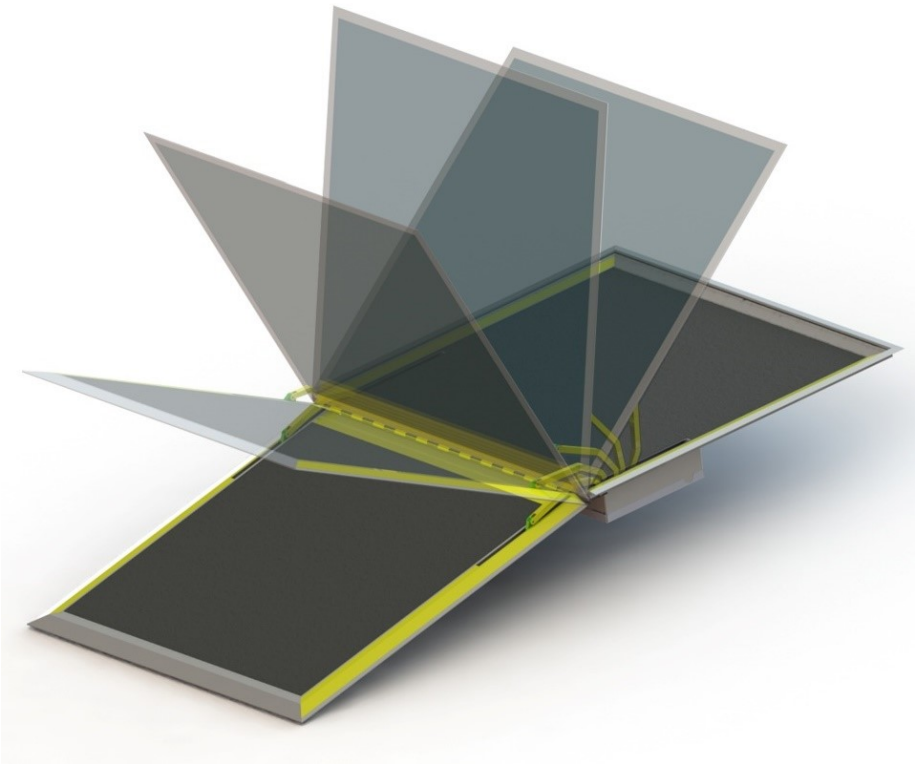
AXS – EPR

A MOBILITY NETWORKS COMPANY

Installation / Maintenance & User

Manual

Versions with belt drive
serial number up to 1796 and 1901 to 1905



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Verion 1.2

1 Technical specifications

Product description	Electrically operated wheelchair ramp for mini- midi- and full size city buses.
Installation	In the vehicle Floor at the front- middle- or rear door
Dimensions	Ramp length 825 mm For detailed dimensions please refer to the installation drawings
Weight	AXS EPR 825 36 Kg
Life cycle	Tested life cycle of the ramp is 100,000 cycles (belt drive 25,000 cycles)
Electrical connection	3.5 meter cable with free wires
Electrical System	IP 65
Drive	Electric motor 12 or 24V 100W
Electric signals	Dashboard / door post light signal Ramp closed signal
Safety functions	Motor switch off by current control / limit torque clutch.
Cycle time	Time required for opening or closing the ramp is approx. 6-7 Sec
Load	Maximum load 350 Kg (3500 N) This is always labeled on the Ramp.
Materials	Anodized Aluminium sandwich plate structure with anti-slip platform. Integrated Aluminium hinge.
Legislation	The product fulfils R107 UN Bus directive and 98/37 EC Machine directive.

2 Terminology

The type of ramp is determined by the following:

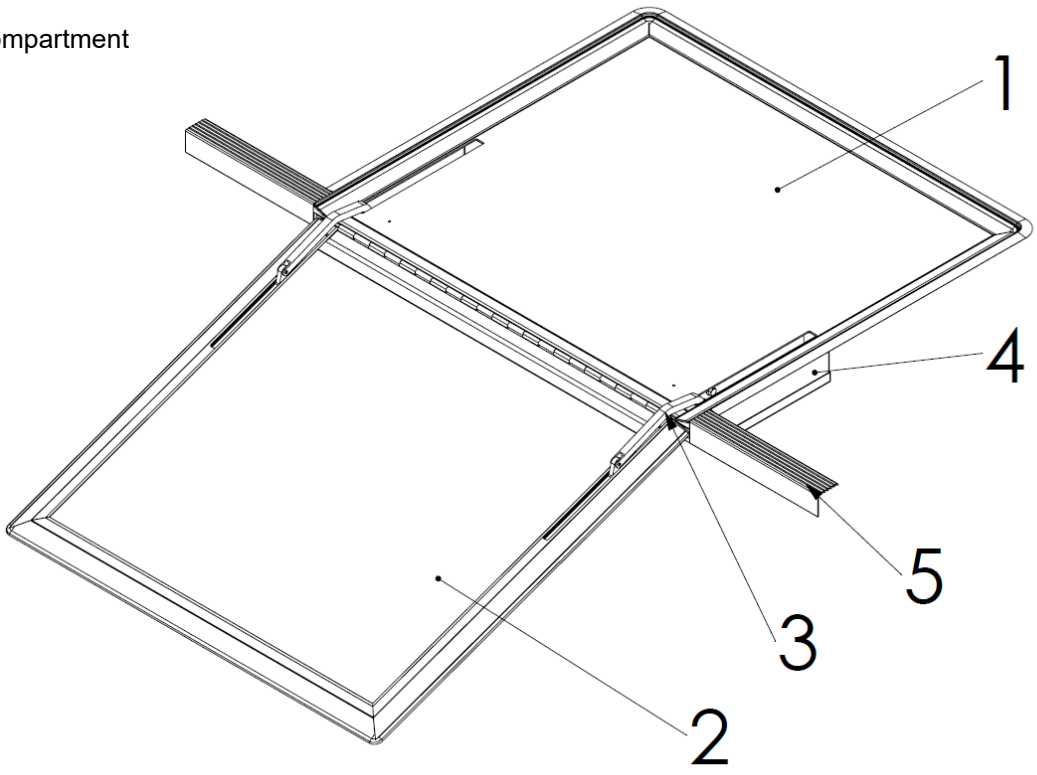
EPR xxx where:

EPR = Electric Powered Ramp
XXX = Nominal length of platform in millimetres

Meaning an EPR 825 is an electrically operated ramp of 825 millimetres in length

Components of the ramp

1. Floor shell
2. Ramp platform
3. Drive arm
4. Drive line compartment
5. Step edge



3 Safety instructions

These Safety instructions should always be kept with the ramp / vehicle. The operator must be made aware of these instructions before operating the ramp. Read and follow these safety instructions carefully.

The ramp is intended to be a boarding device for wheelchairs and their passengers. It should be used appropriately by passengers to enter or exit a vehicle, and the maximum load should not be exceeded.

