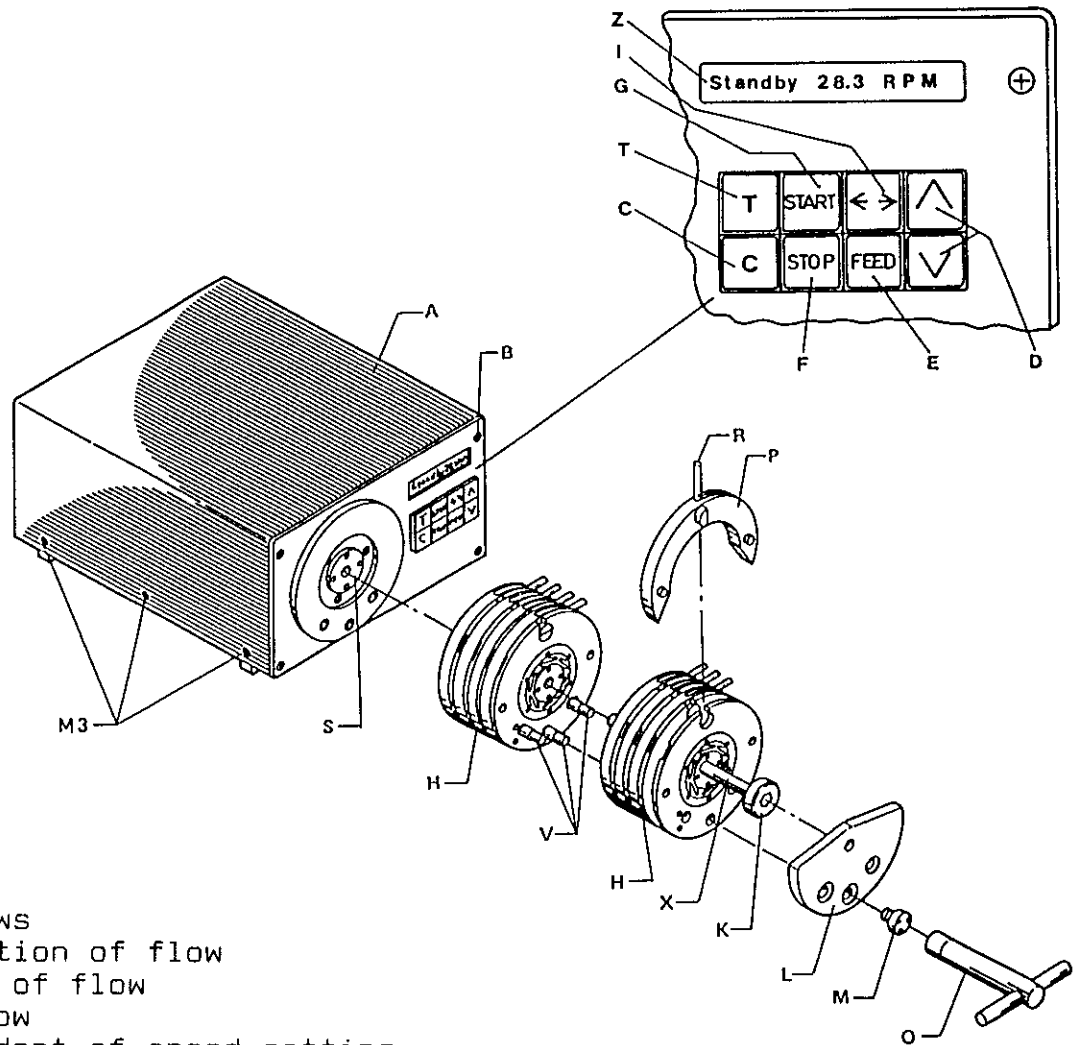


INSTRUCTION
PERISTALTIC PUMP
TYPE 110



- A - Cabinet
- B - M4 screws
- C - Calibration of flow
- D - Setting of flow
- E - Max. flow independent of speed setting
- F - Stop (Standby)
- G - Start
- H - Pump module
- I - Reversing of pump wheel
- K - Ball bearing for pump wheel shaft
- L - Front bearing plate
- M - Cap nut for bearing plate
- O - Special key for securing pump channels
- P - Roller track
- R - Roller track lock
- S - Driving plate for pump wheels
- T - Tube size
- V - M 5 Stay bolts
- X - Pump wheel shaft
- Z - Display

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G E N E R A L

The type 110 Roller Pump is driven by a stepping motor mounted on a gearbox. The speed of the pump wheels are changed steplessly. As standard, the type 110 is delivered with 1 - 20 channels, and with max. speed and number of channels according to requirements. The max. speed of the pump can be changed only by replacing the gearbox.

All functions are controlled by a microprocessor. The control of operations is effected via a keypad and a alpha-numeric LCD display.

The speed setting and diverse service parameters are stored, so that after the main supply has been switched off, the pump will start with the last speed setting or in Standby, depending on the condition before the disconnection. The values set and the functions are updated approx. once every minute. However, the speed setting can be programmed by pressing stop and then start.

The Type 110 can be extended for a larger number of channels than described above. If the pump is desired to be extended, kindly contact us or our agents with regard to flow (speed) requirements and the desired number of channels. Replacement of the gearbox or PROM should be carried out by us or our agents.

The roller pump is designed for use with three different standard pump heads (2 - 3 rollers or 6 rollers minipulse). Consequently, it is possible to cover any demands such as, for example, long tube durability and almost pulse-free dosing.

The pump channels are of module construction. This enables later extension to any number of channels without alteration of the drive unit. Thus it is also possible to extend with combinations of 2 - 3 or 6 roller systems on the same pump.

