

Service manual

elite



Ameda

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1. General

The *elite* is an internationally tried and tested professional milk pump.

The suction rhythm (Cycle) and the vacuum strength have electronic infinitely variable controls, to be stepless and independent of one another.

The pump can be operated for either 230 / 115V at home, or in the car via a separately available 12V cable.

As option to external supply, the *elite* can be modified to operate from a built-in battery.

Cylinder

The vacuum cylinder is accessible from outside and can be replaced or removed for cleaning without extra tools.

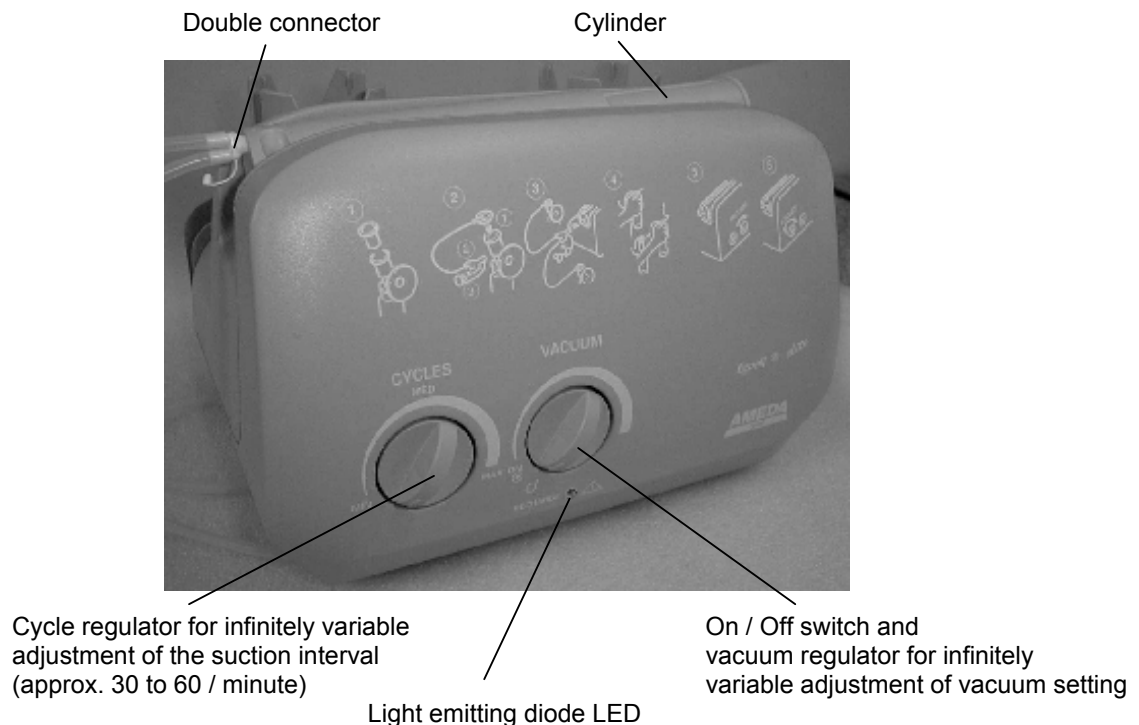
Pump set

The ratings of the Ameda pump sets are optimised for the *elite*.

The bellows in each breast shell separate the milk from the pump and so prevent any undesirable contamination.

By means of a double connector either single or double pump sets can be coupled to the cylinder; the pump is thus ready for service.

By selection of a double pump set the vacuum and cycle operate synchronously, that means at the same time on both breast shells.



2. Functions description

The main part of the pump consists of the support and the electronics.
 The support transforms the turning motion of the DC motor via two belts, a toothed wheel and a toothed segment into a linear motion, which drives the piston.
 A microprocessor - circuit monitors the cycle and the power as well as the segment position and thus the piston.
 The pump electronics are protected against overload and jamming.

Supply

The selection to conform to the available supply can be made by the rotary switch on the printed circuit; 115V or 230V.
 The primary side of the transformer is protected with fuse Z4 = 400 mA.
 The secondary side of the transformer is protected with fuse Z2 = 1.6 AT.
 The transformer protection is achieved by a non-resetable thermal overload.

The pump can be supplied with 12V DC via the rear mounted socket.
 This input is protected via fuse Z1 = 1.6 AT on the printed circuit.

There is a light emitting diode (LED) beneath the vacuum control knob on the front panel. It lights green as soon as the mains or the 12V DC supply is connected, even when the main switch is set to 'Off'.

Battery (Option)

The (optional) built-in 12V NiCad-battery receives a controlled charge via the internal voltage supply and is protected against overcharging. When full charge has been achieved, the supply switches over to trickle charging.
 Battery charging should be carried out between temperatures of 0°C and +30°C.
 The battery pack is protected against overheating and short circuit by a non-resetable thermal overload.
 Before the battery is drained (battery voltage <11V), the control lamp on the front panel change from green to yellow. To prevent deep discharge (<9.5V) the pump operation is shut off automatically.
 The operation time at full power is approximately one half hour.
 Recharging the battery takes about 7 hours.
 After long periods of disuse it is possible that the capacity must be newly formatted: Fully charge and discharge once or twice.

Disposal

At the end of the useful life of the equipment, the equipment and its accessories must be correctly disposed of according to local regulations or returned to Ameda AG for correct disposal.



Do not throw used batteries in normal waste, but bring them back to the sales outlet or dispose of as per local regulations.

Operation hours counter

The *elite*'s electronic circuit offers the possibility of reading off the operational hours. The hours when the machine is connected to a supply, but not in operation, will not be counted.

As soon as the On/Off switch is set to 'On', the hours will be counted.

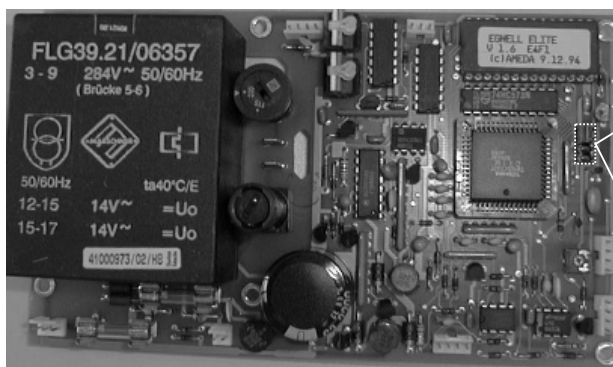
If the supply is interrupted the count is not lost.

If exchange of the electronic board is necessary the count is lost.

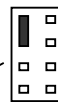
The pump must be opened in order to read off the value: see «Opening the pump».

Reading off the operational hours:

- Disconnect the pump from the mains or 12V supply
- Move jumper J8 to the following position



Jumper J8



Position
Normal operation



Position
Operational hours counter

- Connect the pump to the supply again
- Control lamp LED lights yellow
- Switch the pump on
- Control lamp LED extinguishes

After a short delay the electronics present the operational hours.