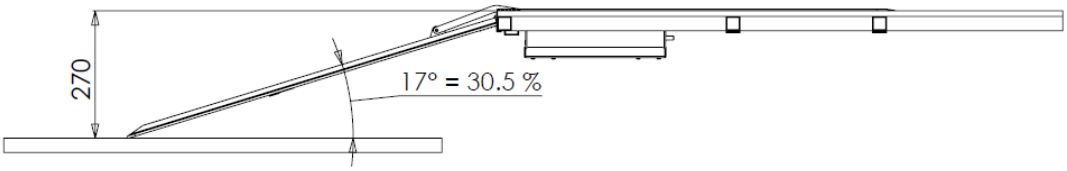
1. **Before operating the ramp the vehicle must be stationary and the hand brake or parking brake must be applied.**
2. **Before operating the ramp, ensure that there is nothing obstructing it. Look out for people moving outside the vehicle near the ramp.**
3. **It is recommended that the ramp is only operated by the driver or other qualified operators.**
4. **The driver or operator must have a clear view of the ramp, when they are operating it.**
5. **It is recommended that the middle of the platform is used when stepping onto the ramp.**
6. **NEVER drive away when the RED dashboard LED light is still on, this means that the ramp is not properly stowed.**
7. **The ramp platform must be kept clean and free of oil and other greasy materials.**
8. **If there is any doubt about the safety of a passenger when using the ramp, ensure they are assisted.**
9. **If you have any questions about the safe operation of the ramp, contact the person responsible directly.**
10. **Never use the ramp for any other use than described here.**
11. **Never overload the ramp.**
12. **The ramp should always be operated until it is fully in or out.**
13. **Repair and maintenance must be done by qualified and trained staff only.**
14. **If any parts need replacing, ensure only original Acdeos Parts are used.**
15. **If the anti-slip surface on the ramp becomes worn, the anti-slip must be replaced.**
16. **Always use the recommended cleaning materials.**
17. **Report any unsafe aspects of the ramp to the ramp supplier.**

4 Constraints

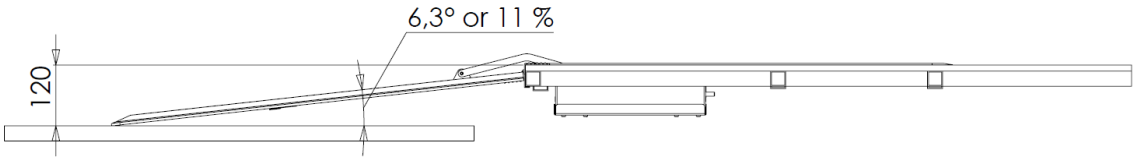
The AXS Ramp has been designed to be functional and reliable. The product is made as simple and reliable as possible. The possibility of use during extreme conditions, has been taken into consideration for the design of the ramp.

4.1 Legal requirements:

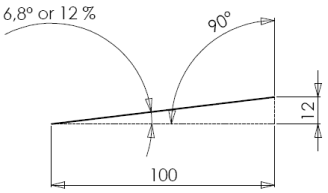
The ramp meets the legal requirements of the RN 107 section 3.11.4.
According to the RN 107 the max slope for boarding at ground is 36%
The EPR 825 meets this requirement with 30,5%



According to the RN 107 the max slope extended or folded out on to a kerb of 150 mm in height, should not exceed 12 %
The EPR 825 meets this requirement with 11%



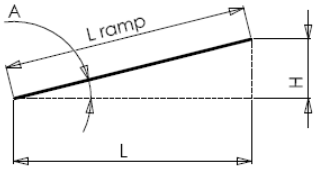
4.2 Slope in % and Deg.



Often % slope and Deg are mixed-up. Below you will find the explanation of a slope in ° (Deg) and %.
An angle is divided in degrees or °. A straight angle is 90° a full circle is 360°
Example: For a ramp according to EC bus directive the maximum angle is 6,8°

Another way to measure an angle is the % of the slope. If you move 100 cm forward and in that 100 cm raise 12 cm the percentage of that slope is 12%

How to calculate:
If you want to know the slope A in % from a ramp
The % slope of a ramp is: A = H / L * 100%.
Normally you don't know L you only know L_{ramp}. For relatively small slopes you can say L_{ramp} = L. This is not exactly right but normally good enough. So than the formula is: A = H / L_{ramp} * 100%



For calculating the angle A in deg you need a calculator with sin, cos and tan. Calculate H / L_{ramp} than take the inv (inverse) tan of this value and you have the angle of the ramp. Again this is not exact but for small angles it's near enough. So the formula is:

A = inv tan (H / L_{ramp})

5 Operation

5.1 Open / Deploy operation procedure

To open the ramp, ensure that the vehicle is completely stopped. Depending on the vehicle layout the parking brake should be applied, or any other device that assures the complete non-movement of the vehicle should be on.
Following the safety instructions in section 3, push the “out” button on the dashboard.
The ramp will start moving in the “out” direction.
A buzzer makes a ‘beep’ signal --- --- --- --- --- and the dashboard light flashes in the same sequence.
Keep the “out” button held until the ramp is completely deployed and stops by itself, the buzzer stops beeping, and the dashboard light is constantly lit.

You can stop the ramp movement at any point during its travel by releasing the “out” button. The ramp will stop immediately and the buzzer will make a faster beeping signal - - - - - - - - and the dashboard light will flash in the same sequence. If the ramp is in the first 90 deg’s of movement (before reaching the doorpost), you can still continue to deploy the ramp by pushing the “out” button again.
If you actively stop the movement in the second 90 deg’s (once the ramp has passed the door post) and you want to continue to deploy the ramp, you will need to push the “in button” to move the ramp back in first. Once the ramp is moved back to inside the door post, you can then push the “out” button again and the ramp will start to deploy.
In later versions you can also continue the movement in the second 90 deg without moving back as described above

If the ramp hits an obstacle, the safety device will make it stop. If the ramp is stopped by the safety device, the buzzer will make a faster irregular beeping signal - - -- -- - - -- -- and the dashboard light will flash in the same sequence.
If the ramp is stopped by the safety device, you will always need to reverse it slightly in the opposite direction before you can make it move in the deployed direction again.

5.2 Close operation procedure

The close procedure is very similar to the open procedure.
Push the “close” button and the ramp will start moving in the closed direction.
The buzzer makes a beep signal --- --- --- --- --- and the dashboard light flashes in the same sequence.
Keep the “close” button held until the ramp is completely closed and stopped by itself, the buzzer stops beeping, and the dashboard light is off.

You can stop the ramp movement at any point during the travel by releasing the “close” button. The ramp will stop immediately and the buzzer will make a faster beep signal - - - - - - - - and the dashboard light will flash in the same sequence. You can make the ramp move in again by re-pressing the “close” button again.

If the ramp hits an obstacle, the safety device will make it stop. If the ramp is stopped by the safety device, the buzzer will make a faster irregular beeping signal - - -- -- - - -- -- and the dashboard light will flash in the same sequence.
If the ramp is stopped by the safety device, you will always need to reverse it slightly in the opposite direction before you can make it move in the close/stow direction again.

5.3 Emergency operation procedure

If the ramps fails to work for any reason it can be operated by hand.
Grab the ramp by hand, and with some force, keep pushing or pulling the ramp in the right direction until you reach the required position.

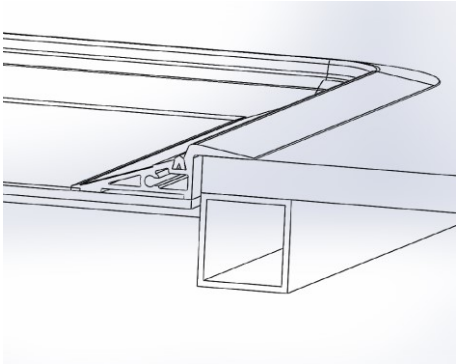
6 Mounting / Installation

The installation can only be carried out by a company familiar with building or modifying vehicles and which has the staff qualified for such work.

