Mini Crosser
QUALITY COMFORT RELIABILITY

Mini Crosser T

Servicemanual

Type: 125, 127, 130 og 140

Version 1.4.4 Valid from 2000 - 2010

KS 23-02-2010

England

Table of contents

1.0 Introduction

This service manual is a supplement to our spare parts catalogue and user's instructions.

- Use the spare parts catalogue to find product numbers of parts that need to be replaced. The drawings in the catalogue show in general how to replace the individual parts.
- The service manual contains pictures showing how to make changes to and/or install electrical accessories step by step.
- The user's instructions contain a general description of how to use the scooter. For the sake of clarity the information on maintenance, batteries / charging, and trouble-shooting from the user's instructions is also included in this service manual.
- The user's instructions contain instructions for general maintenance of the scooter.
- Service and repairs may only be carried out on the scooter by authorised persons trained by Mini Crosser A/S.
- For reasons of safety your Mini Crosser is designed for 10 years of use (but no more than 5,000 hours), providing that it passes a safety test every year (corresponding to 500 hours of use). Servicing must be carried out by an authorised workshop.
- **IMPORTANT**! For safety reasons it is of the utmost importance that the servicing and safety check intervals are complied with as this minimises the risk of brake failure and short-circuits in the wiring with possible heat generation and fire to follow.
- Mini Crosser is always available to provide telephonic help in connection with questions regarding trouble-shooting. Where faults connected with an apparent electrical defect are concerned please inform us of the fault code. This is shown on the steering unit display. Read more about this in the section "Trouble-shooting".
- We would also ask you to inform us of the scooter's serial number in connection with all inquiries to Mini Crosser A/S.
- Mini Crosser reserves the right to update the service manual in connection with any changes to or improvements in the product.

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Telefon: (+45) 70 10 17 55
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Internet: www.minicrosser.com

2.0 Safety service

It is important to become familiar with the product before carrying out service on the scooter in order to avoid injury to technicians and users. Read the relevant sections in the user's instructions and the service manual.

Pay particular attention to the following:

1. The main switch on the scooter MUST be turned off. Remove the ignition key. When carrying out service on electrical components the positive pole on the battery MUST also be removed.

2. When measuring voltage in connection with trouble-shooting be very careful not to create a short-circuit.

3. Be very careful not to short-circuit the battery poles.

4. Take care when lifting heavy components such as seats, batteries, and motor gears, and do not drop these.

5. Always lift one rear wheel in order to ensure that the scooter cannot move under power in connection with incorrect operation.

6. Always use professional, properly maintained tools.

7. If lock nuts are removed in connection with servicing, NEW nuts MUST be used when reassembling the scooter.

8. When installing new cable strips make sure they are installed in the same way as they were originally. Make sure that cables cannot be pinched by moving parts or project so that clothing can catch on them.

9. Always finish off servicing by making sure that the product is in roadworthy condition.
   - Check that all plugs are correctly installed and that all mechanical components have been properly tightened.
   - Start the scooter and check that the solenoid brake clicks when the throttle is activated. When the throttle is released it should not be possible to push the scooter.

3.0 List of tools

The following tools are necessary to carry out service on the scooter:

- A Seeger circlip
- Allen wrenches
- Box spanners, 7 – 17 mm
- Spanners, 7 – 17 mm
- Screwdrivers for Phillips and torx screws, 10, 15, 20, 25 slots
- Pointed pliers
- Side-cutting pliers
- A plastic hammer
- A set of punches
- A retractable knife
- A steel brush
- An adjustable pipe wrench
- A wire and cable stripper
- Cable socket pliers
- Pliers for Molex 5556/5558 crimps
- Riveting tongs
- Small and large cable binders
- A multimeter
- A battery tester
- A tyre pressure gauge
- A tyre pump with automatic valve
- Acid-free oil and grease
- Locktite 406 / 603
- Repair kit, lacker black 9005 dim lustre 30 +/-5 (Item number SR-04804)

4.0 Maintenance

The following can be carried out by the user and/or a helper.

4.1 Once a day

Check lights and indicators.
Test the indicators and also the lights before using the scooter at night or in conditions where visibility is poor.

4.2 Once a quarter

1. Check the brakes.
   It should not be possible to push the Mini Crosser when the brake release lever is pushed back.

2. Check the brake release mechanism.
   When the brake release lever is pushed forwards it should not be possible to drive the Mini Crosser even when the throttle is activated. The battery indicator should flash and indicate defect 9.
   When the release lever is pushed backwards and the scooter has been switched off and switched on again it should be possible to drive it. It should not be possible to push the scooter now.

3. Check throttle regulation
   Activate the throttle when the scooter is switched off. Then switch on the scooter. It should not be possible to drive it now. The battery indicator should ripple up and down.
   Twist the throttle slightly forwards when your scooter is switched on. When you release the throttle your scooter should come to a standstill and there should be a click from the brake. It should not be possible to push your scooter now. Carry out the same check while turning the throttle slightly backwards.

4. Lubricate the rocker arm on the front brake hub using acid-free oil.

5. Check tyre pressure and wear on tyres.

4.3 Safety inspection

For reasons of safety your Mini Crosser is designed for 10 years of use (but no more than 5,000 hours), providing that it passes a safety test every year (corresponding to 500 hours of use). Servicing must be carried out by an authorised workshop.

IMPORTANT! For safety reasons it is of the utmost importance that the servicing and safety check intervals are complied with as this minimises the risk of brake failure and short-circuits in the wiring with possible heat generation and fire to follow.

5.0 Service list, MC standard model

Area	Component	Checks and remedies
Suspension and wheels.	Rear suspension.	Check to see if the rear end of the scooter is too low. The rear wheel should not scrape against the splash guard when the seat is loaded. Replace the blue suspension blocks behind the battery. See the spare parts catalogue. Check to see if the rear suspension and the transaxle are securely installed. Tighten or install nuts and bolts.
	Check that cables cannot become caught in moving parts.	Install cable binders.
	Check the wheels.	Check to ensure they are properly tightened and that the rims are in good condition.
	Check tyre pressure and wear on tyres.	Recommended tyre pressure: 3.5 bar (50 PSI). Minimum tread height for good road holding is approximately 1 mm. See spare parts catalogue for disassembly. NB! The rear wheels and front wheels on 4W models MUST always be removed by loosening the five screws. NEVER loosen the flange itself by removing the screw in the centre. See spare parts catalogue. NB! Always deflate the inner tube before disassembling wheels.
	Check that the handbrake works.	Lubricate the rocker arm on the front brake hub using acid-free oil. Adjust cable length with the help of the adjustment nipple. In cases of defective components – see spare parts catalogue.
	3W models: Front forks. Suspension and straightness.	Check that the front forks are resilient. Have they become crooked? Are there oil leaks? If there are defects that must be remedied replace the entire front forks. See spare parts catalogue.

Area	Component	Checks and remedies
Suspension and wheels	**3W models:** Front wheel.	Check ball bearings for play and wear.
	4W: Suspension front.	Check that the front wheels do not rub against the lower edge of the front shrouds. Check that the rubber damping devices, position 15 in the spare parts catalogue, are firmly attached. They must be installed so that they just touch the axle beam. See the spare parts catalogue.
	4W models: Check that the Rosta suspension block has not been displaced after a collision so that the front axle beam scrapes against the bottom frame.	Loosen the four installation bolts/nuts and push the block back into position. See spare parts catalogue.
	4W models: Front wheel suspension.	Check that the guide rods and guide balls are in good condition and properly tightened. Check the ball bearings in the front wheels and in the guide spindles for play/wear. Front wheel alignment. See sketch below for correct alignment if uneven tyre wear makes this necessary.
Steering unit/ operating panel.	Lights, indicators, hazard lights, and horn.	Check functions and check that the contacts are in good condition. If the indicators and/or lights are defective: replace bulbs if necessary. If this does not help check the plug connections, and he fuse in the steering unit. See chapter 6, page 13.
	Sealing.	Check that the rubber covers on contacts are intact and in good condition. Check to ensure there are no holes that lack plugs and install these if necessary.Check that the sign on the operating panel is straight.
	Throttle and twist grip.	Check that the throttle twist grip is firmly secured to the potentiometer axle. Function test: switch on the scooter at the same time as the throttle is activated.

Area	Component	Checks and remedies
Steering unit/ operating panel continued.	Throttle and twist grip.	It should not be possible to drive the scooter now. The battery indicator should ripple up and down. Twist the throttle slightly forwards when the scooter is switched on. When the throttle is released the scooter should come to a standstill and there should be a click from the brake. It should not be possible to push the scooter now. Carry out the same check while turning the throttle slightly backwards.
	Maximum speed potentiometer.	Check that the potentiometer is firmly in position on the axle. Check that the scooter drives fast and slow in the hare and tortoise positions respectively.
	Battery indicator.	Check that all lights can be switched on when the battery is fully charged. If there is no display at all try another control as this will be where the signal comes from. If this does not help the PCB must be replaced. If one light fails to go on this indicates a defective diode. Check that the parameter “True Charge calibration” is set at 99 ohm. The best test of this can be obtained while driving in hilly surroundings.
Motor, gear, brake (transaxle).	Wear.	Check: That the motor runs smoothly and uniformly. If it does not, this will typically indicate that the carbon brushes in the motor should be replaced. The minimum length of the brushes should be 1 cm. See spare parts catalogue for instructions. The gear wheel in the transaxle for wear. Lift one of the rear wheels and measure the play around the periphery of the tyre. Wheel play on a new machine should be between 16 – 18 mm. Replace the entire unit if there is greater play than this. See spare parts catalogue for instructions. Wear in the rear wheel bearings in the gear. Lift the rear end of the scooter. Lift one wheel up and down at a time to see if there is play in the transaxle bearings. If there is, the entire unit should be replaced.

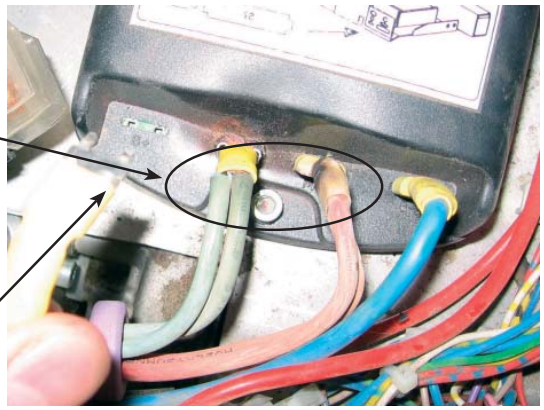
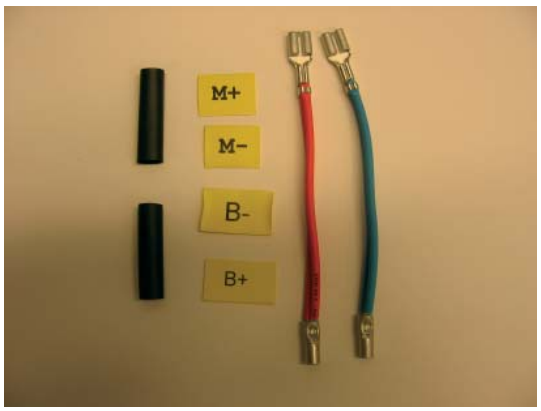
Area	Component	Checks and remedies
Motor, gear, brake (transaxle).	Power consumption.	Power consumption on a level road with 3.5 bar pressure in the tyres and 75 – 100 kg on the seat is: 125 – 10 km/h: 12 – 15 A 125 – 13 km/h: 14 – 16 A 130 – 15 km/h: 17 – 20 A Use a clip-on ammeter on one of the battery cables to measure this.
	Brake and brake release. Check function and check that it prevents the scooter from moving.	It should not be possible to push the scooter when the brake release lever is pushed back. When the brake release lever is pushed forwards it should be possible to push the scooter, but it should not be possible to drive it. The battery indicator should indicate defect 9 when the throttle is turned. If the release lever is pushed backwards it should be possible to drive the scooter again. NB: the scooter must be switched off and on again first. The brake should be capable of holding the scooter on a 15° slope = 26% with 75 – 100 kg on the seat. If it cannot the brake may be defective and must be replaced.
	Braking distance. Check that the scooter can brake as follows when the throttle is released at full speed on a firm, non-slip surface (asphalt).	Speed of scooter / maximum braking distances: 10 km/h – 2.0 m (11) 13 km/h – 2.8 m (10) 15 km/h – 3.5 m (11) The figures in parentheses indicate the normal braking parameter when the scooter leaves the factory. This can be changed with the help of a programming unit (forward deceleration). Read more about this later. Please note that braking distances should not be longer than indicated in order to comply with official requirements.
Tiller.	Play/wear.	Check the following: • The cardan joint • The pins in the tiller axle / front forks • Make sure that the lower aluminium part of the handlebars is firmly secured to the tiller axle (*)

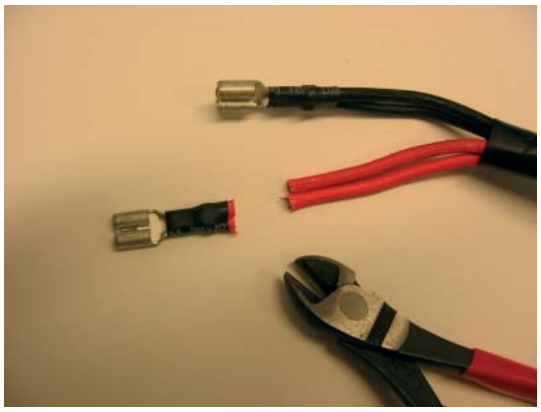
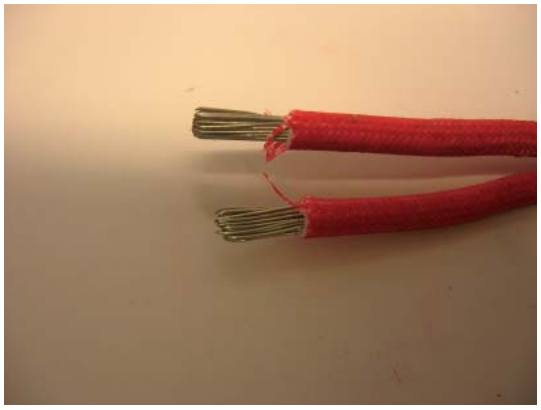
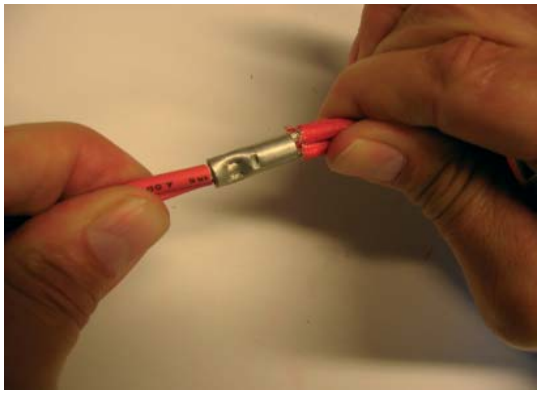
Continued

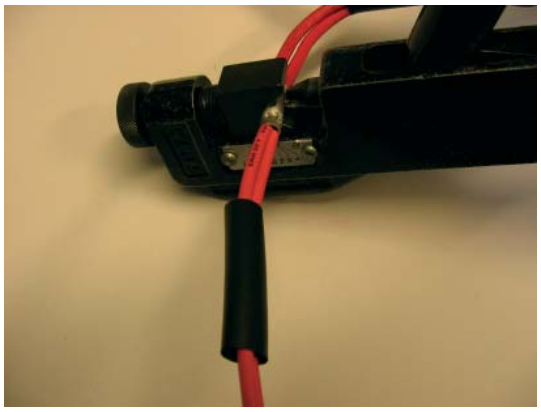
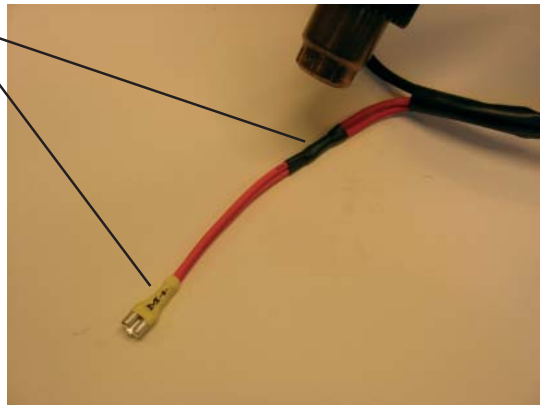
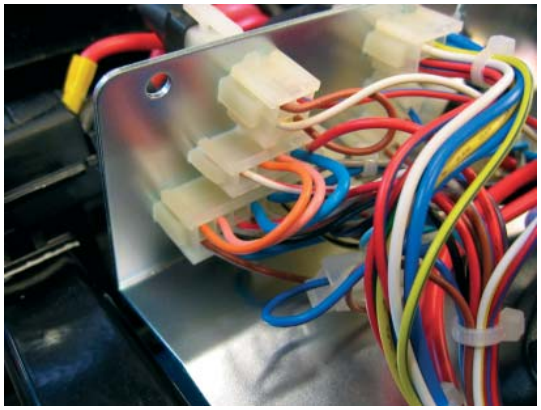
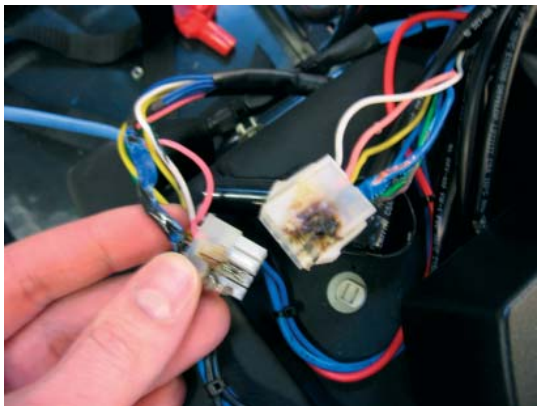
Area	Component	Checks and remedies
Tiller.		Wear and/or rust on the tiller. The uppermost supporting bearing. The bearings in the headtube are protected by seal rings. If the front forks are stiff they can be lubricated with a small amount of grease. (*) On models with an 8 cm screw from the lower aluminium part of the handlebars into the tiller axle: the screw may become loose if the handlebars are turned violently or knocked hard. This can be remedied by drilling a hole for a split pin between the tiller axle and the aluminium part. Contact Mini Crosser A/S.
	Cables.	Check that the cables cannot be pinched or stretched when the handlebars are turned and when the tiller is lowered.
	Gas spring.	Check that the gas spring locks the tiller securely. Check to ensure there is no play in the throttle and in the screws / bushes that secure the gas spring.
	Ignition key / charging plug.	Check that the ignition key is not loose when turned. Clean with a well wrung-out cloth or compressed air if it is dirty. If the contacts are corroded, clean with a contact spray or replace the charging plug.
Chassis, seat, shrouds.	Footplate.	Check the plastic rivets that secure the mat. If necessary replace with new rivets.
	Seat post.	Check that this is properly tightened and in good condition.
	Seat.	Check that: The release handle locks the seat properly. The seat is firmly installed on the seat frame / seat plate. The seat tube is in good condition. If necessary grease the tube with a little acid-free grease. The armrest is in good condition.

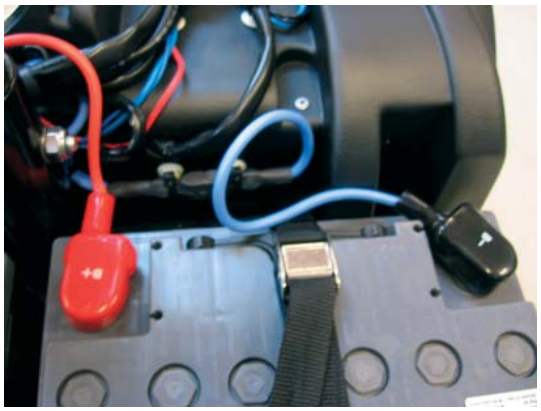
Area	Component	Checks and remedies
Chassis, seat, shrouds.	Shrouds.	Check to ensure that the plastic shrouds are in good condition. Parts with sharp and projecting edges should be replaced. The same applies to shrouds with an operational function such as the splash guard and the battery shroud (water in the controls). Cleaning, see below.
	Other mechanical components.	Check that the other components are in good condition and function properly.
Electrical components.	Controls in PCB.	Check to ensure this is dry and in good condition. Check to ensure that all plug connections are properly installed.
	Cables, plugs.	Check to ensure that the cables are properly installed and do not protrude so that they can catch on anything or can be pinched. Check that plug connections are properly locked.
	Battery straps.	Check that they are firmly secured.
Batteries, charger. (see section 6).	Batteries.	Check to ensure that the battery cases are not cracked, that they are in good condition, and that the battery connections are properly installed.
	Battery capacity.	Check with a battery tester. If this indicates that new batteries should be installed make sure to pair these with a precision of 0.1 V. Apply a little acid-free Vaseline to the battery poles before connecting them.
	Battery charger.	Check that the pilot lamp on the battery charger switches to CHARGING when it is connected to the scooter. If necessary check charging voltage during charging. This should be approximately 28.8 V. Charge the batteries overnight. Remove the charger and measure battery voltage after approximately 15 minutes. This should be about 27.6 V for new batteries. Check to ensure that the scooter is unable to drive while connected to the battery charger.