Pump modules are supplied as spare parts complete with tube holders and pump wheel shaft type 105.07.01 and 3 stays type 105.04.02 corresponding to the desired extension of the pump.

SPECIFICATIONS

Speed of rotation:

Digital setting, absolute accuracy better than 0,25% of the set value.

Re-setting accuracy 100% (quartz precision, better than +/- 0.1 % per month).

Speed stability better than 0,1 % for variations in mains voltage, load and temperature.

Temperature: 0 - 40 °c

Mains voltage: 230 +- 10% Volt AC 50/60 Hz.

Power consumption: 50 W max.

Dimensions: H 130 x B 220 x D 230 mm (without channels).

Weight without channels: 110 SC(R) - 4,0 kg.
 110 AC(R)20 - 4,4 kg.
 110 AC(R)40 - 4,8 kg.
 110 AC(R)80 - 5,3 kg.

Only models with built in dose function

Min. and max. number of doses: 1 - 100.000 or continues.

Min. and max. pause: 0,1 sec. - 9999 hours.

FLOW PER REVOLUTION.

Type 105.B.1 with 2 rollers.

For tube up to max. ID 4 mm or for 2 tubes each ID 1,5 mm.

Wall thickness 0,8 - 1,0 mm.

Tube I.D. mm	0,5	1,0	1,5	2,0	2,5	3,0	4,0
ml per rev.	0,031	0,111	0,25	0,444	0,70	1,0	1,7

Type 105.A.1 with 6 rollers.

For same tube types as above.

Tube I.D. mm	0,5	1,0	1,5	2,0	2,5	3,0	4,0
ml per rev.	0,030	0,08	0,20	0,30	0,55	0,67	1,15

Type 105.L.1 with 3 rollers.

For tube up to max. ID 6,0 mm.

Wall thickness 1,5 mm.

Tube I.D. mm	3,0	4,0	5,0	6,0
ml per rev.	0,95	1,65	2,31	3,3

Flow = Revs x ml per revs.

Pump no: 110-_____ type 110_____ supplied with max.
 _____ rpm. _____ channels type: _____

For the best possible utilisation of the type 110 roller pump, it is important that the following instructions for use be read carefully.

The actual instructions for use are followed by guidance in the rectification of minor operational disturbances.

If the pump cannot be made to function in a satisfactory manner after the guidance has been followed, kindly contact us or our agent.

If the pump is required to be returned for service, it is important that the packing is of good quality, otherwise the pump suspension can be damaged as a result of violent bumps and shock.

Damages and defects arising during transport as a result of poor or inadequate packing cannot be held to be our responsibility.

If during the guarantee period, the pump is interfered with (dismantled) without explicit approval from us or our agent, the factory guarantee will no longer be valid.

We draw the attention to the fact that this pump is for use only in the laboratory, and must not be used for infusion or other purposes in direct contact with patients.

0.0.0 INSTALLATION

- 1.0 Upon receipt of the pump, check for possible transport damage and ensure that the pump voltage (see type label) corresponds with the mains voltage at the place of connection.
 - .1 The pump must be connected to the mains supply earth connection in an approved manner.
 - .2 The ambient temperature must be within the range stated in the specifications (0 - 40°c).
If the pump is required to be used at ambient temperatures outside this range, kindly contact us or our agents.
 - .3 Ensure that there is ample free space around the cabinet. The openings in the backplate and the bottom must not be covered.

1.0.0 OPERATION

- 1.0 Connect the pump to the mains voltage and switch on the main switch (13) in the backplate (see fig. 2 page 12).
 - .1 Check: Text in display.
 - .2 The speed of the pump (flow) is changed by pressing the keys (D). The speed is set stepless by holding the key in until the desired speed is shown in the display. Fine adjustment is possible by pressing the keys in for short periods. If the key (D) is held in for a longer period, the display will show "OUT OF RANGE" for one second and then shortly after, the key is released, the pump will calculate the highest flow which is possible related to the tube bore and pump type used.
 - .3 Rattling and reverberation can arise in the low-speed range. This has no significance with regard to the flow of the pump. However, if dosing is desired to be carried out without noise it is recommended to change to a tube with less clearance, hereby increasing the speed to achieve the same flow. Please note, that if only one channel is in use on a pump with several channels, it is recommended to use the channel furthest away from the drive unit.
 - .4 The direction of rotation of the pump wheels is changed by means of the key marked <->. This can be done without stopping the pump.
 - .5 The FEED key is used for quick filling of the tubes. When the key is held in, the pump will run at max. speed until it is released again. The speed will then fall until the preset value is reached.
 - .6 By pressing the STOP key, it is possible to set the pump in STANDBY without switching off the pump at the main switch. While in the Standby condition, it is possible to preset the speed by pressing the keys (D). (When Volumen dose is chosen the STOP button must be pressed twice).
 - .7 The key (T) is used to select the tubes internal diameter. Press the (T) key and select the tube bore by stepping the keys (D) up or down. When the tube diameter has been selected, press START. The pump will now show the selected channel type ("A", "B", "L" or "XL"). If the pumps stands at DOSING, another press on the START button will show the total dosing time in sec., min or hours. After START has been pressed a third time, the pump will show the selected flow or the selected dose, and is now ready for use.
 - .8 Because of the large tube tolerances, the displayed flow will only be an approximation.
 - .9 In order to bring the displayed flow in agreement with the actual flow, the actual flow must be weighed, and hereafter the (C) button must be held pressed while at the same time the weighed flow is set in the display with the (D) buttons. Release the (C) button.

- .10 The calibration constant will now remain in the backup memory even after disconnection of the mains supply. To change the calibration or to cancel the same, please press (T) key and change tube diameter (as described above). Don't forget to switch back to the original tube diameter in case the same tube continues to be in use.

