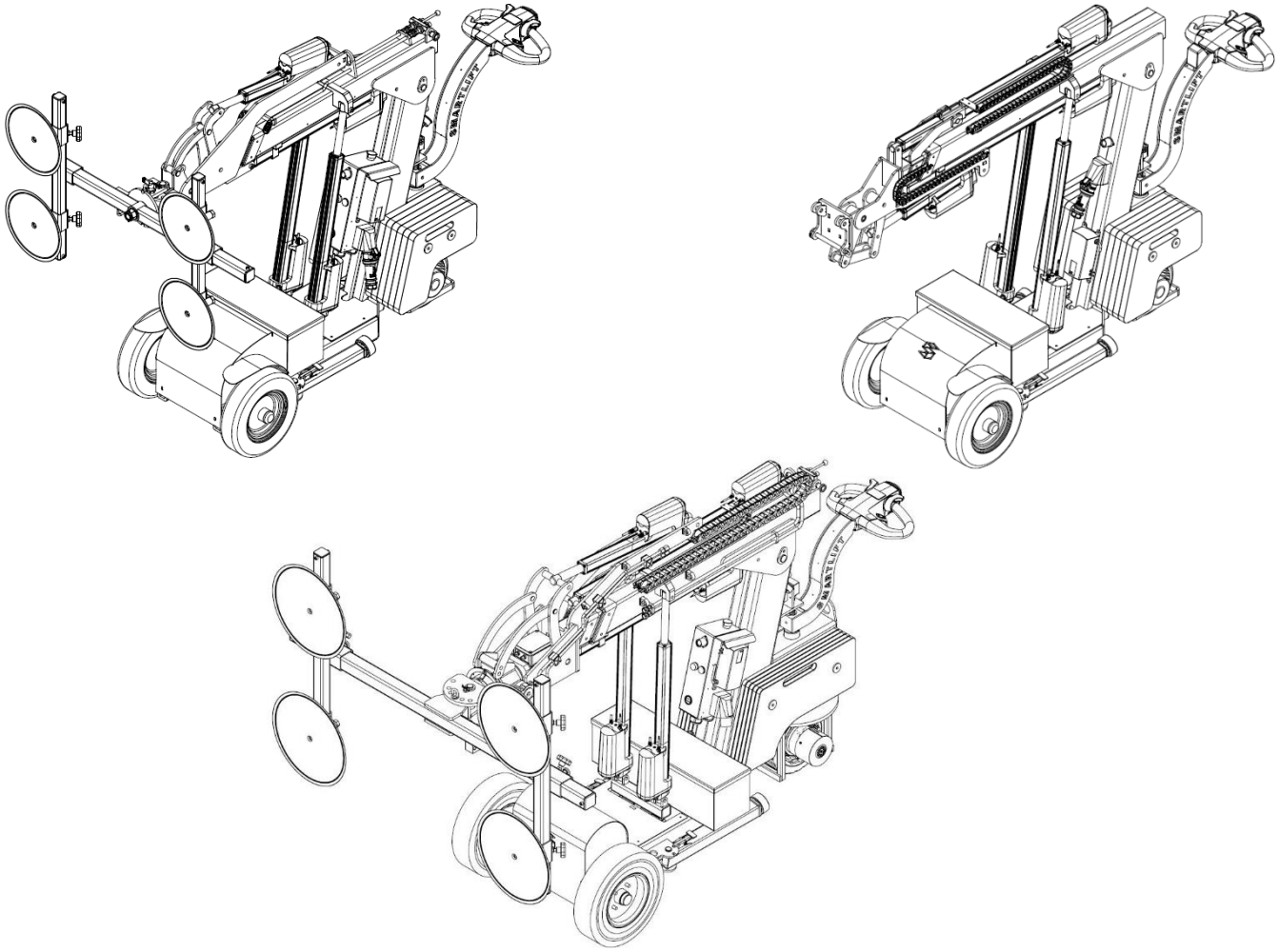
SMARTLIFT



SL 280

SL 380
SL 380 HL
SL 380 RT

SL 580
SL 580 HL
SL 580 HLE
SL 580 HLE RT

SLI 250
SLI 250 HLE

User Manual

English

Issued by:	Date:	Approved by:	Document name.:
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Table of contents

1 Introduction

Smartlift A/S is an innovative company which develops and manufactures smart lifts, which are marketed worldwide. A Smartlift is characterised by the highest levels of precision, reliability and quality.

The **SL machines** are designed for transport and installation of heavy window elements on construction sites and in industry, without exposing the user to heavy gruelling lifting. The machines have been developed with a focus on user-friendliness and flexibility, and can thereby solve most tasks.

The **SLI machines** are based on the basic structure of a similar SL machine, but are built without the vacuum system in favour of specially adapted solutions.

A Smartlift is a utility tool, designed for lifting glass with a controlled and fixed vacuum yoke. The machine's application possibilities can be increased by purchasing accessories like lifting hook and pallet forks, but the machine must not be compared to a crane or a forklift. The machine is not designed to comply with any crane and truck regulations.

1.1 Smartlift customer service

Smartlift customer service
Tel. +45 97 72 29 11
E-mail: Customerservice@smartlift.com.

1.2 Reading guide

These instructions have been prepared in accordance with DS/EN ISO 20607:2019 Safety of machinery – Operating instructions – General principles for design, and they are the manufacturer's original operating instructions for the machines.

The operating manual provides the user with the information necessary to operate the machine effectively and safely throughout the machine's service life. General safety instructions and conditions are described in a separate section, after which the machine and its intended use are described.

The operating manual is aimed at all users of the machine, and is structured according to the user's functions and interactions with the machine. Security-related information and instructions appear either as sections or as general information for all users.

When reviewing the operating manual, the following approach is recommended:

- Identify yourself as belonging to one or more user groups before using the machine.
- Read and understand the contents of the operating manual, including information and instructions. If applicable, you only need to read those which are aimed at your particular user type.

In case of uncertainty regarding the above, contact your immediate supervisor.

Headings followed by (**SL**) only apply to machines with vacuum. The manual mainly contains illustrations of SL machines.

1.3 About the operating manual

The operating manual has been divided into a user manual and a service manual.

 **User manual Includes:**	 **Service manual Includes:**
Machine overview	Parts lists
Safety instructions	Advanced troubleshooting
Operation of the machine	
Service forms	

The user manual must be stored in a place which is known and accessible to the user and to maintenance personnel.

The service manual must be stored in a place which is known and easily accessible to maintenance personnel.

It is the obligation of the employer (machine owner) to ensure that everyone who services, cleans, operates, maintains or repairs the machine has read the user manual and service manual, or at least the parts of them which are relevant to their work.

Additionally, anyone who operates, services, maintains or repairs the machine is under an obligation to seek information in both the user manual and service manual.

1.3.1 The user

"User" refers to an everyday user who is not a skilled worker in the particular field. The user is assumed to have been instructed in the safety and operation of the machine, and to be able to perform tasks within its field of work. For example, for operation, it is expected that the person is able to start and stop, check the proper centring of the vacuum yoke and remove items during normal operation.
It must be ensured that the person in question has been adequately instructed about the operating instructions and trained so that the work can be performed safely.

1.3.2 Maintenance personnel

Maintenance personnel must be qualified, either through having trained as e.g. blacksmiths, electricians or mechanics, or by being trained in a way that makes them equal to these professional groups. In addition, they must be familiar with the machine's operation and safety, and know the location of the emergency stop.
Maintenance personnel must have read and understood the user manual, service manual, instructions, workplace instructions, etc.
Before commencing work, repairmen and maintenance personnel must be instructed about the machine’s safety situation.
New maintenance personnel must be trained by an experienced colleague.

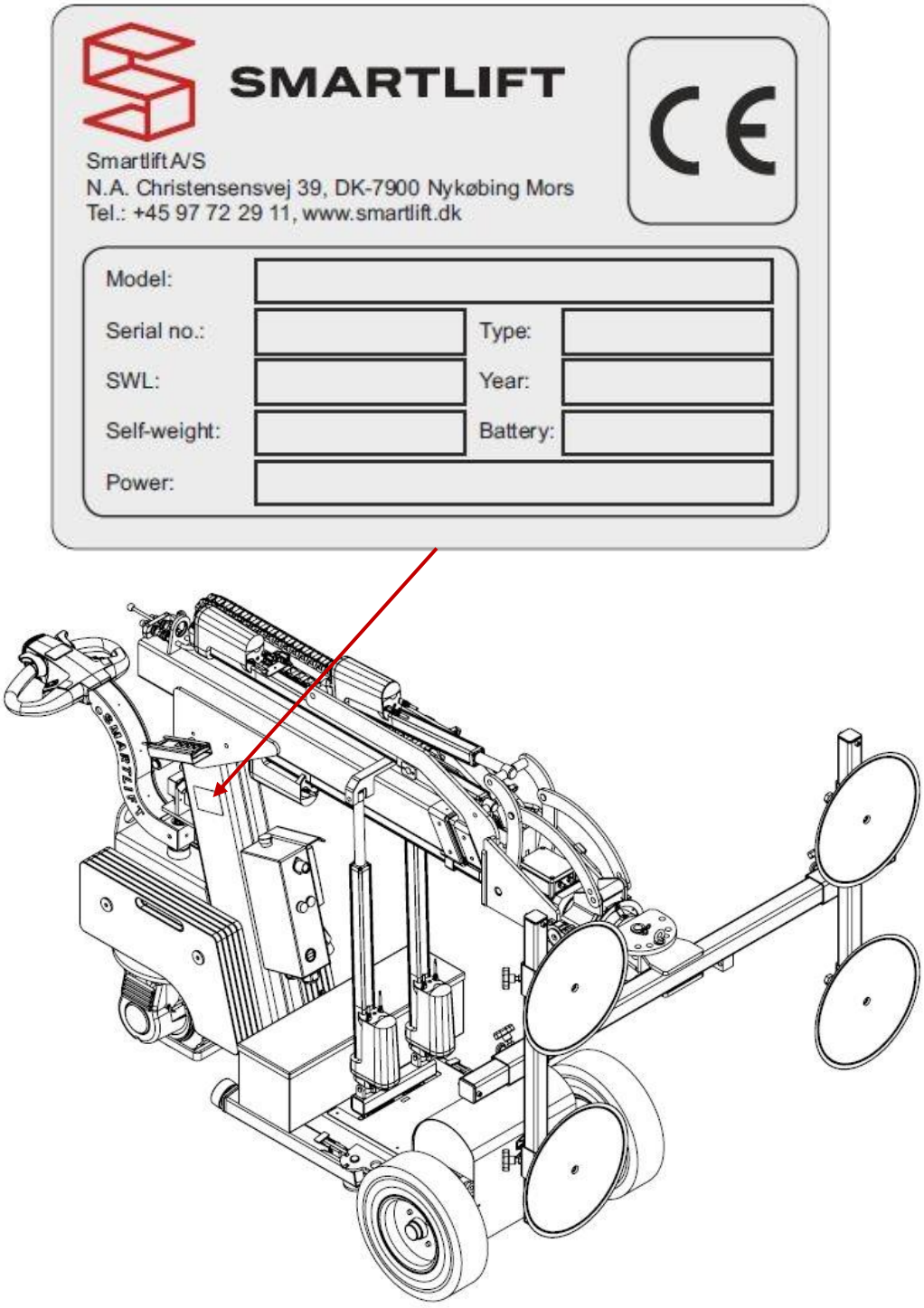
1.4 Machine types covered

The user manual covers machines SL 280, SL 380 and SL 580, which are part of Smartlift's Indoor series which has been designed for performing indoor work on construction sites.
SLI is based on the SL series but is suitable for tasks where lifting with a vacuum cannot be used, but instead uses a special tool. The user manual also covers the equipment models below:

Model - SL	Description	Equipment			
		1. Extension - Electric	2. Extension - Manually	2. Extension - Electric	Electrical Rotation
SL 280 / SL 380 / SL 580	Base machine	X			
SL 380 HL / SL 580 HL	Highlifter	X	X		
SL 380 RT	Rotation	X			X
SL 580 HLE	Highlifter Electric	X		X	
SL 580 HL RT	Higlifter Rotation	X	X		X
SL 580 HLE RT	Highlifter Electric Rotation	X		X	X

Model - SLI	Description	Equipment			
		1. Extension - Electric	2. Extension - Manually	2. Extension - Electric	Electrical Rotation
SLI 250	Base machine	X			
SLI 250 HLE	Highlifter Electric	X		X	

1.5 Nameplate



2 Safety and residual risks

2.1 Safety instructions

The machine may only be used by persons who have received competent training in the use of the machine's functions and who understand the risks involved in using the machine. The user must have read and understood this user manual before using the machine. The user is always responsible for ensuring that the machine is used correctly and safely.
When using special equipment (forks, lifting hooks, etc.), the user must have read and understood the user manual for this equipment, and must hold the relevant certificates required by law.

It is forbidden to

- modify the machine.
- lift or transport people.
- be under or in front of the machine when it is loaded.
- be under the machine if it is hoisted.
- exceed the WLL of the machine or any accessories.
- exceed the load chart of the machine.
- use and charge the machine at the same time.
- lift underneath the machine using a forklift or the like.
- use the machine without wearing safety shoes.
- drive at high speed down slopes.
- use fewer than 4 suction cups when using the vacuum yoke.

WARNING! Risk of danger!

- Never use the machine without having read this manual.
- Never use the machine without having read and understood all labels on the machine.
- Never use the machine in case of visible damage or defects.
- Never use the machine without first considering the surroundings, the surface and the weather.
- Never use the machine to lift wet or greasy items.
- Never use the machine to lift items that are not airtight.
- Never use the machine without exercising great caution.
- Using the machine involves a risk of overturning.
- Always drive down slopes at low speed and with great caution.
- Never leave the machine loaded or on a slope.
- Always stay a sound distance away from the machine and load.

WARNING! Risk of explosion!

- It is forbidden to use the machine in areas where there is a risk of explosion (ATEX zones).

2.2 Emergencies

2.2.1 The machine loses vacuum

⚠ **WARNING! If the machine suddenly loses vacuum, the load must be immediately lowered and placed on a solid surface!**

2.2.2 The machine overturns

- If the machine has overturned, it must be raised by hoisting from the designated hoisting eyes. See section **5.3 Handling and lifting.**

⚠ **WARNING!**

- **The machine's batteries contain acid!**
- **If the machine tips over, there is a risk that battery acid will leak out!**
- **If skin or eyes come into contact with battery acid, rinse them with plenty of clean water and consult a doctor!**

⚠ **WARNING! In case of a crash, the machine must undergo complete servicing!**

2.3 Personal protection equipment

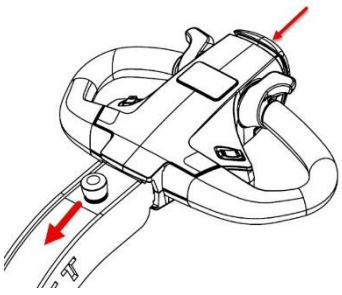
This section describes what personal protective equipment may be required when using the machine.

⚠ **WARNING! It is forbidden to use the machine without wearing safety footwear!**

In addition, the following protective equipment is recommended: Safety helmet.

2.4 Safety switch - Belly button

If the machine is driven backwards and the belly button switch is triggered, the machine will automatically change the direction of travel for a short while. This reduces the risk of getting caught between objects and the machine.

