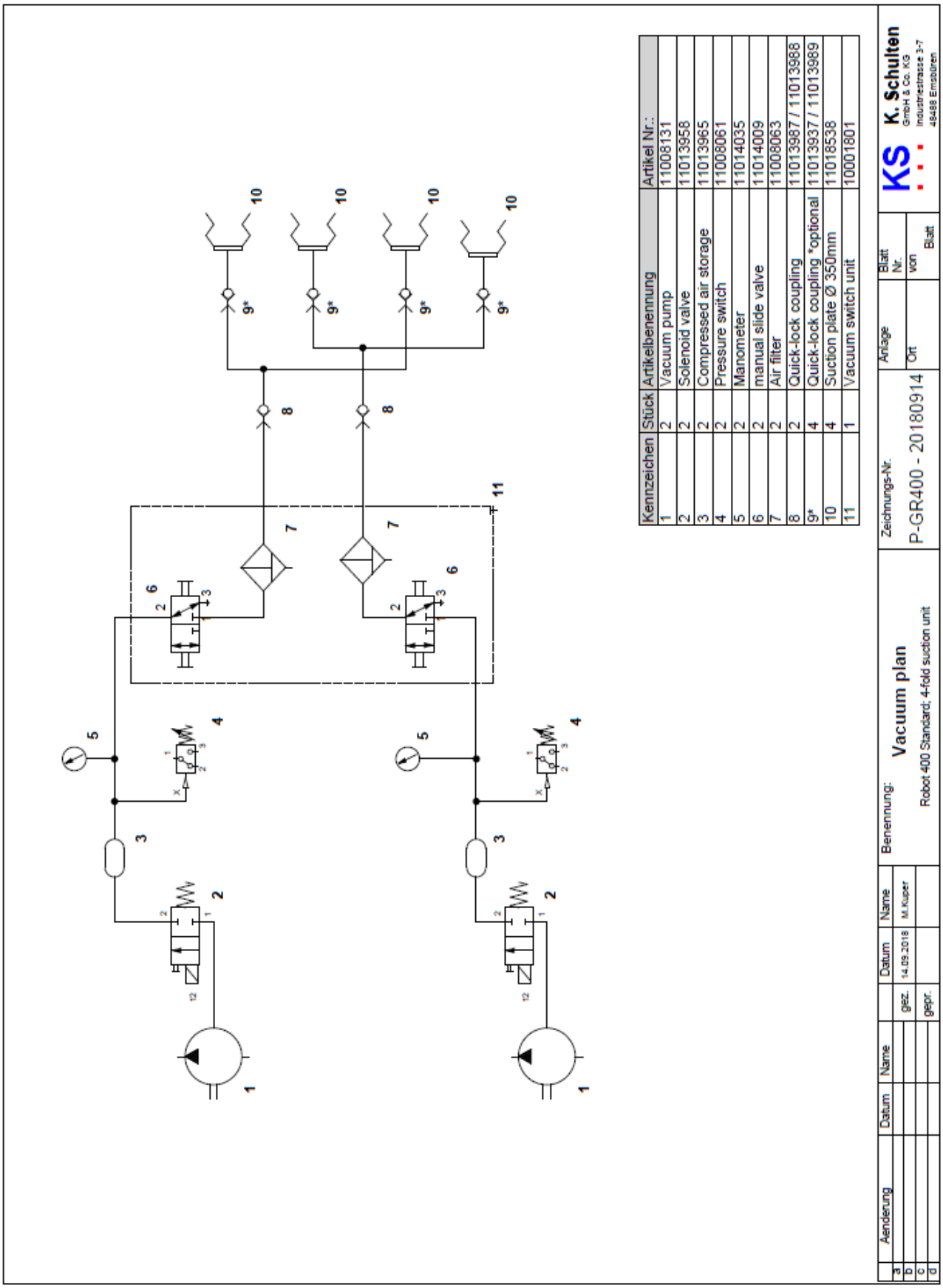
* Optional
² only with electrical double telescope and electrical turning