5.1 Heating

Controler	
Check the controller for signs of overheating. Melted plastics. Burned wirers. Burned connectors. Gently fell if some of the 4 connectors at the controller have come loose. Damaged or warned wirers. If some of the wirers or 4 connectors to the controller look damaged you can repair it as described in the section “Replace receptor”.	
Example of damaged controller. You can see the plastic on the controller is deformed from overheating coming from the motor cables. You can see the connector on the left hand side have come loose from the controller.	
Replace receptor:	
For this operation you need to have the repair kit: T-127-05-033 And the tool: TN 70 SE	 

Controler	
Cut away the bad connector or wirer piece.	
Remove 10 mm of insulation.	
Insert the wirers to the sleeve.	
Adjust the tool to the correct square millimetre wirer. 8 mm2 for two motor wirers in the sleeve and 6 mm2 for one battery wirer in the sleeve.	

Controler	
Crimp the sleeve.	
Crimp the heat shrinkage sleeves onto the wirer and the operation is finished.	
Connectors	
Check to see if any of these connectors have signs of overheating, burned or damaged wirers.	
Example of burned connectors and melted wirer. (Picture from an E-model).	

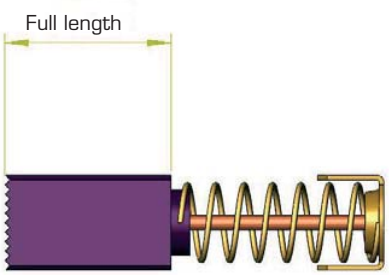
Controler	
Batteries	
Check to see if there are any signs of burned or damaged wirers going to the batteries and to the fuse boxes just before the batteries.	
Check the wirer going to the motor is not damaged, signs of overheated or warned spots.	

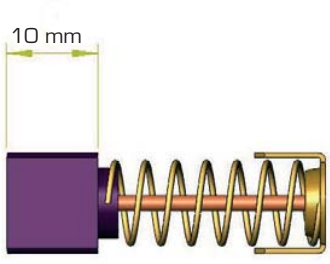
Perform a brake test. Stopping distance must be less than 2 meters at 10 km/h and less than 3,5 meters at 15 km/h.

Test the mechanical brake and adjust if necessary.

Check if the brushes are okay or need changing.

Whether it is a Schmid or a Mini Crosser trans-axle, the brushes must be replaced when they are worn down to 10 mm.





6.0 Fuses and bulbs

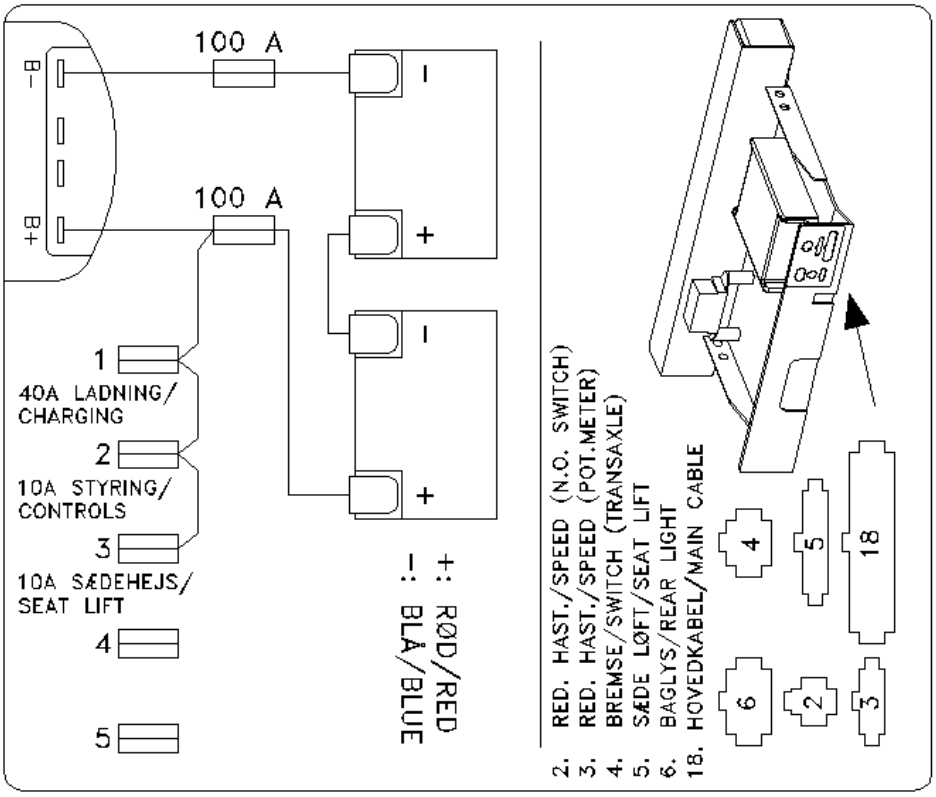
The fuses are located beneath the rear shroud.

1	2	3	4	5
40 A	10 A	10 A	40 A	10 A

Fuse 1:	1 x 40 A fuse	Charging	Product number SR-00066 (40 A)
Fuse 2:	1 x 10 A fuse	Control system	Product number SR-00066 (10 A)
Fuse 3:	1 x 10 A fuse	Seat adjustment	Product number SR-00066 (10 A)
Fuse 4:	1 x 40 A fuse	Extra	
Fuse 5:	1 x 10 A fuse	Extra	(Discontinued, mid-2004).

Main fuses, 100 A, type of fuse DIN 2581 – 100 A Product number SR-00977

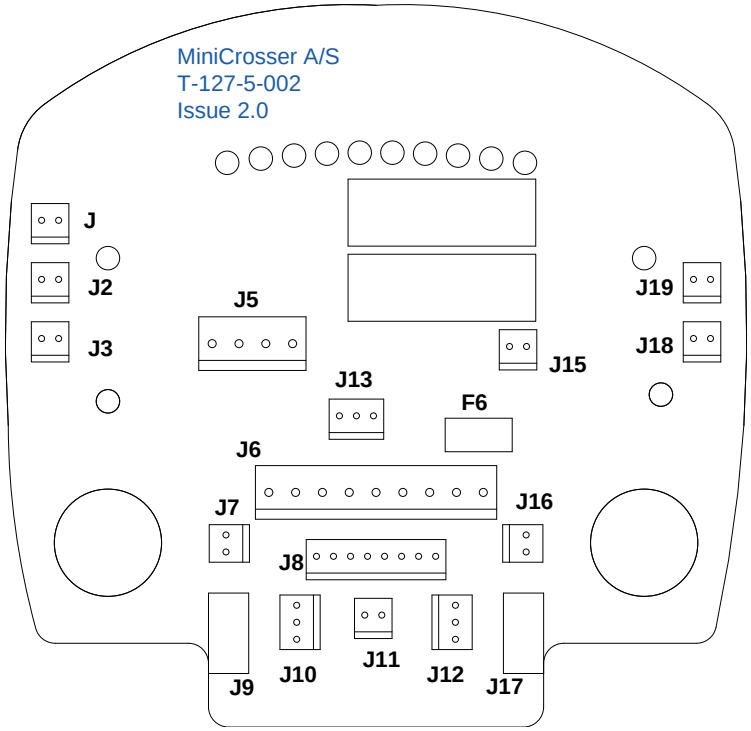
6.1 Diagram of battery connections Fuses and extra sockets on PCB



Fuses on the PCB in the operating panel. Use a pair of tweezers to replace these.

F1: Lamp	2A: Little fuse: 154 002 RA900	Discontinued, beginning of 2004
F2: Lamp, rear	2A: The same	
F3: Right indicator	2A: The same	
F4: Left indicator	2A: The same	
F5: Braking lamp	2A: The same	
F6: Horn	5 A: Little fuse 154 005 RA 900	

6.2 Plugs and fuses in the operating panel



Some of the plugs on the PCB are for extra equipment. Some of them have been connected at the factory and they have been led to the areas of the scooter where they will be used.
The table below shows the cases in which the operating panel should be opened.
The connection for seat adjustment is not relevant to seat adjustment on the S model type. The up/down contact on the T model is also located beneath the armrest.

	Luk op for tilgang/Open to access →		
1	Nøgleomskifter	Keyswitch	
2	Bak	Reverse	X
3	Nødstop	Emergency stop	X
5	Forlys	Front light	
6	Kabelstamme	Harness	
7	Katastrofeblink	Hazard	
8	Kabelstamme	Harness	
9	Blinkprint HØ	PCB Right	
10	Sædeløft	Seat lift	X
11	Max. Hast pot.	Max. speed pot.	
12	Kurve reduktion	Curve reduction	
13	Gasreg. pot.	Throttle pot.	
15	24V horn	24V buzzer	X
16	Lys kontakt	Light switch	
17	Blinkprint VE	PCB Left	
18	Forældre nøgle	Parent key	
19	Red.hast. (N.O.switch)	Red.speed (N.O.switch)	X

Electric bulbs

Headlights (description of method)	BA 15s 24 V/21 W MC product number SR-00066
Indicators, braking lamps:	BA 15s 24 V/01 W MC product number SR-00033
Rear lamps:	BA 15s 24 V/5 W MC product number SR-04244

7.0 Batteries / charging

The Mini Crosser scooter uses closed, maintenance-free GEL batteries (Exide 12 V/56 Ah or Trojan 12 V/71 Ah). They do not normally give off any gas, and must not be filled with water. Only GEL-type batteries may be used for Mini Crosser T models.

Please note that the capacity of the batteries declines over time and at low temperatures. In practice, this means that a vehicle with old batteries will have a lower range than when its batteries were new.

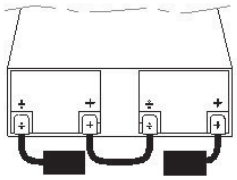
Battery capacity at -10˚C is about half the corresponding capacity at +20˚C.

The battery manufacturer recommends that batteries should be charged at a temperature from +10˚C to +30˚C to achieve the charging time stated under “Technical Data”. Charging time is about 60% longer at a temperature of 5° Celsius by comparison with charging at 20˚ Celsius. This is because from a purely chemical point of view it is more difficult for batteries to absorb current at low temperatures. To prevent batteries from running down completely, we recommend charging them in a heated room. If this is not possible every day, it is a good idea to charge your Mini Crosser in a heated room once a week.

New batteries do not achieve their full capacity until they have been run down and re-charged about 20 times.

Used batteries should be given to your supplier or the local environmental waste disposal facility. Be careful how you handle leaky batteries – they contain corrosive acids bound in a gel substance.

It is important to install the batteries correctly. Battery poles and snap locks are marked +/-. They should be installed as shown in the sketch below. Make sure that the snap locks are closed properly. For the same reason the poles must not be burred.



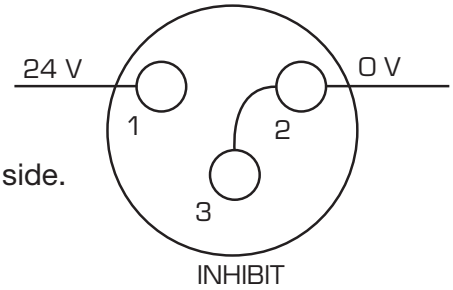
The Mini Crosser should be charged whenever it is not in use. The type of charger supplied by the manufacturer is automatic – it disconnects once the batteries have been fully charged. The charger only consumes current while the batteries are being charged. The charger can therefore be left connected until the Mini Crosser is used again.

The charger will flash until it has finished charging. It will then be lit up continuously.

If the Mini Crosser is stored over a lengthy period of time, it is sufficient to charge it once a month. During storage the batteries must always be kept fully charged because they will be damaged by long-term storage in discharged condition.

On the next page you can see how to connect the charger to the scooter. Also refer to the manufacturer’s instructions for the charger in question, which explain how the charger shows that the scooter is fully charged.

Please note that the Mini Crosser may be equipped with several different types of charger (contact the supplier for information on the various types of charger).
Never place the charger on the seat during charging.
Never use chargers that have not been supplied by the manufacturer without contacting your supplier first.
Never use a charger that has not been designed for charging dry, maintenance-free batteries.
The maximum charge current is 12 A.
The figure below shows the polarity of the charge socket.



Charge plug NEUTRIK NC6MX seen from the pin side.

8.0 Storage

The Mini Crosser scooter is designed for use in all kinds of weather. It should be stored and charged under cover, at a temperature above 0o Celsius. In addition, the charger must be kept dry. If necessary tyres can be protected by blocking up the scooter. We also recommend covering the scooter to protect it against dust, dirt, and sunlight.

9.0 Cleaning

The Mini Crosser can be cleaned with a damp cloth wrung out in a little water containing detergent. The plastic shrouds can be polished with an ordinary window cleaning substance or wax for car windows.
Using a high pressure cleaner or a hose to clean the Mini Crosser can damage its electronic components.

10.0 Trouble-shooting

The list below shows various defects that our experience indicates may arise. The possible causes of these are shown as well as suggestions for remedying them.

DEFECT	POSSIBLE CAUSES	REMEDIES
Mini Crosser won't move.	Key not turned to start.	Turn key and wait 5 seconds before activating the throttle.
No light in battery indicator.	Batteries run down. . Control fuse blown. Main fuse blown.	Charge batteries. Change fuse. Contact your supplier.
Mini Crosser won't move.	Mini Crosser has been overloaded.	Wait approx. 1 min. (with the scooter switched off) before driving on (see page 10, Driving the Mini Crosser T).
Light in battery indicator.	Handbrake on. Defect in electronics. Batteries run down. Charge plug not removed.	Release handbrake. Contact your supplier. Contact your supplier. Remove charge plug.
Driving speed too slow.	Speed selector set at slow Electronics overloaded. Too little air in tyres.	Switch to faster speed. Stop and wait a few seconds before re-starting. Pump tyres to correct pressure.
Range per charge too small.	Defective batteries. Low temperature. Defective charger. Too little air in tyres. Wrong charging procedure.	Charge batteries and check that green light on charger is on before use. Contact supplier. Pump tyres to correct pressure. Read instructions for use.
Charge light not on when charger connected to mains and Mini Crosser. Read charger instructions.	No current in switch. Defective cable.	Turn switch on. Contact supplier.
Light on charger not on to show charging complete, even though charging has lasted 10-12 hours. Read charger instructions.	There has been a power cut. Charger is post-charging. Defective charge plug.	Re-connect charger and charge again. Check again ½ hour later. Contact your supplier. Push charge plug in completely and re-charge.

Light on charger on even when batteries are partly run down. Read charger instructions	Fuse in charger blown. Defective switch in charge plug.	Contact supplier. Contact supplier.
Charger light indicates defect. Read charger instructions.	Charge plug not inserted, or mains defect. Battery voltage too low for charging.	Push charge plug in, or contact your supplier. Contact supplier.

The table below indicates the types of fault that the battery indicator can show in connection with an electronic defect in the Mini Crosser. A number of lamps will flash. Count these and consult the table to see which type of fault is involved. Where faults 2, 3, 8, and 10 are concerned users will typically not be able to do anything. But we recommend informing the dealer how many lamps are lit.

1 light	The batteries need recharging or there is a poor connection to a battery. Check all connections between the controller and batteries. If these are in order, try charging the batteries.
2 light	There is a poor connection to the motor. Check the connection between the motor and the controller.
3 light	There is a short-circuit between the motor and a battery connection.
4 light	Not used.
5 light	Not used.
6 light	The charger is connected. Disconnect the charger.
7 light	Fault in throttle regulation. Make sure that the throttle is in neutral position when the Mini Crosser is switched on.
8 light	There is a fault in the controller.
9 light	There is a poor connection to the mechanical brake or the magnetic brake has been released. Check the connections between the brakes and the controller, or push back the brake lever.
10 light	Voltage in excess of 38 V has been received by the controller. This is normally due to a poor battery connection. Check all connections between the batteries and the controller.

10.1 Programming unit

The Driving properties of the Mini Crosser can be changed with the help of a type SP1B programming unit, which can also be used for more in-depth trouble-shooting.
Read more about this in the enclosed manual from Penny & Giles.
Please note that the values for speed, deceleration, throttle gain, and motor compensation must not be increased. These factors have a major influence on the user's safety and the durability of the product.
We strongly advise that people who have not received instruction in the use of the programming unit should not attempt to use it. Standard driving parameters for the various models are enclosed.

11.0 International addresses

Germany Firma Gerwin Tydecks Am Schmeel 34 D-26135 Oldenburg Tlf: (+49) 441 206 9911	**Sweden** Minicrosser AB Lundens Industriområde SE-473 31 Henån Sverige Tlf: (+46) 304 348 80	**France** Mobile France - Paris 178 Rue de la Tuilerie 77000 Vaux le Penil tel: (+33) 164090471
Conze Elektro-Mobile Britzer Damm 12 D-12347 Berlin (+49) 30 6789 7969	**Norway** Medema gruppen AS Postbox 133 NO-1483 Skytta Tlf: (+47) 67 06 49 00	**Belgium** Mobile Blankenbergsesteenweg 14 B-8000 Brugge Tel: (+32) 50 31 79 19
Elofahr Palm Hohlohstr. 4 D-76307 Spielberg Tlf: (+49) 7202-3643	**Finland** Inva Apuväline OY Kumpolantie 1, 2nd. Floor FIN-00520 Helsinki Tlf: (+35) 892 29 540	**England** E.V. Technology Limited Coventry Road Lutterworth Leicestershire UK-LE17 4JB Tlf: +(44) 1 455 55 42 42/00 11
Systemhaustechnik Reich Clara-Zetkin-Straße 14 D-01445 Radebeul Tlf: (+49) 351/83979522	**The Netherlands** RVS BV Bolderweg 6 NL-1332 AT Almere Tlf. (+31) 318 66 2054	
Beromobil GmbH Draiser Weg 16 D-65346 Eltville-Erbach Tlf.: (+49) 6123 - 60 57 22		

12.0 Air transport certificate

EXIDE TECHNOLOGIES

Exide Technologies GmbH
Im Thiergarten
63654 Büdingen - Germany
Phone: +49 (0) 60 42 / 81 0

www.exide.com

December 17, 2009

Manufacturer's Declaration

We confirm herein, that batteries of our Valve Regulated Lead Acid (VRLA) ranges are exempt from the following Dangerous Goods (Hazardous Goods) Regulations. These regulations cover transport via Air, Water, Road and Rail.

Product Ranges of Nonspillable Batteries:

- *Sonnenschein A200 monoblocks*
- *Sonnenschein A400 monoblocks*
- *Sonnenschein A400 FT monoblocks*
- *Sonnenschein A500 monoblocks*
- *Sonnenschein A500 C monoblocks*
- *Sonnenschein A700 monoblocks*
- *Sonnenschein RAIL SRP monoblocks*
- *Sonnenschein RAIL SRC monoblocks*
- *Sonnenschein RAIL SRL monoblocks*
- *Sonnenschein SOLAR monoblocks*
- *Sonnenschein SOLAR BLOCK monoblocks*
- *df monoblocks*
- *Sonnenschein GF-V monoblocks*
- *Sonnenschein GF-Y monoblocks*
- *Sonnenschein dryfit military monoblocks*
- *Exide AVB monoblocks*
- *EXIDE Gel monoblocks*
- *DETA Gel monoblocks*
- *Sonnenschein A600 cells*
- *Sonnenschein A600 SOLAR cells*
- *Marathon M monoblocks*
- *Marathon M-FT monoblocks*
- *Marathon L monoblocks and cells*
- *Marathon XL monoblocks*
- *Sprinter P monoblocks*
- *Sprinter XP monoblocks*
- *Powerfit S500 monoblocks*
- *Powerfit XS500 monoblocks*
- *Powerfit S300 monoblocks*
- *Tudor Distribution TD monoblocks*
- *J-Series JTT monoblocks*
- *drysafe AS*

Regulations:

International Air Transport Association (IATA)
Dangerous Goods Regulations 51th Edition, 2010
Packing Instruction # 806 and Special Regulation A-67 are applicable.