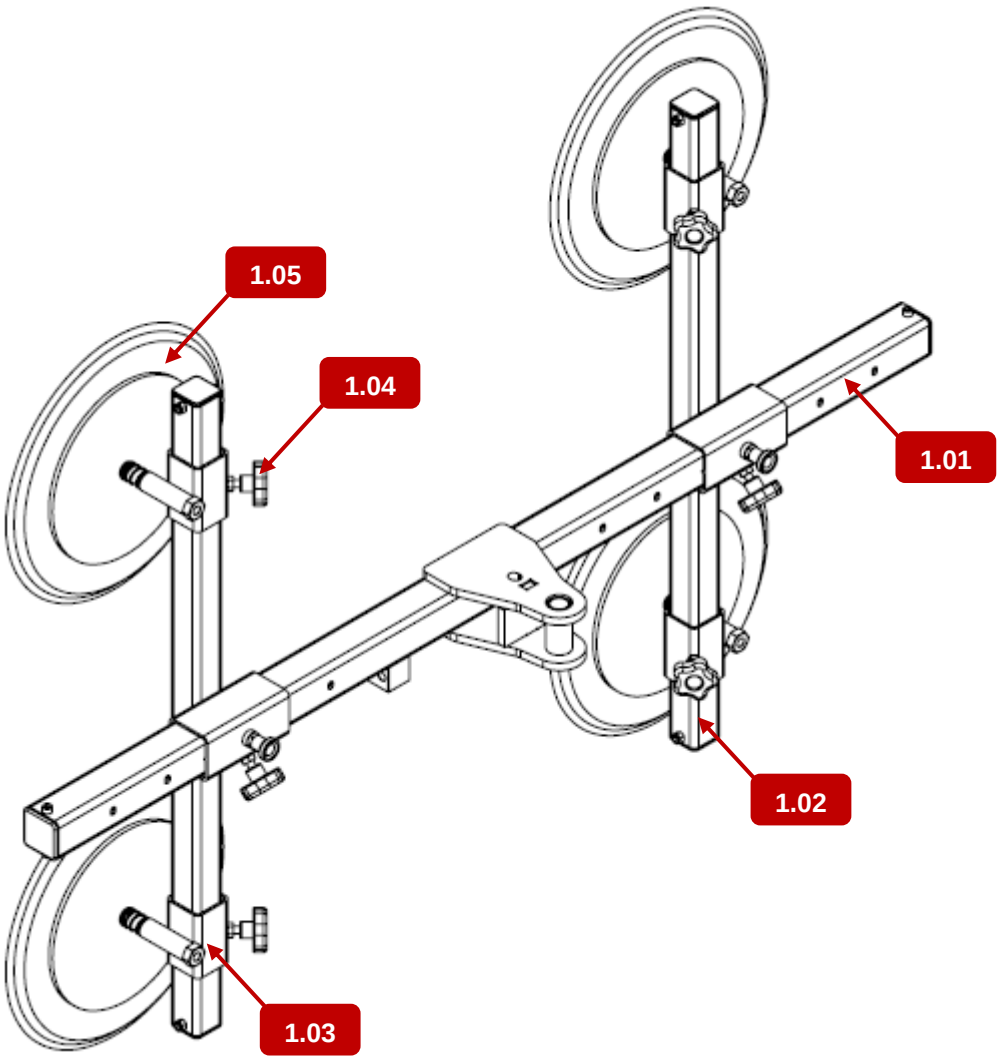


3 Overview and use

3.1 Machine overview

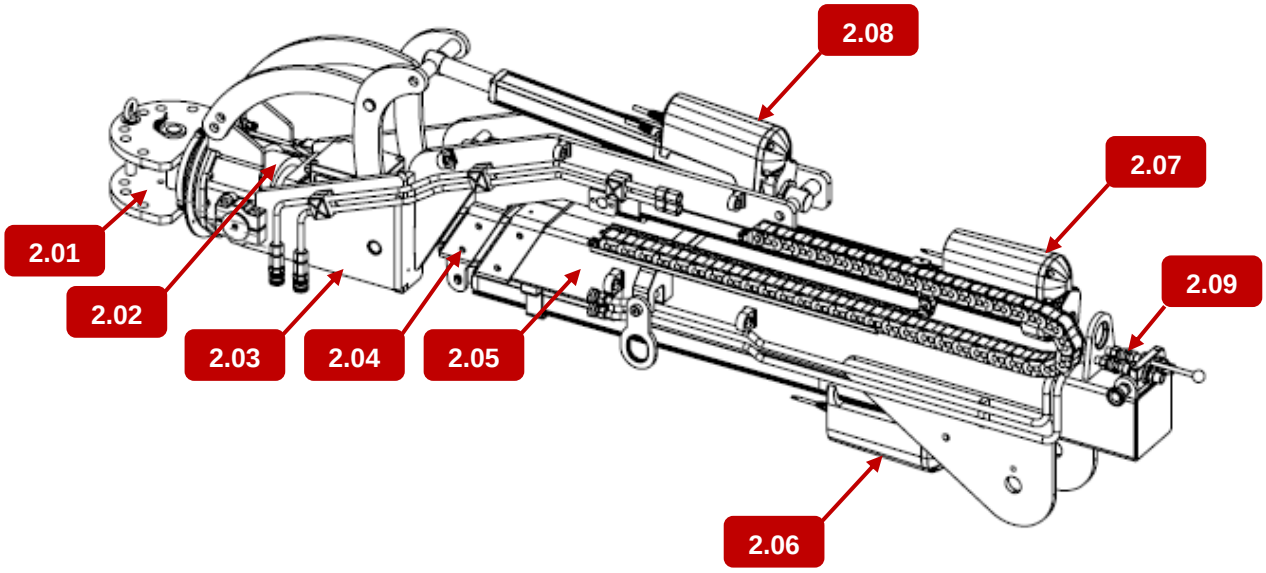
Below is an overview of the components that are mentioned in several places in this manual and which are often referred to in everyday situations. The illustration below shows the SL 580 HLE RT.

3.1.1 Vacuum yoke (SL)



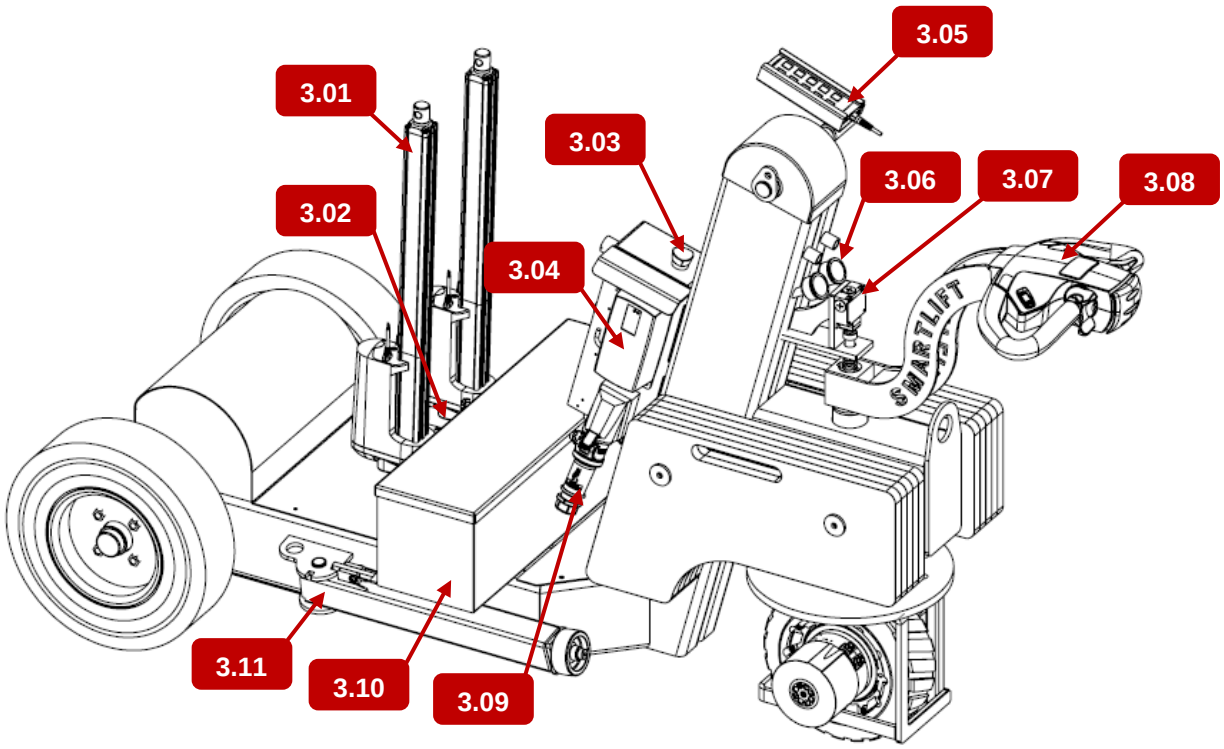
No.	Description	No.	Description	No.	Description
1.01	Yoke	1.03	Suction cup holder	1.05	Suction cup
1.02	Crossbar	1.04	Hand screw		

3.1.2 Boom



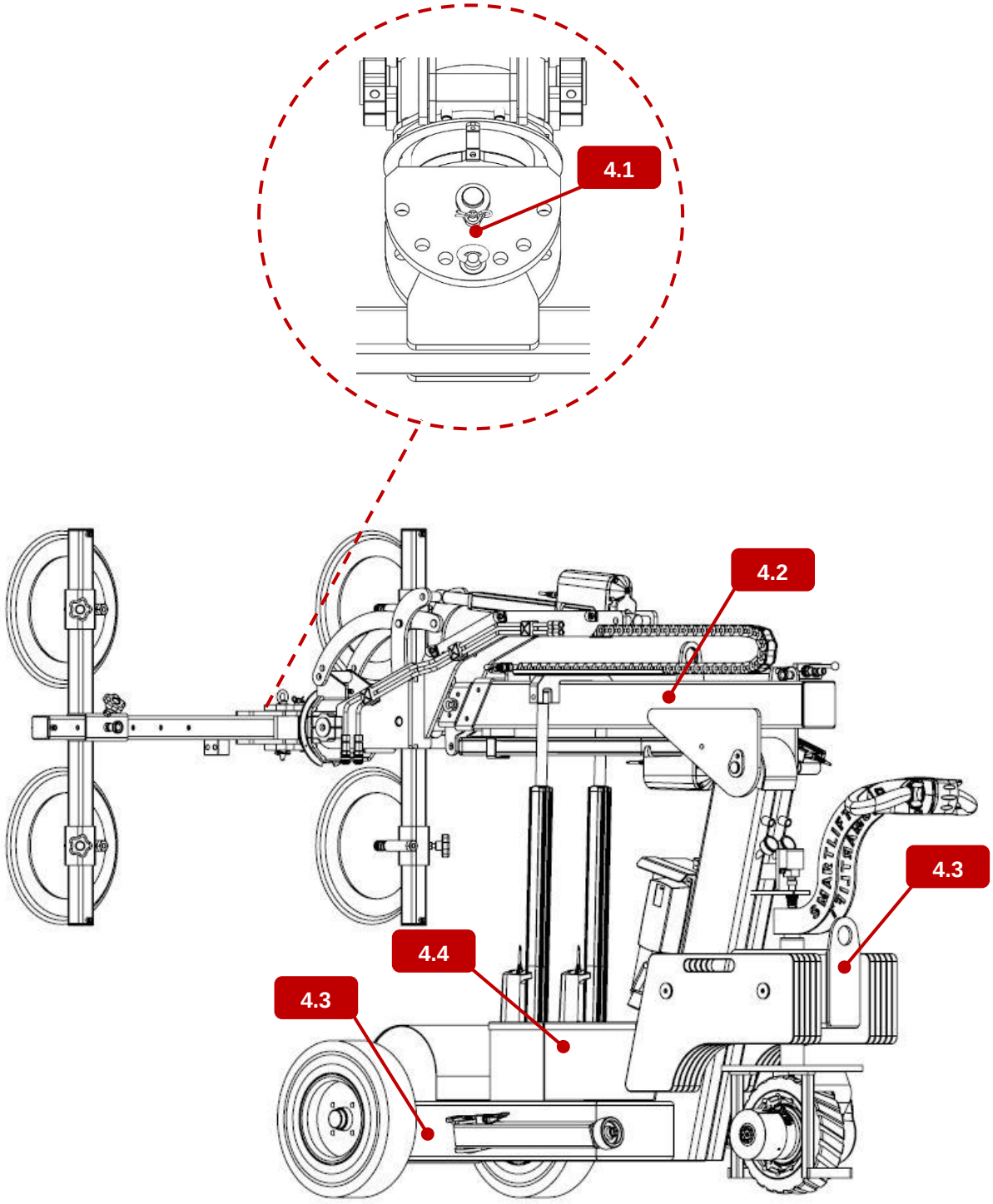
No.	Description	No.	Description	No.	Description
2.01	Turning head	2.04	1. Extension boom	2.07	2. Extension actuator
2.02	Rotator	2.05	Main boom	2.08	Tilt actuator
2.03	2. Extension boom	2.06	1. Extension actuator	2.09	Slide valve

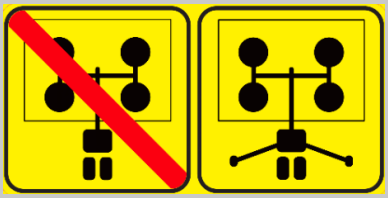
3.1.3 Base machine



No.	Description	No.	Description	No.	Description
3.01	Lifting actuator	3.05	Remote control	3.09	Charging plug
3.02	Main switch	3.06	Vacuum gauge	3.10	Battery case
3.03	Emergency stop	3.07	Load limit switch	3.11	Support leg
3.04	Charger	3.08	Control handle		

3.2 Label overview



No.	Description	Label
4.1	Load on the side of the machine is only for transport and maximum: SL 380 RT max 250 kg (550 lb) SL 580 RT max 400 kg (880 lb)	
4.2	Lashing and hoisting eye	
4.3	Lashing eye	
4.4	Fold out support legs when hoisting and transporting loads	

ATTENTION! In case of illegible or unclear information and warnings on labels, load charts, etc., these must be replaced by new ones.

New labels can be ordered from Smartlift's customer service department on tel. +45 97 72 29 11 or via email: Customerservice@smartlift.com.

3.3 Technical specifications

3.3.1 SL 280 and SL 380

Machine model	SL 280	SL 380	SL 380 HL	SL 380 RT
WLL	280kg 620lb	380kg 840lb	310kg 680lb	380kg 840lb
Self-weight	480kg 1060lb	530kg 1170lb	540kg 1190lb	545kg 1200lb
Total length	2,20m 7,20ft	2,30m 7,55ft	2,40m 7,90ft	2,30m 7,55ft
Transport length	1,60m 5,3ft	1,75m 5,75ft	1,85m 6,10ft	1,80m 5,90ft
Height	1,35m 4,51ft			
Width	0,63m 2,07ft	0,68m 2,23ft		
Driving speed, up to	6km/h 3,7mph			
Operating time, up to	10 hours			
Suction cups (4 with diameters of)	300mm 11,80in			
Vacuum level	-0,53 bar / -0,62 bar			
Batteries (2 pcs.)	12V			
Charger, standard	230V			
Charger, option	110V			
Charging time, minimum	8 hours			
Sound level	84 dB (A) 86 dB (C)			
Expected service life	10 years			

3.3.2 SL 580

Machine model	SL 580	SL 580 HL	SL 580 HLE	SL 580 HL RT	SL 580 HLE RT
WLL	580kg 1280lb	530kg 1170lb		480kg 1060lb	
Self-weight	690kg 1520lb	700kg 1540lb	710kg 1565lb	740kg 1630lb	750kg 1650lb
Total length	2,40m 7,87ft	2,5m 8,20ft			
Transport length	1,80m 5,90ft	1,9m 6,23ft			
Height	1,35m 4,43ft				
Width	0,78m 2,56ft				
Driving speed, up to	6km/h 3,7mph				
Operating time, up to	10 hours				
Suction cups (4 with diameters of)	400mm 15,75in				
Vacuum level	-0,53 bar / -0,62 bar				
Batteries (2 pcs.)	12V				
Charger, standard	230V				
Charger, option	110V				
Charging time, minimum	8 hours				
Sound level	84 dB (A) 86 dB (C)				
Expected service life	10 years				

3.3.3 SLI 250

Machine model	SL 250	SLI 250 HLE
WLL	250 kg 550 lb	
Self-weight	490 kg 1080 lb	550 kg 1210 lb
Total length	2,28 m 7,48 ft	
Transport length	1,74 m 5,64 ft	
Height	1,40 m 4,60 ft	1,5 m 4,90 ft
Width	0,68 m 2,23 ft	
Driving speed, up to	6km/h 3,7mph	
Operating time, up to	10 hours	
Batteries (2 pcs.)	12V	
Charger, standard	230V	
Charger, option	110V	
Charging time, minimum	8 hours	
Sound level	84 dB (A) 86 dB (C)	
Expected service life	10 years	

3.4 Operating limits

It is the user's responsibility to be alert and vigilant in the environment in which the machine is used. The user must be aware of everything that could impact safety of both machine and people.