10 Diagrams

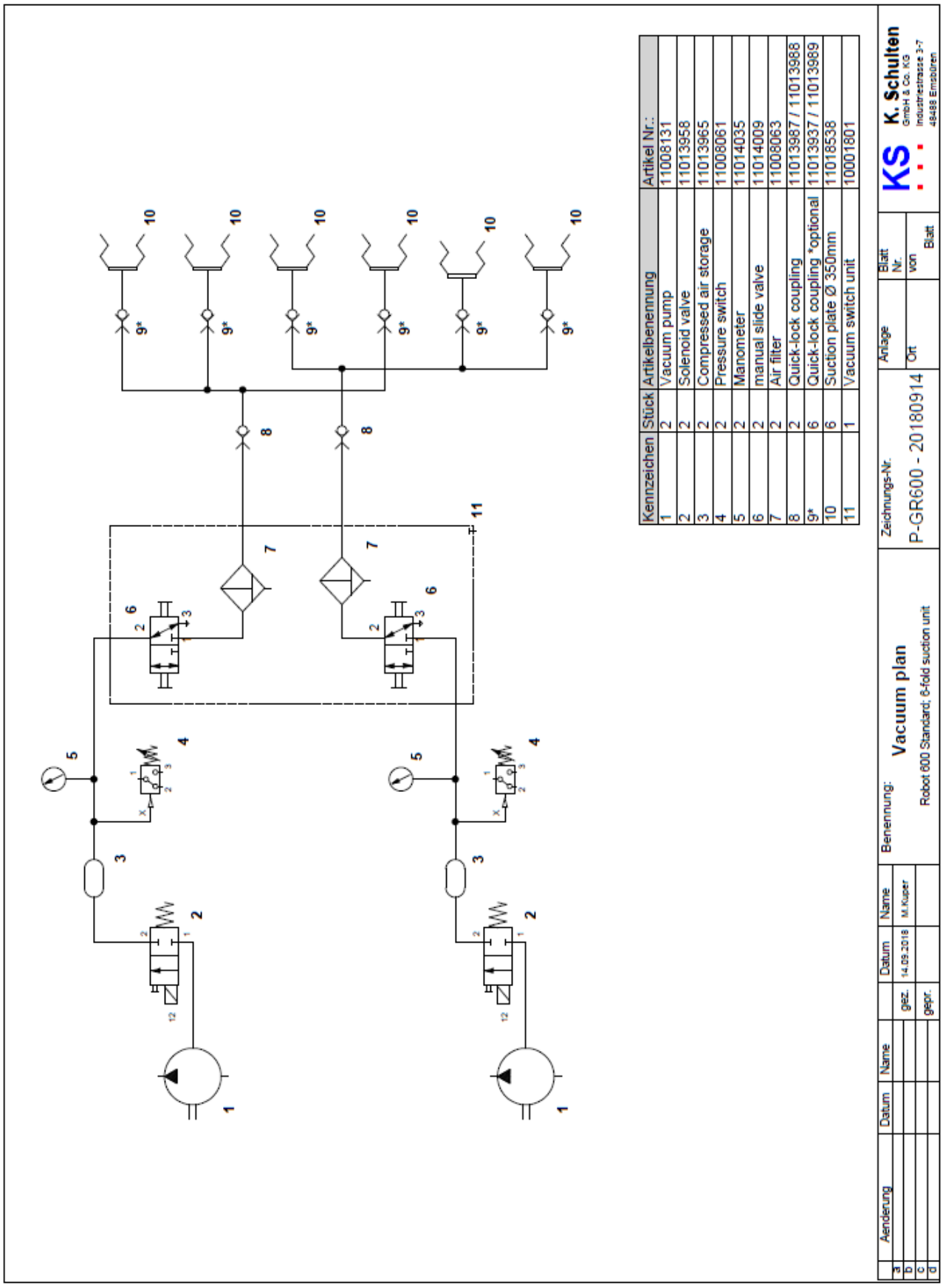
10.1 Vacuum diagram KS Robot 350 Offroad