International Maritime Dangerous Goods Code (IMDG Code)
Amendment # 34, 2008, Special Regulation # 238, item 1 + 2 is applicable.

UN2800 Certification conformity ADR / RID for road and railway transport:
(ADR = 19. ADR-amendment of the ordinance 2009, RID = 14. RID-amendment of the ordinance 2009)
The conditions of Special Regulation # 238 a) + b) are fulfilled, therefore the battery is not subject for other regulations of ADR / RID.

This is to certify that the "Nonspillable" batteries are capable of withstanding the Vibration and Pressure Differential Tests specified in the above regulations and that at a temperature of 55° C the electrolyte will not flow from a ruptured or cracked case and there is no free liquid to flow. The batteries when packaged have been protected against short-circuiting and plainly marked "NONSPILLABLE" or "NONSPILLABLE BATTERY".

Franz-Josef Dette	Dr. Georg Meckl	Friedrich Kramm
Chairman of the Board of Directors	Director Operations	Director Development

This document is valid January 1, 2010 until December 31, 2010. This document supersedes all previous releases to this subject.

A copy of the air transport certificate can be obtained by contacting Mini Crosser A/S.

CERTIFICATE
FOR
NON-RESTRICTED TRANSPORT OF BATTERIES

Concorde's Chairman®, Lifeline®, Reliant® and Sun~Xtender® Sealed, Valve Regulated Lead Acid [VRLA] Absorbent Glass Mat [AGM] Batteries have been tested to the U.S. Department of Transportation [DOT] requirements affecting packaging and transportation of all batteries containing acid or alkali. They are part of the U.S. Code of Federal Regulations, 49CFR, sub-chapter 173.159.

The batteries are classified as a wet, non-spillable electric storage battery. The batteries are exempted from the requirements of this sub-chapter as they meet the requirements of sub-section 159d of 173.159. It states;
① The battery must be protected against short circuits and securely packaged.
② The battery must be plainly and durably marked "Non-Spillable" or "Non-Spillable Battery".
③ The battery must be capable of withstanding the Vibration and Pressure Differential tests as required in 159d.

➜This information is to clarify to all shippers and transporters that these Concorde VRLA/AGM batteries have been packaged, marked and tested in accordance with 49CFR 173.159d and determined to be in compliance with DOT HMR49, Non-Hazardous Materials; the International Air Transport Association [IATA], Special Provisions S.P. A67 & A68; the International Civil Aeronautics Organization [ICAO] and the International Marine [IMDG] requirements. Therefore, these batteries are not restricted from shipment by air or any other means of transport and are exempted from the hazardous materials category. They do not require a UN identification number and do not require hazard/corrosive labels.

Exception: At this time the Chairman® AGM-12210 & AGM-12255, Lifeline® GPL-4D & GPL-8D and the Sun~Xtender® PVX-2120 & PVX-2580 will carry a UN2800 identification number and require a corrosive label. They are still non-spillable, wet electric storage batteries and shippable by air or any other means of transport but will require additional paperwork for shipment. This is due to the size, volume and packaging of these batteries.

E. J. "Ed" Mahoney
Director, Marketing & Sales
Dated - November 27, 1998

CONCORDE BATTERY CORPORATION
2009 San Bernardino Rd. • West Covina, CA 91701, USA
Tel: 626-813-1234 • Fax: 626-813-1235 • http://www.concordebattery.com

13.0 Special adaptations

Products from Mini Crosser can be specially adapted for the individual user. Any special adaptations must be carried out in accordance with written instructions from a person qualified in this respect: a therapist or Mini Crosser A/S. When special adaptations have been carried out they will be accompanied by:

- A risk evaluation
- Documentation (drawings, photos, etc.)
- A notice stating “Specially adapted equipment”, which will be added to the vehicle’s serial number followed by a consecutive designation A, B, etc.
- A declaration from the manufacturer
- Special instructions for use – if necessary

This material will be filed at Mini Crosser A/S under the vehicle’s serial number.

14.0 Declaration of conformity

The Mini Crosser T model is CE labelled in accordance with Medical Directive 93/42/EEC. See the declaration of conformity for model 130T below.

EU Declaration of Conformity

Manufacturer:

Company name	Mini Crosser A/S
Address	Enggårdvej 7, Snejbjerg
Postal code/ Town	7400 Herning
Country	Denmark
Telephone	(+45) 70 10 17 55

Herewith declares that

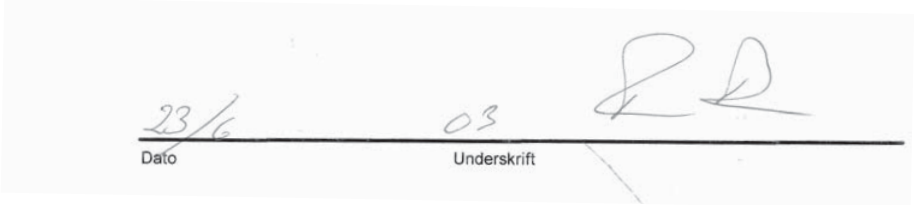
Product:

Product ID	T-130-0-000
Name	MC 130T
Type	3W

complies with the Council’s directive on medical apparatuses (93/42/EEC)

and has been manufactured in accordance with the following national standards, which implement a harmonised standard EN 12184

Electrically-powered wheelchairs, scooters, and chargers for these.



15.0 Installing accessories

The following sections contain descriptions of how to install standard accessories on the Mini Crosser T. In cases of doubt you can contact Mini Crosser A/S.
NB! Please read the precautions on page 4 »Safety service«.

15.1 Throttle regulation

Installing two throttle regulators on the same vehicle.

These could be:

- A standard throttle regulator, right and left (wig-wag)
- A twist grip throttle regulator, right and left (single-ended)
- A twist grip throttle regulator and foot pedal accelerator (single-ended)

It is common to them all that they use a changeover switch to select the type required.

Figure 1: Drill a 6.8 mm hole as shown.

Figure 2: Remove the operating panel

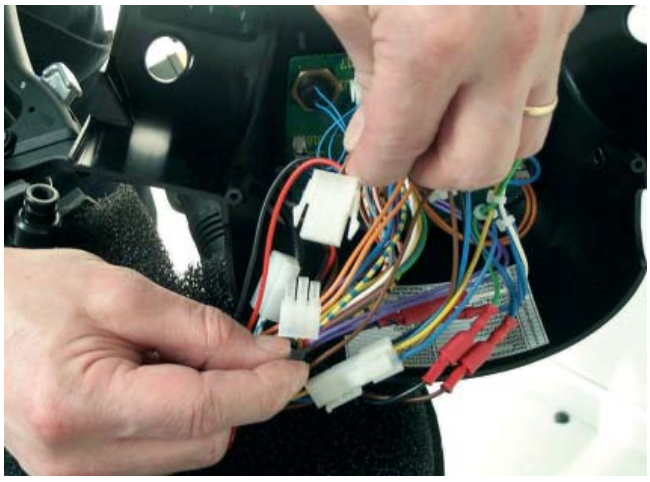


Figure 3: Remove the standard throttle regulator.

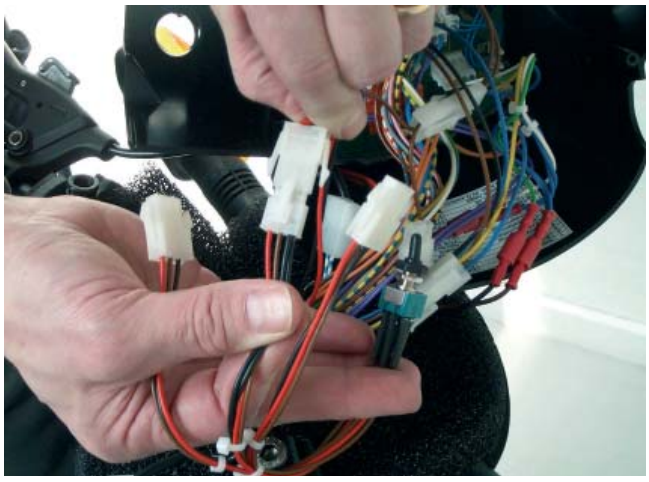


Figure 4: Install the plug from the contact.

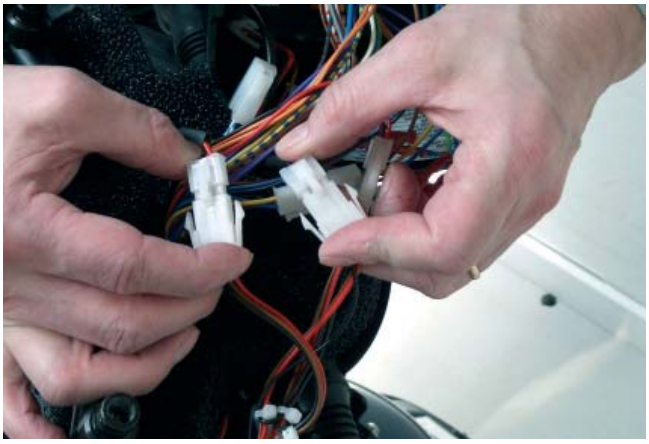


Figure 5: Install the two throttle regulators.

Figure 6:

Figure 7: Install the switch so that it points to the correct side.

Figure 8: Install the operating panel. Take care not to pinch or stretch wires.

Switch on the scooter and check that the magnetic brake clicks when the throttle is activated. When the throttle is released it should not be possible to push the scooter.

15.2 Speedometer

Figure 1: The set comprises these components:

Figure 2: Remove the left rear wheel.

Figure 3: Install the magnet in the groove on the flange. Push in.

Figure 4: Loosen the rear M10 bolt. Remove the front bolt.

Figure 5: Use a self-locking nut when installing the holder for the magnetic sensor.

Figure 6: Install the sensor with a rubber gasket around the holder.

Figure 7: Distance between sensor and magnet.

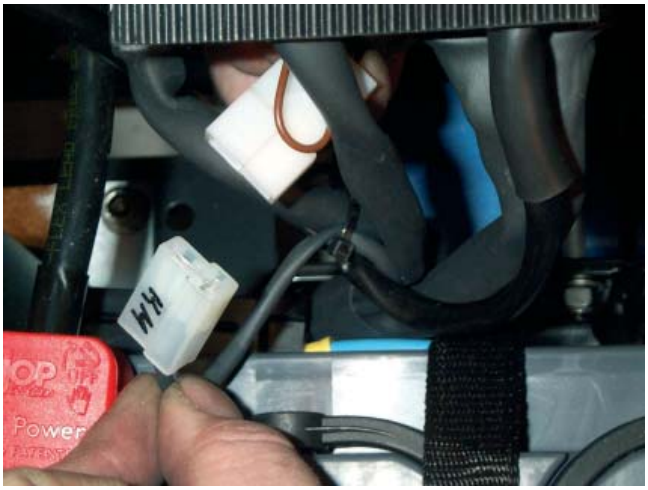


Figure 8: Connect the sensor to the socket on the aluminium plate.

Figure 9: Attach the cable binder.

Figure 10: Connect the speedometer to the plug beneath the rubber bellows.

15.3 Lowering curve

Figure 1: The set comprises these parts.

Figure 2: Remove the plastic handle from the »gas spring release«.

Figure 3: Remove the rear plastic shroud by removing the six plastic screws.

Figure 4: Install the sensor in the holder.

Figure 5: Adjust the height of the sensor so that it is 1 mm above the head of the bolt.

Figure 6: Connect the sensor to socket no. 5. Take care to secure the cable with cable binders so that it cannot be pinched by the front forks and/or handlebars.

15.4 Parent potentiometer

Figure 1: The potentiometer with plug and jumper.

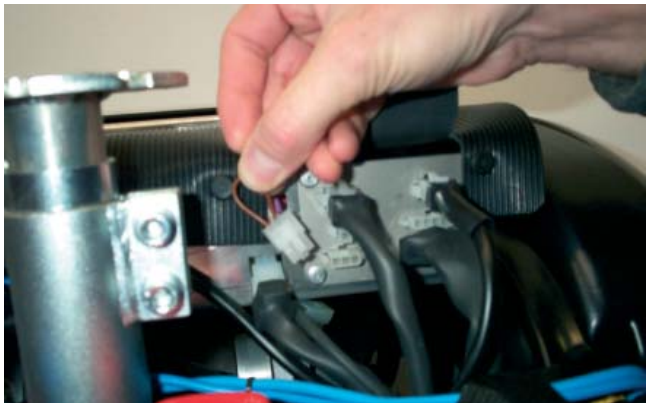


Figure 2: Remove the three-pin jumper.

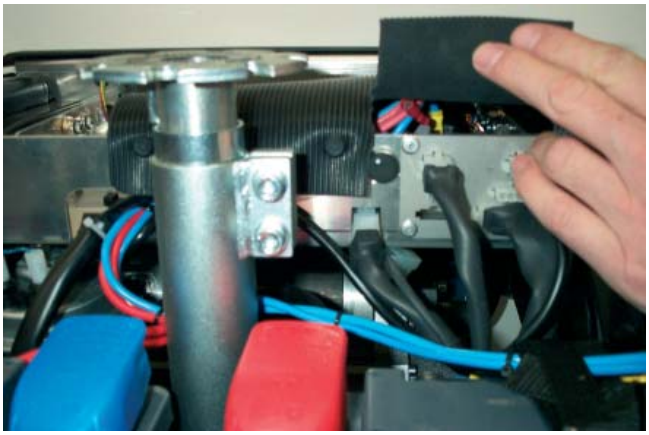


Figure 3: Install the potentiometer and push the three-pin plug out of the aluminium plate.

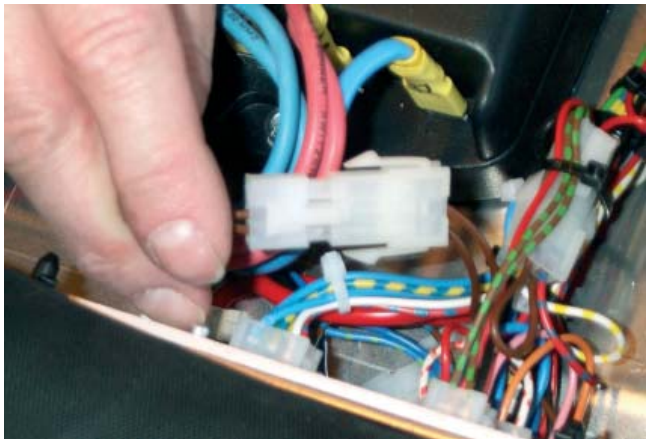


Figure 4: Install the potentiometer plug as shown. Remove the plastic cover from the operating panel as described under »Twist grip throttle – right, left". Remove the plug from the maximum speed potentiometer and install the two-pin plug with the jumper instead. Replace the plastic cover.

Switch on the scooter and check that the solenoid brake clicks when the throttle is activated. When the throttle is released it should not be possible to push the scooter.

15.5 Hour counter

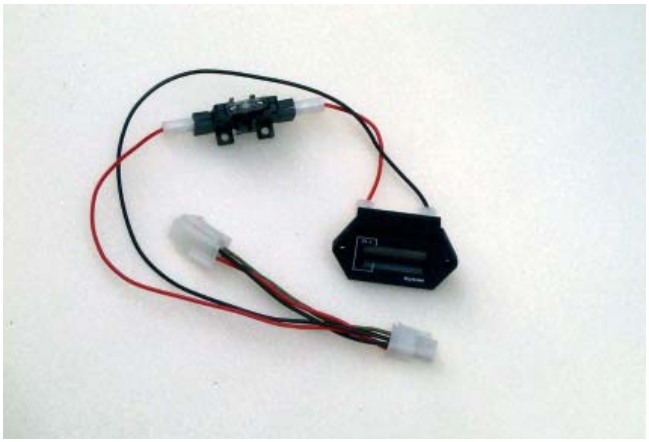


Figure 1: Hour counter kit. To be installed as an intermediate cable to the connection to the solenoid brake.

Figure 2: The four-pin plug is located above the socket area on the PCB above the motor.

Figure 3: Remove the existing four-pin plug from the PCB. Attach one of the plugs from the hour counter.

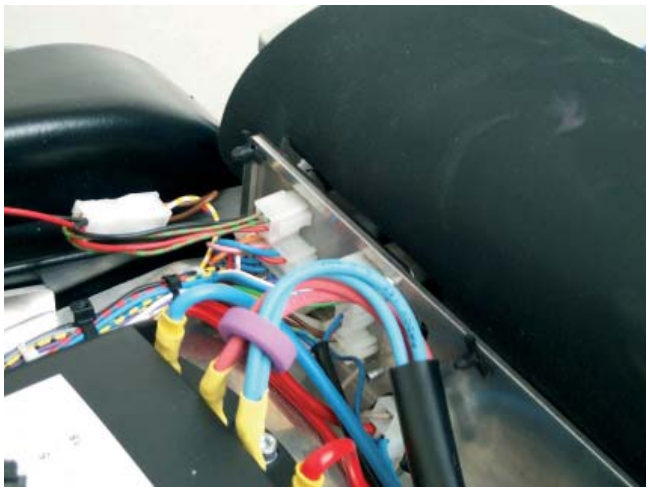


Figure 4: Attach the other plug from the hour counter to the PCB.

Figure 5: Replace the brake plug from the motor.

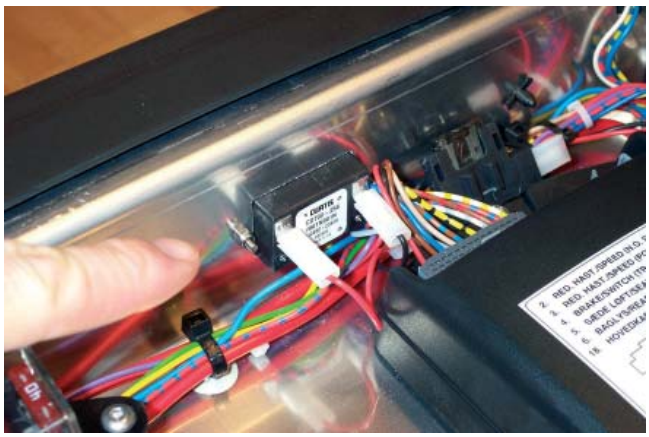


Figure 6: Install the hour counter in the pre-drilled hole in the PCB. Cut a hole in the plastic film with a retractable knife.

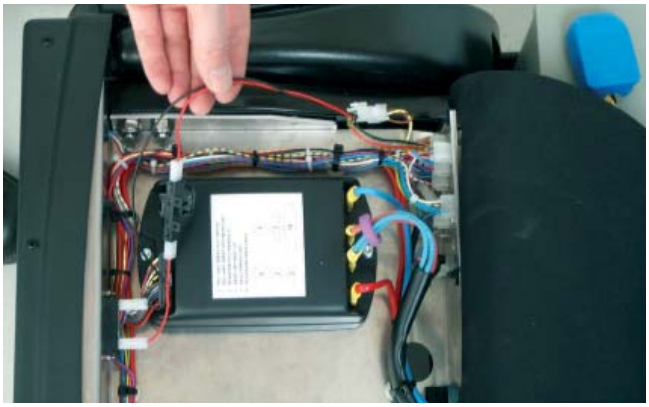


Figure 7: Secure the cable with cable binders.