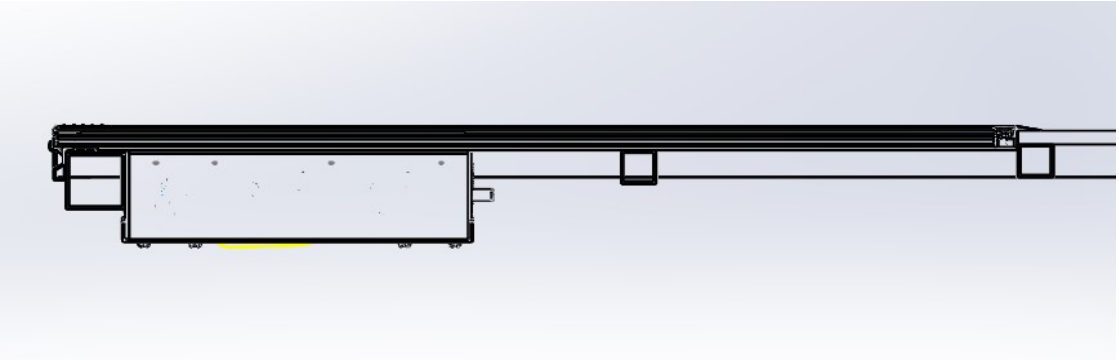
6.1 Mechanical Installation

The fitting of the ramp involves major vehicle adaptations. The ramp is mounted in the top floor in the door section. Modification of the chassis is needed. Exact measurements of the ramp should be taken from the installation drawing in appendix 1 or ask for a 3D cad file drawing from your supplier.
The following guidelines should be kept in mind:

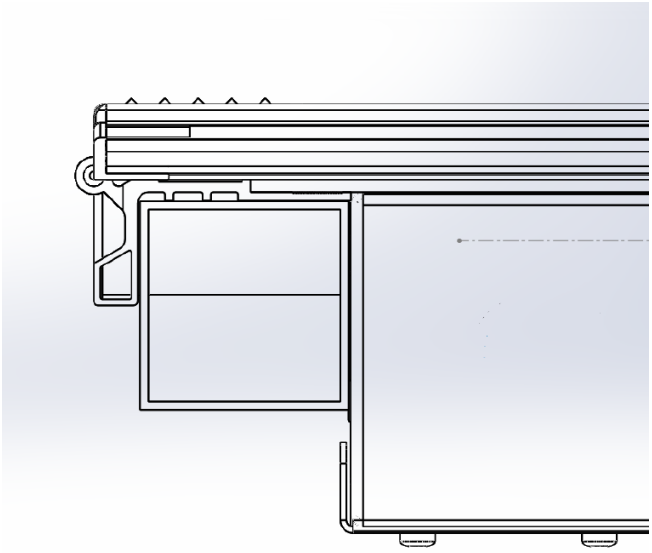
1) Ramp should be fitted in the floor with a PU glue. Do not use a high strength PU as it will be harder to remove the ramp from the vehicle if needed. You can also use Butylene kit or similar products and ad screws for fixation
2) The ramp will need to be supported around the complete floor shell edge, at the top floor.



3) The bottom of the floor shell has to be supported by at least one chassis member in the center of the ramp, or preferably with two chassis members.



4) The front hinge needs to be supported by a chassis bar with a width of 40 to max 50 mm. The hinge profile has to be glued over the full length at this chassis section with a PU glue. Alternatively you can use countersunk screws to fix the profile from the front.



6.2 Electrical Installation

To correctly install the ramp follow these instructions and electrical diagram in appendix II:

1. Find a good route for the cable to the front of the vehicle, or to the area where it will be connected to the vehicles electrical system. The principal idea for the routing of the cable loom is as follows: cable should run under the vehicle to a place where you can enter the vehicle. There you should find a dry place to connect to the bus wiring system.
2. Please refer to the electrical diagrams in the rear of the manual appendix II.
3. The ramp is always operated by the driver via a dashboard switch. The dashboard switch must be a 3 way type with an active neutral center position. The switch must always come back to the neutral center position if released by the driver.
   The switch has to be installed in serial with a door switch / door open signal. So the ramp can only be operated when the door is open.
4. A dashboard LED has to be installed, connected to the blue wire coming from the ramp. This same blue wire has to be used for the Orange blinking lights near the ramp at the door post.
5. Connect the black wire to ground.
6. Connect the red wire to 12V power. **You need to add a fuse of 20 Amp** between the battery and the power cable. Decide whether to connect the step to constant power or to power behind the main switch. We recommend placing the step behind the main switch. The step ECU has a sleep mode using less than 1mAmp in standby mode
7. Cable colours:
   Red Power (Use a 20 Amp fuse)
   Black Ground
   Out-put signals (max 0,6 Amp)
   Blue Pos / high signal for dashboard LED and orange lights at door post.
   Green Ramp closed signal Pos / high when the ramp is closed
   In-put signals
   Orange Pos / high signal to close the ramp
   Yellow Pos / high signal to open the ramp

7 Maintenance

7.1 Cleaning

The ramp must be cleaned in the normal cleaning schedule of the vehicle, depending on the use of the vehicle and the dirtiness of the operation. Normal non-aggressive cleaning materials, as used for cleaning the other parts of the vehicle, should be used.
Do not use aggressive solvents; these could affect the paint, rubber and glue used on the ramp.
Depending on road circumstances it may be necessary to clean the internal drive box once a year.

7.2 Periodical maintenance

The product is maintenance free. This means that it is not necessary to grease any of the moving parts, however it is necessary to do a yearly inspection and it is recommended that the belt drive is changed every 25.000 cycles.

7.3 Yearly inspection

The inspection of the ramp can only be done by a company that is familiar with ramps and lifting devices, and also has trained staff.

This is a people carrying device. ACDEOS recommends inspection maintenance should be carried out yearly.
The following points should be checked every year:

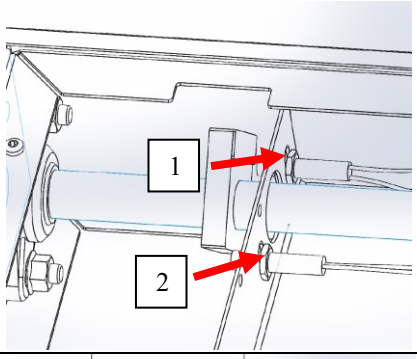
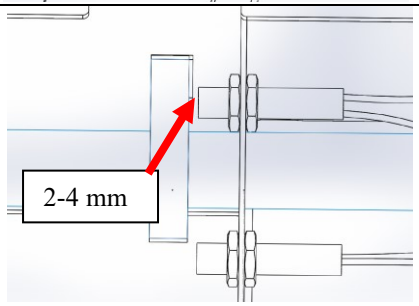
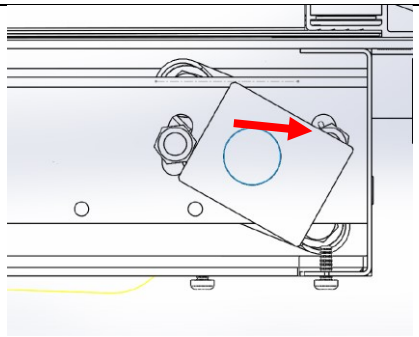
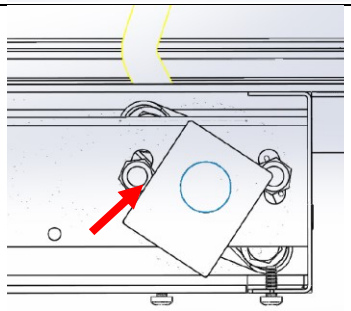
1. The hinge area for stress cracks
2. That the max load stickers are in place and in good condition
3. That the anti-slip surface of the platform is in good condition

Finally a general check of the ramp is needed to determine whether it is safe for another year in service.