3.4.1 Materials (SL)

By default, the machine is equipped with SGF-type suction cups, which are intended for handling flat and smooth objects such as glass, plastic sheets and so on.

⚠ **WARNING! Never use the machine to lift wet or greasy items.**

⚠ **WARNING! Never use the machine to lift items that are not airtight.**

3.4.2 Lifting capacity

See the machine's lifting capacity (WLL) in conjunction with its reach in section **9.3 Load charts SL / 9.4 Load charts SLI.**

3.4.3 Wind impact

Wind greatly impacts the stability of the machine, particularly when lifting large items. Therefore, it is important to assess the wind conditions before starting work. The table below can be used as an indicator of the percentage by which the working load limit (WLL) is reduced under certain wind conditions

	Wind impact index										
	Area		m²	1	2	3	4	5	6	7	8	9
	Speed		sqft	10,8	21,5	32,3	43,0	53,8	64,6	75,3	86,1	96,8
	m/s	mph										
Slight wind	1	2,2		100	100	100	100	100	100	99	99	99
	2	4,5		100	99	99	99	98	98	98	98	97
	3	6,7		99	99	98	97	97	96	95	94	94
Light wind	4	8,9		99	98	96	95	94	93	91	90	89
	5	11,2		98	96	94	92	90	88	86	85	83
	6	13,4		97	94	92	89	86	83	81	78	75
Brisk wind	7	15,7		96	92	89	85	81	77	74	70	66
	8	17,9		95	90	85	80	75	70	65	60	56
	9	20,1		94	88	81	75	69	63	56	50	44
Strong wind	10	22,4		92	85	77	69	61	54	46	38	31
	11	24,6		91	81	72	63	53	44	35	25	16
	12	26,8		89	78	67	56	44	33	22	11	0

An example using an SL 380:

At a distance of *0,75m (2,5ft)* from the front wheel, an SL 380 can lift up to *250kg (550lb)* (se load chart section **9.3.2 SL 380**). At a wind speed of *8 m/s (17.9 mph)* lifting an item with a surface area of *4 m^2 (43 sqft),* the wind load index reads as *80%*

This means that the maximum load is reduced to *250kg (550lb)* x 0,8 = *200kg (440lb)*.

As mentioned, the above table provides an indication of how to take wind impact into account, but it is the user's responsibility to assess the stability of the machine, as turbulence, wind direction, humidity, etc. also influence this.

If there is doubt as to the stability of the machine, you can get a feel of whether the load limit switch is almost letting go by grabbing the counterweights and lifting them gently. If the load limit switch lets go, the limit has been reached.

3.4.4 Temperature and humidity

Permissible temperature range	From -20°C to 40°C
Permissible relative humidity (non-condensing)	From 20% to 80%
Optimum temperature when charging	From 10°C to 25°C

3.4.5 Lighting

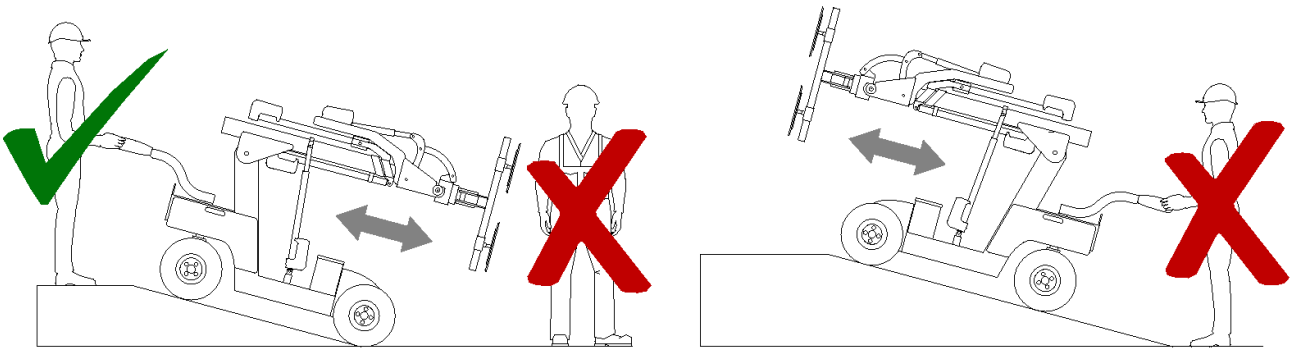
Workspace	Min. 200 lux
Repair and maintenance work	Min. 500 lux

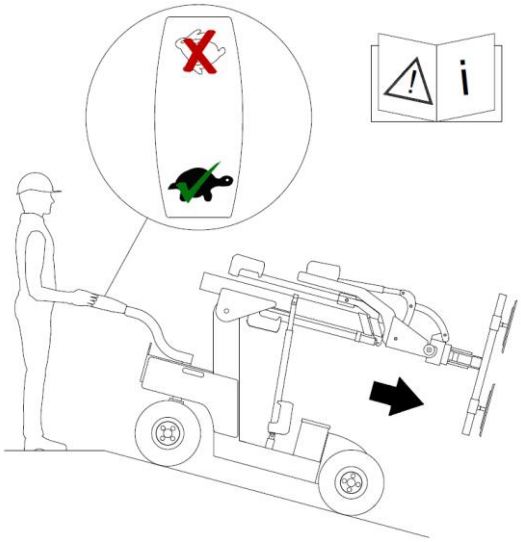
3.4.6 Surface

When using the machine, a solid surface is important. This applies during both the driving and handling of objects. If the surface is soft, it is a great advantage to use ground protection mats.

3.4.7 Slope – Location of user and person

When driving on a slope, the user must be aware of their own and others' positions in relation to the machine.



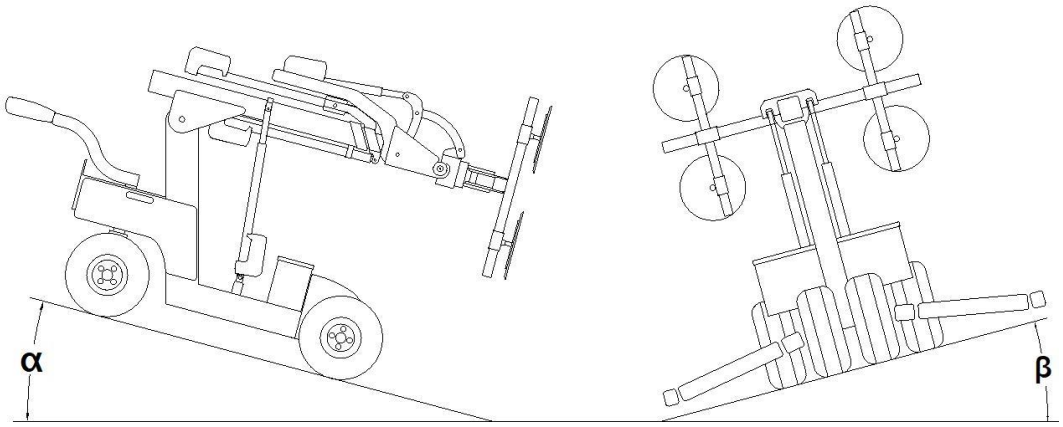


⚠ WARNING!

- **Never stand below the machine when it is moving up or down a slope!**
- **Always drive at low speed and exercise caution when going down a slope!**

3.4.8 Slope – without load

When driving on slopes without a load, the below values cannot be exceeded, as this may increase the risk of losing control of the machine and overturning:

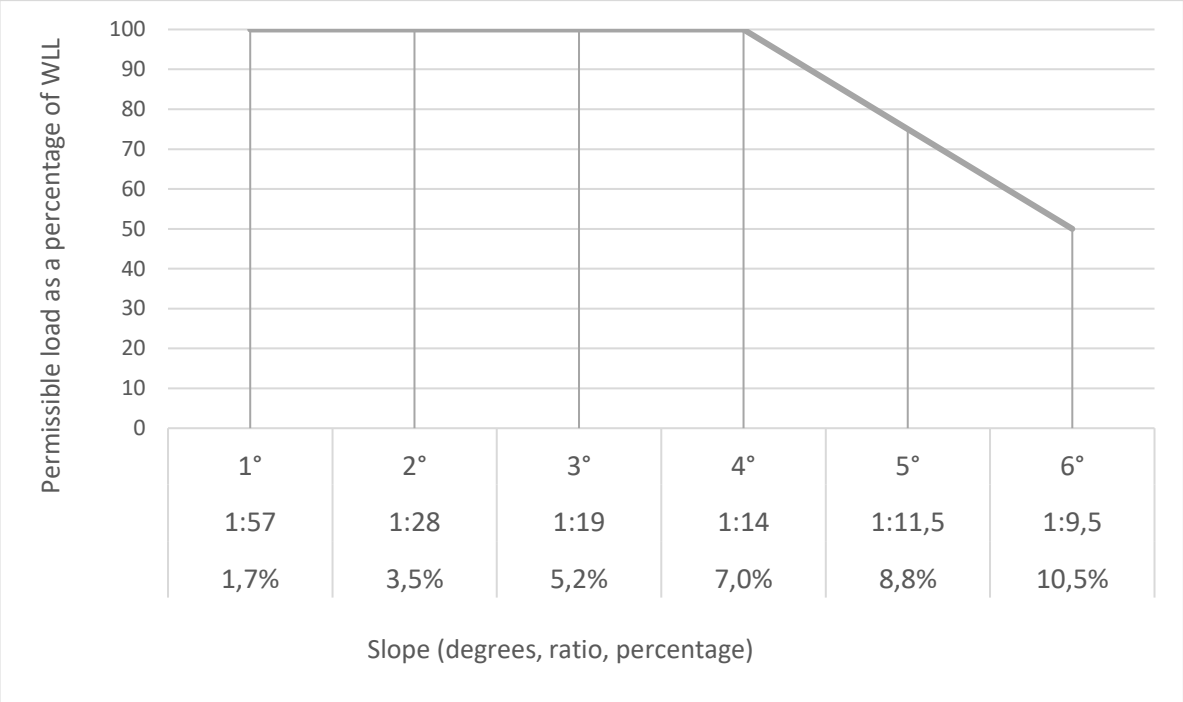


Max slope α	6°
	1:9,5
	10,5%
Max slope β	6°
	1:9,5
	10,5%

3.4.9 Slope – with load

When driving a loaded machine on slopes, the below chart can be used as a guide.

⚠ **WARNING! The shape and weight of the load, the speed of the machine, and weather conditions all affect the stability of the machine when driving on a slope. Therefore, always assess whether moving it is sensible!**



Example of a load situation:

- Machine: SL 380 with WLL 380kg (840lb)
- Surface sloping in the direction of travel: 5° / 1:11,5 / 8,8 %
- Permissible load as a percentage of WLL: 75%

$$WLL_{slope} = WLL_{machine} * Permissible\ load\ as\ percentage$$

$$WLL_{slope} = 380kg\ (840lb) * 0{,}75 = 285kg\ (630lb)$$

4 Operation

This section describes which basic elements it is important to understand in order to maintain a high level of safety when using the machine. This section describes the steps it is necessary to know before, during and after use of the machine.

ATTENTION! The user is always responsible for avoiding irresponsible operation of the machine!

4.1 Before operation

WARNING!

- **Do not use a knife to remove the packaging materials!**
- **Never use the machine if visible damage or defects have been identified!**

Before operating the machine, it must be inspected for visible damage to the i.a. vacuum hoses, wires, suction cups and the vital parts of the steel structure. In addition, the machine must be inspected for any defects. If any damage or defects are identified, these must be repaired before using the machine.

Before operating the machine, the user must always conduct a thorough assessment of the machine's task, including, as a minimum:

- Operation limits (see section **3.4 Operating limits**).
- Lifting capacity (see section **9.3 Load charts SL / 9.3 Load charts SL**).
- Battery level.

4.2 Operation in general

The following describes a typical procedure for using the machine. For a more detailed description of functions, buttons, etc., see section **4.5 Functional overview**.

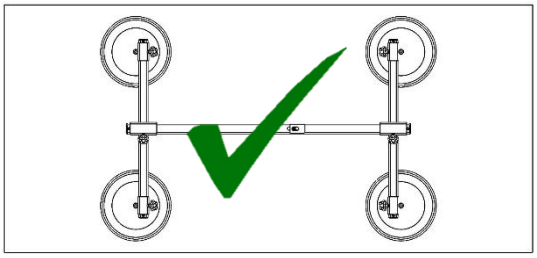
1. Turn on the machine using the main switch.
2. Check the battery level.
3. Activate propulsion on the control handle On/off button.
4. Drive the machine to the object.
   ATTENTION! When driving on terrain, the support legs must be deployed and locked!
5. Centre the machine in front of the object. If necessary, fine-tune the position using the side shift function.
6. Deploy the support legs.
7. Adjust the suction cups to fit the object.
   ATTENTION! The distance between the suction cups must be as great as possible!
8. Push the suction cups against the object using the extension function.
   WARNING! Never lift damp or greasy objects!
9. Activate vacuum.
   ATTENTION! An alarm signal sounds until sufficient vacuum has been achieved!
10. Lift and transport the object.
    ATTENTION! Transport the object as close to the surface and the machine as possible!
11. Place the item in the desired position and fasten.
12. Disable vacuum.
    ATTENTION! Wait for the machine's suction cups to release the object!
13. When handling several objects, repeat steps 2 through 12.
14. Turn the machine off at the main switch.
15. Put it to charge at the end of the working day.

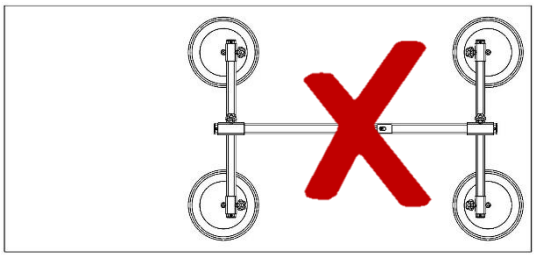
4.3 Operating functions

This section visualises where hazardous situations may occur when using the machines.

4.3.1 General:

- **ATTENTION! Before activating the actuators for lifting, extension or tilting, please note the following:**
  - The vacuum yoke or load can hit the machine or the surface.
- **ATTENTION! Before suction is applied to the load:**
  - The support legs must be deployed and locked.
  - The star knobs on suction cup holders and crossbars must be tightened.
  - The vacuum yoke must be centred relative to the load's centre of gravity.