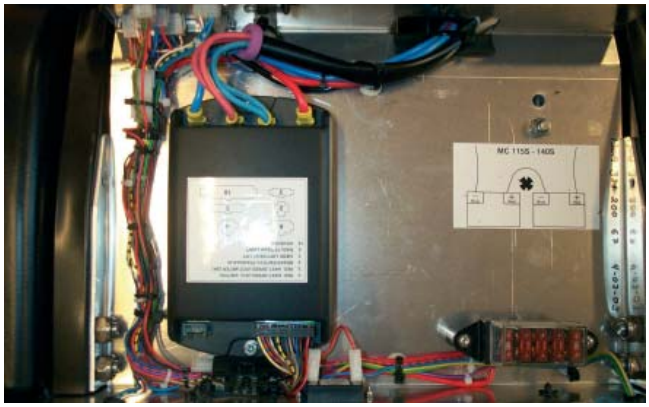


Figure 8:

- Switch on the scooter.
- Check that the display lights up when the throttle is activated.
- Check that the solenoid brake is activated when the throttle is activated, and that the scooter cannot be pushed when the throttle is released.

15.6 Parent key

Figure 1: The set comprises these parts.

Figure 2: Remove the rubber plug from the plastic cover.

Figure 3: Remove the plastic handle.

Figure 4: Remove the rear plastic shroud by removing the six plastic screws.

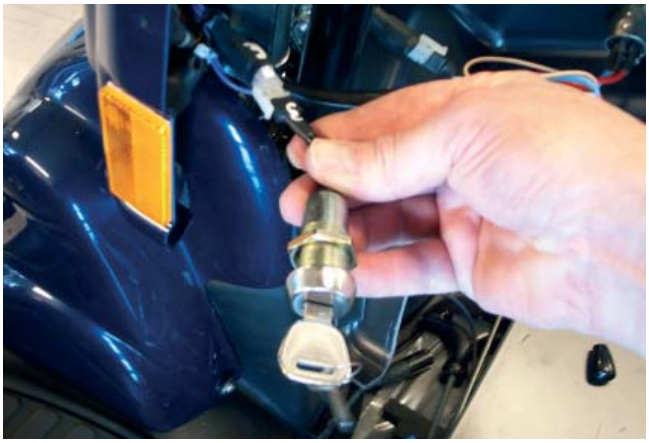


Figure 5: Insert the key in socket no. 3.

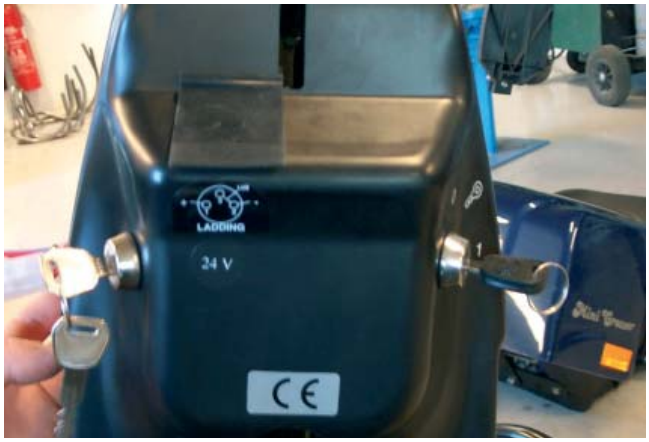


Figure 6: Replace the plastic shroud. Switch on the scooter and check that the solenoid brake clicks when the throttle is activated. When the throttle is released it should not be possible to push the scooter.

15.7 Foot pedal throttle 3W and 4W

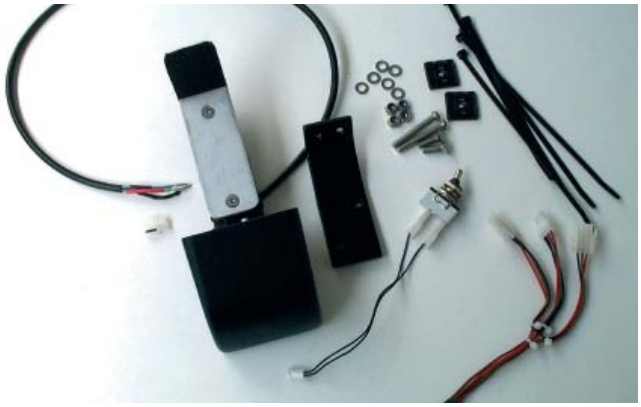


Figure 1: Complete foot pedal throttle.

Figure 2: Open the operating panel to install the forward/reverse switch.

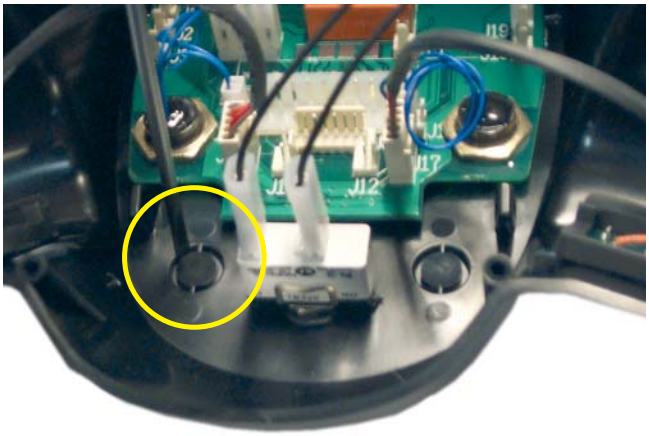


Figure 3: Cut out a hole for the reverse switch.

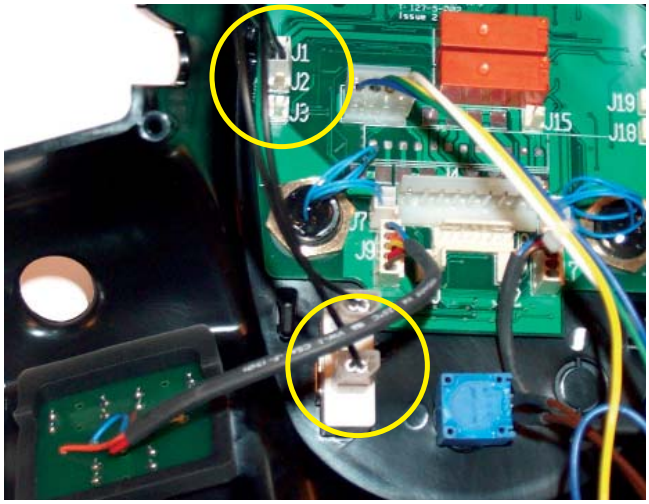


Figure 4: Connect the forward/reverse switch to socket no. 2.

	Luk op for tilgang/Open to access →		
1	Nøgleomskifter	Keyswitch	
2	Bak	Reverse	X
3	Nødstop	Emergency stop	X
5	Forlys	Front light	
6	Kabelstamme	Harness	
7	Katastrofeblink	Hazard	
8	Kabelstamme	Harness	
9	Blinkprint HØ	PCB Right	
10	Sædeløft	Seat lift	X
11	Max. Hast pot.	Max. speed pot.	
12	Kurve reduktion	Curve reduction	
13	Gasreg. pot.	Throttle pot.	
15	24V horn	24V buzzer	X
16	Lys kontakt	Light switch	
17	Blinkprint VE	PCB Left	
18	Forældre nøgle	Parent key	
19	Red.hast. (N.O.switch)	Red.speed (N.O.switch)	X

Figure 5:

Figure 6: Install the reverse switch as shown.

Figure 7: Remove the standard throttle regulator. Remove the rocker arm itself. If you remove the potentiometer it is important to close the holes with the accompanying plugs.

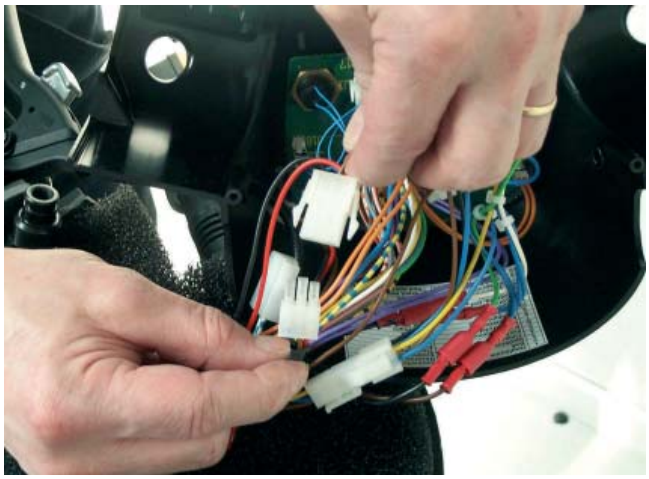


Figure 8: Connect the wires to the foot pedal throttle to the socket where the standard throttle regulation was installed.

Figure 9: Install the foot pedal throttle on the footplate. Drill through the holes in the transverse square tube and up through the plastic plate and the rubber mat.

Figure 10: Connect the foot pedal throttle to socket number 4 beneath the handlebar cover.

Figure 11: Installing the foot pedal throttle on a 4W model.

Figure 12: Install the cable beneath the vehicle.

Figure 13: Remove the plastic handle.

Figure 14: Remove the plastic shroud by removing the six plastic screws.

Figure 15: Insert the small crimps in the socket so that the matching colours are opposite each other.

Figure 16: Connect the foot pedal throttle to socket number 4.

Figure 17:

Program the junction box to »single-ended« input type. See separate description of programming.

Switch on the scooter and check that the solenoid brake clicks when the throttle is activated. When the throttle is released it should not be possible to push the scooter.

It is important to install new plugs in the hole for the side-view mirrors to ensure that the handlebars are watertight. Use a couple of drops of quick-drying glue.

15.8 Electric seat adjustment

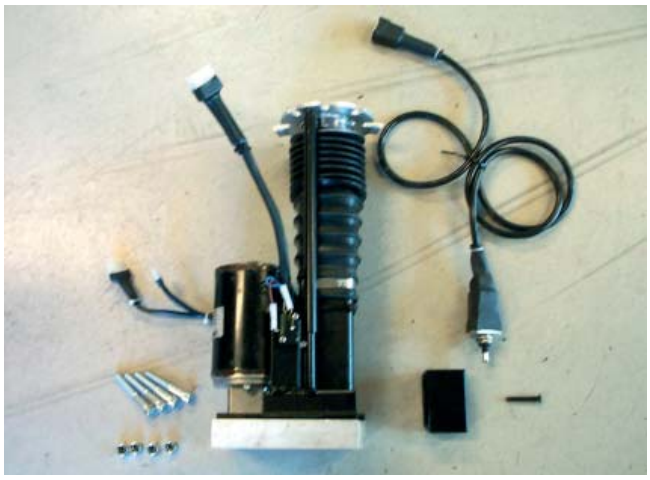


Figure 1: Complete electric seat adjustment unit.

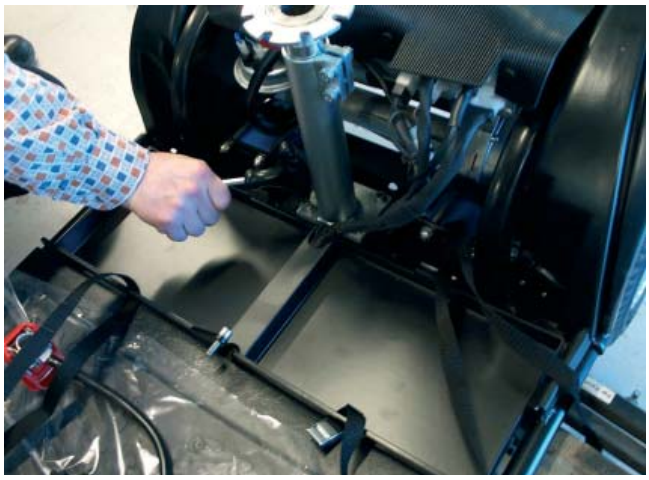


Figure 2: Remove the fixed seat post.

Figure 3: Install the electric seat adjustment unit in the same holes.

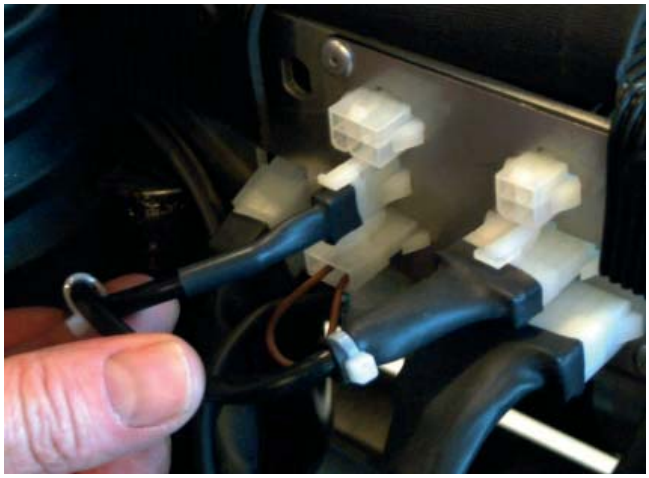
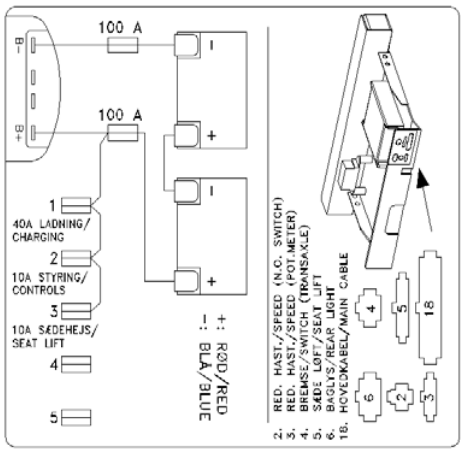


Figure 4: Connect the two-pin and five-pin plugs to the wiring plate.
See drawing.



Figur 5

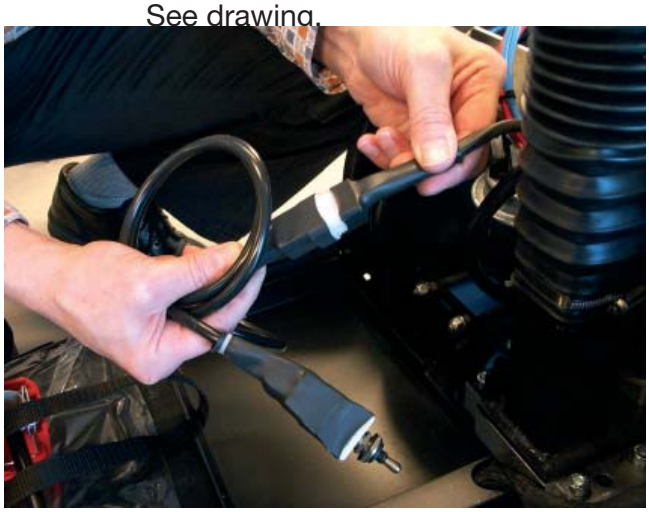


Figure 6: Connect the heavy-duty four-pin plug to the cable from the up/down switch.

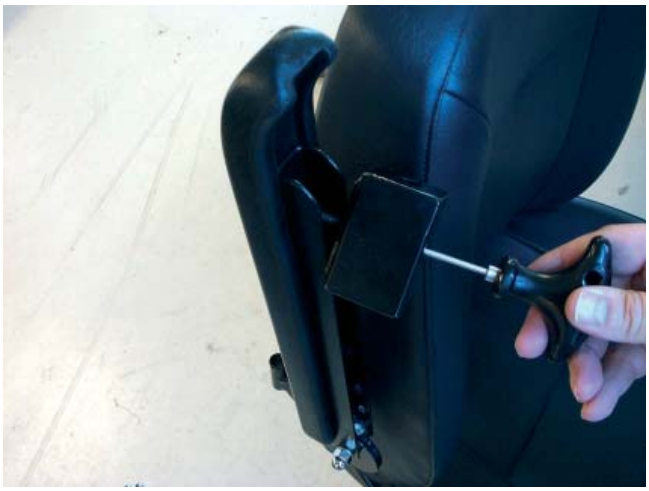


Figure 7: Install the box for the up/down switch beneath the armrest.

Figure 8: Install the up/down switch in the box.

15.9 Twist grip throttle regulator – right and left

Figure 1: Twist grip throttle, right, and programming unit.

Figure 2: Twist grip throttle, left, and programming unit.

Figure 3: Remove plastic cover.

Figure 4: Remove the rubber plug.

Figure 5: Remove the handle.

Figure 6: Remove the potentiometer.

Figure 7: Install the electric plug and rubber plug in the hole.

Figure 8: Install the twist grip on the handlebars.

Figure 9: Tighten the screws.

Figure 10: Connect the twist grip to the three-pin plug which the standard potentiometer was connected to.

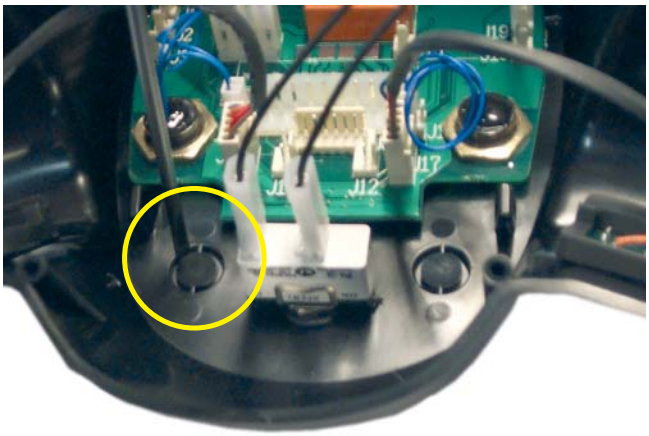


Figure 11: Install the forward/reverse switch.

	Luk op for tilgang/Open to access →		
1	Nøgleomskifter	Keyswitch	
2	Bak	Reverse	X
3	Nødstop	Emergency stop	X
5	Forlys	Front light	
6	Kabelstamme	Harness	
7	Katastrofeblink	Hazard	
8	Kabelstamme	Harness	
9	Blinkprint HØ	PCB Right	
10	Sædeløft	Seat lift	X
11	Max. Hast pot.	Max. speed pot.	
12	Kurve reduktion	Curve reduction	
13	Gasreg. pot.	Throttle pot.	
15	24V horn	24V buzzer	X
16	Lys kontakt	Light switch	
17	Blinkprint VE	PCB Left	
18	Forældre nøgle	Parent key	
19	Red.hast. (N.O.switch)	Red.speed (N.O.switch)	X

Figure 12:

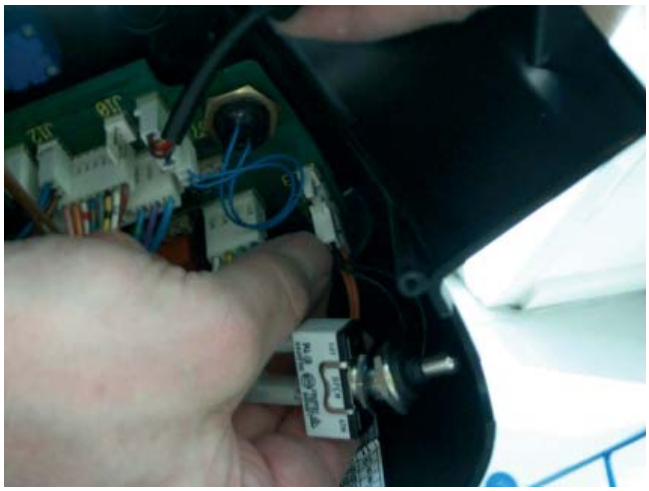


Figure 13: Connect to socket 2 on the PCB. Insert the small crimps in the socket so that the matching colours are opposite each other.

Figure 14: Install the switch and place the sticker as shown.

Figure 15: Program the junction box to »single-ended« input type. See separate description of programming. Switch on the scooter and check that the solenoid brake clicks when the throttle is activated.
When the throttle is released it should not be possible to push the scooter.

It is important to install new plugs in the hole for the side-view mirrors to ensure that the handlebars are watertight. Use a couple of drops of quick-drying glue.

15.10 Installing accessories in the C rail

Examples:

- Walking stick holder
- Zimmer frame holder
- Oxygen bottle holder
- Manual wheelchair holder

Figure 1: Remove the rubber strip in the C profile. Cut off the length that will not be used. Replace.

Figure 2: Install the equipment. Remember washers.

Figure 3

Figure 4

Figure 5

Figure 6

15.11 Replacing bulb in headlight

Switch off the scooter.
Remove the front shroud by removing the three screws as shown. The shroud can then be lifted off towards the front.