In addition to the every day functions of the pump (as these are described in the user's instructions section 1.0.3 to 1.1.10), submenus allow to choose the following

- 1.2.0 Display of the speed of the pumping wheels either in RPM or by showing the actual flow in relation to the tubing used.
 - .1 For models having the "DOSE" function, this may be selected at this stage *1).
 - .2 If the "DOSE" setting has been selected, it is possible to choose between "ANTIDROP ON or OFF". If "ON", the pump will reverse lightly after each dose thus sucking the last drop back into tube. If "OFF", the pump will just stop.
 - .3 The actual flow will be shown either in ml/min. or ml/hour. Flows below 1 ml. are always shown in microliter, and whenever dosing, the display automatically switches between microliters, milliliters and liters. In STAND-BY the display shows the selected dose, and during the dosing shows the remaining dose %. (With very short dosing, the remaining dose in % is not shown).
 - .4 Selecting between the different types of channels (A,B,L and XL) should only be done when a type of channel different from the one mounted by the manufacturer is adapted, or if different types of channels are used on the same pump. The selected setting will only be valid for that specific type of channel.
 - .5 Selection of the numerical order of a specific pump is only relevant whenever the same is under remote control from PC or other. (see special RS 232 MANUAL).
- *1). The "DOSE" function is only available on the models featuring G30, G38, G75 and G150 gearboxes.

1.3.0 HOW TO CHANGE THE PARAMETERS OF THE PUMP

- .1 Press [START] and [/\] simultaneously.
The display now shows "SETUP MENU ??".

- 1.3.2 Press |FEED| and choose either "volume", "rotation" or "volumen dose" with arrow keys.
When you have made your choice, press |START| (enter).
- .3 If "Volumen Dose" has been chosen, you may choose "ANTI drop ON" or "OFF" with arrow keys.
When you have made your choice, press |START| (enter).
- .4 Choose "Ref. minutes" or "Ref. hours", with arrow keys.
When you have made your choice, press |START| (enter).
- .5 If "Volumen Dose" is selected, the arrow keys can be used to select "Delay Start" ON or OFF. When the desired selection has been made, press the |START| (enter).
- .5 Choose channeltype "A", "B", "L" or "XL" with arrow keys.
When you have made your choice, press |START| (enter).
- .6 Now the display shows "RS 232" no.: ". Select call number, if several pumps have to be linked together.
(see special RS 232 manual).
When you have made your choice, press |START| (enter).
- .7 Hereafter the pump is ready for use.

NOTICE:

It is of utmost importance that the type of channels in use corresponds to the chosen channeltype. Otherwise, the displayed flow will not correspond to the actual one.

ONLY MODELS WITH BUILT IN DOSE FUNCTION

- 1.3.8 When "volumen dose" is selected on models with dose function, the following parameters can be set by pressing two buttons simultaneously, and hereafter adjust with the arrowkeys:
 - .9 The desired number of doses is selected by pressing the (T) and (C) buttons at the same time. When the correct number has been set, press START (enter).
 - .10 The pause time between doses is selected by pressing of the (C) and STOP buttons at the same time. When the correct time has been set, press START (enter).
 - .11 When the "volumen dose" is selected, the pump automatically sets the dosing speed at max. If a slower dosing speed is desired, this is selected by pressing of the (STOP) and (FEED) buttons at the same time. When the correct dosing speed has been set, press START (enter).
 - .12 If it is desired to stop the pump in the middle of a programme sequence, this can be done by pressing the STOP button once. The pump will stop immediately. Hereafter, when the START button is pressed, the dosing will continue from that place in the programme sequence at which the STOP button was activated. To exit from a programme sequence, the STOP button must be pressed twice.

2.0.0 TUBES

- 1.0 The pump tubing must be of good elastic quality. For roller tracks type B1 and A1, we recommend the use of a silicone rubber tube with a wall thickness of 1.0 mm and a max. outside diameter of 6 mm. For roller tracks type L1, a wall thickness of 1.5 mm and a max. outside diameter of 9 mm are recommended.
 - .1 Calibrated pump tubes specially produced for roller pumps can be used with advantage in pump type 110.

3.0.0 MOUNTING OF PUMP TUBES

- 1.0 Turn the rollertrack lock (R) upwards and draw the roller track (P) out of the module by means of the rollertrack handle.
 - .1 Place the pump tube down in position in the module (H), then press the roller track (P) down in the module and lock it by means of the rollertrack lock (R).
 - .2 For tubes with less than 1.0 mm inside diameter, pull the tube approx. 5 mm out at the tube holder. This ensures that the tube lying correctly in the roller track.

The correct roller pressure and retention is established automatically.

- .3 Each individual tube can be replaced separately without influencing the remaining channels.
- .4 It is not necessary to stop the pump when changing tubes.
- .5 The pump can operate with just as many different tube dimensions (flow) as the number of channels.

4.0.0 POSSIBLE PUMP FAILURES AND CAUSES

- 1.0 Check the following points:
 - .1 Mains voltage according to type label on pump.
 - .2 Power lead must be pressed completely to the bottom of the mains socket at the rear of the pump.
- 4.1.3 Fuses (2 ea.) must be in order. see: fig. 2 (15)+(16)

Pumpe model 110SC(R): 2 stk 250 mA T.
Pumpe model 110AC(R)20: 2 stk 250 mA T.
Pumpe model 110AC(R)40: 2 stk 500 mA T.
Pumpe model 110AC(R)80: 2 stk 800 mA T.
 - .4 Failures in electronics, motor or gearbox.
 - .5 Tube or foreign bodies jammed between pump wheel and pump section (dismantle roller track).

