Service Manual for Syringe Pump
ARGUS 600 S

Made in Switzerland

CE 0120

ARGUS MEDICAL

ARGUS Medical AG, CH-3627 Heimberg / Switzerland
(a member of the CODAN group)

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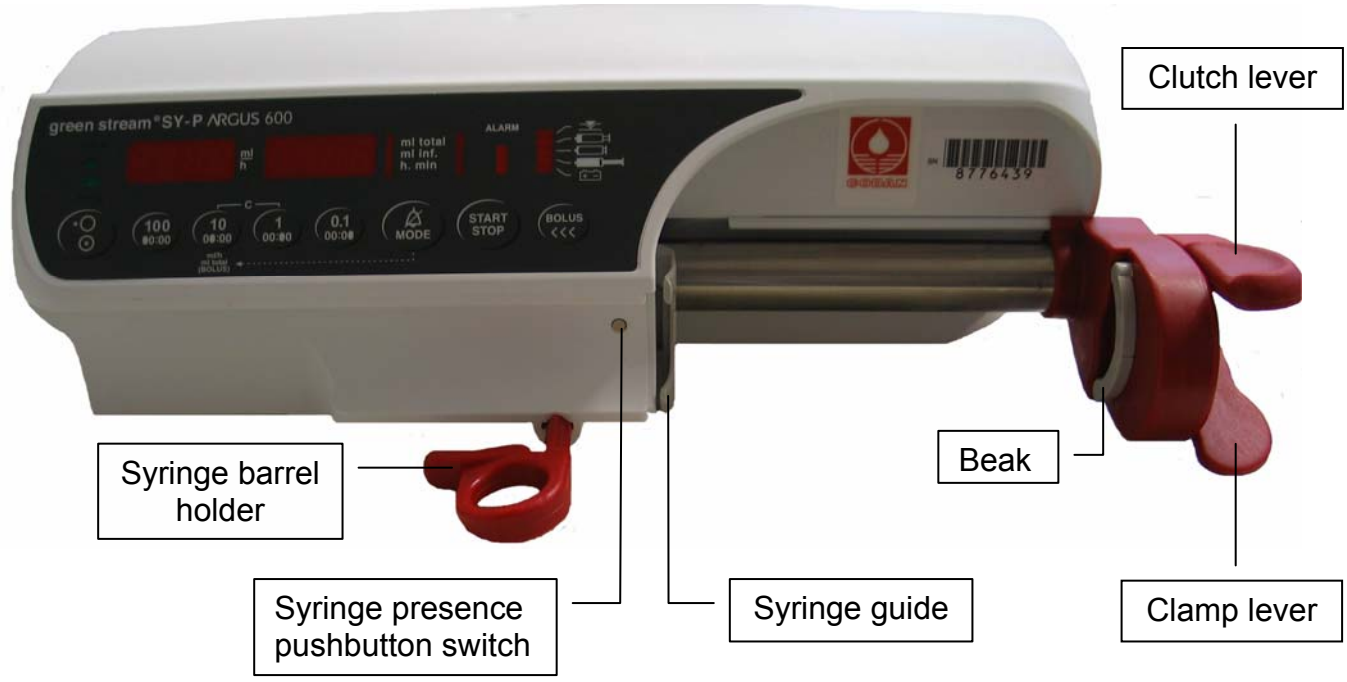
green stream®SY-P ARGUS 600
ALARM
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Clutch lever
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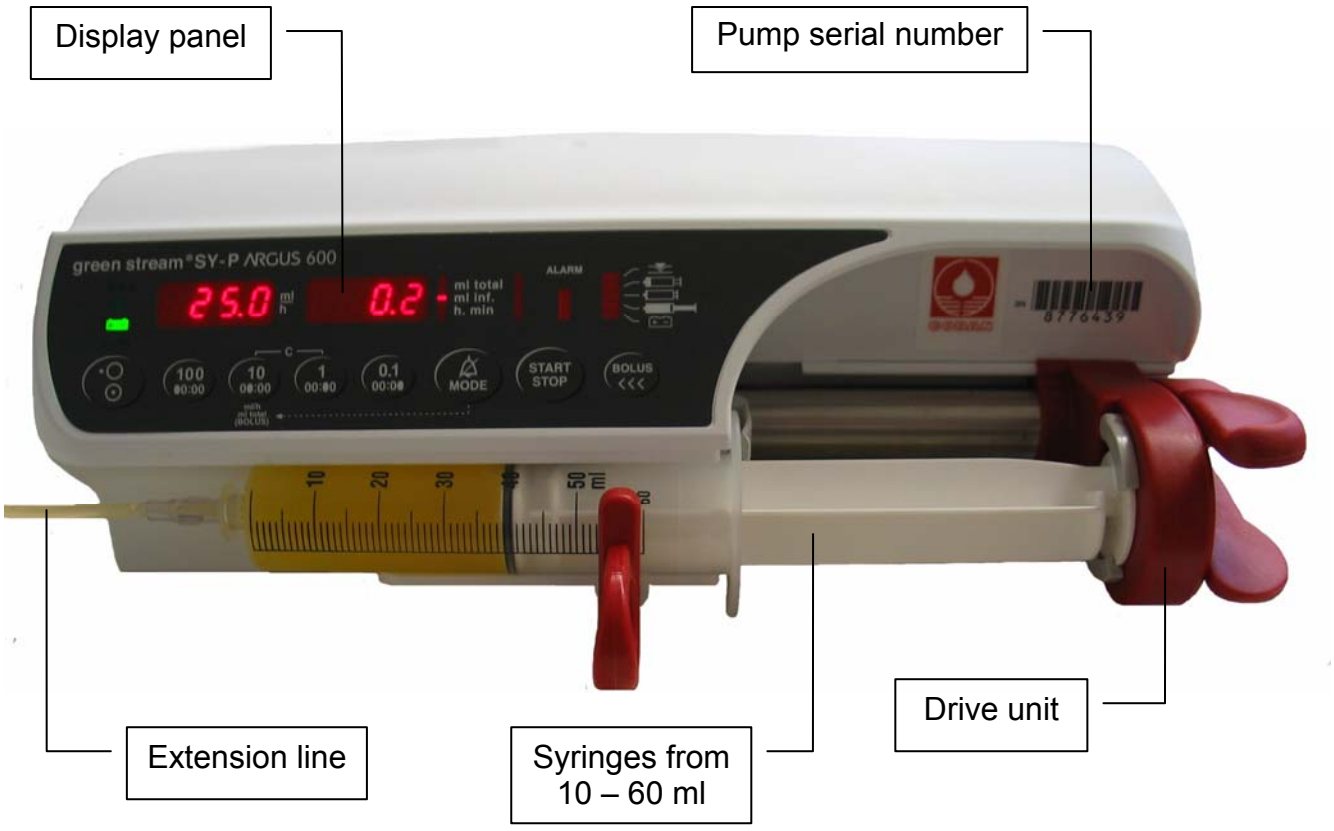
Syringe guide
Clamp lever


Display panel
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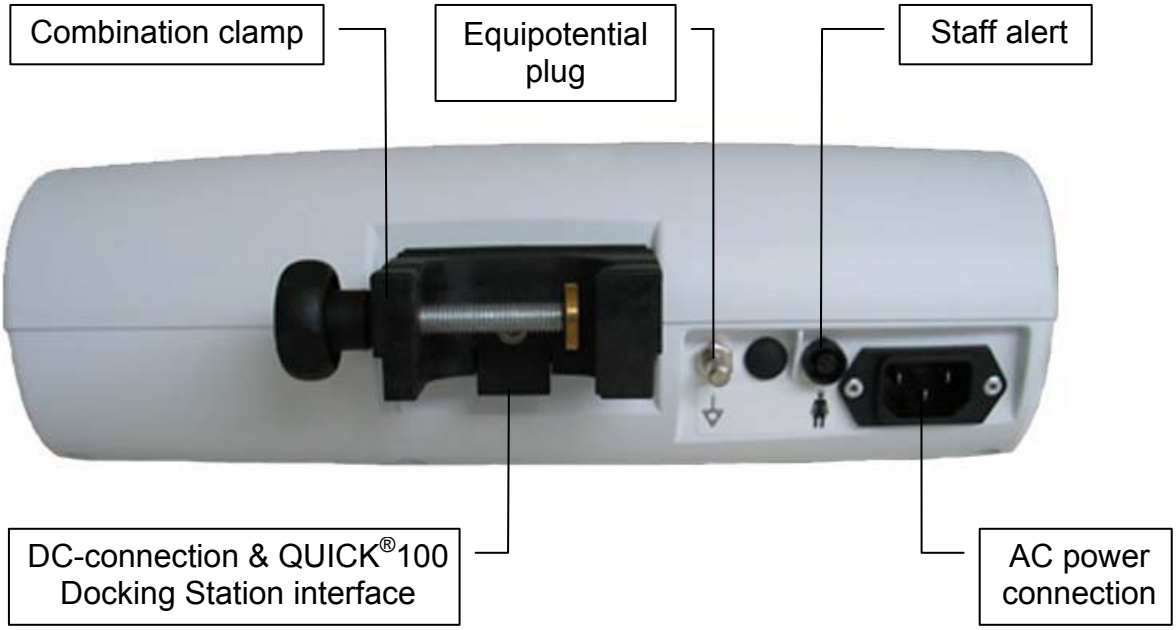

Combination clamp
Equipotential plug
Staff alert
DC-connection & QUICK®100 Docking Station interface
AC power connection

1. INTRODUCTION

1.1. General

IMPORTANT!
This service manual is intended for the exclusive use of authorized persons who have been trained by ARGUS Medical AG in the maintenance and repair of the ARGUS 600 Syringe pump.
The service manual is meant to be used together with the user manual.

IMPORTANT!
ARGUS Medical AG shall not assume any responsibility for any manipulations which have been carried out on the ARGUS 600 Syringe pump by a non-authorized person.

CAUTION!
The ARGUS 600 Syringe pump may only be used with spare parts, accessories, consumables and syringes with Luer-Lock connections recommended by ARGUS Medical AG. The functional safety of the pump is not guaranteed if non approved materials are used. The safety of the patient may be endangered.

This manual contains the latest data available. It is subject to further modifications in accordance with technical improvements.

2. PUMP CONFIGURATIONS

2.1. General

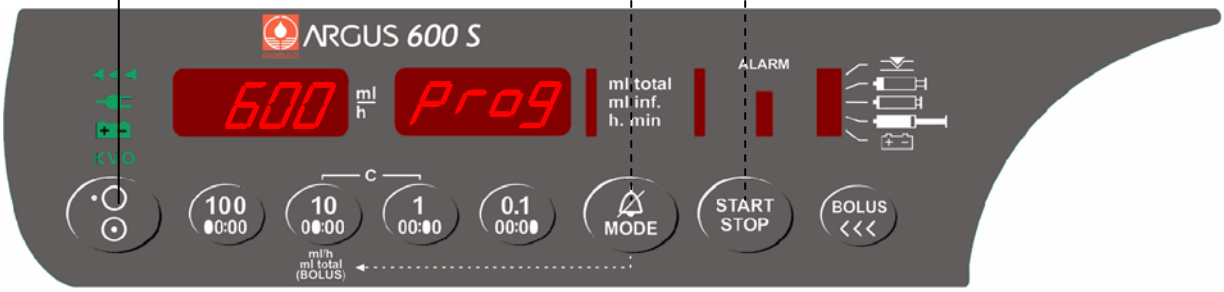
CAUTION!
The configuration possibilities with the “ARGUS *service*” PC utility tool and without PC assistance constitute a modification of the pump and may only be carried out by authorized persons!

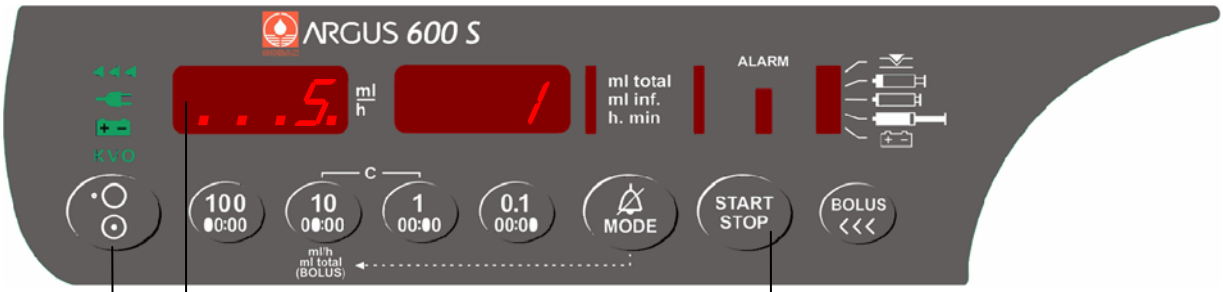
CAUTION!
After changing the configuration a function check and a control measurement has to be performed!

2.2. Interrogation mode (without ARGUS *service*)

With the interrogation mode you can read the present keypad configuration of the pump without the possibility to modify any configurations. For a complete overview, please take the “ARGUS *service*” PC-tool!

1. To enter into the keypad interrogation mode, switch the pump on while keeping the keys “MODE” and “START/STOP” pressed.





3. Enter the requested address (*see chapter 2.6.*), e.g. 5. The programmed value of the address 5 appears in the right hand display.

2. Press the “START/STOP” key.

4. To quit the interrogation mode press the “ON/OFF” key at least 2 seconds.

Flashing decimal points indicate which display is ready to accept an input by the keys 100, 10 & 1.

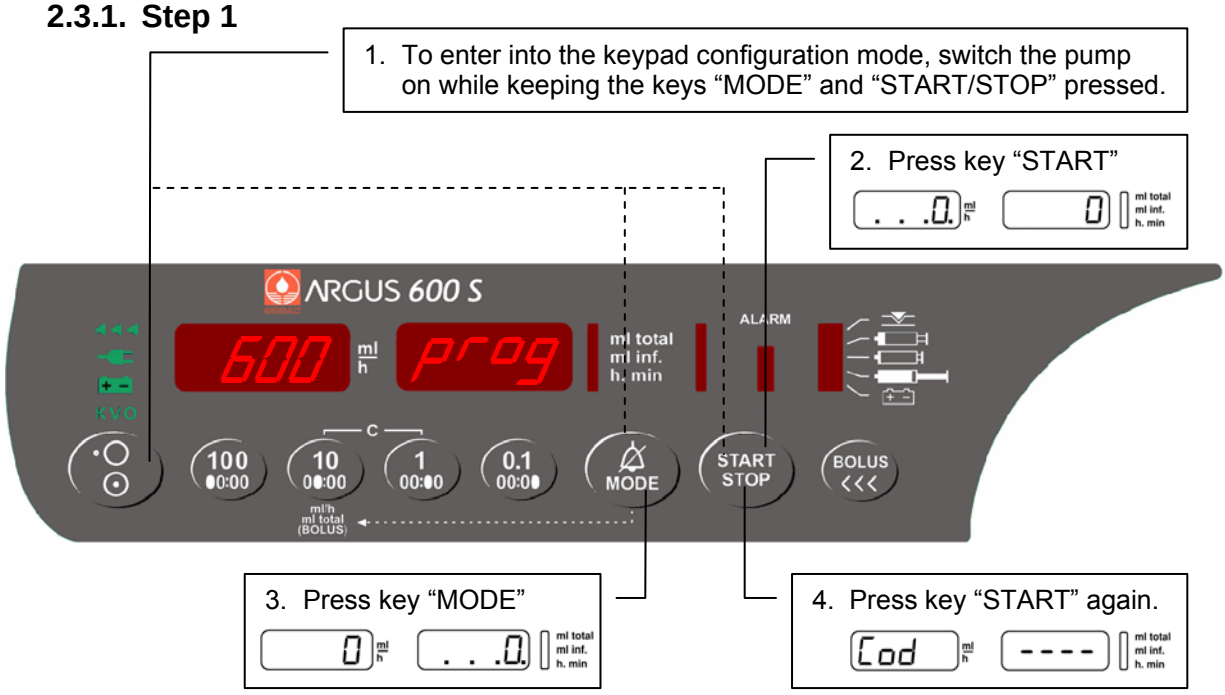
In the keypad interrogation mode the left hand display shows the address and the right hand display shows the according value configured at this address. Please refer to *chapter 2.6.* where the meanings of the addresses are explained.