8 Repair

The repair of the ramp is simple and can be done with normal workshop equipment and tools. All bolted or screwed parts can be replaced by workshop personnel with average technical skills.

8.1 Adjustment of the in and out / center switch

Adjustment of both switches is not critical and does not need adjustment under normal circumstances.	
Remove the bottom plate from the drive box by loosening the 10 torx screws. The switches are in the same compartment as the ECU. Number 1 is the close switch Number 2 is the open or center switch	
The magnet must have a gap of 2-4 mm with the switch front	
Position of the magnet holder in reference to the close switch with the ramp in closed position. The magnet should just overlap the switch. This will ensure the signal will come about 10 deg before the ramp is closed. This is good as the ramp stops finally at current control, to make sure the ramp is always fully closed.	
Position of the magnet holder in reference to the open or center switch with the ramp in 90 deg open position. The magnet should just be in front of the open switch	

8.2 Electrical system.

To repair the electrical system, it is necessary to understand the function of the ECU and the rest of the electrical system. First check appendix 2 with the electrical schedule.

8.2.1 Open Operation procedure

The ramp can only be safely operated once the bus system confirms that the parking brake is applied, the driver or operator can then press the button, giving a signal to deploy the ramp. This is a steady signal that stays on during the operation. The electric motor receives the signal and starts running in the right direction for deployment. As soon as the deploy signal is not received, the ramp should stop moving.

The out signal (magnetic switch) in the ramp will give a signal when the ramp is deployed over 90 deg. This means that ramp is nearly half way through the total movement of 200 Deg. After the ramp reaches the out signal the motor must run for additional 4 sec. This is enough time to reach the ground in every situation. If the ground is reached earlier, the torque control will switch the motor off and the torque limited clutch will prevent the system from overloading.
If the ramp encounters an obstacle it automatically stops on current control, both in and out direction.
If the ramp is stopped by the safety device the driver has to operate it briefly in the opposite direction to reset the system.

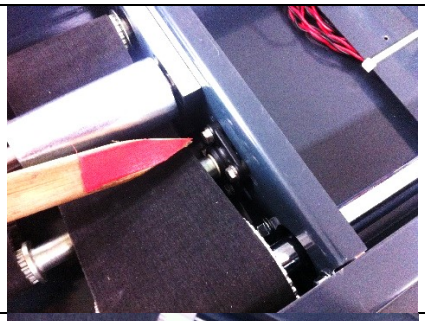
8.2.2 Close operation procedure

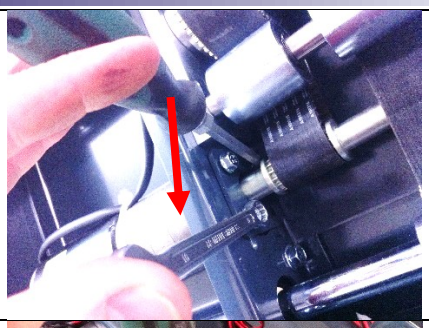
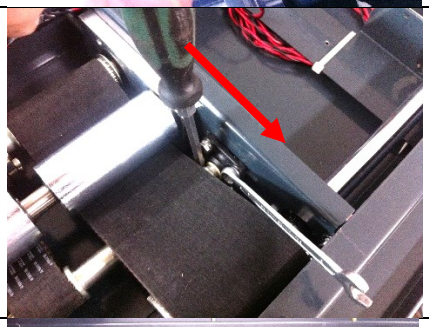
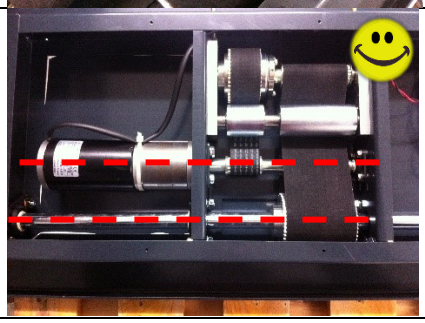
To stow the ramp the driver has to push the button, giving the signal that the ramp should close. The motor starts turning in the opposite direction. The ramp starts moving in. The same rules apply as for moving out.
A close signal from magnetic read switch will indicate that the Ramp is completely stowed. Again if the ECU recognizes the stow signal it takes control and lets the motor continue for 0.8 sec to make sure that the ramp is fully stowed. After the 0,8 sec the motor stops even if the driver is still giving the stow signal from the button on the dashboard.
This stowed signal will also give the bus system confirmation that it is safe to drive the bus away.

8.2.3 Safety control by Amp setting related to ramp angle

The mechanical driveline of the ramp in combination with gravity applied to the ramp, creates a need for a more sophisticated current safety device. The ramps motion has to be divided in to four sections, each section has its own safety settings.

8.3 Replacement of the motor

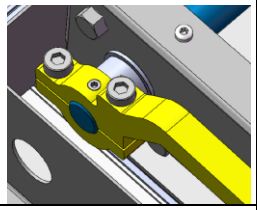
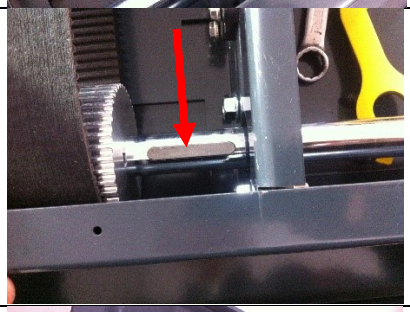
	Disassembly	
1	Remove bottom plate and clean interior of the driveline compartment.	
2	Loosen 4 bolts M5 from bearing Do not remove the bolts	
3	Take out 4 bolts M6 from motor Warning: Belt is under preload and will pull the shaft + motor in the direction of the secondary shaft	
4	Pull motor out of the primary shaft. Take care not to lose the forelock in the motor shaft. Disconnect the electric connection and remove the motor.	
	Assembly	
6	Slide the motor in the primary shaft. Make sure the forelock is aligned. If needed turn the shaft of the motor carefully, this requires hi force but is possible.	
7	Place the 4 M6 flange bolts back in the motor. Keep the motor support plate in line with the M6 holes in the motor. Warning Make sure the Belt fits properly with all the teeth located in the pulley. If needed, move the ramp platform a bit to turn the main shaft and secondary shaft	

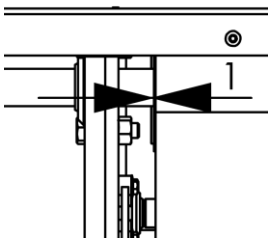
8	Place a mid-size screwdriver behind the shaft, locate the flat end in the slot of the plate above the shaft. Pull the screwdriver with a lot of force in the direction of the main shaft (arrow on picture). Keep preload on the shaft and tighten at least one M6 flange bolt to keep the motor in position.	
9	Place the screwdriver at the other end of the shaft in the second slot, and pull the screwdriver in the same direction. Align the primary shaft with the motor. If the shaft is aligned with the axis of the motor, tighten one of the M5 flange bolts.	
10	Check the alignment between primary shaft motor and mains shaft as on picture. If alignment is good, fix the M5 and M6 bolts. Connect the electrical connection and check the function of the ramp. Then replace the bottom plate	