The control lamp gives the following indication:

- | | | | | |
|------------------------|----|----------|-------|------------|
| ▪ LED flickering green | => | count of | 1'000 | hour units |
| ▪ LED green | => | count of | 100 | hour units |
| ▪ LED yellow | => | count of | 10 | hour units |

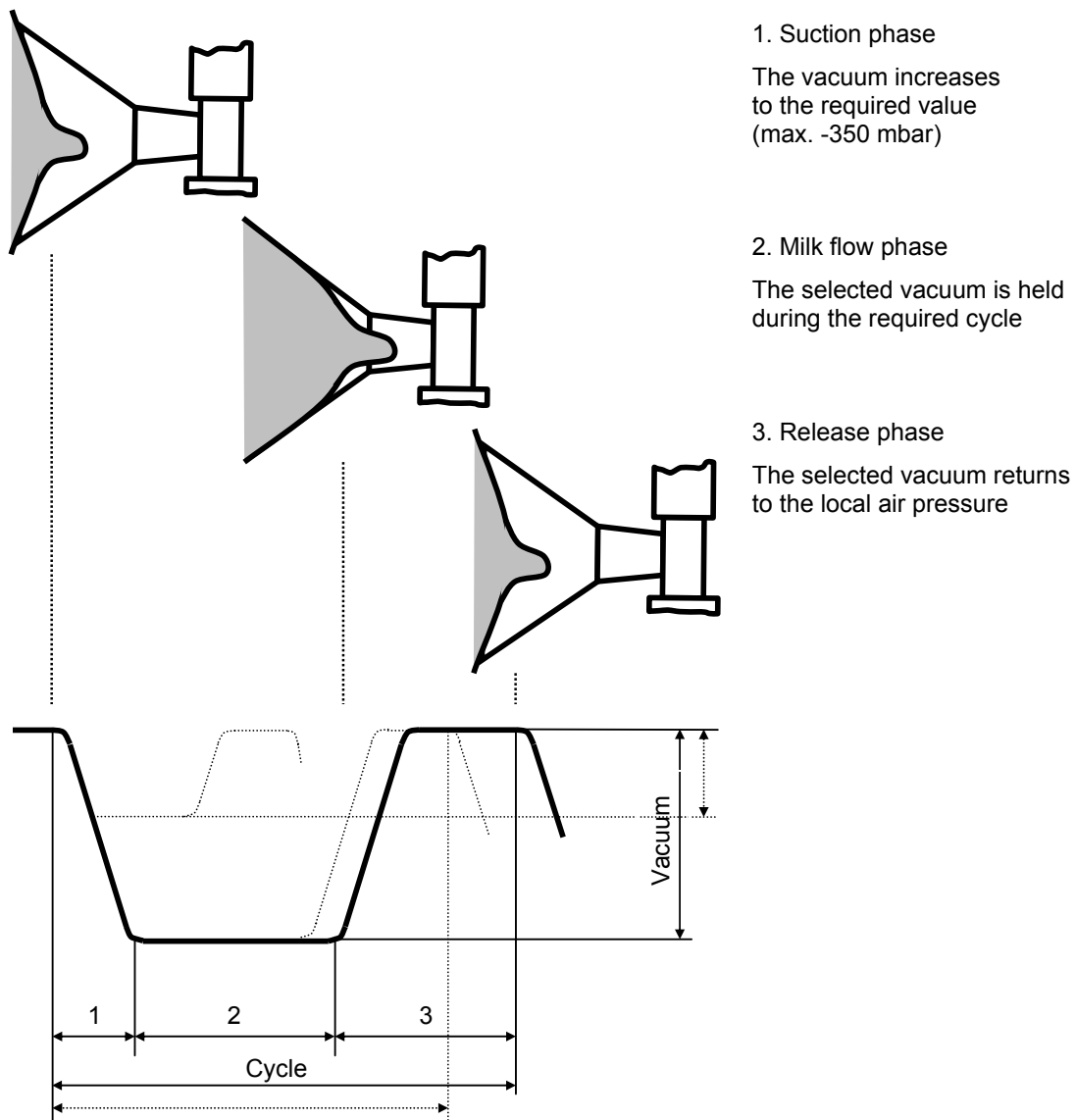
By counting the LED - pulses the operation hours can be calculated.

The output starts again after a short pause, until the pump is switched off again.



- Disconnect the pump from the supply again
- Place jumper J8 in the normal position again

Operating sequence

The operation and mechanical process of the breast pump consists of three phases: the first phase the vacuum build-up, the second phase holding the vacuum and the third phase the vacuum release.



3. Technical Data

Main voltage	220 / 240V ~ / AC or 100 / 120V ~ / AC	
Frequency	50 / 60 Hz	
Power consumption	30 VA	
Main fuse	T 400mA	
Low voltage supply	12V = / DC	
Max. current consumption	1.2A	
Fuse	T 1.6A	
Battery	NiCd 12V / 700mAh	
Minimum operation period	0.5 h	
Recharge approx.	7 h	
Protection class	Class II  Double isolated or with protective conductor for Type UL / CSA (115V~ / AC Hospital Grade)	
Safety level	 = BF	
Drip protection	IP 21	
Operational conditions	+10 - +40°C	10 - 90% rel. humidity
Transport and Storage conditions	- 40 - +70°C	10 - 100% rel. humidity
Weight [kg]	3.0	
Dimensions H x B x D [mm]	175 x 270 x 230	
Vacuum max.	[mbar]	[mm Hg]
Single pump set	350 (-10%)	262
Double pump set	310 (-15%)	232
Variable cycle	30 - 60 / Min	
Accordance with Medical Device Directive	CE 0123	
Conforming to	UL / CSA	

4. Maintenance, Repair

General

Ameda can only assure the user of safety, reliability and serviceability of the equipment when:

- Installation, expansion, new set-up, changes or repairs are performed by their authorised personnel
- The electrical installation of the operational area fulfils the requirements of the relevant IEC standards
- The equipment is utilised according to the operation instructions.

If work is carried out by an authorised service centre, the user must request a report from said centre. The report must provide information relating to type of and reason for service, particularly regarding changes to basic data or operation.

This report must further show the date of service, the company details and signature.

'Precautionary Inspection'

Ameda AG recommends the 'Precautionary Inspections' to carry out at latest two years and to document them; for example in the equipment book, equipment file, etc.