To modify any configuration data you have to go into the configuration mode.

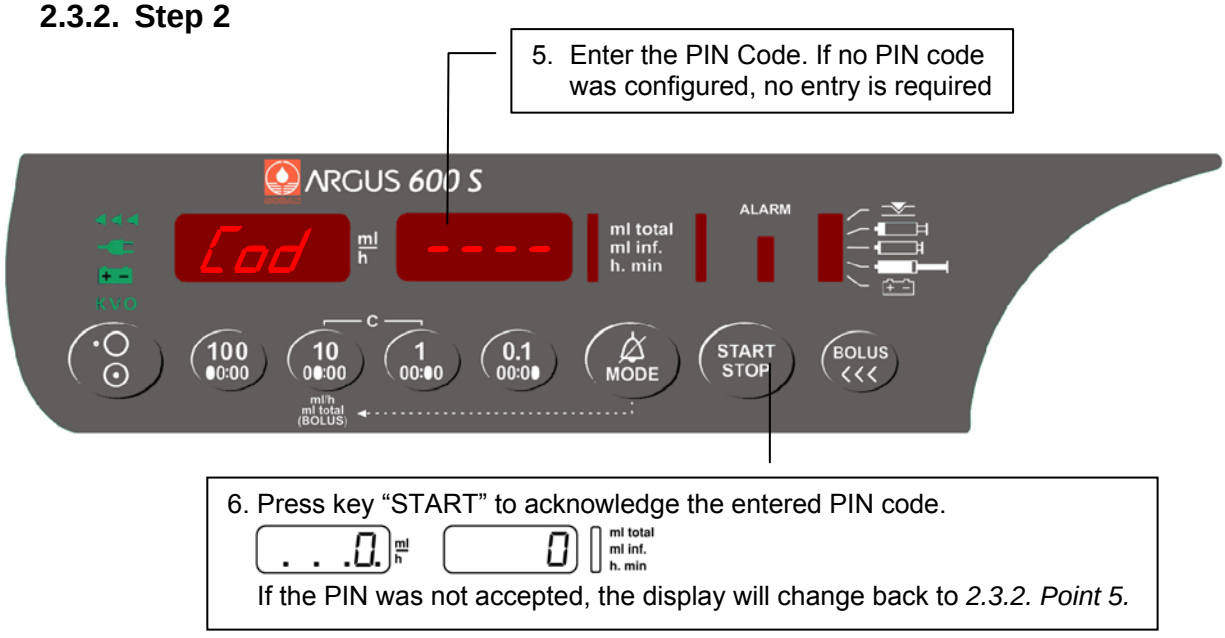
2.3. Configuration mode (without ARGUS *service*)

The configuration mode permit you to modify the pump keypad configuration manually using the keypad. Please refer to *chapter 2.6.* where the meaning of the addresses are explained. To have access to all configuration options, please use the “ARGUS *service*” PC-tool!

2.3.1. Step 1



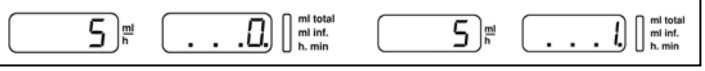
2.3.2. Step 2



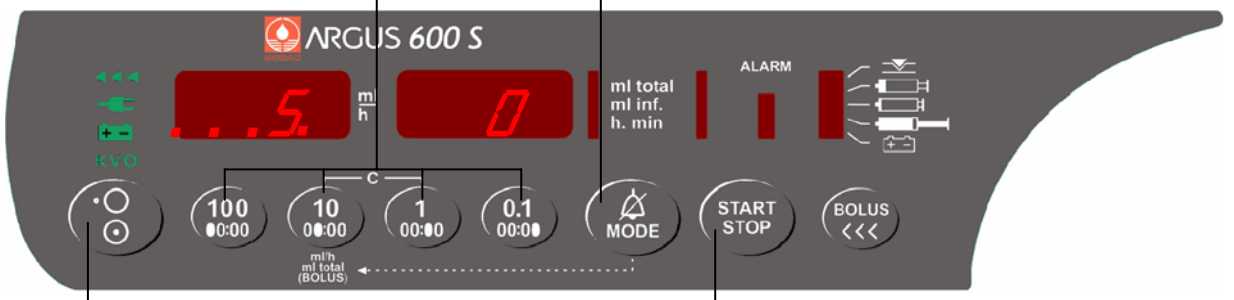
You have now access to all addresses in the list of *chapter 2.6*.
Select therefore any address in the left display (*see next page*).

2.3.3. Step 3

8. Enter now the value on the right hand display. The range of the value is given by the table in *chapter 2.6*.



7. After entering an address e.g. 5 press the key “MODE”. The flashing decimal points will change to the right hand display.



10. To quit the configuration mode press the “ON/OFF” key at least 2 seconds. Changes in configuration become active, after the pump is switched on normally again.

9. Press key “START/STOP” to acknowledge the entered value. The flashing decimal points change back to the left hand display.

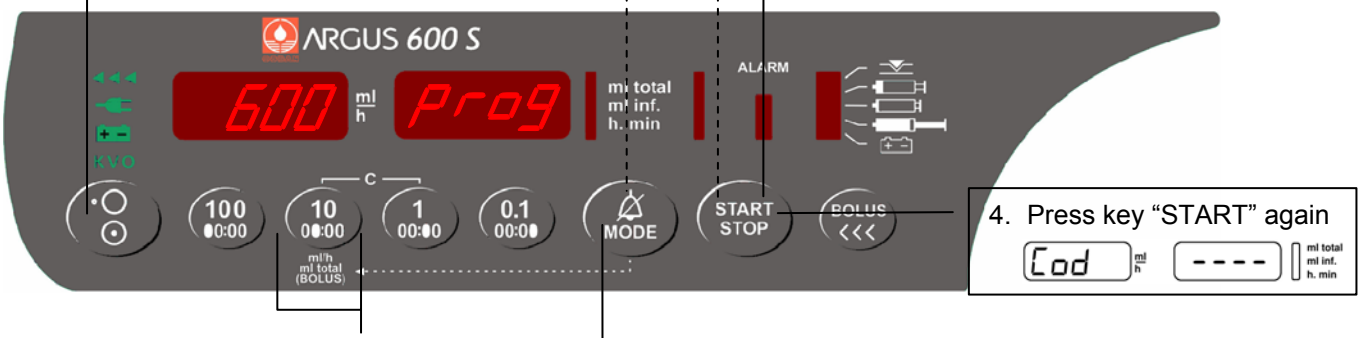
Important remark:
Invalid values entered will be corrected automatically by the pump to the maxima or minima value allowed for the according address!

2.4. First activation of a PIN Code (write protection)

The activation of a PIN code allows you to protect the configuration from unauthorized access. To activate the PIN code, enter into the configuration mode.

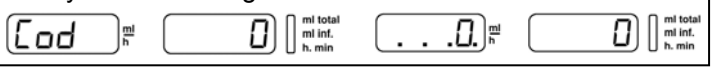
1. To enter into the configuration mode, switch the pump on while keeping the keys “MODE” and “START/STOP” pressed.

2. Press key “START”



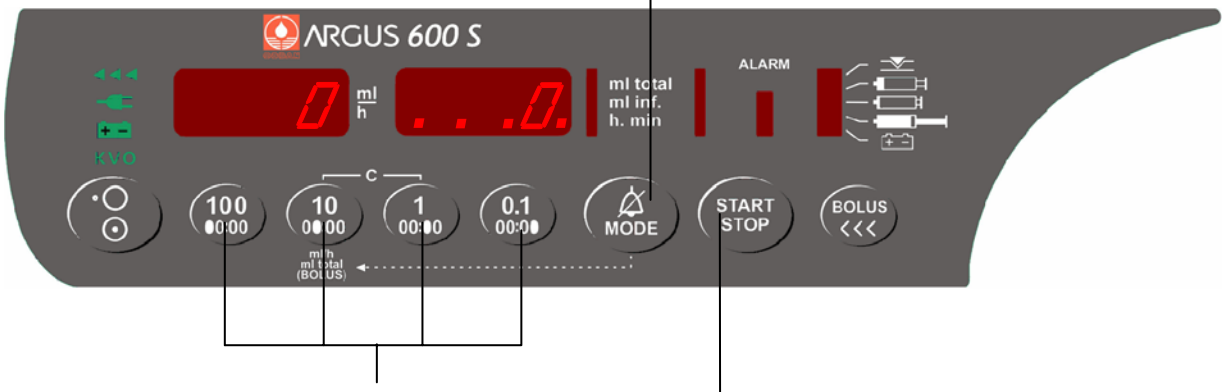
4. Press key “START” again

5. Press “MODE” key (Code “0” will be set) then “START” key to acknowledge the entered PIN code “0”.

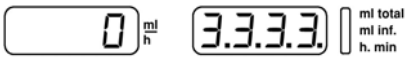


3. Press key “MODE”

6. Press the “MODE” key. The flashing decimal points will change to the right hand display.

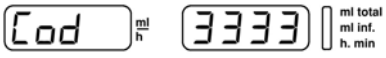


7. Enter now the new PIN Code (max. 4 digit number).
Please remember this code, it will never be visible again!

e.g. 

8. Press key “START/STOP” to acknowledge the new PIN.

CAUTION!
After you switch the pump OFF and ON again you can enter into the configuration mode only, if you enter the correct PIN code.

e.g. 

Please note: The interrogation mode can always be accessed without the PIN.

2.5. Changing an existing PIN code

Enter the configuration mode using present PIN, select add. “0” and set new code.

Enter actual PIN code and confirm with “START” key.

Press “MODE” key (#0). The flashing decimal points will change to the right hand display.

Enter the new PIN code and press the “START/STOP” key to acknowledge the entered code.

2.6. Address list of the pump configuration (without ARGUS *service*)

The following list declares the possible configuration options which can be performed on the pump keypad without using the PC.
All these options can also be configured by the PC-Software “ARGUS *service*”.

Address left display	Index PC	Default	Function	Unit	Range right display
1	2	No	Key ON/OFF only at stop valid	-	0=No / 1=Yes
2	11	Yes	Recall of the last used ml/h rate	-	0=No / 1=Yes
3	19	Yes	Buzzer at start	-	0=No / 1=Yes
4	44	Yes	Automatic pressure release	-	0=No / 1=Yes
5	49	No	Alarm acknowledge with key MODE	-	0=No / 1=Yes
100	361	5	Key ON/OFF delay time	• 0.1 s	0 - 31
101	362	2	Display brightness	level	1 - 3
102	363	10	Buzzer volume	level	5 - 10
103	365	9	Default pressure limit	• 100 mbar	2 - 12
200	368	495	Battery capacity (discharge time)	min	45 - 615
399	-	600	Enter the calibration menu	-	123

Note!
The address does not correspond with the index used by the “ARGUS *service*” tool.

2.7. Index list of the pump configuration (with ARGUS *service*)

Index PC	Add.	Default	Function		Unit	Range
1		No	Run indication by running decimal point		-	No / Yes
2	1	No	Key ON/OFF only at stop valid		-	No / Yes
3		No	Rate change allowed only at STOP		-	No / Yes
4		No	Key STOP delayed	# 361	-	No / Yes
5		No	Second entry of rate	# 3=Yes, # 9=No	-	No / Yes
6		No	Static alarm (staff alerting system)		-	No / Yes
7		No	Display elapsed time in run mode	# 8=No	-	No / Yes
8		No	Display remaining time	# 7=Yes	-	No / Yes
9		No	Rate change confirmation in stop mode		-	No / Yes
10						
11	2	Yes	Recall of ml/h rate at next power on	# 9=No	-	No / Yes
12		No	Recall of ml total at next power on		-	No / Yes
13		No	Recall of ml inf. at next power on		-	No / Yes
14		No	SBS (step by step function)		-	No / Yes
15		No	Display VTBI (volume to be infused)		-	No / Yes
16		No	Syringe type acknowledge at start		-	No / Yes
17		Yes	KVO (KOR) enabled	# 60	-	No / Yes
18						
19	3	No	Buzzer at start		-	No / Yes
20		No	Menu Clr (clear ml inf.)	# 15=No, # 65	-	No / Yes
21						
22						
23		Yes	Menu PrL (pressure alarm limit)		-	No / Yes
24		Yes	Menu CAP (battery capacity)		-	No / Yes
25						
26		No	Menu InF (ml inf. since last power on)		-	No / Yes
27		No	Menu dLo (data lock)		-	No / Yes
28		No	Menu Stb (stand by)		-	No / Yes
29		Yes	Menu Med (medication name)		-	No / Yes
30		No	Menu tM (timer alarm)		-	No / Yes
31						
32		Yes	Menu boL "bolu Man" / "bolu Auto" (bolus always possible)		-	No / Yes
33		Yes	Menu boLr (bolus rate)	# 32=Yes	-	No / Yes
34		Yes	Menu tot (bolus total)	# 32=Yes	-	No / Yes
35		No	Display BOLUS-VTBI		-	No / Yes
36						
37						
38		Yes	Automatic bolus application	# 32, 34=Yes	-	No / Yes
39		No	Bolus total to be reset after each auto bolus		-	No / Yes
40						
41		No	Clear ml/h after infusion completed		-	No / Yes
42		No	Clear ml total after infusion completed	# 41=Yes	-	No / Yes
43		Yes	Syringe clamp diameter outside control		-	No / Yes
44	4	Yes	Automatic pressure release after occlusion		-	No / Yes
45		Yes	Pressure display ON (LED bar graph - 20/40/60/80/100%)		-	No / Yes
46		No	Pressure display with indicator	# 45=Yes	-	No / Yes
47		No	Stand by- and battery pre alarm low volume		-	No / Yes
48		Yes	Flashing numeric display at alarm		-	No / Yes
49	5	No	Alarm acknowledge only with key MODE		-	No / Yes