4.2.0 VARYING AND UNSTABLE FLOW WHEN TUBES OF THE SAME DIMENSIONS ARE USED IN ALL CHANNELS

- .1 Incorrect quality of tubes (see section 2.0.0).
- .2 Oval tube cross-section (worn tube).
- .3 Failure at pump wheel.
- .4 Pressure rollers are out of adjustment.
- .5 Pressure rollers and guide rollers are jammed - lubricate with thin oil.
- .6 Pressure roller jammed - cannot be moved forwards by the spring pressure because of impurities. (see: section 5.2.4).

4.3.0 THE TUBE "WANDERS" THROUGH THE PUMP

- .1 Incorrect quality of tube. (see: section 2.0.0).
- .2 Dirt (fluid) between the tube and the tube holder 105.01.03
- .3 The tube holder is jammed because of impurities. (see section 5.1.0 - 5.1.1 and 5.2.0.)

4.4.0 TUBE RUPTURE

- .1 If a tube rupture results in escape of liquid, the pump channels must be dismantled and cleaned. see: section 5.2.0
- .2 If a tube rupture results in **corroding liquid** penetrating pump wheels, tube holders etc., one must immediately limit any damage by thoroughly rinsing with clean water before dismantling.

IMPORTANT! ISOLATE MAINS SUPPLY BEFORE RINSING WITH WATER.

5.0.0 MAINTENANCE

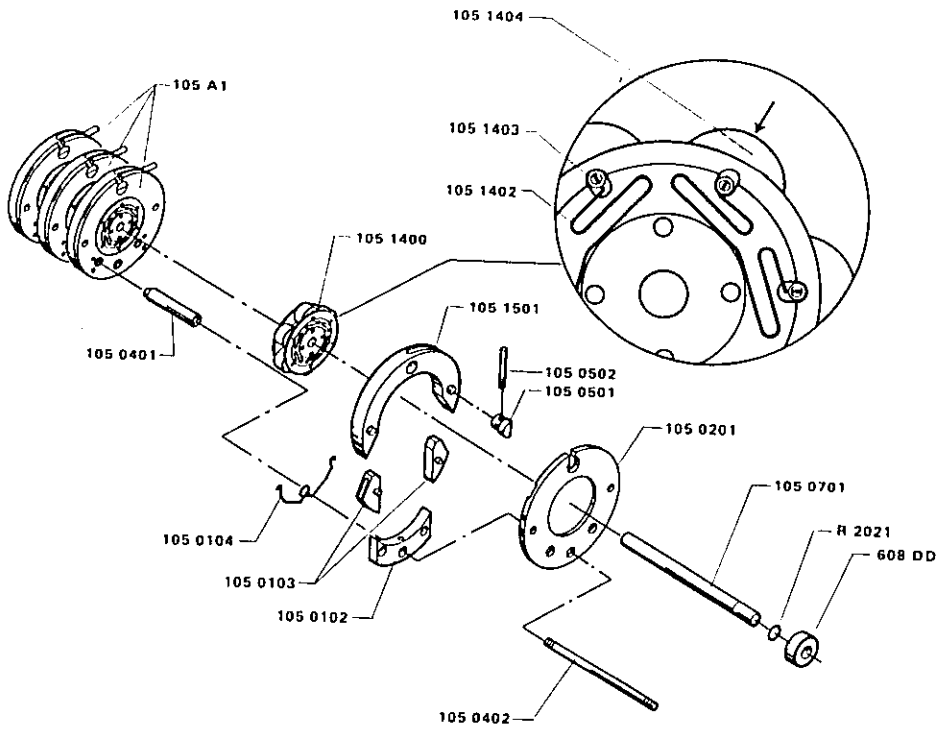
- 1.0 The bearings in the pump, the motor and the gearbox are one-shot lubricated.
 - .1 The tube holders 105.01.03 must be able to move freely forwards and backwards, and must therefore be inspected at regular intervals.
 - .2 Without the tube mounted, the springs 105.01.04 must be able to press the tube holders 105.01.03 into position and flush with the outer diameter of the module.
 - .3 If the tube holder 105.01.03 gets jammed or it moves sluggishly, the pump channels must be separated and cleaned. (See section 5.2.0 - 5.3.4)