WARNING! If the yoke is not centred relative to the load's centre of gravity, there is a risk that the load will be pulled off the suction cups and the machine will tip over.

- **ATTENTION! Before the load is lifted:**
  - The machine must be level.
  - The positioning bolt on the swivel joint must be engaged.
  - The positioning bolt for the vacuum must be engaged.
  - The vacuum pumps must stop, signifying sufficient vacuum.
- **ATTENTION! Before the vacuum yoke is rotated (manually):**
  - The positioning bolt on the swivel joint must be engaged.
  - The vacuum yoke and load can hit the machine or the surface.
  - Vacuum hoses can get pinched or stretched.
- **ATTENTION! Before the load is rotated to the side of the machine:**
  - The tilt head must be level in both directions.
  - The vacuum yoke may only be placed on the side of the machine during the transport of objects. The load must be kept as close to the surface as possible!
  - The positioning bolt must be engaged.
  - The vacuum yoke and load can hit the machine or the surface.
  - Vacuum hoses can get pinched or stretched.
  - **WARNING! When the load is rotated onto the side, it creates a risk that the machine will tilt, as the safety switch only detects an absence of load on the rear wheels.**

4.3.2 HL models:

- **ATTENTION! Before the manual extension is adjusted:**
  - The arm must be level and free from any load.
  - Fingers can get trapped when the shaft and the split are moved or when the extension is adjusted.

4.3.3 RT models:

- **ATTENTION! Before the yoke is rotated (electric):**
  - The locking shaft and split must be installed on the tilt head.
  - The vacuum yoke and load can hit the machine or the surface.
  - Vacuum hoses can get pinched or stretched.

4.4 After operation

In order to ensure optimum preservation of battery capacity, use the following charging pattern:

- Connect the charger for at least 8 consecutive hours before using the machine.
- Connect the charger permanently when storing the machine. This maintains the batteries at a constant rate.

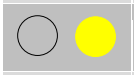
ATTENTION! Using and charging the machine at the same time is forbidden. This will damage the charger and batteries!

ATTENTION!

- **Charging must take place somewhere with good ventilation!**
- **Charging can never take place in a location where there are sparks, flames or smoking!**
- **The machine must be switched off at the main switch before charging!**
- **If the charger is connected for a period of time which is shorter than recommended, over time, the battery capacity will be reduced permanently!**
- **If the machine is stored for a long period of time without the charger being connected to a power supply, the battery capacity will be reduced permanently!**
- **The machine must be charged before the voltage on the batteries falls below 22V, otherwise the batteries will be permanently damaged!**

4.4.1 Charger – LED indications

Battery charger 230V	
LED	**Description**
	Connected supply/storage mode
	Quick flashing – fast charging
	Slow flashing – reduced charging
	Fully charged

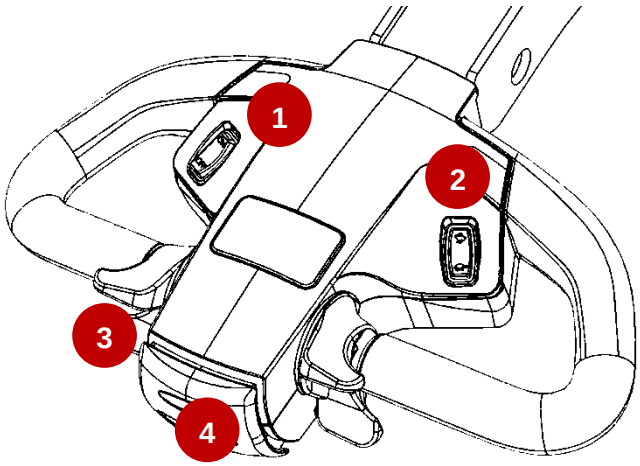
Battery charger 110 V	
LED	**Description**
	Fast charging
	Reduced charging
	Fully charged – Maintenance

For further information about charging and maintenance of batteries, refer to the manufacturer's website: www.victronenergy.com

4.5 Functional overview

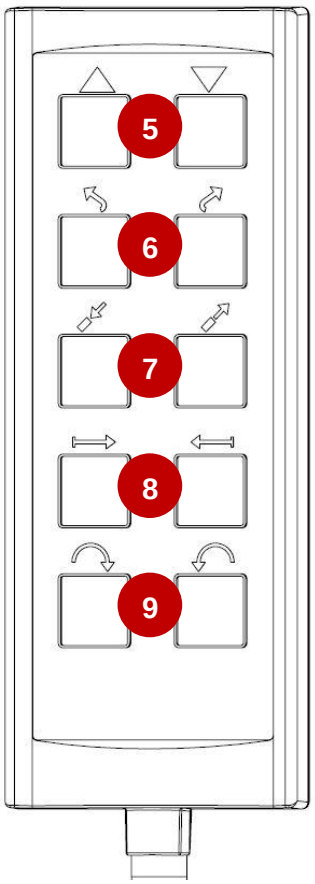
Control handle with buttons for propulsion

No.	Description
1	On/off button for propulsion
2	High/low travel speed
3	Speed and direction regulator
4	Safety switch



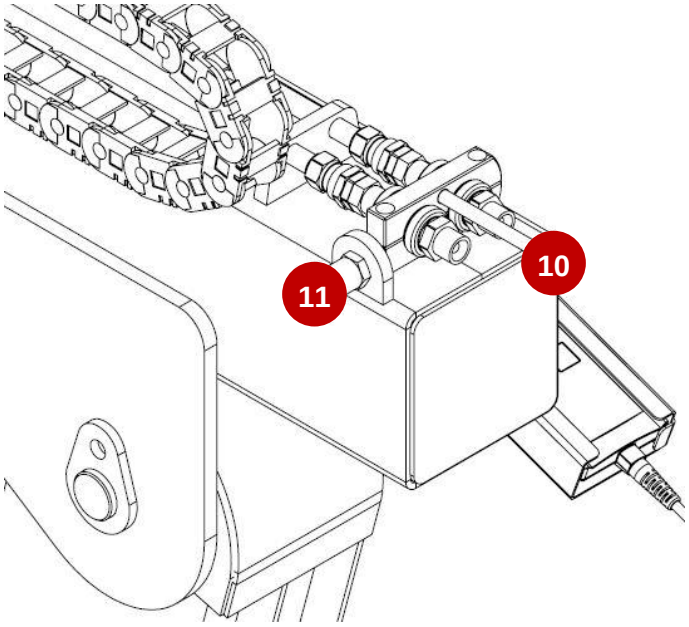
Control panel for hoisting functions, etc.

No.	Description
5	Raise/lower arm
6	Tilt backwards/forwards
7	Extend in/out
8	Side shift
9	Rotation (only RT models)



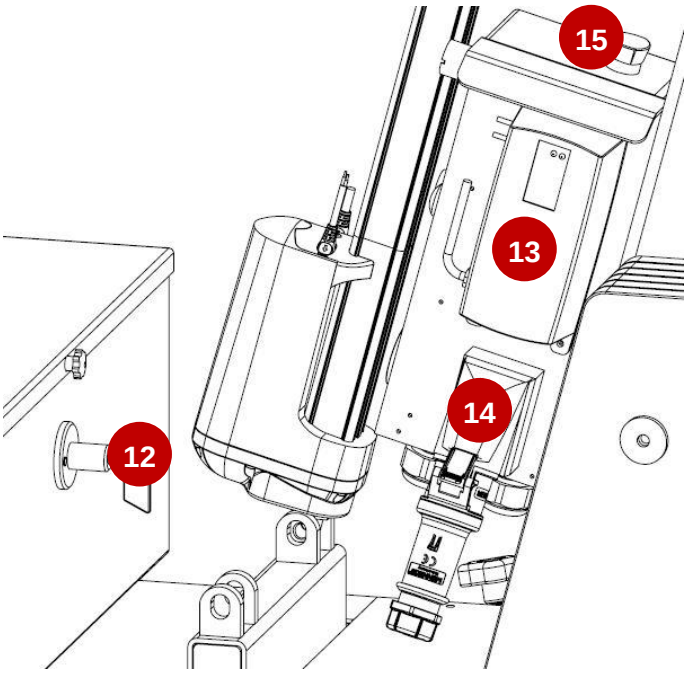
Activation of vacuum

No.	Description
10	On/off handle for vacuum
11	Safety lock for vacuum



Power

No.	Description
12	Main switch
13	Charger
14	Charging plug
15	Emergency stop



4.6 Functional description

No.	Description	Function
1	On/off switch	Interrupts signal power to the motor. Can be used if accidental activation of propulsion must be eliminated
2	High/low travel speed	Switching between high and low speed.
3	Speed controller	Regulator for propulsion. From 0 to max. speed – reverse and forward
4	Safety switch	"Belly button" minimises the risk of pinching between machine and object
5	Raise/lower arm	Raises or lowers the arm
6	Tilt forward/backward	Tilts the yoke forward or backward
7	Extend in/out	Pushes out or retracts arm
8	Side shift left/right	Moves chassis sideways relative to the front wheels
9	Rotation	Electric rotation of yoke (only RT models)
10	On/Off handle for vacuum	Handle for activating and deactivating the vacuum
11	Safety lock for vacuum	Safety lock is pulled out before deactivation of the vacuum
12	Main switch	Cuts power to all functions
13	Battery charger	24 V charger for 230 V or 110 V
14	Charging plug	Connect to mains socket for charging
15	Emergency stop	Stops all the machine's moving parts

5 Storage, transport, handling and lifting

5.1 Storage

If the machine needs to be stored, storage must be done under the following conditions in order to preserve the machine's condition and functional capacity:

- Indoor
- Dry
- With good ventilation

ATTENTION!

- **Water, moisture and dust can affect the machine's functionality and reduce the service life of suction cups!**
- **Drought, sunlight and temperatures below 0°C (32°F) or above 25°C (77°F) may reduce the service life of the suction cups!**

How to store:

- Turn off the main switch.
- Connect the charger so that the batteries are constantly charged and maintained. See section 4.4 After operation.

5.2 Transport

When transporting the machine, it is recommended that a van, machine trailer, flatbed truck or similar with sufficient load capacity is used. Find the weight of the machine in section **3.3 Technical specifications**.

A method for secure fastening of the machine: See section **3.2 Label overview**.

- Turn off the main switch.
- Strap the machine in place using the lashing eye at the rear of the machine.
- Strap the machine in place using the lashing eyes by the support legs.
- Protect the machine from rain, moisture and dust.

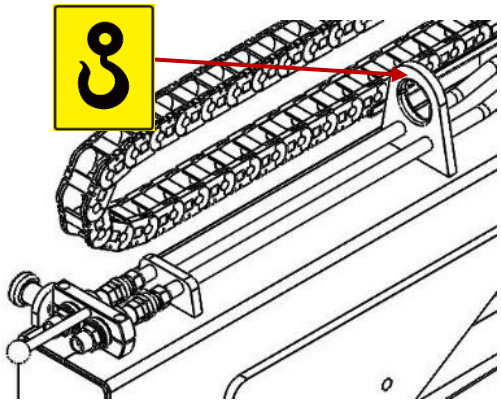
5.3 Handling and lifting

When handling and lifting the machine, use approved lifting equipment in the form of a crane or hoist with sufficient load capacity. In addition, approved lifting equipment must be used in the form of round slings, chains etc. with sufficient load capacity.

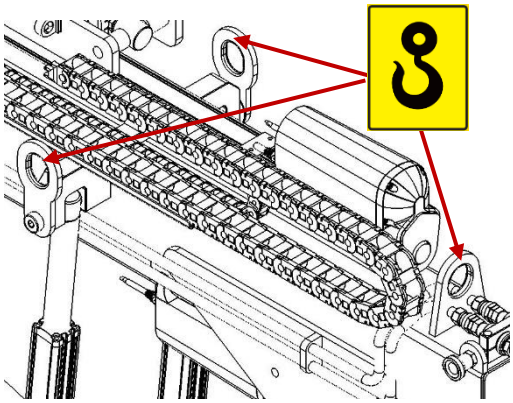
Method for handling and lifting the machine:

See section **3.2 Label overview**.

- Turn off the main switch.
- Machines should be lifted by the designated hoisting eyes.
- Hoisting eye sets for HLE and HLE RT models can be purchased in addition.



380 HL



380 HLE

6 Maintenance and troubleshooting

6.1 Overview of service, maintenance and lubrication intervals

No.	Annually ⇩	Monthly interval ⇩	Daily	In addition to the dates listed, some components are subjected to ongoing wear and must therefore be replaced if necessary.	
1.0				**Machine log and labelling**	
1.1	X	12	X	The user manual is accessible and easy to understand.	Receipt of new user manual. State machine type and serial number when ordering.
1.2	X	12		Labels on the machine. Check that all labels are visible and intact.	Defective labels must be replaced if necessary. Load chart, WLL, attention/warning stickers.
2.0				**Battery and charger**	
2.1	X	12	X	Battery	Check the capacity of the batteries (minimum 24V on fully charged batteries).
	X	12		Battery	Battery indicator. Replace the batteries if the voltmeter reads less than 22 volts when the batteries are fully charged. The terminals must be lubricated (A).
2.2	X	12		Charger	Check the charging function: output must be 28 volts when charging.
3.0				**Vacuum system (SL)**	
3.1	X	12	X	The alarm function must be checked for each lift.	The yellow light and acoustic alarm must be active when one or both vacuum pumps are active. See vacuum level in section **3.3 Technical specifications**.
3.2	X	12		Vacuum control	Check red/green LEDs
3.3	X	12	X	Vacuum pumps	See vacuum level in section **3.3 Technical specifications**. If the pressure drops, check and remedy. Replace defective pumps.
3.4	X	12	X	Vacuum valves	Check the opening and closing function for the slider valves.
3.5	X	12		Vacuum filters	Remove and clean. Replace if necessary.
3.6	X	3		Vacuum system test	Check vacuum on a *test plate. Switch off the main switch and controller if the test plate remains stuck for a minimum of 10 min. If the test plate falls off, find the problem and remedy it.
3.7	X	12		Test vacuum sequences	The pumps start. See vacuum level in section **3.3 Technical specifications**. The pumps stop. See vacuum level in section **3.3 Technical specifications**.) The acoustic alarm and yellow light are active when the vacuum pumps start. The acoustic alarm and yellow light stop when the vacuum limit is reached.
3.8	X	12		Vacuum hoses	Check and replace if damaged.
3.9	X	12	X	Suction cups	Check for damage and replace if necessary.
3.10	X	12		Couplings	Clean and lubricate (A). Check for leaks. Tighten if necessary and replace if damaged.
4.0				**Actuator**	

4.1	X	12		Check for suspicious sounds and full movement in all directions; lifting, extension, side shift, tilt and rotation.	Defective actuators must be replaced.
4.2	X	1		Reset lifting actuator	Move the lifting actuators all the way down. Press up and down simultaneously for 10 to 15 seconds. Restart
4.3	X	12		Cables, cable routes, connectors and connections.	Check all cables for breakage and fastening. Check all connectors and connections for poor connection and proper attachment.
5.0				**Mechanical equipment**	
5.1	X	12		Base machine	Visual inspection. Welds, damage or excessive wear on parts must be repaired or replaced.
5.2	X	12		Side shift	Visual inspection. Welds, damage or excessive wear on parts must be repaired or replaced.
5.3	X	12		Arm	Visual inspection. Welds, damage or excessive wear on parts must be repaired or replaced. Adjust the liner for the extension arm.
5.4	X	12		Yoke **(SL)**	Visual inspection. Welds, damage or excessive wear on parts must be repaired or replaced. Lubricate moving parts. (B)
5.5	X	12		Bearings and shafts	All moving parts must be checked for wear and clearance. Defective bearings must be replaced. Lubricate all shafts and grease nipples. (B)
5.6	X	6		After approx. 50 hours of use, follow the guide on the left. Tighten all bolts according to the manual.	Make sure the bolts and screws are secured with Loctite. Bolts on the actuators cannot be retightened.
5.7	X	12	5	Main yoke **(SL)**	Visual inspection. Check the hand screw function. Checks: M24 nut, washer and ring pin. It must be possible to remove and reinstall the yoke easily. Attach the yoke – rotatable. Add end sections and a stop screw if necessary. Damaged parts must be replaced. Lubricate all moving parts (B)
5.8	X	12	5	Crossbars **(SL)**	Visual inspection. Check the hand screw function. Add end sections and a stop screw if necessary. Damaged parts must be replaced. Lubricate moving parts (B)
5.9	X	12	5	Suction cup holders **(SL)**	Visual inspection. Check the hand screw function. Damaged parts must be replaced. Lubricate moving parts. (B)
6.0				**Electronics and safety equipment**	
6.1	X	1		Main switch	Check the on/off function.
6.2	X	1		Emergency stop contact	Check the functionality. Repair or replace if necessary.
6.3	X	12		Remote control • ON/OFF switch • Emergency stop switch • Function switches	Check all functions. Remedy if this does not work or is damaged, and repair or replace if necessary.