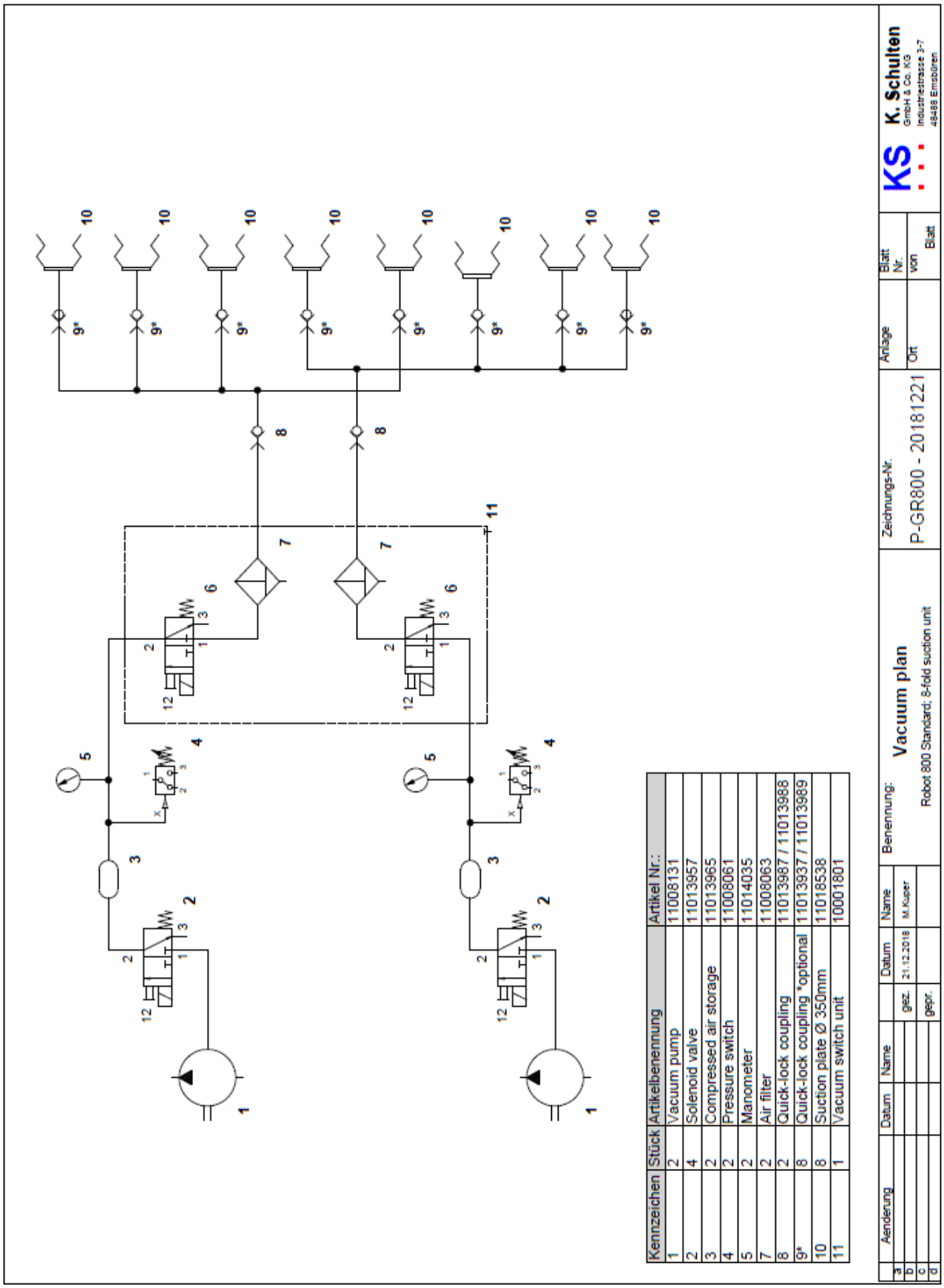
10.2 Vacuum diagram KS Robot 400 Offroad