The following points are to be checked:

Casing

- Visual control for breakage, cracks, etc.
- Cylinder externally serviceable and correctly mounted
- Control bottle holder in its support
- Rotary knobs are correctly fixed
- Potentiometers are securely screwed
- All signs and information labels are readable

Electrical

- Check mains cable between equipment and plug for mechanical damage
- Electrical test (only with 115 V ~ 'Hospital Grade' with protective conductor)

Function

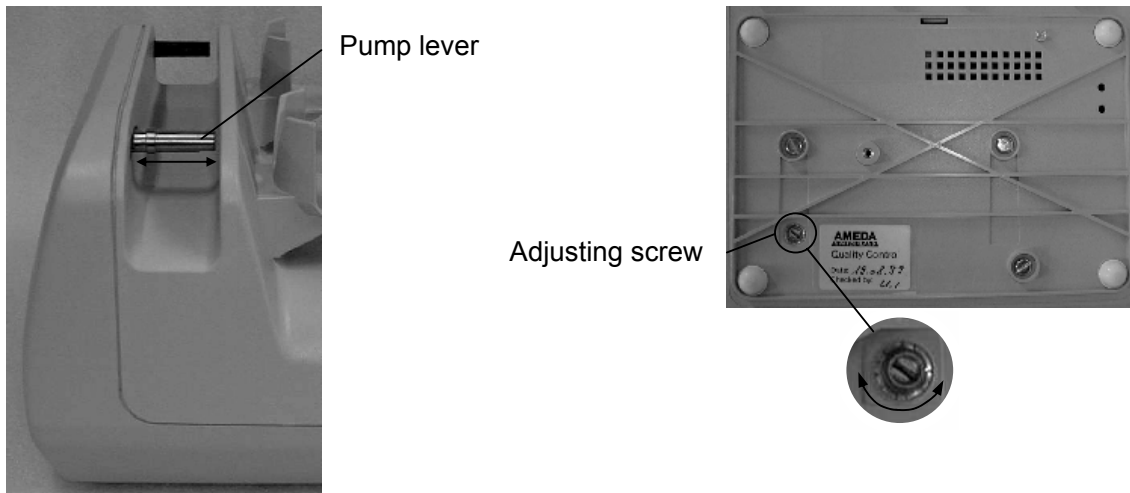
- No abnormal noise
- Vacuum and cycle regulator
- LED green
- Built-in battery (optional)

Mechanical

When the pump lever rubs or scratches against the case when moving, it is adjustable from the outside via the adjusting screw in the casing floor.

The basic setting should be carried out without cylinder. Finally, install the cylinder and connect a single pump set.

The pump lever may not rub with max. vacuum.



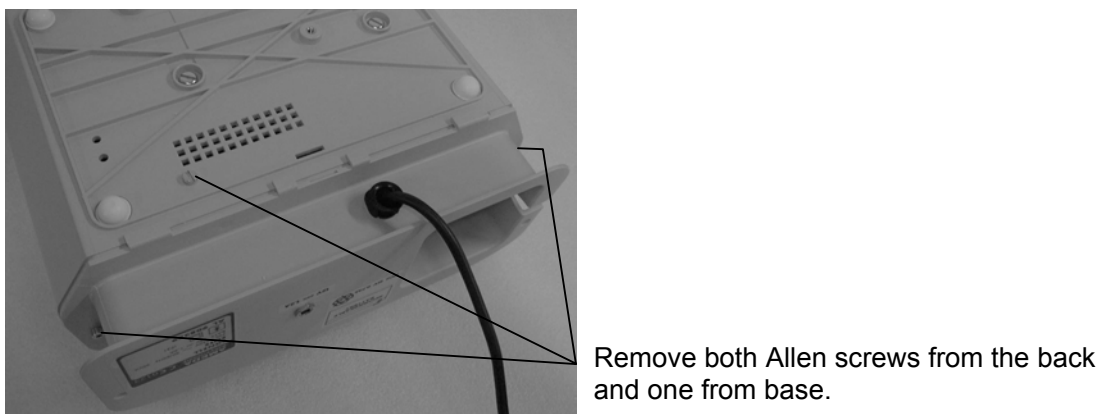
Opening the Pump

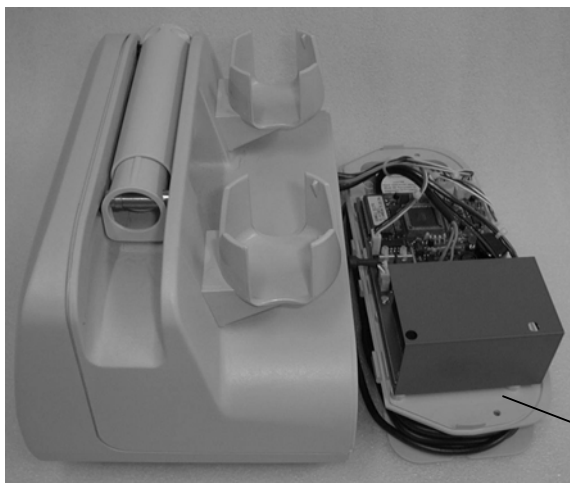
If a failure is found during functional control, and the pump has to be opened, the following instructions must be followed.

Danger

Always switch off the pump before opening.

Disconnect the equipment from the mains or DC supply.