55		Yes	Med. disp. alternate with rate and ml inf.	# 29=Yes	-	No / Yes
60		No	KVO only after infusion completed		-	No / Yes
65		No	Clear and continue	# 15=No	-	No / Yes
75		No	Select binder connector for serial interface		-	No / Yes
100		No	**User syringe 10 ml**	USEr -10-	10 ml	
101		No	BD Plastipak	b-d PL10	10 ml	
102		No	Braun Omnifix	brn OF10	10 ml	
103		Yes	Codan	Cod -10-	10 ml	
104		No	Fresenius Injectomat	FrES In10	10 ml	
105		No	Sherwood Monoject	Mono -10-	10 ml	
106		No	ONCE	OnCE -10-	10 ml	
107		No	PIC Indolor	PIC -10-	10 ml	
108		No	Rymco	ryco -10-	10 ml	
109		No	Terumo	tEru -10-	10 ml	
110		No	Braun Injekt (#43=No)	brn In10	10 ml	
111		No	Chirana-Prema	Chir -10-	10 ml	
120		No	**User syringe 20 ml**	USEr -20-	20 ml	
121		No	BD Plastipak	b-d PL20	20 ml	
122		No	Braun Omnifix	brn OF20	20 ml	
123		Yes	Codan	Cod -20-	20 ml	
124		No	Sherwood Monoject	Mono -20-	20 ml	
125		No	ONCE	OnCE -20-	20 ml	
126		No	Braun Perfusor	brn PE20	20 ml	
127		No	Braun Inject	brn In20	20 ml	
128		No	Chirana-Prema	Chir -20-	20 ml	
129		No	Terumo	tEru -20-	20 ml	
130		No	Penta Ferte	PF -20-	20 ml	
140		No	**User syringe 30 ml**	USEr -30-	30 ml	
141		No	BD Plastipak	b-d PL30	30 ml	
142		No	Codan	Cod -30-	30 ml	
143		No	ONCE	OnCE -30-	30 ml	
144		No	Braun Omnifix	brn OF30	30 ml	
145		No	Terumo	tEru -30-	30 ml	
146		No	Penta Ferte	PF -30-	30 ml	
150		No	**User syringe 50 ml**	USEr -50-	50 ml	
151		No	BD Perfusion	b-d PE50	50 ml	
152		No	BD Plastipak	b-d PL50	50/60 ml	
153		No	Braun Omnifix	brn OF50	50/60 ml	
154		No	Braun Perfusor	brn PE50	50 ml	
155		No	Chirana-Prema	Chir -50-	50/60 ml	
156		No	Codan	Cod -50-	50 ml	
157		Yes	Codan Perfusion	Cod PE50	50 ml	
158		No	Dispomed	dISP -50-	50/60 ml	
159		No	Dipomed Perfusion	dISP PE50	50 ml	
160		No	Fresenius Injectomat	FrES In50	50/60 ml	

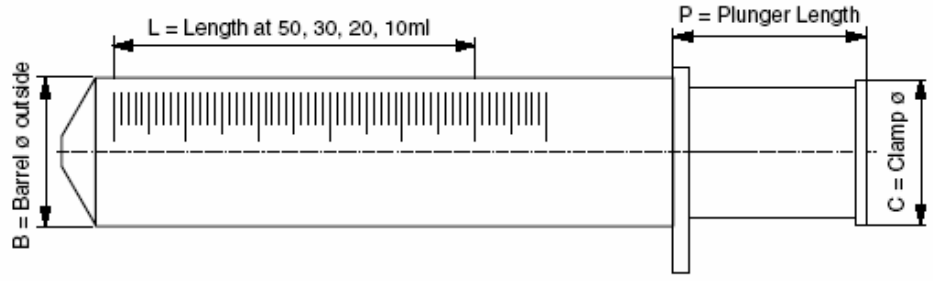
161		No	Fresenius Perfusion		FrES PE50	50/60 ml	
162		No	Ivac		IVAC -50-	50/60 ml	
163		No	JMS		JMS -50-	50/60 ml	
164		No	Sherwood Monoject		Mono -50-	50/60 ml	
165		No	PIC Indolor		PIC -50-	50 ml	
166		No	PIC Indolor Perfusion		PIC PE50	50 ml	
167		No	Rymco		ryco -50-	50 ml	
168		No	Terumo		tEru -50-	50/60 ml	
169		No	Disoprivan (ZENECA)		dIPr -50-	50 ml	
170		No	ONCE		OnCE -50-	50 ml	
171		No	Braun Proinjekt		brn Pr50	50 ml	
172		No	Penta Ferte		PF -50-	50 ml	
310		300.0	Max. rate		**10 ml syringe parameters**	ml/h	1 - 300
311		300.0	Prime rate			ml/h	1 - 300
312		300.0	Max. bolus rate			ml/h	1 - 300
313		1.0	Max. total			ml	1 - 10
314							
315		61.0	Syringh length	**user syringe**		mm	45 - 70
316		16.0	Plunger length			mm	12 - 30
317		16.2	Barrel diameter			mm	15 - 19
318		18.7	Clamp diameter			mm	15 - 25
319							
320		500.0	Max. rate		**20 ml syringe parameters**	ml/h	1 - 500
321		500.0	Prime rate			ml/h	1 - 500
322		500.0	Max. bolus rate			ml/h	1 - 500
323		2.0	Max. total			ml	1 - 20
324							
325		69.5	Syringh length	**user syringe**		mm	50 - 80
326		16.8	Plunger length			mm	12 - 30
327		21.4	Barrel diameter			mm	20 - 24
328		23.8	Clamp diameter			mm	20 - 30
329							
330		500.0	Max. rate		**30 ml syringe parameters**	ml/h	1 - 500
331		500.0	Prime rate			ml/h	1 - 500
332		500.0	Max. bolus rate			ml/h	1 - 500
333		3.0	Max. total			ml	1 - 25
334							
335		82.0	Syringh length	**user syringe**		mm	70 - 90
336		16.0	Plunger length			mm	12 - 30
337		24.0	Barrel diameter			mm	22 - 26
338		26.0	Clamp diameter			mm	20 - 30
339							
340		999.9	Max. rate		**50 ml syringe parameters**	ml/h	1 - 999.9
341		999.9	Prime rate			ml/h	1 - 999.9
342		800.0	Max. bolus rate			ml/h	1 - 800.0
343		5.0	Max. total			ml	1 - 25
344							
345		90.0	Syringh length	**user syringe**		mm	70 - 100
346		16.5	Plunger length			mm	12 - 50
347		29.4	Barrel diameter			mm	28 - 34
348		31.0	Clamp diameter			mm	25 - 37

361	100	5	Key ON/OFF delay time # 4	• 1/10 s	0 - 31
362	101	2	Display brightness	level	1 - 3
363	102	7	Buzzer alarm volume	level	5 - 10
364					
365	103	9	Default pressure limit (PrL levels)	• 100mbar	2 - 12
366		1	Pressure display unit (mbar / mmHg / kPa / cmH2O / Psi)	Enum	1 - 5
367		3	Time for near empty alarm	min	1 - 15
368	200	495	Battery capacity (discharge time)	min	45 - 615
369		5	Automatic menu fall back delay time	sec	5 - 30
390		0	Last service date in year	year	0 - 99
391		0	Last service date in month	month	0 - 12
392		0	Last service date in day	day	0 - 31
393		0	Service interval in months	month	0 - 24
394		0	Service interval in hours of operation	hour	0 -10000
395					
396		0	Pump serial number	**xxx** 6 **yyy**	xxx 6 yyy
397					
398					
-	399	600	Enter the calibration menu / clears protection key	-	123
518		2	Permissions for serial communication 0 = none, 1 = query only, 2 = parametrising, 3 = remote control	Enum	0 - 3
522		No	Allow change of ml total while infusing # 65=No	-	No / Yes
523					
524			Display a department info text (after power up)	char	1-16 ASCII

Using the “ARGUS service” tool, the complete and detailed pump configuration can be done.

2.8. User syringe

The ARGUS 600 Syringe pump uses syringes from various manufacturers (see user manual list of recommended syringes). If you want to use any other brand you must be sure that the syringe is CE marked and is specified by the syringe manufacturer to be pressure resistant and/or safe to be used with infusion pumps, the syringe must be made out of 3 parts (barrel, plunger, sealing) and have Luer-Lock connection (same applies to extension lines). When all these points are met you are allowed to configure your own "USER" syringe (one per size). Use the “ARGUS *service*” tool to enter the syringe parameters into index 340 – 348 (50 ml syringe).



2.9. Medication list

2.9.1. General

To display medication names, index 29 (menu "MEd") must be set to "Yes". The selected medication name can be displayed also in alternate mode (rate, ml inf./ med. name) during infusion, for that set index 56 to “Yes”.

After enabled special function “Med” the following medication names can be selected via pump keypad (see user manual).

2.9.2. User medication

32 user medication names can be custom defined. Choose between capital and small letters for a better displayed medication name. Because of the 7-segment pump display some characters maybe difficult to read.

Index PC	Default	Function	Unit	Range
561	UserM 1	User medication name 1	char	1 - 8 ASCII
562	UserM 2	User medication name 2	char	1 - 8 ASCII
563	UserM 3	User medication name 3	char	1 - 8 ASCII
564	UserM 4	User medication name 4	char	1 - 8 ASCII
565	UserM 5	User medication name 5	char	1 - 8 ASCII
566	UserM 6	User medication name 6	char	1 - 8 ASCII
567	UserM 7	User medication name 7	char	1 - 8 ASCII
568	UserM 8	User medication name 8	char	1 - 8 ASCII
569	UserM 9	User medication name 9	char	1 - 8 ASCII
570	UserM 10	User medication name 10	char	1 - 8 ASCII
571	UserM 11	User medication name 11	char	1 - 8 ASCII
572	UserM 12	User medication name 12	char	1 - 8 ASCII
573	UserM 13	User medication name 13	char	1 - 8 ASCII
574	UserM 14	User medication name 14	char	1 - 8 ASCII
575	UserM 15	User medication name 15	char	1 - 8 ASCII
576	UserM 16	User medication name 16	char	1 - 8 ASCII
577	UserM 17	User medication name 17	char	1 - 8 ASCII
578	UserM 18	User medication name 18	char	1 - 8 ASCII
579	UserM 19	User medication name 19	char	1 - 8 ASCII
580	UserM 20	User medication name 20	char	1 - 8 ASCII
581	UserM 21	User medication name 21	char	1 - 8 ASCII
582	UserM 22	User medication name 22	char	1 - 8 ASCII
583	UserM 23	User medication name 23	char	1 - 8 ASCII
584	UserM 24	User medication name 24	char	1 - 8 ASCII
585	UserM 25	User medication name 25	char	1 - 8 ASCII
586	UserM 26	User medication name 26	char	1 - 8 ASCII
587	UserM 27	User medication name 27	char	1 - 8 ASCII
588	UserM 28	User medication name 28	char	1 - 8 ASCII
589	UserM 29	User medication name 29	char	1 - 8 ASCII
590	UserM 30	User medication name 30	char	1 - 8 ASCII
591	UserM 31	User medication name 31	char	1 - 8 ASCII
592	UserM 32	User medication name 32	char	1 - 8 ASCII

2.9.3. Defined medication

Index PC	Def.	Function	Range
600	Yes	(Medication)	No / Yes
601	No	Actilyse	No / Yes
602	No	Adrenaline 0.1	No / Yes
603	No	Adrenaline 0.2	No / Yes
604	No	Ajmalin	No / Yes
605	No	Alfentanil	No / Yes
606	No	Alupent	No / Yes
607	No	Ambroxol	No / Yes
608	No	Amiodaron	No / Yes
609	No	Amphotericine	No / Yes
610	No	Aprotinin	No / Yes
611	No	Atracurium	No / Yes
612	No	Bretylium	No / Yes
613	No	Bupivacïne	No / Yes
614	No	Ceruletid	No / Yes
615	No	Clonidin	No / Yes
616	No	Diltiazem	No / Yes
617	No	Dobutamin	No / Yes
618	No	Dopamine	No / Yes
619	No	Dopexamine	No / Yes
620	No	Esmolol	No / Yes
621	No	Fentanyl	No / Yes
622	No	Flecainide	No / Yes
623	No	Fluimucil	No / Yes
624	No	Flumazenil	No / Yes
625	No	Furosemid	No / Yes
626	No	Glucose 5%	No / Yes
627	No	Glucose 30%	No / Yes
628	No	Heparin	No / Yes
629	No	Hydrocortison	No / Yes
630	No	Insulin	No / Yes
631	No	Isoprenaline	No / Yes
632	No	KCl	No / Yes
633	No	Ketamin	No / Yes
634	No	Labetalol	No / Yes
635	No	Lidocain	No / Yes
636	No	Liothyronin	No / Yes
637	No	Magnesium	No / Yes
638	No	Midazolam	No / Yes
639	No	Milrinone	No / Yes
640	No	Morphin	No / Yes
641	No	Nacl 0.9 %	No / Yes
642	No	Nalbuphin	No / Yes
643	No	Naloxone	No / Yes
644	No	Neostigmine	No / Yes
645	No	Nicardipine	No / Yes
646	No	Nifedipin	No / Yes
647	No	Nimodipin	No / Yes
648	No	Nitroprussiate	No / Yes
649	No	Noradrenalin	No / Yes
650	No	Omeprazole	No / Yes
651	No	Pancuronium	No / Yes
652	No	Pentoxityllin	No / Yes
653	No	Phentolamine	No / Yes
654	No	Phenylephrin	No / Yes

Index PC	Def.	Function	Range
655	No	Procainamide	No / Yes
656	No	Propafenon	No / Yes
657	No	Propofol	No / Yes
658	No	Rapilysin	No / Yes
659	No	Remifentanyl	No / Yes
660	No	Risordan	No / Yes
661	No	Ropivacaïne	No / Yes
662	No	Salbutamol	No / Yes
663	No	Somatostatin	No / Yes
664	No	Streptokinase	No / Yes
665	No	Sufentanil	No / Yes
666	No	Terbutaline	No / Yes
667	No	Theopyllin	No / Yes
668	No	Thiopental	No / Yes
669	No	Tirofiban	No / Yes
670	No	Trinitrine	No / Yes
671	No	Urapidil	No / Yes
672	No	Urokinase	No / Yes
673	No	Vasopressine	No / Yes
674	No	Vecuronium	No / Yes
675	No	Verapamil	No / Yes
676	No	User defined med. 1	No / Yes
677	No	User defined med. 2	No / Yes
678	No	User defined med. 3	No / Yes
679	No	User defined med. 4	No / Yes
680	No	User defined med. 5	No / Yes
681	No	User defined med. 6	No / Yes
682	No	User defined med. 7	No / Yes
683	No	User defined med. 8	No / Yes
684	No	User defined med. 9	No / Yes
685	No	User defined med. 10	No / Yes
686	No	User defined med. 11	No / Yes
687	No	User defined med. 12	No / Yes
688	No	User defined med. 13	No / Yes
689	No	User defined med. 14	No / Yes
690	No	User defined med. 15	No / Yes
691	No	User defined med. 16	No / Yes
692	No	User defined med. 17	No / Yes
693	No	User defined med. 18	No / Yes
694	No	User defined med. 19	No / Yes
695	No	User defined med. 20	No / Yes
696	No	User defined med. 21	No / Yes
697	No	User defined med. 22	No / Yes
698	No	User defined med. 23	No / Yes
699	No	User defined med. 24	No / Yes
700	No	User defined med. 25	No / Yes
701	No	User defined med. 26	No / Yes
702	No	User defined med. 27	No / Yes
703	No	User defined med. 28	No / Yes
704	No	User defined med. 29	No / Yes
705	No	User defined med. 30	No / Yes
706	No	User defined med. 31	No / Yes
707	No	User defined med. 32	No / Yes

REMARK :
Via barcode reader all medication names can be selected, even if they are not released in the configuration.

3. SERIAL COMMUNICATION OF THE PUMP

3.1. General

The ARGUS 600 Syringe pump has two serial interfaces on board. One is wired to the docking interface connector and one is an optional RS232 connector.