6.4	X	3		Function check of overload	Use a load to trigger an overload by moving the extension out. When the overload is triggered, all lifting except extension must be deactivated. Retract the load until the overload switch disconnects, and all functions should be functional again. Repair or replace if necessary.
7.0				**Propulsion system**	
7.1	X	12		Function test of the propulsion system	Test the throttle in both directions. Test on/off function on the steering gear Test slow/turtle and fast/hare Function test of belly button.
7.2	X	12	X	Check the brake system.	With the machine moving at full speed, release the throttle. The machine must stop completely within 2 metres. This must be done in both directions and at both speeds (turtle/hare).
7.3	X	12	X	Check the parking brake	When the machine is stationary, the parking brake must be applied. Test this by pushing and pulling on the machine. It should not be possible to move the machine manually.
	X	12		Check the mechanical brake	The brake disc is located on the propulsion engine. Check the distance between the electromagnet and the pressure plate. The distance should be 0.2 to 0.3 mm. The minimum thickness of the brake disc is 6.5 mm.
8.0				**Static test load**	
8.1	X	12		Test with load Follow the load diagram according to the label/manual.	

The test plate is a plate which is big enough to allow all suction cups to be on the plate at the same time (approx. 1,5x1,5m). The plate must be airtight and can be made of plastic, steel, etc.

Lubrication schedule:

A = Silicone grease, Kema SC4 or equivalent

B = Calcium sulfonate grease

Bearings are made with Teflon surfaces or oil-rubbed bronze. Lubrication is intended for smaller moving parts.

6.2 Functional inspection

6.2.1 Vacuum system

A method for inspecting the vacuum system for leakages, referred to as a leakage inspection in this document.

ATTENTION!

- **Suction cups should be inspected daily!**
- **Vacuum hoses should be inspected monthly or quarterly, as needed!**
- **Leakage inspection of the vacuum system must be done according to section 6.1 Overview of service, maintenance and lubrication intervals!**

1. Turn on the machine using the main switch.
2. Check the battery level.

3. Adjust the suction cups to fit the test object.
   ⚠ **WARNING! Never use a wet or greasy object!**
   ⚠ **WARNING! Never use an object that is not airtight!**
   ⚠ **WARNING! There is a risk that the machine will release the object in connection with the leakage inspection!**
   ❗ **ATTENTION! The object must be an airtight sheet, e.g. one of plastic, steel, glass or the like!**
4. Push the suction cups against the object using the extension function.
5. Activate vacuum.
   ❗ **ATTENTION! An alarm signal sounds until sufficient vacuum has been achieved!**
6. Monitor the machine's vacuum pumps for at least 10 minutes.
   ⚠ **WARNING! If the vacuum pump starts before 10 minutes have passed, the machine cannot be used! See section 6.4 Troubleshooting.**
7. Disable vacuum.
   ❗ **ATTENTION! Wait for the machine's suction cups to release the object!**
8. Turn the machine off at the main switch.

6.2.2 Safety functions

Method for inspecting security features.

❗ **ATTENTION!**

- **Security features must be inspected according to section 6.1 Overview of service, maintenance and lubrication intervals!**
- **Security features must always be available and functional!**
- **If an inspection of the security features cannot be completed and approved, the machine cannot be used until repairs have been completed and a new inspection has been carried out!**
- **Always inspect security features in an open space where there are no obstacles!**

- **Main switch**
  - Turn off the main switch.
  - Checks: All moving functions should now be inoperational.
  - Activate the main switch.
  - Checks: All moving functions should be operational again.
- **Emergency stop**
  - Activate the emergency stop by pushing the mushroom emergency stop button manually.
  - Checks: All moving functions should now be inoperational. Vacuum functions are not affected by emergency stop.
  - Deactivate the emergency stop by rotating the mushroom.
  - Checks: All moving functions should be operational again.
- **Safety switch – Belly button**
  - Activate low driving speed
  - Activate the speed and direction regulator to put the machine in reverse.
  - Activate the belly button by pushing it manually.
  - Checks: The travel direction must be briefly changed, following which propulsion is interrupted.
  - Deactivate the speed and direction regulator and then repeat the procedure at a high driving speed
- **Reset the lifting actuators**
  - Press and hold the buttons “UP” and “DOWN” until the actuators have lowered fully. Alternatively, it may be necessary to do this by repeatedly pressing “DOWN”
  - Then hold “UP” and “DOWN” for approx. 5 seconds to reset.

- Repeat 3-5 times until the actuators stop correcting.

- **Parking brake**
  - Turn off the main switch.
  - Checks: It must not be possible to push or roll the machine.
- **The support legs**
  - Checks: It must be possible to put the support leg in either position.
  - Checks: Locks for the support leg must be functional in both positions.
- **Load limit switch – Method 1**
  - Lift the rear of the machine so that the rear wheels hover freely above the ground and the load limit switch is interrupted.
    It is recommended that the lashing eye at the rear of the machine is used to do this.
    Regarding requirements for lifting equipment, see section **5.3 Handling and lifting**.
  - Checks: The following features must now be inoperational:
    - Side shift
    - Raise and lower arm
    - Extension of arm
    - Rotation
    - Tilt back and forth
  - Lower the machine again and dismantle the lifting equipment.
  - Checks: All functions must be operational again.
- **Load limit switch – Method 2**
  - Read the load chart on the machine to see what the lifting capacity is at fully extended position. See section **9.3 Load charts SL / 9.4 Load charts SLI**. For example, at fully extended position, the lifting capacity of a SL 380 HL will be 85 kg/185 lb.
  - Then lift a load which exceeds this, and extend this forward until the load limit switch is interrupted.
  - Checks: The following features must now be inoperational:
    - Side shift
    - Raise and lower arm
    - Extension of arm
    - Rotation
    - Tilt back and forth
  - Retract the load and set it down.
  - Checks: All functions must be operational again.

6.3 Cleaning the machine

- Clean the machine with running water, soap and a soft brush.
  ATTENTION! Do not use a pressure washer to clean the machine!
  ATTENTION! Never direct the jet of water at the engine!
- Clean the control handle using a cloth with soap and water.
  ATTENTION! Never direct the jet of water at the control handle!
- Clean the suction cups with ethanol.
- Alternatively, the suction cups can be cleaned with hot water, soap and a soft brush.
  - Always rinse with clean water.
  - Let the suction cups dry at room temperature.

  ATTENTION!
  - **Never direct the jet of water at the suction cups or any electronic components!**
  - **Always make sure that water does not enter the vacuum system!**

  ATTENTION! Never use the following products to clean the suction cups:
  - **Pure glycerine!**
  - **The solvents trichlorethylene, carbon tetrachloride or hydrocarbons!**
  - **Vinegar-based cleaners!**
  - **Sharp objects, metal brushes, sand paper etc!**

6.4 Troubleshooting

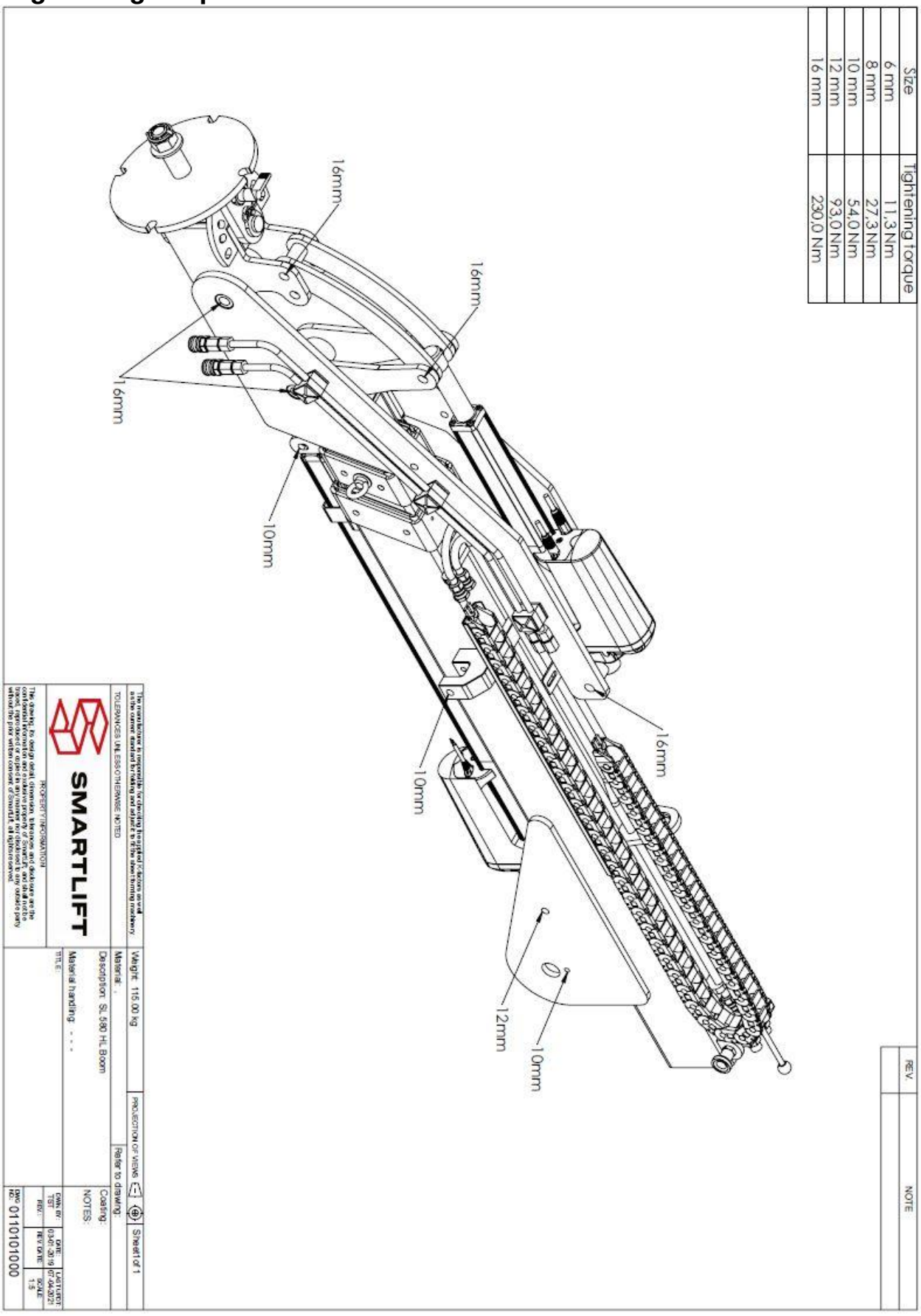
ATTENTION! In case of unexpected failure or malfunctioning of the machine, the machine must be stopped immediately! The fault must be reported to Smartlift customer service immediately via tel. +45 97 72 29 11 or via email customerservice@smartlift.com.

No.	Problem	Cause	Solution
1.	No response to: • Lowering/raising • Tilt • Extension • Side shift • Propulsion • Rotation	• The power has been interrupted • The batteries have been discharged • The emergency stop has been pushed	• Turn the main switch • Check the battery level • Release the emergency stop • Check fuses
2.	No response to:: • Lowering/raising • Tilt • Extension • Side shift • Rotation	• The safety switch has interrupted these functions due to overload	• Retract extension arm back
3.	No response to: • Lowering/raising	• Encoder error • The actuators are not running in parallel. • The tilting joint is out of alignment.	• Reset the actuators: ○ Press and hold the buttons "UP" and "DOWN" until the actuators have been lowered fully. Alternatively, it may be necessary to do this by repeatedly pressing "DOWN" ○ Then hold "UP" and "DOWN" for approx. 5 seconds to reset. ○ Repeat 3–5 times until the actuators stop correcting.
5.	No response to: • Propulsion	• The engine has no electricity • The brake does not release • On/off switch is on “off”	• Check point 1. • Press the “on” button • Check fuse for motor control
6.	• Vacuum pump runs frequently or continuously	• Leak in the vacuum system. • ATTENTION! The vacuum level must be maintained for at least 10 minutes without the pumps running!	• Unload the machine immediately • Check that the suction cups seal tightly against the object • Check the vacuum hoses and suction cups for damage • Check that the slide valve has been closed • ATTENTION! The vacuum pumps must start and stop again!

6.5 Fuses

Size	Function	Position
100A	Propulsion	By the motor controller
30A	Supply to the control box	In the battery case
15A	Charger	By charger

6.6 Tightening torques




Size
Tightening
6 mm
11,3
8 mm
27,3
10 mm
54,0
12 mm
93,0
16 mm
230,0
10mm
10mm
10mm
10mm
10mm
SMARTLIFT
REV.
NOTE
SMARTLIFT
Weight: 485,40 kg
Material: -
Description: SL 580 Base machine
Material handling: - - -
Coating:
NOTES:
Refer to drawing:
Sheet1 of 1
DWG NO: 0110100001

6.7 Spare parts

If spare parts are needed, these can be ordered by contacting your nearest dealer or Smartlift Customer Service at tel. +45 97 72 29 11 or email: customerservice@smartlift.com.