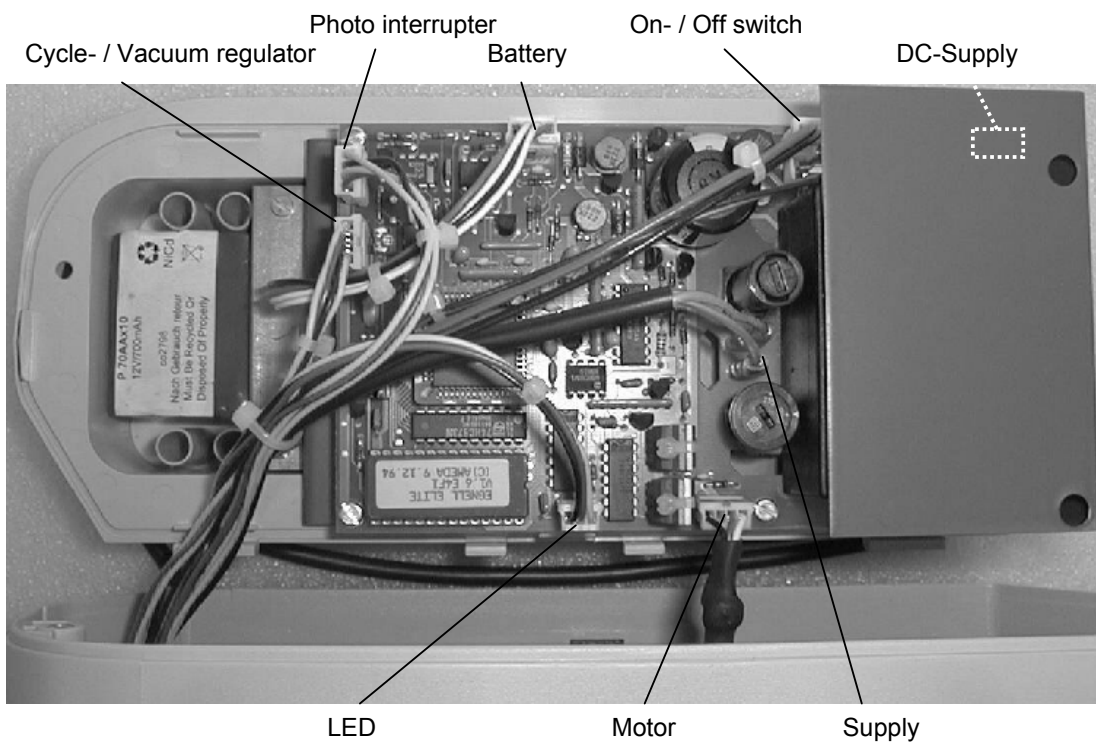




Pull the back housing gently away and lay it flat on the table

Electronic

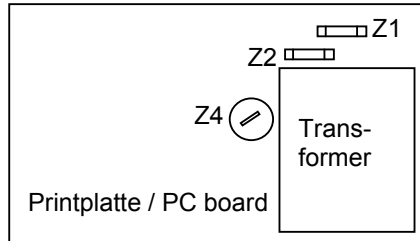
If an electrical or electronic function is incorrect check the connections first.



Troubleshooting

Conditions for the following tests:

All fuses to have a resistance check and to be of correct melt value.



Z1 = T 1.6A 12 V DC extern / external power

Z2 = T 1.6A Transformator sekundär / secondary side

Z4 = T 400mA Netzsicherung / main fuse

* For operation with built-in battery (optional)

Plug in mains cable	Green LED lit	Yes	OK
		No	Supply ok? LED or PC board defect
Plug in 12V DC supply	Green LED lit	Yes	OK
		No	Supply ok? LED or PC board defect
Vacuum regulator to maximum	Pump lever moves to maximum positions	Yes	OK
		No	On- / Off switch ok? Motor plug ok? Motor or PC board defect * battery defect
Reduce Vacuum	Pump lever moves less	Yes	OK
		No	Potentiometer defect
Vacuum to maximum Cycle to maximum	Pump lever moves with max. displacement and frequency (approx. 60 cycles / Min)	Yes	OK
		No	Potentiometer defect
Vacuum to maximum Reduce cycle	Pump lever moves with maximal displacement and reducing frequency (from approx. 60 towards 30 cycles / Min)	Yes	OK
		No	Potentiometer defect
Vacuum to maximum Cycle to minimum	With single pump set measure the vacuum: 350mbar –10%	Yes	OK
		No	Pump set leak? Change cylinder Change belts Readjust

Vacuum to maximum Cycle to minimum	With double pump set measure the vacuum: 310mbar –15%	Yes	OK
		No	Pump set leak? Change cylinder Change belts Readjust

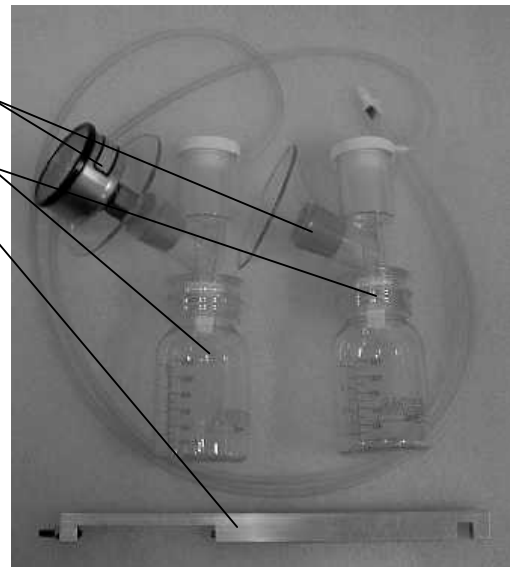
*** Operation with built-in battery (optional)**

Operate the pump with built-in battery* only. Vacuum to maximum Cycle to maximum Connect double pump set	Pump should run for at least 30 minutes on full power. (with fully charge battery)	Yes	OK Wait 'til the LED changes from green to yellow. Finally recharge the battery on the mains; approx. 7h.
		No	*Replace battery

5. Adjusting

Required tools

Art. No.	Bezeichnung	Description
617659	Vakuummeter mit zwei Verschlusszapfen	Vacuum meter
17131	Doppelpumpset	Double pump set



Adjusting basis

To readjust the pump (programming) the pump must be opened.

Move jumper 8 on the board from the position 'Normal operation' to position 'Adjust'.

The vacuum and cycle regulators no longer have their original function. They are no longer vacuum and cycle regulators.

During adjustment the required values from the regulators are saved in the memory.

The vacuum control, meaning the On-/Off switch, switches the procedure of the adjustment step by step forward.

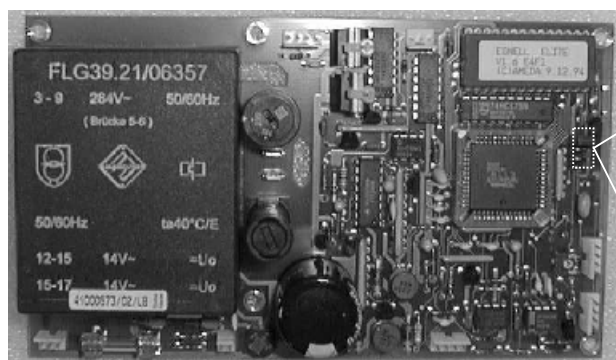
The switching on and off, meaning the program steps, must be strictly adhered to.

If a failure occurs during these steps the adjustment has to start again from step one.

The cycle regulator becomes responsible for the various values and also the maximum vacuum is so set.

Adjustment procedure

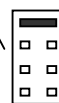
- Prepare the required measuring equipment
- Switch off pump and disconnect from all external supplies
- Open the back housing, as described in «Opening the pump»
- Set the jumper 8 as shown:



Jumper J8

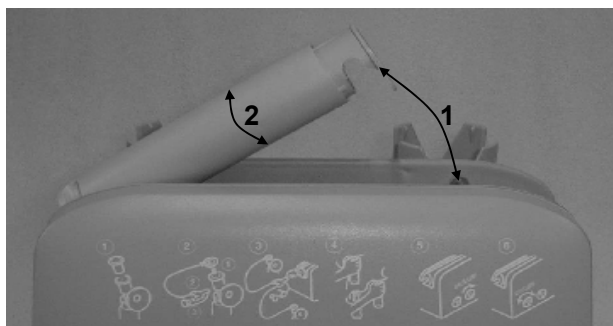


Position
Normal operation



Position
Adjust

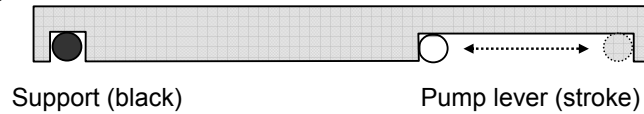
- Remove the cylinder from the pump



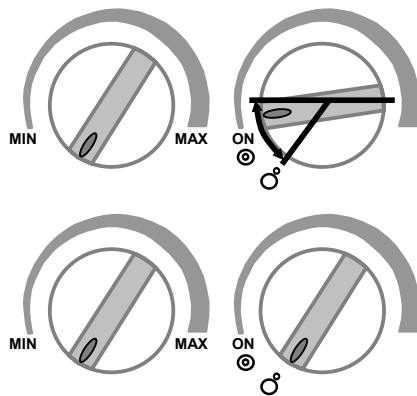
First lift the cylinder (piston) on the side of the pump lever. Then by turning the cylinder release from support. (Don't turn it on the piston!)