5.2.0 DISMANTLING THE PUMP MODULES

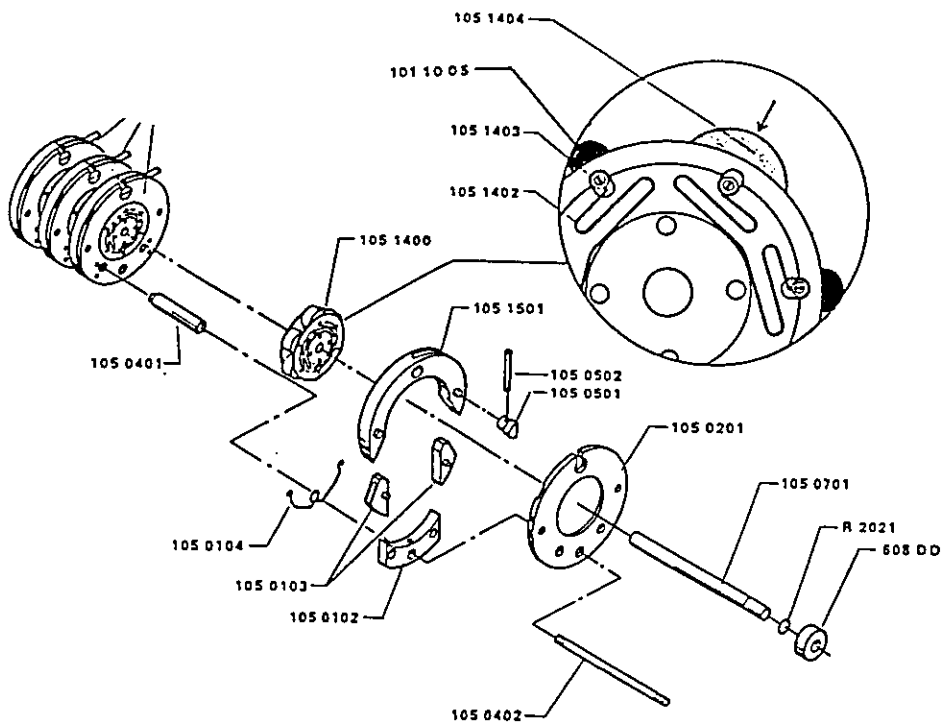
- .1 The pump modules (H) are dismantled by removing the cap nuts (M) by means of the key (O).
- .2 Remove the front bearing plate (L) and the pump wheel shaft (X) from the module.
- .3 Carefully press out the guide bushes 105.04.01. This completes the separation of the modules. **The use of metal tools must be avoided.**
- .4 Checking and cleaning of pump wheels.
- .5 Dry off the pump wheels and check for damage.
- .6 Check that pressure rollers and guide rollers rotate very easily.
- .7 Check that when the pressure roller system is pressed inwards, the spring is very easily able to press it back again.
- .8 Lubricate all moving parts of the pump wheel with thin oil.
- .9 Check and clean the remaining parts of the pump module.
- .10 All parts (with the exception of pump wheels) can be washed off with lukewarm soapy water.

5.3.0 ASSEMBLY OF THE PUMP MODULE (see: fig.1)

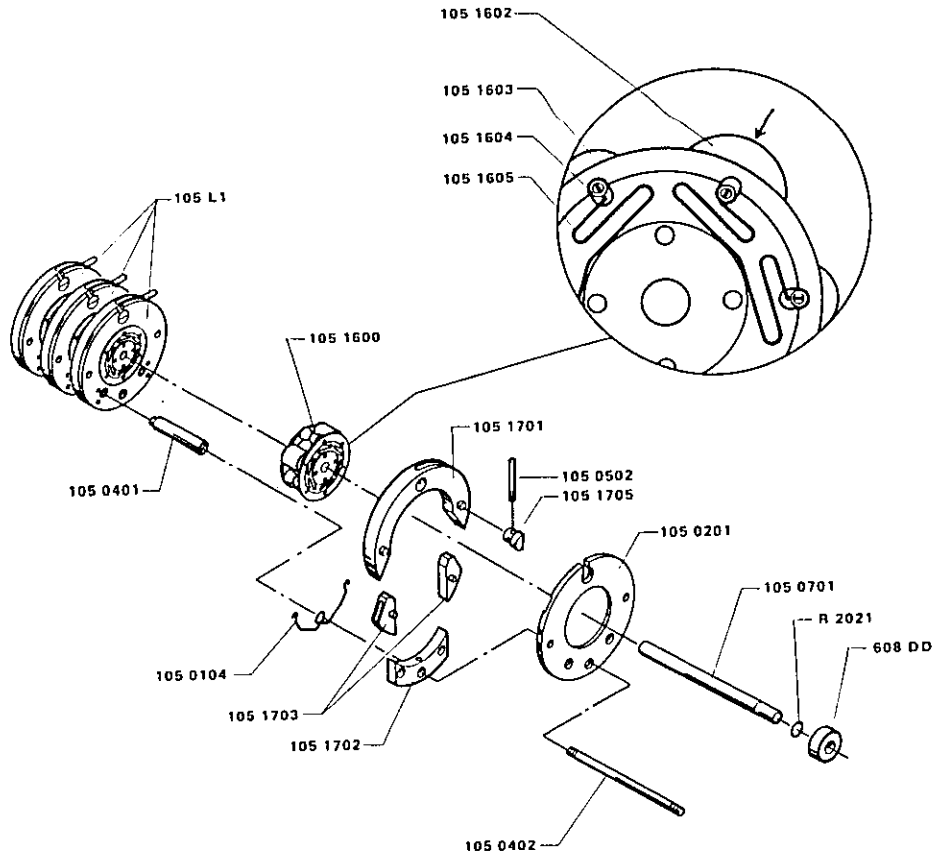
- .1 When assembling the pump module, the central guide bush 105.04.01 and the spring 105.01.04 should not be fitted.
- .2 When the module has been built up, press the central guide bush into place while at the same time inserting the springs in their respective grooves.
- .3 Screw the stay bolts (V) without cap nuts (M) into the frontplate of the pump.
- .4 Place the pump module (H) on the stay bolts (V) and ensure that the guide bushes enter the holes in the frontplate, while at the same time the pins in the pump wheel enter the holes in the driving plate (S). If the roller tracks pinch, tighten the lowermost cap nut slightly more than the uppermost cap nuts. Test the tube holder 105.01.03 according to point: 5.1.1 - 5.1.3.