Important remark!
Only the optional RS232 connector is galvanic separated. The docking interface on the pump is a non galvanic isolated interface! Do not use the docking interface on the pump together with the interface cable (part 10.093) on a patient!

If the pump is docked into a docking station ARGUS 60 M or ARGUS 100 M, the software switches automatically to the docking interface and the docking station builds the separation device (galvanic isolation) then.

3.2. Serial communication protocol

The following characteristics are basics for all the ARGUS devices (volumetric pumps, syringe pumps, docking stations with V4.xx and PCs) which are intended to communicate with the device mentioned in this service manual.

- Full-duplex RS232, currently 4800Baud for single pumps,
  9600 Baud for docking stations (also on master/slave-link).
- Simple master (host/PC) – slave (device) communication (host does polling).
- The host has to repeat the request if there is no valid response.
- Uses a checksum (CRC-8).
- Binary data transmission, thus no ASCII/text parsing.
- Fast & direct communication with pumps on ARGUS docking station.
- Specified timeouts during remote mode.
- Basic framing technique used as in the *Serial Infrared Link Access Protocol (IrLAP) Version 1.1*.

Please contact your local distributor or ARGUS Medical AG for the complete serial communication protocol description.

4. ARGUS *SERVICE*

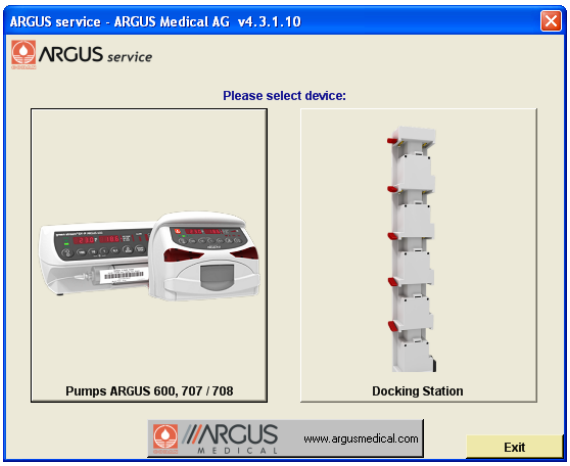
4.1. General

The ARGUS *service* utility is a high and user friendly PC software which can configure and upgrade pumps over PC serial COM port. With this Windows based software you can also set pump clock, change PIN code, read and print out history and easily replicate pump configurations, and so on. The modern and clearly structured design of this self-describing PC-tool allows a very easy and rapid modification of the A600 Syringe pump, the A707 & 708 Volumetric pump and the ARGUS docking station. This software may be available from your local distributor or directly from ARGUS Medical.

REMARK:
"ARGUS *service*" may only be used with software versions greater or equal to 4.00.

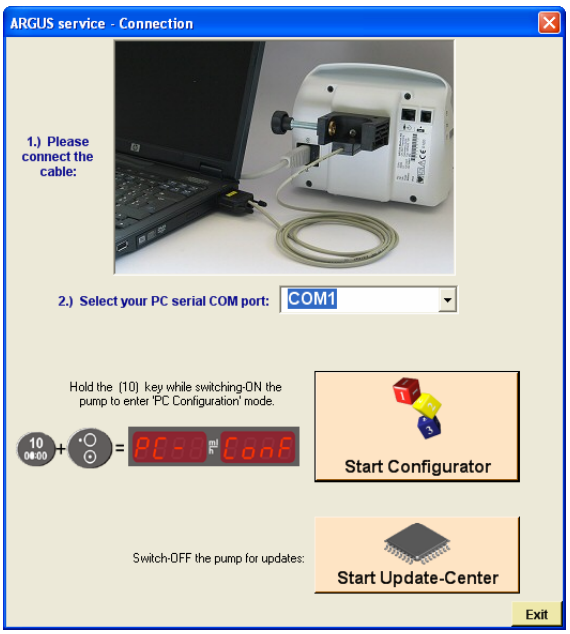
CAUTION!
The syringe pump has to be disconnected from the patient before and while the serial interface cable is connected to the pump.

The connection of an A600 over serial interface RS232 can be done by connecting the interface cable (*REF* 10.093) to the serial interface outlet of the serial PC-COM port.

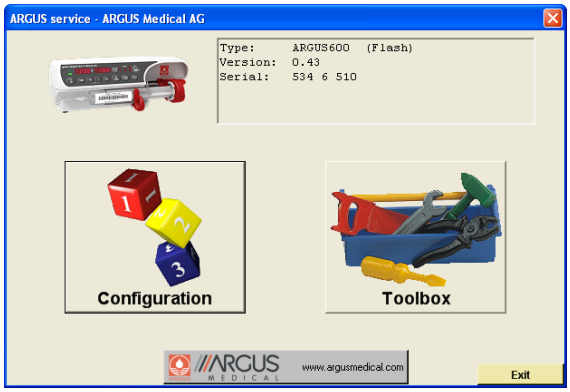


Start the ARGUS *service*

Press the button which confirm to your previously connected device (ARGUS pump or docking station).

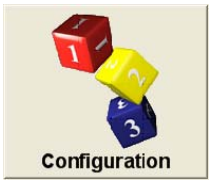


Hold the "10" key while switching-ON the pump.
Select "Start Configuration" (*see next chapter*) or "Start Update-Center" (*see chapter 5.3.2.*).



Select the next step by pressing one of the buttons (configuration, calibration or toolbox).

4.2. ARGUS *service* – Configuration



Important remark:
After configuration change, a function check and control measurement has to be done!

4.2.1. Configuration tree structure

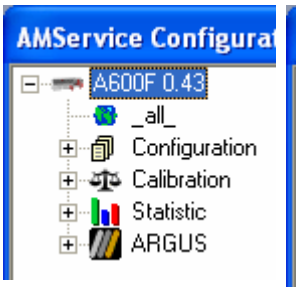
The configuration is split into 4 areas:

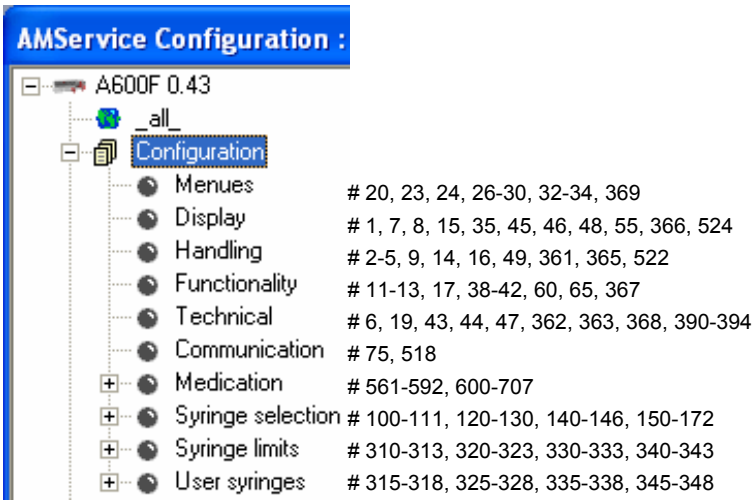
Configuration (part 1)
All configuration possibilities (indexes) mentioned in *chapter 2.7* can be modified herein in its own tree structure as shown below.
All indexes which are different from the pump firmware default are high lighted.

Calibration (part 2)
Details of the pump calibration can be read out of the pump.
The calibration cannot be modified herein.

Statistic (part 3)
Details about last used infusion parameters, total of infused volume and infusion time and so on are shown.
Also the last technical failure numbers are listed in this part.

ARGUS (part 4)
This part contains ex-works settings (e.g. pump serial number)





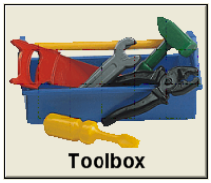
4.2.2. How to edit a configuration

The following procedure describes how to edit a pump configuration:

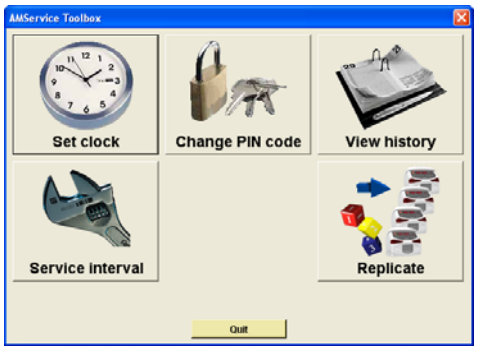
1. Press the green “Edit” button.
2. The software will ask for the pump PIN code as next. The button “Edit” changes its colour and will be renamed into “Download”.
3. If you want to import a configuration from a file press the “Import” button, otherwise skip this point.
4. Select “Configuration” in the structure tree in the left upper frame.
5. Select the category you want to modify by selecting the according structure tree and the according index.
6. Modify the according index (within the given restrictions shown).
   Each value (number) must be acknowledged by the green “Enter” button.
   Go through point 5 & 6 for all further indexes you want to modify.
7. Press the “Download” button if you want to save the modified configuration on the pump. Otherwise you can save the modified configuration into a file by pressing the “Save” button.
8. **Make a functional check on each pump you have configured.**

Important remark!
If a config. has been edited (performed point 1 and 2) once do not switch off the pump! Otherwise the pump will change always into the PC-configuration mode automatically.

4.3. ARGUS *service* - Toolbox



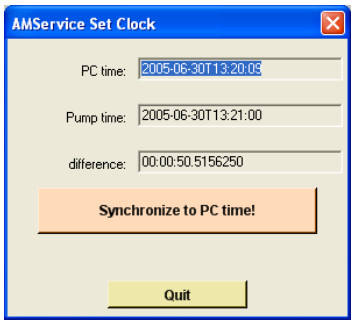
With the “ARGUS *service*” PC-tool you can set the pump clock, change PIN code, read and print out history, etc.



Select the next step by pressing one of the buttons (set clock, change PIN code, view history, service interval or replicate).

4.3.1. ARGUS *service* - Toolbox - Pump clock

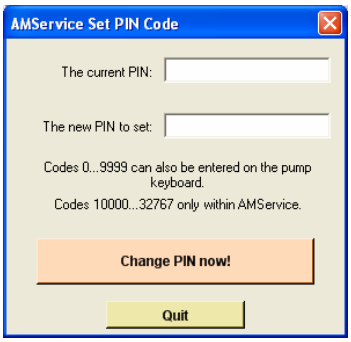
Use this feature to synchronize the pump internal clock with your PC time.



Please note: The pump internal clock will set to the central European time zone (Bern, CET, GMT +1.00h) as ex-works settings, the pump internal clock will not switch automatically between summer and winter time. All history logs (refer to *chapter 4.3.5*) will base on this time.

4.3.2. ARGUS *service* - Toolbox - PIN code

Use this feature to set the pump PIN code.



The setting of a PIN code prevents access to the pump configuration of third persons.
The default PIN code is “0” by ex-works settings.

Please note: The PIN code corresponds with the PIN code mentioned in *chapter 2.3.2*. If a PIN code greater than 9999 is entered, the pump configuration can only be accessed using the ARGUS *service* PC tool.

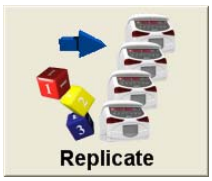
4.3.3. ARGUS *service* - Toolbox - Service interval

Use this feature to set a reminder alarm on the pump for the next service interval.
A pending reminder alarm will be shown on the pump display after power up by a flashing “CtrL” text accompanied by an acoustic sound.

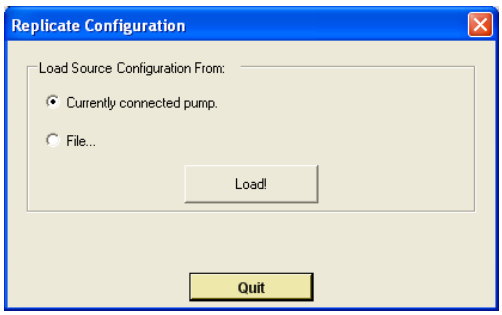
The point in time when an active reminder alarm occurs, is given by the settings of the configuration (#393 and #394) and the pump internal clock. Any value higher than 0 on those indexes will release the reminder alarm after the service interval has elapsed. Please check those settings first, before you set the reminder alarm!

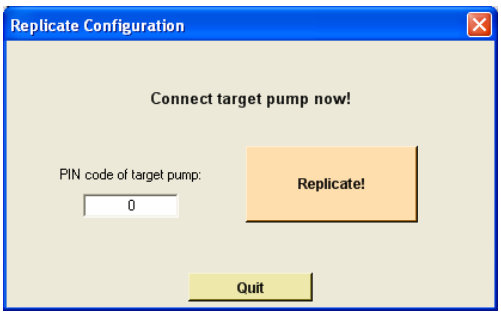
Please note: By the ex-works settings, the reminder alarm is disabled.

4.3.4. ARGUS *service* - Toolbox - Replicate



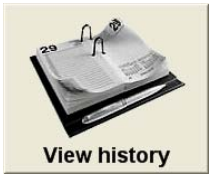
Use this feature to replicate fast and easily pump configuration from a saved configuration file or from a pump to another. A configuration can only be replicated if the saved configuration (and pump type) corresponds with the firmware of the connected pump in the first 2 digits (for e.g. 4.30 to 4.31 is possible).





Please note:
The pump internal clock and remainder alarm settings must be done individually on each pump!

4.3.5. ARGUS *service* - Toolbox - Pump history



Each registered event has his own date & time stamp. An event is registered on each pump status change. Please refer to the complete list mentioned in *chapter 4.3.6.* below.