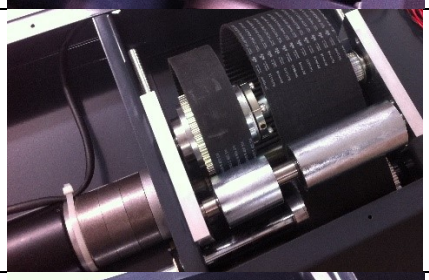
8.4 Driveline / belt replacement

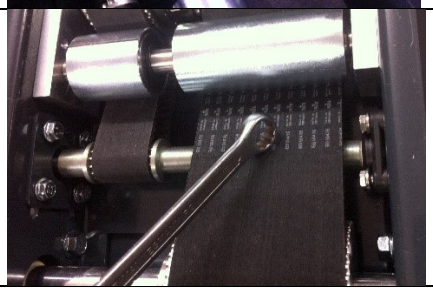
	Disassembly	
11	**Warning: Complete disassembly of the driveline is possible when the ramp is installed at the vehicle: However we recommend that the ramp is removed from the vehicle, and the required work is done at a workbench, with the ramp positioned upside down**. Follow step sub 8.3 no 1 to 4 Remove bottom plate motor etc	
12	Remove the two M8 nuts on the outside of the driveline compartment to release the pre load from the belt.	
13	Remove 2x 4 M6 flange bolts from the two bearing holders.	

14	Remove the complete assembly with the two shafts out of the cassette.	
15	Take the bearing holder away from the two shafts.	
16	Removed parts	
17	Release the set screw from the belt pulley at the main shaft	
18	Release the set screw from the magnet holder at the main shaft	
19	Following steps are need for one piece drive arms Later two piece drive arms can be disconnected easy by unlocking the two M8 bolts. Make two small wedges from a short (9mm) plate screw like picture	

20	Loosen M8 bolt(s) from drive arm. Turn the set screw 5 turns anticlockwise For two piece arms: Remove both M8 Bolts and the drive arm segment and go to step 23 	
21	Bring the platform to a 90 deg position Drive the wedges in split on both of the arms	
22	Bring platform back to a closed position Remove arms one by one from the main shaft by forcing them sideways. It may be necessary to remove the ramp platform first, if there is not enough free movement in the arm to push them sideways.	
23	With both arms removed from the main shaft and the other parts loose, it is possible to slide the Main shaft sideways through the hole at the left side of the cassette. First release the fixations screw from the pulley	
24	Slide the pulley sideways and remove the forelock.	
25	Slide the shaft sideways out of the cassette	
26	Remove the belt and pulley from the shaft	

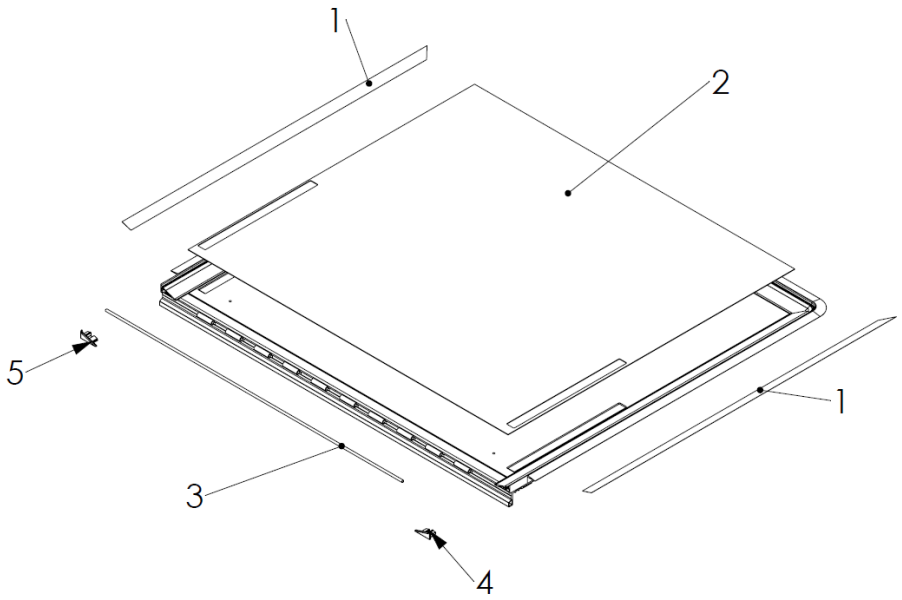
27	Removed / disassembled parts	
	Assembly of the Driveline	
28	Slide the main shaft through the first bearing and place the magnet holder at the shaft with the magnet in the direction of the Switches.	
29	Place belt and pulley and slide the shaft through the pulley.	
30	Place forelock and slide pulley sideways over the forelock	
31	Place spacers at the end of the main shaft at both sides, and align the shaft with the spacers at the center of the cassette	
32	Place the pulley in the right position. This is about 1 mm free from the square hole at the bottom of the cassette 	
33	Lock the pulley on the shaft with the set screw	
34	Place primary shaft belt motor fixation plate and motor	

35	Fix the motor with the 4 flange bolts M6 very loosely.	
36	Place the two belts around the assembly of the two shafts and one bearing holder.	
37	Place the second bearing holder. Use a plastic hammer if needed to bring the bearings in place.	
38	Slide the complete assembly in place with the two M8 threaded studs, going through the holes in the cassette.	
39	Place the 2x 4 M6 flange bolts and fix the bearing holder loosely.	
40	Place the two M8 nuts outside the cassette. Now you can start to bring the secondary belt at the required pre load.	

41	Warning First check if the belt is properly fitted with all the teeth located on the pulley. This needs to be checked for all 4 pulleys and need to be rechecked during the rest of the assembly process. 	
42	Bring pre load at the secondary belt by turning the two M8 nuts at the outside of the cassette (picture step 40) Check that both bearing holders have the same distance to the cassette.	
43	Check the pre load by tapping with a spanner at the belt. The Pre Load is ok if the belt makes a high “Ping” sound Keep step 41 in mind!!! If the belt is at pre Load, fix the 2x 4 M6 flange bolts (picture step 39)	
44	Finish the assembly by following steps 7 -10 from the 8.3 motor replacement. Adjust the magnet holder as described in 8.1 Check the function of the ramp by opening and closing the ramp a few times. Check during this process the fitting of the belt at the pulley.	