10.3 Vacuum diagram KS Robot 600 Offroad

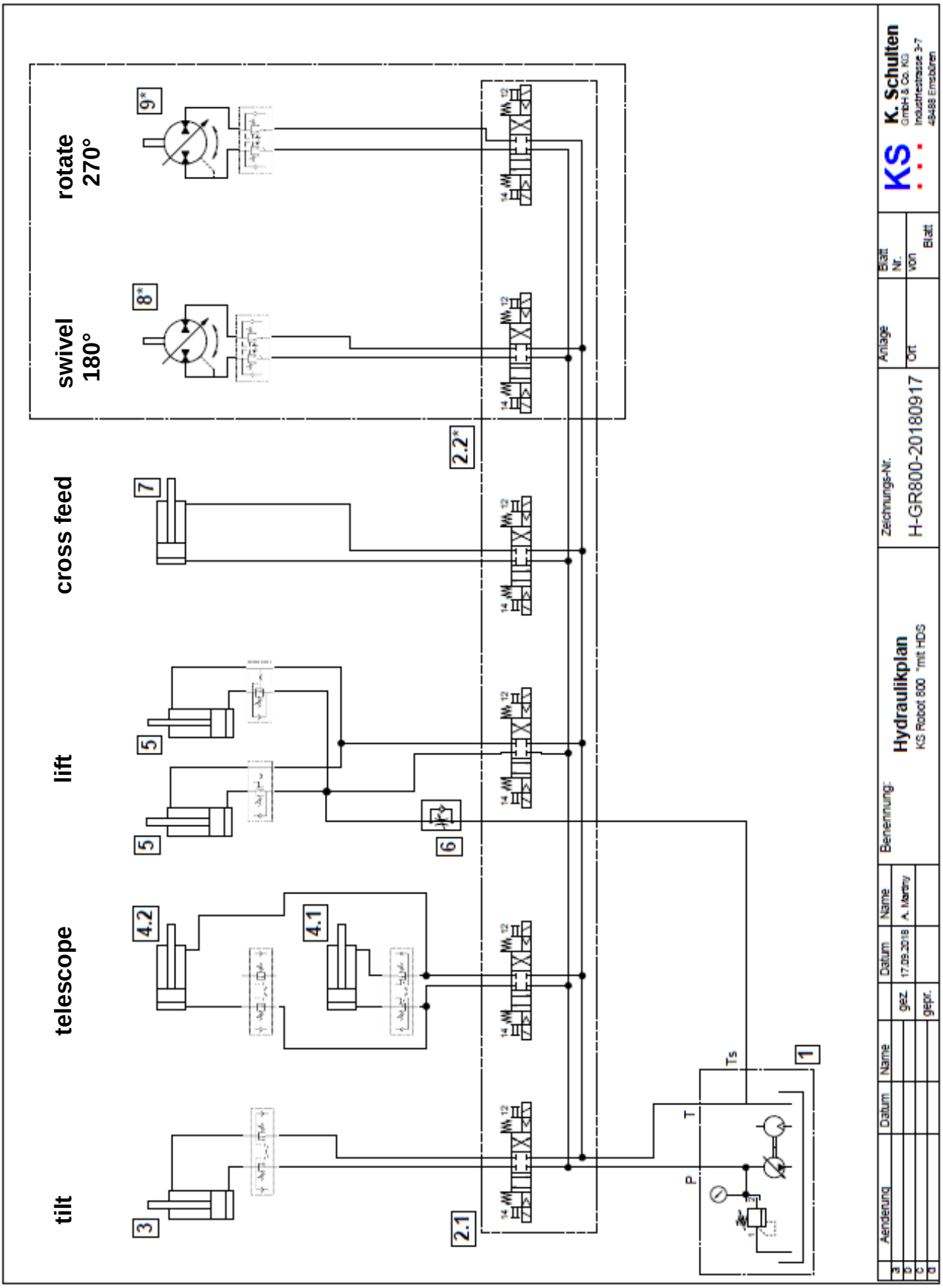


10.4 Vacuum diagram KS Robot 800 Offroad



Kennzeichen	Stück	Artikelbenennung	Artikel Nr.:
1	2	Vacuum pump	11008131
2	4	Solenoid valve	11013957
3	2	Compressed air storage	11013965
4	2	Pressure switch	11008061
5	2	Manometer	11014035
7	2	Air filter	11008063
8	2	Quick-lock coupling	11013987 / 11013988
9*	8	Quick-lock coupling *optional	11013937 / 11013989
10	8	Suction plate Ø 350mm	11018538
11	1	Vacuum switch unit	10001801

10.5 Hydraulic diagram KS Robot 800 Offroad



10.5.1 Parts list (KS Robot 800 Offroad)

Pos.	Pcs.	Name	Type		Part No.
1	1	Hydraulic unit	3KW		11008080
2.1	1	Valve block	4/3 Prop. directional valve 24V	4-piece	11000120
2.2				6-piece *	11000118
3	1	DW-cylinder	70 / 30-500 stroke		11020645
4.1	1	DW-cylinder	40/25-1000 stroke LHV-rod side		11020423
4.2	1	DW-cylinder	40/25-1000 stroke LHV-bottom side		11019769
5	2	DW-cylinder	63 / 45-600 stroke		11019767
6	1	Throttle-check valve	1/4"		11020729
7	1	DW-cylinder	50 / 20-100 stroke		11024274
7 *	1	Hydraulic swivel motor	180°		11001035
8 *	1	Hydraulic swivel motor	270°		11001036

* Optional
HDS (Hydraulic Turning and Swivel Head)

11 Load Diagrams

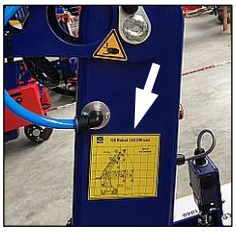
By default, the KS Robot is equipped with a vacuum suction unit when delivered.
If the KS Robot is used to lift while the load is in front of the wheels, it has a different load capacity than if the load is telescoped, lifted or swiveled.
In addition, the load-bearing capacity of the KS Robot with each attachment (e.g. fork) or the number of suction discs on the suction crossbar is different.

Danger!

Danger of tipping over:

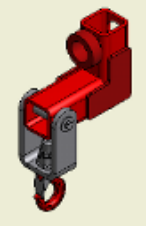
- Please observe the respective load diagram of your KS Robot
- Please note the load diagram that corresponds to the respective attachment and the specified weights (e.g. manual double telescope) may not be exceeded.
- The load-bearing capacity may be limited if the load is swiveled sideways (+/- 90°) or electrically turned.
- Please note that by reducing the number of suction discs the load-bearing capacity is also reduced.
- The number of counterweights on the KS Robot may not be increased.

- The load diagram is located on the side of the base frame support arm.



11.1 Attachments

11.1.1 Load hook (optional)

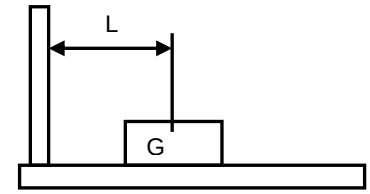
KS Robot - Standard			KS Robot 800 HDS *		
	Part number:	Load-bearing capacity:		Part number:	Load-bearing capacity:
	10000896	Max. 600 kg		10014203	max. 800 kg