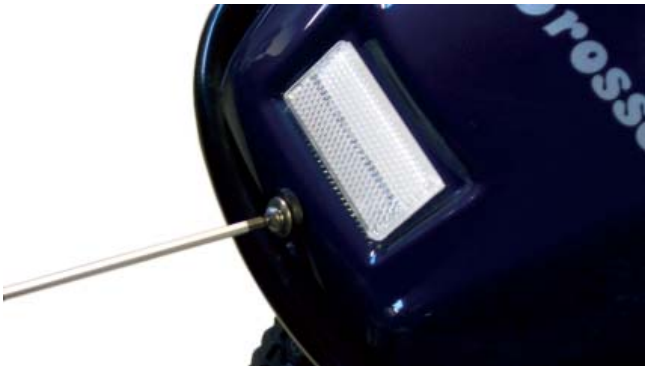


Figure 1

Figure 2

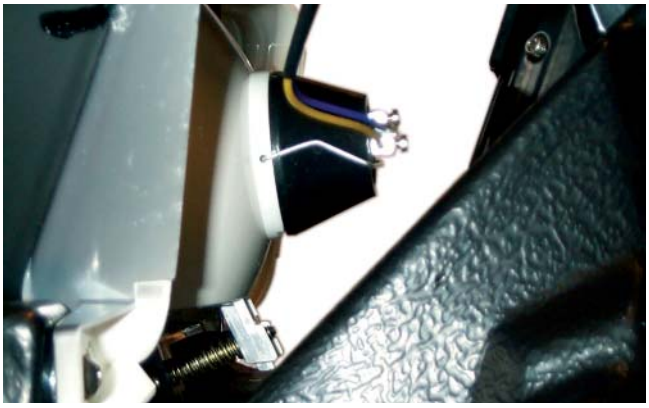


Figure 3: Lift the bracket at the back of the headlight upwards and remove it. Make sure to turn the socket in the same way again. The bracket must not touch the conductive parts of the socket.

Figure 4: The socket holder can now be pulled out of the headlight assembly.

Figure 5: Remove the bulb by twisting it and pulling it forwards out of the socket.

Make sure that the wires are not pinched when replacing the front shroud.

15.12 Installing a side-view mirror

Remove the rubber plug from the threaded bush on the handlebars. Twist off the centre piece as shown.

Figure 1

Figure 2

Install the plug and press the rubber edge down along the edge of the round bush.

Figure 3

Figure 4 Install the side-view mirror.

16 Technical data

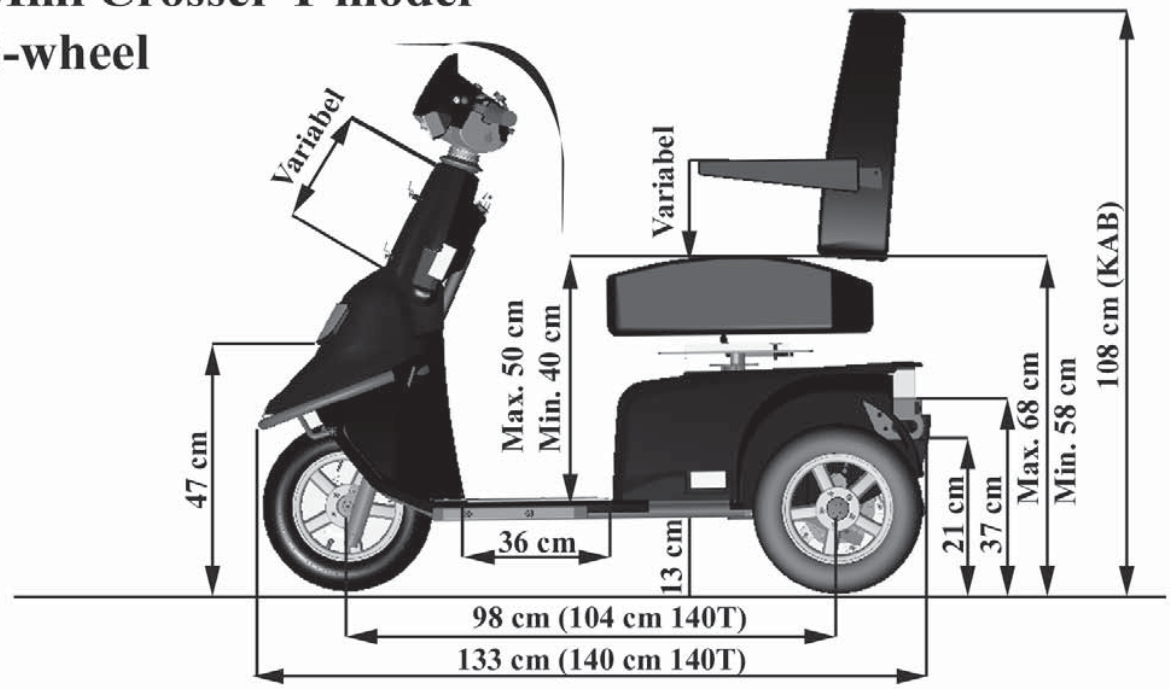
	MC 130 T 3W	MC 140 T 3W	MC 130 T 4W	MC 140 T 4W
Transport height without seat (tiller down)	68 cm.	68 cm.	68 cm.	68 cm.
Total weight	142 kg.	179,5 kg.	151,5 kg	188 kg.
Weight without seat	123,5 kg.	161,5 kg.	133,5 kg	170 kg.
Battery weight (2 batteries) 56 Ah 73 Ah 110 Ah	 43 kg. 50 kg.	 80 kg.	 43 kg. 50 kg.	 80 kg.
Static stability in all directions	15°	15°	15°	15°
Dynamic stability in all directions at lowest speed	10°	10°	10°	10°
Climbing capacity with person weighing 150 kg	17°	15°	17°	15°
Max. kerb height	12 cm.	12 cm.	12 cm.	12 cm.
Max. speed	15 km/h.	15 km/h.	15 km/h.	15 km/h.
Braking length at max. speed.	3,5 meter	3,5 meter	3,5 meter	3,5 meter
Effective seat depth*	44 cm.	44 cm.	44 cm.	44 cm.
Effective seat width*	48 cm.	48 cm.	48 cm.	48 cm.
Clearance - front edge of seat to road	58 cm.	58 cm.	58 cm.	58 cm.
Clearance - floorboard to front edge of seat	40 cm.	40 cm.	39 cm.	39 cm.
Angle of backrest*	Approx. - 25° til +30°	Approx. - 25° til +30°	Approx. - 25° til +30°	Approx. - 25° til +30°
Height of backrest	53 cm.	53 cm.	53 cm.	53 cm.
Approx. charge time at 20˚C	8 hours	8 - 12 hours	8 hours	8 - 12 hours

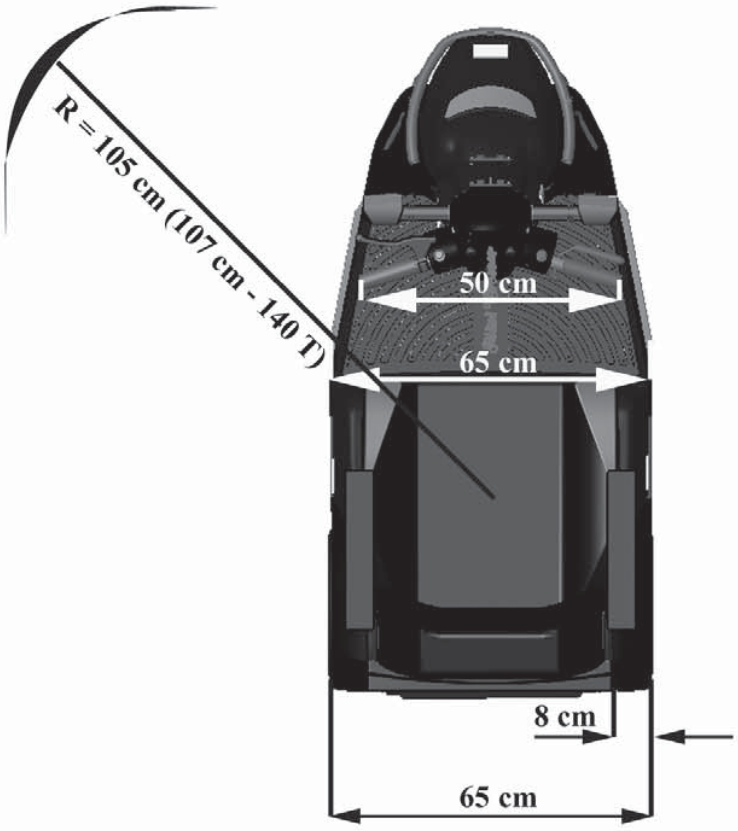
Note:
* The seat is a KAB seat.

Tyre dimensions (6-ply)	3.00-8 Max. outside diameter 340 mm.	3.00-8 Max. outside diameter 340 mm.	3.00-8 Max. outside diameter 340 mm.	3.00-8 Max. outside diameter 340 mm.
Tyre pressure	3.5 bar	3.5 bar	3.5 bar	3.5 bar
Classification (ISO)	Class C	Class C	Class C	Class C

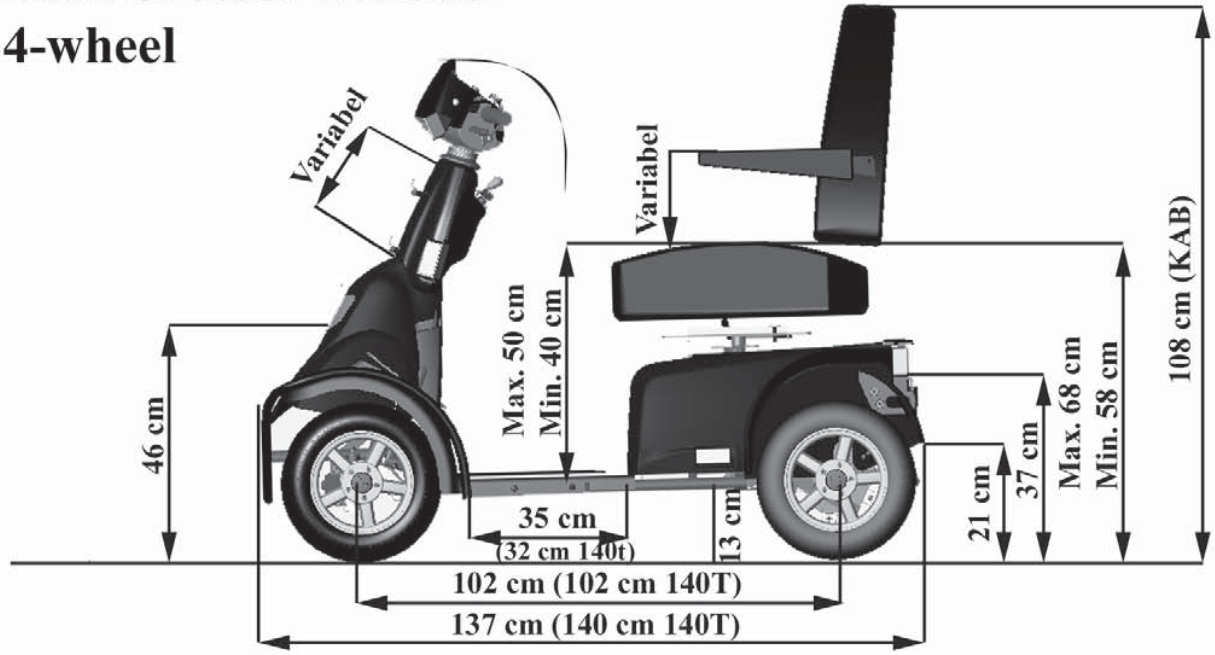
	Mini Crosser 130 T 3W & 4W	**Mini Crosser 140 T 3W & 4W**
56 Ah batteries	v. Standard	v. Standard
Max. range with new batteries at +20oC on flat, firm road	40 km. v/ 3 W 35 km. v/ 4 W	80 km. v/ 3 W 70 km. v/ 4 W
73 Ah batteries	v. Option	
Max. range with new batteries at +20oC on flat, firm road Optimum battery capaity achieved after charging/running down about 20 times	60 km. v/ 3 W 55 km. v/ 4W	
Battery type: Standard: Option:	 2 x 12V / 56 Ah 2 x 12V / 73 Ah	 2 x 12V / 110 Ah
Max. battery dimensions (cm)	27,8 x 17,5 x 22	27,8 x 22,9 x 28,3
Energy consumption (KWh) when charging from »empty«	Approx. 1.5	Approx. 3.0
Charge unit, 24 V DC	8 - 10 A	12 A
Bulbs (headlights)	24 V - 21 W	24 V - 21 W
Bulbs (rear lights)	24 V - 5 W	24 V - 5 W
Bulbs (indicators)	24 V - 10 W	24 V - 10 W
Standard colour	Blue - metallic	Blue - metallic

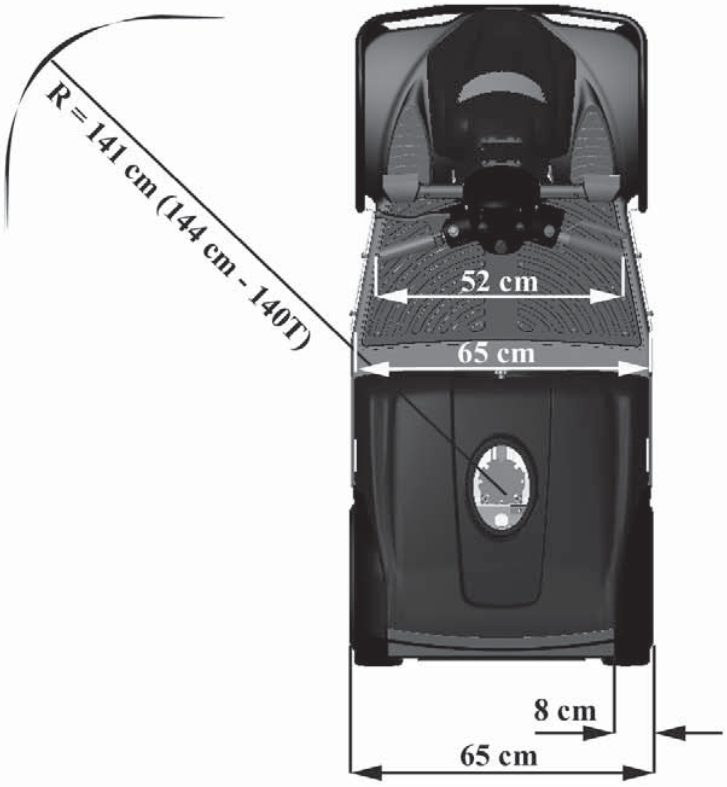
Mini Crosser T model 3-wheel





Mini Crosser T model 4-wheel





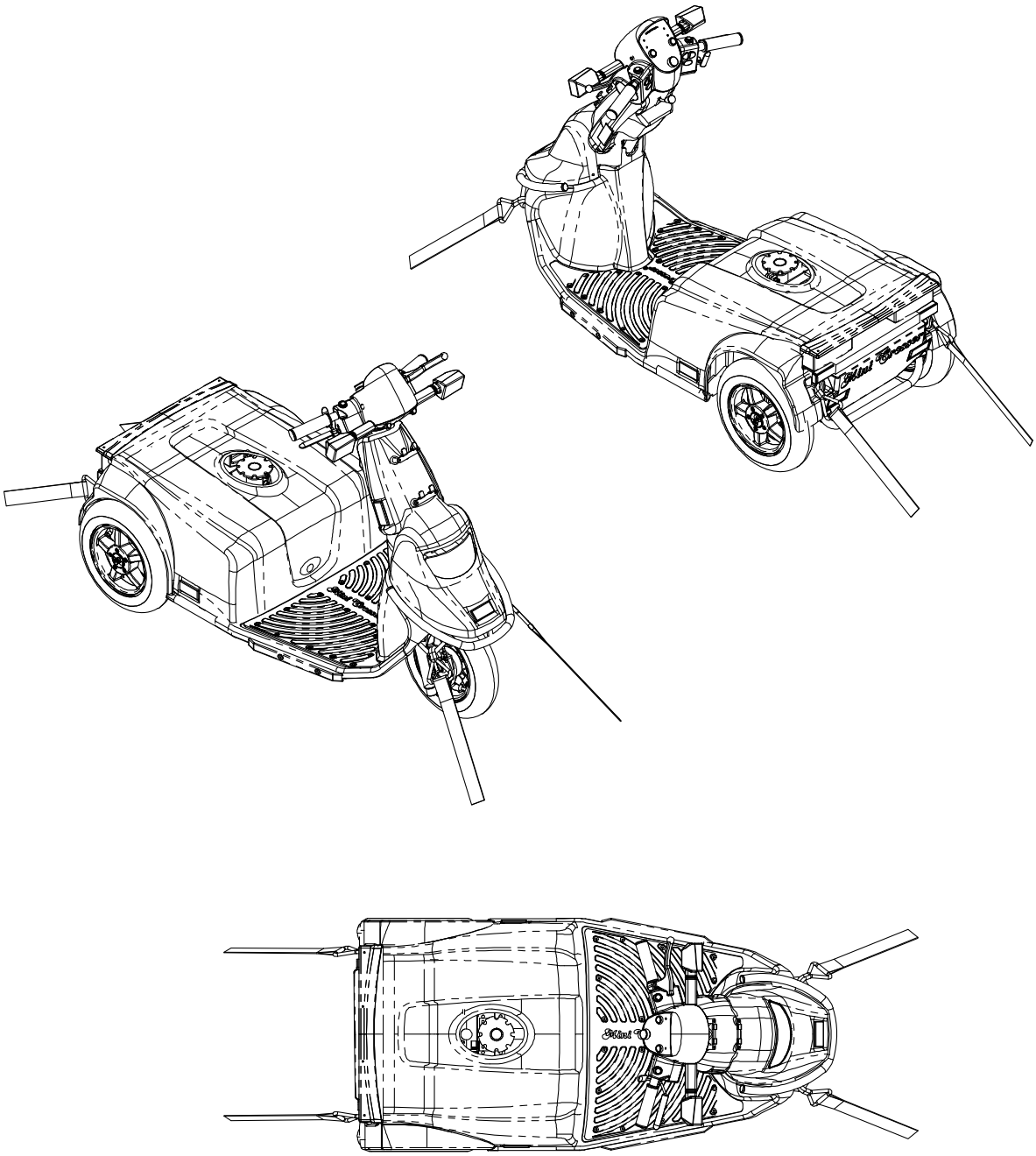
17 Belts for securing an MC in a car

Beskrivelse:

Selesæt til fastspænding af køretøj

Description:

Belts for securing a MC in car



Dwg. no.	Issue:	Date:
T - 127 - 06 - 146	A	20 - 05 - 2003

Mini Crosser A/S

T - 127

SHEET 1 OF 1

The Mini Crosser T series has been crash tested in accordance with the ISO 10542/ISO 7076-19 and SAE J2249 standards. These standards stipulate that an 85 kg wheelchair must be used for the tests, but in recognition of the fact that the Mini Crosser T series is considerably heavier, the tests were carried out to the same specifications as those for the lighter chair.

The above-mentioned tests are carried out by securing the Mini Crosser with Q'Straint four-point harness and crash testing it dynamically at 48 km/h, with a braking time of 25 milliseconds, which produces a force of 20 g. Where applicable, a person sitting on the scooter would be secured with a three-point safety belt that is integrated into the scooter's harness system. However, we recommend that users sit in one of the seats in the car or coach. Other things being equal, this is safer.

Instructions – Q'Straint QRTTM deluxe four-point harness with static three-point safety belt.

Securing the wheelchair with four retractors:

1. Install the two front retractors on the floor so that the distance between them is greater than the width of the harnessing points marked on the scooter.
2. Place the scooter at a maximum distance of 70 cm from the front retractors.
3. Draw out the belts and secure the hooks in the fittings used for this purpose (marked in yellow on the scooter).
4. Push the scooter forwards until the restraining belts are at an angle of about 45°.
5. Install the two rear wheelchair harnesses on the floor immediately behind the harness points marked on the scooter.
6. Draw out the belts and place them on the frame of the wheelchair at an angle of 45°.
7. Switch off the scooter by turning the ignition key. If necessary tighten the two handles on the sides.

NB: It makes no difference which retractors are placed in which position around the scooter as they are identical.