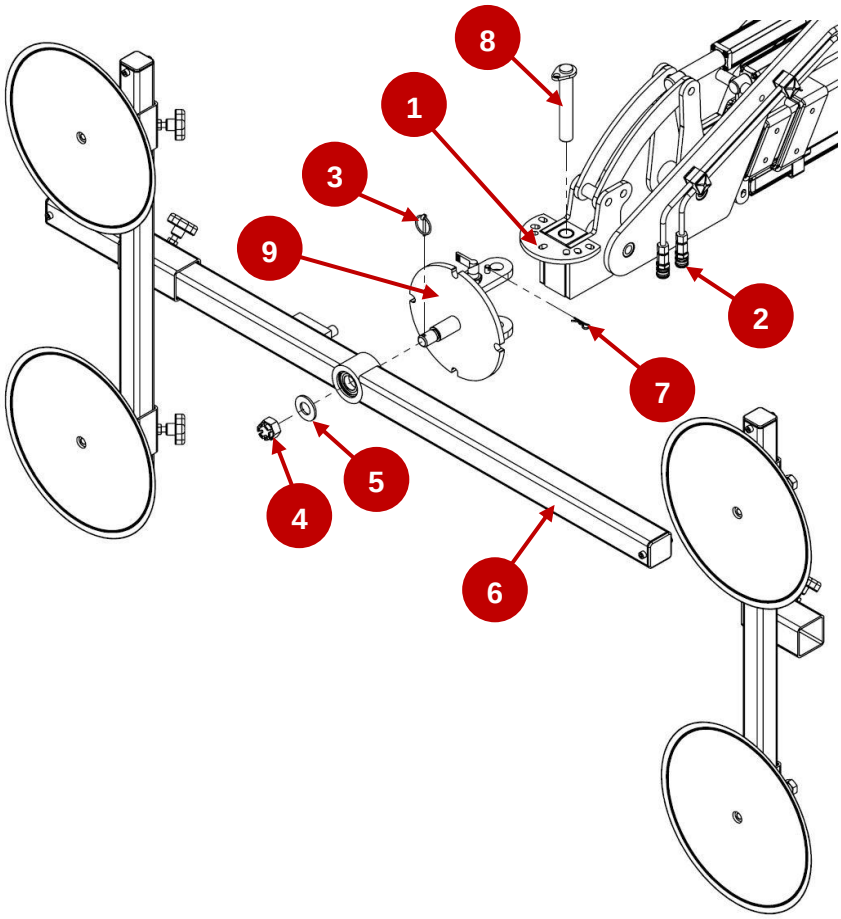
7 Scrapping and disposal

The machine must be scrapped and disposed of in accordance with local regulations.

8 Dismantling of vacuum yoke and swivel joint (SL)

This describes how the vacuum yoke is removed from the different models of machine.

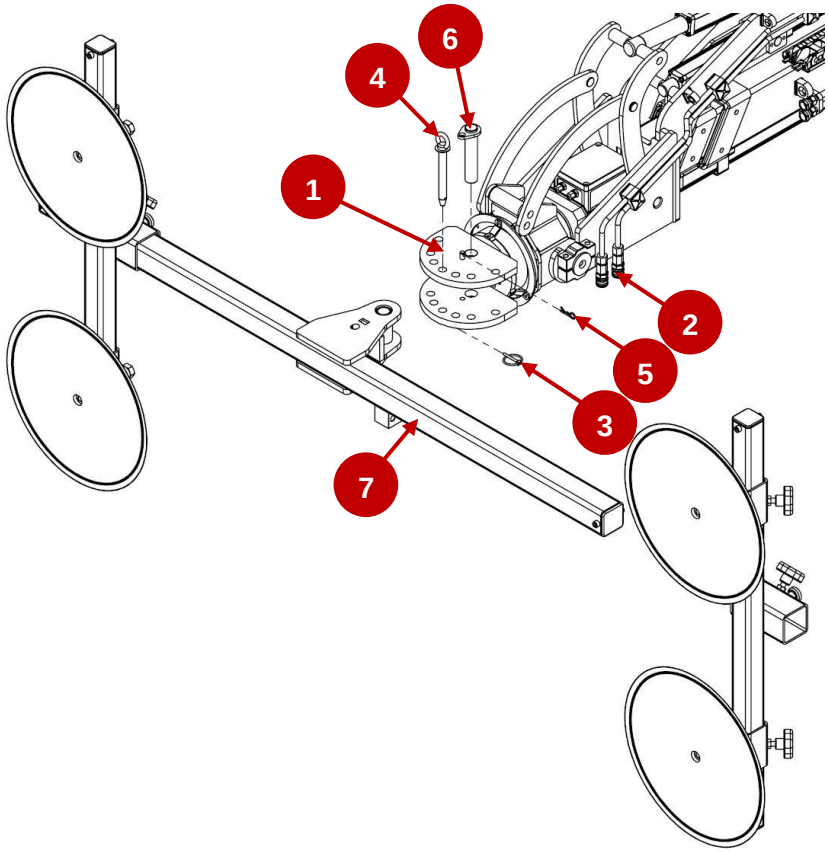
In order to remove the vacuum yoke and swivel joints, the following steps must be completed in the indicated order.



No.	Description
1	Placing the tilt head in the horizontal position
2	Disconnecting vacuum hoses using quick couplings
3	Removing the tractor split
4	Removing the castellated nut
5	Removing the washer
6	Removing the vacuum yoke
7	Removing the hairpin cotter
8	Removing the lock for the swivel joint
9	Removing swivel joints

8.1 RT, HL RT and HLE RT models (SL)

In order to remove the vacuum yoke, the following steps must be completed in the indicated order.



No.	Description
1	Placing the tilt head horizontally (both directions)
2	Disconnecting vacuum hoses using quick couplings
3	Removing the tractor split
4	Removing the locking shaft
5	Removing the hairpin cotter
6	Removing the lock for the tilt head
7	Removing the vacuum yoke

9 Annexes

9.1 Terms and abbreviations

Term	Text
⚠ Warning!	Things that can cause bodily injury or death
Attention!	Things that can cause bodily injury or property damage
The user	The person who operates the machine and is responsible for security
The machine	The entire basic machine unit and any equipment model
Vacuum yoke	A collective term for yoke, crossbars and suction cups
The load	The object to be lifted
Wind load	Effect of wind on the load and machine

Abbreviation	Significance
HL	Highlifter
HLE	Highlifter Electric
RT	Rotation
SL	Smartlift
SLI	Smartlift Industry Machines without vacuum
WLL	Working load limit / maximum load capacity

9.2 Declaration of conformity

Manufacturer and bearer of responsibility for the compilation of technical files:

Morten Rosengreen
Head of development
Smartlift A/S
N.A. Christensensvej 39
DK - 7900 Nykøbing Mors

CE

Hereby declares that:

Model:

☐ SL 280

☐ SL 380 ☐ SL 380 HL ☐ SL 380 RT

☐ SL 580 ☐ SL 580 HL ☐ SL 580 HLE ☐ SL 580 HLE RT

☐ SLI 250 ☐ SLI 250 HLE

Serial nr.: _____

Date: _____ - _____ - 20_____

has been manufactured in accordance with the following EC directives:

The Machinery Directive 2006/42EC

The EMC Directive 2014/30/EU

The following standards have been used:

DS/EN ISO 12100 (Machine safety – General principles for design – Risk assessment and risk reduction)

DS/EN ISO 20607 (Machine safety – Instruction handbook – General drafting principles)

DS/EN ISO 14121-2 (Machine safety – Risk assessment - Part 2: Practical guidance and examples of methods)

Date:_____ **Signature:**_____

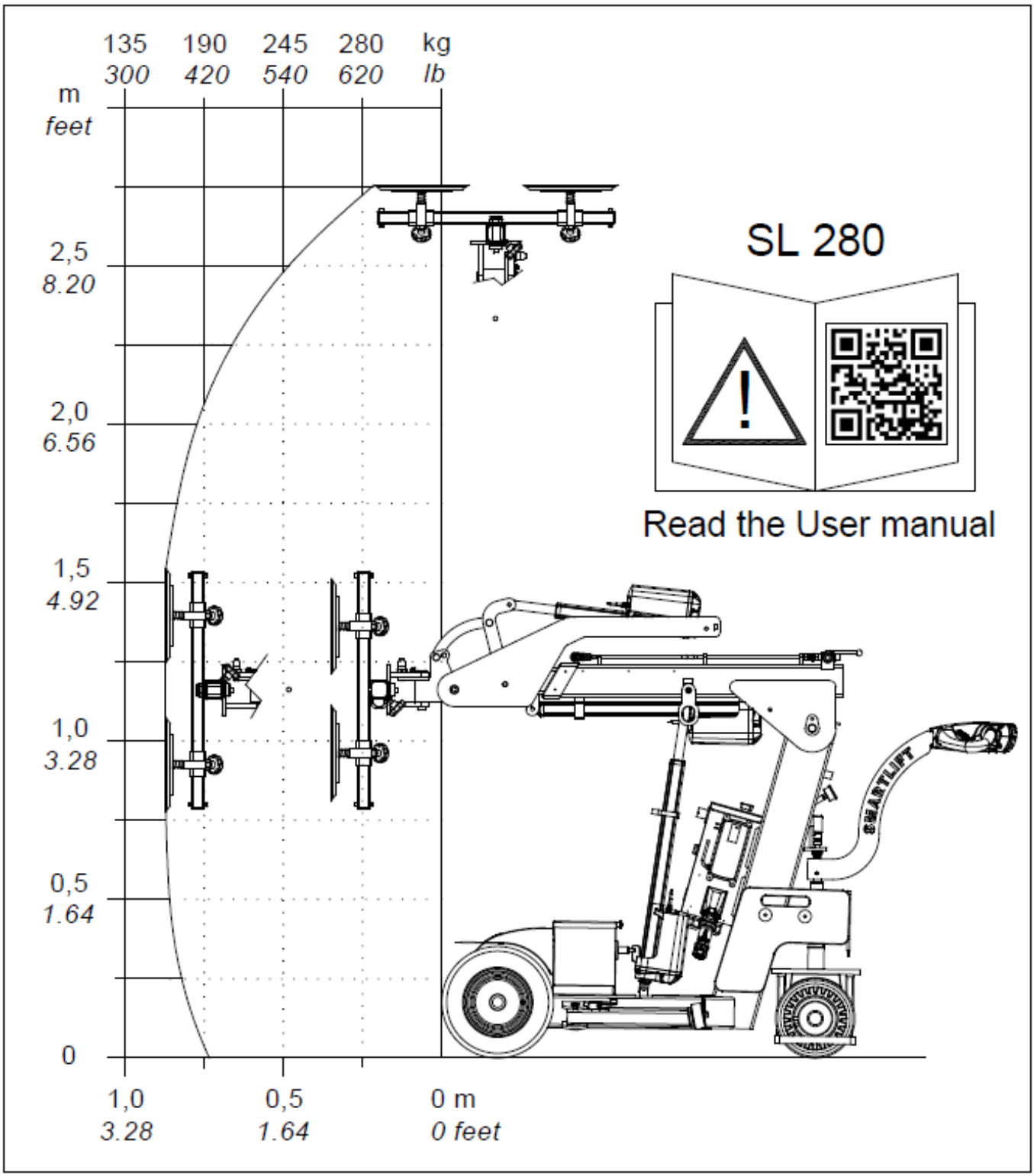
SMARTLIFT
N. A. Christensensvej 39, DK-7900 Nykøbing Mors
Tel. +45 9772 2911, E-mail: smart@smartlift.com

Nicolai Tange Jørgensen, CEO

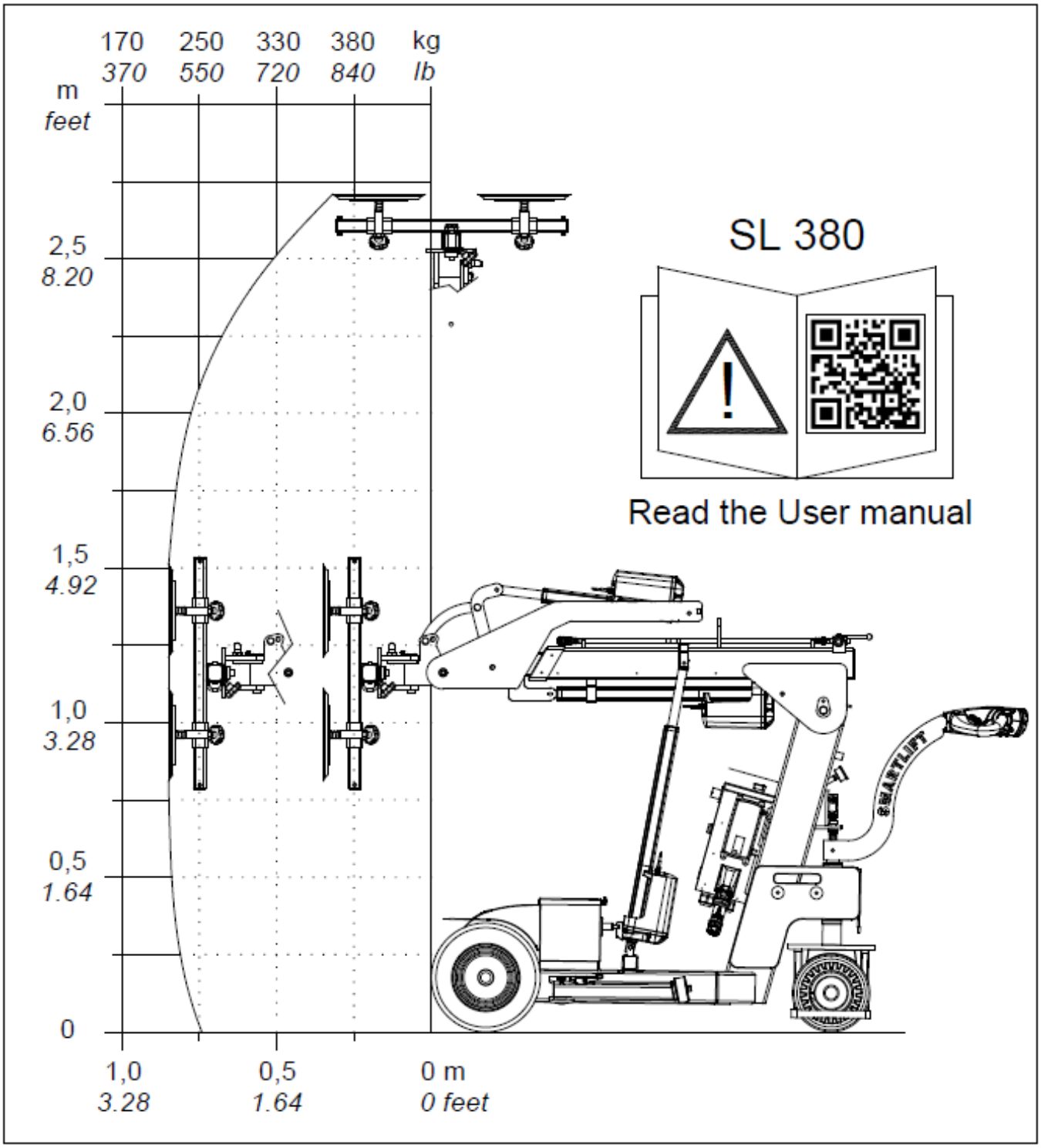
9.3 Load charts SL

Load charts only apply to machines with standard configurations.