* Optional - HDS (hydraulic turning

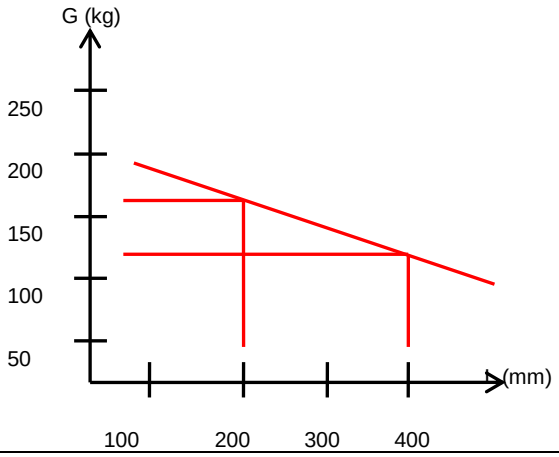
11.1.2 Load fork

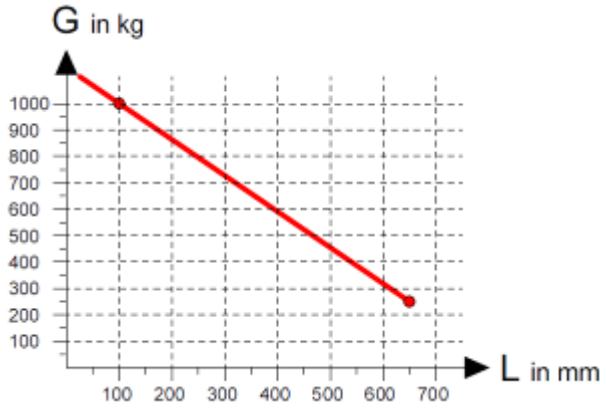
KS Robot - Standard	KS Robot 800 HDS *
 Part number: 10005286	 Part number: 10017258

Fork diagram



L = rail leading edge to payload center of gravity
G = payload





12 Suction Unit (standard)

12.1 Intended use

The suction unit is intended for use with the KS Robot.
It is suitable for the vertical and horizontal transport of flat glass and sheet materials. The load is held during lifting by vacuum.

12.2 Improper use

- The load-bearing capacity may not be exceeded.
- No alteration of the load handling attachment is allowed.
- The use of the load handling attachment to transport persons is prohibited.
- When transporting the load, avoid pendulum movement and bumping into obstacles.
- Only one load may be transported at a time with the load handling attachment.
- Do not drop the load handling attachment from a significant height.

12.3 Safety information

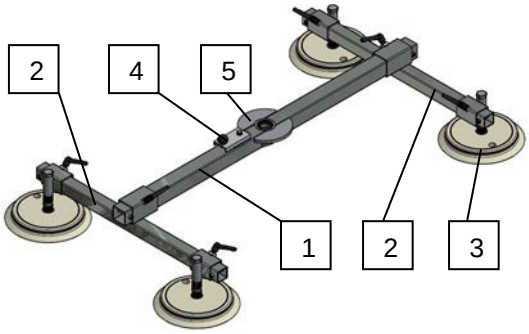
All work with the suction unit may only be carried out by trained and instructed personnel.
Please make sure that every person responsible for transport has read and understood these operating instructions before starting work.

- Wear suitable work clothes: hard hat, work gloves, safety shoes.
- Only use the suction unit under conditions for which it is intended.
  (see **intended use**)
- Never use a damaged, not fully functional or incomplete device.
- Do not use the device if the sealing edge of a suction disc has been cut or otherwise damaged.
- Do not use the device if it appears that information about the lifting capacity or other warning labels is missing or unrecognizable.
- Always make sure that the contact surfaces of the load and all suction discs are clean before applying vacuum from the suction discs.
- The transport of persons as well as dwelling in the danger zone is forbidden.
- Position the suction discs correctly on the load before lifting.
- Never walk under suspended loads.
- The specified payload may not be exceeded.
- Never leave the load unattended.
- Any defects found must be remedied immediately by qualified personnel.

12.4 Product Description

The suction unit consists of a support frame and adjustable suction discs on a longitudinal beam with two or four cross members.

1. Longitudinal crossbar (beam)
2. Crossbeam
3. Suction unit, simple
4. Latch bolt
5. Mounting flange

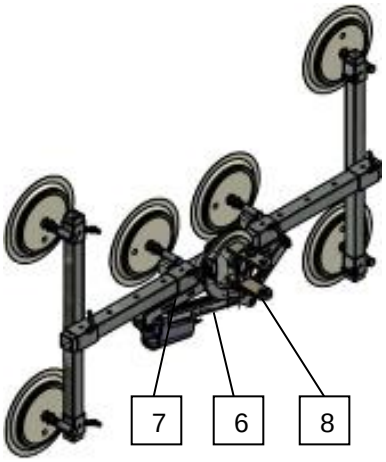


12.4.1 Accessories

The suction unit can also be equipped with an electrical rotary cylinder as an option.
It allows turning up to 100°.