CHANNEL TYPE 105.A1



CHANNEL TYPE 105.B1



CHANNEL TYPE 105.L1

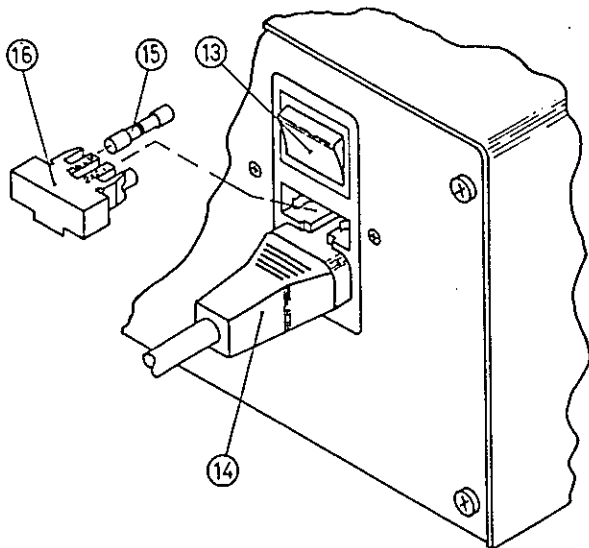


FIG. 2

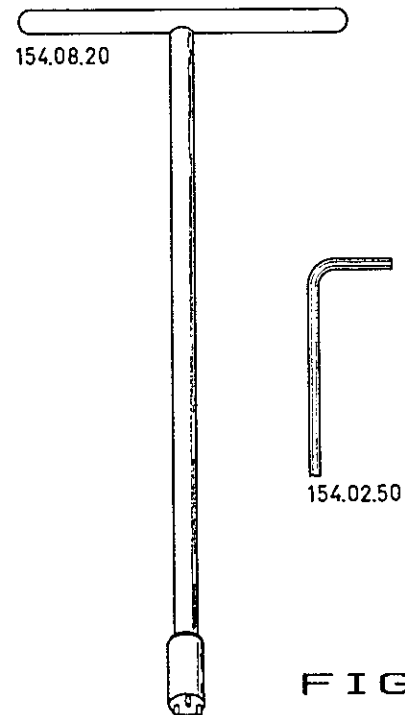


FIG. 3

INSTRUCTION SWITCH CONTROL

The 110 pumptype are delivered with a DSUB connector, allowing external control using simple switch/relay-boxes or timer units.

CABLING.

Pump module: DB9 Female

Pin Description

1	Chassis ground	
2	SW5 - Stop	input
3	SW4 - Reverse	input
4	SW6 - Start	input
5	SW3 - Feed	input
6	Reserved	
7	Ext. ground	
8	Reserved	
9	Dose stop	output

CONTROL INPUTS

The pump is controlled making switch closures from function input pins to ext. ground pin. A continuous signal is required on inputs Feed and Reverse, and a pulsed signal on inputs Start and Stop.

IMPORTANT!

To control the pump properly, make sure that the front panel Forward/Reverse switch is deselected (not locked).

The front panel switches Reverse, Start, Stop and Feed operate in parallel with external switches, so don't touch during an external controlled session. The front panel STOP key acts as an emergency stop. The pump is stopped and will not start again before the proper input line is activated.

CONTROL OUTPUT

In dose mode, the Dose stop output is activated approx. 0.5 sec. when the dose is finished (and the pump is stopped).

ELECTRICAL SPECIFICATIONS

Inputs.

When open, the switches is internally pulled up to approx. 12 V.
When closed, approx. 10 mA is running through the switch.

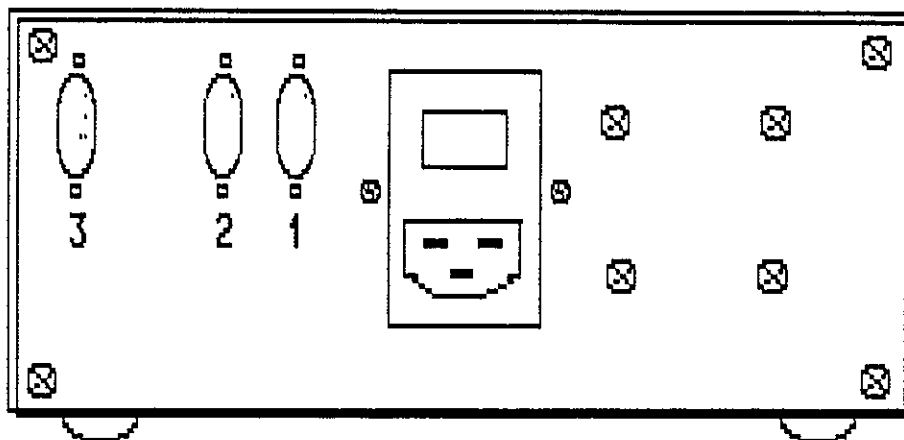
DON'T CONNECT AN EXTERNAL POWER SUPPLY TO CONTROL INPUTS !

Output.

NPN open collector transistor. Emitter connected to ext. ground.

Switch current: max. 100 mA.
Saturation voltage: max. 1 V.
Switch supply voltage: max. 30 V.

SWITCH CONTROL USE PORT NO. 3



S P A R E P A R T L I S T

105.A.1	Single channel complete 6 roller.
105.B.1	Single channel complete 2 roller.
105.L.1	Single channel complete 3 roller.
105.00.05	Rollertrack complete type "B".
105.01.02	Distance piece for type "A" and "B".
105.01.03	Tube holders (1 set) for type "A" and "B"
105.01.04	Spring.
105.02.01	Dividing plate.
105.04.01	Guide bush set (3pcs).
105.04.02	Stay bolt for modul set (3pcs).
105.06.01	Front bearing plate.
105.07.01	Shaft for pump wheels.
105.08.01	Cap nut for bearing plate.
105.14.00	Pumpwheel type "A" 6 roller.
105.14.02	Spring for type "A" and "B"
105.14.03	Shaft for pressure roller for type "A" and "B"
105.14.04	Pressure roller for type "A" and "B"
105.14.10	Pumpwheel type "B" 2 roller.
105.15.00	Rollertrack complete type "A".
105.16.00	Pumpwheel type "L" 3 roller.
105.16.02	Pressure roller type "L"
105.16.04	Shaft for pressure roller type "L"
105.16.05	Spring type "L"
105.17.00	Rollertrack complete type "L".
105.17.02	Distance piece type "L"
105.17.03	Tube holders (1 set) type "L"
110.00.01	Main control board ex. cables.
110.00.05	Keyboard complete ex. cables.
110.08.01	MEC switch.
110.08.02	Display ex. cable.
110.08.04	Transformer ex. cables.
110.08.05	Cable for keyboard.
110.08.06	Fan.
110.08.07	Cable for display.
110.08.10	RS-232 link set complete.
110.SAS.	Motor and gearbox complete for pump type 110AC(R) please state pump serial no.
110.UFB.30	Motor ex. gearbox for pump type 110SC(R).
110.SAI.F	Gearbox for pump type 110SC(R) Please state serial no.
154.08.20	Key for cap nuts.
157.12.06	Main switch.