9 Spare parts

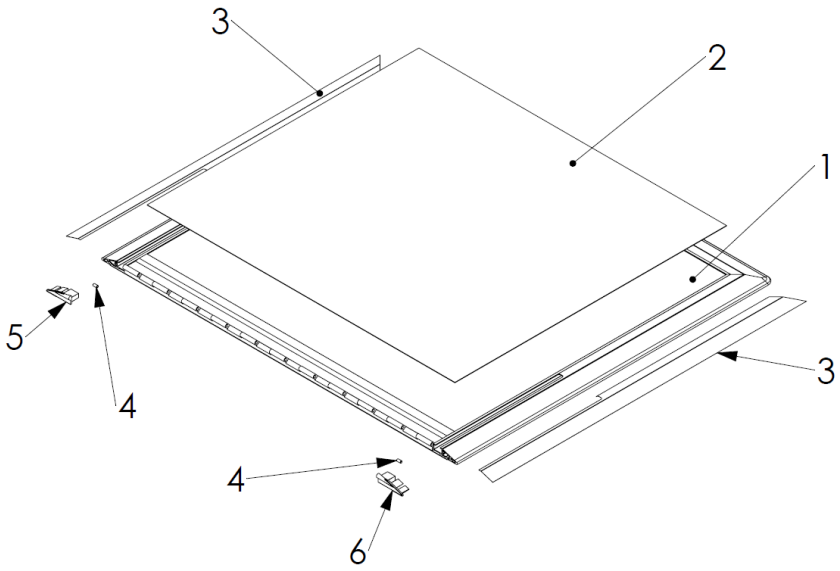
9.1 Floor shell



item	Part description	Part number
1	Yellow reflective tape	CR 116
2	Anti-slip sheet	CR 114
3	Hinge pin.	CR 060

item	Part description	Part number
4	Front cover floor shell R	CR 073
5	Front cover floor shell L	CR 072

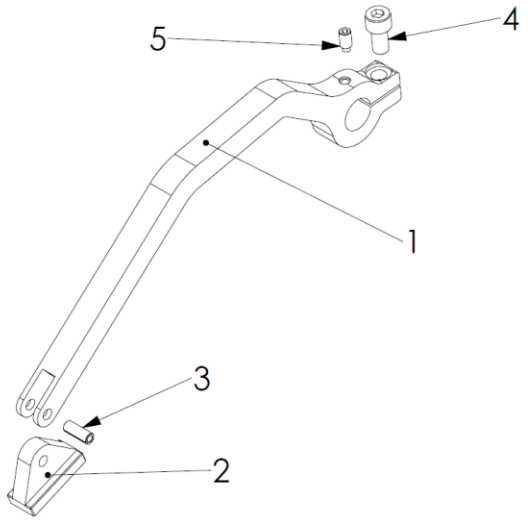
9.2 Ramp platform

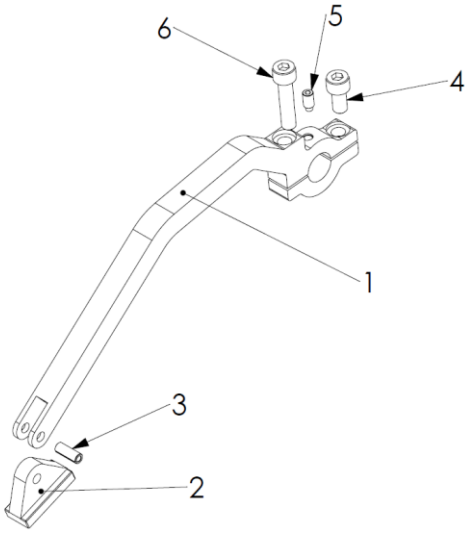


item	Part description	Part number
1	Platform complete yellow corners	ER 130 01 20
1a	Platform complete grey corners	ER 132 01 03
2	Anti-slip sheet	CR 102
3	Yellow reflective tape	CR 107

item	Part description	Part number
4	Pin ISO 8752 5x10	
5	Ramp front cover R	CR 034
6	Ramp front cover L	CR 035

9.3 Drive arm



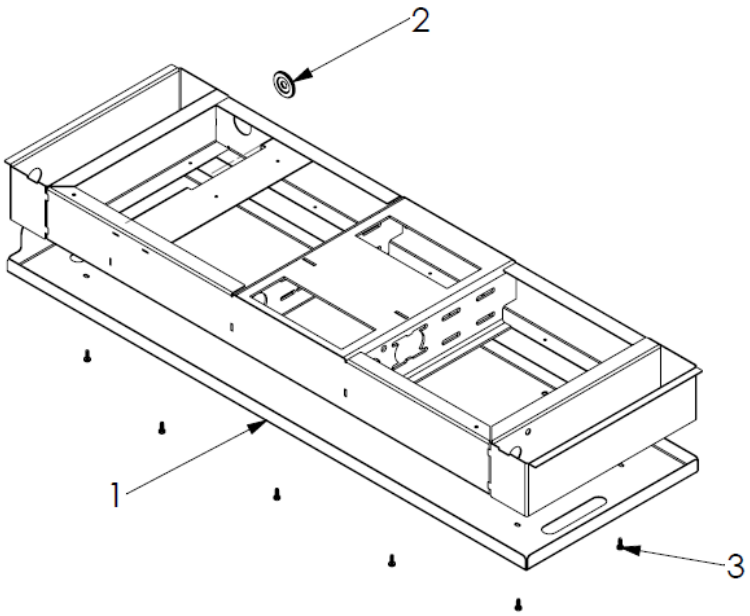


item	Part description	Part number
1	Lift arm *	ER 021
2	Sliding Shoe	ER 046
3	Pin DIN 7343 6x16	

item	Part description	Part number
4	Screw ISO 4762 M8 x16	
5	Set screw ISO 4028 M6x12	
6	Screw ISO 4762 M8 x35	

* Old arm in one piece will always be replaced by a new two piece arm. Both are exchangeable