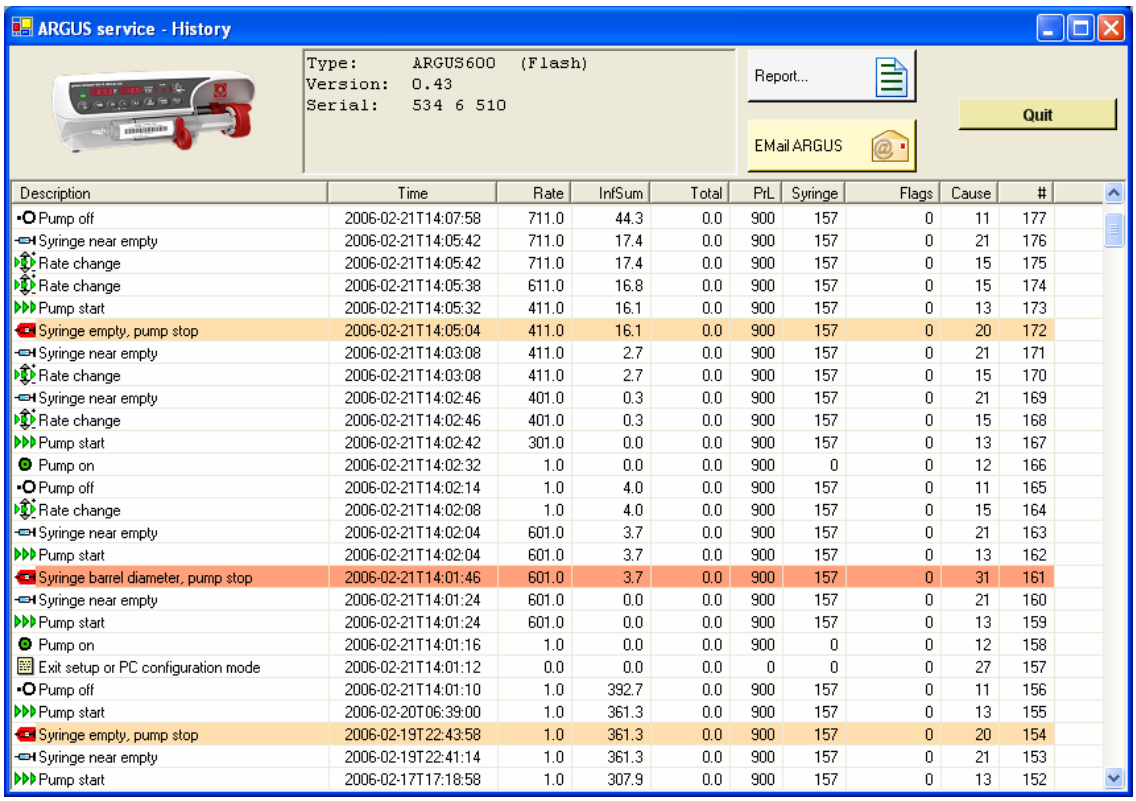
4.3.6. History messages

Possible messages appearing in the description of each history event:

```
Battery defective
Battery low prealarm
Battery low, pump stop
Bolus start
Bolus stop
External power off
External power on
Occlusion, pump stop
PrLimit change
Pump has detected failure
Pump off
Pump on
Pump start
Pump stop (KVO)
Rate change
Enter setup mode
Data lock off
Data lock on
Pump off in remote mode
Total (VTBI) change
```

```
No information available
Exit setup or PC configuration mode
Syringe barrel switch, pump stop
Syringe barrel diameter, pump stop
Syringe drive unit, pump stop
Syringe clamp, pump stop
Syringe clutch, pump stop
Syringe empty, pump stop
Syringe near empty
Timer alarm, pump stop (KVO)
Total volume reached, pump stop (KVO)
Logon in PC configuration mode
Logoff in PC configuration mode
Infsum cleared
Pump start, ext. changed parameters
Any defaults written in EEPROM area
CRC error in PC configuration mode
Enter PC configuration mode
PC communication timeout reached
Pump start in remote mode
Rate change during remote mode
```

4.3.7. History printout example



Description	Time	Rate	InfSum	Total	PrL	Syringe	Flags	Cause	#
Pump off	2006-02-21T14:07:58	711.0	44.3	0.0	900	157	0	11	177
Syringe near empty	2006-02-21T14:05:42	711.0	17.4	0.0	900	157	0	21	176
Rate change	2006-02-21T14:05:42	711.0	17.4	0.0	900	157	0	15	175
Rate change	2006-02-21T14:05:38	611.0	16.8	0.0	900	157	0	15	174
Pump start	2006-02-21T14:05:32	411.0	16.1	0.0	900	157	0	13	173
Syringe empty, pump stop	2006-02-21T14:05:04	411.0	16.1	0.0	900	157	0	20	172
Syringe near empty	2006-02-21T14:03:08	411.0	2.7	0.0	900	157	0	21	171
Rate change	2006-02-21T14:03:08	411.0	2.7	0.0	900	157	0	15	170
Syringe near empty	2006-02-21T14:02:46	401.0	0.3	0.0	900	157	0	21	169
Rate change	2006-02-21T14:02:46	401.0	0.3	0.0	900	157	0	15	168
Pump start	2006-02-21T14:02:42	301.0	0.0	0.0	900	157	0	13	167
Pump on	2006-02-21T14:02:32	1.0	0.0	0.0	900	0	0	12	166
Pump off	2006-02-21T14:02:14	1.0	4.0	0.0	900	157	0	11	165
Rate change	2006-02-21T14:02:08	1.0	4.0	0.0	900	157	0	15	164
Syringe near empty	2006-02-21T14:02:04	601.0	3.7	0.0	900	157	0	21	163
Pump start	2006-02-21T14:02:04	601.0	3.7	0.0	900	157	0	13	162
Syringe barrel diameter, pump stop	2006-02-21T14:01:46	601.0	3.7	0.0	900	157	0	31	161
Syringe near empty	2006-02-21T14:01:24	601.0	0.0	0.0	900	157	0	21	160
Pump start	2006-02-21T14:01:24	601.0	0.0	0.0	900	157	0	13	159
Pump on	2006-02-21T14:01:16	1.0	0.0	0.0	900	0	0	12	158
Exit setup or PC configuration mode	2006-02-21T14:01:12	0.0	0.0	0.0	0	0	0	27	157
Pump off	2006-02-21T14:01:10	1.0	392.7	0.0	900	157	0	11	156
Pump start	2006-02-20T06:39:00	1.0	361.3	0.0	900	157	0	13	155
Syringe empty, pump stop	2006-02-19T22:43:58	1.0	361.3	0.0	900	157	0	20	154
Syringe near empty	2006-02-19T22:41:14	1.0	361.3	0.0	900	157	0	21	153
Pump start	2006-02-17T17:18:58	1.0	307.9	0.0	900	157	0	13	152

All pre-alarms, alarms and technical failures are high lighted in a different colour.

5. SOFTWARE UPDATES

5.1. General

This chapter describes the procedure to perform a software update on the ARGUS 600 Syringe pump. To check the installed software release in your ARGUS 600 S press the "MODE" key while switching on the pump.

Please refer to your local distributor or ARGUS Medical AG to determine the latest software release able to run on your device hardware.

NOTE: Flash upgrades are only possible, starting from software version 3.0X.

5.2. Requirements for a software update

To update an ARGUS Medical device, the following items are needed:

- PC with Microsoft® Windows™ 2000 or newer, .NET Framework must be installed!
- RS-232 serial interface cable (part no. 10.093)
- PC configuration tool "ARGUS *service*"
- Latest firmware included in a text file named "A600_xxx.txt". ("xxx" is the placeholder for the firmware version).

Those items are available from your local distributor or from ARGUS Medical AG.

5.3. Software update procedure

5.3.1. General

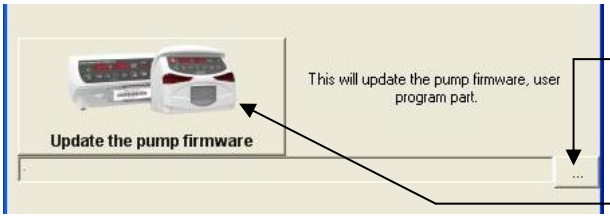
Please carefully check the software present installed on the pump. If you have a firmware < version 4.xx please follow *chapter 5.3.2* to upgrade the firmware.

5.3.2. Update of a pump with firmware > V4.xx

Important remark!

The actual calibration (and configuration) will be stored in a file on the PC, please be sure you will restore the correct file into the pump after the firmware update. Otherwise invalid calibration values will be stored on the pump.

1. Connect the pump to the serial interface of your PC. Please remember the COM port number where you have connected the pump.
2. Switch the pump **ON** while keeping key [10] pressed.
3. Start the PC configuration tool "ARGUS *service*" and select the according COM port.
4. Go into the configuration part and save the present pump configuration (incl. calibration) to a file.
5. Close the "ARGUS *service*" and switch the pump **OFF**.
6. Perform point 3 again, go into the "Update center".



7. Select the requested pump firmware file by pressing the button "…".
8. Press "Update the pump firmware". Follow the instructions displayed on the PC. The firmware will be installed and the pump will be switched off automatically.

9. Go into the configuration part again (refer to point 2-3). Press the "Edit" button and enter the pump PIN code (default PIN after firmware update is 0).
10. Restore the old configuration (incl. calibration) from the **previous** created file.
11. Restore the configuration by pressing the "Download" button.
12. Perform a standard safety check *(see chapter **Error! Reference source not found.**)*, normally the calibration will not be destroyed if the procedure is carefully performed step by step**.**

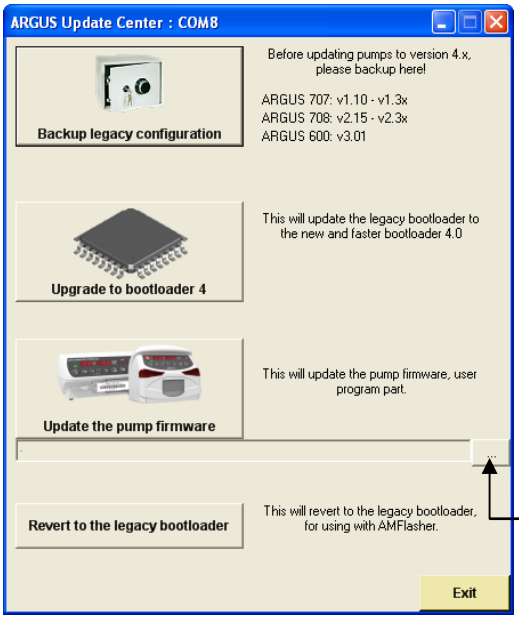
5.3.3. Upgrade of a pump with firmware < V4.xx

With the "Update center" it is also possible to upgrade pump firmware older than V4.xx.

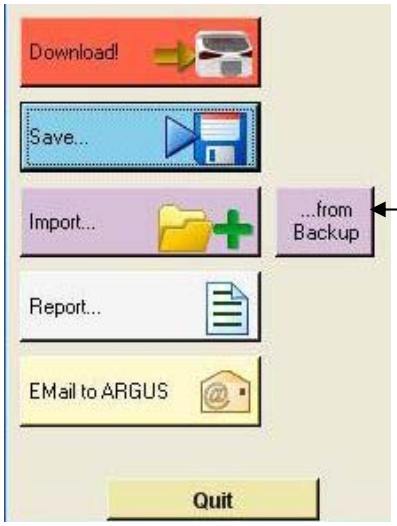
Important remarks!

The actual calibration (and configuration) will be stored temporary on the PC, please perform the upgrade procedure pump by pump. Otherwise invalid calibration values will be stored on the pump.

It is urgent necessary to perform a standard safety check (*see chapter 10*)!



1. Go into the "Update center" (*see point 1-4 of chapter 5.3.2.*):
2. Switch the pump ON by keeping the key [10] pressed.
3. Backup the legacy configuration (present configuration before the firmware update). This may take several seconds.
4. Switch the pump OFF.
5. Press "Upgrade to bootloader 4". Follow the instructions displayed on the PC. The bootloader will be upgraded then.
6. Select the requested pump firmware file by pressing the button "…".
7. Press "Update the pump firmware". Follow the instructions displayed on the PC. The firmware will be installed and the pump will be switched off automatically.



8. Switch the pump ON while keeping key [10] pressed. Start the “ARGUS service” tool and select the according COM port.
9. Import configuration *from backup*. The calibration values and configuration of last connected pump will be imported.
10. Download it to the pump by pressing the “Download” button.
11. **Important:**
    Perform a standard safety check (*see chap.10*), the calibration values maybe lost during the upgrade procedure!

5.4. Safety aspects

Be aware of the following points:

! For medical device traceability your local distributor or ARGUS Medical AG needs to be informed about every device updates (serial number) you performed!

! Do not make any software updates when the device is used and/or connected to a patient!

CAUTION!
A standard safety check *(see chapter 10)* has to be performed after every software update!

6. MAINTENANCE

6.1. General

CAUTION!
Only authorized persons who have been trained by ARGUS Medical AG or by the local distributor are allowed to service the ARGUS 600 Syringe pump. In case of repair request, send the unit with the filled out “repair order form” *(see chapter 11)* to the local distributor. Further information is available from:

ARGUS Medical AG
CH-3627 Heimberg / Switzerland
E-mail: info@argusmedical.com

CAUTION!
The Safety Standard Check (SSC) has to be performed at least every 24 month or after 10'000 hrs of operation. The check has to be done in accordance to *chapter 10*.
No special maintenance of the ARGUS 600 Syringe pump is necessary. There are no wear and tear parts.

6.2. Recalibration

6.2.1. General

The ARGUS 600 Syringe pump has been calibrated by the manufacturer with a calibrated spring gauge. The basic ex works configuration enables only one CODAN syringe type per size. To select a different pre-configured syringe, see *chapter 2.7*.

CAUTION!
For a new syringe calibration of a none recommended brand, see *chapter 2.6*.

6.3. Final calibration

6.3.1. General

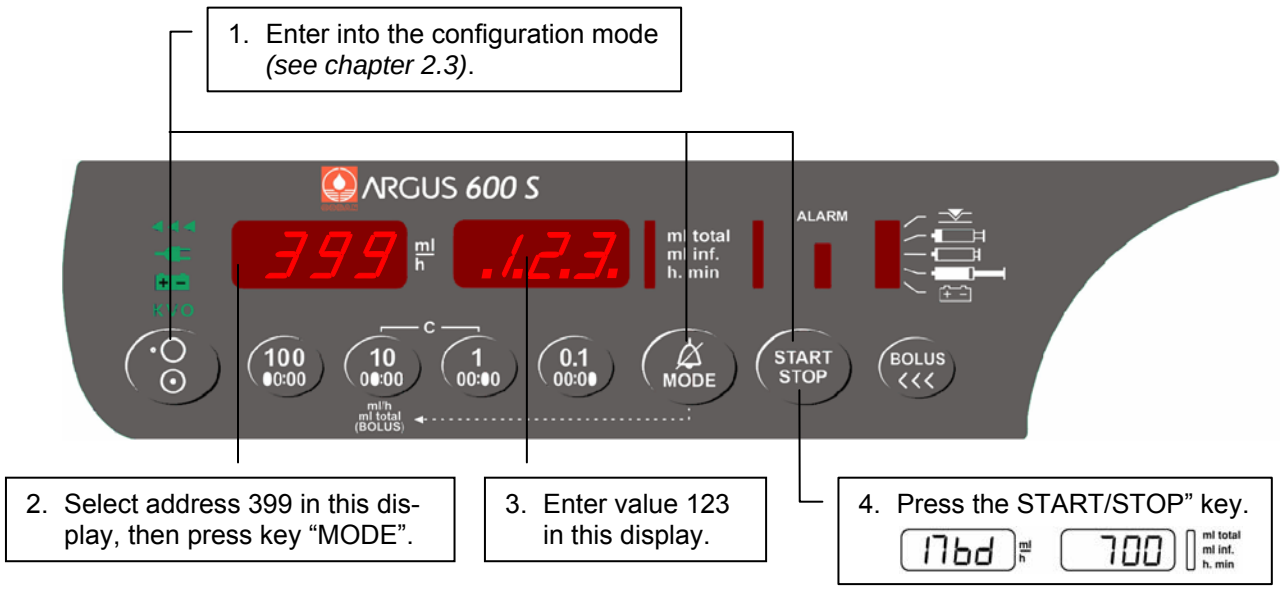
The ARGUS 600 Syringe pump contains different calibration steps:

- *syringe barrel holder* (pulled and unpulled)
- *drive unit* (totally left and right)
- *clamp* (fully closed and opened)
- *barrel diameter* (17 and 31 mm)
- *plunger length* (20 and 120 mm)
- *clamp diameter* (20 and 32 mm)
- *pressure limit* (0.2 and 1.2 bar)

CAUTION!
A calibration becomes necessary if the pressure control measurements were not accurate enough, a new syringe configured or any spare part was replaced (e.g. pressure sensor, main board, etc.)