CONDITIONS OF GUARANTEE

Should this apparatus be found to have defects or deficiencies, use can be made of the guarantee as stipulated in this written guarantee.

The guarantee does not restrict your rights with respect to prevailing law.

PERIOD OF GUARANTEE

This guarantee is valid for 12 months from the documented date of purchase from us or our agents.

EXTENT OF GUARANTEE

Our service department or our agents undertake at our expense to rectify production or material failures which can be ascertained in normal use of the apparatus.

When possible failures are to be rectified, the purchaser must at his own expense and risk deliver the apparatus with reference to its date of purchase and serial number to our service department or to the agent from whom the product was purchased. If the apparatus is to be dispatched or transported for service (repair), the packaging instructions must be closely adhered to. If the pump is to be transported for service, it is important that the packing is of good quality, otherwise the pump motor suspension can be damaged by bumps and jolts. Damages and defects which arise during transport (dispatch) as a result of incorrect or inadequate packing etc. are not covered by the guarantee.

Repairs effected under the guarantee will be carried out free of charge. The repair will not extend nor give rise to a new start date for the period of the guarantee. Parts which are replaced will become our property. After repair, the apparatus will be returned at our expense.

THE GUARANTEE DOES NOT COVER

Defects or damages arising directly or indirectly as a result of incorrect operation or use, or inspection of the apparatus as prescribed in the instruction for use.

Defects and damages arising as a result of the ingress of water, incorrect installation or connection, or as the result of fire, accident, lightning, extraordinary voltage variations or other electrical disturbances such as, e.g. defective fuses in the electrical power supply installations, and repair or other maintenance not carried out by us or our agent, without our written consent.

DATE OF PURCHASE:

STAMP:

INVOICE NO.

TYPE/SERIAL NO.

AGENT:

INSTRUCTION RS232 REMOTE CONTROL

Functional specification

(Rev. 92-01-09)

GENERAL DESCRIPTION.

The 110 pump can be delivered with a RS232 data port, allowing intelligent remote control from a PC or equivalent.

In the standard version up to 9 pumps may be connected to one RS232 line, and individually controlled. Daisy chain technique is used. In this way only 1 PC COM port is used to control 9 pumps. Pump no. is manual set from the front panel, using the Setup menu. Mode switching between manual and auto mode is controlled from the RS232 line. In AUTO mode all front panel keys (except the STOP key) is inactive. If the STOP key is activated, the pump stops and mode is switched to MANUAL.

Simple ASCII strings are used for communication between the PC and the pump. All data characters transmitted and received are 7 bit ASCII code (only uppercase characters are recognized).

Received characters may be echoed or not to check transmission. All pumps accept pump no. '0', but no response is transmitted in that case. Use this no. to initialize all pumps, then use individual no's to control different pumps. All pumps connected to the chain must be switched on to enable RS232 amplifiers.

CR (0D hex) is string terminator. This terminator starts command execution and clears the input buffer. Strings longer than 18 characters (excl. CR) are not accepted (truncated). Any LF (0A hex) is skipped.

Don't transmit a new command before an accept/reject (or status plus accept/reject) command is received from the pump module.

Transmission parameters:

Type : RS232
Baudrate : 9600
Databits : 7
Parity : Space
Stopbit : 1
Handshake : None
Protocol : Character Echo and Response string.
Default: Echo on.

Cable for Communication between Pump and PC:

Use a PC to PC 9 pin/9 Pin or 9 pin/25 pin Female/Female PC/PC link cable.

Cable for Communication between Pumps:

Use a 9 pin/9 pin Female/Female PC/PC link cable.

Pump module: DB9 Male PC COMX: or Pump module: DB9 Male

Pin Description	Pin Description
3 TxD (out) _____	2 RxD (in)
2 RxD (in) _____	3 TxD (out)
5 Signal Ground _____	5 Signal Ground

Pump module: DB9 Male PC COMX: DB25 Male

Pin Description	Pin Description
3 TxD (out) _____	3 RxD (in)
2 RxD (in) _____	2 TxD (out)
5 Signal Ground _____	7 Signal Ground

ASCII CONTROL CODES

@. Auto / Manual Selection.

No	Code	Description
1	@	Command identifier
2	n	Pump no.
3	x	Command. M: Select Manual mode. R: Select RS232 mode.
4	CR	End of Command

C. Set Calibration constant.

No	Code	Description
1	C	Command identifier
2	n	Pump no.
3..7	fix	Calibration constant (0.500 - 2.000) Default: 1.000
8	CR	End of Command

D. Dose set.

No	Code	Description
1	D	Command identifier
2	n	Pump no.
3..y	float	Dose value in ml.
y+1	CR	End of Command

E. Echo On/Off.

No	Code	Description
1	E	Command identifier
2	n	Pump no.
3	x	Command. E: Select echo on. N: Select echo off.
4	CR	End of Command.