Securing passengers with a static three-point safety belt:

1. Secure the two hip belts on the rear retractors. Note that the "male" part of the hip belt, which has a knob for fastening it to the shoulder belt, must be installed on the same side as the shoulder belt. Make sure that the belt has an incline of about 45°, is taut, and does not come into contact with the armrests or other parts of the wheelchair.

Hofteselens fastgørings-punkt på retraktoren

2. Install the shoulder belt so that the belt rests against the user's collar bone and runs diagonally down to the hip where the belt is secured to the knob on the male part of the hip belt.

3. Tighten the belts by pulling the loose strap, and loosen them by lifting the buckle, similarly to the belt on a passenger plane.

Hun stik Han Stik

18 Programming

18.1 125T 3 & 4W

Programmering af MC 125T + 4W med P&G

Det er kun tilladt at reducer: Speed, Deceleration tid og Throttle Gain.		
	Fast	**Slow**
Forward Acceleration	26	26
Forward Deceleration	10	10
Reverse acceleration	60	60
Reverse Deceleration	23	23
Forward Speed	100	60
Reverse Speed	38	38
Invert Throttle Polarity	No	*
Power Down Time	10	*
Current Limit	110A	*
Motor Compensation	40	*
Hold Factor	108%	*
Mid Current	3 sek., 80%	*
Brake Time	70	*
ISO	ON	*
Inhibit Polarity	Lo	*
Bridge Hold	60	*
Throttle Gain	120%	*
Pulse Reverse Alarm	Yes	*
Wig-Wag Throttle	Yes	*
Low Battery Flash Inhibit	Yes	*
Throttle Deadband	15%	*
Output Voltage	24V	*
Trucharge Cable Resistance	40m ohm	*
Trucharge Calibration	99	*

18.2 130T 3 & 4W

Programmering af MC 130T + 4W med P&G

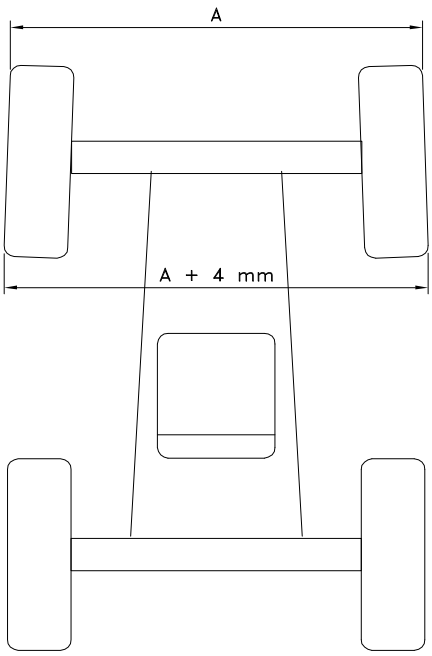
Det er kun tilladt at reducer: Speed, Deceleration tid og Throttle Gain.		
	Fast	**Slow**
Forward Acceleration	26	26
Forward Deceleration	11	11
Reverse acceleration	60	60
Reverse Deceleration	23	23
Forward Speed	100	60
Reverse Speed	30	30
Invert Throttle Polarity	No	*
Power Down Time	10	*
Current Limit	130A	*
Motor Compensation	40	*
Hold Factor	136%	*
Mid Current	3 sek., 80%	*
Brake Time	70	*
ISO	ON	*
Inhibit Polarity	Lo	*
Bridge Hold	60	*
Throttle Gain	120%	*
Pulse Reverse Alarm	Yes	*
Wig-Wag Throttle	Yes	*
Low Battery Flash Inhibit	Yes	*
Throttle Deadband	15%	*
Output Voltage	24V	*
Trucharge Cable Resistance	40m ohm	*
Trucharge Calibration	99	*

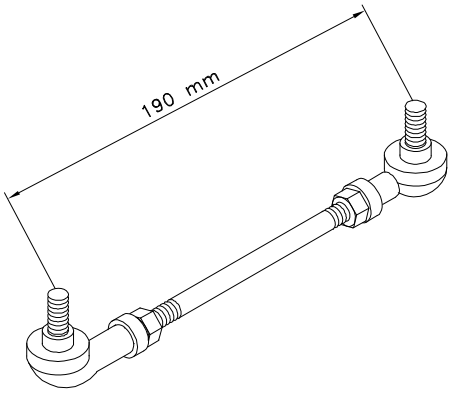
18.3 140T 3 & 4W

Programmering af MC 140T + 4W med P&G

Det er kun tilladt at reducer: Speed, Deceleration tid og Throttle Gain.		
	Fast	**Slow**
Forward Acceleration	26	26
Forward Deceleration	9	9
Reverse acceleration	60	60
Reverse Deceleration	23	23
Forward Speed	100	60
Reverse Speed	30	30
Invert Throttle Polarity	No	*
Power Down Time	10	*
Current Limit	130A	*
Motor Compensation	40	*
Hold Factor	136%	*
Mid Current	3 sek., 80%	*
Brake Time	70	*
ISO	ON	*
Inhibit Polarity	Lo	*
Bridge Hold	60	*
Throttle Gain	120%	*
Pulse Reverse Alarm	Yes	*
Wig-Wag Throttle	Yes	*
Low Battery Flash Inhibit	Yes	*
Throttle Deadband	15%	*
Output Voltage	24V	*
Trucharge Cable Resistance	40m ohm	*
Trucharge Calibration	99	*

19 Front wheel alignment 4W



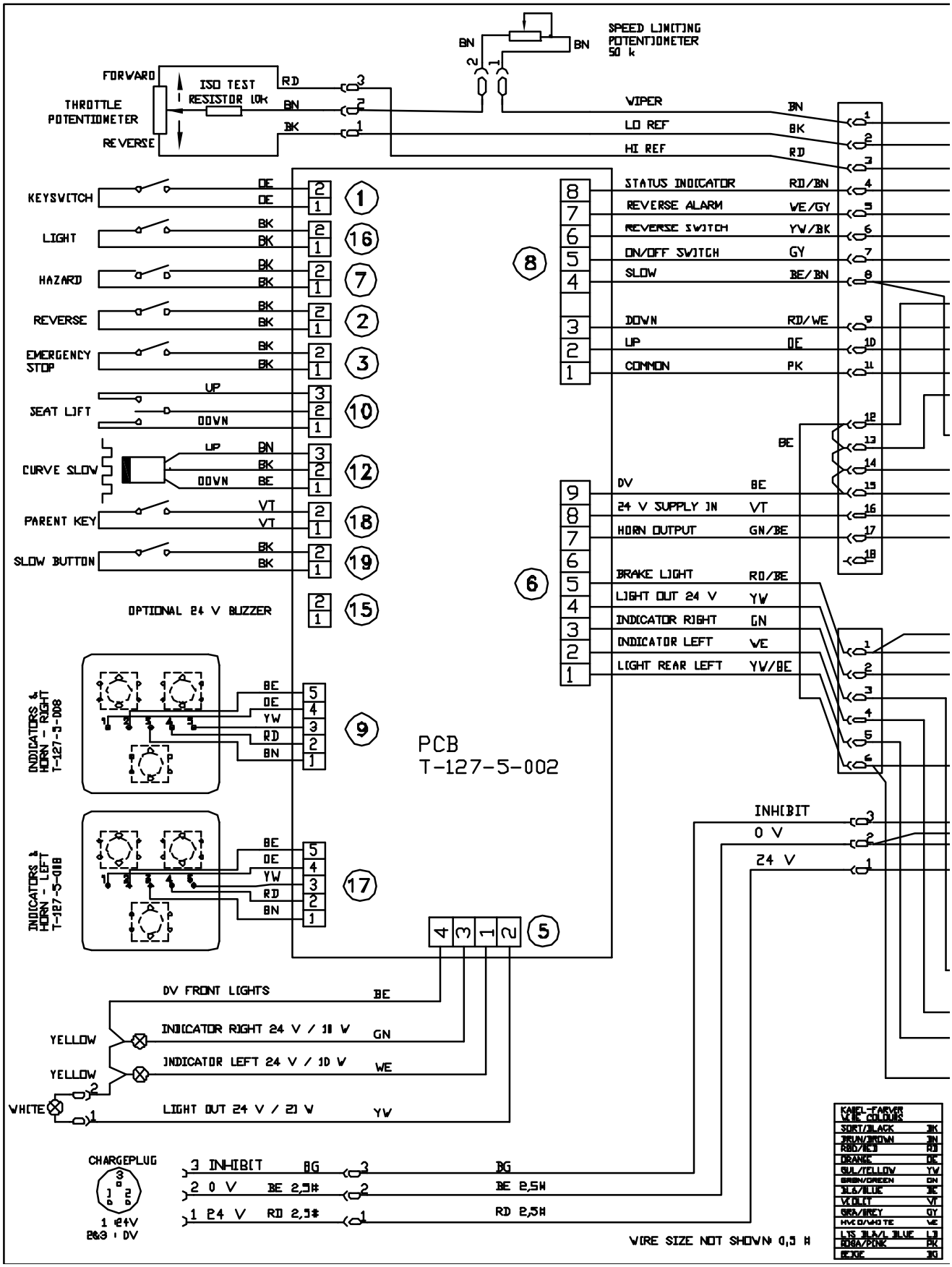


Front wheel alignment (toe-in) 4W

W-127-0-021 200899

20Wiring diagram

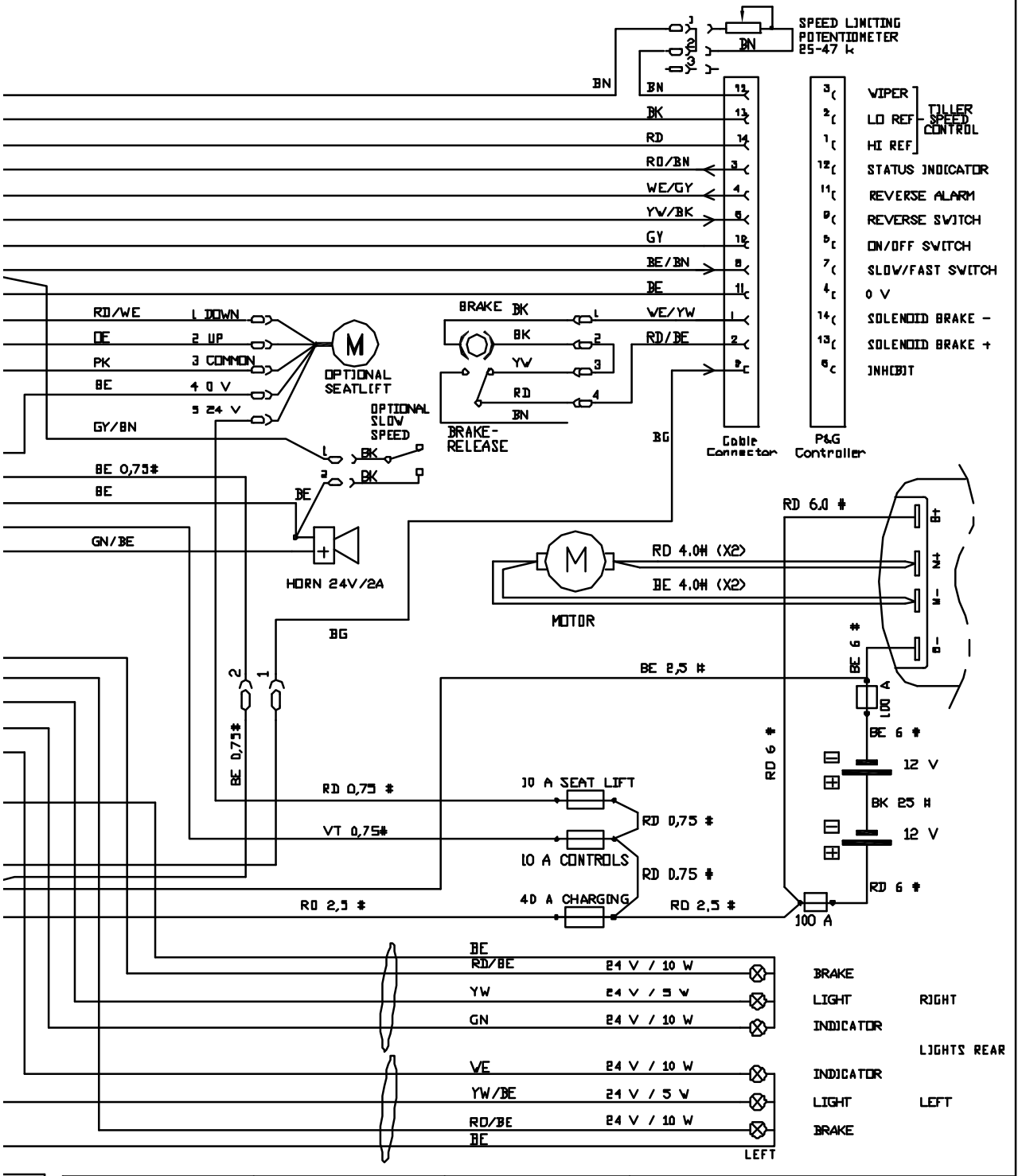
In case of doubt, ask! Spar



Spørg hvis der er tvivl

In case of doubt, ask.

H	Controller connector pins added	181205	HS	APPR.



General tolerances	Geometrical toleran.	Welding tolerances	Min. general roughness: Ra 12.5
ISO 2768-1-m	ISO 2768-2-K	EN/ISO 13920-AE	Material

Mini Crosser A/S
Enggaardvej 7
DK-7400 Herning
Tlf.: 70 10 17 55
Fax.: 97 16 85 82
Mail: info@minicrosser.com
www.minicrosser.com

Dimensions in mm	European projection
Beskrivelse	El-diagram MiniCrosser 127T
Description	Circuit diagram MiniCrosser 127T
Scale:	
Sign:	HS
Date:	291203
Dwg. no.	T-127-5-004
Issue	H

21PG Drivers Technology

PG DRIVES TECHNOLOGY

SPIB

PROGRAMMER FOR
SOLO AND EGIS
CONTROLLERS

PROGRAMMING
AND DIAGNOSTICS

SK73750/7

21.1 Indholdsfortegnelse til PG

TABLE OF CONTENTS

Chapter 2 - Diagnostics

Chapter 3 - Warning Summary

About this manual

This manual is split into 3 chapters which are in turn split into separate sections. Each chapter deals with a specific issue.

Chapter 1 - Programming

This chapter gives an overview of the programmable parameters within the Scooter Controllers.

Chapter 2 - Diagnostics

This chapter deals with identifying a trip within a controller, and how to deal with the trip once found.

Chapter 3 - Warning Summary

Lists all the Warnings used within the manual.

ICONS

PG Drives Technology. will be abbreviated to PGDT throughout the manual.

Throughout the manual icons are used to draw the reader's attention.

The icons used are:

Note - A general point for best practice.

Caution - A point of safety which if ignored could result in damage to the controller or the vehicle.

Warning - A point of safety which if ignored could cause injury to the individual.

CHAPTER I
PROGRAMMING

I Introduction

The main advantage of using programmable controllers is that they can be easily tailored to the specific needs and capabilities of a particular vehicle while taking into account safe performance characteristics.

The programmable controller achieves this great flexibility by referring to a set of internal parameters which govern factors such as the vehicle's speed, acceleration and braking. These parameters can be changed over a wide span to suit different vehicles and users, using a simple, hand-held programmer. If you are setting up a speed controller on a vehicle for the first time, refer to section 6.

If you are using the SPI programmer with a DTI25 controller, please contact PGDT for more information.

It is possible to set up a controller so that it is unsuitable for some uses and possibly even some vehicles. Take care when programming a controller and if you need any advice in programming or selecting values, please do not hesitate to contact PGDT.

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values.

2 The SPI Programmer

The SP1 is a handheld programmer for use with PGDT Solo and Egis controllers. Primarily intended for the specialized design and test requirements of electric vehicle manufacturers and engineers, the SP1 takes full advantage of the programmability of the controller, offering functions not available with less sophisticated controller designs.

Operation of the SP1 is identical for both Solo and Egis controllers. However, each controller has a different programming connector. Adapter cables are available to enable the same programmer to be used with both controllers.

The programmer is a menu-driven device which plugs directly into the controller, and is available in two configurations, suited to different applications.

Below is a list of SP1 and adapter cable part numbers:

SP1a Solo	D49371
SP1a Egis	D50040
SP1b Solo	D49378
SP1b Egis	D49923
SP1 Solo - Egis Cable	D50048
SP1 Egis- Solo Cable	D50257

2.1 The SPIa Programmer - Basic Version

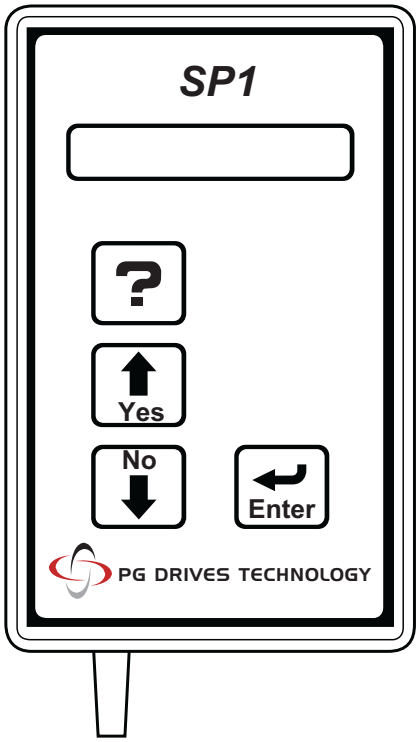
The basic programmer version - SP1a - is intended for general purpose use. It can set all of the key controller speed, acceleration and braking characteristics, and allows different settings to be tried out while the programmer is still plugged into the controller. A context-sensitive help function is available to guide users through the menus and the SP1a can also display error messages from the controller. This allows any problems with the vehicle's electrical system to be identified and corrected quickly.

2.2 The SPIb Programmer - Engineering Version

The engineering version - SP1b - offers all of the SP1a features and also includes a suite of advanced functions for designers, such as matching the controller to the motor impedance, setting maximum drive current and changing the controller to suit different throttle configurations. Clearly, the SP1b is a very powerful tool for prototype design work. However, users who program parameters incorrectly do run the risk of damaging controllers or motors, so it should only be used by experts in vehicle electrical systems.

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values.

SP1B KEYPAD LAYOUT



?	Help Button:	Pressing this button displays information regarding the function you have selected. In menus, HELP tells you what each option does. In options, it tells you what to do next.
Yes	Up / Yes Button:	This button steps up through the menu lists, increases the value of settings and selects functions
No	Down / No Button:	This button steps down through the menu lists, decreases the value of settings and de-selects functions
Enter	Enter Button:	This button selects options, settings and function states.

Function		Range	Res.	SP1a	SP1b
Forward Acceleration		0.1 to 10s, Fast / Slow	100ms	❍	❍
Forward Deceleration		0.1 to 10s, Fast / Slow	100ms	❍	❍
Reverse Acceleration		0.1 to 10s, Fast / Slow	100ms	❍	❍
Reverse Deceleration		0.1 to 10s, Fast / Slow	100ms	❍	❍
Forward Speed		0 to 100%, Fast / Slow	1%	❍	❍
Reverse Speed		0 to 100%, Fast / Slow	1%	❍	❍
Invert Throttle Polarity		Yes / No	--	❍	❍
Power Down Timer	(3)	0 to 20 minutes	1 min	❍	❍
Help Mode		On-line help text	--	❍	❍
Diagnostics		Trip codes from controller	--	❍	❍
Read System Log	(4)	View stored diagnostic codes	--	❍	❍
Read Timer	(4)	View elapsed running time	--	❍	❍
Current Limit		20A to max rating	1A		❍
Motor Compensation		0 to 1Ω	5mΩ		❍
Hold Factor		100 to 420%	4%		❍
Mid Current		0 to 100%, 1 to 255s	1%, 1s		❍
Brake Time		0 to 1s	10ms		❍
Iso Tests	(1)	0.1 to 10s, Fast / Slow	100ms		❍
Inhibit Polarity	(2)	Hi / Lo	--		❍
Inhibit Mode	(3)	1 to 6	--		❍
Bridge Hold Time	(1)	0 to 5s	20ms		❍
Throttle Gain	(1)	0 to 1250%	5%		❍
Pulse Reverse Alarm		Yes / No	--		❍
Wig-wag Throttle		Yes / No	--		❍
Low Battery Flash Inhibit		Yes / No	--		❍
Soft-Stop	(3)	On / Off	--		❍
Throttle Deadband		3 to 100%	1%		❍
Output Voltage		20 to 40V	1V		❍
TruCharge Cab Resistance		10 to 250mΩ	5mΩ		❍
TruCharge Cal.		1 to 200	1		❍
Max. Charge Amps	(3)	0 to 12A	0.1A		❍
Min. Charge Amps	(3)	0 to 12A	0.1A		❍
Erase System Log	(4)	Clears stored diagnostic codes	--		❍
Clear Timer	(4)	Resets run timer	--		❍

Functions indicated by (1) are only available with revisions of controller's identified by a letter on the barcode label fixed to the underside of controller as shown below.