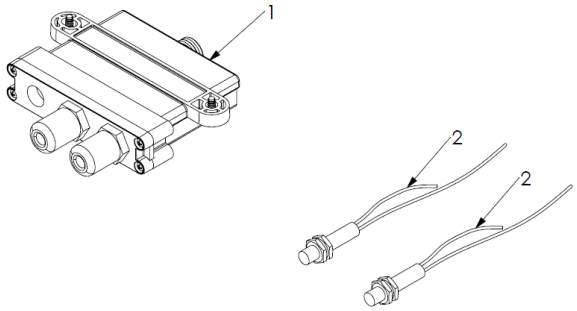
9.4 Drive line box



item	Part description	Part number
1	Bottom cover	ER 039
2	Grummet	S 150 102

item	Part description	Part number
3	SHR-PCLK-FL-C-AW20-(DSS)-4,2X9,5	

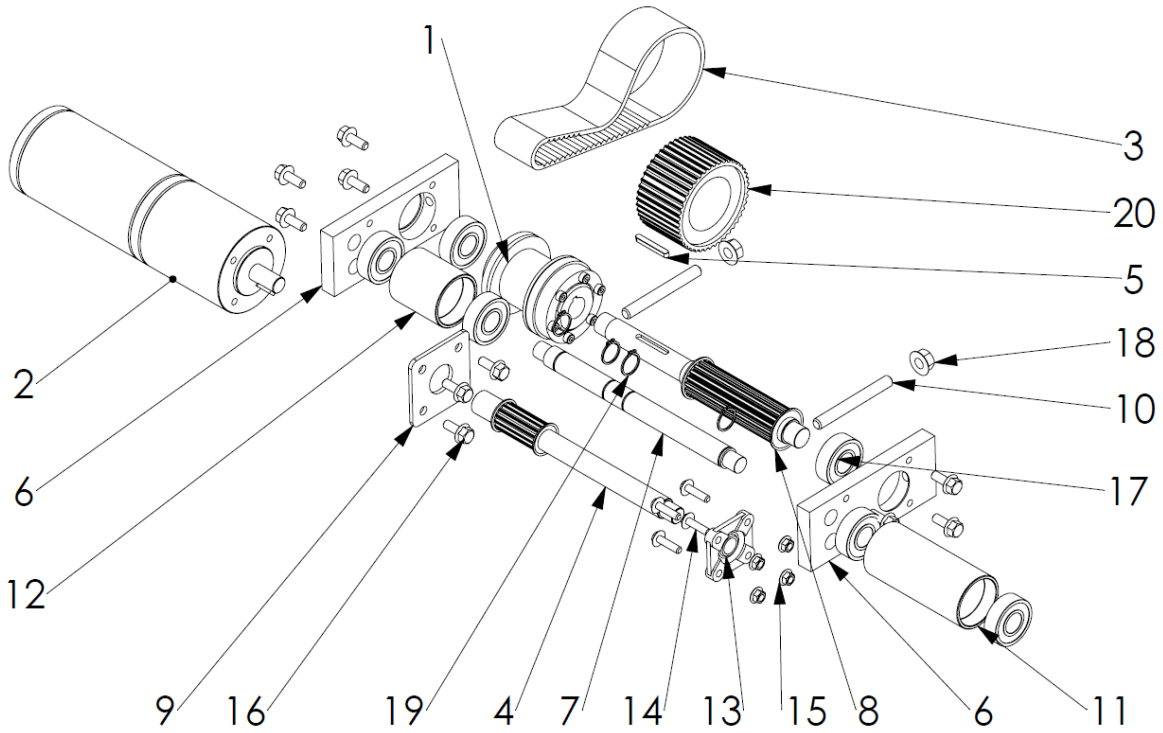
9.5 Electric components



item	Part description	Part number
1	ECU 12 V	ER 062
1	ECU 24 V	ER 073

item	Part description	Part number
2	Close / open switch	S150 147

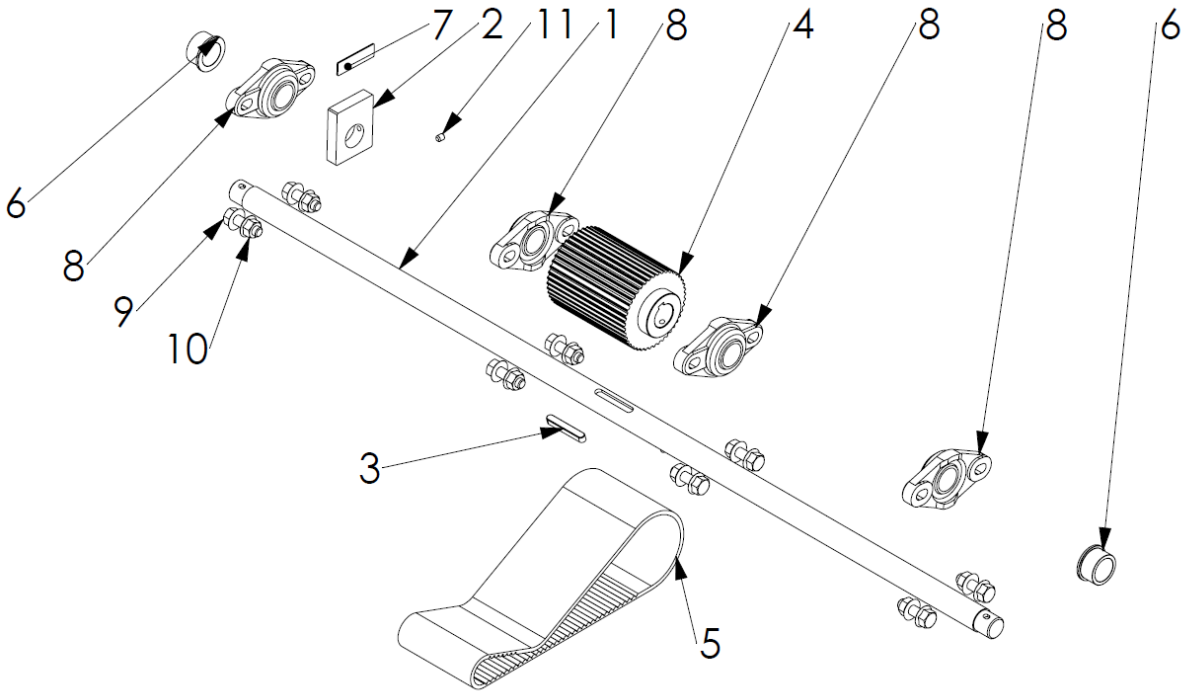
9.6 Motor assembly components



item	Part description	Part number
1	Safety clutch	ER 120 008
2	Motor 12V	ER 008
2	Motor 24V	ER 074
3	Yellow reflective tape	CR 107
4	Belt 400 5M 35	ER 011
5	Forelock 4x4x30	ER 031
6	Bearing holder	ER 051
7	Shaft 3	ER 052
8	Belt shaft 2	ER 054
9	Motor sup. plate	ER 055
10	M8 x 70	ER 056

item	Part description	Part number
11	Support roll long	ER 058
12	Support roll short	ER 061
13	Bearing EFSM 12	ER 075
14	Flange bolt DIN 6921 M5x20	
15	Flange nut DIN 6923 M5	
16	Flange bolt DIN 6921 M6x16	
17	Bearing 6202 2RS	
18	Flange nut DIN 6923 M8	
19	Retaining ring DIN 471 15x1	
20	Belt pulley 44 5M	ER 024

9.7 Main shaft assembly components



item	Part description	Part number
1	Main shaft	ER 019
2	Magnet holder	ER 006
3	Forelock 6 x 40	ER 020
4	Belt pulley 44-5M80	ER 025
5	Belt 535 5 M 80	ER 030
6	Spacer	ER 038

item	Part description	Part number
7	Magnet	ER 059
8	Bearing	ER 076
9	Flange nut DIN 6923 M8	
10	Flange bolt DIN 6921 M8x25	
11	Set screw DIN 916 K M5 x 6	

10 Environment

The AXS ramp is made of durable materials which can all be recycled. Each different material can be easily separated for individual recycling.