F. Forward start.

No	Code	Description
1	F	Command identifier
2	n	Pump no.
3	CR	End of Command.

G. Get status.

No	Code	Description
1	G	Command identifier
2	n	Pump no.
3	CR	End of Command.

Status response transmitted.

No	Code	Description
1	G	Response identifier.
2	n	Pump no.
3	x	Pump channel. A, B, L or X(L).
4..6	x.x	Tube bore. 0.5 to 12 (mm)
7	x	Speed mode. D: Dose, Anti drop On. d: Dose, Anti drop Off. R: Rotation. V: Volume.
8	x	Time unit. H: Hour. M: Minute.
9	x	Condition. C: Calibrate. D: Dose running. F: Forward. R: Reverse. P: Pause (Dose mode) S: Standby. >: Feed forward. <: Feed reverse.
10..y	float	Programmed speed value (floating point).
y	,	Comma separator.
y+1	fix	Programmed calibration constant (0.500 - 1.000)
y+6	,	Comma separator.
y+7	float	Programmed dose value (floating point).
z	CR	End of status response

M. Mode set.

No	Code	Description
1	M	Command identifier.
2	n	Pump no.
3	x	Speed mode. D: Dose, Anti drop On. d: Dose, Anti drop Off. R: Rotation. V: Volume.
4	x	Time unit. M: Minute. H: Hour.
5	CR	End of Command.

T. Tube set.

No Code Description

- 1 T Response identifier.
- 2 n Pump no.
- 3 x Pump channel. A, B, L or X(L).
- 4 x Tube bore table no. (1..7).
If tube bore is changed, calibration constant is set to
default value 1.000 . 5 CR End of Command.

V. Version.

No Code Description

- 1 V Command identifier
- 2 n Pump no.
- 3 CR End of Command.

Version response transmitted.

No Description

- 1..y ASCII string describing
pump hardware and software.
- y+1 CR End of response

W. Write display.

No Code Description

- 1 W Command identifier
- 2 n Pump no.
- 3..18 Text.. Display text ASCII
- 19 CR End of Command.

X. Feed.

No Code Description

- 1 X Command identifier
- 2 n Pump no.
- 3 x Command. S: Set feed.
R: Reset feed.
- 4 CR End of Command.

Y. Test. (for service use only, not specified)

No Code Description

- 1 Y Command identifier
- 2 n Pump no.
- 3 !
- 4 CR End of Command.

Z. Clear display (Zap).

No	Code	Description
1	Z	Command identifier
2	n	Pump no.
3	CR	End of Command.

General reply on commands (Transmission OK):

No	Code	Description
1	\$	Accept identifier.
2	n	Pump no.
3	CR	End of response

General reply on commands (Transmission NOT OK):

No	Code	Description
1	?	Reject identifier.
2	n	Pump no.
3	CR	End of response

Comments:

Floating point format IEEE. Max no. of characters recognized:
0.1234567E-xx.

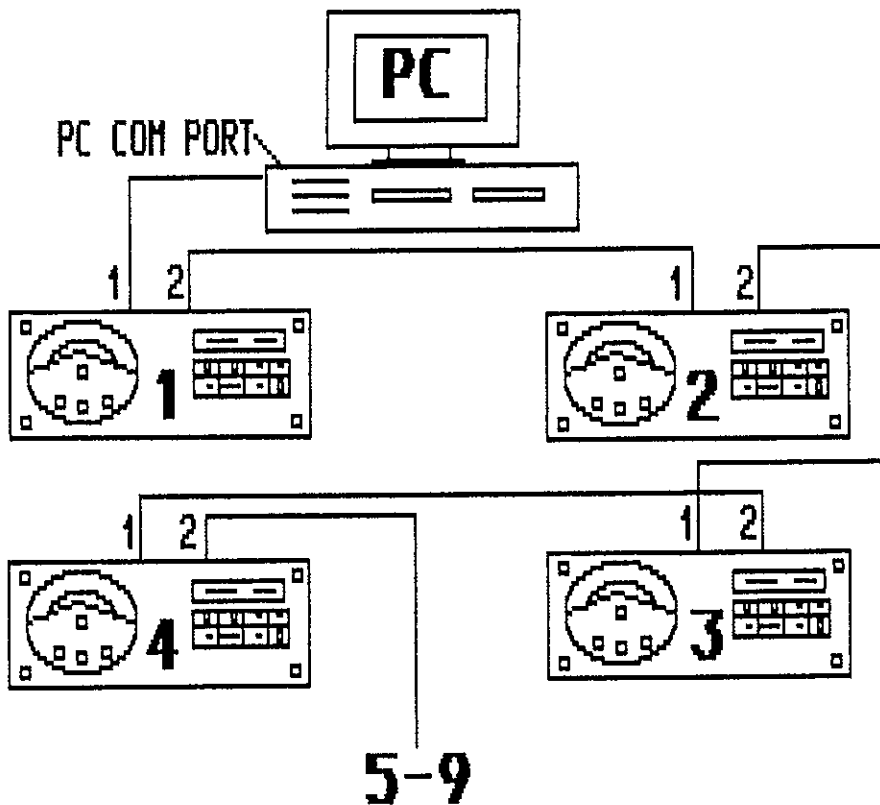
Examples of allowed strings:
0.1234E2, 0.1234E-1, 1.2345, 0.01234, 12.3

Always make status reads to be sure that pump is in the mode selected.

In dose mode, use Query Dose instead of Get status, to speed up transmission time.

RS232 library drivers written in C or Pascal are available upon request.

Up to 9 pumps can be connected to one RS232 line.



Connect the data port no. 1 to the PC'er or equivalent.

Connect data port no. 2 to data port no. 1 on the next pump in the chain.