Functions indicated by (2) are not available with Egis Controllers.

Functions indicated by (3) are only available with Egis Controllers.

Functions indicated by (4) are only available with Egis Controllers and SPI programmers manufactured after September 2002.

Resetting parameters to non-compatible values could damage controllers and motors, and invalidate any warranties. Contact PGDT if there is the slightest doubt.

In addition, the SPI programmer should not be connected to a controller when the vehicle batteries are being charged. The high voltages present during charging may damage the SPI programmer.

It is possible to set up a controller so that it is unsuitable for some uses and possibly even some vehicles. Take care when programming a controller and if you need any advice in programming or selecting values, please do not hesitate to contact PGDT.

If you need any advice on programming, please do not hesitate to contact PGDT.

3 Using The SPIb

Please read this guide carefully before using the SP1b Programmer.

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values.

3.1 Connection

The SP1 can be connected to the controller when the controller is switched either on or off. You can also drive with the SP1 connected.

For safety reasons, accessing some critical parameters will cause the controller to trip. This is intentional and the controller can be reset by switching it off then on again.

3.1.1 Programming

To program, simply connect the SP1 to the controller whilst it is turned on. If the SP1 is showing diagnostic information, press the ENTER key and the SP1 will go into programming mode.

3.1.2 Diagnostics

To use the SP1 to view trip codes and messages, connect it to the controller when the controller has tripped.

If a trip occurs when the SPI is already connected, then no diagnostic information will appear.

When the SPI is connected to a controller, the electromagnetic compatibility (E.M.C.) performance of the vehicle may be affected. Disconnect the SPI as soon as programming is complete and do not use the SPI in environments which are E.M.C. sensitive.

4 Root Menu

The ROOT menu, contains all the parameters which set the normal drive characteristics of the vehicle. Each parameter is explained in the following paragraphs.

4.1 Forward Accel'n ?

Adjusts the value for forward acceleration of the vehicle, in increments of 1. There are two settings:

Fast	This value is used when the vehicle's slow/fast switch is set to fast.
Slow	This value is used when the vehicle's slow/fast switch is set to slow.

The values are approximately displayed in "units" of 100ms and correspond to the time taken to reach full forward speed from standstill, i.e. the higher the value the slower the acceleration.

4.2 Forward Decel'n ?

Adjusts the value for forward deceleration (or braking) of the vehicle, in increments of 1. There are two settings:

Fast	This value is used when the vehicle's slow/fast switch is set to fast.
Slow	This value is used when the vehicle's slow/fast switch is set to slow.

The values are approximately displayed in "units" of 100ms and correspond to the time taken to reach standstill from full forward speed, i.e. the higher the value the slower the deceleration.

It is the responsibility of the scooter manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184.

4.3 Reverse Accel'n ?

Adjusts the value for reverse acceleration of the vehicle, in increments of 1. There are two settings:

Fast	This value is used when the vehicle's slow/fast switch is set to fast.
Slow	This value is used when the vehicle's slow/fast switch is set to slow.

The values are approximately displayed in "units" of 100ms and correspond to the time taken to reach full reverse speed from standstill, i.e. the higher the value the slower the acceleration.

4.4 Reverse Decel'n ?

Adjusts the value for reverse deceleration (or braking) of the vehicle, in increments of 1. There are two settings:

Fast	This value is used when the vehicle's slow/fast switch is set to fast.
Slow	This value is used when the vehicle's slow/fast switch is set to slow.

The values are approximately displayed in "units" of 100ms and correspond to the time taken to reach standstill from full reverse speed, i.e. the higher the value the slower the deceleration.

It is the responsibility of the scooter manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184.

4.5 Forward Speed ?

Adjusts the value for forward speed of the vehicle, in increments of 1%. Note, this speed will only be achieved if the speed limiting control is at the maximum speed position. There are two settings:

Fast	This value is used when the vehicle's slow/fast switch is set to fast.
Slow	This value is used when the vehicle's slow/fast switch is set to slow.

.

4.6 Reverse Speed ?

Adjusts the value for reverse speed of the vehicle, in increments of 1%. Note, this speed will only be achieved if the speed limiting control is at the maximum speed position. There are two settings:

Fast	This value is used when the vehicle's slow/fast switch is set to fast.
Slow	This value is used when the vehicle's slow/fast switch is set to slow.

4.7 Throttle Pol'ty?

This selects the polarity of operation of a wig-wag throttle or, on a single-ended throttle system, the polarity of operation of the reverse switch. You can set the Throttle Invert Polarity to Yes or No.

On a wig-wag system, setting Throttle Invert Polarity to No means that if throttle potentiometer wiper is approaching the high reference then direction will be forwards, Yes is opposite to this.

On a single-ended type system, No means that if the reverse switch input is connected to 0V then direction will be reverse, Yes is opposite to this.

4.8 PwrDn Timer ?

A length of time can be set, such that if the controller accepts no valid input for that period of time, it will power down safely. The time can be set from 0 to 20 minutes. If the value is set to 0, no power down will occur.

4.9 Read Timer ?

Later versions of Egis have a timer which records how long the controller has been driven.

This function is not present on Solo controllers.

4.10 Read System Log ?

Later versions of Egis have a diagnostic log facility which stores the number of occurrences of the last eight detected system problems. This prompt allows you to view the contents. Refer to Chapter 2 to interpret the contents of the log.

This function is not present on Solo controllers.

5 Engineer Menu ?

Selection of this enters the ENGINEER menu and allows you to adjust the technical performance parameters or functions of the controller. The ENGINEER menu is included in the SP1b. Each parameter or function is described below.

5.1 Current Limit ?

This sets the current limit of the controller. The maximum value will depend on the controller version you have, refer to the relevant data sheet.

You can set the current limit between 20A and the maximum value in steps of 1A.

5.2 Compensation ?

This matches the controller to different motor types in order to achieve optimal performance and control, especially regarding anti-rollback and braking on gradients. PGDT recommend that you set this value to 70% of the resistance of the motor armature and all connectors and cables to it.

Motor manufacturers should be able to supply figures for armature resistance, and typical cable and connectors would be about 40mΩ.

You can set this value between 0 and 1000mΩ in steps of 5mΩ.

Never set to greater than 70% of the total motor, cable and connector resistance.

5.3 Hold Factor ?

This sets the amount by which the compensation is automatically increased during the period between the controller detecting the vehicle is at zero speed and the application of the solenoid brake. This is especially important in reducing roll-back and roll-forward on gradients.

The value is expressed as a percentage of the Compensation setting. PGDT would recommend a value between 150% and 200%. If the value is too low then the roll will be excessive, if the value is too great then the vehicle may "twitch" prior to the brakes being applied.

5.4 Mid Current ?

The controller's current limit can be set to reduce after a period of time. Both the reduction and the time period are programmable. This functions allows a measure of protection for a motor when it gets into a stalled condition.

The current limit reduction is expressed as a percentage of the current limit and can be set between 0 and 100% in steps of 1%. e.g. with a value of 100%, there will be no current reduction; if the value is 25%, the current would reduce to 25% of the normal current limit.

The time period for which the current limit is maintained can be set between 1 and 255 seconds in steps of 1 second. After the current reduction has occurred, the full current limit level is resumed after 5 times this period. If the value for this time period is set to 0 seconds, then no current reduction will occur.

5.5 Brake Time ?

This sets the period of time between the controller detecting zero motor speed and the application of the solenoid brake.

This value should be set long enough to ensure the vehicle doesn't jerk or skid on a level surface, but short enough to minimize roll-back or roll-forward on slopes.

You can set this between 0 and 100, which represents 0 to 1s in steps of 10ms.

5.6 ISO Tests ?

This function can be set to on or off. For mobility applications where ISO7176/14 tests are implemented, a 10kΩ series resistor should be placed in the tiller between the wiper and speed limiting pot. The ISO Tests function must then be set to on.

For industrial applications the resistor need not be incorporated and the ISO Tests function should be set to off.

This function is not present on some Solo controllers, refer to section 2.4.

5.7 Inhibit Pol'ty ?

The controller has an inhibit input which can be used to stop drive of the vehicle. This input is accessed by connector P2 pin 6.

You can select the inhibit input polarity to be either active low or active high.

Lo — Means the controller will not drive if the inhibit input is connected to 0V.

Hi — Means the controller will not drive if the inhibit input is not connected to 0V.

This function is not present on Egis controllers.

5.8 Inhibit Mode ?

The controller has an inhibit input which can be used to stop drive of the vehicle. This input is accessed via the Charger Connector pin 4.

This parameter sets the polarity of this input. The numerical value of the parameter sets the polarity as shown in the following table below.

Inhibit Mode	Inhibit Connection
1	0V
2	Open-cct
3	0V and Open-cct
4	24V
5	24V and 0V
6	24V and Open-cct

Note: this function is not present on Solo controllers.

5.9 Bridge Hold ?

This function allows a length of time to be set such that voltage is held on the bridge after the vehicle has come to rest. It is usually set to 200 ms and should not normally require adjustment. Contact PGDT if you feel your application requires this setting to be changed.

5.10 Throttle Gain ?

This parameter amplifies the drive signal to the controller, thus allowing throttle mechanism's that do not employ the full electrical angle of the throttle potentiometer to be used. The parameter can be set between 5% and 1250% in steps of 5%. A value of 100% means no amplification is applied.

Example 1 If a 5kΩ throttle potentiometer is being used in a wig-wag configuration and the mechanical arrangement of the throttle means the potentiometer's wiper reaches the high reference when the throttle is fully deflected, the Throttle Gain should be set to 100%

Example 2 If a 5kΩ throttle potentiometer is being used in a wig-wag configuration and the mechanical arrangement of the throttle means the potentiometer's wiper reaches only 4kΩ when the throttle is fully deflected, then Throttle Gain should be set as below.

Full electrical angle	= 5kΩ - 2.5kΩ = 2.5kΩ
Actual electrical angle	= 4kΩ - 2.5kΩ = 1.5kΩ
Required gain	= 2.5 / 1.5 = 1.67
Set Throttle Gain to	= 167%

5.11 Pulse Rev. Alarm ?

The controller has an output to power an audible reversing alarm. This output can be set to give a steady or a pulsing signal, the pulsing signal is approximately 1.25Hz.

You can set this function to on or off - on is pulsing, off is steady.

5.12 Wigwag Throttle ?

This programs the controller to operate with either a wig-wag (center off) or a single-ended throttle configuration.

Wig-wag means the throttle potentiometer is used to control both speed and direction, i.e. center is no drive, forward is away from center in one direction, reverse is away from center in the opposite direction. Single-ended means the throttle potentiometer controls speed only, direction selection is with a separate switch.

You can select yes or no for this setting - yes means wig-wag, no means single-ended.

5.13 Low Battery Flash ?

This allows you to inhibit the slow flash of the TruCharge display when a low battery condition is detected. If this inhibit is set to yes, the TruCharge display will not flash on low battery.

5.14 Soft-Stop

This selects whether the soft-stop facility is enabled. Soft-stop means that if you switch the controller off whilst driving, the scooter will steadily decelerate to standstill.

You can turn this function on or off.

This function is not present on Solo controllers.

If this function is on, you must ensure that the emergency stopping distance is within the distance specified for the country in which the vehicle will be used. For countries requiring CE marking this is as specified in EN12184.

5.15 Throttle D'band ?

This sets the amount of throttle potentiometer movement before the solenoid brake is disengaged and the vehicle starts to drive. It is expressed as a percentage of the potentiometer full forward/reverse movement.

The following two examples cover the cases of single-ended and wig-wag throttle types.

Example 1 — For a single-ended throttle, if the throttle deadband is 10% and the potentiometer is 5kΩ, then there will be no drive until the potentiometer wiper is at the 500Ω position.

Example 2 — For a wig-wag throttle if the throttle deadband is 10% and the potentiometer is 5kΩ, then there will be no drive when the potentiometer wiper is between the 2.25kΩ and 2.75kΩ positions.

This value is adjustable between 3 and 100% in steps of 1%, and should always be set greater than the mechanical repeatability of the throttle mechanism.

5.16 Output Voltage ?

This sets the value of voltage applied to the motor when the throttle potentiometer is at the full drive position and the relevant speed, forward or reverse, is set to 100%. This feature allows you to choose a motor voltage value such that the vehicle top speed will remain constant all the time the battery voltage is above that value.

This value can be set between 20 and 40 V in steps of 1V. The range of 20 to 29V is used for 24V controllers and the range 30 to 40V for 36V controllers.

5.17 TruCharge Cable ?

This sets the value of cable and connector resistance between the controller and the

batteries. The value corresponds to the total resistance in both the positive and negative paths.

You can set this between 10mΩ and 250mΩ in steps of 5mΩ.

5.18 TruCharge Cal. ?

This allows further fine calibration of the TruCharge battery gauge. This is normally set at the factory and should not need adjustment. Please contact PGDT if you are considering altering this factor.

5.19 Max. Charge Amps ?

If the Egis controller is being used with a scooter on-board battery charger and a PGDT TruCharge display, then an indication of the battery charge status can be given on the TruCharge display.

This parameter should be set to a value corresponding to the charger's current output when the batteries are fully discharged. The value is displayed in "units" of 0.1A and is adjustable from 0A to 12A in steps of 0.1A.

This function is not present on Solo controllers.

5.20 Min. Charge Amps ?

If the Egis controller is being used with a scooter on-board battery charger and a PGDT TruCharge display, then an indication of the battery charge status can be given on the TruCharge display.

This parameter should be set to a value corresponding to the charger's current output when the batteries are fully charged. The value is displayed in "units" of 0.1A and is adjustable from 0A to 12A in steps of 0.1A.

This function is not present on Solo controllers.

5.21 Erase System Log?

This function clears the controller's diagnostic log.

This function is only present on later Egis controllers.

5.22 Clear Timer?

This function resets the controller's timer.

This function is only present on later Egis controllers.

5.23 Back to root ?

This takes you back to the ROOT menu.

6 Tips on Programming

PGDT controllers have a large number of programmable parameters which can be used to optimize the driving performance of almost any vehicle. Many of these factors are dependent on one another, which means that if you change one factor to achieve a certain performance characteristic then other factors may also need to be adjusted. Therefore, to minimize the number of iterations whilst programming, it is helpful to follow a logical programming sequence. This is described below.

1 Refer to section 5.2 and set the desired level of COMPENSATION. If you don't know the armature resistance of the motor, then it is possible to set the compensation level empirically. To do this:

- Set the vehicle to drive at 30% speed and approach a gradient.
- If the level of compensation is correct, the vehicle will drive up the gradient at the same speed as it drove on the level.
- If the level of compensation is too low, the vehicle will slow down as it drives onto the gradient.
- If the level of compensation is too high, the vehicle will try and drive faster up the gradient.

If this method is used rather than using motor manufacturer's figures, then to allow for the effects of temperature, the compensation level should be confirmed by performing the test again when the motor and controller have fully cooled.

2 Refer to section 5.3 and set the desired level of HOLD FACTOR.

- If the level of hold factor is correct, the vehicle should only roll-back very slightly before the solenoid brake is applied.
- If the level is too low, the vehicle will roll-back excessively before the solenoid brake is applied.
- If the level is too high, the vehicle may start to drive back up the gradient before the solenoid brake is applied.

As with the previous section, this setting should be confirmed by performing the test again when the motor and controller have fully cooled.

3 To further optimize the vehicle's roll-back performance, refer to section 5.5 and set the BRAKE TIME.

4 Refer to sections 4.1 to 4.6 to set the desired driving speeds and accelerations for the vehicle.

5 Perform the gradient tests once more to ensure the performance is still as required.

If you have any questions about the programming sequence, then please contact PGDT

7 Factory Programmed Options

7.1 Miscellaneous settings

There are several settings that can be factory programmed for specific applications. Please refer to the relevant controller Data Sheet or contact PGDT for details.

7.1.1 Check Lo Ref

This option allows the lo reference of a single ended throttle to be tied to 0 Volts.

7.1.2 Check Tiller Refs.

This option allows a 0-5V throttle input signal to be used instead of a potentiometer.

7.1.3 Unipolar Tiller

This option allows a wig-wag throttle to drive the vehicle in one direction irrespective of which side of the wig-wag is pushed. The direction of travel is determined by the reverse switch input.

7.1.4 Tiller Displacement on Start-up

If the throttle is displaced on start-up, the TruCharge display will normally ripple up and down and drive is disabled. This option can be set such that the controller will immediately trip if the throttle is displaced on start-up.

7.1.5 Motor Open Circuit Test

This option can be switched off and should be used for vehicles that do not use an electro-magnetic brake on the motor.

7.1.6 High Pedal Disable

This option can be switched off such that if the throttle is displaced on start-up, drive is immediately enabled.

Switching this option Off will contravene international mobility vehicle safety legislation. If, under exceptional circumstances, the condition set being set to Off is required, it becomes the sole responsibility of the scooter manufacturer. PGDT accept no liability for losses of any kind resulting from this opotion being set to Off.

7.1.7 Solenoid Brake Test

This option can be switched off for those vehicles that do not use an electro-magnetic brake on the motor.

7.1.8 Brake Light

This option can be used to drive a brake light instead of a reverse alarm from the controller connections, P2- pin 11 (Solo) and pin 4 (Egis). It is active during the programmed deceleration period and for a further 2 seconds after the vehicle has stopped.

7.1.9 Diagnostic Flash Code

The Diagnostic Flash Code Feature is a factory programmed option available on Egis controllers built after September 2002 that allows a single status lamp or LED to

display the TruCharge trip code. This is done by pulsing the lamp on for a number of times equivalent to the number of TruCharge bars that would be flashing for a given trip.

The information in Chapter 2 section 3.1.1, still applies, so for example, if an Egis with this option enabled had a throttle trip, the status lamp would flash 7 times, pause briefly, flash 7 times, pause briefly and so on.

7.2 Safety Fences

These allow minimum and maximum settings for acceleration, deceleration and speeds to be held within the controller. The SP1 would then be unable to set parameters outside these limits. The default safety fences are as follows:

Parameter	Min	Max
Forward Acceleration	0.1 secs	10 secs
Forward Deceleration	0.1 secs	10 secs
Reverse Acceleration	0.1 secs	10 secs
Reverse Deceleration	0.1 secs	10 secs
Forward Speed	0%	100%
Reverse Speed	0%	100%

CHAPTER 2
DIAGNOSTICS

I Introduction

The primary objective of this chapter is to assist service personnel in finding the likely area of a detected fault within the whole scooter electrical system. It is important to realize that even though the controller is signaling a fault, it may not be the controller itself that is defective. This is because the controller is able to detect problems in other electrical components (motors, batteries, solenoid brakes etc.) or, more importantly, the wiring to them. When a controller has detected a fault, a system trip is indicated.

This chapter covers diagnostics of scooters fitted with PG Drives Technology Solo and Egis controllers. For a basic diagnostic capability it is not necessary to have a programmer to use this guide, as all these controllers have a sophisticated level of on-board diagnostics.

Using this guide, it is possible to define a trip as belonging to one of 10 types. Once this type has been established, there are suggestions as to what the possible cause may be.

This chapter should only be used to decide the starting point of your own diagnosis, as it is possible for the controller to indicate a trip in another component even though the controller itself may be defective. Nevertheless, experience has shown that connectors and wiring are the major cause of scooter electrical problems, so it is necessary to examine these more vulnerable areas first.

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair.

I.I Diagnostics Process

For efficient and effective diagnosis the following basic steps should be taken.

- Establish the type of controller fitted to the scooter.
- Confirm there is a trip, or has been an intermittent trip. Refer to section 2.
- Establish the trip type. Refer to section 3.
- Refer to the trip table for the controller you are working with. Refer to section 4.
- Refer to the possible cause as indicated by the trip table, and carry out recommended investigative and corrective action. Refer to Section 7.