Option:

6. Rotating joint
7. Rotary cylinder
8. Crank



12.5 Technical data

Suction unit	4-piece - Ø250	4-piece - Ø300	4-piece - Ø350	6-piece - Ø350	8-piece - Ø350
Load-bearing capacity max.:	280 kg	350 kg	400 kg	600 kg	800 kg
Lifting capacity per suction disc approx.:	70 kg	90 kg	100 kg	100 kg	100 kg
Dimensions frame:					
Length approx.:	1200 mm	1200 mm	1600 mm	1600 mm	1600 mm
Width approx.:	750 mm	750	1000 mm	1000 mm	1000 mm

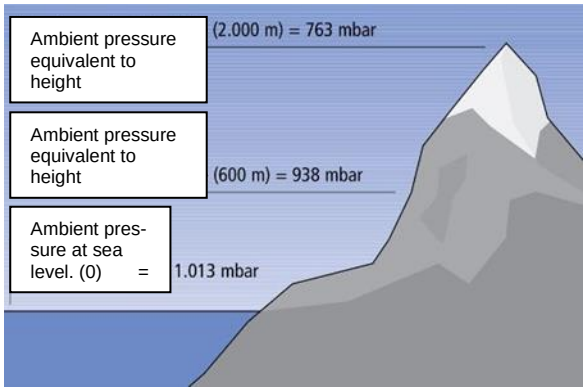
12.6 Payloads suction unit

Suction disc Ø	Number of suction plates	Max. load capacity (kg)	Suction disc Ø	Number of suction plates	max. load capacity (kg)	Suction disc Ø	Number of suction plates	Max. load capacity (kg)
Ø 250	2	140	Ø 300	2	180	Ø 350	2	200
	4	280		4	350		4	400
	6	400					6	600
							8	800

12.7 Effect of air pressure changes on the suction force

The load-bearing capacity of the vacuum suction depends, among other things, on the pressure difference between the suction surface and the atmosphere. As the altitude increases, the air pressure and thus the load-bearing capacity of the vacuum suction system decreases.

Up to 2000 m above sea level, the atmospheric pressure drops by 12.5 mbar per 100 m.
This would result in an atmospheric pressure of just under 938 mbar for the city of Memmingen in Bavaria (601 m above sea level).



Altitude	**Air pressure** (compared to 0m altitude)	**Air pressure**	**Differential pressure** (at 78% achievable vacuum)	**Suction force** (at 600 mbar set differential pressure)
0 m	100 %	1013.25 mbar	790 mbar	100 %
100 m	98.7 %	1000.3 mbar	780 mbar	100 %
200 m	97.5 %	987.6 mbar	770 mbar	100 %
300 m	96.2 %	975.0 mbar	760 mbar	100 %
400 m	95.0 %	962.5 mbar	750 mbar	100 %
500 m	93.8 %	950.3 mbar	741 mbar	100 %
600 m	92.6 %	938.1 mbar	731 mbar	100 %
700 m	91.4 %	926.2 mbar	722 mbar	100 %
800 m	90.2 %	914.4 mbar	713 mbar	100 %
900 m	89.1 %	902.7 mbar	704 mbar	100 %
1000 m	88.0 %	891.2 mbar	695 mbar	100 %
1500 m	82.5 %	835.8 mbar	652 mbar	100 %
2000 m	77.4 %	783.8 mbar	611 mbar	100 %
2241 m	75.0 %	759.9 mbar	593 mbar	98.8 %
2500 m	72.5 %	735.1 mbar	573 mbar	95.5 %
2962 m (Zugspitze)	68.4 %	692.8 mbar	540 mbar	90 %
3000 m	68.0 %	689.4 mbar	538 mbar	89.67 %
3500 m	63.8 %	646.5 mbar	504 mbar	84 %
3798 m (Großglockner)	61.4 %	622.8 mbar	486 mbar	81 %
4000 m	59.8 %	606.3 mbar	473 mbar	78.83 %
4810 m (Mt. Blanc)	53.9 %	546.52 mbar	426 mbar	71 %

The vacuum pumps of the vacuum suction system are always set to a differential pressure of 600 mbar, so that a suction force of 100% is guaranteed up to an altitude of 2000 m.

Note!
When used at altitudes greater than 2000 meters, the vacuum pressure switch must be readjusted to prevent the vacuum pumps from running continuously.
Adjustments to the vacuum parts may only be made by authorized and properly qualified personnel.

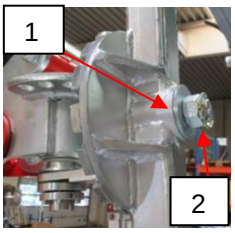
12.8 Handling

12.8.1 Installation

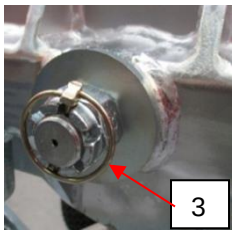
Attach the suction unit to the KS Robot as follows.

Procedure:

1. Place the load handling unit (e.g. vacuum suction unit) with the included washer (1) on the mounting of the KS Robot rotating assembly. Screw to the mounting with the nut (2).

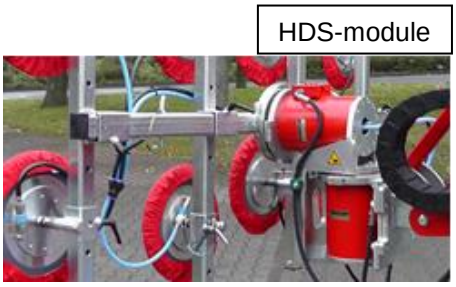


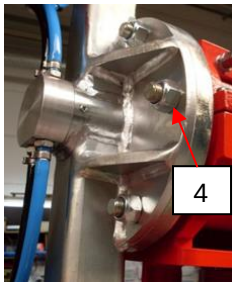
9. Then secure the nut with the linch pin (3) against twisting.