Adjustment procedure (continued)

- Push pump lever more or less to centre by hand
- Plug in pump supply (LED must light yellow)
- Lay on adjusting gauge



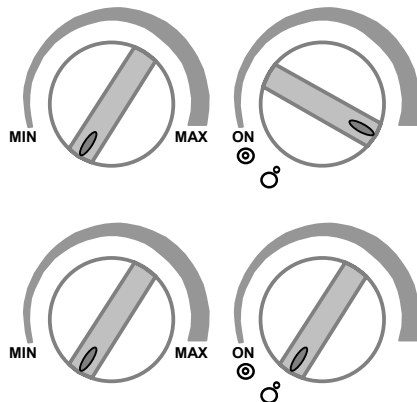
1.



Switch on
(Do not turn control knob past 9 o'clock)

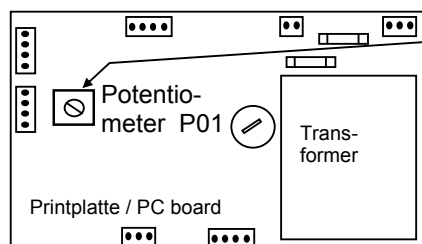
Switch off

2.



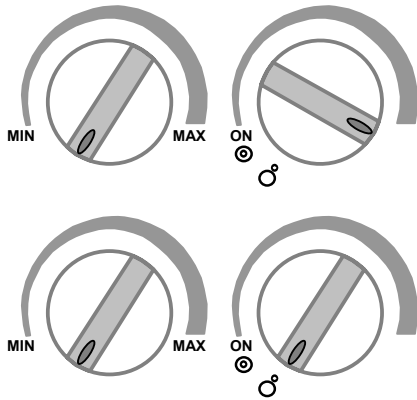
Switch on
Vacuum to maximum
Pump lever moves to the right

Pump lever stops against
adjusting gauge's right hand stop.
Switch off



Turn potentiometer gently until the
control lamp (LED) changes from
yellow to green

3.



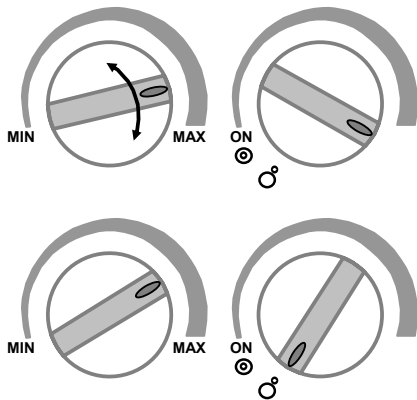
Switch on
Vacuum to maximum
Pump lever moves to the left

Pump lever stops against adjusting
gauge's left hand stop
Switch off

4.

- Remove adjusting gauge
- Set in cylinder
- Connect **single** pump set with test vacuum meter

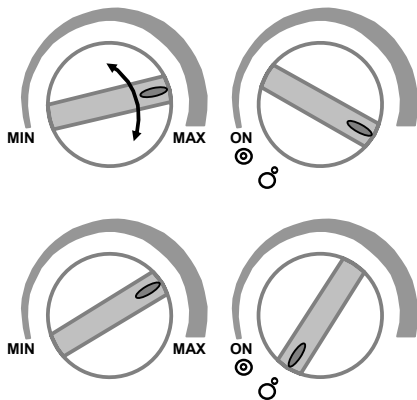
5.



Switch on
Vacuum to maximum
Set the Cycle regulator, so that the
max. vacuum is close to 360 mbar

Switch off
Ventilate cylinder and bellows
in the single pump set

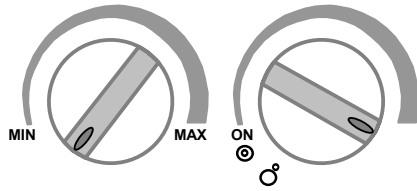
6.



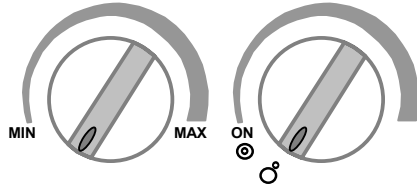
Switch on
Vacuum to maximum
Set the Cycle so that the vacuum
climbs quickly to 330 mbar and then
slowly to 360 mbar

Switch off
Ventilate the cylinder and the bellows
in the pump set

7.



Switch on
Vacuum to maximum
There is no control required
The pump will create 9 high and
9 low vacuums

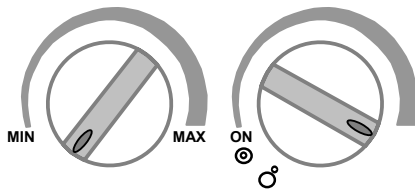


Switch off
Ventilate cylinder and the bellows
in the pump set

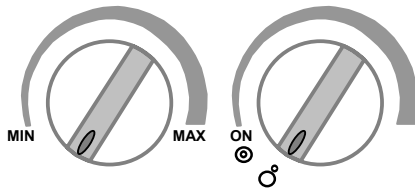
8.

- Connect **double** pump set with
test vacuum meter

9.

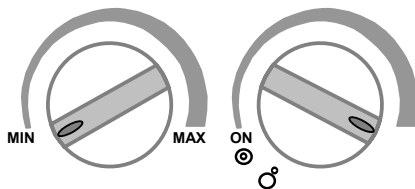


Switch on
Vacuum to maximum
No control is required
The pump will create 9 high
and 9 low vacuums

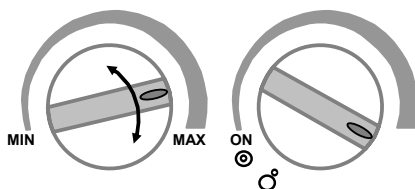


Switch off
Ventilate cylinder and both bellows
in the double pump set

10.



Connect **single** pump set
Switch on
Vacuum maximum
No control is required
The pump creates a certain vacuum

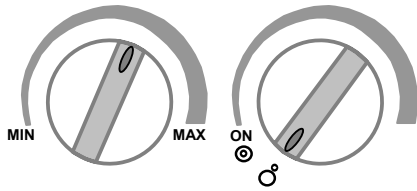


Read the value of the vacuum on the
test vacuum meter

Without switching off the pump,
connect the **double** pump set.
Set the vacuum with the Cycle control
knob to the same value as the single
pump set had.