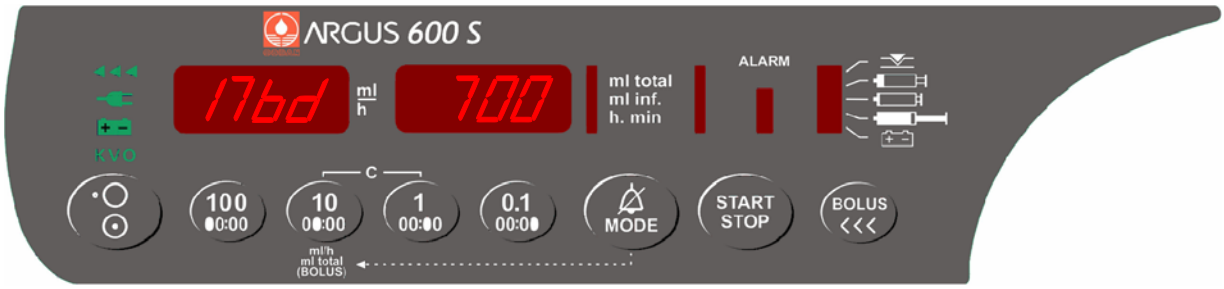
Needed equipment:
- a manometer with a resolution of 0.1 bar
- a 3-way stop cock
- a syringe extension line
- calibration part-2 & part-3
- a recommended 50 ml syringe

6.3.2. Enter into the calibration mode



6.3.3. Syringe barrel holder range verification (barrel diameter)

Please verify that the displayed values in the right hand display are within the correct ranges (without calibration part)

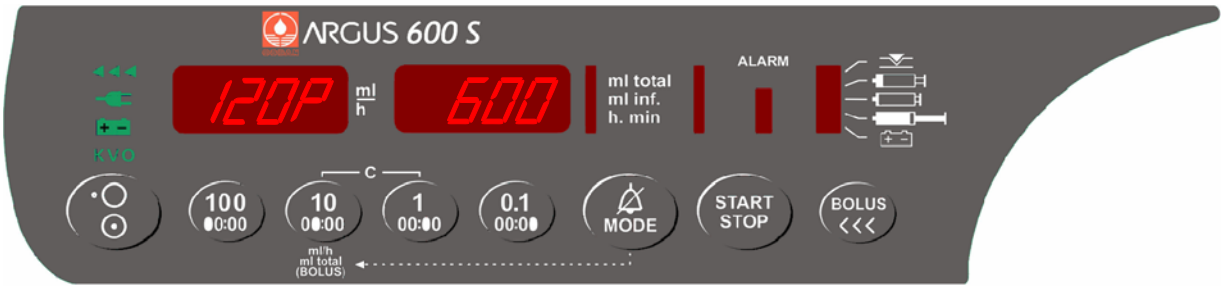


Valid range for the syringe barrel holder *(unpulled):* **700 ±300**
Valid range for the syringe barrel holder *(pulled):* **4200 ±300**

NOTE!
Please refer to chapter "Rough alignments" if the displayed value is out of range!

6.3.4. Drive unit range verification (plunger)

Press “MODE” key and verify that the displayed values in the right hand display are within the correct ranges (without calibration part)

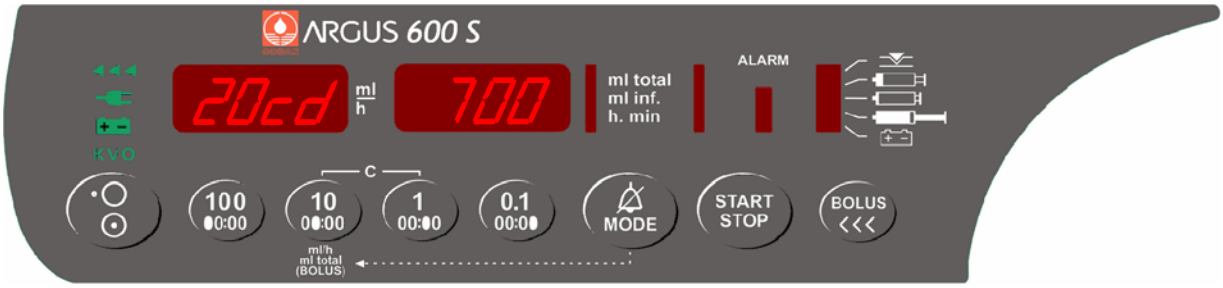


Valid range for the drive unit *(totally left):* **600 ±200**
Valid range for the drive unit *(totally right):* **4400 ±200**

NOTE!
Please refer to chapter "Rough alignments" if the displayed value is out of range!

6.3.5. Clamp range verification (clamp diameter)

Press “MODE” key and verify that the displayed values in the right hand display are within the correct ranges (without calibration part)



Valid range for the clamp *(fully closed):* **600 ±300**
Valid range for the clamp unit *(fully opened):* **2500 ±300**

NOTE!
Please refer to chapter "Rough alignments" if the displayed value is out of range!

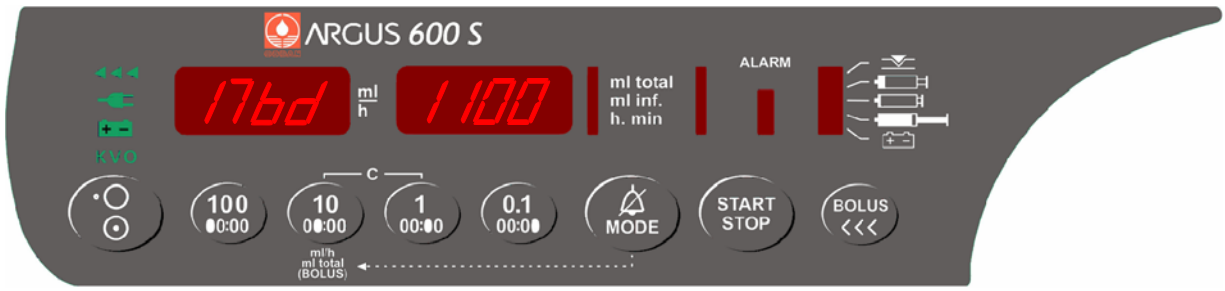
6.3.6. Syringe barrel holder diameter calibration (part-3)

Press “MODE” key until the display indicates “17bd” “xxxx” and put the calibration part-3 (∅17, l=120mm) in place.

Important remark: Verify the firm capture of the beaks and make sure there is no gap between drive unit and calibration part.

calibration part-1
(REF 11.194)

calibration part-3
(REF 10.153)

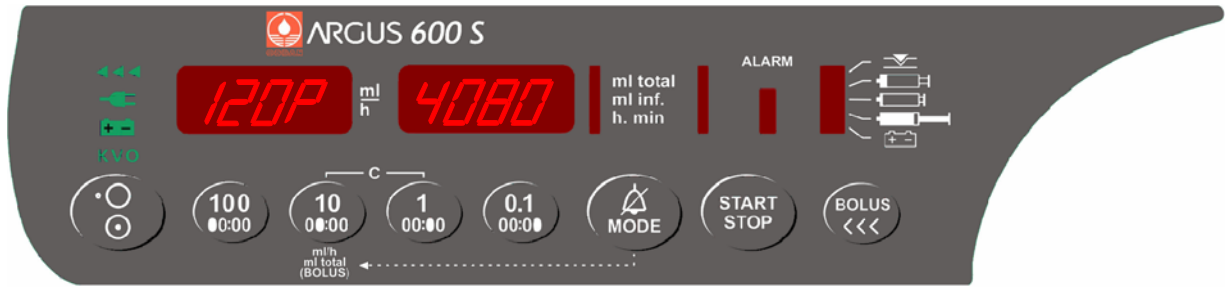


Press “START/STOP" key to store the barrel diameter for 17 mm.

NOTE! Each stored value will be acknowledged by a sound.

6.3.7. Drive unit (plunger) length calibration (part-3)

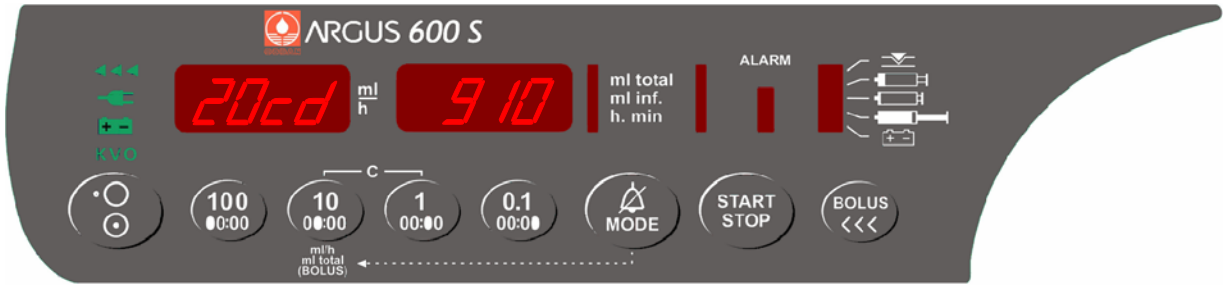
Press “MODE” key, the display indicates “120P” “xxxx”.



Press “START/STOP" key to store the plunger length for 120 mm.

6.3.8. Clamp diameter calibration (part-3)

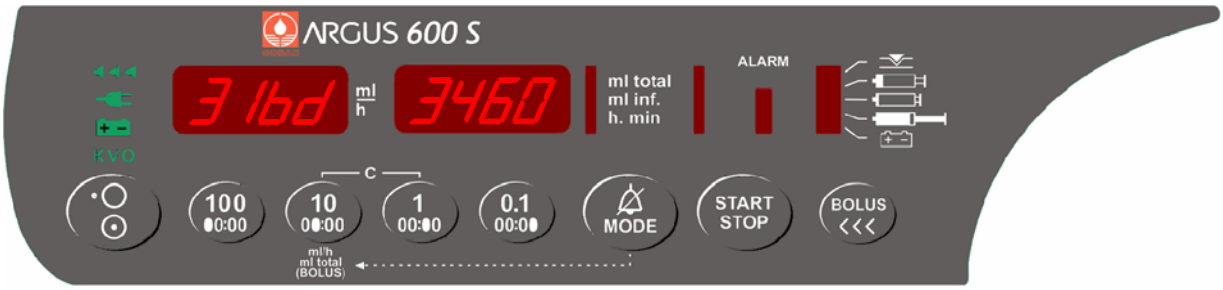
Press “MODE” key, the display indicates “20cd” “xxxx”.



Press “START/STOP" key to store the clamp diameter for 20 mm and then remove the calibration part-3.

6.3.9. Syringe barrel holder diameter calibration (part-1)

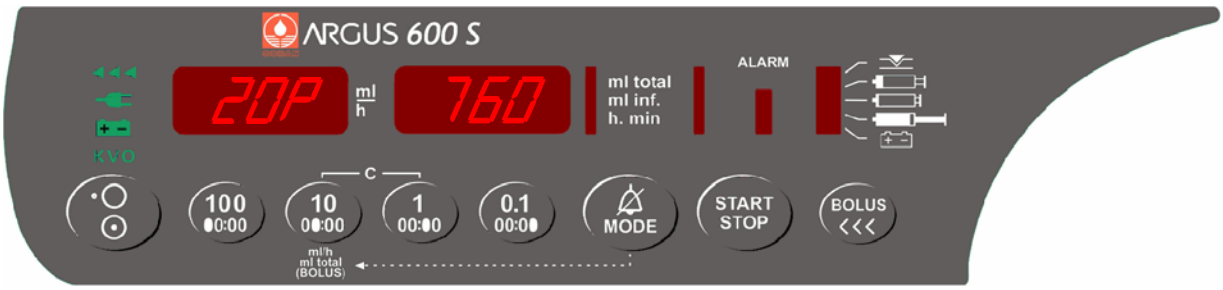
Press “MODE” key, the display indicates “31bd” “xxxx”, then put the calibration part-1 (∅31, l=20mm) in place.



Press “START/STOP" key to store the barrel diameter for 31 mm.

6.3.10. Drive unit (plunger) length calibration (part-1)

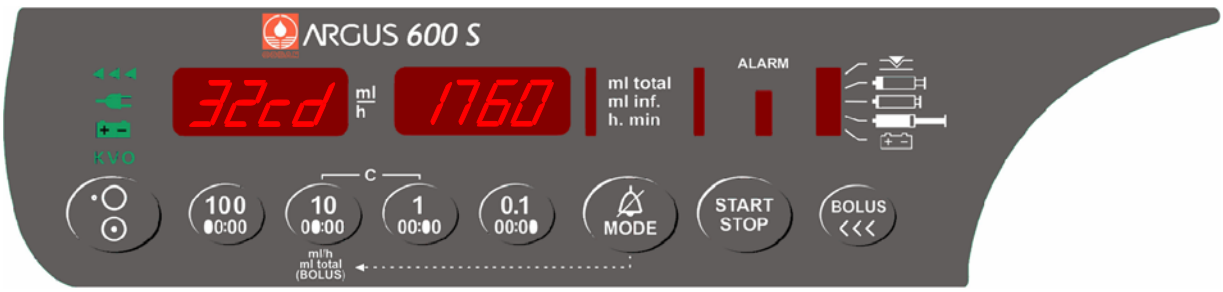
Press “MODE” key, the display indicates “20P” “xxxx”.



Press “START/STOP" key to store the plunger length for 20 mm.

6.3.11. Clamp diameter calibration (part-1)

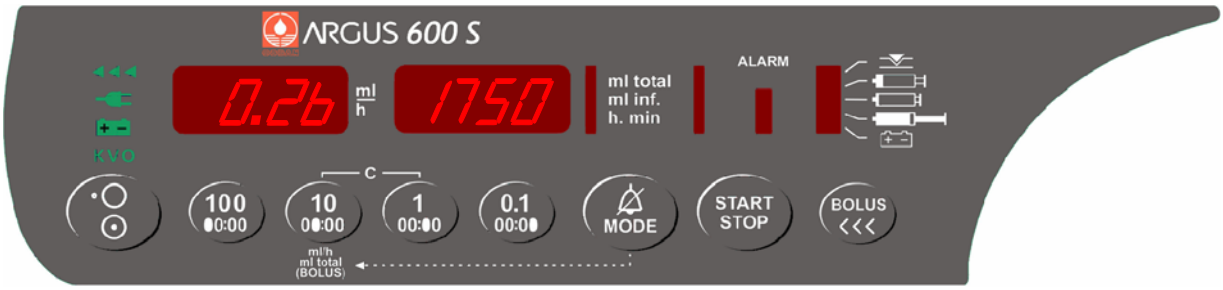
Press “MODE” key, the display indicates “32cd” “xxxx”.



Press “START/STOP" key to store the clamp diameter for 32 mm and then remove the calibration part-1.

6.3.12. Pressure limit calibration (minimal)

Insert a filled 50 ml syringe and connect the patient line to the pressure measurement system (manometer). Press "MODE" key, the display indicates "0.2b" "xxxx" and the pump starts to run with a low rate. Close the line (occl.)



Simulate an occlusion by the 3-way stop cock and start a pressure build-up.
Wait until 0.2 bar is reached on the scale and then press the "START/STOP" key immediately, to register the minimal pressure limit value for 0.2 bar.