2 Detecting a Trip has Occurred

Depending on how the controller is programmed and the setup of the scooter a trip will be identified in one of two ways.

- Via the TruCharge Indicator.
- Via the LED or single Lamp indicator.

The TruCharge indicator operates in the following manner.

2.1.1 Flashing Rapidly

The controller is tripped. To determine the trip type, refer to section 3. Connecting a programmer to the controller while this is happening will give you a trip code.

2.1.2 Flashing Slowly

No trip is currently detected by the controller. The slow flash is an indication that the batteries require charging.

A trip may have occurred previously, refer to Chapter 1 section 4.10 for details of how to read the controller's diagnostic log, then section 3.1 to establish the trip type.

2.1.3 Display is Steady

The controller is not currently tripped.

A trip may have occurred previously, refer to Chapter 1 section 4.10 for details of how to read the controller's diagnostic log, then section 3.1 to establish the trip type.

2.1.4 Display Does Not Illuminate

No power is reaching the controller. Ensure the batteries are fully charged and that all connections between batteries and the controller are made. If these connections are good, then the controller may be defective, refer to Section 7.

To see how the Single Lamp (or LED) indicators operate, depending on the controller type, refer to section 3.2.

3 Trip Diagnosis

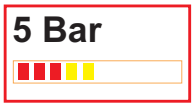
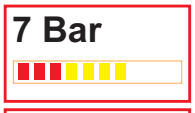
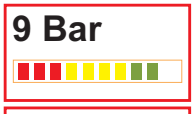
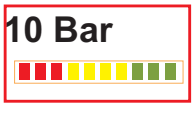
Depending on the type of status indicator fitted to the vehicle - single bulb (or LED) or TruCharge battery and diagnostics indicator - there are two methods of trip diagnosis.

3.1 Trip Diagnosis with a TruCharge Display Type Status Indicator

This section is only applicable if the vehicle is fitted with a PGDT TruCharge battery and diagnostics indicator.

If you look at the below diagram you will see that 10 different types of trip are defined. The number of bars flashing rapidly on the TruCharge display indicates the trip type. A brief description for each trip type is given in sections 5.1 to 5.10.

3.1.1 TruCharge Display Diagnostics

	Low Battery Voltage
	Motor Disconnected
	Motor Wiring Trip
	Parking Brake OFF.
	Not used.
	Inhibit Active
	Throttle Potentiometer Trip
	Possible Controller Trip
	Solenoid Brake Trip
	High Battery Voltage

3.2 Trip Diagnosis with a single bulb (or LED) type status indicator

3.2.1 Solo Controllers & Egis prior to 2002

If the vehicle is not fitted with a TruCharge type status indicator you will need a PGDT SP1 Programmer to determine the trip type.

You must connect the SP1 to the controller whilst the status indicator is flashing rapidly, a trip message will then be displayed on the SP1's screen. As an example, assume that the wires to the solenoid brake have been disconnected, the message displayed would be as below.

Diagnosis.... **Code 1500: solenoid brake trip - check brakes and connections. Press enter to continue.**

From the above, you can see there is a 4 digit number - this is known as the trip code, in this case 1500.

When this code is used in conjunction with the following trip tables, you can determine the trip type, 1 to 10. The trip types and their possible causes are described in more detail in sections 5.1 to 5.10.

3.2.2 Egis Controllers

If the Egis controller with a single lamp (or LED) has been programmed accordingly then the Trip Code will be displayed in a rapid flash sequence.

Example: **If the controller detects a Motor Wiring Trip then the single lamp (or LED) will rapidly flash three times, pause, and then flash three times, and so on. The flash sequence represents the Trip Code which would be displayed if a TruCharge module was fitted.**

Refer to section 3.1.1 for details of the TruCharge trip types.

4 Trip Tables

Trip Code	Trip Type	Description
0002	8	Possible Controller Trip
0003	8	Possible Controller Trip
0100	8	Possible Controller Trip
0203	8	Possible Controller Trip
0204	8	Possible Controller Trip
0810	7	Throttle Trip
0814	7	Throttle Trip
0815	7	Throttle Trip
0816	7	Throttle Trip
0817	7	Throttle Trip
1400	3	Motor Wiring Trip
1500	9	Solenoid Brake Trip
1501	8	Possible Controller Trip
1502	9	Solenoid Brake Trip
1600	10	High Battery Voltage
1705	8	Possible Controller Trip
1802	8	Possible Controller Trip
1805	8	Possible Controller Trip - Refer to section 5.7
1B20	8	Possible Controller Trip
1D02	7	Throttle potentiometer Trip
1E03	6	Inhibit Active
2102	8	Possible Controller Trip
2C00	1	Low Battery Voltage
2C01	1	Low Battery Voltage
2D01	8	Possible Controller Trip
3100	8	Possible Controller Trip
3102	8	Possible Controller Trip
3210	8	Possible Controller Trip
3211	8	Possible Controller Trip
3212	8	Possible Controller Trip
3213	8	Possible Controller Trip
3600	8	Possible Controller Trip
3601	8	Possible Controller Trip

Trip Code	Trip Type	Description
3602	8	Possible Controller Trip
3603	8	Possible Controller Trip
3604	8	Possible Controller Trip
3605	8	Possible Controller Trip
3607	8	Possible Controller Trip
3608	8	Possible Controller Trip
3609	8	Possible Controller Trip
360A	8	Possible Controller Trip
360B	8	Possible Controller Trip
360C	8	Possible Controller Trip
360D	8	Possible Controller Trip
360E	8	Possible Controller Trip
3B01	2	Motor Disconnected
4401	8	Possible Controller Trip
7000	4	Parking Brake Off
7001	4	Parking Brake Off

If any other trip code is experienced, please contact PGDT for further details.

5 Trip Types and Their Possible Causes

Once the trip type has been established, refer to the relevant section below for further information.

5.1 Trip Type 1 - Low Battery Voltage

This occurs when the controller detects that the battery voltage has fallen below 16V. Check the condition of the batteries.

If the trip is still present after the batteries and connections have been checked, then the controller may be defective. Refer to section 7.

5.2 Trip Type 2 - Motor Disconnected

This occurs when the controller detects that the motor has become disconnected. Check the motor connectors and wiring.

Some vehicles may disconnect the motor from the controller whilst in freewheel mode. If so, check the position of the parking brake disengage lever.

If the trip is still present after the above checks have been made, then the controller may be defective. Refer to section 7.

5.3 Trip Type 3 - Motor Wiring Trip

This occurs when the controller detects a trip in the wiring to the motor, in particular if a motor connection has "short-circuited" to a battery connection. Check the motor connectors and wiring.

If the trip is still present after the above checks have been made, then the controller may be defective. Refer to section 7.

5.4 Trip Type 4 - Parking Brake Off

This occurs if the freewheel switch is operated whilst the vehicle is driving, or if the freewheel switch is already operated when the vehicle is switched on. Check the position of the freewheel switch.

If the freewheel switch is in the correct position, then the voltage at controller's input pin should be checked. On a correctly functioning system the voltage should be as below. If the voltages are incorrect then check the wiring to the freewheel switch.

Freewheel to Battery -ve : 0V ± 0.5V to freewheel

5V ± 0.5V to drive

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 7.

5.5 Trip Type 5 - Not Used

Not used.

5.6 Trip Type 6 - Inhibit Active

This occurs when the controller detects that the input is activated. The most common use for the inhibit input is for disabling the vehicle's drive when the battery charger is

connected. Check that the battery charger is disconnected.

5.6.1 Solo Controllers

If the charger is disconnected, then the voltage at the Solo's inhibit input, P2-6, should be checked. Depending on whether the controller is programmed to active low or active high inhibit (see chapter 1, section 5.7), then on a correctly functioning system the voltage at P2-6 should be as below. If the voltages are incorrect then check the wiring to charger socket or other inhibit source.

Active low inhibit:	P2-6 to Battery -ve :	0V ± 0.5V to inhibit
		5V ± 0.5V to drive
Active high inhibit:	P2-6 to Battery -ve :	0V ± 0.5V to drive
		5V ± 0.5V to inhibit

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 7.

5.6.2 Egis Controllers

If the charger is disconnected, then the voltage at the Egis inhibit input should be checked. Depending on how the Egis is programmed via the Inhibit Mode parameter (see chapter 1, section 5.8), then on a correctly functioning system, the conditions in the table below should apply.

Inhibit Mode	Voltage on Egis' Inhibit Input	
	To Drive	To Inhibit
1	V_{BATT} ±0.5V or 5V ± 0.5V	0V ± 0.5V
2	0V ± 0.5V or V_{BATT} ±0.5V	5V ± 0.5V
3	V_{BATT} ±0.5V	0V ± 0.5V or 5V ± 0.5V
4	0V ± 0.5V or 5V ± 0.5V	V_{BATT} ±0.5V
5	5V ± 0.5V	V ± 0.5V or V_{BATT} ±0.5V
6	0V ± 0.5V	V_{BATT} ±0.5V or 5V ± 0.5V

5.7 Trip Type 7 - Throttle Trip

This occurs if the controller detects a trip in the throttle potentiometer or the connections to it.

This occurs if the controller detects a problem in the throttle potentiometer or the connections to it. In Egis controllers, specific trip codes relate to different scenarios and these are detailed below.

Trip Code 0814: Throttle High Reference (Egis pin 12) Disconnected.

Trip Code 0815: Throttle Low Reference (Egis pin 5) Disconnected or Short Circuit between Throttle High and Low References (Egis Pins 12 & 5) or Throttle Potentiometer is Incorrect Value.

Trip Code 0816: Short Circuit between Throttle Wiper and Throttle High Reference (Egis Pins 7 & 12)

Trip Code 0817: Short Circuit between Throttle Wiper and Throttle Low Reference (Egis Pins 7 & 5)

Check the operation of the throttle potentiometer or voltage input mechanism, in particular ensure it is returning to the rest position.

The following voltage measurements can be made for either a potentiometer input throttle or voltage input throttle. Check that the throttle is in the rest position and any speed limiting pots or buttons are set to maximum speed. The nominal voltage levels should be as follows:

Wig-wag throttle:	Hi Ref to BATT –ve:	nominal 4.75V
	Wiper to BATT –ve:	nominal 2.5V
	Lo Ref to BATT –ve:	nominal 0.25V
Single-ended throttle:	Hi Ref to BATT –ve:	nominal 4.75V
	*Wiper to BATT –ve:	nominal 0.25V
	Lo Ref to BATT –ve:	nominal 0.25V

* If the 10 kΩ ISO Test resistor is used with single ended throttle, the nominal value at Wiper is 0.188V

Trip code 1805 specifically relates to the Egis controller detecting electrically conductive deposits around its throttle potentiometer connections.

If the throttle input is functioning correctly and the trip is still present, then the controller may be defective. Refer to section 7.

5.8 Trip Type 8 - Possible Controller Trip

This occurs when the controller detects a trip within itself. The controller must be assumed defective and repaired by an authorized person. Refer to section 7.0.

5.9 Trip Type 9 - Solenoid Brake Trip

This occurs when the controller detects a trip in the solenoid brake or the connections to it. Check these connections and the solenoid brake. On a correctly functioning system, the following voltage levels should be present.

Brake + to Brake-: 0V ± 0.5V, when the throttle is at rest.
Battery voltage ± 1V, when the throttle is away from rest.

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 7.

The above voltage measurements should be carried out with the vehicle's drive wheels raised above the ground. Read the vehicle manufacturer's instructions regarding the jacking up of the vehicle.

5.10 Trip Type 10 - High Battery Voltage

This occurs when the controller detects that the battery voltage has risen above 38V for a 24V controller or above 42V for a 36V controller. The most common reasons for

this are overcharging of the battery or bad connections between the controller and the batteries. Check the batteries and the connections to them.

If the trip is still present after the batteries and connections have been checked, then the controller may be defective. Refer to section 7.

6 Other Trip Symptoms

This section covers trips which are not displayed on the status indicator by the controller. This maybe because: either the controller cannot switch on; the trip is not considered critical enough to "trip" the controller; or the controller cannot detect the trip. None of these types of trips would present a hazard to the vehicle user.

6.1 System Will Not Switch On

With the on/off switch and keyswitch (if fitted) in the on position, check the voltage at of the controller connections, P2- pin 5 (SOLO) and pin 1 (Egis).

For controller to operate, the voltage at the specified pin should be equal to battery positive ± 0.25V. If this voltage is present and the vehicle will not switch on, then the controller may be defective. Refer to section 7.

6.2 Vehicle Drives Slowly

If you think the controller has been programmed differently from the manufacturer's presets, check the programmed values. If these appear to be correct, then carry out the following checks.

Firstly, check that the solenoid brake is not jammed. Refer to the vehicle manufacturer's instructions to see how to do this.

Secondly, check the voltage at the controller's slow/fast input. On a correctly functioning system the voltage should be as below. If the voltages are incorrect then check the wiring and connectors to the slow/fast switch.

Slow/ Fast to Battery –ve: 0V ± 0.5V for slow mode

5V ± 0.5V for fast mode

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 7.

6.3 Status Indicator Does Not Light

If the vehicle appears to be operating correctly but the status indicator does not light, then check the wiring and connectors from the controller's status indicator output to the status indicator itself.

On a correctly functioning system with a fully charged battery, the voltage on status indicator output should be 12V ± 1V. If this voltage is not present even when there is no connection to the controller, then the controller may be defective. Refer to section 7.

6.4 Reverse Alarm Does Not Sound

If the reverse alarm does not sound, firstly check the wiring and connectors from the controller's reverse alarm output and the sounder itself.

6.5 Vehicle Will Not Drive in Reverse

This section is only applicable to vehicles fitted with single-ended throttle configurations. If the vehicle does not drive in reverse and the reverse switch is in the correct position, then the voltage at reverse input should be checked. Depending on whether the

controller is programmed to non-inverting or inverting throttle polarity (refer to Chapter 1 section 5.12), then on a correctly functioning system the voltage at reverse input should be as below. If the voltages are incorrect then check the wiring and connectors to the freewheel switch.

Non-inverting throttle:

Reverse to Battery - :	0V ± 0.5V to drive in reverse
	5V ± 0.5V to drive forwards

Inverting throttle:

Reverse to Battery - :	0V ± 0.5V to drive forwards
	5V ± 0.5V to drive in reverse

If the voltages are correct and the trip is still present, then the controller may be defective. Refer to section 7.

6.6 Motor or Brake Becomes Very Warm

The motor will become very warm if it is being overloaded. One cause maybe that the solenoid brake is jamming. To check this, refer to the vehicle manufacturer's instructions.

6.7 Batteries Discharge Very Quickly

The batteries can discharge very quickly for several reasons, these are listed below.

- Worn or damaged batteries - check battery condition.
- Charger defective or incorrect charger being used - check charger operation type (refer to vehicle operating instructions).
- Incorrect batteries being used - refer to vehicle manufacturer's instructions for correct battery types.
- Solenoid brake jamming - see section 6.6.

The ambient temperature has a significant effect on battery capacity. Therefore, if the temperature is lower than normal the vehicle's range will be reduced. In this situation, the TruCharge battery gauge still gives an accurate state-of-charge reading.

7 Servicing of Defective Units

There are no serviceable parts within the controller. Consequently, any defective units must be returned to PGDT or a PGDT approved service organization for repair.

Opening or making any unauthorized adjustments or modifications to the controller or its components will invalidate any warranty and may result in hazards to the vehicle user, and is strictly forbidden.

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modification to the controller.

CHAPTER 3
WARNING SUMMARY

1 Introduction

This section summarizes all of the very important warnings that appear throughout the text of this manual. Do not operate the SP1 Progammer without reading, understanding and observing the following warnings. Failure to observe these warnings could result in UNSAFE CONDITIONS for the user of a vehicle or affect the reliability of the programmer and controllers. PG Drives Technology accepts no liability for losses of any kind arising from failure to comply with any of the conditions in the warnings listed below.

2 Warnings

2.1 Introduction

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values.. Chapter 1 section 1.1.

2.2 The SPIb Programmer - Engineering Version

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values.. Chapter 1 section 2.2.

2.3 Using the SPIb

Programming should only be conducted by competent personnel with in-depth knowledge of PGDT electronic controllers. Incorrect programming could result in an unsafe set-up of a vehicle for a user. PGDT accept no liability for losses of any kind if the programming of the controller is altered from factory pre-set values. Chapter 1 section 3.

2.4 Diagnostics

When the SPI is connected to a controller, the electromagnetic compatibility (E.M.C.) performance of the vehicle may be affected. Disconnect the SPI as soon as programming is complete and do not use the SPI in environments which are E.M.C. sensitive. Chapter 1 section 3.1.2.

2.5 Forward Decel'n & Reverse Decel'n ?

It is the responsibility of the scooter manufacturer to ensure that the emergency stopping distance is within the distance specified for the country in which the scooter will be used. For countries requiring CE marking this is as specified in EN12184.. Chapter 1 section 4.3 & 4.4.

2.6 Soft-Stop

Never set to greater than 70% of the total motor, cable and connector resistance. Chapter 1 section 5.2.

2.7 Soft-Stop

If this function is on, you must ensure that the emergency stopping distance is within the distance specified for the country in which the wheelchair will be used. For countries requiring CE marking this is as specified in EN12184. Chapter 1 section 5.14.

2.8 Tips on Pogramming

If this method is used rather than using motor manufacturer's figures, then to allow for the effects of temperature, the compensation level should be confirmed by performing the test again when the motor and controller have fully cooled. Chapter 1 section 6.

2.9 High Pedal Disable

Switching this option Off will contravene international mobility vehicle safety legislation. If, under exceptional circumstances, the condition set being set to Off is required, it becomes the sole responsibility of the scooter manufacturer. PGDT accept no liability for losses of any kind resulting from this opotion being set to Off. Chapter 1 section 7.1.6.

2.10 Introduction

Diagnostics should only be conducted by healthcare professionals with in-depth knowledge of PGDT electronic controllers. An incorrect or badly effected repair could result in an unsafe set-up of a scooter. PGDT accept no liability for losses of any kind arising from an incorrect or badly effected repair. Chapter 2 section 1.

2.11 Servicing of Defective Units

PGDT accept no liability for losses of any kind arising from unauthorized opening, adjustment or modification to the controller. Chapter 2 section 7.

Appendix A Check list

Supplier: Mini Crosser A/S TLF: 70101755 FAX: 97188835			
medema®			
INDEX NO	GENERAL CHECK LIST FOR PERIODIC MAINTENANCE OF:	VALID FROM:	INIT.
2.4.2	MINI CROSSER S - T - TJ- E	01.02.10	

APPLIANCE NO	INDIVID. NO	MODEL	SERIAL NO

POS	DESCRIPTION	EXE. DATE	INIT.
1	**MOTOR:** Check the brushes. Minimum length: 15mm.		
2	**TRANSAXLE -** clean, check for leakage and noise. Check that no threads or similar around the axle. Clean dirt and dust.		
3	**BRAKES:** Check the magnetic brakes and the parking brakes.		
4	**BATTERIES:** Make a load test on the batteries, maybe they need to be replaced. Clean battery connections and poles.		
5	**CHARGER:** Make sure that the charger gives the correct charge voltage / current.		
6	**WHEELS:** Check if the wheels are to worn. Check tyre pressure.		
7	**ELECTRONIC / POWER UNIT:** Make function test. Check for overheating. Check all coublings.		
8	**ACCESSORIES:** Make function test, electronic and manual. Replace any faulty finger screws or handles.		
9	**ELECTRIC:** check that the insulation on the cables are intact and that no cables are trapped, fasten loose cables. Exchange defect fuses. Check charger connection for damage. Check all electric functions.		
10	**KAROSSERI:** Check for damage. Exchange damaged parts.		
11	**FRAME:** Check for cracks. **If there are cracks, change frame - must NOT be welded.**		
12	**SEAT:** Clean with a damp cloth. Damaged seat parts can be delivered as spare parts.		
13	**Cleaning:** If you want to shower the scooter, the electronic components have to be protected with plastic.		
14	**TEST DRIVING:** Test drive - all functions tested in their extreme positions. Test the MC with max. load.		
Time	**Time frame standard: 1 hour.**		
Exe.	**Execution: Once per year**		