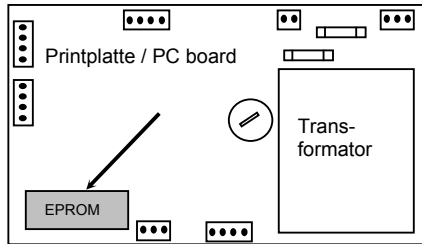
10. (Continued)



Once the double set vacuum is adjusted to the same value as the single pump set, do no more adjust the Cycle regulator.

Switch off

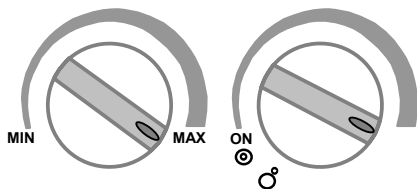
11.



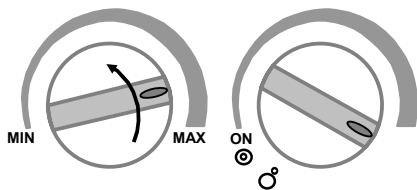
Clarification to step 11

This 11th and last step is only valid with software versions from 1.6. If the SW version is less than 1.6, the step 11 is to be ignored and step 12 carried out.

This set up with step 11, prevents the piston from swing back by the stroke end.



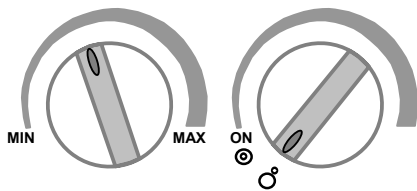
The adjustment is carried out without a pump set, only with an installed cylinder.
Switch on
Vacuum to maximum
Cycle to maximum



Turn the Cycle knob slowly towards the minimum until the cylinder no longer swings over the end of the stroke. Do not reduce further than necessary or there will be insufficient vacuum.



11. (Continued)

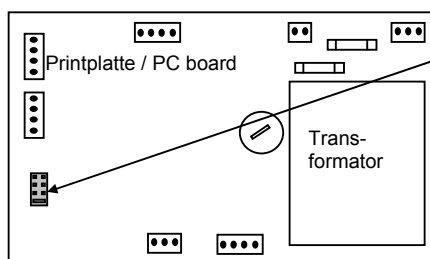


Once the soft end of the stroke is set do no more adjust the Cycle knob.

Switch off

12.

Disconnect the pump from the mains or 12V DC supply.



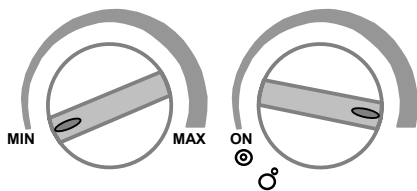
Change jumper J8 from Adjust position to Normal operation position

Adjust

Normal operation

13.

**Reconnect the pump to the mains or to 12V DC supply.
LED must light green.**



Switch on
Vacuum to maximum
Cycle to minimum

Measure vacuum:
Single pump set: 350 mbar –10%
Double pump set: 310 mbar –15%

When the vacuum lies within the given tolerance the pump can be rebuilt.

The adjustment is finished.

Failure occurring during adjustment

Typical failures are listed in the following table which can be caused by or occur during adjustment. Because the interplay between the mechanical and electrical components is very complex, this table cannot be taken as complete and final.

Jumper 8 changed from «Normal operation» to «Adjust»	LED lights yellow	Yes	OK
		No	Supply connected? Jumper 8 correctly set? LED or pc board defect
The LED must change from yellow to green under point 2 in chapter «Adjustm. procedere».	Changes from green to dark	Yes	LED defect (when not) ↓
			pc board defect
	LED stays green	Yes	Support defect (when not) ↓
			pc board defect
At point 5 the vacuum must be set.	It is possible to adjust the vacuum by the Cycle knob.	Yes	OK
		No	Potentiometer defect
Also the maximum vacuum must be set at point 5.	360mbar is not achieved	Yes	Cylinder defect (when not) ↓
			Belts slipping or defect (when not) ↓
			Support defect (when not) ↓
			pc board defect
The soft end of the stroke must be set up at point 11.	The soft end can be set.	Yes	OK
		No	Support defect
	The soft end can be set but the vacuum is insufficient.	Yes	Adjust again (when not) ↓
			Support defect

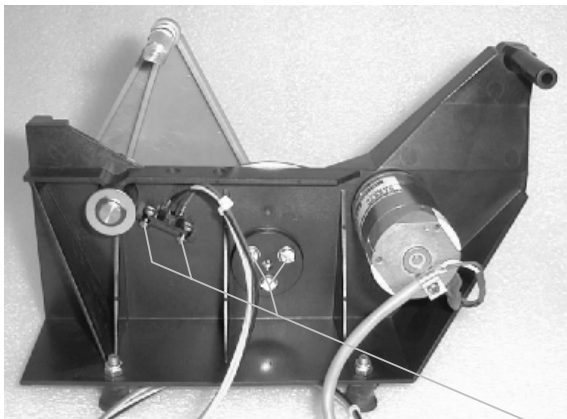
6. Replacing the support

Introduction to the Support

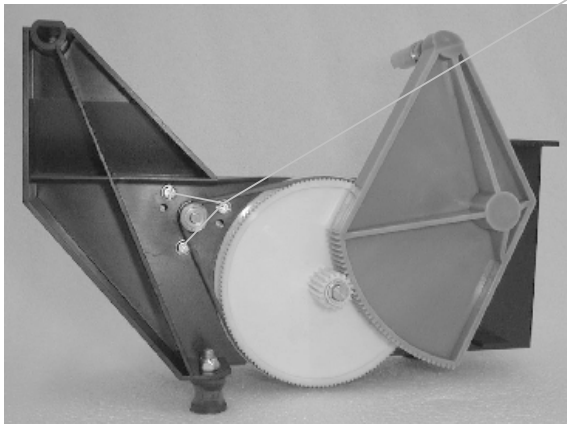
The support is the mechanical heart of the *elite* breast pump. Despite its optically simple mechanics various settings are carried out in the works which cannot be achieved without the relevant knowledge and equipment.

- The distance between the tooth segment and pulley are exactly set over a eccentric cam.
- The current of the motor is exactly measured and adjusted.
- The photo interrupter is dynamically carefully adjusted with an oscilloscope and the screws secured after setting.

Each support has sustained a run in time of two hours prior to delivery. That makes it clear why the support is only available as a complete assembly in the spare parts list.



Do not tighten or loosen these screws !