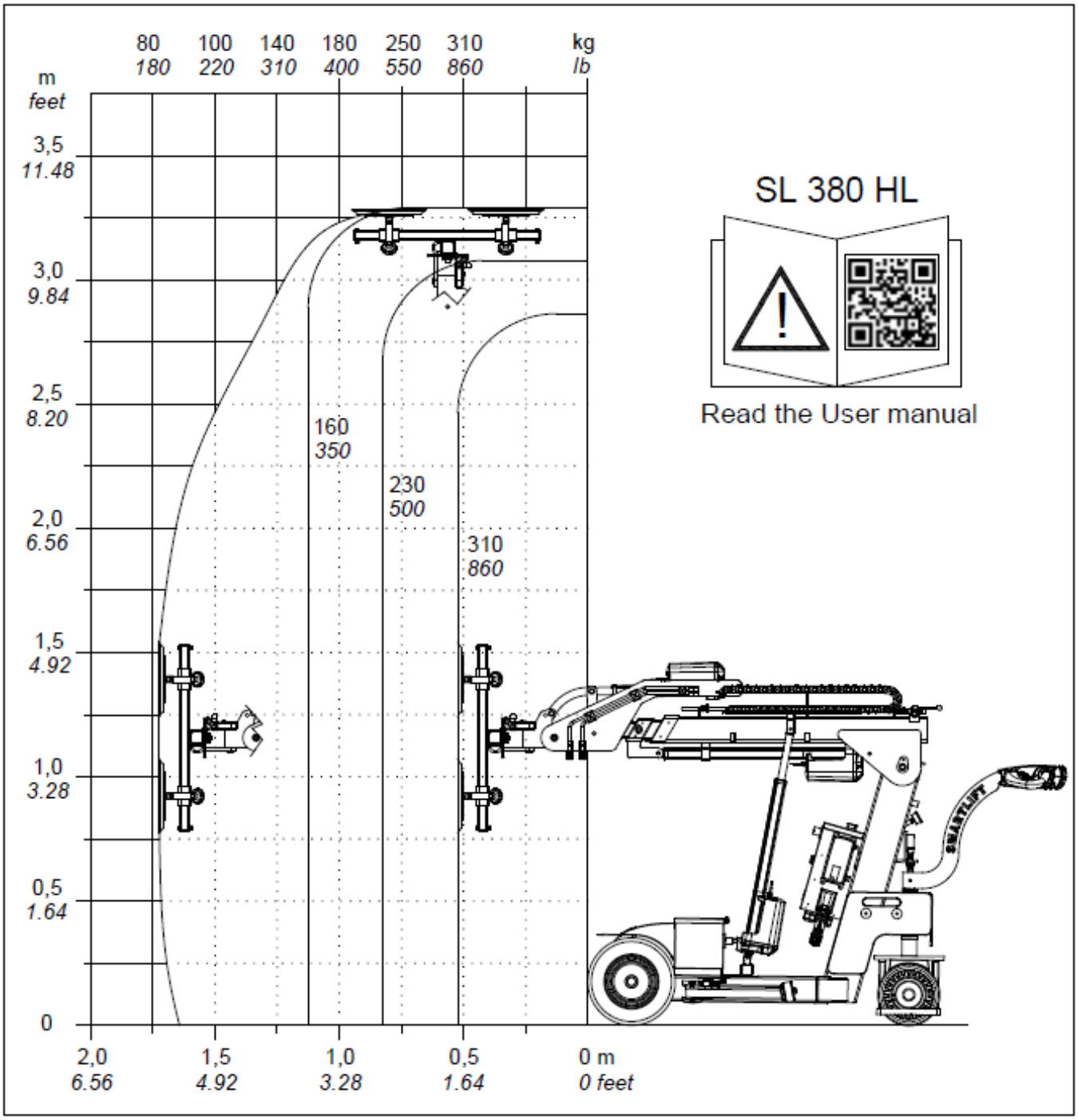
9.3.1 SL 280



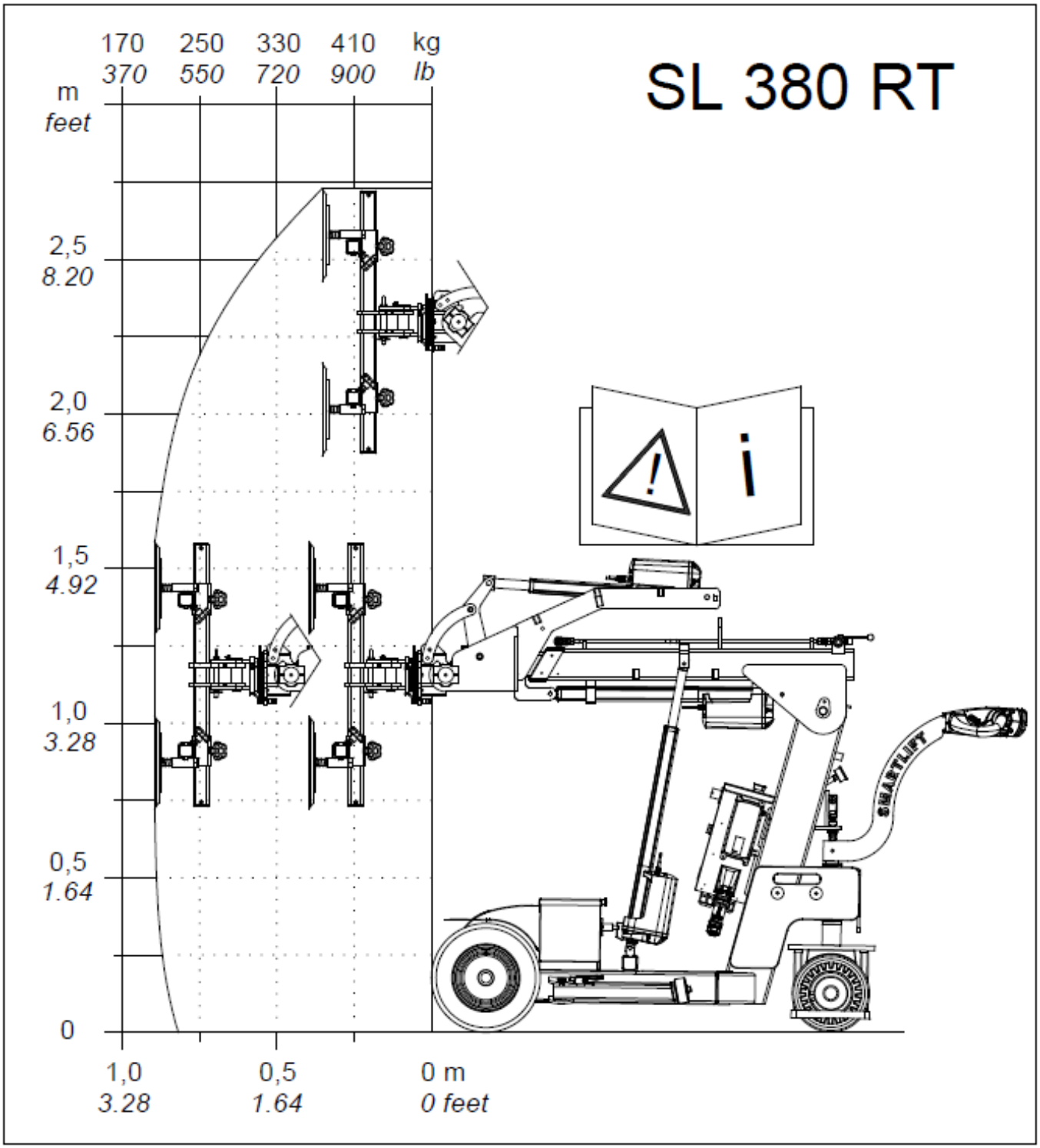
9.3.2 SL 380


170 250 330 380 kg
370 550 720 840 lb
m
feet
2,5
8.20
2,0
6.56
1,5
4.92
1,0
3.28
0,5
1.64
0
1,0
3.28
0,5
1.64
0 m
0 feet
SL 380
Read the User manual
SMARTLIFT

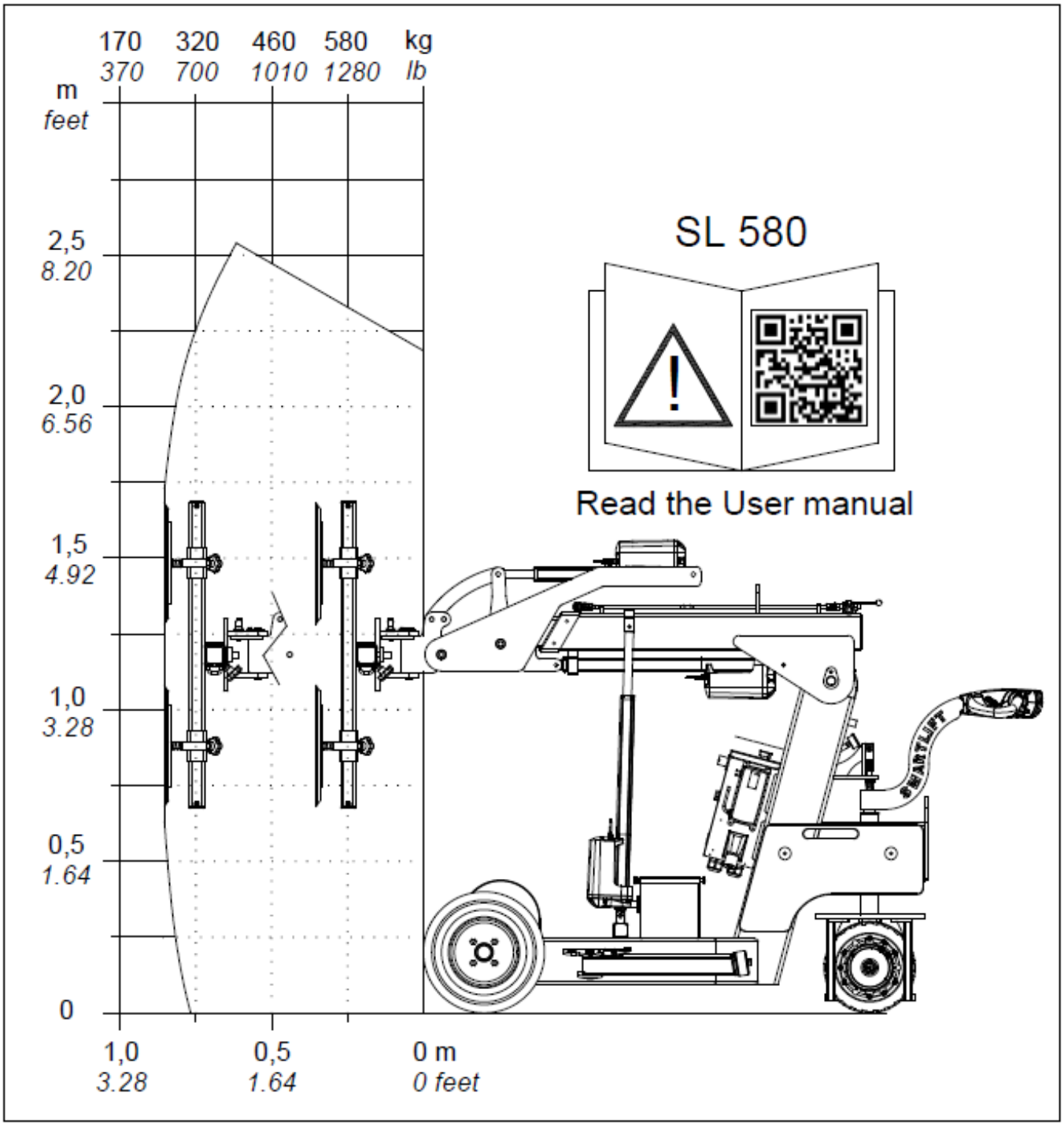
9.3.3 SL 380 HL


80 100 140 180 250 310 kg
180 220 310 400 550 860 lb
m
feet
3,5
11.48
3,0
9.84
2,5
8.20
2,0
6.56
1,5
4.92
1,0
3.28
0,5
1.64
0
160
350
230
500
310
860
SL 380 HL
Read the User manual
2,0
6.56
1,5
4.92
1,0
3.28
0,5
1.64
0 m
0 feet

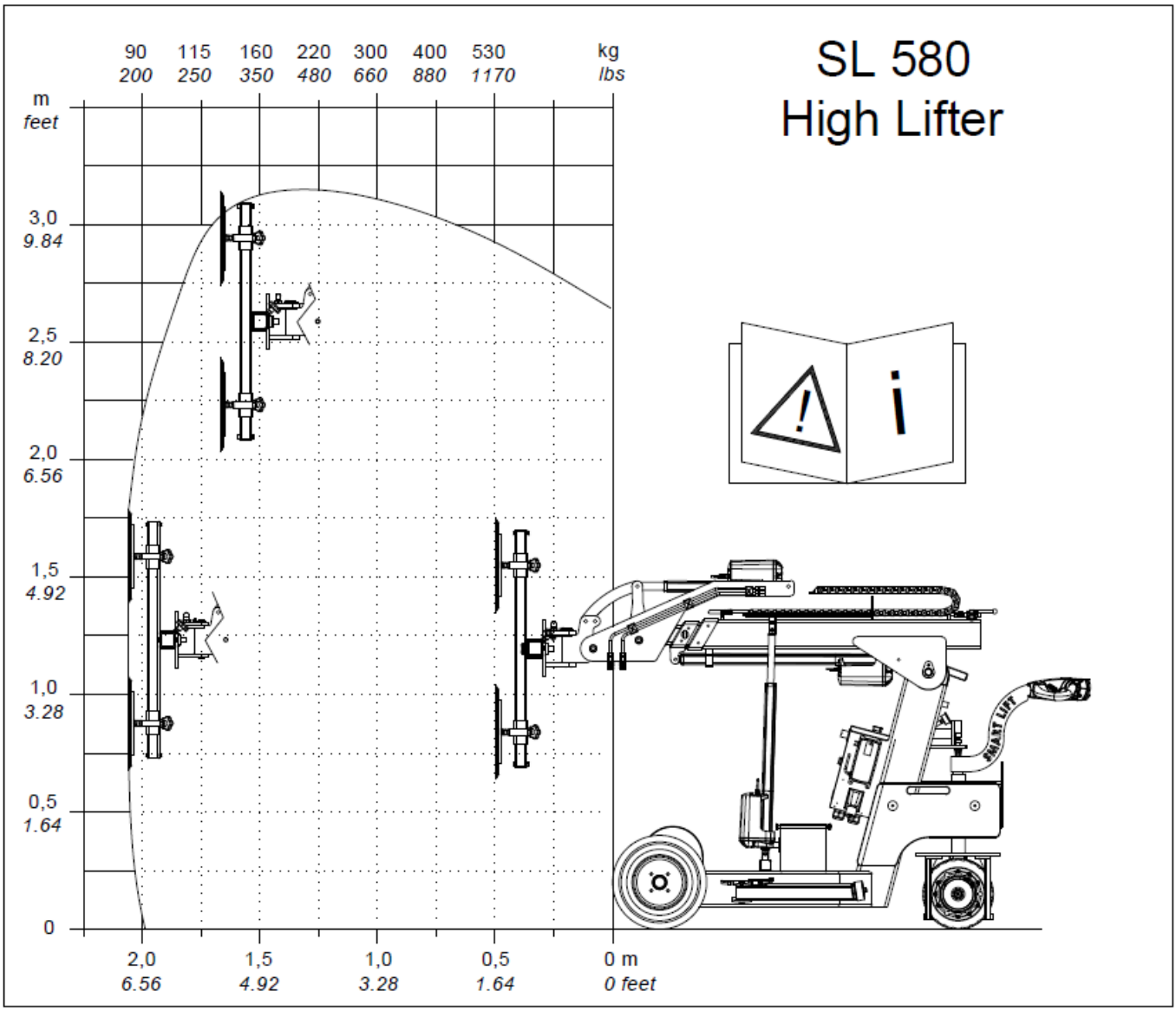
9.3.4 SL 380 RT


SL 380 RT
170 250 330 410 kg
370 550 720 900 lb
m
feet
2,5
8.20
2,0
6.56
1,5
4.92
1,0
3.28
0,5
1.64
0
1,0
3.28
0,5
1.64
0 m
0 feet
SMARTLIFT