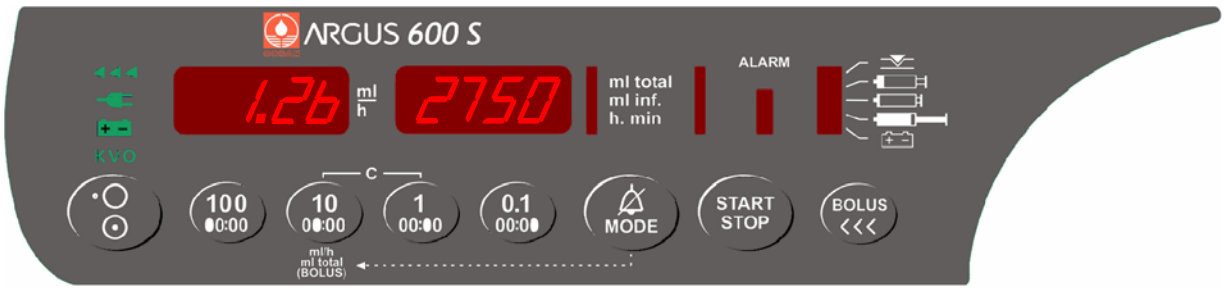
NOTE!
To speed up the process increase the infusion rate in steps, by pressing the key "1". It is recommended to reduce the rate (with key “100”) when the pressure on the manometer is close to 0.2 bar, this allows a more precise calibration.

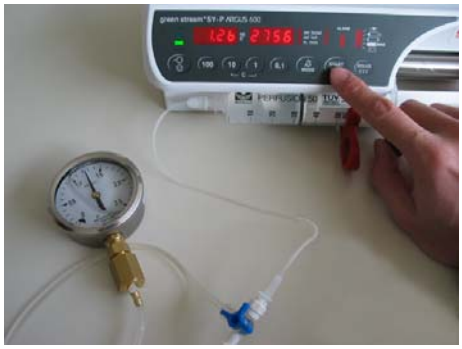
Important remark:
For each pressure calibration step, a new syringe from the same brand and batch must be used. For a more precise calibration, use a spring gauge. The ex works calibration has been performed with a spring gauge.

The spring gauge can be ordered directly from ARGUS Medical AG.

6.3.13. Pressure limit calibration (maximal)

Press "MODE" key, the display indicates "1.2b" "xxxx" and the pump continuous to run with a low rate.





Wait until 1.2 bar is reached on the scale and then press the "START/STOP" key immediately, to register the maximal pressure limit value for 1.2 bar.
Switch off the pump.

NOTE!
To speed up the process increase the infusion rate in steps, by pressing the key "1". It is recommended to reduce the rate (with key “100”) when the pressure on the manometer is close to 1.2 bar, this allows a more precise calibration.

6.4. Pressure control and pump accuracy measurement

Pressure control
Start an infusion at an infusion rate of 200 ml/h according to the user manual and set the pressure limit at 900 mbar. Connect a manometer with the system to see the pressure in the tube and then simulate a downstream occlusion.

The pump must stop and the alarm must be activated at the default pressure limit of 900 mbar ±200 mbar.

If the result of this control measurement does not fulfil the stated requirement, a pressure calibration according to chapter "Final calibration" has to be done.

Pump accuracy
Select a 50 ml syringe (e.g. Cod -50-) to check the pump accuracy. Insert a new syringe (e.g. Codan Perf. 50 ml) filled with distilled water and start to pump into a cup placed on a balance.

Pump settings: set rate at 200 ml/h, set “ml total” at 20 ml
Net weight result: 20 g ±2%

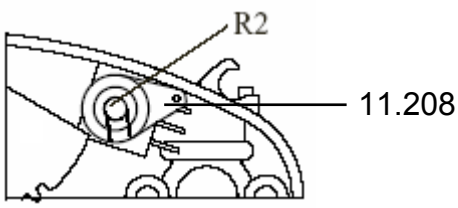
6.5. Rough alignments

Drive unit (plunger) length (P):

- Go into the configuration mode *(see chapter 2.3)*
- Select address 399
- Press key "MODE"
- Enter data 123
- Press key "START/STOP", the display indicates "17bd" "xxxx"
- Press key "MODE" until "120P" "xxxx " is displayed
- Loosen the lock screw of the cogwheel on the plunger potentiometer axle
- Move syringe drive (without syringe) fully to the left
- Turn the potentiometer axle in clockwise direction up to the final position and afterwards in the counter clockwise direction until approx. 600 is displayed
- Fix the lock screw!
- Control whether the full stroke can be made

Syringe clamp diameter (cd):

- Go into the configuration mode *(see chapter 2.3)*
- Select address 399
- Press key "MODE"
- Enter data 123
- Press key "START/STOP", the display indicates "17bd" "xxxx"
- Press key "MODE" until "20cd" "xxxx" is displayed
- Remove the syringe and make sure the clamp is fully closed
- Remove the cover of the drive unit (10.151)
- Remove the clamp spring
- Loosen the lock screw of the position lever (11.208)



- Turn carefully the potentiometer axle (R2) in counter clockwise direction up to the final position
- Turn position lever (11.208) counter clockwise until it touches the housing (see picture above)
- Fix the lock screw (make sure the position lever touches the housing)
- Re-install the clamp spring, then a value of approx. 600 is displayed
- Re-install the cover of the drive unit
- Control whether the clamp stroke can be made

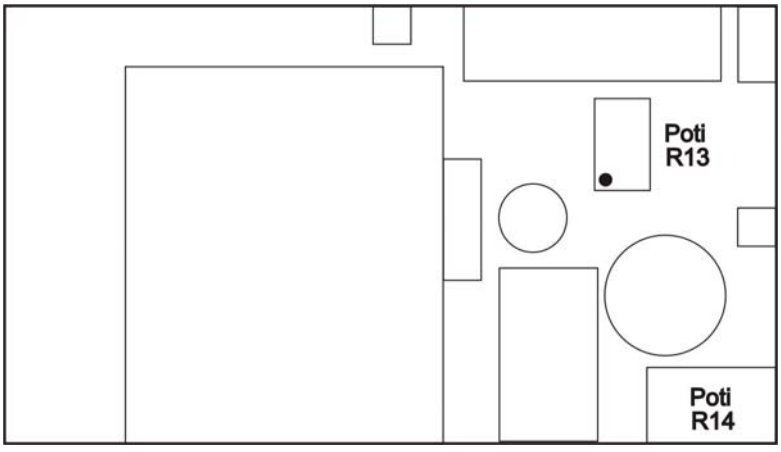
Syringe barrel holder diameter (bd):

- Go into the configuration mode *(see chapter 2.3)*
- Select address 399
- Press "MODE" key
- Enter data 123
- Press "START/STOP" key, the display indicates "17bd" "xxxx"
- Loosen the lock screw of the potentiometer R14 on the power board
- Turn the potentiometer axle (R14, on the power board) in the counter clockwise direction up to the final position and afterwards in the clockwise direction until approx. 700 appears in the display.
- Fix the lock screw
- Control whether the syringe barrel can make the full stroke.

Strain (pressure) gauge (b):

Caution: No syringe is inserted and the syringe drive is positioned fully right.

- Go into the configuration mode *(see chapter 2.3)*
- Select address 399
- Press "MODE" key
- Enter data 123
- Press key "MODE" several times until "0.2b" "xxxx" is displayed.
- Adjust the screw of the trimmer (R13, on the power board) until approx. 1500 is displayed.



Power Board

6.6. Battery capacity calibration

Each battery is subject to a chemical process with a slowly decreasing running time. After many charge and discharge cycles the battery may not have the capacity to provide the running time shown in the menu "CAP".

To adjust the running time of the used battery please follow these steps:

- Go into the configuration mode *(see chapter 2.3)*.
- Select address "200" in the left display (or index "368" if you are using the "ARGUS *service*" tool).
- Enter the data "615" in the right display and press the "START/STOP" key to accept the data. This will set the battery discharge time to the maximum of >10 hours.
- Switch the pump off.
- Be sure you have unplugged the line connection.
- Switch the pump on and run the pump on battery until it switches off.
- Charge the battery for more than 16 hours.
- Switch on the pump and start an infusion with a rate of 5 ml/h. The infused sum at this rate multiplied by 12 is now equal to battery operating time in minutes.
- Leave the pump running on battery until it switches off again.
- Connect pump to the AC line.

- Switch the pump on while keeping the key "1" pressed. Multiply the value in the right display by 12, this gives the capacity of the battery in minutes. Multiply this time by 0.8 and enter the result on address "200" in the configuration mode (or index "368" if you are using the "ARGUS *service*" tool). This time defines from now on, the battery running time of the pump including a 15 minutes pre-alarm (valid after a full charge).

- *Standard battery 6V/1.2 Ah*
  If this time is less than 2 h, you should replace the battery (part 12.032). If the specified typical time of 2 h is not required, the battery has to be changed only if the time less than 1.5 h, to respect to environmental pollution.

- *High energy battery 6V/4 Ah*
  If this time is less than 8 h, you should replace the battery (part 12.026). If the specified typical time of 8 h is not required, the battery has to be changed only if the time less than 5 h, to respect to environmental pollution.

6.7. Pump specifications

Please refer to the user manual for the specifications *(chapter 9)*.

6.8. Fault codes and "CtrL" message

6.8.1. Fault codes

A technical failure will be indicated by the pump with a continuous alarm. During this state, the fault code which causes the pump to fail can be displayed by pressing the “MODE” key. If the pump was switched OFF after a detected failure, the fault code will be stored in the history and also in the configuration of the pump, please refer to *chapter 2.7* (index 380 - 385).

Possible fault codes:

Fault Code	Failure
F_20	Internal watchdog
F_21	ROM test
F_22	ROM check (Runtime)
F_23	RAM test/check
F_24	XRAM test/check
F_25	CPU test
F_26	Invalid function menu
F_27	EEPROM data invalid
F_28	RTC (real time clock) data invalid, no RTC etc.
F_29	Stepper motor power test (delayed 5s)
F_30	Plunger position calculation failed
F_31	Check for near empty
F_32	5Volt supply out of range
F_33	20Volt supply out of range (delayed 5s)
F_34	Pressure reference out of range (LM385 2.5V)
F_35	Pressure signal out of range
F_36	Pressure result invalid
F_37	Pressure sensor test failed
F_38	Barrel diameter signal test failed
F_39	Barrel diameter signal out of range
F_40	Clamp diameter signal out of range
F_44	Address invalid for config-EEPROM
F_45	Address invalid for history-EEPROM
F_46	Frequency from µC or RTC (real time clock) out of range
F_47	Display-print not present
F_48	Key(s) too long active
F_54	Movement result invalid
F_55	Frequency calculation
F_56	Invalid volume adjustment over time
F_57	Rotation (SW overflow)
F_58	Internal volume control (10/ml)

We recommend replacing the main board in case a fault code is not included in above list.

6.8.2. "CtrL" message

If the time of the safety standard check is elapsed, the reminder alarm "CtrL" will be displayed after power up. The "CtrL" message also lights up when an invalid serial number is set or a faulty calibration done (pressure & mechanic).

7. REPLACEMENT OF PARTS

7.1. General

CAUTION!
The ARGUS 600 S may only be used with accessories and spare parts which have been approved by ARGUS Medical AG for safe technical use.

CAUTION!
If a new syringe was configured, pressure sensor, complete syringe drive, side wall, housing, main board or power board was replaced, a full calibration is required.

Battery replacing:
After a battery change a safety standard check becomes necessary or at least a visual check of the connections

Disassembly of the housing:
Disconnect the power cord and all interface connections prior to disassembly. Remove pole clamp at the rear side. Remove the 7 screws on the casing base (6 • M4 and 1 • M3), the 2 screws on left side cannot be removed completely. Place the casing cover behind the casing base.

Remove the main board:
Remove the battery connector and all other cables of the main board.

Remove the syringe drive:
Move the drive unit fully right and remove the fixing plate. Unsolder the connecting leads of the strain gauge (DMS) on the power board. Move the drive unit fully left. Disconnect earth cable from side wall, motor cable from main board and flex cable from power board. Remove the syringe drive out from the housing by fully pressed clamp & clutch levers.

Remove the cover drive unit:
Remove the 3 screws on the cover.
Important: To disassemble the unit, open the beaks by hand one third (or put a coin between the beaks) then pull the cover with the levers out of the housing.

Remove the power board:
Important: Replacing the power board requires a new rough alignment of syringe barrel holder diameter, strain gauge and a finale calibration. Unsolder the connecting leads of the strain gauge on the power board. Remove all cables from the board and the 4 fixing screws. Remove the board carefully.

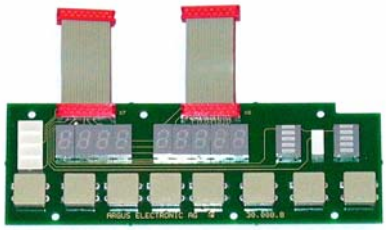
Insert the power board:
Syringe barrel holder must be in the closed position (no syringe inserted). Loosen the lock screw of the cogwheel on the syringe barrel holder potentiometer (R14) axle. Fix the power board with the 4 screws. Make sure the lock screw of potentiometer R14 is accessible from above. Solder the connecting leads of the strain gauge and connect the other cables. Make sure to remove the AC power cord and operate the pump (with open housing) on battery power for rough alignments.

Replace the sidewall (motor):
After each disassembly or replacing of the sidewall, the rough alignment of the strain gauge and a final calibration must be executed to guarantee a perfect pump operation and pressure monitoring.