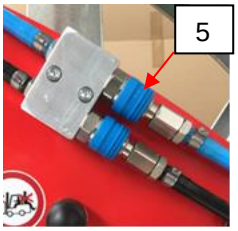
When equipped with HDS module (hydraulic rotary swivel unit)

10. The load handling unit (e.g. vacuum suction unit) is mounted on the rotating assembly with 6 threaded bolts (4). First loosen the 6 nuts, place the load handling unit on the mounting and then secure the load handling unit by screwing the nuts back on.



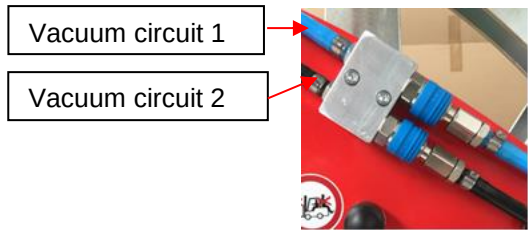


11. Now connect the two vacuum hoses of the suction unit via the quick couplings (5) to the telescopic boom of the KS Robot vacuum system.



12. When installing a vacuum suction unit, make sure that the vacuum hoses are connected to the same vacuum circuit.

Vacuum circuit 1 = blue hose lines
Vacuum circuit 2 = black hose lines

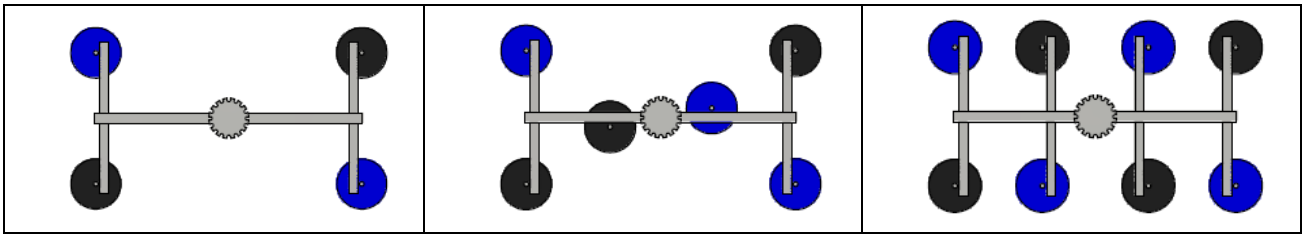


Note!
The suction discs are evenly arranged on the vacuum suction unit in the two-circuit system.

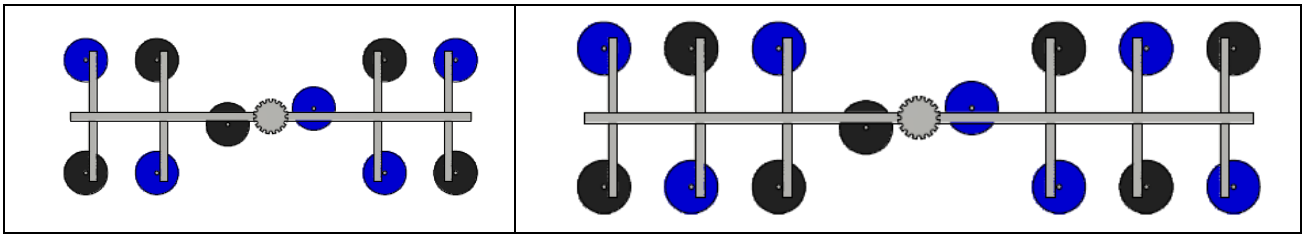
Please observe the respective vacuum plan of your vacuum suction unit.

12.8.2 Arrangement of suction discs

The vacuum suction discs of the suction unit are arranged evenly in the two-circuit system.



4-piece suction unit | 6-piece suction unit | 8-piece suction unit



10-piece suction unit | 14-piece suction unit

12.8.3 Transport of elements

The suction unit offers various options for positioning the suction discs in order to accommodate different load dimensions.
The operator can set up the configurations by inserting or removing the extension arms of the suction frame, repositioning or removing the adjustable suction holders, and connecting or disconnecting the vacuum hoses for certain suction discs.
Always position the suction frame symmetrically in order to balance the suction unit.

Warning!

The removal or separation of any suction disc affects the lifting capacity of the suction unit!
Make sure that all vacuum hoses are rolled up or arranged and that they do not become knotted, kinked or punctured during the turning or tipping process.

12.9 Maintenance and service

12.9.1 Inspection

Note!
Check every vacuum disc for defects on a regular basis.
Eliminate any defects before using the lifting device.