Replacing the Support

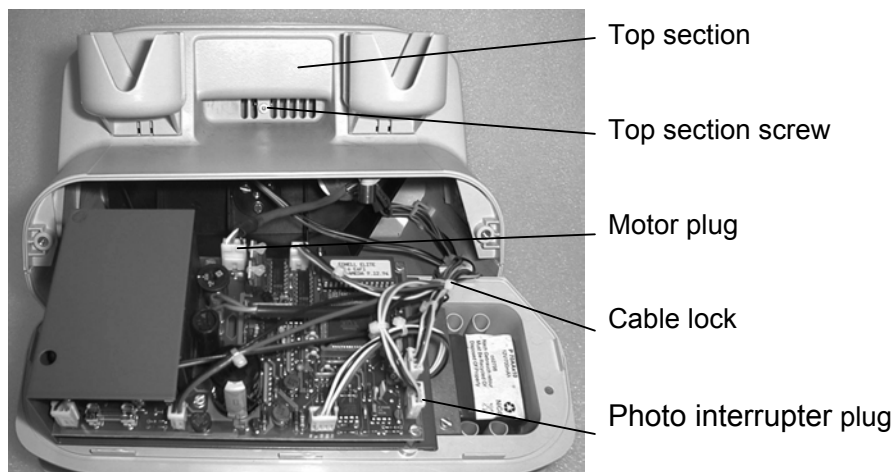
When the support or belts has to be replaced keep to following procedure.

Danger

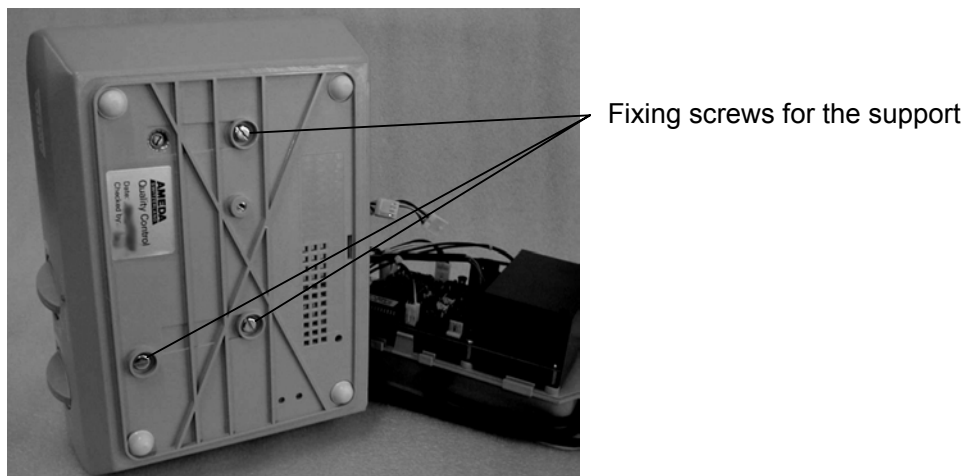
**Always switch off the pump before opening.
Disconnect the equipment from the mains or DC supply.**

Open the pump as described in «Opening the Pump».

- Remove top section screw
- Unplug motor
- Unplug photo interrupter
- Carefully cut cable lock



Push the pump lever against the left hand stop. Pull the top section backwards. Then set the front section to the side and remove the three support fixing screws.



Installing the Support

Installing the support is effectively the reverse of the removal procedure. Take care that the support's rubber feet do not turn when tightening the fixing screws. Once the top section of the housing is remounted, it's possible that the support (pump lever position) must be correctly positioned with the adjusting screw: see description under «Mechanical».

Replacing the support means readjusting (programming) the *elite pump*

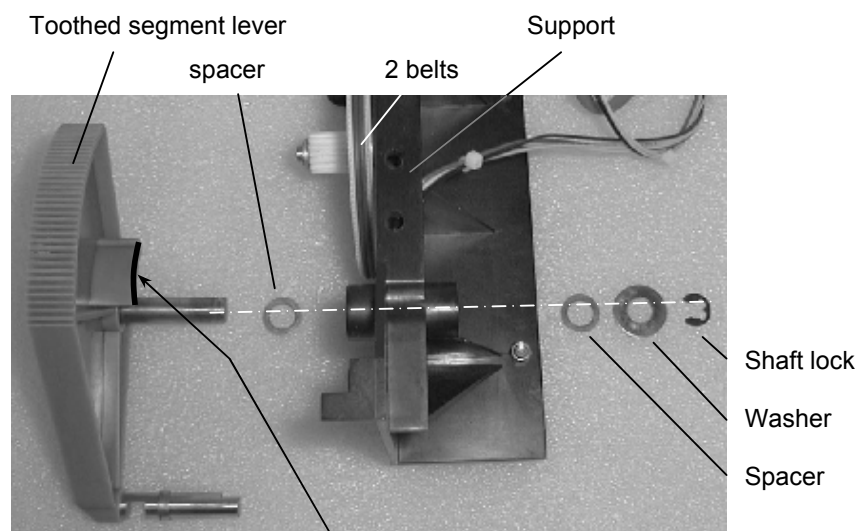
7. Replacing the belts

When the belts have to be replaced, the support must be removed as described in «Replacing the support».

The belts must always be replaced as a pair !

Replacing the belts does not mean readjusting.

- Carefully remove the shaft lock
- Remove the washer and spacer
- Pull the toothed segment lever out of the slide bearing



Keep this surface free from grease, scratches and finger prints (Reflection surface for photo interrupter).

Clean old grease from shaft and bearing.
Smear the shaft with a little grease before assembly.
Tested and recommended grease from Ameda:

Paraliq in tube, 60g each
Art. No. 00010411

8. Replacing the potentiometer

The cycle and vacuum potentiometers are on delivered as one assembly.

The assembly is complete with cables, plugs and fixing nuts.

The support has to be removed in order to replace the potentiometers. The control knobs are fixed with a spring on the shaft of the potentiometers and are pulled off forwards. The shafts are finished with a flat surface to prevent spinning of the knob. When replacing the knob, the flat surface position must be noted.

Cycle-potentiometer:

The thread and turn lock extrusions are finished in plastic. Therefore the nut must be carefully and only moderately tightened.

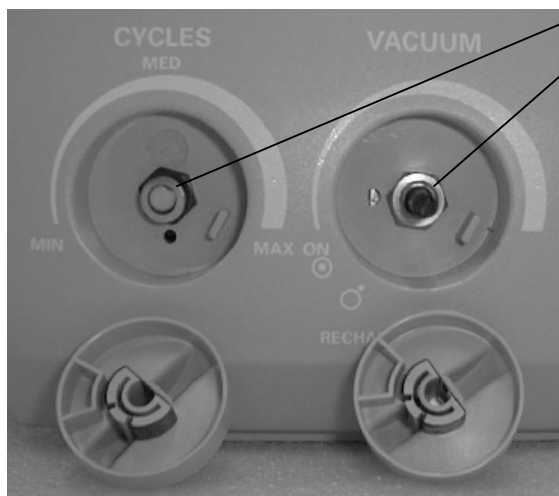
The thread does not have the same size and length as the vacuum potentiometer. So that both knobs will be flush with the front, a special spacer with thickness = 1.5 mm is pushed onto the shaft.