11 CE Certification

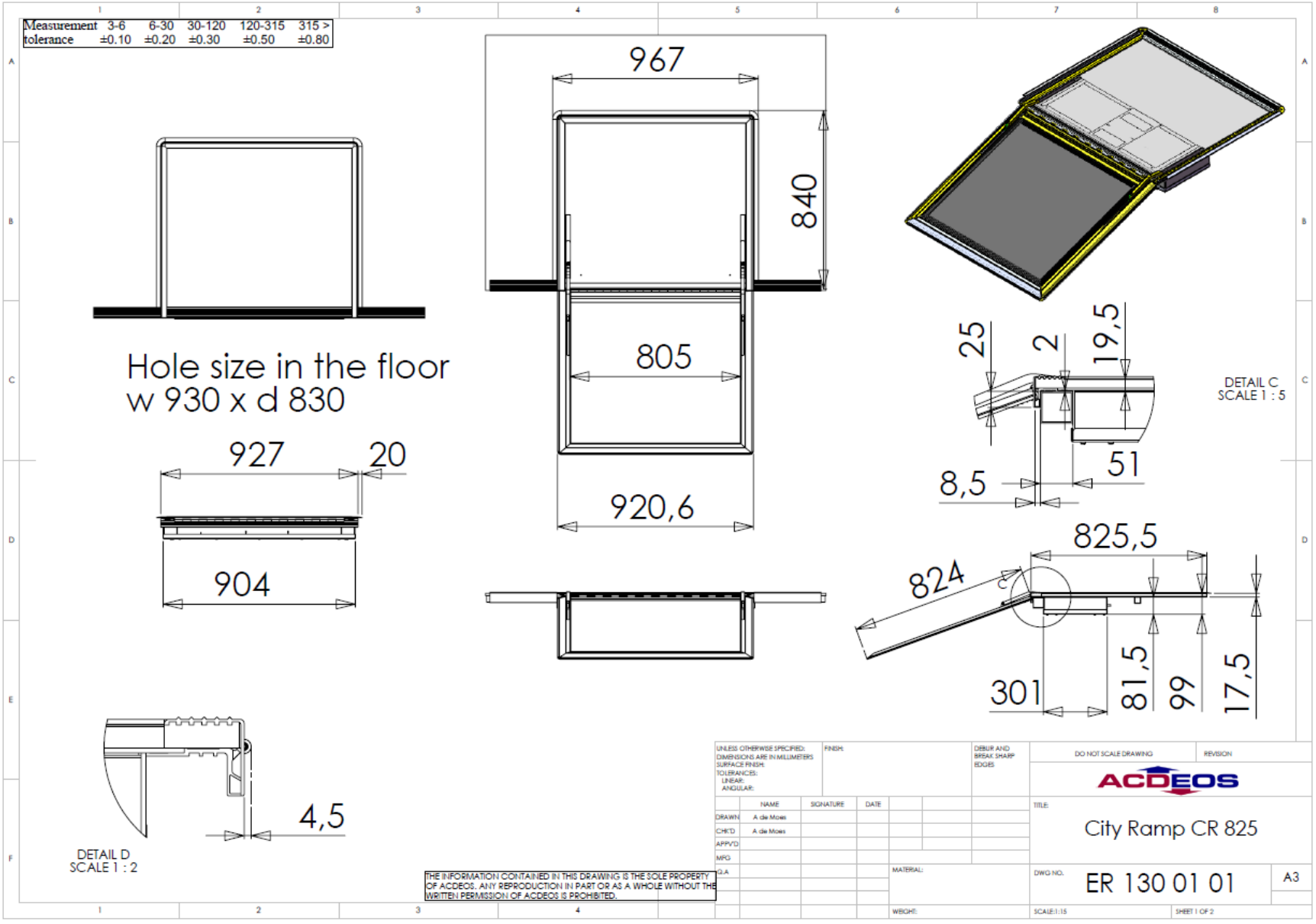
Certification

	Product description
Product	AXS EPR (Electric Powered Ramp)
Type	EPR 825 EPR other lengths
	Production under responsibility of
Company	Acdeos BV
Address	Touwbaan 1A
City	2352 CZ Leiderdorp
Country	Netherlands
Website	WWW.ACDEOS.COM
Legal represented by	Mr. A de Moes

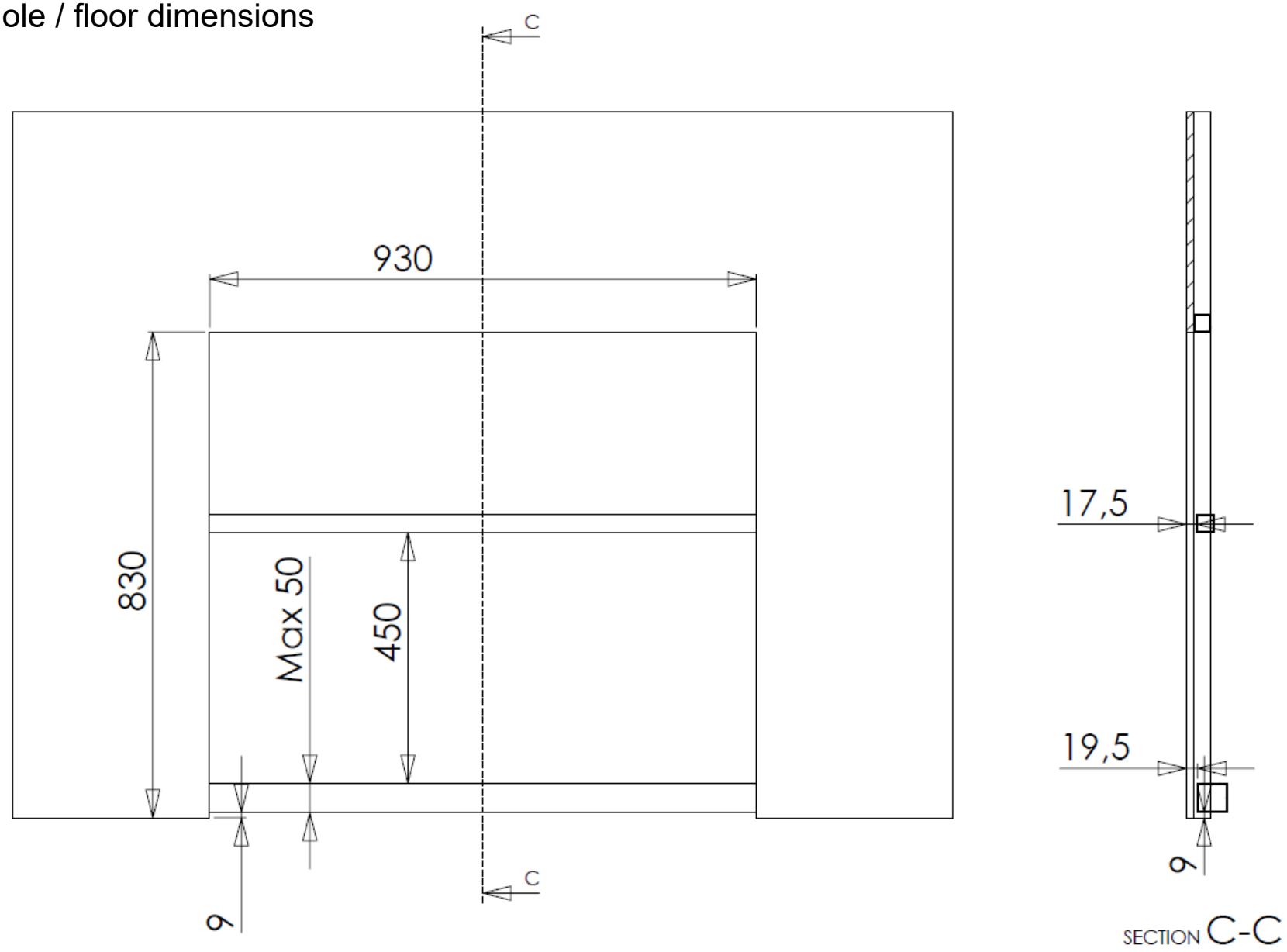
Conformity
Product is designed, tested and produced confirm:
The loading recommendations in the Machine directive 2006/42/EC and NEN-EN 1756-1
Ramp is tested for a maximum weight of 350 Kg

On behalf of producer:
Name / Function
A de Moes / Engineering
Date
December 2015
Place
Leiderdorp, Netherlands

Appendix I; Installation drawing EPR ramps:



Hole / floor dimensions



Appendix II: Electrical schedule