Defects	Remedy
Soiling on the surface or the sealing edges of the suction disc:	Soiling can impair the ability of the suction discs to seal properly. Follow the instructions for cleaning the suction disc if necessary.
Notches, cuts and abrasions at the sealing edges:	Damage to the suction unit may affect the load-bearing capacity of the lifting device. Replace each damaged suction disc immediately.

Warning!

Replace a vacuum disc if the edges of the seal have any notches, cuts, or abrasions.

12.9.2 Cleaning the suction discs

- Clean the suction discs with soap and warm water, while at the same time using a tool (e.g. a soft brush). Then allow the suction discs to dry at room temperature.

Caution!
Under no circumstances should solvents such as trichlorethylene, carbon tetrachloride, hydrocarbons or vinegar cleaner be used for cleaning.
Do not use sharp objects, wire brushes, sandpaper, etc.

13 Declaration of Conformity

- Translation -

EC Declaration of Conformity

in accordance with EC Machinery Directive 2006/42/EC dated 17 May 2006, Appendix II 1.A

We hereby declare that the machine described below, in its design and construction as well as in the version we have placed on the market, complies with the basic health and safety requirements of the EC Directive 2006/42/EC.
This declaration loses its validity if unauthorized modifications are made to the machine.

Manufacturer / Distributor
K. Schulten GmbH & Co. KG
Industriestraße 3-7
D-48488 Emsbüren

Product:

Product name:	Glass lift
Functional description:	be used for lifting and lowering of loads
Model name:	KS Robot 350 Offroad, KS Robot 400 Offroad, KS Robot 600 Offroad, KS Robot 800 Offroad
Machine number:	
Year of construction:	

Consistency with other directives/regulations that also apply to the product is declared:
EMC Directive 2014/30/EU

The following harmonized standards were applied:

EN ISO 12100:2011-03	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 349:2008	Safety of machinery – Minimum gaps to avoid crushing of body parts
EN 13035-1:2008	Machines and plants for the manufacture, treatment and processing of flat glass - Safety requirements - Part 1: Storage, handling and transportation equipment inside the factory
EN 13035-2:2008	Machines and plants for the manufacture, treatment and processing of flat glass - Safety requirements - Part 2: Storage, handling and transportation equipment outside the factory
EN 13155:2017-11	Crane - loose load lifting attachments

The following entity is authorised to compile the technical documentation in accordance with the Machinery Directive:
K. Schulten GmbH & Co. KG
Industriestraße 3-7
D-48488 Emsbüren

Place: D- 48488 Emsbüren
Date: 12.01.2018

_____ _____

Jörg Alsmeier, Managing Director Horst Anker, Managing Director

Vacuum pump heater

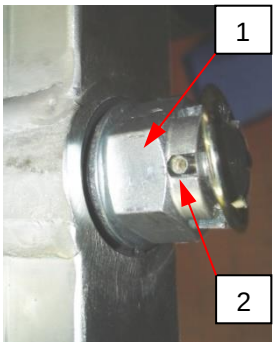
Attention!
The KS Robot may be used in an environmental temperature range between 0°C to + 50°C! The machines exploitation is to be stopped when the environmental temperature falls below 0°C!

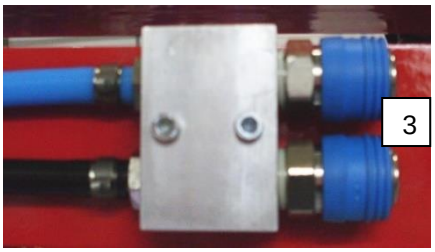
The machine is equipped by vacuum pump heaters, which grant a secure usage also during lesser environmental temperatures.

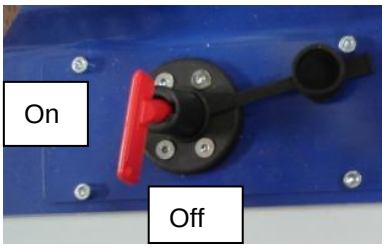
Hint!

For environmental temperatures lesser than 5°C, we recommend to switch on the vacuum pump heaters prior to switch on the machine by the main key.

Putting into Operation







1) Firstly mount the load attachment on the KS Robot.

2) For that purpose, please put the load attachment (for example a suction unit) onto the pin on the KS Robot and fix it by the female screw (1).

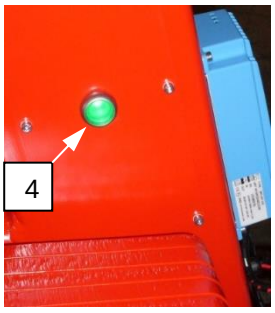
3) Following this, secure the female screw with the lock pin (2) against loosening.

4) Connect both vacuum pipes (black/blue) tot he according adapters 3).

5) The KS Robot is switched on and off by the battery key (main key).

6) The pump heating is switched on by pushing the green button (4), now the button lights.

7) The pump heaters shall be activated approx. 15 minutes prior to machines putting into operation, by what the pumps gains the required operation temperature.



8) After this the machine may be switched on by the main key.

Attention!
Switch off the pump heater again by pushing of green button after the assignment, to rest the batteries.

Notes