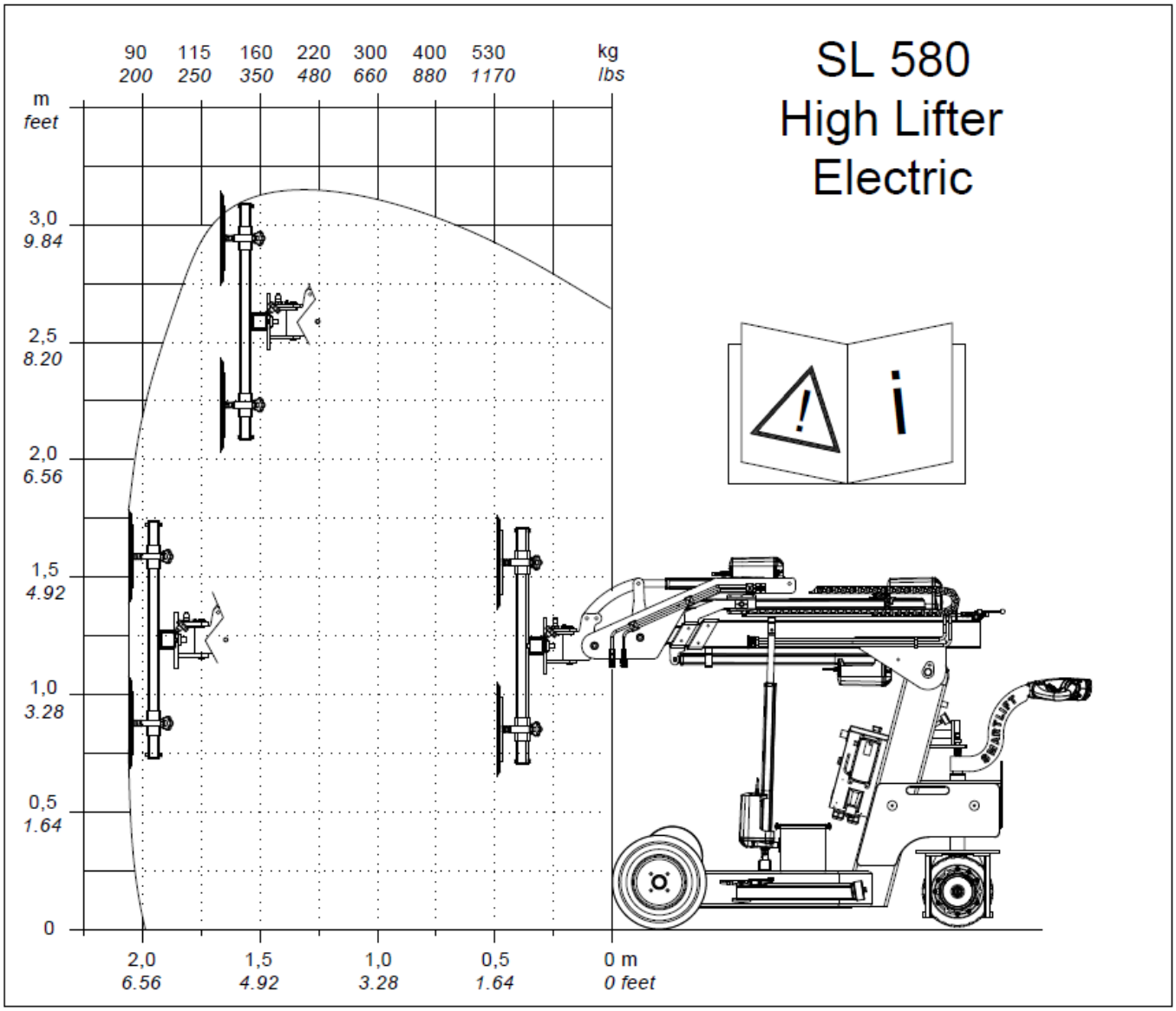
9.3.5 SL 580


170 320 460 580 kg
370 700 1010 1280 lb
m
feet
2,5
8.20
2,0
6.56
1,5
4.92
1,0
3.28
0,5
1.64
0
1,0
3.28
0,5
1.64
0 m
0 feet
SL 580
Read the User manual
SMARTLIFT

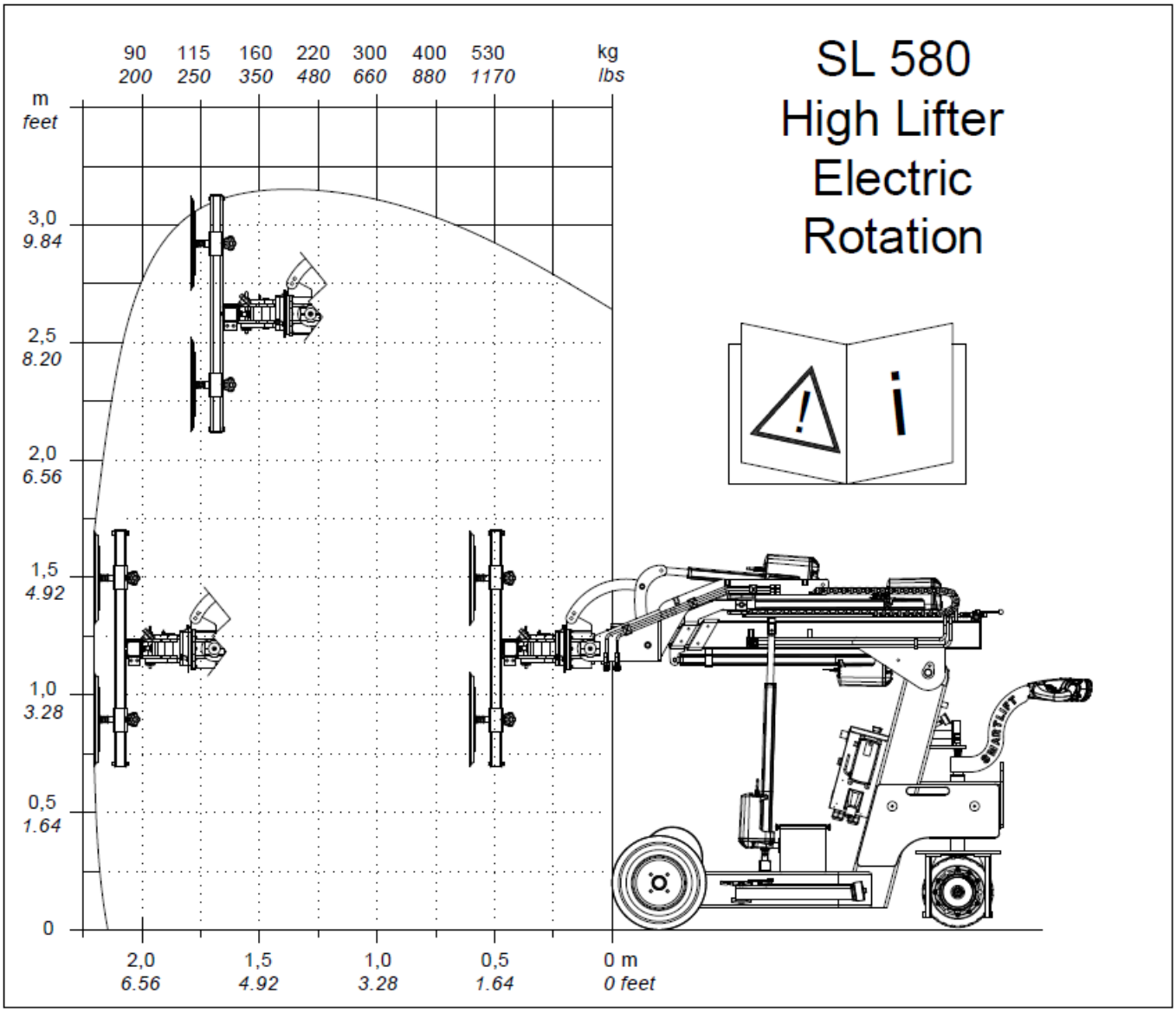
9.3.6 SL 580 HL


SL 580
High Lifter
90 115 160 220 300 400 530 kg
200 250 350 480 660 880 1170 lbs
m
feet
3,0
9.84
2,5
8.20
2,0
6.56
1,5
4.92
1,0
3.28
0,5
1.64
0
2,0
6.56
1,5
4.92
1,0
3.28
0,5
1.64
0 m
0 feet

9.3.7 SL 580 HLE



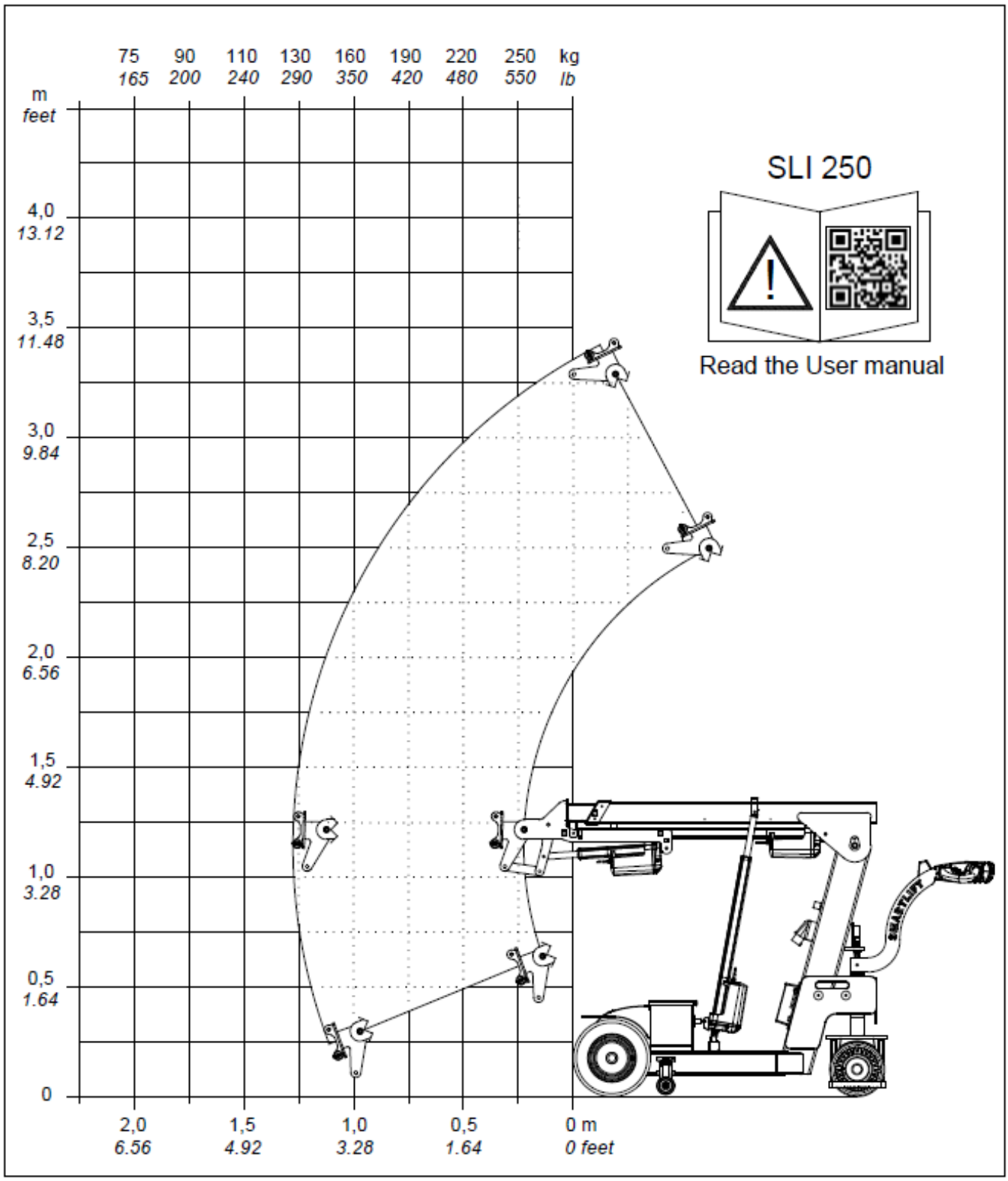
9.3.8 SL 580 HLE RT



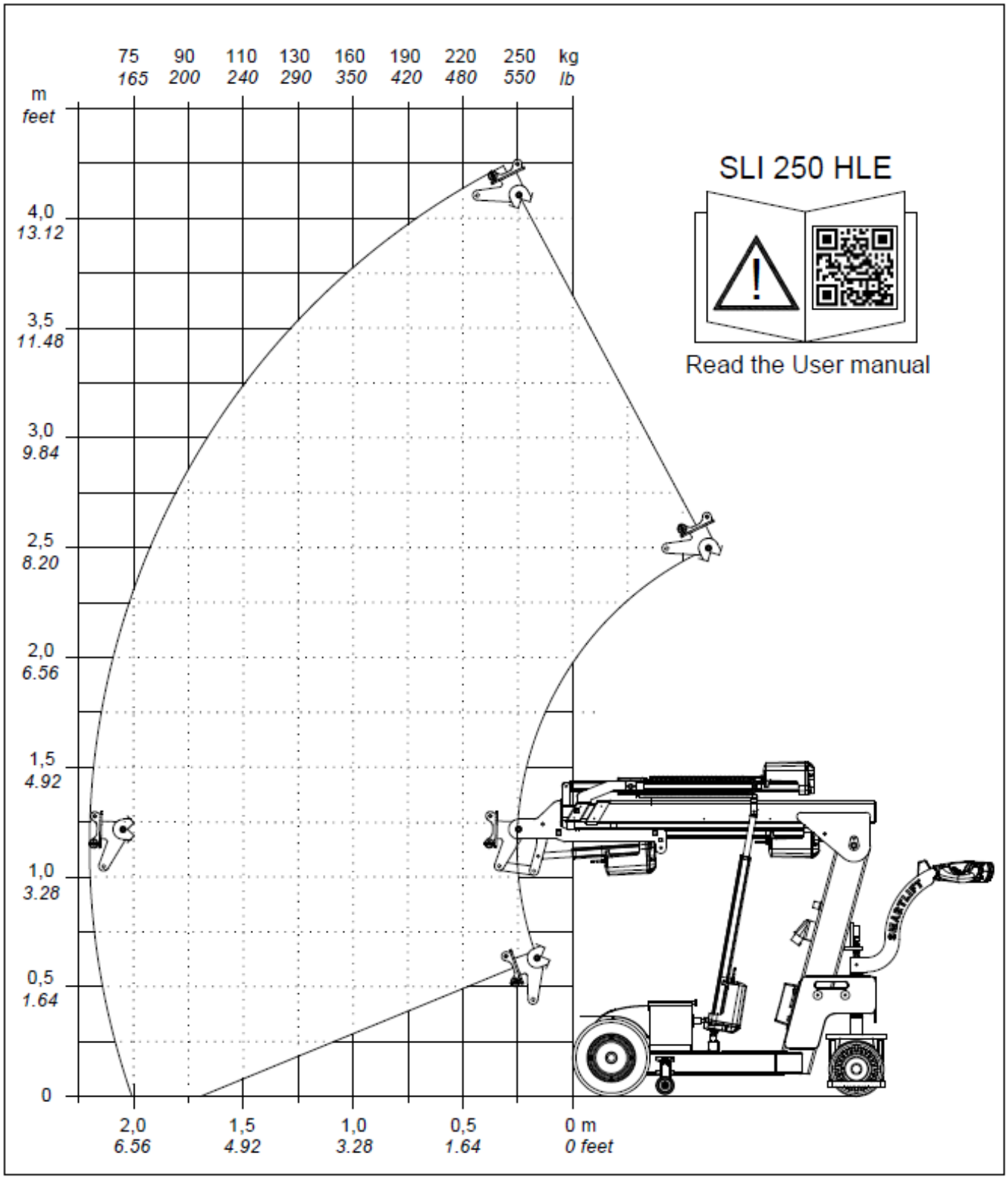
9.4 Load charts SLI

Load charts only apply to machines with standard configurations (Without tools).

9.4.1 SLI 250



9.4.2 SLI 250 HLE



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