Vacuum-potentiometer:

The thread and turn lock extrusions are finished in aluminium. The nut can be normally tightened.

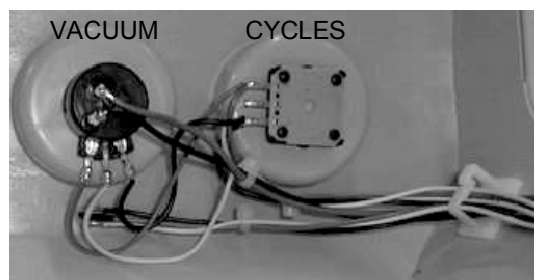
After tightening the first nut the second nut is fitted as a securing nut.

The thread is longer than for the cycle potentiometer, so the knob is flush with the front without a spacer.



Spacer 1.5mm

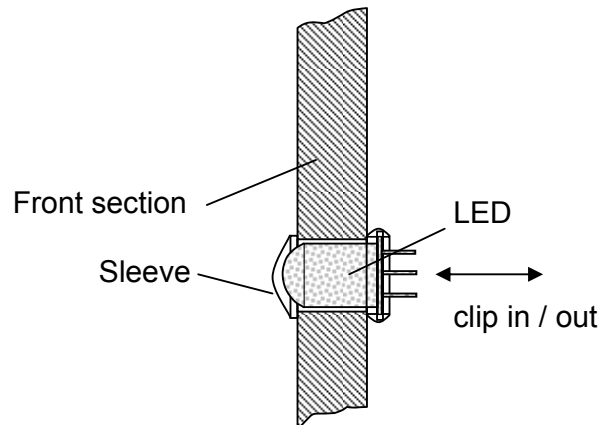
Nut and securing nut



The wiring may not come into contact with the moving parts of the support (chafing through).

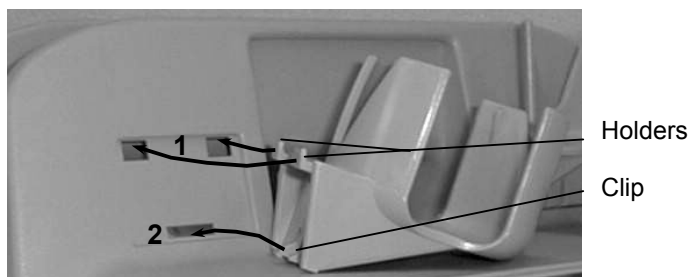
9. Replacing the light emitting diode LED

The support has to be removed in order to replace the control lamp.
 The control lamp (LED) is delivered as a complete assembly with cables and plug.
 This LED is a bicolor version with green and yellow.
 The LED is clipped in a sleeve from inside looking out.



Pay attention after replacing the LED, that the cabling does not come in contact with any moving parts of the support (chafing through).

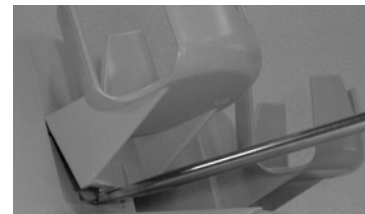
10. Replacing the bottle holder



A broken bottle holder can be simply replaced from outside without opening the pump.
 To replace the bottle holder first guide the holders into the two upper openings, and then pass the clip into the lower house opening.

Tip:

Let the clip slide into the opening over a screwdriver blade (no. 4).



11. Cleaning and Disinfection

The cylinder has to be removed from the pump for cleaning.

Wipe the housing and cylinder with a damp cloth.

Standard household cleaner fluid may be used.

Only use disinfectant which does not contain phenol, for ex. Kohrsolin-solution 3%.

12. Spare parts

Art-No.	Bezeichnung	Description
617024	Oberteil mit Flaschenhalter	Top module incl. bottle holder
616980	Gummifuss weiss	Rubber foot white
617598	Print	PC Board
617026	Flaschenhalter Satz	Bottle holder
617607	Zylinder komplett	Cylinder complete
617514	Akku inkl. Halter	Battery and battery holder
617025	Rückteil komplett, ohne Print	Back housing complete, without PC board
617600	Potentiometer komplett	Potentiometer complete
617601	LED komplett	LED complete
617319	Drehknopf	Control knob
617603	Support komplett	Support complete
617020	Rundriemen	Belt
617023	Frontteil komplett	Front housing complete

Adjusting tools

Art-No.	Bezeichnung	Description
617659	Test-Vakuummeter mit zwei Verschlusszapfen	Test vacuum meter
17131	Doppel-Pumpset	Double Pump Set

Disposable parts (for pump set)

Art-No.	Bezeichnung	Description
620559	Doppelanschluss weiss	Double connector white
402326	Ventil weiss	Valve white

13. *elite* for USA and Canada 'Hospital Grade'

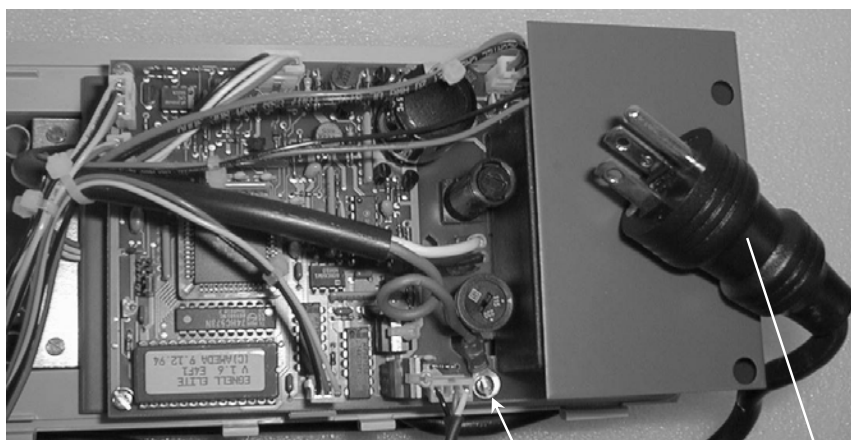
This section is only valid for *elite* breast pumps which are delivered to the USA or Canada.

These 115V ~ AC types are different as follows:

- Two pole mains cable
Double isolated
- Three pole mains cable with earth ground
Type 'Hospital Grade'

The version with the two pole cable is, except for the plug, identical to the European CE-Version.

The 'Hospital Grade' version with a three pole cable is additionally connected an earth ground.



Earth ground connection

Mains plug 'Hospital Grade'

During the 'Precautionary Inspection' or after repairs or service, an electrical test must be carried out.

The electrical test and the maintenance or repairs are to be documented.

Electrical test:

Schutzleiterwiderstand	Resistance of earth ground	< 0.2Ω
Erdableitstrom in Betrieb	Current lost to earth in operation	<100μA