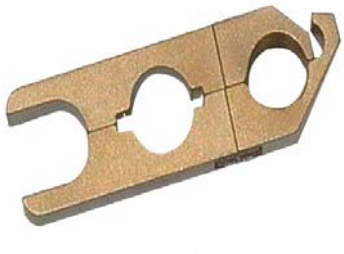
For the part numbers of replacements parts consult the following chapter:

7.2. Spare parts

10.059 Cable staff alert 2m



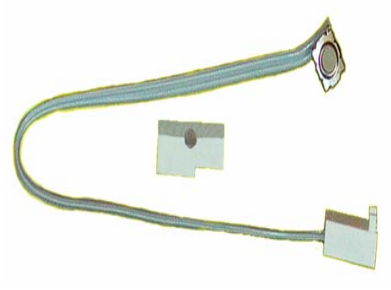
10.061 Display board A600



10.066 Spindle nut complete

10.068 Motor and gear

10.087 Combination clamp

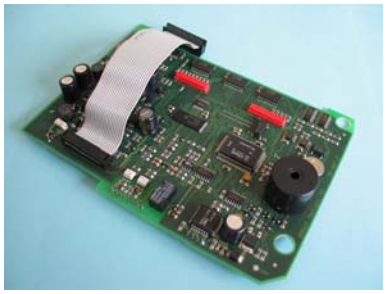


10.091 Pushbutton Kit

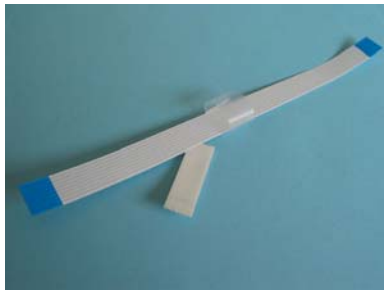
10.093 Interface cable, docking & pumps

10.131 DC-Plug

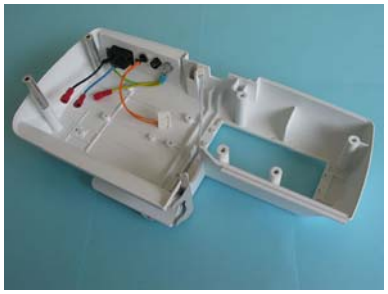
10.146 Power board A600 Flash



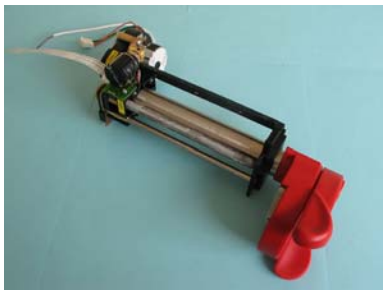
10.147 Mainboard A600 Flash



10.148 Kit Flex cable Flash version



10.149 Casing base Flash version

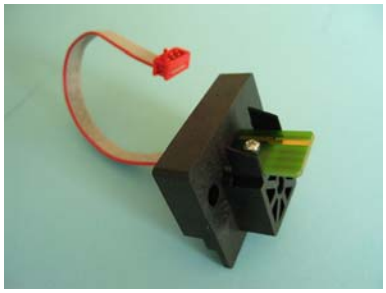


10.150 Syringe drive complete Flash version

10.151 Cover drive unit Flash version

10.152 Housing drive unit Flash version

10.153 Calibration part 3



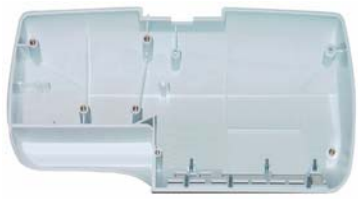
10.155 Edge board holder
Flash version

10.157 Driving head complete
Flash version

11.168 Syringe barrel holder

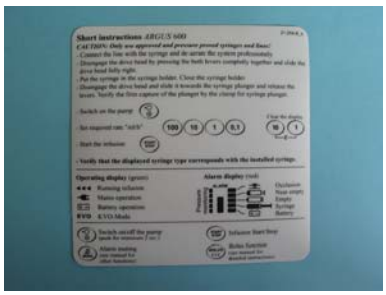
11.170 Side wall motor incl. DMS

11.188 Syringe guide



11.189 Casing cover

11.194 Calibration part 1



11.199 + 11.201 + 11.225 - 11.232
Short instructions A600
(DE,EN,FR,PT,SW,SP,NL,DK,IT,CZ)

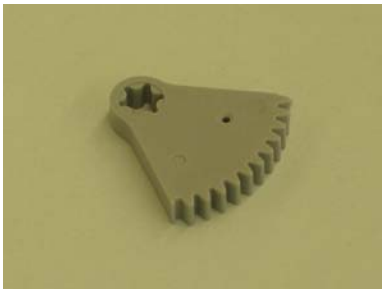
11.200 Identification plate A600

11.213 Front panel A600

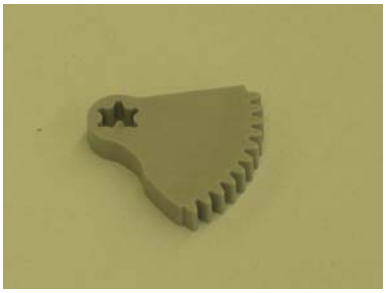
11.267 Battery cover 4Ah

11.270 Clamp (top) Flash version

11.271 Clamp (bottom) Flash version



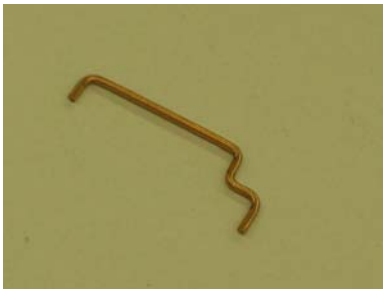
11.272 Cog segment (top)
Flash version



11.273 Cog segment (bottom) Flash version

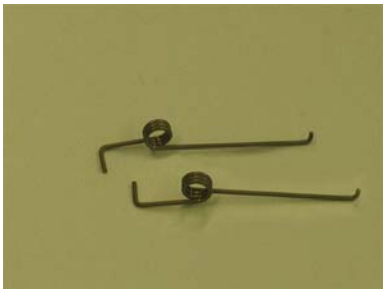
11.274 Working lever Flash version

11.275 Beaks lever Flash version



11.276 Spring clamp Flash version

11.277 Casing (driving head) Flash version



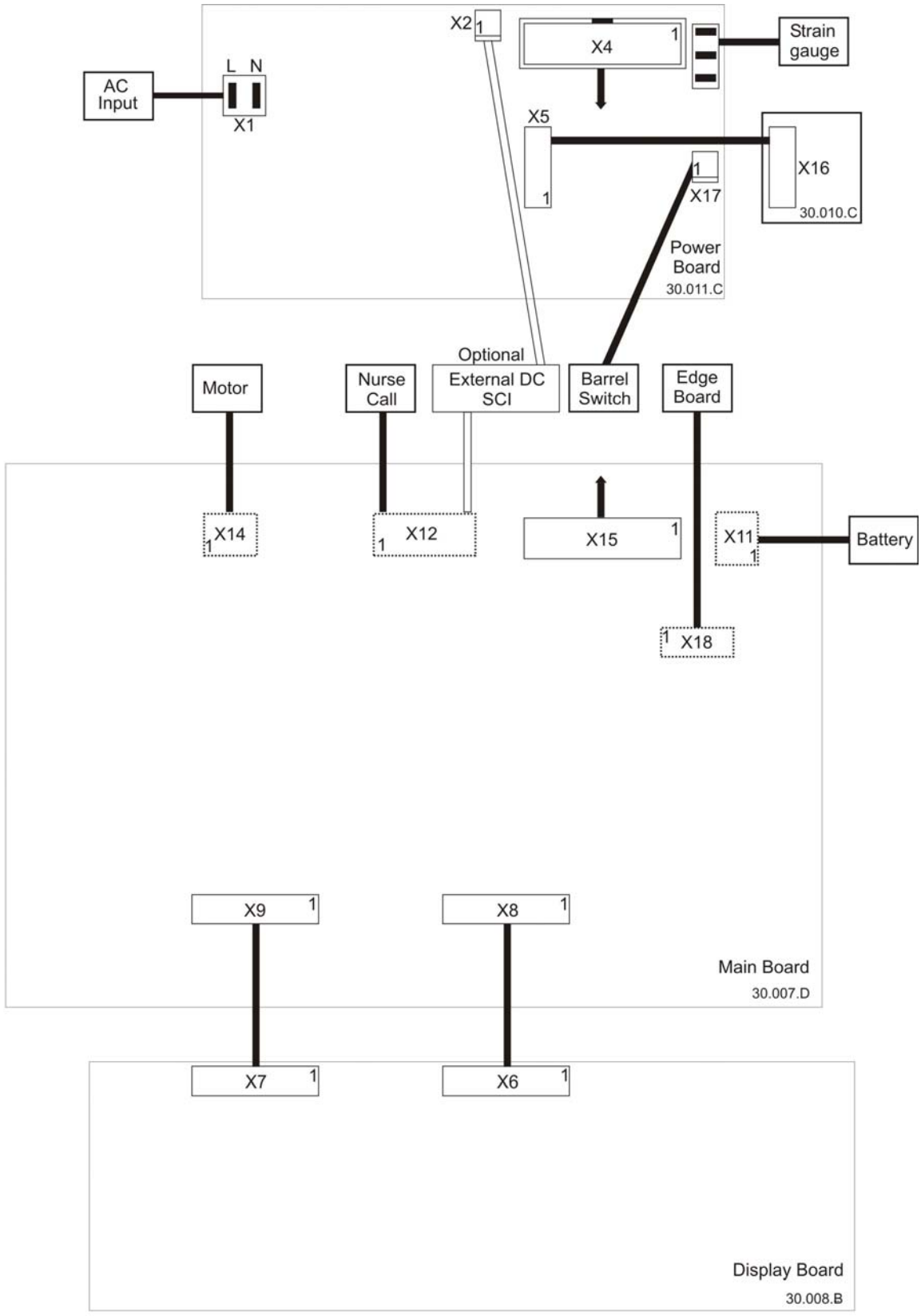
11.278 Torsion spring Flash version

12.026 Battery 6V/4Ah

12.032 Battery 6V/1.2Ah

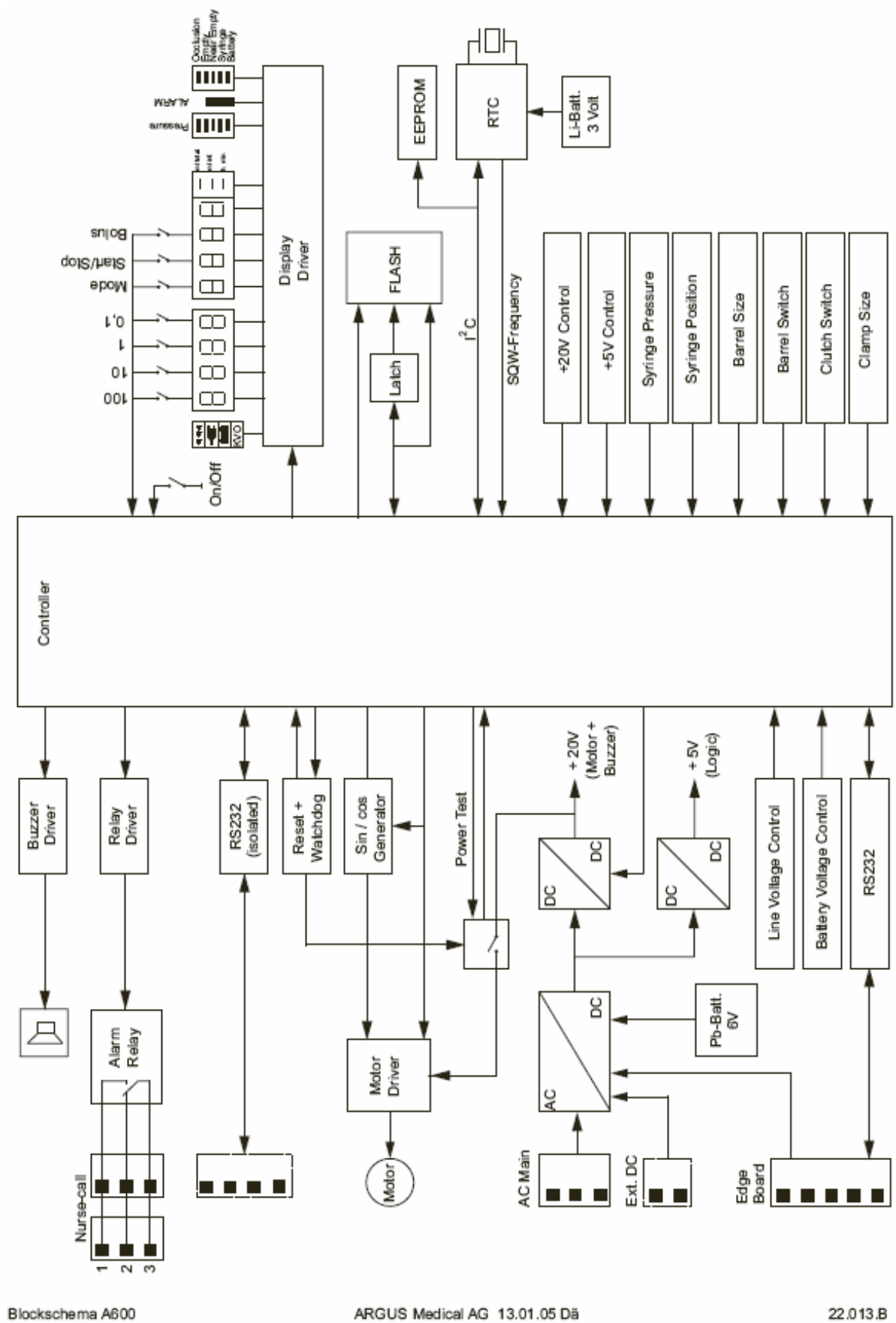
12.035 Pressure gauge with stopcock (manometer)

8. WIRING DIAGRAMM



Verdrahtungsplan A600 ARGUS Medical AG 13.01.05 Dä 22.014.B

9. BLOC SCHEMATIC



Blockschema A600 ARGUS Medical AG 13.01.05 Dä 22.013.B

10. SAFETY STANDARD CHECK

Safety Standard Check (SSC) ARGUS 600_en

Serial-no.: ……..……..	Inventory-no.: ……..…….....
Software version: ……..…	Customer: ……..……..
Hospital: ……..……..…	Department: ……..

The SSC has to be performed at least every 24 months or after 10'000 hours of operation.
The check has to be done in accordance to the user- and service manuals.

1	Check if a software upgrade is required		
2	Visual check for damage, cleanness and completeness. Remove the syringe and ensure that the barrel holder is closed at the end.	- Housing, labels, accessories, connectors, power cable, etc. - Beaks must be fully closed without a syringe inserted	
3	Keep "MODE" key pressed while switching on the pump	- Display of pump type and software release - Display of 2, 4, 7, F., in numeric display - Display of all operation/alarm indicators	
4	Press each key in the following order: "100", "10", "1", "0.1", "MODE", "BOLUS", "START/STOP"	- Every key is aknowledged by a acoustical click, at the end an alarm (buzzer and LED) occurs	
5	Hold the clamp lever in its upper position ① Press the syringe presence switch ② Actuate the clutch lever, release it ③ Release the clamp lever ④ Release the syringe presence switch ⑤	① "Syringe" alarm ② No "Syringe" alarm ③ "Syringe" alarm, no "Syringe" alarm ④ "Syringe" alarm ⑤ "Syringe" alarm	
6	Insert a 50 ml syringe and test the pump at its max. rate (999.9 ml/h)	- Running smooth?	
7	Check the occlusion-alarm pressure. See chapter "Pressure control and pump accuracy measurement".	- Pressure increase to ≥ 1.2 bar possible? - Preset level: …….. mbar - Measured level: ……. mbar	
8	Check the pump accuracy. See chapter "Pressure control and pump accuracy …".	- Preset ml total: 20 ml - Measured volume: ……. ml	
9	Check the external connection “nurse-call”	- Relay contact switches (see chapter "Bloc schematic")	
10	Check the Docking Station interface (if the pump is used in a Docking Station)	- The indicator “external supply” must light on a docked pump	
11	Check time and date	- Get the history entries	
12	Charge the battery min. 16 hours on mains	- The indicator “external supply” must light	
13	Discharge the battery at a rate of 6 ml/h until the pump switches off automatically. Keep "1" key pressed while switching on the pump. Read the infused sum (ml inf.) and multiply it with 10.	- The green indicator "battery" must light while discharging - Running time = ml inf. • 10 = ……. min Reference: 120 min or 480 min	
14	Charge the battery again		
15	Electrical test according to EN 60601-1 (all measurements made with a power cable 2.5m)	- Visual check of mains connector - Measurements attached	

The pump has passed the SSC and is safe for use

Date / Name: ……..……	Signature: ……..…

ARGUS Medical AG

11. REPAIR ORDER FORM

ARGUS Medical AG / Heimberg Switzerland
REPAIR ORDER FORM

Purchase order / Proforma invoice number:

Customer name and address:

Name of contact person: Tel. number:

Device:

A414	☐	ARGUS 100 P	☐
A400	☐	ARGUS 100 M	☐
A404	☐	ARGUS 600 S	☐
A200	☐	ARGUS 707 V	☐
A300	☐	ARGUS 708 V	☐

Serial Number:

Accessory: Serial Number / Production code:

Detailed failure or problem description:

Expected work / repair to be done:

Repair	☐
Warranty repair	☐
Replacement	☐
Other	☐

Description:

Date: Signature: